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The effects of conditioning sports activity on hypertensive patients

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Abstract---The study aimed to investigate whether regular physical activity plays a role in the treatment of high blood pressure in Algerian individuals, given that over 90% of hypertension cases do not respond well to pharmaceutical or surgical treatment. Regular physical activity is an accessible and cost-effective way to maintain health, and recent scientific studies have shown its effectiveness in treating various chronic diseases, such as diabetes and respiratory disorders. To address this, the study was divided into three parts: Preliminary Chapter: This section introduces the research problem, hypotheses, objectives, definitions, challenges faced, and previous studies on the subject. Theoretical Background: This part consists of three chapters. The first chapter covers physical activity, including its concept, historical evolution, types, and its various health, psychological, and economic benefits. The second chapter discusses the cardiovascular system's role in maintaining normal blood pressure and the effects of engaging in physical activity on different body systems. It emphasizes physical activity's crucial role in prevention and the treatment of certain diseases. The third chapter addresses high blood pressure, its nature, types, scientific causes, complications, medications, and how to reduce and manage blood pressure while considering potential side effects. Applied Aspect: This section covers the study's methodology, the tools used, the selection of the study's sample, the definition of study variables, and the presentation and analysis of the obtained results.

Keywords---conditioned physical activity, hypertensive disease, cardiac function, physical health, systolic, diastolic blood pressure.

Introduction

Hypertension, commonly known as high blood pressure, is considered one of the most significant public health issues worldwide. Over a quarter of the global population is afflicted with this ailment, which scientists have aptly dubbed the "silent killer" due to its delayed diagnosis, difficulty in detection, and the often lethal nature of its complications. Algeria, like many other countries, grapples with the menace of this disease, which has proliferated alarmingly within its society. The Ministry of Health and Population has reported 11 million cases of hypertension in Algeria. A statistical study conducted by a group of heart disease specialists in Algeria revealed that 35 percent of Algerians are affected by this disease, with its victim count increasing day by day.

Considering that more than 90 percent of hypertension cases lack effective medicinal or surgical treatments, it has become essential to explore alternative methods alongside pharmaceutical treatment to alleviate the suffering of these patients. Physical exercise, a fundamental human activity that is easy, cost-effective, and universally practiced, has been a part of human societies since ancient times. Additionally, modern scientific studies have demonstrated its significant role in directly contributing to the treatment of other chronic conditions such as diabetes, respiratory disorders, and more.

First: The Preliminary Chapter, which includes the problem statement, the hypotheses being addressed, the reasons for choosing this research, its objectives, definitions of key terms, the challenges faced, and previous studies on the topic.

Second: The Theoretical Background of the Study, which consists of three chapters. The first chapter discusses physical activity, its concept, historical development, types, and its physical, psychological, and economic health benefits. The second chapter focuses on the cardiovascular system, explaining the role of the heart and the circulatory system in maintaining normal blood pressure, and then explores the effects of engaging in physical activity on different components of blood pressure. The third chapter delves into hypertension, defining it, its types, the scientific causes of its occurrence, its complications, and finally, the medications used in its treatment, their types, how they lower blood pressure, and their side effects.

Third: The Applied Aspect, which covers the research methodology, presentation and analysis of the obtained results, and a summary and conclusion.

The problem

It is a medical fact today that the likelihood of one developing hypertension (high blood pressure) increases as we age, especially in the period following one's forties. However, in contrast to the apparent inevitability of this occurrence, the results of medical studies that have examined the effects of healthy lifestyle behaviors suggest that there are many factors that can be highly beneficial in reducing the chances of developing high blood pressure as we age and can

contribute to its treatment. Among these behaviors, the researcher has focused on conditioned physical activity.

Because the term "treatment" is a broad concept with various aspects and multiple indicators, each of which is considered a part of it, we will attempt to study these indicators, each one individually. These indicators are:

- Blood pressure values, both systolic and diastolic, recorded during medical examinations, because obtaining lower blood pressure values is considered an indicator of approaching treatment for this disease.
- The quantity of daily medication taken by a patient with high blood pressure, as the decrease in the amount and types of medication taken is an indicator of the patient's progress in treatment.
- Obesity and high cholesterol levels in the blood, because the more severe the obesity in a patient, or the higher the level of cholesterol in their blood, the greater the risk of high blood pressure disease to their health.

