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The effect of preventive exercises using different weights on improving some health fitness variables for first-year female students at the College of Physical Education and Sports Sciences for Girls

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Abstract

The research aims to prepare preventive exercises using different weights to improve some health fitness variables to reduce injury among female students of the College of Physical Education and Sports Sciences for Girls, first stage. The researcher used the experimental method because it is suitable for the nature of the research. The researcher used the experimental design with pre- and post-measures for two groups, one experimental and the other control. The research was conducted on a sample of (65) female students of the first stage of the College of Physical Education and Sports Sciences for Girls, Section (A), Section (B), and Section (C). One of the most important results was that the experimental group outperformed the control group in health fitness variables (strength characterized by speed, motor speed, flexibility, agility, coordination, balance). This is due to the implementation of preventive exercises using the step box with weights for the targeted muscles proposed by the researcher on the experimental group. The experimental group did not achieve a significant increase in bio-kinetic abilities tests (transitional speed, reaction speed) over the control group. One of the most important recommendations was the need to be guided by the content of preventive exercises using different weights in some motor abilities because of what they achieved. Positive impact on first-year female students at the College of Physical Education and Sports Sciences for Girls.

Keywords: preventive exercises, health fitness.

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Introduction

Sport is naturally good for you, but participation in any exercise, as we know can lead to a number of different types of injuries. These can inflict a variety of muscle groups and joints in the body, particularly the loading-bearing joints such as knees and ankles. They are especially prevalent among novices. Preventive measures have become of the greatest significance in contemporary fundamental Principles in therapeutic physical education, which lies right now on prevention of damage and reducing it to an absolute minimum by studying sports traumas as well as methods of prevention, treatment actions at their occurrence. Health-related fitness is also a critical factor in lessening injury severity. It is seen as a basic cornerstone of an individual's existence that help to increase physical capacity and prevent injury in addition to improving the person's ability to function in sports and dip significance. Health related fitness promotes components of physical capabilities including speed, strength, agility, and flexibility amongst others and work to develop these elements significantly contributes to protecting the human body from injuries as well as diseases (Jaber, 2015; p.47).

Physical fitness represents the basic foundation for sports performance in both competitive sport and sport for health, which has given it a prominent status among specialists. Throughout history, physical fitness h Physical capacities are statistical foundations of sports performance in both high level sport and health-oriented sport, which is why they occupy a special place among experts. Physical fitness has always been, and will always be, a notion that survives despite the fact that there are dozens of new terms identifying physical and health status that can leave readers' heads spinning because of the sheer number of related concepts. Its significance is maintained due to the further development of its components and fields (Abdul Latif & Sabhan, 2023).

has a continued relevance even though various new terms have been introduced to express status of physique and health, which can be overwhelming for the readers because many have similar concept. It is due to the continuous development of its components and fields that it has been able to maintain its importance (Abdul Latif & Sabhan, 2023).

The concept of physical activity includes competitive (high-level) sport, recreational (moderate- and low-level) sport, and health-related fitness. Physical fitness and overall general health are closely related to each other (physically as well as psychosocially). It is difficult to think of a person who exercises steadily and at the same time suffers from physical or psychological health problems and in which those two variables are directly proportional (Hamoudi & Rashid, 2022).

Research has demonstrated the positive impact of preventive exercises on health-related fitness components, including:

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· Muscular strength is developed by increasing the ability of the muscles to support joint and withstand loads.

· Muscle endurance increase: the individual's ability to work (in general) over an extended period of time without becoming too fatigued – most other sports are repetitive.

· Improving balance, reducing risk of falls and movement-related injuries.

· Enhanced flexibility and mobility help your horse to move more freely and to limit muscle spasm.

· It indirectly helps to maintain a healthy cardiorespiratory system by exerting the body in moderate-intensity exercises (Al-Fay, 2024, p. 1).

