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# The Effect of Distributed and Intensive Training on Developing Performance in Human Wheel and Headstand Skills in Artistic Gymnastics

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**Abstract**

The researcher employed an experimental method suitable for the nature of the research problem. The research population consisted of third-year female students from the College of Physical Education and Sports Sciences at the University of Babylon, totaling 28 students. A sample of 20 students was randomly selected, which was then divided into two groups (control and experimental). The researcher conducted a pilot experiment for the tests and subsequently established the scientific foundations for the tests. Data were analyzed using appropriate statistical methods, including mean, standard deviation, t-test, correlation coefficient, mode, and skewness. Therefore, the main aim of this paper are:

1. In order to identify the impact of the educational curriculum using distributed and intensive training on the performance of the skills of human roll and headstand among female students.
2. In order to assess the performance of the skills of human roll and headstand among female students.

Based on the results of the study, the key conclusions are:

1- The educational curriculum followed by the trainer has a positive impact on teaching the skills of human roll and headstand among female students.

2- .Rest periods play a significant role in learning the skills of human roll and headstand among female students, especially in distributed training.

**Keywords:** Distributed; Intensive Training; Developing Performance; Human Wheel; Headstand Skills; Artistic Gymnastics.



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# 1. Introduction to Research

1.1 Introduction and Importance of the Research:

The global athletic levels achieved by athletes in various international sports result from the diverse efforts contributed by many specialists in this field. Furthermore, this is supplemented by training methodologies that rely on theoretical and applied sciences, which have enhanced the effectiveness and efficiency of the sports training process. This has led to elevated performance levels and the attainment of optimal results.

Artistic gymnastics is one of the sports that has rapidly and notably developed due to its reliance on the correct scientific foundations of sports training, supported by advanced studies and scientific research. This is evident in its relatively short history compared to other team sports and the advanced level it has reached globally.

It holds a prominent and unique position in the hearts of its enthusiasts and sports lovers. Countries have begun to utilize expertise and provide necessary resources, and scientific efforts have intensified to reach the most precise details that would enhance the physical, technical, and tactical abilities of athletes.

Basic skills form the backbone of player development in all aspects, considering all the possibilities dictated by match conditions. Learning the essential skills for each activity is one of the most crucial conditions for successful performance improvement, provided it is based on sound scientific principles. This facilitates rapid learning and ensures efficiency in effort and movement.

The sole factor that differentiates the educational unit is the training, which influences the degree of learning and the enhancement of performance. The application of scientific principles and the variety of training methods adopted by sports education sciences, in light of the scientific and technological advancements experienced globally, stem from extensive research and studies. These initiatives have resulted in elevated performance levels and the attainment of sports achievements.

Considering the variety and diversity of training methods, there has been ongoing debate among specialists regarding how to select the best ones, as each method presents its own advantages and objectives. Therefore, it is crucial to consider the player's level, age, training experience, and the specific skill to be learned when choosing any method. This ensures the effective application of the method for skill acquisition. Furthermore, distributed and intensive methods are among the contemporary approaches utilised in skill learning, as they provide diverse elements for the educational process based on a progressive approach to learning motor skills while also taking into account the characteristics of the age group.

This research is significant because it will help develop an educational program for executing the skills of human rolling and head standing for female students, which coaches can employ to achieve favorable results.

## 1.2 The Research Problem:

The game of artistic gymnastics relies heavily on mastering its fundamental skills. This mastery is achieved through skill numbers, which are crucial in the realm of mathematics. A student's success is largely dependent on their ability to learn and master these basic skills.

Given the rapid advancements in educational methods, their role in correcting errors and accelerating the learning process has become increasingly significant.



