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Intensifying the exercise using a device to control the angles of muscle work in developing the chest muscles and maximum strength for bodybuilding players

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Abstract

The significance of the research emerged through the development of certain muscle groups (chest muscles and maximum strength) in the sport of bodybuilding, which requires intensive exercises using a device that controls the angles of muscle work. This device greatly contributes to creating a qualitative training breakthrough that aligns with the demands of bodybuilding by determining the movement path of the exercise to achieve the goal the researcher aims to explore in using the muscle angle control device. The focus is precisely on this in exercises to develop certain muscle groups (chest muscles and maximum strength) so that they harmonize with the development objective.

As for the research problem, there is fatigue or a drop in effort in specific parts during the exercise's movement path. This involves performing traditional exercises that have been in practice for many years across all bodybuilding exercises. The transition in the amount of effort exerted on the muscle along the range of motion for the involved body parts is required to address the state of fatigue and reduced effort in those parts, which demands greater muscle pressure in each exercise according to the working muscles. The result of this is to generate an intensification of the effort exerted on the muscle. Since the researchers work in training and development by supervising the

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training of many athletes practicing this sport, it was found important to move towards designing an innovative device that demonstrates control of muscle work angles in executing exercises. This is something not currently available in the Iraqi, Arab, or global training environments specialized in bodybuilding.

Keywords: exercise, angles of muscle ,maximum strength, bodybuilding

Introduction

The goal of developing training methods and techniques is to elevate athletic performance to achieve high levels of achievement in various sports. Consequently, the methods have diversified, and their effects have varied, prompting specialists and those involved in training to choose the best approaches that regulate training, improve technical performance, and develop players' capabilities. This is what coaches aim for in order to reach the same effort and technical performance required in competitions. Even when athletes reach higher levels, it still requires maintaining performance with nearly the same effort in most competitions.(Mousa & Kadhim, 2023)

Training with weights through intensive exercises to achieve competitive bodybuilding has many requirements, and the trainee must have the capacity to endure these somewhat strenuous exercises needed over long training hours. Often, we find a lack of noticeable physical progress, where the focus on muscle size may lead to neglecting other performance aspects, potentially resulting in injuries or delays in muscle development.(Mondher et al., 2023)

The development of certain muscle groups (chest muscles) in bodybuilding requires intensive exercises using a muscle angle control device, which significantly contributes to creating a qualitative training breakthrough that aligns with the demands of bodybuilding to develop certain muscle groups through intensive exercises. This is achieved by determining the movement path of the exercise to fulfill the training objectives and maintaining regular exercise. This is a challenging task that demands significant effort to reach higher levels and optimal performance during bodybuilding competitions.(HalahAtiyah et al., 2024)

The idea of the research emerged from the determination of one of the researchers, who is a star in bodybuilding locally and regionally, in consultation with other researchers to design a muscle angle control device for the challenging exercises aimed at developing important muscle groups. Therefore, the researcher established intensive exercises using the muscle angle control device.

From here, the importance of the topic the researcher intends to explore in using the muscle angle control device became evident, with a precise focus on exercises to develop and enhance certain muscle groups (chest muscles and maximum strength) so that they harmonize with the development objectives.(Khedir, 2018)

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Problem Statement:

Bodybuilding has witnessed significant interest from enthusiasts worldwide, especially in the last decade. This is evident from the growing number of young people focusing on developing their muscle groups and showcasing them through weight training in specialized gyms. This study aims to provide a genuine solution to transforming the traditional movement patterns and performance that have been in practice for many years. The movement path of all exercises in bodybuilding involves the transition of the amount of effort exerted on the muscle throughout the range of motion for the body parts involved in the exercise. This leads to points of fatigue or reduced effort in specific areas during exercise performance.

Consequently, the researcher is motivated to address this issue and attempt to overcome it by constraining the athlete's movement during exercise within a path of movements with higher impact, avoiding periods of fatigue or decreased effort. This will exert greater muscle pressure in every exercise according to the working muscles, generating an intensification of the effort applied to the muscle. Since one of the researchers is a champion in this sport and works in training and development by supervising the training of many athletes practicing this sport, it was deemed important to design an innovative device that demonstrates control of muscle work angles in executing exercises. Such a device is currently unavailable in the Iraqi, Arab, or global training environments specialized in bodybuilding.

Research Objectives:

1. Design and manufacture a muscle angle control device.
2. Develop intensive exercises using the muscle angle control device to enhance chest muscles and maximum strength for bodybuilders.
3. Identify the impact of exercise intensification using the muscle angle control device on the development of chest muscles and maximum strength for bodybuilders.

Research Hypotheses:

1. Intensifying exercises using the muscle angle control device has a positive effect on developing chest muscles and maximum strength for bodybuilders, favoring the post-test results.
2. Intensifying exercises using the muscle angle control device has a positive effect on

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developing chest muscles and maximum strength for bodybuilders, favoring the experimental group in the post-test results.

Definition of Terms:

Intensive Exercise is defined as "the absence of rest periods or the presence of short rest periods between attempts or repetitions, focusing solely on the movements to be learned" (Hammad, 2010, p. 215).

The researchers consider intensive exercise to be one that relies on either increasing the training load or reducing the assumed duration of normal training by constraining the athlete's movement during exercise within a path of movements with higher impact, thus avoiding periods of fatigue or reduced effort. This will result in greater muscle pressure exerted in each exercise, generating intensification in the effort applied to the muscle and achieving greater strength.

Materials and Methods

The researchers utilized the experimental method, "which is a path followed by the researcher to identify various conditions and variables related to a phenomenon and to control and manage them" (Farhan, 2015, p. 29). This includes designing two equivalent groups: the experimental and control groups, with pre-test and post-test measurements.

Research Community and Sample:

The researchers conducted their study on a sample from the community represented by specialized bodybuilding centers in Baghdad, with a weight range of (80-95 kg), consisting of (35) players participating in the Iraqi Championship in Baghdad for the 2022-2023 season. "This part represents the original community or is considered the model on which the researcher conducts his work" (Al-Kadhimi, 2012, p. 84). The researchers randomly selected their sample from the research community from some specialized centers participating in the Iraqi Championship in Baghdad through a lottery system, as shown in Table (1). They divided them into an experimental group consisting of (8) players and a control group consisting of (8) players.