The ability to perform preventive exercises with different weights compels the individual to exert more power and specificity, high-quality resistance that can be modified for a personal training level will induce strong muscular stimulation and improvements in health-related fitness components. While these exercises help in developing the body since they work on muscles and joints, using different weights on each workout will enhance the resistance to various movements making less likely for a sprain or fracture. Secondary prevention exercises also improve overall physical fitness by improving muscle strength, flexibility, endurance and balance as well as reducing risk for disease and injury due to strengthening of muscles and increased flexibility and balance (Nouri, 2015, p. 49).

Some first-year female students of the Colleges having Physical Education and Sports Sciences also encounter injuries in practical classes because of their physical stress. In addition, many of these students were unaccustomed to consistent sports practice in secondary school nor had they ever taken any extracurricular playing lessons before college; which led them to be unprepared for the rigorous practical sessions that took place over the course of a week. As a consequence, injuries and physical discomfort become evident in and outside of the class room with serious implications on their practical performance. According to the investigator's practical experience in this field, and also because of her being a student in College of Physical Education and Sports Sciences (and an acquaintance with similar previous studies) due to her familiarity with different injuries that can occur following sport activities, preventive exercises using various weights were chosen for the same purpose. Significance of the study is identifying types and distribution of sports injuries which happen by practicing activities within college of physical education and sports sciences, also to study effect caused by practice these exercises on some health variables between female students. The research also is intended to create a knowledge base for prevention and protection, utilize proper means of injury reduction, recognize deficiencies and respond as appropriate with scientifically sound techniques.

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The research problem seeks to answer the following questions:

- Which are the prevalent injuries to first year female students in College of Physical Education and sports science?
- Are preventive exercises with varied loads effective in improving some health-related physical fitness levels of female students at the College of Physical Education and Sport?

Research Objectives

- To design preventive exercises using different weights to improve certain health-related fitness variables and reduce injuries among first-year female students in the College of Physical Education and Sports Sciences.
- To identify the extent of the effect of preventive exercises using different weights on improving certain health-related fitness variables among first-year female students in the College of Physical Education and Sports Sciences.
- To identify the effect of preventive exercises using different weights on improving certain health-related fitness variables.

The research of Gaith Hamed Shaker and Haider Jumaa Asri (2024), "Impact of Several Preventive Exercises for Knee Injuries on training Some Motor Abilities to Basketball Players 18-Years- Old." The purpose of the study was to investigate the influence of interventions in knee injury prevention on some selected motor skills of U18 basketball players. It is postulated that a difference will occur between the control and experimental groups in follow-up tests favoring the experimental group. The experimental method was used. The participants were 16 immature basketball players aged less than (18) years in Al-Rawdatain Club of Karbala who played for Iraqi Central Basketball Federation activities for season (2023–2024). They were randomly assigned to one of the two groups (control and experimental groups) 8 players per group. The findings indicate that the preventive exercises do make a contribution to developing these muscle groups surrounding the knee joint, so as to prevent injuries in the future.

Farah Essam Abdulameer and Ali Shaboot Ibrahim (2023): A study was by titled, "The Effect of Preventive Exercises on the Range of Motion in Spinal Flexibility in Less Than 20 Year Old Squash Players." This research was conducted to determine the magnitude of spinal flexibility and difference of changes between before- (pretest) and after-training (post-test assessment) players 6 squash under 20 years. The experimental method was used. The sample was composed of 12 squash players under 20 years, who accounted for 100% of the research population in the sports season (2022–2023), through a sense-population determination. The findings evidenced substantial treatment effects in favor of posttests because of the preventive exercises designed for that purpose. Thus, they suggested that more studies should be performed in this sport and preventive measures should be given priority to avoid the lower back injuries which represent one of most frequent injuries.

