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Effect of Scheduled Exercise Regimen on Physical Health Outcomes in Older Adults: An Experimental Study

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Abstract: Introduction: Aging-related declines in physical health are associated with a reduced overall quality of life, a greater risk of chronic diseases, and a reduction in mobility. The global demographic trend toward an aging population has increased focus to older people's health and well-being. India's elderly population is growing rapidly, which is contributing to issues with age-related health decline. As people age, their physical health declines, which can have an impact on their quality of life. It is commonly known that maintaining the health and functional independence of older adults requires frequent physical activity. **Objective:** To assess effect of scheduled exercise regimen on physical health outcomes among older adults. **Materials and Methods:** For a quasi-experimental study, 80 senior volunteers, all 60 years of age or older, who lived in specific old age homes in the state of Punjab and were split into two groups (40 experimental and 40 control), were selected via purposive sampling. Self-structured questionnaires were used to collect data. The interventional group followed a scheduled exercise program for four weeks, while the control group continued with their daily routine without an organized exercise program. Physical health outcomes were measured before and after the intervention using standardized tools, including systolic and diastolic blood pressure, random blood sugar, waist circumference, BMI, heart rate, and respiration rate. **Results:** The statistical analysis showed that the experimental group's physical health parameters significantly improved when compared to the control group ($p<0.05$). **Conclusion:** According to the study's findings, older persons' physical health can be improved by following a planned exercise program.

Keywords: Scheduled exercise regimen, Physical health outcomes, older adults.

Introduction

As the world's population ages, older people's health and wellbeing have grown to be significant problems. The number of elderly people in India is steadily rising, and a sizable portion of them live in rural and semi-rural regions like Punjab. One of the numerous factors

influencing aging is physical health, which has a significant impact on older people's quality of life. It is well accepted that regular physical activity is one of the best strategies to slow both the physical and mental decline that occurs with aging. Nevertheless, despite the proven benefits of exercise, older adults continue to underutilize structured exercise programs, especially in places like Punjab.

Scheduled exercise routines, which involve systematic and regular physical activity, have been shown to improve a number of physical health outcomes, including cardiovascular health, muscle strength, mobility, and overall physical function. Conversely, sedentary behavior is associated with an increased risk of chronic diseases like diabetes, arthritis, and hypertension, which are prevalent among the elderly. However, there hasn't been much research specifically on how formal exercise programs effect older adults in Punjab, where social, cultural, and regional factors may influence exercise participation.

The aim of this research is to examine the effects of a consistent exercise regimen on the physical health outcomes of older adults residing in Punjab. Using a quasi-experimental research design, the study aims to evaluate the degree to which an organized exercise program enhances physical health indicators such cardiovascular endurance, muscle strength, flexibility, and balance. This study is expected to provide valuable new insights into how exercise programs tailored to the specific needs of Punjab's aging population may encourage healthier aging and potentially influence regional public health policies and initiatives.

By offering a model for similar communities aiming to create age-appropriate and sustained physical activity programs, the study's findings may help fill a research gap on exercise interventions in rural India.

Design of the study: A quasi-experimental research design with a pretest-posttest control group was used to assess the effectiveness of a scheduled exercise program.

Participants and study setting: A few state senior living institutions in Punjab served as the study's locations. Participants in the study were older adults (over 60) who met the inclusion criteria by consenting to participate and making themselves available for data collection. The grounds for exclusion were arthritis and cognitive impairment in older persons.

The size of the sample is A total of 80 older people were selected through purposeful selection, and the sample's 95% confidence interval was calculated using power analysis. They were divided into two groups: 40 people in the experimental group participated in a planned exercise program, whereas 40 people in the control group continued with their regular activities without engaging in any kind of structured exercise regimen.

Intervention: The planned exercise program was based on the suggested exercise regimen for senior citizens.

Aerobic Activity: walking lightly five days a week.