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Therefore, understanding these methods and identifying the most suitable approach for teaching these skills, particularly the human wheel, is essential.
Moreover, mastering the headstand provides an opportunity to enhance and elevate the performance level of these skills. The trainer's success in selecting the most appropriate method tailored to the individuals' capabilities and the available educational environment leads to more effective learning and, consequently, the achievement of the educational process's desired goals.
Through the researcher's experience as an artistic gymnastics' teacher, it has become evident that there is a disparity among coaches in their choice of educational methods, with some relying on traditional approaches for teaching basic skills. Occasionally, learners demonstrate proficiency in motor skills during practice, but over time, a noticeable decline in their performance occurs. This fluctuation may stem from the failure to select an appropriate method or from a mismatch between the chosen method and the learners' levels and abilities. This observation prompted the researcher to conduct a study utilising intensive and distributed training in teaching certain human wheel skills and headstands among female students in artistic gymnastics.

**1-3 Research Objectives:**

To identify the effect of distributed and intensive training on teaching the skills of the human wheel (cartwheel) and headstand among female students in the experimental group.
To identify the effect of traditional training on teaching the skills of the human wheel (cartwheel) and headstand among female students in the control group.
To determine the differences between the experimental and control groups in the research variables.

**1-4 Research Hypotheses:**

There are statistically significant differences between the first and second measurements of teaching the skills of the human wheel (cartwheel) and headstand among female students, favoring the second measurement in the experimental group.
There are statistically significant differences between the first and second measurements of teaching the skills of the human wheel (cartwheel) and headstand among female students, favoring the second measurement in the control group.
There are statistically significant differences between the second measurement of the experimental group and the control group, favoring the experimental group.

**1-5 Research Fields:**

Human Field: Third-year female students at Babylon University, College of Physical Education and Sports Science.
Temporal Field: From March 1, 2022, to May 1, 2022.
Spatial Field: Gymnastics hall at Babylon University, College of Physical Education and Sports Science.



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## 3. Research Methodology and Field Procedures

### 3.1 Research Method:

The researcher used the experimental method with two equal groups (utilizing the same pre- and post-test) because it is the most appropriate for achieving the research goals.

### 3.2 Research Community and Its Sample:

The research community consists of the students in the third stage of the Faculty of Physical Education and Sports Sciences at the University of Babylon, totaling 28 female students. A random sample of 20 female students was selected, and they were then divided into two equal groups (control and experimental).

### 3.3 Research Tools, Devices, and Means Used

#### 3.3.1 Research Tools:

1. Observation
2. Personal Interviews
3. Testing and Measurement
4. Questionnaire

3.3.2 Devices and Means Used:

1. Electronic calculator (Pentium 4)
2. Electronic stopwatches (Casio, 2 units)
3. Manual camera (Sony)
4. Measuring metal strip (length: 3 m)
5. Linen metric tape measure (length: 30 m)
6. Legal handballs (10 balls)

### 3.4 Field Research Procedures:

#### 3.4.1 Determination of the Validity of the Form of My Skill and Shooting Handball for Juniors:

To determine the validity of the human wheel and headstand skills among female students, the researcher designed a questionnaire based on scientific sources, references, and research related to artistic gymnastics. This questionnaire was then presented to specialised experts in the field of artistic gymnastics. After collecting the completed forms and analysing the data, those with statistical significance were accepted and evaluated based on the achieved percentages and their significance level (KA2). Table 1 illustrates these findings.

Table 1: shows the validity of the human wheel and headstand skills for female students

| No. | Skills | Validity | | Ka2 | Significance Moral |
|---|---|---|---|---|---|
| | | Fit | Does not fit | | |
| **1** | The Human Wheel | **8** | **0** | **8** | Moral |
| **1** | Standing on the head | **8** | **0** | **8** | **Moral** |



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### 3.4.1 Exploratory Experience:

The researcher conducted the exploratory experiment with eight female students at exactly ten o'clock in the morning on 20/9/2022 in the technical gymnasium at the University of Babylon, Faculty of Physical Education and Sports Sciences. All tests were conducted, and the exploratory experiment was repeated after seven days, on 27/9/2022, with the same individuals and under the same conditions. The aims were:

1. ensuring the efficiency of devices and tools
2. determining the time taken for each test as well as the overall testing duration
3. assessing the level of difficulty of the tests for the research sample
4. identifying the challenges faced by the researcher to avoid them in the future
5. extracting scientific bases for tests (constancy and objectivity).

