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Article

An Experimental Study of the Intervention of Physical Exercise in Elderly Patients with Essential Hypertension

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Abstract: Objective: To study the application effect of physical exercise on the intervention of elderly patients with essential hypertension. Methods: 100 cases of hypertensive patients in our hospital between April 2023 and April 2024 were selected and grouped according to the randomized numerical table method, with the control group (n = 50) implementing conventional interventions and the observation group (n = 50) implementing scientific physical exercise interventions, to compare the quality of life scores before and after the intervention of the patients in the two groups; the attitudes and beliefs scores before and after the intervention; the scores of self-care ability before and after the intervention; the blood flow kinetic indexes; cognitive function scores before and after intervention; and intervention satisfaction. Results: The quality of life scores of both groups of patients were compared before intervention ($p > 0.05$). The quality of life scores for both groups of patients increased after intervention, where observation scores were significantly higher than control group scores ($p < 0.05$). The attitudes and beliefs scores for both groups of patients were compared before intervention ($p > 0.05$). The attitudes and beliefs scores for both groups of patients increased after intervention, where observation group scores were significantly higher than control group scores ($p < 0.05$). The self-care ability scores for both groups of patients were compared before the intervention ($p > 0.05$). The self-care ability scores of both groups improved following the interventions, with the intervention group scoring higher than the control group ($p < 0.05$). The hemodynamic indexes were compared before intervention ($p > 0.05$). After the intervention, hemodynamic indexes were lower, and the intervention group was lower than the control group ($p < 0.05$). Cognitive function before intervention showed no significant difference ($p > 0.05$). Following the intervention, the cognitive function scores were significantly increased, and the observation group was greater than the control group ($p < 0.05$). Satisfaction with intervention was higher for the observation group than for the control group ($p < 0.05$). Conclusion: Elderly patients with essential hypertension can improve their quality of life, attitude toward intervention, self-care ability and cognitive function, improve their blood pressure, and have high intervention satisfaction through scientific physical exercise.

Keywords: physical activity; essential hypertension; elderly patients; blood pressure; quality of life

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1. Introduction

In the present society, the quality of people's life is on the upward trend; however, the increase in number of unhealthy lifestyle patients is also on the increase, resulting in chronic diseases such as hypertension. It is estimated that approximately 160 million people in China suffer from hypertension, according to recent health statistics. Hypertension can lead to dysfunction of the heart, brain, and kidney, among others, causing such secondary diseases as stroke, heart disease, and kidney diseases, which become quite a threat to patients in terms of life maintenance. Presently, the primary mode for treating hypertension in medical settings is pharmacological treatment targets being treated. However, traditional drug treatments not only are responsible for causing much harm to the bodies of patients but also fail to achieve good and long-lasting therapeutic effects. Nowadays, it has become more and more recognized that guiding patients to engage in scientific physical exercise has become an intervention measure for patients with a chronic disease. Several studies have concluded that through guiding patients to perform scientific exercises, blood pressure levels in patients with primary hypertension can be reduced [1]. The World Health Organization (WHO) has also conducted expert discussions on primary hypertension and suggested that employing exercise therapy can assist in treating hypertension and controlling blood pressure. Patients with primary hypertension who engage in appropriate physical activities can improve their physiological and biochemical indicators, reduce the dosage of antihypertensive drugs, which is beneficial for enhancing clinical treatment outcomes. Based on this, applying non-pharmacological rehabilitation treatments for elderly patients with primary hypertension that are safe, healthy, economical, and highly effective holds significant importance. In this paper, 100 hypertensive patients from our hospital between April 2023 and April 2024 were selected and divided into groups using the random number table method to analyze the application effects of physical exercise. The following is a detailed exposition of this analysis.

2. Information and Methods

2.1. General Information

A total of 100 hypertensive patients treated at our hospital from April 2023 to April 2024 were randomly assigned into groups using a random number table. The control group (n = 50) underwent standard interventions: 29 males and 21 females, aged 60-75 years, with an average age of (67.68 ± 2.49) years, a disease duration of 1-10 years, with an average duration of (5.95 ± 1.13) years, and a BMI ranging from 18-30 kg/m², with an average BMI of (23.89 ± 1.65) kg/m². The observation group (n = 50) underwent a scientific physical exercise intervention: 31 males and 19 females, aged 60-77 years, with an average age of (67.89 ± 2.57) years, a disease duration of 1-11 years, with an average duration of (6.01 ± 1.18) years, and a BMI ranging from 18-30 kg/m², with an average BMI of (23.95 ± 1.78) kg/m². The general data were comparable ($p > 0.05$). Note: This study was approved by the hospital's ethics committee [2].