Research Fields:

- Human Field: The human field consists of bodybuilders from specialized centers for the 2022-2023 season, totaling (35) players.

- Time Field: From 1/12/2023 to 7/2/2024.

- Spatial Field: Centers such as (True Gym), (Top Gym), and (Destroy Gym) for bodybuilding and fitness.

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Table (1)

Shows the homogeneity of the research samples in weight, chronological age, and training age.

Measurements	Units of Measurement	Mean	Standard Deviation	Median	Skewness Coefficient
Weight	Kg	87,375	5,402	85,000	0,292
Chronological Age	Y	29,562	4,857	29,000	0,098
Training Age	Y	4,187	0,981	4,000	0,564

N=1

It can be observed from Table (1).

All skewness coefficient values were less than (±1), indicating their homogeneity. The equivalence between the control and experimental groups in physical tests and body measurements will be calculated after they have been determined, selected, applied, and measured using the independent samples t-test, which will be detailed and explained in the pre-test.

Methods of Data Collection and Tools Used: Tools and Equipment Used:

Muscle Angle Control Device.

Dell brand laptop (Chinese-made).

Strength training equipment (free weights and machines).

20-meter fabric measuring tape.

Electronic Body Scale (TCS-200-RT).

iPhone (14) mobile camera for documentation.

Exercise benches.

A barbell with weight discs ranging from (2.5 kg - 25 kg).

Dumbbells of various weights from (2.5 kg - 25 kg).

Methods of Information Gathering:

Arabic and foreign sources.

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The World Wide Web (Internet).

Personal interviews (see Appendix 1).

Observation.

The research team (see Appendix 2).

Tests and measurements.

Field Research Procedures: Determining Research Variables and Selecting Tests: After reviewing the sources and consulting among researchers, the researchers determined the variables being investigated, which are targeted by intensive exercises using the muscle angle control device aimed at developing certain muscle groups (chest muscles and maximum strength) suitable for the sample of the research.

Muscle Angle Control Device: This device is wireless and displays on a screen, aimed at measuring the range of motion angles during exercise at (0, 15, 30, 45, 90, 110). It provides an auditory signal and displays the angle on the screen wirelessly. It consists of either two pieces or one piece as follows:

First Piece: Muscle angle control device, which includes

A three-digit digital screen with specifications mentioned in materials.

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Figure (1)

2. Two microcontrollers, IC number 16F873A.

3. One operational amplifier, LM3583.

4. Two lithium batteries, 3.7V, 2500mAh. Additionally, one small lithium battery,

Figure (4)

5. Two Type-C charging cards for the two pieces.

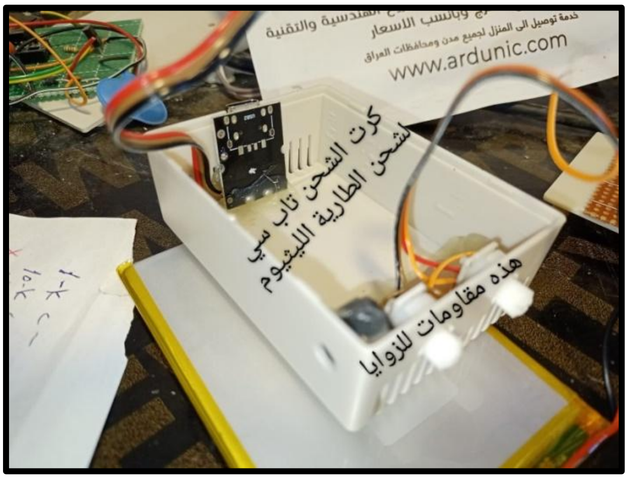

Figure (5)

6. Sound alarm, 12 volts.

7. Small Voltage Booster XL6009E1

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Figure (6)

Figure (7)

8. Gyroscope, model No. GY61, unlock.

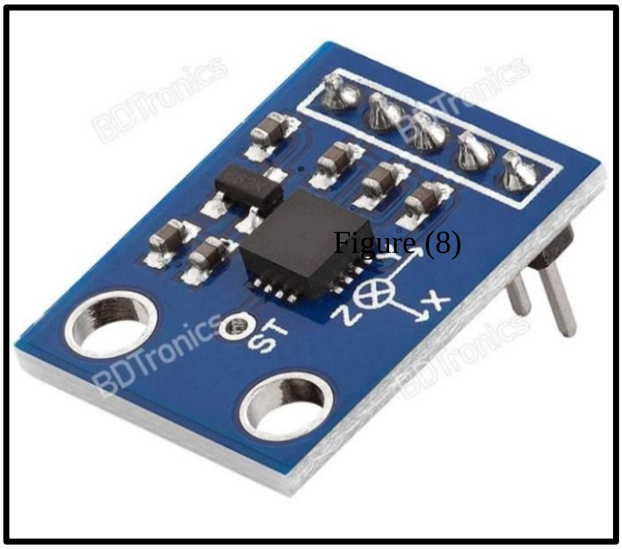

Figure (8)

9- No bc337 transistor. Number 15.

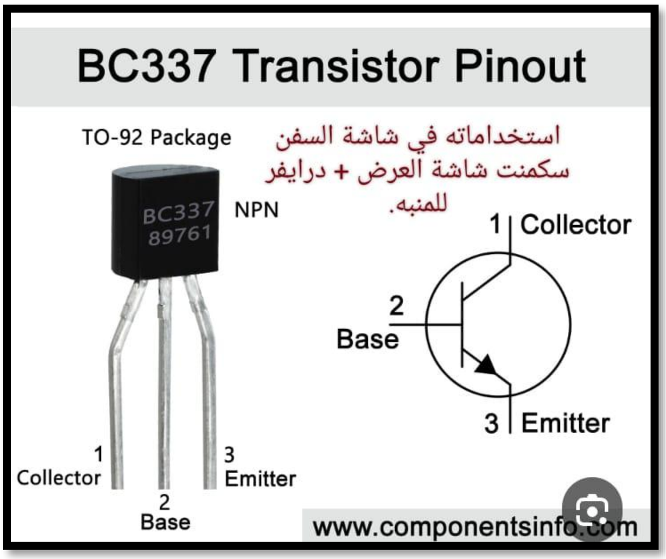

Figure (9)

10. Quarter-watt resistors for various general uses, dividers, and protection, etc.

11. Various capacitors for filter usage and stabilizing readings naturally.

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Figure (10)

Figure (11)

12. Transparent black acrylic plastic interface.

13-Two 315khz remote controls.