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Research Scope

- **Human scope:** The study was conducted on a sample of (54) first-year female students from the College of Physical Education and Sports Sciences for Women, distributed across Sections (A), (B), and (C).
- **Spatial scope:** Pre- and post-tests and measurements were implemented at the College of Physical Education and Sports Sciences for Women.
- **Temporal scope:** The pilot study was conducted on 12/10/2024 – 11/2025.

Research Procedures

Research Method

The experimental method was used by the researcher because it was most appropriate for the study. There were two groups that involved the use of a pre-and-post measurement with random assignments and an experimental group and control group.

Research Population and Sample

Research Population

The sample of the study was drawn as a first-year female student `s population in college of Physical Education and Sports Sciences for women divided into three sections: A with (10) students, B with (21), and C with 23).

Research Sample

The researcher used comprehensive enumeration method for the selection of sample, which was included by (54) female first year students from College of Physical Education and Sports Sciences for Women distributed into Section (A) with (10) students, Section (B) with (21) students, and section(C) with (23) students. The sample was split into;

- **Pilot study sample:** Section (A), consisting of (10) students, was selected as a pilot sample to standardize the tests used in the study.
- **Control group:** Section (B), consisting of (21) students, was selected as the control group.
- **Experimental group:** Section (C), consisting of (23) students, was selected as the experimental group.

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Table 1. Numerical distribution of the research sample

Classification	Number of Students	Percentage
Pilot sample	10	18.52%
Main sample – Control group	21	38.89%
Main sample – Experimental group	23	42.59%
Total sample size	54	100%

Statistical Description of the Research Sample

The basic data (age, height and weight) of the sample in this study is also measured, so as to control factors that might have an influence on science research. Table (2) below provides for the sample statistical characteristics of these variables before the experiment.

Table 2. Statistical indicators of the research sample in the basic variables before the experiment (N = 54)

Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness	Kurtosis
Age	Year	20.17	20.00	0.83	0.09	-0.23
Height	cm	159.86	160.00	1.95	-0.41	-0.51
Weight	kg	60.82	61.50	2.02	0.29	0.74

It is clear from Table (2) that exhibits the homogeneity for the research sample in relation to the basic preliminary measurements that are normally distributed except that they are also not diffused and centered around same mean value for all sample data. The skewness varied from (−0.41 to 0.29) that is near to zero, indicating normal distribution. Kurtosis values ranged from −0.51 to 0.74, indicating a normal and moderate distribution curve which is neither too peaked nor actually flat. This validates that the research group members are similar in the initial variables previous to conducting the experiment.

Tools and Methods of Data Collection

The researcher relied on a set of supporting tools appropriate to the nature of the work, particularly Arabic and foreign references, scientific journals, and the Internet.

Devices and Instruments Used in the Research

The devices and instruments that contributed to completing the research procedures and achieving its objectives included:

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- Rest meter for measuring body height to the nearest centimeter
- Calibrated medical scale for measuring weight to the nearest kilogram
- Dumbbells with different weights
- Whistle
- Lenovo computer
- Electronic calculator
- Tennis balls
- Training cones
- Plyometric boxes of different heights
- Resistance bands
- Measuring tape (0–2000 cm)
- Stopwatch accurate to 0.01 second
- Recording forms

Measurements and Tests Used in the Study

The investigator has reviewed literature of references and studies, as well as scientific research concerning variables related to health-related physical fitness. These factors were brought to the attention of a group of six experts in measurement, evaluation, training, and rehabilitation to define if they would be appropriate for this study. According to the opinions of experts, variables with less than 80% approval were removed. Therefore, health related fitness variables used in the study were:

No.	Health-Related Fitness Variables	Tests
1	Speed–strength	Two-leg hopping test for maximum distance in 10 seconds
2	Agility	Agility T Test
3	Coordination	Ball throwing and catching test
4	Balance	Static balance test on the forefoot

Description of the Tests

Two-Leg Hopping Test for Maximum Distance in 10 Seconds

- **Test name:** Maximum hopping distance in 10 seconds
- **Purpose:** To measure speed–strength of the legs
- **Equipment:** Stopwatch, whistle, measuring tape, recording form
- **Procedure:** The participant stands behind a marked line. Upon hearing the whistle, she hops with both legs as quickly as possible.

