Exploring The Impact Of Varied Training Approaches On Low-Density Lipoprotein Cholesterol In Middle-Aged Women

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ABSTRACT

Introduction: The examination in this study focused on assessing the impact of a 16-week program involving aerobic, resistance, and interval training with low to sub-maximal intensity on LDL-C levels among untrained women aged 30-35 years. **Objective:** The aim was to explore the impact of a sixteen-week progressive training program, featuring sub-maximum intensity, aerobic, resistance, and interval training, on LDL-C levels in young men. **Methods:** The participants were divided randomly into different groups: an aerobic-based training group (ABTG) with n=15, a resistance-based training group (RBTG) with n=15, an interval-based training group (IBTG) with n=15, and a control group (CG) with n=15. The participants in the experimental groups followed their respective training protocols. **Results and Discussion:** The results indicated that the maximum intensity aerobic, resistance, and interval training program led to a significant decrease in LDL-C levels when compared to the control group. Furthermore, there was no variation in LDL-C levels between the different exercise protocol groups.**Conclusion**: In conclusion, the findings from this study highlight the effectiveness of a comprehensive training program encompassing maximum intensity aerobic, resistance, and interval training in producing a substantial reduction in LDL-C levels when compared to the control group. Notably, the investigation also revealed that there were no discernible differences in LDL-C levels among the various exercise protocol groups. These results underscore the potential of a multifaceted exercise regimen in promoting cardiovascular health by targeting LDL-C levels.

KEY WORDS: LDL-C, Aerobic, Resistance, Interval.

INTRODUCTION: In countries that have made significant strides in technological development, the prevalence of sedentary lifestyles among residents has given rise to a host of problems, ranging from health concerns to cardiovascular issues such as heart diseases, obesity, and coronary artery disease (CAD). Atherosclerosis is a noteworthy challenge faced by developed nations today. Addressing health-related physical fitness, a crucial element in an individual's well-being, requires active engagement in various physical activities.Low-density lipoprotein cholesterol (LDL-C) stands as a prominent and independent risk factor for coronary heart disease (CHD), showing an inverse correlation with CHD incidence. Endurance exercise training, characterized by sustained moderate-intensity activity, has demonstrated remarkable reductions in LDL-C levels in both male and female participants following a training period. For endurance athletes, these reductions typically range from 20% to 30% compared to inactive control groups.

Aerobic-based training has been advocated as an effective strategy for enhancing cardiovascular protection. Research has indicated that such training leads to LDL-C decreases in men aged 18 and above. Additionally, positive training-related adaptations have been observed in Total Cholesterol, Triglycerides, LDL-C, and High-Density Lipoprotein Cholesterol. Some studies have reported changes solely in LDL-C and the ratio of Total Cholesterol to HDL-C, without affecting HDL-C and Triglyceride levels.Given the evident susceptibility of the cardiovascular system and metabolic profile among young men, understanding the potential advantages of exercise becomes pivotal. Although there have been comparisons between the effects of aerobic and resistance training on cardiovascular risk factors, the specific benefits derived from each approach remain important points of investigation (7,8).

METHODOLOGY AND MATERIALS: Sixty inactive individuals within the age range of 30 to 35 years volunteered for this study. The participants, consisting of women (with a mean age ± standard deviation of 32.5 ± 2 years), were made aware of any potential risks or discomforts associated with their involvement. Before being enrolled in the study, written informed consent was obtained from each participant.

The individuals were randomly allocated into three distinct training groups and one control group. All the participants were selected from different colleges within Kurnool city, situated under the jurisdiction of Rayalaseema University, Kurnool, Andhra Pradesh, India.