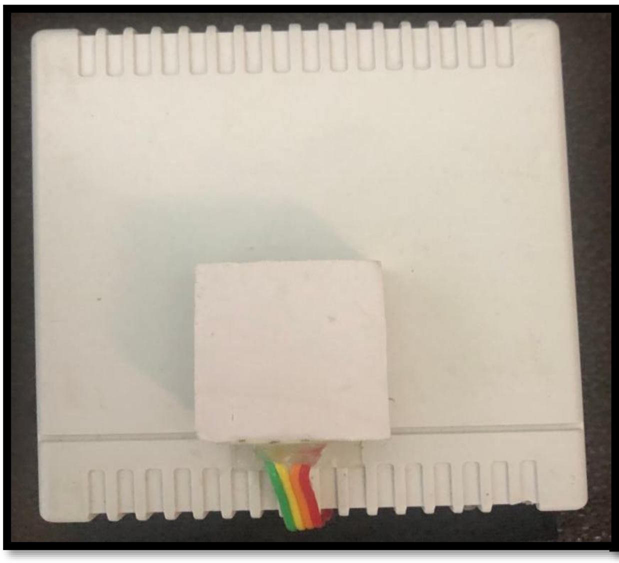

Figure (12)

Figure (13)

14. Two remote receivers.

15. A small plastic box to place on the foot or hand, containing the device materials for sending data to the digital screen.

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Second Piece: Muscle Angle Control Device (auditory signal only): This device determines the starting angle and the ending angle of motion and is placed on the elbow or knee:

1. Flex sensor with a resistance of 10 kilo-ohms.

2. Microcontroller type PIC12F675.

3. IC type operational amplifier No. LM358 for sensor operation regulation.

4. Variable resistors, 10k ohms, number 2, to determine the starting and ending angles.

5. Small voltage booster that raises from 3.7V to...

6. Lithium battery 2000mAh to power the device.

7. Type-C charging card for charging the battery.

8. Small sound alarm, 5 volts.

9. Various resistors for multiple uses.

10. Multiple capacitors for filter uses, etc.

11. Voltage regulator type LM7805.

12. Small plastic box for assembling the components + small switch, ON/OFF.

First: Body Measurements (Chest Muscles)

The tests for the research were selected after agreement with the scientific committee and supervisors, as follows:

1- Test name: Bench Press (Allawi & Rizwan, 1994)

Purpose of the test: To measure the maximum strength of the arm muscles through forward pushing motion.

Equipment used:

1. A barbell weighing 20 kg.

2. Iron plates of various weights, ranging from 0.5 kg to 25 kg.

3. A bench specifically designed for the bench press exercise.

- Performance description:

After calculating the weight of the bar and plates in accordance with the player's capability, the player lies flat on the bench, holding the barbell with a grip width equal to chest width. The player then bends their arms down to chest level, pauses for two seconds, and then fully extends the arms.

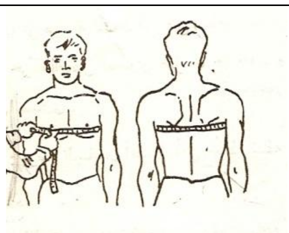
- Scoring:

The player is given three attempts, and the highest weight from a single, legally performed attempt is recorded.

Figure 14 the maximum strength test for the chest and arm muscles.

Second: Body Measurements (Rizwan M., 1997).

Table 2 shows the forms of body measurements.

n	Test or measurement form	Name of the test or measurement
1 2	Chest circumference measurement – ale Chest circumference measurement – ale	

Pre-Tests

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The researchers conducted a maximum strength test and pre-measurements before starting intensive exercises using a device for controlling muscle angle during chest muscle development for bodybuilders in the research sample.

The pre-tests were conducted on 8 players from the research sample on Friday, December 1, 2023, at 3:00 PM at True Gym, a specialized bodybuilding center, over one day. The tests included body measurements and the physical test (maximum strength bench press).

After performing the pre-tests for the research variables, the research sample was divided into two groups: 8 players for the experimental group and 8 players for the control group.

The researchers then calculated the equivalence between the two groups (experimental and control) in all physical tests and body measurements using the independent samples t-test, which shows that both groups (experimental and control) were equivalent in all physical tests and body measurements. This is evident since all calculated significance level values (sig) were greater than the adopted significance level (0.05), indicating the equivalence of the two samples, as illustrated in Table 3.

Table (3) shows the equivalence of the research groups.

n	tests	Experimental up		Control Group		t- ue	sig	Significa
		b	a	b	a			
1	Chest umference ale	116.7	5.83	114.5	5.05	0.7	0.4	Non- ral
2	Chest umference alation	114.6	6.27	112.8	5.81	0.5	0.5	Non- ral
3	Maxim Strength t (Bing ss)	107.5	15.8	99.37	14.7	1.0	0.3	Non- ral

The researchers implemented intensive exercises (training units) using a device to control muscle work angles, taking into account the following: the duration of the training unit, the goal of the training unit, the target muscles in the specific exercises, the training intensities used in the exercises, the number of sets and repetitions, and the rest intervals between sets and between exercises.

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The researchers employed a hierarchical method and selected the maximum weight for each exercise and muscle. Based on this, the planned training intensity for the exercises was executed according to specific angles on the device.

Target Weight = Maximum Weight × Desired Intensity / 100

Similarly, the maximum repetitions for each exercise were calculated as follows:

Target Repetitions = Maximum Repetitions × Desired Intensity / 100

The researchers determined the number of training hours to be 8 weeks, with 2 training units per week, totaling 16 training units. They also set the start and end dates for the training. During each training unit, the researchers focused on one muscle group and targeted it in the training.

The exercises included the following:

- The exercises began on Tuesday, December 5, 2023, and ended on Monday, February 5, 2024.

- The duration of the exercises was 8 weeks, divided into 2 training units per week, totaling 16 training units.

- The number of exercises was 5 (see Appendix 3).

- The number of sets for each exercise was 3-4.

