Journal of Studies and Researches

of Sport Education

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# The Effect of a Proposed Physical-Health Program on Developing Some Functional and Health Fitness Indicators and Cardiorespiratory Efficiency in the Elderly (60-65 years)

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**Article information**

**Article history:**
**Received** 17/05/2026
**Accepted** 12/08/2026
**Available online** 15, Sep ,2026

**Keywords**:

Functional Fitness, Elderly, Cardiorespiratory Efficiency, Physical-Health Program, Body Mass Index (BMI), Active Aging, Blood Pressure.

**DOI**:

https://doi.org/10.55998/jsrse.v36i5.1609

Journal of Studies and Researches of Sport Education
https://jsrse.edu.iq/index.php/home/index

Online ISSN: 2789-6560
Volume 36, Issue 5, 2026
Pages:92-106

## Abstract

The study aims to design a physical-health program (combining aerobic exercises and health education) and identify its effect on health-related physical fitness variables (muscular strength, flexibility, cardiorespiratory endurance) and physiological variables (blood pressure, resting heart rate, BMI) among the elderly.

Methodology: The researcher used the experimental method with a two-group design (experimental and control) with pre- and post-tests6666. The sample consisted of (20) elderly men (aged 60-65) in Baghdad, randomly divided into two groups. The experimental group underwent the proposed program for (12) weeks (3 sessions/week), while the control group continued their daily routine.

Results: The results showed significant superiority for the experimental group in functional fitness tests (6-minute walk test, chair stand test) and significant improvement in reducing blood pressure and Body Mass Index (BMI) compared to the control group.

Aging is considered an inevitable biological phenomenon characterized by gradual physiological and morphological changes affecting all vital body systems (Ezz El-Din, 2015). This stage is usually accompanied by a decline in functional efficiency, such as reduced Vital Capacity of the lungs, a decrease in Basal Metabolic Rate (BMR), in addition to age-related muscle atrophy (Sarcopenia) (Powers & Howley, 2017), which negatively affects motor performance and independence in performing daily life burdens.(Andrieieva et al., 2019)

In light of contemporary technological development, the phenomenon of "Hypokinetic" (lack of movement) has emerged as one of the most dangerous challenges facing societies, especially the elderly category. Recent scientific literature indicates that physical inactivity is not merely a behavior, but a major risk factor for chronic diseases of the era, such as hypertension, Type 2 diabetes, and obesity (Chodzko et al., 2009).

Studies (Nelson et al., 2007) indicate that physical inactivity is one of the major causes of chronic diseases in this population. The American College of Sports Medicine (ACSM) confirms that integrating physical activity with health guidance is an effective strategy for improving quality of life. Hence lies the significance of the research as a scientific attempt to design a "hybrid" (physical and health) curriculum that is not limited to abstract exercise, but supports it with health behavior modification, contributing to reducing reliance on medication and improving motor independence for the elderly in Iraqi society(Diwan et al., 2025) . The American College of Sports Medicine confirms that integrating physical activity with health guidance is an effective strategy for improving quality of life (ACSM, 2018). Hence, Physical Education and physical activity are no longer viewed merely as recreation but have become a preventive and therapeutic necessity (Al-Khouli, 1996). However, physical practice alone may not be sufficient without being coupled with health awareness that includes proper nutrition and lifestyle modification (Salama, 2000).

Therefore, a need has emerged to design "hybrid" curricula that integrate the physiological regulation of training loads with health education, aiming to enhance "Health-Related Physical Fitness" and maintain a decent level of cardiorespiratory efficiency, ensuring "Active Aging" that avoids disability and dependence on others.

The importance of the current research lies in adding accurate scientific data to the Arab and Iraqi libraries regarding the responses of a critical age group (60-65 years) to regulated training loads, a group that often suffers from a scarcity of sports research compared to youth and athletes. It contributes to providing non-pharmacological solutions to control dangerous indicators such as blood pressure and Body Mass Index (BMI), thereby reducing the therapeutic bill and the burden on health institutions.

Research Problem ,through the researcher's field experience and observation of the health and sports reality, it was noted that the elderly category (especially after retirement age, 60-65 years) suffers from clear neglect regarding systematic sports care. Most individuals at this age tend to rest, which accelerates the pace of physiological deterioration and the onset of early aging diseases.

The research problem specifically lies in:

1. Absence of specialized programs: Scarcity of scientific training curricula designed specifically for this group that consider individual differences and their health determinants.
2. Separation between sports and health: Medical advice is often provided in isolation from sports application, or random walking is practiced without health and nutritional guidance, which reduces the desired benefit.