### 3-4-1-1 Scientific Foundations of Tests:

3-4-1-1 Test Validity: To establish the validity of the tests, the researcher presented the test contents to a group of experts, thereby achieving content validity.

3-4-1-2 Test Reliability: To extract the reliability coefficient of the tests, the principle of a stable test must be applied, yielding similar or identical results when administered multiple times under equivalent conditions. The reliability coefficient was calculated using the "test-retest" method, with a time interval of seven days between the first and second tests. The researcher determined the reliability coefficient using Pearson's correlation between the results of the first and second tests and assessed the significance of the correlation using the statistical method (t-test) for correlation significance, as shown in Table 2.

**3.4.1.3 Objectivity:** The researcher employed the Pearson correlation coefficient to assess the objectivity of the tests between the scores of the first and second judgments, as illustrated in Table (2).

Table (2) displays the stability coefficient and objectivity coefficient for the human wheel and headstand tests.

| No. | Auditions | coefficient constancy | T.R. Calculated | Significance Statistics | coefficient Objectivity | T.R. Calculated | Objective significance |
|---|---|---|---|---|---|---|---|
| **1** | The Human Wheel | **0.79** | **3.16** | Moral | **0.88** | **4.54** | Moral |
| **2** | Standing on the head | **0.91** | **5.38** | Moral | **0.92** | **5.75** | **Moral** |

* The tabular correlation value at an indicative level of (0.05) with a degree of freedom of (6) was (0.62).

### 3-5 Tribal Testing:

The researcher conducted tribal tests on a sample of (20) students on 1/10/2022, prior to commencing the main experiment while controlling all variables.

### 3.6 Sample Homogeneity and Equivalence of Two Research Groups:

### 3.6.1 Homogeneity of the Sample:

In order to achieve homogeneity among the individuals in the research sample, the researcher implemented several procedures to adjust the variables. This was done despite the fact that the selected sample is from a similar age group, as well as to mitigate influences that may affect the experimental results due to individual differences among the participants. Consequently, the researchers employed statistical measures such as the arithmetic mean, standard deviation, mean, and skewness coefficient for the variables of height, weight, chronological age, and training age to assess the reality of homogeneity, as illustrated in Table (3).



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Table (3) demonstrates the homogeneity of the individuals in the research sample.

| NO. | Variables | Arithmetic mean | Standard deviation | Lines | Torsion coefficient |
|---|---|---|---|---|---|
| **1** | Length | 162.24 | 7.55 | 145 | 0.13 |
| **2** | Weight | 54.37 | 4.93 | 42 | 0.59 |
| **3** | Training age | 2.09 | 0.29 | 2 | 0.31 |
| **4** | Chronological age | 13.32 | 0.86 | 13 | 0.37 |

Table (3) indicates that the values of the skewness coefficient for the studied variables, including height, weight, chronological age, and training age, were all less than (1), which signifies the homogeneity of the individuals in the research sample across all variables.

**3-6-2 Equivalence of the Research Groups:**

An important aspect that the researcher should follow is to attribute differences to the experimental factor. Therefore, both research groups (control and experimental) must be equivalent in the variables under study. Before the researcher commenced her educational methodology, she made efforts to ensure the principle of equivalence between these two groups. The researcher utilized statistical methods (mean, standard deviation, and independent samples t-test) to compare the control and experimental groups, as illustrated in Table 4.

Table (4) Equivalence of the Research Sample for the Pre-tests Under Study

| No. | auditions | Adjuster | | Experimental | | Calculated T-value | Indication Type |
|---|---|---|---|---|---|---|---|
| | | Q- | on | Q- | on | | |
| 1 | The Human Wheel | 2.15 | 1.10 | 2.05 | 1.03 | 1.43 | Willy-nilly |
| 2 | Standing on the head | 16.48 | 2.37 | 16.22 | 2.40 | 1.52 | **Willy-nilly** |

Table 4 shows that the calculated t-values for the tests under study are smaller than the tabulated value of 2.10 at the significance level of 0.05 and with 18 degrees of freedom, indicating that the principle of equivalence has been achieved in the tests under study.