- The number of repetitions ranged from 8 to 12.

- The rest interval between sets was 30 seconds to 1 minute.

- The rest interval between exercises was 1-2 minutes.

- A hierarchical training method was used.

- The duration of the training unit was 45 to 60 minutes.

It should be noted that the movement path for the exercises was determined using the muscle work angle control device for the experimental group.

3-5-5 Post-Tests

After completing the specific exercises, the researchers conducted the post-tests on February 7, 2024, at 3:00 PM. The researcher repeated the same procedures as in the pre-tests at the same specialized centers and within the designated time for the research sample.

Statistical Methods

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1. Mean.

2. Standard Deviation.

3. Skewness Coefficient.

4. T-test for paired samples.

5. T-test for independent samples.

6. Rate of Improvement = {(Post-Test Mean - Pre-Test Mean) / Pre-Test Mean} × 100 (Dimitriou et al., 2002).

Results

presentation of the T-Test Results for Anthropometric Measurements and their Development Percentage for the Experimental Group in the Pre- and Post-Tests:

The results of the T-test for body measurements and the percentage of improvement for the experimental group in the pre-test and post-test are presented below:

Table(4)

Means, Standard Deviations, and Calculated t-Values for the Pre-Test and Post-Test in Body Measurements for the Experimental Group

N	Tests	bre		Post		GF	G H2	T ıe	sig	assi
		b	a	b	A					
1	Chest umference ale	116.71	5.834	117.91	5.887	1.200	0.200	5.973	0.001	sigr
2	Chest umference alation	114.60	6.277	116.11	6.197	1.512	0.314	4.814	0.002	sigr

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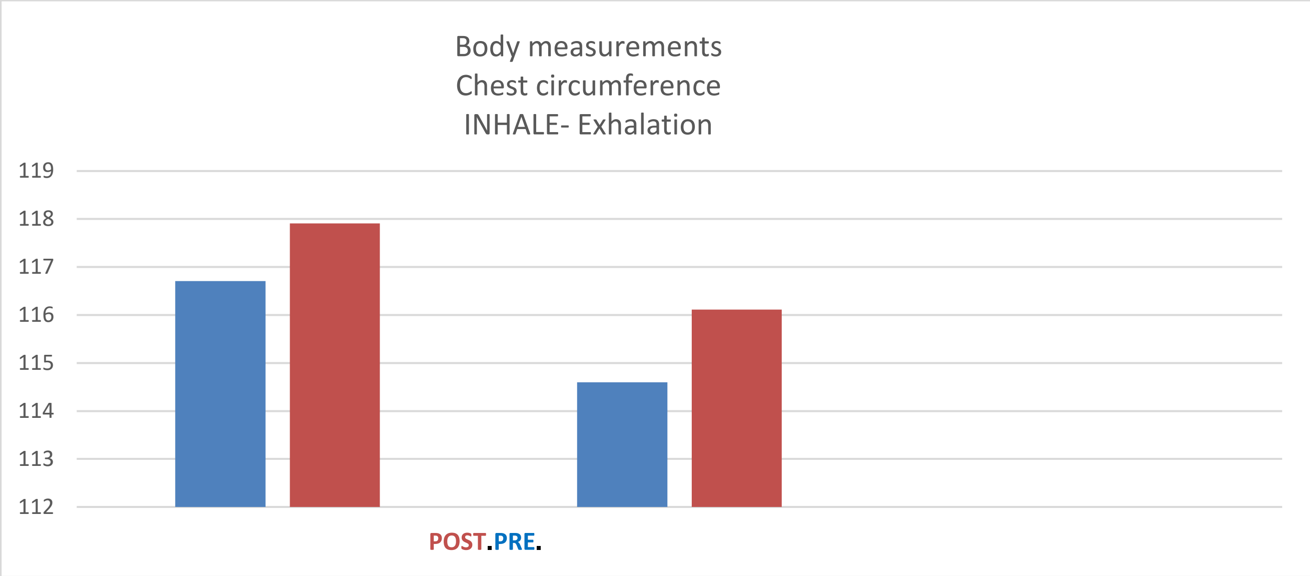

Figure (15) shows the pre- and post-arithmetic means of the experimental group in the body measurements test.

Presentation of the T-Test Results for Maximum Strength Test and its Development Percentage for the Experimental Group in the Pre- and Post-Tests:

Table (5) : Means, Standard Deviations, and Calculated T-Value for the Pre- and Post-Tests in Maximum Strength Tests for the Experimental Group

N	Tests	bre		post		GF	G H2	T ıe	sig
		b	a	b	a				
1	Maximum ɛngth Test ɴch Press)	107.50	15.811	120.625	15.683	13.125	1.619	8.104	0.001

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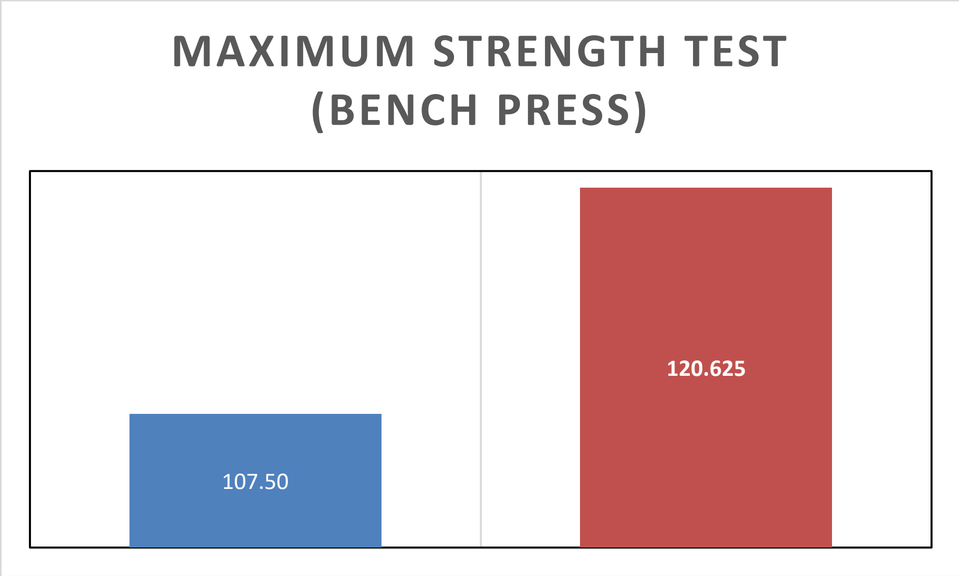

Figure (16) : This figure illustrates the means (arithmetic averages) of the pre- and post-test results for the experimental group in the maximum strength tests.