Inclusion criteria:

1) Confirmed diagnosis of hypertension through comprehensive assessment;
2) Good compliance;
3) Patients and their families signed the informed consent form;
4) Primary hypertension;
5) Age ≥ 60 years.

Exclusion criteria:

1) Secondary hypertension;
2) Comorbid conditions such as heart failure;
3) Psychiatric disorders;
4) Malignant tumors;
5) Cardiomyopathy;
6) Cerebrovascular accidents.

1.2. Methodologies

Control Group: Conventional Intervention:

1) Pharmacotherapy: For the majority of hypertension patients, pharmacological treatment primarily involves the administration of antihypertensive medications to regulate blood pressure. This approach necessitates strict adherence to medical prescriptions, prohibiting any self-adjustment or discontinuation of medication to prevent recurrence of the condition. Healthcare personnel guide the patient on ho to implement the antihypertensive interventions along the path of treatment, monitoring, for instance, in cases where elderly hypertensive persons have renal failure or poor physical health.

2) Lifestyle Management: diet, lifestyle advice, sleep practices. For modifications in daily diet, a low-sodium, low-fat diet is necessary, restricting high-fat foods with a moderate increase in fruits and vegetables. Other lifestyle recommendations include smoking cessation, moderating drinking alcohol, refraining from heavy exercise to prevent increases in arterial blood pressure, and improving resiliency of blood vessel walls. After meals, patients are encouraged to engage in shallow aerobic practices like Tai Chi or slow walking. Sleep-wise, they are required to develop habits of sleeping early and getting up early, entirely avoiding prolonged states of extreme tension or fatigue. In this case, one would aim for balance between work and rest, maintaining emotional equilibrium and relaxation.
3) Minimal Psychological Intervention: Briefly apprising the patients about hypertension and other core points of daily monitoring encourages individual cooperation and compliance, giving way for deeper insights into his or her emotional states. Psychological interventions thereafter address negative feelings through patient education [3].

The exercise principle: The principle applies progressive intensity to increase exercise intensity for patients. The actual exercise will be conducted for an hour including a warm-up, main exercise, and cool-down. It is strongly suggested that before, during, and upon completion of exercise sessions, physicians or nurses assess vital cardiopulmonary signs per time; especially heart rates were carefully measured through telemetry to monitor that patients would remain within their target heart rate range. Warm-up included passive stretching or jogging, ten to fifteen minutes prior to procedures, to avoid muscle injuries. Other cool-down exercises typically include eight to ten minutes of muscle group stretching after workouts to manage post-exercise soreness. For the sake of the patients' understanding and ability to perform the exercises appropriately, they receive an elaborate verbal explanation of all exercises and safety measures before the initiation of exercises. Simultaneously, while exercising, a whole shift will be supervised by two medical personnel to prevent any unpleasant occurrence. More importantly, antihypertensive medication and the physical exercise must not overlap each other. In addition, if it is necessary to interrupt the exercise if c/o; palpitations, signs and symptoms of discomfort, or chest tightness are experienced during the exercise period. Finally, it requires a certain amount of conversation between health care providers and the patients in positive terms to develop a medication and exercise regime [4]. This communication intends to instill a positive approach and boost confidence in treatment for diseases among patients. Healthcare professionals should take the family on board in the intervention to relatively ensure that they provide appropriate care and support being brought by the warmth of family love, thereby strengthening the will of patients. The team caring for the patients should monitor fluctuating emotional distress and supervise periodical communication among patients, applying music listening, television, and the like as diversions while teaching deep-breathing techniques, meditation, and relaxation in regulating emotions and nurturing optimal mental states. For patients lacking willpower, health professionals should assist in employing specific measures of self-restraint for daily routines by organizing reminders for administering medications. As circumstance may dictate, planning out schedules for taking medications could be undertaken to sustain a rhythmic pattern of medication use.