So, the researcher aimed to answer the general question posed at the beginning of this study, which was as follows:

How does regular physical exercise help patients with high blood pressure?

Hypotheses

General Hypothesis

Regular adapted physical activity plays an effective role in the treatment of high blood pressure.

Partial Hypothesis

- Adapted physical activity contributes to lowering both systolic and diastolic blood pressure values in patients.
- Adapted physical activity has an effective role in reducing the daily intake of medication by hypertensive patients.
- Engaging in adapted physical activity helps in weight loss and obesity reduction in hypertensive patients.
- Adapted physical activity plays a positive role in modifying blood cholesterol levels for individuals with high blood pressure.

Reasons for Choosing the Research

Personal Reasons

- Personal Experience: The researcher's personal experience as a general practitioner and head of the emergency department at the hospital played a significant role in sparking interest in this topic.
- He encountered numerous individuals suffering from high blood pressure in his daily life and work, and, tragically, even witnessed cases where individuals passed away due to this condition.

- **Widespread Prevalence:** The alarming prevalence of high blood pressure in Algerian society is a major reason for concern. This condition affects a large portion of the population, making it a critical public health issue.
- **Alignment with Scientific Specialization:** The topic aligns with the researcher's scientific specialization as a medical doctor, making it a subject of professional interest and relevance.
- **Desire to Investigate:** The desire to delve into the causes, treatments, and complications of high blood pressure is a driving force behind this research. Understanding the physiological aspects and reasons behind the prevalence of this condition in Algerian society is a vital endeavor.
- **Limited Existing Studies:** The scarcity of in-depth studies on this topic within the Algerian context further emphasizes the need for research and a comprehensive understanding of the issue.

Objective Reasons

- The variations in types of this disease, the differences in medications, and chemical drugs used in its treatment.
- The growing scientific interest in physical sports activity.
- Studying the extent of interest in physical activity in Algerian society.
- Verifying the extent of adoption of physical sports activity in society, especially among those affected by this disease.
- Contributing to enriching the university library with a research study on this subject to serve as a reference for future similar studies.

Research Methods

A researcher in the scientific field should plan their research by thinking about the methods they will use in each stage of their study¹. This planning is referred to as the research methodology. Every study requires the researcher to choose a research methodology specific to it, based on the research problem and the objectives they aim to achieve. This choice should be made objectively and with scientific integrity. The research methodology represents the approach the researcher follows in studying the problem to discover the truth and obtain accurate and reliable results².

Descriptive-Analytical Methodology

Given the nature of our study, which aims to analyze the role of physical exercise in treating high blood pressure, we have chosen a descriptive methodology. This choice aligns with the study's objectives because the descriptive methodology focuses on investigating a specific phenomenon, diagnosing it³, uncovering its

¹ Methodology of Scientific Research in the Humanities," authored by Maurice Agers, translated by Mustafa Madi and Bouzid Sehraoui, and published by Dar El Qasba for Publishing in Algeria in 2004.

² Scientific Research: Design, Method, and Procedures" by Mohammed Gharib, published by the Modern University Office in Alexandria in 1982. p

³ Theories and Methods of Education" by Muhammad Awad Bassiouni and Faisal Al-Shatei, published by the University Publications Council in Algeria in 1992 p 206

aspects, determining the relationships between its elements, and quantifying it through data collection, classification, and subsequent analysis. In our survey and field study, we have employed the descriptive-analytical methodology to explore various facets and dimensions of our research topic.

Statistical Methodology

The statistical methodology was employed to convert data and information into quantitative values by constructing simple and complex tables. This allowed for the meaningful connection of variables to achieve scientific and objective analysis. Cases were presented in tables that contained key characteristics and various results over the study's months. After the data collection phase, the data was processed and analyzed using the statistical software SPSS. This analysis was conducted to test the hypotheses in the context of the research objectives.