Presentation of the T-Test Results for Anthropometric Measurements and their Development Percentage for the Control Group in the Pre- and Post-Tests:

Table (6): Arithmetic means, standard deviations and calculated (t) value for the two tests (pre- and post-test) in body measurements for the control group

N	Tes ts	bre		Post		GF	G I2 F	T alue	sig	assime nt	Devlop ng raito
		b	a	b	A						
1	Ch est mferenc nhale	114.56	5.052	114.8 62	5.020	0.30 00	0.0 73	4.0 99	0.0 05	signific ant	0.26%
2	Ch est mferenc halation	112.87	5.811	113.3 12	5.827	0.43 7	0.1 37	3.1 82	0.0 15	signific ant	0.39%

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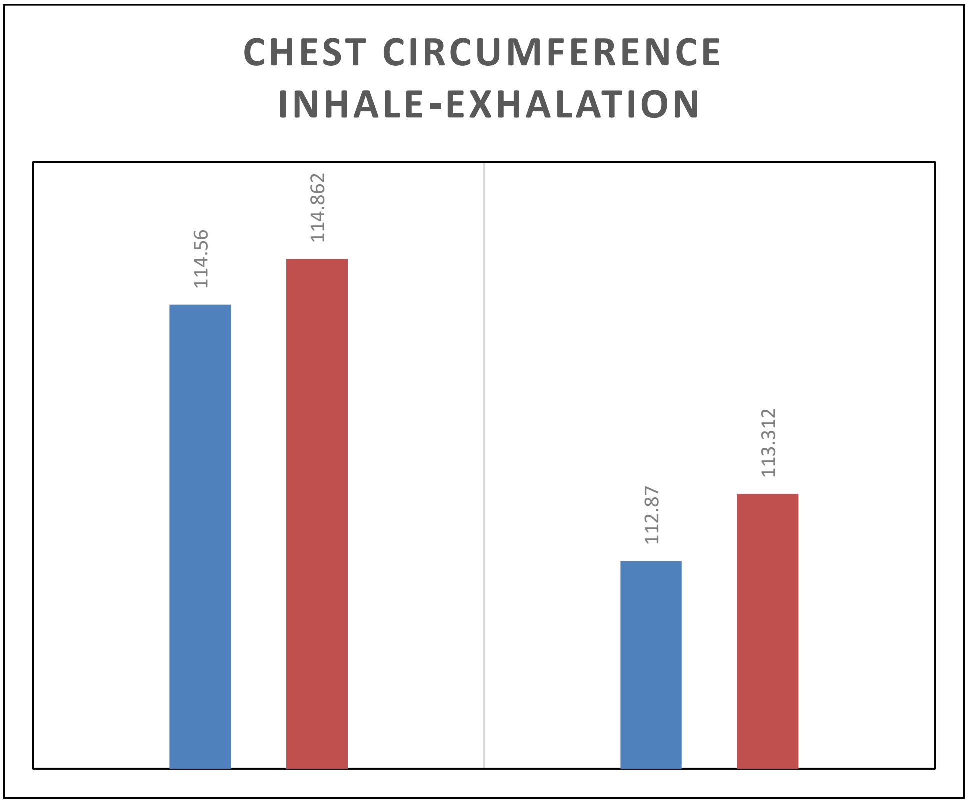

Figure (17) shows the pre- and post-arithmetic means of the control group in the body measurements test.

Presentation of the T-Test Results for Maximum Strength Test and its Development Percentage for the Control Group in the Pre- and Post-Tests:

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Table (7) : Means, Standard Deviations, and Calculated T-Value for the Pre- and Post-Tests in Maximum Strength Tests for the Control Group

N	Tests	bre		post		G	G	T	si	assim	Devlo raito
		b	a	b	a						
1	Maxi Strength (Bench s)	99.	14.	102.	13.	3.	1.	2.	0.	signif	3.45

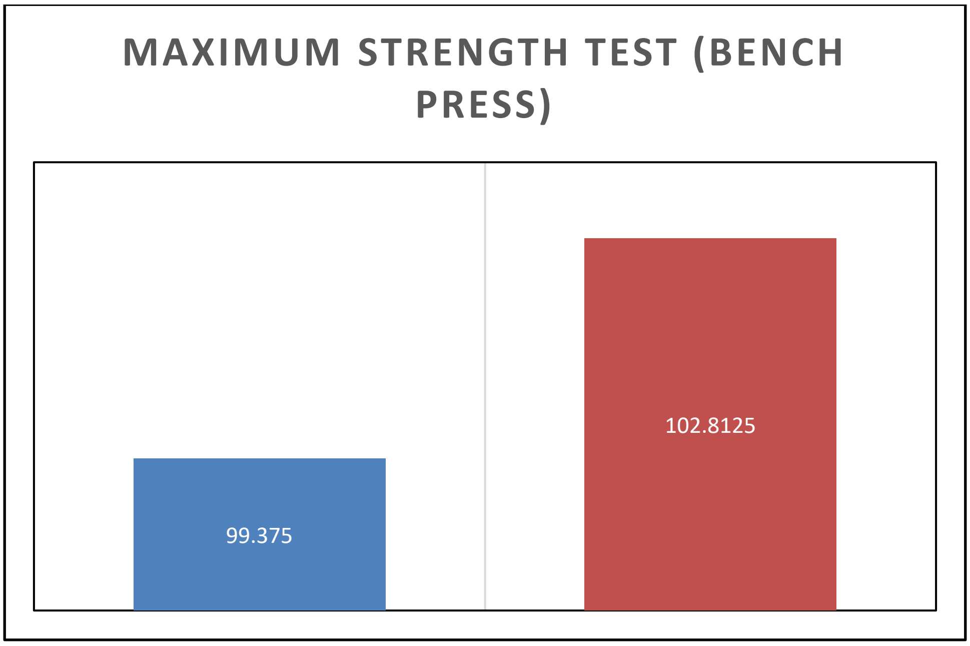

Figure (18) shows the pre- and post-arithmetic means of the control group in the maximum strength tests.