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- **Scoring:** The distance covered within 10 seconds is recorded. Only one attempt is allowed (Hassanein, 2004, p. 65).

Agility T Test

- **Purpose:** To measure agility
- **Equipment:** Whistle, six cones, stopwatch
- **Procedure:** The participant runs 10 meters forward from the starting point, moves 5 meters to the right, then 10 meters to the left, followed by 5 meters back toward the starting point, finishing by crossing the start line.
- **Scoring:** The total time taken to complete the test is recorded (Pauole, 2000).

Ball Throwing and Catching Test

- **Purpose:** To measure eye–hand coordination
- **Equipment:** Tennis balls
- **Procedure:** A line is drawn 5 meters from a wall. The participant stands behind the line and throws balls at the wall as follows:
  - Five consecutive throws with the right hand and catches with the same hand
  - Five consecutive throws with the left hand and catches with the same hand
  - Five consecutive throws with the right hand and catches with the left hand after rebound
- **Scoring:** One point is awarded for each successful attempt; the maximum score is 15 points (Al-Fartousi & Jaafar, 2015, p. 23).

Static Balance Test on the Forefoot

- **Purpose:** To measure static balance while standing on the forefoot
- **Equipment:** Stopwatch or wristwatch with seconds hand, recording form
- **Procedure:**
  - The participant stands on one foot (preferably the take-off foot).
  - The other foot is placed on the inner side of the knee of the supporting leg, with hands on the waist.
  - Upon the signal, the participant lifts the heel off the ground and maintains balance as long as possible without moving the foot or touching the heel to the ground.
  - The test is performed barefoot, and hands must remain on the waist.
  - The test ends when balance is lost or the heel touches the ground.
  - Three attempts are allowed.
- **Scoring:** The best time of the three attempts is recorded, from lifting the heel until loss of balance or heel contact (Hassanein, 2004, p. 59).

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Pilot Study

The pilot study was taken place on the pilot sample and out of the main sample from 17/11/2024 to 19/11/2024. It aimed to check compatibility of the tests, confirm validity of equipment and instruments used, find most suitable procedure/s used in measurement process, train collaborators for the collection of exercises described in this study, detect if there were any weakness concerning equipment and procedures proposed, adapt level of difficulty and execution fitness for the proposed exercises.

Form for Identifying the Most Common Injuries

The researcher also prepared a questionnaire to discover the most reoccurred injuries in the first year female students of college of physical education and sport sciences. The instrument was used in the entire sample, and injuries more frequently reported were as follows:

- Knee joint injuries
- Ankle joint injuries
- Foot injuries
- Shoulder injuries

Based on these findings, preventive exercises were developed accordingly.

Preventive Exercises Using Different Weights

While strength and stability exercises utilizing different weights are designed to increase muscular strength and balance as well as stability for the prevention of exercise-related or sport-induced injuries, particularly knee, ankle and shoulder injuries. These are the same type of exercises used in sports rehab and core strengthening. The exercises were determined by the researcher and reviewed by experts in biomechanics, assessment/evaluation, rehabilitation and fitness professionals in experts based on the first-year female college students.

Implementation of Preventive Exercises

The preventive exercises were applied regularly during the week as follows:

- Number of weekly training sessions: 2 sessions
- Duration of the program: 12 weeks
- Duration of each session: 30 minutes
- Training days: Sunday and Tuesday

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Main Study

The main study was conducted from 10/11/2024 to 11/2/2025.

Pre-test Measurements

The pre-measurements were performed on the research sample (44 students) in the fitness hall at the College of Physical Education and Sports Sciences for Women – Baghdad, The College of Physical education for women/Baghdad University, by the help of a supporting team, from Sunday 10/11-/2024 to Tuesday[12/11-/2024(For study variables Pre-measurements were also applied.