**3-7 educational curriculum:**

An educational curriculum has been developed for the students of the Faculty of Physical Education and Sports Sciences at the University of Babylon, specifically for the experimental group consisting of (10) female students. The curriculum commenced on (2/12/2022) and was implemented over two months (8 weeks), with (3) units per week, resulting in a total of (24) educational units. The exercises were scheduled to begin at ten o'clock in the morning, following a warm-up lasting (10-15) minutes, and continued until.(2022/12/3)

**3-8 dimensional tests:**

After the completion of the educational curriculum for the experimental group, dimensional tests were conducted for both the control and experimental groups on (5/12/2022). The tests were performed under conditions similar to the initial tests, following the same procedures and under the direct supervision of the researcher.

**3.10 statistical methods :**



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1 .The arithmetic mean .
2 .Standard deviation .
3 .Simple correlation coefficient .
4 .Test (t-test) for symmetrical samples .
5 .Test (t-test) for independent samples .
6 .Torsion .
7 .The Loom .
8. Torsion coefficient.

4 - Presentation of Results, Analysis, and Discussion.

**4 - 1 Presentation of the Results of the Differences in Pretest and Posttest Measurements for the Human Agility and Headstand Tests in the Experimental Group, along with their Analysis and Discussion:**

Table (5) shows the mean, standard deviation, and t-test results for the human agility and headstand tests for the experimental group

| No. | Auditions | Pre-test | | Post-Test | | Calculated T | Significance Statistics |
|---|---|---|---|---|---|---|---|
| | | S | A | S | A | | |
| **1** | The Human Wheel | 2.05 | 1.03 | 4.22 | 1.13 | 3.77 | Moral |
| **2** | Standing on the head | 16.22 | 2.40 | 19.34 | 2.12 | 3.69 | **Moral** |

Table 5 shows the results of the pre- and post-tests of the experimental group of the tribal test. First, in the human wheel test, the arithmetic mean was 2.05, with a standard deviation of 1.03. In the dimensional test, the arithmetic mean was 4.22, with a standard deviation of 1.13. The results indicated significant differences in the two tests. To clarify these differences, the researcher used the t-test for related samples. The calculated value of t was 3.77, which is greater than the tabular value at the significance level of 0.05, with a degree of freedom of 9, which was 2.26, in favor of the dimensional test.

As for the headstand test, the arithmetic mean was 16.22, with a standard deviation of 2.40. In the dimensional test, the arithmetic mean was 19.34, with a standard deviation of 2.12. The above results also indicated significant differences in the two tests. To indicate these differences, the researcher used the t-test for related samples. The calculated value of t was 3.69, which is greater than the tabular value at the significance level of 0.05, with a degree of freedom of 9, which was 2.26, in favor of the dimensional test.

**4 2– presentation, analysis, and discussion of the results of the differences in the pre- and post-measurements of the human wheel and headstand tests for the control group:**

Table (6) presents the arithmetic mean, standard deviation, and t-test results for the human wheel and headstand tests for the control group

| No. | auditions | Pre-test | | Post-Test | | Calculated T | Significance Statistics |
|---|---|---|---|---|---|---|---|
| | | S | A | S | A | | |
| **1** | The Human Wheel | 2.15 | 1.10 | 3.58 | 0.78 | **3.24** | Moral |
| **2** | Standing on the head | 16.48 | 2.37 | 18.22 | 1.63 | **3.81** | **Moral** |

Table (6) displays the results of the tribal and dimensional tests for the control group of the tribal test. In the human wheel test, the arithmetic score was (2.15) with a standard deviation



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of (1.10). For the dimensional test, the arithmetic mean reached (3.58) with a standard deviation of (0.78).