Aerobic-Based Training Group (ABTG): The supervision of the training was overseen by an exercise physiologist, and the regimen involved engaging in sessions three times per week over a span of 16 weeks, with each session lasting 45 minutes. The core part of the session's intensity commenced with a target heart rate (HR) set at 50% of the individual's reserve during the initial four weeks. This intensity was then progressively increased to 51-55% HR reserve during the subsequent four weeks, followed by 55-60% HR reserve from the 9th to the 12th week, and ultimately reaching 60-65% HR reserve during the 13th to 16th week.

Resistance-Based Training Group (RBTG): Following a suitable warm-up, participants in this group undertook resistance exercises for duration of 16 weeks, with a frequency of three days per week. This regimen encompassed a sequence of 8 exercises employing elastic bands, targeting major muscle groups.

The progression pattern adhered to the following structure:
1 set of 8 repetitions (1st - 2nd week)
1 set of 12 repetitions (3rd – 4th week)
2 sets of 8 repetitions (5th – 6th week)
2 sets of 10 repetitions (7th - 8th week)
2 sets of 12 repetitions (9th - 10th week)
2 sets of 15 repetitions (11th - 12th week)
3 sets of 12 repetitions (13th - 14th week)
3 sets of 15 repetitions (15th - 16th week)

A minimum interval of 3 minutes was incorporated between sets of the same exercise to ensure appropriate recovery**.**

Interval-Based Training Group: Within the interval-based training group, participants were engaged in a regimen of running and walking, covering a distance of 3.2 km on 3 separate days each week over a span of 16 weeks. During each training session, the participants performed 4 sets of 800 meters' intervals, adhering to a work-to-rest ratio of 1:1. These intervals were executed at an intensity corresponding to approximately 60-65% of their predicted maximal heart rate (HR Max), calculated using the formula 220 - age in complete years.

Control Group: Individuals in the control group received specific instructions to abstain from engaging in any form of strenuous exercise throughout the entire duration of the training period.

Materials: Venous blood samples were gathered in the morning timeframe spanning from 8 AM to 9:30 AM, carried out by two specialized staff nurses. These blood samples were collected prior to the commencement of the training session, as well as after the culmination of the 16-week training program. The assessment of LDL-C levels was conducted through the utilization of a direct two-point Kinetic assay kit (CH2652, Randox Laboratories Ltd., U.K.).

Statistical Analysis: The Analysis of Covariance technique was harnessed to scrutinize the influence of the experimental variable on the chosen physiological parameters. Furthermore, Scheffe's post hoc test was applied to identify the origins of notable distinctions among the various groups and to scrutinize the hypotheses that lead to conclusive findings. The designated level of significance for these analyses was set at 0.05.

LDL Cholesterol Analysis:

Presented in Table I is the analysis of covariance concerning the subjects' LDL Cholesterol in relation to the chosen experimental variable. The data in the table distinctly illustrates a substantial impact attributed to the selected experimental variable, encompassing aerobic, resistance, and interval training, over the designated

experimental period. Notably, the derived F value, 34.915, greatly surpasses the tabulated F value, 2.78, signifying that the chosen experimental variables have brought about noteworthy alterations in the subjects' LDL cholesterol levels.

Mean Values of LDL Cholesterol (Table II): Table II provides an overview of the mean values pertaining to the selected criterion variable, which is the LDL Cholesterol of the subjects. The table yields the following insights: among the three groups - aerobic running, resistance, and Interval Based Training Group - the aerobic running group demonstrates superior reductions in LDL cholesterol levels. The post-training mean for LDL cholesterol in the aerobic running group stands at 116.30, while the resistance group exhibits a mean of 121.7636, and the Interval Based Training Group registers a mean of 125.214. A clear comparison of the mean values across the three groups establishes that the aerobic group achieves a significant decrease in LDL cholesterol when contrasted with the other two groups. Furthermore, the resistance group also displays a reduction in LDL cholesterol levels compared to the Interval Based Training Group. This rudimentary analysis of the adjusted mean values subsequent to training underscores the evident and significant decline in LDL cholesterol levels among the subjects due to the implementation of the three chosen activities at the predetermined intensity.