Therefore, the researcher decided to address this problem through an experimental study aiming to answer the following question:

"What is the effect of a proposed physical-health program on developing some functional fitness indicators and cardiorespiratory efficiency in the elderly?".

Research Objectives:

1. Prepare a proposed physical-health curriculum that suits the functional and physiological capabilities of the elderly group (60-65 years).
2. Identify the effect of the proposed program on developing some health-related functional fitness components (Muscular Strength, Cardiorespiratory Endurance, Flexibility).
3. Identify the effect of the proposed program on improving some functional and health variables (Systolic and Diastolic Blood Pressure, Resting Heart Rate, Body Mass Index).
4. Compare the results between the experimental and control groups in the post-tests to identify the superiority of the effect.

Research Hypotheses:

1. There are statistically significant differences between the results of the pre- and post-tests for the experimental group in favor of the post-tests in all research variables.
2. There are statistically significant differences in the results of the post-tests between the experimental and control groups, in favor of the experimental group in physical fitness variables and health indicators (positive improvement in values).

Research Methodology

The researcher used the experimental method with an "Equivalent Groups" design (Experimental and Control) with pre- and post-tests, due to its suitability for the nature of the research problem (Allawi & Abdel Fattah, 2000), which aims to determine the effect of an independent variable (Physical-Health Program) on dependent variables (Functional and Health Fitness).

The research population consisted of attendees of some gyms and retired and non-retired university professors aged 60-65 years, totaling (50) individuals.

The sample was chosen randomly after excluding those with diseases preventing physical exertion (based on medical reports), numbering (20) individuals. They were divided equally into:

- Experimental Group (10): Subjected to the proposed physical-health program.
- Control Group (10): Did not undergo the program (continued their normal life).

The sample was restricted to male participants in order to control for a key confounding variable – namely, the hormonal changes associated with post-menopause in females – which could otherwise interact with the effect of the proposed program and compromise the accuracy of result interpretation. Accordingly, Recommendation (4) proposes conducting a parallel study on a female sample to isolate this hormonal effect.

Prior to inclusion, all prospective participants completed a self-reported Health History Questionnaire covering cardiovascular, respiratory, and musculoskeletal conditions, in addition to reviewing any prior medical reports available to them. Individuals reporting a diagnosed condition that would contraindicate moderate-intensity physical exertion were excluded from the study. This screening step was undertaken to safeguard participant safety, in accordance with standard practice for exercise research involving older adults (ACSM, 2018).

Homogeneity and Equivalence:

The researcher performed homogeneity checks for all sample members in variables (Age, Height, Weight) using the Skewness Coefficient. Then, equivalence between the two groups was performed in the pre-tests to ensure no significant differences existed before starting the experiment (using t-test for independent samples).

Table (1): Sample Homogeneity

| Variables | Unit | Mean | Median | SD | Skewness |
|---|---|---|---|---|---|
| Age | Year | 62.40 | 62.00 | 1.85 | 0.64 |
| Height | cm | 171.50 | 172.00 | 4.20 | −0.35 |
| Weight | kg | 78.30 | 79.00 | 5.10 | −0.41 |

Table (1) shows that Skewness values for (Age, Height, Weight) ranged between (± 1), indicating that the research sample is normally distributed (homogeneous) and free from data extremism.

Table (2): Equivalence of the Research Groups (Experimental and Control) in Pre-tests

| Variables | Exp. Group (Mean ± SD) | Control Group (Mean ± SD) | t-value | Sig. | Significance |
|---|---|---|---|---|---|
| Age (Year) | 62.1 ± 1.5 | 62.7 ± 1.8 | 0.81 | 0.42 | Non-Sig |
| Weight (kg) | 77.5 ± 4.5 | 79.1 ± 5.2 | 0.73 | 0.47 | Non-Sig |
| 6-Min Walk (m) | 350 ± 45 | 355 ± 40 | 0.26 | 0.79 | Non-Sig |
| Systolic BP (mmHg) | 145 ± 5 | 144 ± 6 | 0.40 | 0.69 | Non-Sig |

Table (2) shows that calculated (t) values for all variables were smaller than the tabulated value, and the significance level was greater than (0.05), indicating no significant differences between the groups in pre-tests, confirming group equivalence at the starting point.