1.3. Observation Indicators

1) Quality of life scores before and after the intervention were evaluated using the SF-36 scale, with a maximum score of 100. Higher scores indicate a better quality of life.

2) Attitude and belief scores before and after the intervention are assessed according to the Hypertension Treatment Attitude and Belief Evaluation Scale, where a higher score represents a better attitude and belief.
3) Self-care ability score before and after intervention: assessed according to the self-care ability scale, the higher the score, the stronger the self-care ability;
4) Hemodynamic indicators before and after intervention: including heart rate, systolic blood pressure, diastolic blood pressure;
5) Cognitive function scores before and after intervention: assessed according to the Basic Cognitive Ability Test, the higher the score, the better the patient's cognitive function;
6) Intervention satisfaction: assessed according to the homemade nursing satisfaction questionnaire in the hospital, which was divided into three items: very satisfied, satisfied, and dissatisfied, and the patients did anonymous filling in, nursing satisfaction = (very satisfied + satisfied) / total number of cases in the group × 100%.

1.4. Statistical Processing

SPSS 20.0 statistical software was used, in which mean + standard deviation conformed to normal distribution, (±s) was used to represent the measurement data, which was checked by calculating the t-value, and rate (%) was used to represent the count data, which was checked by calculating the x^2 [5].

2. Results

2.1. Comparison of Quality of Life Scores Before and After Intervention

A comparison of the pre-intervention quality of life scores between the two groups showed no significant difference ($p > 0.05$). Following the intervention, both groups exhibited an improvement in their quality of life scores, and the observation group was higher than the control group ($p < 0.05$), see Table 1;

Table 1. Comparison of quality of life scores before and after intervention ($\bar{x}$ ± s) (points).

Quality of Life Score	Time	Observation group (n = 50)	Control group (n = 50)	t	p
Mental Health	Pre-intervention	69.35 ± 3.86	70.25 ± 3.94	1.154	0.251
	post-intervention	89.89 ± 5.32	80.34 ± 4.16	9.999	<0.001
Social Functioning	Pre-intervention	73.89 ± 4.52	73.12 ± 4.46	0.857	0.393
	post-intervention	91.25 ± 5.16	84.53 ± 6.30	5.835	<0.001
General Health	Pre-intervention	65.79 ± 4.89	65.13 ± 4.76	0.684	0.496
	post-intervention	85.79 ± 6.38	76.85 ± 5.74	7.366	<0.001
Physiological Functioning	Pre-intervention	68.75 ± 4.98	68.13 ± 4.91	0.627	0.532
	post-intervention	87.65 ± 5.49	80.12 ± 5.23	7.022	<0.001
Energy	Pre-intervention	64.35 ± 6.46	64.71 ± 6.52	0.277	0.782
	post-intervention	88.56 ± 7.85	78.92 ± 9.33	5.590	<0.001
Somatic Functioning	Pre-intervention	61.32 ± 5.49	61.79 ± 5.52	0.427	0.670
	post-intervention	88.34 ± 6.56	76.46 ± 6.15	9.342	<0.001
Emotional function	Pre-intervention	69.82 ± 4.53	69.13 ± 4.58	0.757	0.451
	post-intervention	89.82 ± 5.03	79.68 ± 4.98	10.130	<0.001
Physiological Function	Pre-intervention	71.56 ± 3.98	71.03 ± 4.16	0.651	0.517

post-intervention	92.65 ± 4.18	83.35 ± 4.12	11.205	<0.001

2.2. Comparison of Attitude and Belief Scores Before and After the Intervention

Prior to the intervention, there was no significant difference in attitude and belief scores between the two groups ($p > 0.05$). After the intervention, both groups showed increased scores, with the observation group demonstrating significantly higher scores than the control group ($p < 0.05$), as presented in Table 2.

Table 2. Comparison of attitude and belief scores before and after the intervention ($\bar{x} \pm s$) (points).