Table 3. Equivalence between the control and experimental groups in the pre-tests before the experiment

Abilities	Tests	Unit of Measurement	Control Group (n = 21) Mean	SD	Experimental Group (n = 23) Mean	SD	t-value	Significance Level
Speed–strength	Two-leg hopping test for maximum distance in 10 seconds	Meter	6.12	1.52	6.19	1.36	0.91	0.38
Agility	Agility T Test	Second	15.688	1.31	15.83	1.29	1.02	0.80
Coordination	Ball throwing and catching test	Score	6.28	1.52	6.41	1.23	1.26	0.56
Balance	Static balance test on the forefoot	Second	22.63	1.63	21.96	1.14	1.39	

It could be seen from Table (3) which describes the statistical means and values of health-related fitness variables for experimental and control group before taking the experiment that there was no significant difference at significance level 0.05 between both beams. The computed t-value values (0.49–1.39) were all smaller than the tabled one at 0.05 significance level, =2.018

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with significance levels greater than 0.05. This suggests that the two groups were similar to each other prior to experimentation**.**

Implementation of Preventive Exercises

The preventive exercises were administered to the experimental group, which included (23) female students compared with (21) in the control group as a regular program. The preventive program presented in the experimental group has been conducted during 12 weeks two times a week on subject's own samples.

Post-Test Measurements

Follow-up measurements of the study variables were performed on the research sample from 12/2/2025 to 13/12/2025 at College of Physical Education & Sports Sciences for Girls, and after twelve weeks of applying prevention exercises with a duration of twenty-four training sessions.

Statistical Treatments Used

- Arithmetic mean
- Standard deviation
- Median
- Skewness coefficient
- Kurtosis coefficient
- t-test
- Pearson correlation coefficient
- Frequency and percentage

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Results

Table 4. **Statistical significance of the differences (t-test) between the pre- and post-measurements in health-related fitness variables for the control group (N = 21)**

Abilities	Tests	Unit	Pre-test Mean	SD	Post-test Mean	SD	t-value	Significance
Speed–strength	Two-leg hopping for maximum distance in 10 s	m	6.12	1.52	7.12	1.36	*2.16	0.042
Agility	Agility T Test	s	15.688	1.31	13.92	0.98	*3.10	0.000
Coordination	Ball throwing and catching	score	6.28	1.52	8.92	1.47	*4.51	0.000
Balance	Static balance on forefoot	s	22.63	1.63	25.78	1.25	*4.39	0.000

t-value at $(0.05) = 2.086$

Table 5. **Statistical significance of the differences (t-test) between the pre- and post-measurements in health-related fitness variables for the experimental group (N = 23)**

Abilities	Tests	Unit	Pre-test Mean	SD	Post-test Mean	SD	t-value	Significance
Speed–strength	Two-leg hopping for	m	6.19	1.36	8.79	0.94	*3.87	0.000

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	maximum distance in 10 s							
Agility	Agility T Test	s	15.83	1.29	10.38	1.64	*10.74	0.000
Coordination	Ball throwing and catching	score	6.41	1.23	13.83	1.86	*13.69	0.000
Balance	Static balance on forefoot	s	21.96	1.14	33.46	1.25	*9.62	0.000

t-value at $(0.05) = 2.074$

Table 6. **Statistical significance of the differences (t-test) in post-measurements of health-related fitness variables between the control and experimental groups**

Abilities	**Tests**	**Unit**	**Control Group Mean**	**SD**	**Experimental Group Mean**	**SD**	**t-value**	**Significance**
Speed–strength	Two-leg hopping for maximum distance in 10 s	m	7.12	1.36	8.79	0.94	*2.46	0.000
Agility	Agility T Test	s	13.92	0.98	10.38	1.64	*6.11	0.000
Coordination	Ball throwing and catching	score	8.92	1.47	13.83	1.86	*8.05	0.000

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Balance	Static balance on forefoot	s	25.78	1.25	33.46	1.25	*7.42	0.000	

t-value at (0.05) = 2.018

Discussion

The first null hypothesis proposed that no significant differences exist between the pre- and post-test performances of the control and experimental groups on the health-related fitness variables identified above as well as certain motor abilities.