The results indicated significant differences in the two tests, and to highlight these differences, the researcher employed the t-test for symmetrical samples, where the calculated value of (t) (3.24) exceeded the tabular value at the level of (0.05), with the degree of freedom (9) reaching (2.26), favoring the dimensional test. In the standing on the head test, the arithmetic mean was (16.48) with a standard deviation of (2.37), while in the dimensional test, the arithmetic mean reached (18.22) with a standard deviation of (1.63). The results showed significant differences in the two tests, and to indicate these differences, the researcher used the t-test for symmetrical samples, where the calculated value of (t) (3.81) was higher than the tabular value at the significance level (0.05), with the degree of freedom (9) reaching (2.26), again favoring the dimensional test.

**4 – 3 Presenting the results of the differences in the pre-test and post-test measurements for the human agility and headstand tests for the control and experimental groups, analyzing and discussing them:**

Table (7) shows the mean, standard deviation, and t-test results for the post-tests in human agility and headstand for the two groups (control and experimental)

| No. | auditions | **Adjuster** | | **Experimental** | | **Calculated T** | **Significance Statistics** |
|---|---|---|---|---|---|---|---|
| | | **S** | **A** | **S** | **A** | | |
| **1** | **L** | 3.58 | 0.78 | 4.22 | 1.13 | 4.26 | Moral |
| **2** | Side payment handling | 18.22 | 1.63 | 19.34 | 2.12 | 3.58 | Moral |
| **3** | Whip handling from head plane from pivot | 3.86 | 0.35 | 4.57 | 1.11 | 4.83 | Moral |
| **4** | Aim Jump High | 2.55 | 0.17 | 3.35 | 0.31 | 3.13 | Moral |
| **5** | Aim from a level above the head | 2.62 | 0.33 | 3.64 | 0.14 | 4.22 | Moral |
| **6** | Aiming from the front drop | 2.57 | 0.19 | 3.24 | 0.42 | 3.92 | **Moral** |

Table (8) presents the results of the dimensional tests for the two groups in the control group. The test (whip handling from above the head) yielded an arithmetic mean of (3.58) and a standard deviation of (0.78), while the experimental group achieved an arithmetic mean of (4.22) with a standard deviation of (1.13). The results indicate significant differences between the two tests, and to clarify these differences, the researchers employed the t-test for paired samples. The calculated value of (t) (4.26) exceeds the tabular value at the significance level of (0.05) with a degree of freedom of (9), which is (2.26), favoring the experimental group.

Regarding the test (payment handling to the side), the arithmetic mean was (18.22) with a standard deviation of (1.63), while the experimental group recorded an arithmetic mean of (19.34) and a standard deviation of (2.12). The results revealed significant differences between the two tests, and to highlight these differences, the researchers utilized the t-test for paired samples, where the calculated value of (t) (3.58) is greater than the tabular value at the significance level of (0.05) with a degree of freedom of (9), which is (2.26), also favoring the experimental group .



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For the test (whip handling from the head level of the fulcrum), the arithmetic mean was (3.86) with a standard deviation of (0.35), while the experimental group achieved an arithmetic mean of (4.57) with a standard deviation of (1.11). The results indicated significant differences between the two tests, and to clarify these differences, the researchers applied the t-test for paired samples, where the calculated value of (t) (4.83) exceeds the tabular value at the significance level of (0.05) with a degree of freedom of (9), which is (2.26), favoring the experimental group.

4.2 Discussion of the Results of Basic Skills:

Through the presentation and analysis of the previous tables, it is evident that the control group has shown development in their basic skills. The researcher attributes this progress to the influence of the established curriculum developed by the trainer. Additionally, the consistency and regularity of the players in training sessions, along with the repetition of basic skills, played a significant role in this advancement. He also emphasized (Hanoi Mahout: 1994, p. 94) that "persistence plays an important role in a player's ability to reach a high level of technical performance in terms of accuracy, integration, fixation, and mechanisms of high technical performance." Salad Moisten (1996, p. 98) stated, "The opinions of experts, regardless of the diversity of their scientific and practical backgrounds, confirm that a training program inevitably leads to achievement development if it is founded on a scientific basis for organizing and programming the training process, utilizing appropriate and gradual intensity, and considering individual differences. Furthermore, optimal repetitions and effective rest periods should be employed under the supervision of specialized trainers in favorable training conditions regarding space, time, and tools used." The results also indicated that there are significant differences and preferences within the experimental group regarding the development of basic handball skills for juniors.