Presentation of the maximum strength tests of the control group in the pre- and post-tests:

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Table (8): Means, Standard Deviations, and Calculated T-Value Between the Experimental and Control Groups in the Post-Tests for Anthropometric Measurements

N	Tests	Experimental		Control		T ue	sig	assiment
		b	a	b	A			
1	Ches umferen nhale	117.9	5.88	114.8	5.02	1.11	0.28	unsignific
2	Ches umferen alation	116.1	6.19	113.3	5.82	0.93	0.36	unsignific

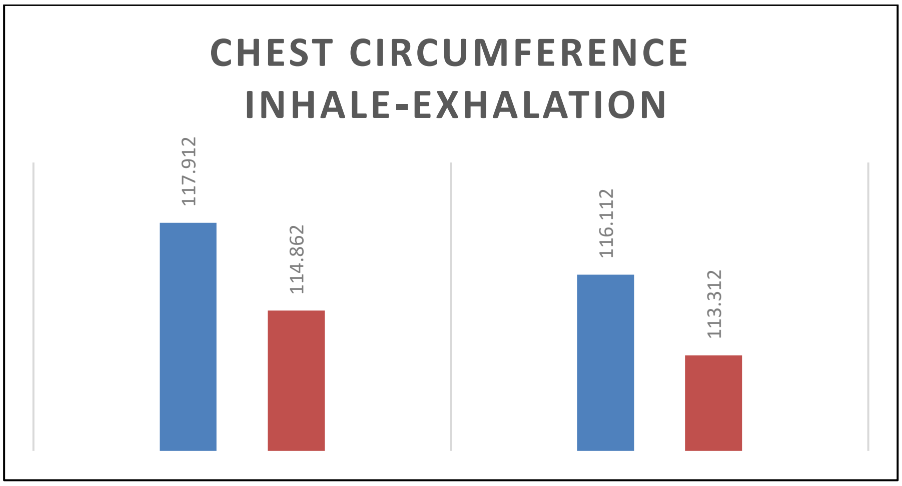

Figure (19) shows the arithmetic means of the experimental and control groups in the post-tests of the body measurements.

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Table (9): Comparison of the Development Percentage Between the Experimental and Control Groups in Anthropometric Measurements Test

N	Tests	Experimental	Control
1	Chest circumference ale	1.02%	0.26%
2	Chest circumference alation	1.31%	0.39%

presentation of the T-Test Results for Maximum Strength Tests of the Experimental and Control Groups in the Post-Test:

Table (10): Means, Standard Deviations, and Calculated T-Value Between the Experimental and Control Groups in the Post-Tests for Maximum Strength Tests:

N	Tests	exprimental		controlled		T ue	sig	assimen
		b	a	b	a			
1	Maxim Strength t (Bench ss)	120.6	15.6	102.8	13.8	2.4	0.0	signific

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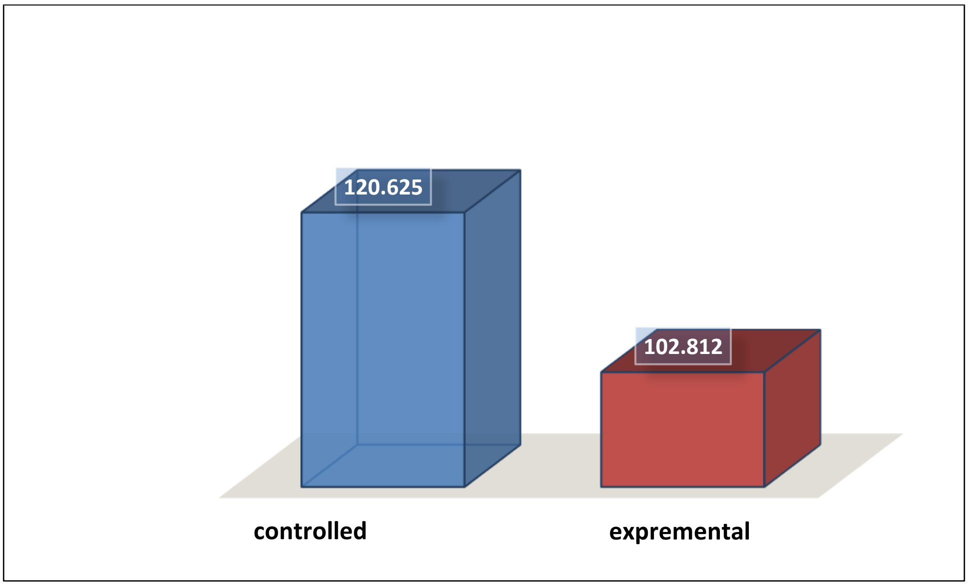

Figure (20): Comparison of Arithmetic Means for the Experimental and Control Groups in the Post-Tests for Maximum Strength

Table (11) shows a comparison of the rate of development between the experimental and control groups in the maximum strength tests.

N	Tests	Experimental	Control
1	Maximum Strength t (Bench Press)	3.45%	12.2%

Discussion

Discussion of the Anthropometric Measurements of the Experimental Group in the Pre- and Post-tests:

Based on Table (4) and Chart (15), the results of the anthropometric measurements for the experimental group in the pre- and post-tests show significant results in all aspects. Researchers emphasize that the adherence to the intensive exercises in question has yielded positive results in terms of the chest circumference, which is a crucial factor in bodybuilding, as it reflects the amount of muscle density achieved through intensive training. This is supported by Nouri Ibrahim Al-Shouk, who stated that "Anthropometric measurements are among the most important indicators for selecting athletes, as they are the foundation upon which athletes reach higher levels" (Al-Shouk, 1996, p. 13). These positive results are attributed to the precise and calculated adherence to intensive training over a period of 60 days. This resulted in noticeable changes in the chest circumference, as confirmed by Marwan Abdul Hamid, who noted that "Sports training is one of the factors leading to anthropometric changes in the athlete's body. Engaging in any type of sports activity regularly and

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over a long period results in physical changes in accordance with the nature of that activity" (Abdul Hamid, 1999).