The following statistical methods were used by the researcher:

- Calculating the mean and standard deviation for the sample participants' scores for each variable in the study.
- Conducting one-way analysis of variance (ANOVA) for each variable in the study.
- Employing the t-test (T-test) to assess the significance of differences between the means of the research group's scores during the four study months.

The researcher used as a tool throughout the survey

The bibliographic technique

This was achieved through thorough investigation that covered various aspects of the research subject and field, encompassing the writings of both Arab and Western authors. The exploratory reading continued until the completion of the research preparation.

The reading process began with the initial reading to crystallize the research, define its framework, and continued with readings that helped shape ideas and opinions and analyzed them. Our study included a wide range of references, including medical and biological books, physical education and sports literature, psychology, sociology, methodological references, university theses, journals, magazines, and newspapers, with a focus on materials related to the research topic. Additionally, the researcher visited various relevant websites on the internet.

This comprehensive literature review helped provide a solid foundation for the study and ensured that the research was based on existing knowledge and the latest developments in the field.

The interview

It is a directed conversation between a researcher and one or more individuals with the goal of uncovering a specific fact or understanding a particular perspective, serving the objectives of the study. Interviews can be effectively used

in various settings, particularly in communities with limited literacy and in studies related to children⁴.

It is a structured dialogue in which one person interacts with another individual or a group of people to gather information that serves the research topic, with the purpose of utilizing this information in their scientific research⁵. The interview process involved a guide that included a set of questions organized by the researcher. These questions were structured around two main axes aimed at exploring the role of physical sports activity in treating high blood pressure.

- A. The first axis: it is focused on high blood pressure, including its presence in the family, the duration of its appearance, its complications, and the presence of other diseases alongside it.
- B. The second axis: was centered on the extent of engagement in physical sports activity, its type, duration, frequency, and the period since its initiation. The questions were formulated in a simple and detailed manner to gather as much information as possible about the studied cases to achieve the study's objectives.

After developing the interview guide and reviewing it with a cardiologist, the researcher conducted the interviews with the sampled individuals.

Content analysis

Content analysis is an indirect technique applied to written, auditory, or visual materials created by individuals or groups. It enables both quantitative and qualitative data extraction and is undoubtedly one of the most commonly used methods for analyzing secondary data. It is considered one of the best analysis techniques and is applicable not only to materials produced in the present but also to content generated in the past⁶.

The method of content analysis is used in research to describe a phenomenon in an organized and objective manner, often quantitatively. It is employed in various fields of research, including psychology, sociology, teaching methods, physical education, and sports. Content analysis can be used to track growth in a specific practice or style and to uncover the relationships between the intended goals of certain content and what is actually being implemented⁷.

In your study, you utilized content analysis as a tool for examining medical records to monitor the health status of the individuals in your sample at a healthcare facility. This method allowed you to extract valuable information and insights from these records, aiding in the research process.

⁴ Scientific Research Methodology Rules, Stages, and Applications by Mohammed Abidat and others, published in Oman in 1999, on page 55.

⁵ Scientific Research: Its Principles and Writing Method by Mohammed Al-Aawi. Al-Maktaba Al-Academya , Cairo. p 79

⁶ Research Methodology in the Social Sciences" by Maurice Angers. p 218

⁷ Fundamentals and Principles of Scientific Research" by Fatima Awad Saber and Mervat Ali Khafaja. p 160

The variables of this study

Certainly, scientists of methodology agree that variables are linked to a concept. We refer to them as such because they denote something that can take different values. Variables originate from a concept or indicators, making the phenomenon measurable.⁸

One of the variables is presented as the cause and is called the independent variable, while the other is the one that depends on it in interpreting the phenomenon, representing the outcome, and is called the dependent variable, meaning the result of the action of the first. And the variables in our study are:

The independent variable: It is regular practice of physical sports activity.

The dependent variable: It is the treatment or aspects of recovery from high blood pressure. Since we cannot directly measure the treatment of the disease, we used some indicators that represent it, which are:

Measuring diastolic and systolic blood pressure.

The quantity of medication, as a decrease in the amount of medication taken indicates progress toward treatment.