Group	number of examples	Treatment Troubles		Adherence		Lifestyle		Medication	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Observation Group	50	11.66 ± 2.84	20.19 ± 3.40	6.10 ± 1.66	12.30 ± 1.92	20.13 ± 1.54	26.75 ± 0.76	9.22 ± 1.01	19.15 ± 1.59
Control group	50	11.77 ± 2.90	17.63 ± 3.08	6.06 ± 1.69	10.32 ± 1.74	20.29 ± 1.18	24.13 ± 0.54	9.38 ± 1.04	17.15 ± 1.43
t	-	0.192	3.946	0.119	5.403	0.583	19.871	0.780	6.613
p	-	0.848	<0.001	0.905	<0.001	0.561	<0.001	0.437	<0.001

2.3. Comparison of Self-Care Ability Scores Before and After Intervention

A comparison of self-care ability scores between the two groups before the intervention revealed no significant difference ($p > 0.05$). Following the intervention, both groups experienced an increase in self-care ability scores, with the observation group scoring significantly higher than the control group ($p < 0.05$), as illustrated in Table 3.

Table 3. Comparison of self-care ability scores before and after intervention ($\bar{x} \pm s$)(points).

Observation Group	number of examples	Health Awareness		Self-Care Skills		Self-care responsibilities		Self-concept	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	50	20.73 ± 3.16	43.58 ± 7.44	21.43 ± 3.70	41.28 ± 5.16	15.32 ± 2.45	26.80 ± 4.05	17.50 ± 3.04	32.69 ± 3.77
Observation Group	50	21.02 ± 3.25	32.16 ± 5.01	21.82 ± 4.01	34.16 ± 4.28	15.40 ± 2.56	21.82 ± 3.24	17.90 ± 3.13	24.61 ± 4.19
t	-	0.452	9.003	0.505	7.510	0.160	6.789	0.648	10.137
p	-	0.652	<0.001	0.614	<0.001	0.874	<0.001	0.518	<0.001

2.4. Comparison of Hemodynamic Indices Before and After Intervention

A comparison of hemodynamic indexes between the two groups prior to the intervention showed no significant difference ($p > 0.05$). After the intervention, both groups exhibited a decline in hemodynamic indexes, with the observation group demonstrating significantly lower values than the control group ($p < 0.05$), as shown in Table 4.

Table 4. Comparison of hemodynamic indices before and after intervention ($\bar{x}$ ± s).

Observation Group	number of examples	Heart rate (beats/min)		Systolic blood pressure (mmHg)		Diastolic blood pressure (mmHg)	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	50	85.68 ± 4.35	80.53 ± 5.68	153.35 ± 15.65	137.23 ± 11.94	94.65 ± 11.65	75.24 ± 10.66
Observation Group	50	86.79 ± 7.16	85.26 ± 5.13	154.13 ± 15.32	146.85 ± 12.20	94.73 ± 11.82	84.54 ± 10.41
t	-	0.937	4.370	0.252	3.985	0.034	4.414
p	-	0.351	<0.001	0.802	<0.001	0.973	<0.001

2.5. Comparison of Cognitive Function Scores Before and After Intervention

Before the intervention, the cognitive function scores of the two groups of patients were compared ($p > 0.05$), and after the intervention, the cognitive function scores of the two groups of patients were elevated, and the observation group was higher than the control group ($p < 0.05$), as shown in Table 5.

Table 5. Comparison of cognitive function scores before and after intervention ($\bar{x}$ ± s)(points).

Observation Group	Number of Exampl	Perceptual speed		Mental arithmetic efficiency		Spatial Representation		Working Memory	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	50	13.56 ± 2.16	17.06 ± 2.09	8.98 ± 1.13	10.89 ± 1.86	7.03 ± 1.16	8.65 ± 0.76	11.23 ± 2.65	15.13 ± 1.52
Observation Group	50	12.99 ± 2.03	13.56 ± 1.16	8.73 ± 1.06	8.92 ± 0.81	7.10 ± 1.19	7.68 ± 0.62	11.71 ± 2.43	11.13 ± 2.46
t	-	1.360	10.354	1.141	6.866	0.222	6.993	0.944	9.781
p	-	0.177	<0.001	0.257	<0.001	0.825	<0.001	0.348	<0.001

2.6. Comparison of Intervention Satisfaction

Observation group: 96.0% (48/50), 36 cases were very satisfied, 12 cases were satisfied, and 2 cases were dissatisfied, Control group: 80.0% (40/50), 30 cases were very satisfied, 10 cases were satisfied, and 10 cases were dissatisfied, Comparison of the two groups ($p < 0.05$).