Chest circumference is one of the essential anthropometric measurements, reflecting the physical condition of the athlete. Continuous measurements help track the progress and improvements resulting from intensive training on the body's structure. Muscle cross-sectional area is one of the most influential factors in strength. This is confirmed by Risan Khuraibit and Ali Turki, who stated, "Increased muscle mass (circumference) is associated with increased strength, especially maximum strength. Muscle hypertrophy is reflected in the increase in the muscle's cross-sectional area, where an increase of 1 cm^2 in men leads to an increase in muscle strength by 7–12 kg" (Khuraibit & Turki, 2002, p. 75).

As for the measurement of chest circumference (inhalation and exhalation), it reflects the functional condition of the athlete, particularly in bodybuilding. During competition, athletes need to achieve maximum inhalation and exhalation, holding their breath for the longest possible time. The purpose of this is to emphasize the body's structure and muscular development through various poses.

The athlete takes a deep breath to demonstrate and highlight the expansion of the rib cage, evident in the front and back lat spread, as well as in the front and rear double biceps poses, and in the side poses. In contrast, the maximum exhalation performed by the athlete while displaying bodybuilding poses serves to highlight the muscles of the waist area through the contraction of the abdominal muscles, aiming to showcase the muscular leanness of the waist, which is emphasized in the abdominal poses from the front and side.

Discussion of Maximum Strength for the Experimental Group in the Pre- and Post-Tests:

Researchers attribute the superior results of the post-test over the pre-test in terms of maximum strength, as shown in Table (5) and Chart (16), to the intensive exercises employed by the experimental group. These exercises involved high-intensity movements with a wide range of motion, which had a positive effect on the outcomes achieved by the group. This is particularly beneficial in bodybuilding, where the performance technique helps to guide the movement's path, allowing more space within the muscle fibers to absorb greater amounts of protein and adaptations. These adaptations are what bodybuilders strive for. This is supported by Adel Abdel Basir, who states, "Every set of exercises should be designed to have a strong impact in developing adaptations for the specific abilities required by the type of activity" (Abdel Basir, 2006, p. 108). The term "exercise intensification" refers to muscles being subjected to resistance along the full range of motion, influenced by supportive techniques to achieve the desired outcomes of these exercises.

Additionally, the muscle angle control device had a clear impact through the precision it provided in defining the movement path of the exercise. This resulted in greater exercise intensification, which is emphasized by Kamal Al-Rabadi, who says, "Devices, tools, and equipment

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have become essential for any training team and coach alike, to assess the athlete's level, capabilities, progress, and the time required for development. The coach can use this information to determine the necessary training doses to improve performance" (Al-Rabadi, 2005, p. 8).

The method of intensifying training using the muscle angle control device adds to the strength of contraction more effectively than other methods. This includes the high-frequency transmission of nerve impulses, as well as additional energy generated by stimulating the soft tissues in the ligaments, joints, and tendons. This added energy itself leads to relative increases in maximum strength, thereby enhancing the muscles' efficiency in lifting heavier weights .

In bodybuilding, there is a strong connection between strength training and the continuous pursuit of muscular adaptations. As maximum strength increases, muscle mass increases as well. Maximum strength is used with varying training loads in bodybuilding, aiming to achieve specific muscular adaptations, such as hypertrophy.

The use of maximum strength in bodybuilding is essential for achieving muscular adaptation, as high-intensity strength exercises are commonly employed, especially during the general preparation phase when athletes need to build significant muscle density. This is achieved through the use of a pyramid system, with gradual increases in intensity based on training methods and other foundational principles.

-Discussion of the Anthropometric Measurements for the Control Group in the Pre- and Post-Tests:

From Table (6) and Chart (17), it is clear that all anthropometric measurements for the control group showed statistically significant differences between the pre- and post-tests, with the post-test results being superior. Researchers attribute these improvements to the training program designed by the coach and implemented by the control group, which had a positive impact on developing the anthropometric measurements of bodybuilders in specialized centers.

However, it should be noted that while the coach played a key role in the progress made by the players through diligent training, the improvements did not reach the same level of statistical significance as those seen in the experimental group. This aligns with what Dua A'id emphasizes, stating that "The method used allows the coach to control the intensity of the exercises and the rest intervals between repetitions and between different training sessions" (Al-Ta'i, 2014, p. 113).

This suggests that while the control group benefitted from a structured training program, the experimental group's intensive and specialized training led to more pronounced physical development.

- Discussion of Maximum Strength Tests for the Control Group in the Pre- and Post-Tests:

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From Table (7) and Chart (18), it is evident that the maximum strength test for the chest showed statistically significant differences between the pre- and post-tests, with the post-test results being superior. Researchers attribute this improvement to the non-intensive regular training program designed by the coach, which successfully developed the control group. However, the development was less significant compared to the experimental group, which followed a more intensive training regimen.

- Discussion of T-Test Results for the Anthropometric Measurements of the Experimental and Control Groups in the Post-Test:

To compare the post-test results of the anthropometric measurements between the experimental and control groups and to determine which group showed greater improvement, a T-test was conducted for the two independent (non-correlated) groups, which were equal in number. This test aimed to determine the statistical significance of the differences between the two groups, as shown in Table (8).

The analysis will reveal which group experienced greater improvements in physical measurements, providing insights into the effectiveness of the different training programs used.

- Discussion of T-Test Results for Body Measurements of the Experimental and Control Groups in the Post-Test:

It is evident from Table (8) and Chart (19) that all the results between the experimental and control groups in the post-tests for anthropometric measurements were statistically non-significant. Researchers attribute this to the difficulty of achieving statistically significant results within a two-month training period, especially since the research sample consisted of advanced players in specialized centers. While there may be physical development, it does not show statistically because these athletes already have substantial muscle mass and size, which can increase, but the changes are too subtle to be captured statistically.(Kadhim et al., 2021)

If the research sample had included beginner athletes, there would have been more noticeable development in anthropometric measurements, as beginners typically experience rapid physical improvements at the start of their training. This aligns with the findings of Isra'a Fouad and Suhad Qasim, who state that "the rapid development in the level of training condition occurs at the beginning of the training journey, but then it progresses more slowly and becomes more difficult" (Saleh Al-Wais & Saeed Al-Moussawi, 2016, p. 90).