Content Validity of the Program:

The proposed physical-health program was constructed based on established scientific guidelines from the American College of Sports Medicine (ACSM, 2018) regarding exercise prescription for older adults, and on the internationally standardized Senior Fitness Test battery (Rikli & Jones, 2013), which specifies safe and validated protocols for this age group. The program's content thus reflects an evidence-based rather than an empirically pre-tested design; formal review by a specialized expert panel prior to application is recommended as a direction for future research to further strengthen content validity.

Data Collection Means and Tools:

Arabic and foreign sources, data dumping form, physical and physiological tests/measurements.

Tools: Stopwatch, medical scale (weight/height), mercury sphygmomanometer and stethoscope, Pulse Oximeter, standard height chairs (43 cm) without armrests, cones, and measuring tape.

Research Tests:

The researcher relied on the globally approved "Senior Fitness Test" battery (Rikli & Jones, 2013):

- Physical Variables:
  - 6-Minute Walk Test (6MWT): To measure cardiorespiratory endurance (aerobic capacity). Description: Walking the maximum possible distance in 6 minutes.
  - 30-Second Chair Stand Test: To measure lower body muscular strength. Description: Number of full stands and sits in 30 seconds with arms crossed.

    - Chair Sit and Reach Test: To measure flexibility of hamstrings and lower back.
- Health and Physiological Variables:
    - Blood Pressure: (Systolic and Diastolic) at rest.
    - Heart Rate: Measured in the morning or after complete rest for 10 minutes.
    - Body Mass Index (BMI): Equation: Weight (kg) / Height squared ($m^2$).

Field Procedures:

- Pilot Study: Conducted on 1/10/2024 on (4) individuals to ensure tool safety and timing.
- Pre-tests: Conducted on 7/11/2024.
- Program Application: Applied to the experimental group from 14/11/2024 to 6/2/2026 (Note: Date in source seems to have a typo regarding the year 2026, likely intended to be a 12-week period in 2024/2025).
- Program Specifications: 12 weeks, 36 sessions (3/week: Sat, Mon, Wed), 60 minutes per session.
    - Warm-up (10 min): Light walking and joint flexibility.
    - Main Part (35 min):
        - Physical (25 min): Aerobic exercises (intermittent brisk walking), strengthening exercises using body weight or very light weights, and balance exercises. Intensity: 50% - 70% of Max HR.
        - Health (10 min): "Health Education Segment" covering topics like water intake, salt reduction, sleep, and fall prevention.
    - Cool-down (15 min): Stretching and deep breathing.
- Post-tests: Conducted on 8/2/2026.

- Monitoring: The experimental group's heart rate was monitored during each training session using a Pulse Oximeter to ensure exercise intensity remained within the prescribed safe range (50-70% of maximum heart rate), in addition to weekly checks for any unusual symptoms.

Statistical Means: SPSS was used (Mean, SD, Median, Skewness, Paired T-test, Independent T-test, Percentage of improvement).

-Results, Analysis, and Discussion

Table (3): Means, Standard Deviations, and Calculated (t) Value for Pre and Post Tests of the Experimental Group

| Variables | Pre (Mean ± SD) | Post (Mean ± SD) | t-value | Sig. | Significance |
|---|---|---|---|---|---|
| 6-Min Walk (m) | 350 ± 45 | 480 ± 30 | 5.82 | 0.001 | Significant |
| Leg Strength (Rep) | 10 ± 2 | 16 ± 3 | 4.15 | 0.003 | Significant |
| Systolic BP (mmHg) | 145 ± 5 | 130 ± 4 | 3.90 | 0.004 | Significant |
| BMI ($kg/m^2$) | 29.5 ± 1.2 | 27.1 ± 1.1 | 3.22 | 0.01 | Significant |

(t-value at df 9 and sig 0.05)

Table (4): Comparison of Post-Test Results Between Experimental and Control Groups

| Variables | Exp. Group (Post) | Control Group (Post) | t-value | Significance |
|---|---|---|---|---|
| 6-Min Walk | 480 | 360 | 6.11 | Significant |
| Systolic BP | 130 | 142 | 3.75 | Significant |
| BMI | 27.1 | 29.2 | 2.88 | Significant |

Discussion of Results:

Discussion of Functional Fitness Results:

The researcher attributes the significant superiority of the experimental group in the (6-minute walk) test to the effect of the proposed physical program, which relied on progressive loading and regular aerobic training (Abu Al-Ela, 2003).