Weight, as an increase in weight or obesity is considered a negative indicator for disease treatment.

Blood cholesterol levels, as a decrease in these levels is a positive sign of disease treatment.

The sample and its selection method

Selecting the sample is a fundamental step in research because it defines the study's framework and is the basis upon which the research is built. A comprehensive study of all subjects is often impractical due to time constraints, limited resources, physical and mental stamina, and other factors, so researchers choose to work with a subset of subjects, which constitutes the sample. They study this sample and generalize its characteristics to the larger population. The method of sample selection varies from one study to another, depending on the research's nature and its surrounding circumstances. Researchers estimate their information needs and choose their sample accordingly, making sure to achieve their objectives⁹. Hence, our study required the use of a purposive sampling method, which means selecting subjects intentionally, guided by the researcher's criteria. This non-probabilistic sampling method typically yields more precise results compared to random sampling. It is used because specific characteristics of the selected individuals are important for the study¹⁰.

Our sample possesses two essential characteristics for our research: being diagnosed with high blood pressure and regularly engaging in physical exercise. It consists of 38 individuals, including 28 males and 10 females, with ages ranging from 19 to 60 years. The researcher met them at Qasr Al-Hiran Hospital in the

⁸ Maurice Angers, *Research Methodology in the Humanities*, p 168

⁹ Morris, same reference, p. 316.

¹⁰ Mohammed Obaidat and others, *Research Methodology: Principles, Stages, and Applications*, p 96

Wilaya of El Oued, where they receive regular medical checkups for their heart and vascular conditions.

Presenting the results obtained

Some of the responses obtained in the interviews with the patients

- Question 1: Since when have you been suffering from high blood pressure?

This question aims to determine the duration of the patient's illness, as the longer the duration, the more severe and complicated it becomes. Table 1 shows the sample's responses to the first question.

Table 1

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	Total
Less then 3 years	x								x	x	x	x								10
3-6 years		x	x	x	x	x	x								x	x	x	x	x	22
More then 6 years								x					x	x						06

From the table, it is evident that 10 individuals, which represents 58%, or the majority, have been suffering from the disease for 3-6 years.

The second question: What are the benefits of physical activity that you are aware of? And what are the diseases that you know can be treated through physical activity? Table 02 illustrates the responses of the sample individuals.

Table 2

individuals	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	36	مجموع
Blood pressure	x	x	x	x		x		x	x	x	x	x	x	x			x	x	x	38/30
Diabetes	x	x	x	x	x	x	x	x	x	x	x				x	x				38/26
Weight loss	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	38/38
Psychological benefits			x	x				x			x			x		x				38/12
Social benefits			x						x		x									38/06

This question aims to assess the level of awareness among the sample participants regarding the general health benefits of physical activity and its role in treating chronic diseases specifically.

Reviewing the Medical Records

The sample consists of 38 individuals, all of whom are affected by high blood pressure and engage in regular physical activity. After reviewing their medical records and studying the content of each, and in line with the research hypotheses, the study examined four variables over an eight-month period, from

February to September. These variables include blood pressure measurements and the daily dosage of medication taken by the patients. These two are direct indicators of the effectiveness of treating high blood pressure. Additionally, there are two indirect indicators of treatment, which are body weight and the cholesterol levels in the blood. The collected data was then organized and presented in tables that are proportional to the study.

Study Fields

Spatial Field

The spatial area refers to the location where the field study was conducted, based on the selected sample. Our study was carried out at the Public Institution for Community Health, Qasr El-Hiran, in the Wilaya of El-Oued.

Temporal Field

The temporal area involves the time frame of the field study, particularly regarding the case interview questionnaire. After the final design was set, we conducted interviews with the 38 cases from January 19th to May 13th. We also analyzed the content of the medical records of the cases available in the medical examination department of the hospital from the beginning of April to the end of May 2022.

Analysis and Discussion of the Results

The researcher used statistical analysis techniques to examine the relationship between the dependent variable (the treatment of high blood pressure) and the independent variable (conditioned physical activity). Three statistical tests were employed at a significance level of $\alpha = 0.05$:

First -Way Analysis of Variance (ANOVA).