Looking at Table (9), which shows the development percentages between the experimental and control groups in the post-tests for anthropometric measurements, we observe that both groups exhibited progress. However, the experimental group showed a greater level of development compared to the control group. Researchers attribute the superiority of the experimental group to the intensive training using the muscle angle control device, which provided focused and intensive

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training, keeping the muscles under constant tension without rest periods. This is reinforced by Ya'rub Khayyoun, who states that "intensive training involves minimal or no rest periods between attempts or repetitions of the movements being learned" (Khayyoun, 2002, p. 84). This had a positive impact on muscle development, particularly in terms of the increase in the cross-sectional area of the muscle, as supported by Rula Maqdad and Ali Ahmed, who emphasize that intensive training affects most physiological variables and contributes to their effective development (Ubaid & Najib, 2015, p. 4).

- Discussion of T-Test Results for Maximum Strength Tests of the Experimental and Control Groups in the Post-Test:

From Table (10), Figure (20), and Table (11), it is evident that the experimental group outperformed the control group in the post-tests for maximum strength of the chest muscles. This superiority is attributed to their commitment to employing intensive exercises using the muscle angle control device in a precise and methodical manner. The results clearly demonstrate the positive impact of these exercises.(Kareem, 2023)

Researchers attribute this development to the device and the athletes' adherence to regular and rigorous training with varied ranges of motion and training intensity. The enhancement in maximum strength for the experimental group holds significant importance for bodybuilders aiming to achieve muscular hypertrophy, which contributes to an increase in muscle diameter.(Mondher et al., 2023)

Additionally, the structured and consistent intensive training played a crucial role in the balanced development of the targeted muscle groups, achieving uniform growth. As stated by Mahdi Kazem, “maximum strength refers to the highest level of force that muscles exert against high-resistance loads, which is a crucial requirement for many sports activities, especially strength-related activities such as weightlifting, bodybuilding, and wrestling” (Ali, 1999, p. 28) .

One of the factors leading to the experimental group’s success is the training angle and movement level utilized by the researchers in training and hypertrophying muscle fibers. The specific angles employed in performing the exercises made the training more intensive. Over a period of 60 days, the researchers implemented exercises using the angle control device, resulting in significant positive outcomes in maximum strength tests by ensuring the correct angles for intensive exercises.(Kadhim, 2023)

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Conclusions

In light of the results obtained, the researcher has drawn the following conclusions:

1 .The effect of exercise intensification using the muscle angle control device has positively influenced the development of body measurements for all targeted muscles.

2 .The intensification of exercise using the muscle angle control device has positively impacted the maximum strength of the targeted muscles.

3 .The use of non-intensive exercise contributes to the development of body measurements and maximum strength; however, relying on intensive exercise leads to greater development.

Recommendations:

Based on the conclusions reached, the researcher recommends the following, It is essential to employ the method of exercise intensification using the muscle angle control device.

Appendix

Appendix (1): Personal Interviews Conducted by the Researcher with Experts and Specialists

n	name	Specialization	Workplace
1	Prof. Dr. Ali Shabut Ibrahim	Biomechanics/Weightlifting	University of ghdad\College of sical Education Sports Sciences
2	Prof. Dr. Mustafa Saleh hdi	Training/Weightlifting	University of ghdad\College of sical Education Sports Sciences
3	Prof. Dr. Yasser Najah ssein	Biomechanics/Gymnastics	University of ghdad\College of sical Education Sports Sciences
4	Prof. Dr. Ahmed Farhan Al-himi	Training/Wrestling	University of ghdad\College of sical Education Sports Sciences

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5	Prof. Dr. Huda Hamid Abdul ssein	Biomechanics/Basketball	University of hdad\College of sical Education Sports Sciences
6	Prof. Dr. Muayad Jassim bas	Training/Weightlifting	University of hdad\College of sical Education Sports Sciences
7	Assistant Professor Dr. ssan Adeeb Abdul Hassan	Training/Weightlifting	University of hdad\College of sical Education Sports Sciences
8	Dr. Zain Mohammed Hassan n Al-Abidin	Biomechanics/Basketball	Al-Farahidi versity/College of ication/Department Physical Education Sports Sciences
9	Assistant Professor Haider hid	Training/Bodybuilding	Iraqi National eration for lybuilding and ess

Appendix (2): Names of the support team

n	name	Specialization	Workplace
1	Dr. Zain Mohammed Hassan n Al-Abidin	Biomechanics/basketball	Al-Farahidi versity/College of ication/Department Physical Education Sports Sciences
2	Ammar Kamel Nasser	Master's Student/College Physical Education and rts Sciences	

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3	Saad Abdulrahman Mohsen	Bodybuilding Coach	
4	Muntather Abdulrahman hsen	Bodybuilding Coach	
5	Abdulkarim Saad dulrahman	Bodybuilding Coach	
6	Abdullah Rafid Jawad	Bodybuilding Champion	
7	Hassan Saad	Bodybuilding Champion	
8	Salman Muwaffaq	Bodybuilding Champion	
9	Abdullah Alaa Al-Obaidi	Photographer	

Appendices (3)

Exercise 1

Exercise name: High bar press (high bar bench press)

Exercise description: (Bending and extending the arms with the bar from a lying position on the highest bench)

Elbow joint angle at the end of the exercise (145-155) degrees

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Exercise 2

Exercise name: Bench press upper dumbbell (Bench press upper dumbbell)

Exercise description: (Bend and extend the arms with the dumbbell from a lying position on the highest bench)

Elbow joint angle at the end of the exercise (140-150) degrees

Exercise 3

Exercise name: Flat bar press (Bench press flat bar)

Exercise description: (Bend and extend the arms with the bar from a lying position on a flat bench)

Elbow joint angle at the end of the exercise (145-155) degrees

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Exercise 4

Exercise name: Flat dumbbell press (Bench press flat dumbbell)

Exercise description: (Bend and extend the arms with the dumbbell from a lying position on a Lying on a flat bench)

Elbow joint angle at the end of the exercise (140-150) degrees

Exercise 5

Exercise name: Bench press (Bench press bar down)

Exercise description: (Bending and extending the arms with the bar from a lying position on the bench tilted down)Elbow joint angle at the end of the exercise (145-155) degrees

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