Practicing brisk walking and aerobic exercises at moderate intensity (50-70% of Max HR) for 12 weeks led to physiological adaptations in the elderly. The most important of these is increased heart muscle efficiency: training improved Stroke Volume, meaning the heart's ability to pump a larger amount of oxygenated blood to working muscles per beat, thereby reducing the burden on the heart and delaying fatigue (Wilmore & Costill, 2005).

Metabolic efficiency also improved, as aerobic exercises increase the number and size of "Mitochondria" within muscle cells, enhancing the body's efficiency in oxygen consumption ($VO_2max$) (Powers & Howley, 2017).

This aligns with Rikli & Jones, who noted that regular physical activity for the elderly reduces age-related biological deterioration in the cardiorespiratory system by up to 50% (Rikli & Jones, 2013).

Discussion of Health Indicators (Blood Pressure and BMI):

The results showed a positive decrease in Systolic Blood Pressure and BMI in the experimental group. The researcher attributes this to the positive interaction between physical exertion and health education.

- Regarding Blood Pressure: The decrease is due to a physiological mechanism known as "Post-exercise Hypotension," where regular exercise reduces total peripheral resistance of blood vessels (ACSM, 2018)[69]. Additionally, health education included in the curriculum (reducing sodium, avoiding stress) contributed to lowering the activity of the Sympathetic Nervous System, which is usually elevated in the elderly, aiding in blood vessel relaxation (Salama, 2000).
- Regarding BMI: The researcher attributes the decrease to increased Basal Metabolic Rate (BMR) and calorie consumption (Al-Hashimi, 2018)[71]. This agrees with studies confirming that combining physical activity with nutritional behavior modification is the most effective method to combat obesity in the elderly, rather than relying on diet alone which may cause loss of muscle mass (Nelson et al., 2007).

The control group's results remained stagnant (or slightly declined) due to the continuation of a sedentary lifestyle, confirming the research hypothesis that improvement is contingent upon regulated and guided practice.

Study Limitations:

The study relied primarily on functional physical tests from the internationally standardized Senior Fitness Test battery (6-Minute Walk Test, Chair Stand Test), which prior research has shown to be sensitive to change within an 8-12-week window in older adults (Rikli & Jones, 2013) (ACSM, 2018). These were supplemented by objective physiological indicators (blood pressure, BMI) as supporting – not substitute – measures for long-term clinical follow-up. A 12-week duration is therefore considered sufficient to detect measurable initial functional and physiological adaptations, though it does not necessarily reflect deeper structural changes that would require a longer intervention period.

It should also be noted that, aside from the pre- and post-tests, no comprehensive periodic medical examinations were conducted during the 12-week application period; monitoring was limited to session-based heart-rate tracking and weekly symptom checks.

-Conclusions and Recommendations

Conclusions:

1. Effectiveness of the Hybrid Curriculum: The proposed (Physical-Health) curriculum proved highly effective in developing functional fitness for the elderly, specifically in cardiorespiratory endurance (walking distance) and leg muscle strength, enhancing their motor independence.
2. Integrative Role of Health Education: Integrating "Health and Nutritional Awareness" with training sessions had a decisive impact on improving physiological indicators (lowering systolic BP and adjusting BMI) better than relying on physical exercise alone
3. The control group's results showed stability or a slight decline in functional fitness levels over the course of the study, confirming that physical inactivity at this stage of life accelerates biological deterioration and weakens functional efficiency – whereas the proposed physical-health program helped curb this decline and preserve the elderly participants' motor independence.
4. Training Safety: It is possible to apply strength and endurance exercises at moderate intensity (50-70%) for the elderly safely, without complications, as long as they undergo scientific regulation and continuous monitoring.

Recommendations:

1. Generalize the proposed "Physical-Health" curriculum to nursing homes, retiree forums, and health centers, considering it part of preventive care programs, not just recreational ones.
2. The Ministry of Health and Ministry of Youth and Sports must adopt awareness campaigns to establish the concept of "Active Aging" and encourage the elderly to practice regulated walking and simple strengthening exercises daily.
3. Periodic Examination: Emphasize conducting comprehensive medical examinations for the elderly before engaging in any sports activity to determine appropriate intensity.
4. Conduct a similar study applied to the female elderly population to determine the effect of hormonal changes (post-menopause) on response to the physical curriculum.
5. Conduct studies addressing the effect of this curriculum on other important variables such as: (Osteoporosis, Motor Balance to prevent falls, Psychological State, and Depression).
6. A comparative study between the effect of land-based training and aquatic training (Therapeutic Swimming) on the elderly suffering from joint problems.

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