Second -Multivariate Analysis: The researcher used two methods within multivariate analysis - the Least Significant Difference (LSD) method and the Dunnett method.

Third "T" Test.

Hypothesis 1: The Relationship between Physical Exercise and Blood Pressure Values

A. Analyzing the results using Analysis of Variance (ANOVA):

Table 3

Variable	Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Level (p)
Blood Pressure	Between Groups	897.231	3	301.389	4.17	0.009
	Within the group	5179.69	70	69.232		
	Total	5431.94	71			

From Table 03:

A - We can observe that the F-value is statistically significant at the significance level $\alpha = 0.009$. Therefore, it is also statistically significant at $\alpha = 0.05$. This indicates that there are statistically significant differences in blood pressure values among the sample individuals over the four months of the study.

Given the significant differences in the means of the 8 months, this means that at least two months have different means. Therefore, we need to perform a post hoc analysis to determine which pairs of months are significantly different from each other. This can be done using the L.S.D. (Least Significant Difference) and Dennett's method for multiple comparisons.

B. In table 04, you can see the results of the post hoc analysis using the LSD (Least Significant Difference) and Dunnett's methods for multiple comparisons to test for significant differences in blood pressure values between different pairs of months in the study. The table provides information on which pairs of months show significant differences in blood pressure values.

Table 04 - Multiple Comparisons:

the dependent variable		the compared month (a)	the compared month (b)	the difference between the averages of months (A - B)	significance level α
blood pressure values	LSD	February	April	1,66667	0,542
			June	7,22222*	0,01
			August	8,33333*	0,003
		April	February	-1,66667	0,542
			April	5,55556*	0,045
			September	6,66667*	0,017
		June	February	-7,22222*	0,01
			April	-5,55556*	0,045
			September	1,11111	0,684
		August	February	-8,33333*	0,003
			April	-6,66667*	0,017
			June	-1,11111	0,684
	Dennett (2-sided) α	September	February	-1,66667	0,873
		March	February	-7,22222*	0,027
		April	February	-8,33333*	0,009

significance level at 0.05

From Table 04, we can observe the following results when comparing the differences in blood pressure measurements between the month of January (JAN) and the other months of the study:

- No differences are found between the results of February (FEB) and April (APR). The difference in blood pressure measurements between the first two months of the study, specifically FEB and APR, is 1.66667, and the significance level (α) equals 0.542 at $\alpha = 0.05$. This is not statistically significant because the significance level is greater than 0.05. In other

words, the blood pressure measurements have not changed significantly from February to April.

- Differences exist between the results of February (FEB) and June (JUN), with a difference in blood pressure measurements from the first month to the fourth month by a margin of 7.22222. The significance level equals 0.001 at $\alpha = 0.05$. This is statistically significant because the significance level is less than 0.05. In other words, there is a significant decrease in blood pressure values after four months, i.e., between February and June.
- Differences exist between the results of February (FEB) and September (SEP), with a difference in blood pressure measurements from the first month to the eighth month by a margin of 8.33333. The significance level equals 0.003 at $\alpha = 0.05$. This is statistically significant.

In conclusion, there is an improvement in blood pressure values, but it is only achieved after a period of four to eight months of regular physical exercise. This validates the first hypothesis.

Hypothesis 2: The relationship between physical exercise and the quantity of medication taken

To confirm or refute the study hypothesis that "Regular physical exercise plays an effective role in reducing the daily amount of medication taken by hypertension patients," an analysis of variance (ANOVA) test was used for the variable of daily medication intake during the four study months. Table 05 displays the test results for the daily medication intake in the four study months.

Table 5

Variable	Source of Variation:	Sum of Squares	Degrees of Freedom	Mean Squares	F-value	Significance Level (α)
the quantity of medication taken	Between Groups	0.89936587	3	8321.733	0.199	0.043
	Within th group	2295731.11	71	33937,485 35123.172		
	Total	2329305,944	71			

From Table 05, we observe that the F-value is not statistically significant at the significance level $\alpha = 0.043$. However, it is statistically significant at $\alpha = 0.05$. This indicates that there are statistically significant differences among the results obtained during the study period.