Range-of-motion Exercises: Toe and heel lifts, arm circles, elbow rotations, tricep and bicep workouts, and head and neck stretches are examples of range-of-motion exercises. Do deep breathing exercises for five minutes every day, five days a week. (every day of the week).
Each session lasted thirty minutes and was supervised by a licensed physiotherapist five days a week.

Physical health-related outcomes: Body mass index includes heart rate, respiration rate, weight in kilograms per square meter (m^2), waist circumference (measured with a measuring tape), systolic blood pressure, diastolic blood pressure (measured with a sphygmomanometer), and random blood sugar.

Data Analysis: Descriptive analysis was used to validate the subjects' characteristics, and chi square was utilized to assess homogeneity. A paired and unpaired "t" test was used to evaluate the changes in the pretest physical health outcome ratings. The association between the demographic traits and physical health outcomes of the samples in the interventional group was examined using the one-way ANOVA, the t-test, and Pearson's correlation coefficient (r). The IBM SPSS software (version 21) was used to examine the data.

Result: We discovered that a planned exercise program successfully reduced RBS, systolic and diastolic blood pressure, heart rate, breathing rate, and waist circumference. According to the study's findings, there was a statistically significant difference between the two groups' posttest scores. With the exception of dietary preferences, there was no statistically significant variation in the study group's demographic characteristics.(Table 1)
When compared to the control group, the experimental group's mean post-test scores for systolic and diastolic blood pressure, waist circumference, respiration rate, random blood sugar, and heart rate were significantly different ($p<0.05$), as indicated in Table 2.
The results showed a moderately positive correlation (.448) between diastolic blood pressure and random blood sugar, a strong positive correlation (.728) between body mass index and waist circumference, and a very strong positive correlation (.859) between systolic and diastolic blood pressure (Table 3).Therefore, it was determined that when older adults' systolic blood pressure rises, so does their diastolic blood pressure; when their body mass index rises, their waist circumference rises as well; and when their diastolic blood pressure rises, their random blood sugar rises to a certain degree.
The relationship between the body mass index of older persons in the experimental and control groups and demographic factors (i.e., age, gender, education, body build, prior education, and dietary habits) is displayed in Table 4. The results showed that body mass index was statistically significantly correlated with body build in both the experimental and control groups, as well as with eating habits in the latter group alone. Additionally, neither

group's body mass index and the remaining demographic factors showed any discernible correlation.

Table 5 shows how older persons' waist circumferences in the experimental and control groups relate to their age, gender, education, body type, previous education, and eating habits. Both the experimental and control groups' waist circumferences and body build, as well as the control group's eating practices alone, were significantly correlated, according to the data. Additionally, neither group's waist circumference and the remaining demographic factors showed any discernible link.

Discussion: The results of this study firmly showed that an organized and planned exercise program greatly enhanced physical health outcomes in older persons, including blood pressure, heart rate, waist circumference, respiration rate, and random blood sugar levels. These findings are in line with other research highlighting the importance of exercise in preserving metabolic and cardiovascular health. Nystoriak and Bhatnagar (2018), for instance, emphasized the cardiovascular advantages of exercise, such as lowered blood pressure and enhanced endothelial function, which are consistent with the gains seen in our intervention group.

The findings of Colberg et al. (2010), who highlighted that regular physical activity improves glycemic control and insulin sensitivity in older persons with or at risk of type 2 diabetes, are further supported by the notable decrease in random blood sugar levels.

Although not always statistically significant, the observed decreases in BMI and waist circumference are significant markers of better metabolic health. Physical activity, according to Langhammer et al. (2018), lowers the risk of falls and disability by promoting musculoskeletal strength and reducing obesity-related hazards.

Furthermore, our sample's association between blood pressure, BMI, and waist size highlights how closely related metabolic and cardiovascular health are. Large-scale surveys have shown this association, such as Malaysia's NHMS 2015, which discovered that cardiovascular risk factors clustered among older persons (Sazlina et al., 2020).