Table-IANCOVA TABLE

SOURCE	DF	SS	MS	F	CR.F
TOTAL	59	2849.847			
BG	3	1868.653	622.8845	34.91526	2.78
WG	55	981.1941	17.83989		

Table- IIPre training, Post training and adjusted post training means for LDL Cholesterol:

GROUPS	N	MX	MY	MY.X
IBTG	15	115.0667	109	125.2149
RTG	15	124.3333	114.2	121.7626
AG	15	136.4667	120.0667	116.3004
CG	15	153.8667	152.0667	132.0541
		132.4333	123.8333	123.833

Table III - Scheffe's Post Hoc test for LDL Cholesterol

CD FOR SCHEFFE'S TEST

CD=	√(a-1)F√((2(MsError)/n)) 4.355

INDIVIDUAL COMPARISONS FOR LDL CHOLESTEROL

GROUPS And VALUES	A G 116.3004	RBTG 121.7626	IBTG 125.2149
RBTG 121.7626	-5.4622 Sig		
IBTG 125.2149	-8.9447 Sig	-3.45227 n.sig	
CG 132.0541	-15.7537 Sig	-10.2915 sig	-6.83918 sig

Variance in LDL Cholesterol Mean Values: Although there exists variability in the mean LDL Cholesterol values due to the three exercise protocols, the pursuit of genuine distinctions and the underlying reasons behind notable variations led to the execution of the Scheffe's post hoc individual comparison test.

Scheffe's Post Hoc Individual Comparison Test (Table III): Table III presents the outcomes of the Scheffe's post hoc individual comparison test, which delves into individual group comparisons. This examination through the Scheffe's post hoc test unveiled that the aerobic running group, in particular, showcased a noteworthy reduction in LDL Cholesterol among the subjects when juxtaposed with the other two experimental exercise protocols. Notably, the post-training adjusted means for the resistance and Interval Based Training Groups are disparate in numerical values. The Scheffe's post hoc comparison test underscored that the distinction between these groups is insignificant, signifying that the training effects of the resistance and Interval Based Training Groups are comparable.

Nonetheless, it is crucial to emphasize that all three exercise protocol groups within the experimentation registered marked reductions in LDL cholesterol levels, as revealed by the Scheffe's post hoc individual comparison test. This reduction is distinct when contrasted with the Control group's LDL cholesterol levels.

CONCLUSIONS AND RECOMMENDATONS

CONCLUSIONS:

The following conclusion has been derived after analyzing the experimentation results through the appropriate statistical tools:

1. All the three different protocols selected for the aerobic training group, resistance training group and interval training group at the moderate intensity of maximal heart rate intensity caused for the significant decrease in the LDL cholesterol levels of the subjects.

RECOMMENDATIONS:

The scholar offers the following recommendations in this context:

Implementation of Moderate-Intensity Aerobic Programs: To effectively manage the contributing factors of degenerative diseases such as Coronary Heart Disease and Hypertension, it is advisable to undertake aerobic exercise programs characterized by a moderate intensity, specifically ranging from 60% to 70% of the maximal heart rate. The engagement should encompass a minimum distance of four kilometers.

Exploration of Diverse Populations: For a broader understanding, it is recommended to undertake cross-sectional studies across varied populations, transcending geographical limitations.

Inclusion of Diverse Age Groups and Geographical Regions: A valuable extension of the research would involve conducting similar studies targeting different age groups within the same geographic population, or alternatively, investigating populations from various geographical areas.

Exploration of Longitudinal Studies with Extended Duration: To achieve a more comprehensive perspective, a suggestion is to embark on similar studies with longitudinal designs, thereby extending the experimental period to gather insights over an extended timeframe.

Varied Intensity Levels in Experimentation: To further deepen the understanding, it is proposed that multiple analogous studies be conducted, exploring variations in the intensity factor within the experimental exercise protocols.

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