Given the presence of statistically significant differences between the means of the four months, this means that the averages of the eight months have changed. We can conclude that the drug dosage changes after the study's four months, thus confirming the second hypothesis of the study.

Hypothesis 3: The Relationship Between Physical Activity and Weight Variable

To prove or disprove the study's hypothesis that states: "Regular physical activity helps in weight loss and obesity reduction in patients with high blood pressure," a t-test for weight variable was used in the months of January and April. Table 06 illustrates the t-test between the beginning and end of the study.

Table 6

Weight Variable	The average	The standard deviation	T value	Degree of freedom	F value	The level of significance
February	89,6667	9,6345	2,382	34	0,177	0.023
September	82,5	8,37538				

Through Table 06, we can observe that the t-value has statistical significance, and the level of significance is 0.023, which is at the 0.05 significance level. This means that there are differences in the weight results among the sample individuals between the months of February and September.

It is observed that the average weight for February is 89.6667 with a standard deviation of 9.6345, which is higher than the average weight for September, which is 82.5 with a standard deviation of 8.37538. This indicates that weight has changed from February to September. In other words, 97.7% of the sample individuals have lost weight from the beginning to the end of the study, thus confirming the third hypothesis of the study.

Fourth hypothesis: The relationship between physical exercise and blood cholesterol levels

To confirm or refute the study's hypothesis, which states that 'physical exercise has a positive role in modifying blood cholesterol levels for individuals with high blood pressure,' the weight variable was tested using a 't-test' between January and April (beginning and end of the study). Table 07 shows the results of the 't-test' between the start and end of the study.

Table 7

The variable	The average	The standard deviation	T value	Degree of Freedom	F Value	The level of significance
Blood cholesterol levels						
February	640	92,00975	2,111	34	1,027	0,042
September	602	73,00239				

Through Table 07, we observe that the 't' value has statistical significance with a significance level of 0.042, at a significance level of 0.05. This indicates that there are significant differences in the results of measuring blood cholesterol levels among the study sample between February and September. Notably, the mean for February is 640 with a standard deviation of 92.00975, which is higher than the mean for September, measuring 602 with a standard deviation of 73.00239. These findings suggest that blood cholesterol levels decreased from February to September. In other words, 99.6% of the study's participants had reduced cholesterol levels from the beginning of the study until its end. This confirms the validity of the fourth hypothesis of the study. By proving the validity of all the sub-hypotheses initially proposed in the study, we can conclude that the general hypothesis of the study is valid. In other words, regular physical activity indeed plays a positive role in treating high blood pressure.

Conclusion

The neglect of a culture of regular physical activity in Algerian society is one of the factors contributing to some chronic diseases, which have reached alarming levels in our society, threatening the lives of many every day. Diseases like obesity, diabetes, and high blood pressure, known as the silent killer due to its difficulty to detect and monitor, often reach an advanced stage where their serious and fatal complications become evident.

To this day, despite scientific advancements in the fields of medicine, pharmacy, and biology, the reasons for contracting such diseases and how to effectively treat them remain mysterious and raise numerous questions. The predominant treatment options mainly rely on various medications and drugs, yet they have not achieved the desired results in accurately and consistently regulating blood pressure values in patients. It remains insufficient, thus requiring alternative treatment methods that collaborate in combating this disease that has baffled scientists.

Among these methods, our study has aimed to clarify the effective role that regular physical activity plays in contributing to the treatment of the disease. It directly enhances heart function and strengthens blood vessels while indirectly reducing excess weight and modifying the blood fat ratio. This is in addition to the other health benefits of physical activity, which enhance almost all body functions, regardless of gender or age. Thus, it is imperative that we alert individuals, particularly the community as a whole, to the necessity of establishing a strategy for regular and consistent physical activity that suits everyone based on their circumstances and abilities. By doing so, we hope to contribute to the treatment of certain diseases and mitigate their complications

through simple, cost-effective, and accessible means. Each one of us can engage in physical activity, whether it be at home, in a sports facility, at the pool, or even on the street, which can accommodate walking or jogging. By doing so, we become regular practitioners of physical activity.

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