Table (4) and Table (5) results also indicated improvement in both groups, all measured differences were statistically significant in favor of posttest assessment. Nevertheless, the experimental group showed greater progress in all variables (speed–strength, agility, coordination and balance), which suggests that the preventive exercises with different weights were effective.

This improvement resulted from the systematic preventive training program that was aimed at the strengthening of muscles, neuromuscular coordination, and balance as well as joint stability mainly knee, ankle and shoulder joints. Such findings are in agreement with both motor learning and training principles, which emphasize forward overload, resistance variation, and movement pattern specificity for optimal development of physical fitness components while minimizing injury risks.

These findings were corroborated by the study of Hamdi Abdelrahim (2024) that found explosive strength training to be the most effective elements in the reduction of lower limb injuries; followed by eccentrics, balance and agility. Also, Farah Essam Abdulameer and Ali Shaboot Ibrahim (2023) reported significant differences between the pre-tests and post-tests in favor of the post-testing as a result of prophylactic exercises. Mahmoud Abdelrahman Hamed (2022) also witnessed improvements in physical abilities and skill performance of young goalkeepers after 12-week step-box training. Mahmoud Abdelrazek Bayoumi (2022) also stated that preventive programs which combine muscular strength and flexibility training through isokinetic techniques will have a positive effect on the shoulder joint stabilization and in reduction of injuries.

The second hypothesis stated that there are no statistically significant differences between the experimental and control groups in the post-tests of the health-related fitness variables.

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Results of Table 6 demonstrated the statistically significant differences in all variables towards experimental groups in favors of preventive exercises with different weight when compared to the traditional program done by the control group. The experimental intervention for the improvement of speed–strength, agility, coordination and balance were characterized by controlled possibility of exercise progression based on specific tasks aimed at increasing neuromuscular efficiency and joint stability.

These results correspond with the research of (Gaith Hamed Shaker and Haider Jumaa Asri, 2024) in which it is also proved that preventive exercises improved the muscles surrounding to knee joint and decreased proneness to injury in future. Similarly, Mustafa Hamid Wroor, & Shaimaa Reda Ali (2022) reported very significant scoliosis enhancement and physical skills as a result of preventive application rather than traditional workout. Also, Mohammed Saad Ismail and others (2022) the experimental group and control group in post-tests for balance, ankle flexibility, and strength had significant differences.

Overall, the results confirm the effectiveness of preventive exercises using different weights in improving health-related fitness components and reducing the risk of injuries among first-year female students in the College of Physical Education and Sports Sciences.

Conclusions

In light of the research objectives, hypotheses, sample, methodology, and the statistical analyses and results obtained, the researcher reached the following conclusions:

- The experimental group achieved statistically significant improvement in the health-related fitness variables (speed–strength, agility, coordination, and balance). This improvement is attributed to the implementation of preventive exercises using different weights targeting the specific muscle groups proposed by the researcher.
- The experimental group outperformed the control group in the health-related fitness variables (speed–strength, agility, coordination, and balance), which is due to the application of the preventive exercise program using different weights on the experimental group.

Recommendations

Based on the results and conclusions of the study, and within its scope, the researcher recommends the following:

- Extrapolating from the content of preventive exercises by variable load, as with predictable efficacy in increasing specific health components.

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- Increasing faculty awareness of prevention training devices and application for effective use to physically prepare students and serve as their injury prevention during activity or physical performance.
- Emphasizing the development of basic physical capacities with students as a strategy to prevent injuries by programming training that addresses fitness components linked to injury prevention.

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