The increases in heart rate and respiration rate may also be explained by the deep breathing and flexibility exercises we included in our program. This is consistent with research by Perci & Kanchana (2019) and D'silva et al. (2014), which showed that deep breathing improves heart rate variability, lowers anxiety, and increases parasympathetic activity.

Furthermore, even though our study showed beneficial short-term impacts, more research is needed to determine whether these benefits will last. According to Peterson & O'Connor (2019), maintaining aerobic activity over the long term is essential to weighing the advantages and disadvantages of physical training in older adults.

Strengths and Limitations: The primary strength was that study tackles a critical public health concern: enhancing older persons' physical health outcomes through exercise, particularly in India, where the number of elderly people is growing quickly. Because the exercise program (walking, stretching, and breathing exercises) was easy to follow, affordable, and practical, it could be replicated in both community and institutional settings. A comprehensive picture of health advantages is offered by a number of physiological measurements, including blood pressure, body mass index, waist circumference, blood sugar, heart rate, and respiration rate. Findings are more credible when t-tests, ANOVA, and correlation analysis are used. Adds important data from Punjab, India, where there aren't many studies on structured exercise for senior citizens. The research's integrity is strengthened by the assurance of anonymity and ethical clearance. Furthermore future studies can investigate other mediating variables that were not included in the study & study could be extend for more duration (12 weeks) to assess the long term sustainability. To determine if the advantages were sustained over a long period of time, post-intervention follow-up could be conducted.

Conclusion: The current study concluded that a scheduled exercise program was a successful intervention in improving the heart rate, random blood sugar, respiration rate, waist circumference, SBP, and DBP of adults residing in specific assisted living facilities. Exercise programs centered in the community ought to be established in order to encourage healthy aging.
To validate these results, larger sample sizes and longer follow-up periods are required in future research.

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Conflict of interest: There are no competing interests.

Ethical clearance: The Institution Ethics Committee provided ethical clearance and approval with reference number (IHEC/DHR/CU/PB/21/03/41).Authorities from a few chosen assisted living facilities were also consulted for permission. Information confidentiality was preserved.
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Table 1: Frequency and Percentage distribution of the characteristics of samples. N=80

Variable	Experimental group (n=40)		Control group (n=40)		df	χ^2
1) Age (in years)	F	%	F	%	2	0.971 NS
a. 60-69	17	42.5	18	45		
b. 70-79	17	42.5	16	40		
c. 80-89	06	15	06	15		
2. Gender					1	0.654 NS
a. Male	22	55	20	50		
b. Female	18	45	20	50		
3. Education						
a. No formal education	11	27.5	09	22.5	4	0.11 NS
b. Primary education	06	15	20	50		
c. Elementary education	15	37.5	05	12.5		
d. Senior secondary education	01	2.50	01	2.5		
e. Graduate or above	07	17.5	05	12.5		
4. Previous occupation					4	0.088 NS
a. Government	09	22.5	01	2.5		
b. Private job	06	15	08	20		
c. Agriculture	04	10	03	7.5		
d. Business	06	15	10	25		
e. House wife	15	37.5	18	45		
5.Body built					2	0.120 NS
a. Obese	22	55	13	32.5		
b. Normal	09	22.5	15	37.5		
c. Thin	09	22.5	12	30		
6. Dietary habits					1	0.000 *
a. Vegetarian	17	42.5	34	85		
b. Non-vegetarian	23	57.5	06	15		

Table 2: Comparison between mean post-test scores of older adults in experimental and control group. N=80

S.No.	Physical health outcomes	Experimental group		Control group				
		Mean	S.D	Mean	S.D	MD	t value	p value
1.	Systolic BP	125.25	1.99	133.63	14.05	8.38	3.735	0.0004**
2.	Diastolic BP	81.25	1.025	85.75	7.12	4.50	3.957	0.0002*
3.	Body mass index	26.47	.713	28.76	29.75	2.29	0.486	0.6278NS
4.	Waist circumference	41.26	.783	38.40	5.00	2.86	3.574	0.0006*
5.	Heart rate	75.78	1.678	78.85	6.79	3.07	2.776	0.0069*
6.	Respiration rate	18.55	.411	17.80	1.85	0.75	2.503	0.0144*
7.	Random blood sugar	134.00	11.855	157.45	71.20	23.45	2.055	0.0433*