The researcher attributes this development to the effects of distributed training, where the principle governing this approach is the rest period. In this type of training, sufficient rest intervals are allowed, which prevents fatigue among learners during exercise, enabling them to perform movements and skills effectively without feeling tired. Baha Al-Din Ibrahim Salama (1992, p.24) noted that "the rest period influences recovery processes, whether between training sessions or between repetitions of a single session, and it varies for beginners compared to advanced learners." Additionally, Mohammed Abdul Ghani (1987, p.267) indicated that increasing the rest duration between exercise attempts significantly enhances learning and development. In this training method, learners receive complete rest, aimed at restoring their full strength after physical exertion, ensuring they are ready to perform again with the same vigor and without hindrance. Wajih Mahjoub (2000, p.217) emphasized that "extending the rest period mitigates the strain on the body's organs, as performance improves when training resumes after rest." The researcher employed modern techniques in motor learning and conducted an integration of educational methods through the use of intensive and distributed training. This integration was executed based on scientific principles, systematically and consistently, contributing to preparing the learner for future play and accelerating the learning process by effectively utilizing time and effort within the designated learning period (Qasem Lazam, 2005, p.246).

## 5. Conclusions and Recommendations

### 5.1 Conclusions:

According to the results of the study, the most important conclusions are:

1. The distributed and intensive training program led to an improvement in the handling and shooting skills of handball for juniors in the experimental group.
2. The traditional training program also resulted in an improvement in the handling and shooting skills of handball for juniors in the control group.



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3. The individuals in the experimental group, which utilized distributed and intensive training, outperformed those in the control group, which used traditional training.

**5.2 Recommendations:**

Based on the previous conclusions, the researcher recommends:

1. Implementing the distributed and intensive training program to teach and develop the handling and shooting skills in handball for juniors.
2. Emphasizing the importance of providing sufficient breaks between exercises and educational units to allow for an appropriate rest period, which significantly contributes to enhanced learning.
3. Diversifying and changing the exercises used when teaching motor skills to help learners engage with enthusiasm and avoid boredom.
4. Conducting similar studies employing other methods that overlap different techniques for practicing other basic skills in handball to identify the most effective approaches.

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**Appendix (1) shows the names of experts and specialists who determined the validity of the forms or tests of handball correction for juniors**

| t | Specialist Name | Job site | Specialization |
|---|---|---|---|
| 1 | Prof. Dr. Kamal Aref | University of Baghdad / College of Physical Education | Sports Training-Handball |
| 2 | Prof. Dr. Saad Mohsen Ismail | University of Baghdad / College of Physical Education for Girls | Sports Training-Handball |
| 3 | Prof. Dr. Ahmad Yusuf Mutaib | University of Babylon / Faculty of Physical Education | - Sports Training Handball |
| 4 | Prof. Dr. Samer Yousef Miteb | University of Babylon / Faculty of Physical Education | - -Motor Learning Handball |
| 5 | Asst. Prof. Dr. Ahmed Abdel Zahra | University of Al-Qadisiyah / Faculty of Physical Education | - Physiology Handball |
| 6 | Asst. Prof. Dr. Atheer Abdullah Al-Lami | University of Al-Qadisiyah / Faculty of Physical Education | - Sports Training Handball |
| 7 | Asst. Prof. Dr. Ammar Darwish | University of Baghdad / College of Physical Education | Tests - Handball |
| 8 | Asst. Dr. Hussein Abdel Amir | University of Babylon / Faculty of Physical Education | Physiology – Handball |



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