3. Discussion and Conclusion

Hypertension is a chronic condition with a high incidence rate in modern clinical practice. Once a patient develops hypertension, their blood pressure abnormally rises, and it is often accompanied by disorders in lipid and glucose levels. In clinical settings, anti-hypertensive drugs are typically used to control blood pressure. However, for the elderly, whose bodily functions gradually decline with age and who often suffer from multiple underlying diseases, the probability of adverse drug reactions and emotional disturbances is significantly higher, thus necessitating effective interventions. While the conventional intervention model yields some clinical benefits for elderly patients with primary hypertension, it fails to meet the expected outcomes, and thus the integration of other methods is essential [6].

The results of this study demonstrate that the intervention outcomes for the observation group were markedly superior to those of the control group. The reason lies in the application of a scientifically designed physical exercise regimen. During exercise, the patient's entire musculature is actively engaged, promoting coordination between the upper and lower limbs. This process involves deep and steady breathing, ensuring the exercise is safe. By guiding patients in sustained, low-intensity aerobic activities, we can enhance their cardiac and pulmonary functions, reduce heart rate and blood viscosity during rest, and improve cardiovascular metabolism. Additionally, an increase in the number of capillaries can correct peripheral circulation, enlarge and thicken muscle blood vessels, and boost collateral coronary arteries, thus increasing the diameter of blood vessels and blood flow, enhancing the elasticity of the vascular walls, and ultimately lowering blood pressure. Research indicates that after a single bout of dynamic, low-intensity exercise, a patient's blood pressure is notably lower than during rest, and this effect can persist for one to three hours. The application of scientific physical exercise, grounded in evidence-based medicine, clearly showcases the benefits of exercise in blood pressure regulation [7].

The success of exercise interventions for primary hypertension closely correlates with exercise intensity. If the intensity is either very low or very high, interventional effects are likely to be suboptimal. Exercise intensity is best expressed in terms of heart rate, through which feedback may be offered to indicate appropriate exercise intensity. In the present study, all patients were given aerobic training, mainly employing fat along with glycogen for energy, a means by which to effectively train the heart and lungs, elicit a positive microcirculatory response within the body, minimize heart rate, and increase dilation of blood vessels while achieving a significant antihypertensive effect [8]. The physical exercise plan formulated for this study aimed at achieving steady state, continuous intensity in the exercise and ensuring that the patient reached, during most exercises, 70%-85% of their maximum heart rate, hence enhancing the antihypertensive effect.

Results from this study show that the cognitive function in the observational group is better than the control group, representing physical exercise as a potential enhancer of cognitive function in elderly patients with primary hypertension. However, the actual mechanisms by which exercise benefits cognition remain quite murky according to the current clinical research. Given that the hippocampus of the central nervous system handles information and constitutes short-term memory, it is speculated that the active exercises will boost the hippocampal performance in elderly patients with primary hypertension, thereby temporarily enhancing their information processing capacity [9]. The onset of primary hypertension may increase the prevalence of Alzheimer's disease. Patients who have high blood pressure for a long time will lead to the damaging of their brain white matter along with the hippocampus, thus increasing their possibility of developing dementia. Physical exercise improves cardiovascular functioning, blood pressure control, corrects cerebral blood circulation, and increases the growth of blood vessels, thereby reducing the instance of Alzheimer's disease. Additionally, oxidative stress reactions would cause various cardiovascular diseases and hypertional situations that have shown to lead to shortened or dysfunctional telomeres. Shortened telomeres reinforce the inability of cells to resist oxidative stress while equally diminishing cellular coordination ability, thus furthering aging, cardiovascular disease, and neural damage. Physical exercise ultimately enhances the activities of antioxidant enzymes-soothing the capability of the patients to deal with oxidative stress reactions, averting excessive damage directed toward cellular telomeres, and protecting the neural cells. Related human neuroimaging studies show that improved physical fitness alleviates inferior white matter integrity in the frontal lobe of the brain while also increasing gray matters. The findings imply that anatomical structural changes constitute another important mechanism through which physical exercise improves cognitive function within elderly patients with primary hypertension [10].

To sum up, elderly patients suffering from primary hypertension will have improvement in quality of life, cognitive functions, the ability to care for themselves, patient satisfaction, and lowered blood pressure through physical exercise which makes it really valuable.

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