Table 3; Correlation of post-test physical health outcomes of older adults in experimental group. N=40

Post-test	Systolic BP	Diastolic BP	BMI	Waist Circumference	Heart rate	Respiration rate	RBS
Systolic blood pressure	1	.859**	-.053	.025	.130	.144	.299
		.000	.747	.880	.425	.374	.061
		40	40	40	40	40	40
Diastolic blood pressure		1	.000	.061	.176	.202	.448**
			.998	.707	.278	.212	.004
			40	40	40	40	40
Body mass index			1	.728**	.031	.072	.000
				.000	.849	.658	1.000
				40	40	40	40
Waist Circumference				1	-.020	.096	.052
					.903	.556	.749
					40	40	40
Heart rate					1	-.116	.164
						.475	.313
						40	40
Respiration rate						1	.069
							.670
							40
Random blood sugar							1

Table 4: Association of mean post-test body mass index of older adults with socio demographic variables in both groups. N=80

Variables		Experimental group(n=40)				Control group (n=40)			
		Mean	df	F/t value	p value	Mean	df	F/t value	p value
Age (in years)	60-69	27.02	2/37	1.713NS	.194	24.34	2/37	.127NS	.881
	70-79	27.01				23.74			
	80-89	23.38				23.93			
Gender	Male	25.59	38	1.386NS	.174	23.42	38	1.146NS	.259
	Female	27.55				24.67			
Education	No formal education	27.06	4/35	.685NS	.607	21.86	4/35	2.167NS	.093
	Primary education	27.67				24.48			
	Elementary education	26.77				26.82			
	Senior secondary education	22.70				25.80			
	Graduate or above	24.41				23.10			

Body built	Obese	28.97	2/37	14.28**	.000	26.80	2/37	9.030*	.001
	Normal	24.66				23.16			
	Thin	22.17				22.15			
Previous occupation	Government job	25.89	4/35	.899NS	.475	22.70	4/35	.402NS	.806
	Private job	24.90				23.40			
	Agriculture	24.88				24.80			
	Business	25.75				23.27			
	Housewife	28.16				24.70			
Dietary habits	Vegetarian	25.97	38	.597NS	.554	23.58	38	2.101*	.042
	Non-vegetarian	26.84				26.67			

Table 5: Association of mean post-test waist circumference of older adults with socio-demographic variables in both groups. N=80

Variables		**Experimental group(n=40)**				**Control group (n=40)**			
		Mean	**df**	**F/t value**	**p value**	**Mean**	**df**	**F/t value**	**p value**
Age(in years)	60-69	41.59	2/37	.177NS	.839	39.17	2/37	1.112NS	.340
	70-79	41.32				38.50			
	80-89	40.17				35.67			
Gender	Male	41.20	38	.081NS	.936	38.45	38	.093NS	.926
	Female	41.33				38.30			
Education	No formal education	42.64	4/35	1.278NS	.297	34.56	4/35	3.106*	.027
	Primary education	42.00				38.90			
	Elementary education	41.63				43.20			
	Senior secondary education	42.00				40.00			
	Graduate or above	37.57				38.00			
Body built	Obese	43.89	2/37	9.684**	.000	42.31	2/37	8.544**	.001
	Normal	38.56				37.07			
	Thin	37.56				35.75			
Previous occupation	Government job	40.56	4/35	.328NS	.857	36.00	4/35	.248NS	.909
	Private job	39.50				37.38			
	Agriculture	42.00				40.00			
	Business	41.92				39.10			S
	Housewife	41.93				38.28			
Dietary habits	Vegetarian	39.88	38	1.541NS	.132	37.56	38	2.632*	.012
	Non-vegetarian	42.28				43.00			

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