Abel L. Toriola

INFLUENCE OF 12-WEEK JOGGING ON BODY FAT AND SERUM LIPIDS

A. L. TORIOLA, MA

Institute of Physical Education, University of Ife, Nigeria

ABSTRACT

This study examined the influence of different levels of distance running on percent body fat and serum lipids in untrained male University students ($n = 40$) with a mean age of 24.1 years. Subjects were assigned randomly to four groups ($n = 10$ in each group): Group 1 (control), Group 2 (1.6 km joggers), Group 3 (3.2 km joggers) and Group 4 (4.8 km joggers). Subjects in the exercise groups jogged the prescribed distances three times a week for 12 weeks at about 85 percent of maximal heart rate. Percent body fat, serum cholesterol and triglyceride levels were estimated before and after the training programme. In comparison with control group, exercise groups showed statistically significant ($p < .05$) decrease of body fat values (1.6 km joggers 6%; 3.2 km joggers 5%; 4.8 km joggers 8%). Decrease in serum triglyceride levels were also observed in the exercise groups (1.6 km joggers 5.33%; 3.2 km joggers 11%; 4.8 km joggers 9.42%). However, Newman-Keul's post hoc analysis showed a significant ($p < .05$) reduction in serum triglyceride only in 3.2 km joggers. This was attributed to the high pre-training level of serum triglyceride in the group. Cholesterol values showed insignificant changes. It was concluded that moderate physical activities of different intensities have lowering effects on body fat and serum lipids.

Key words: Jogging, Coronary heart disease, Body fat, Serum lipids.

INTRODUCTION

Regular participation in physical activity is associated with decreased incidence of coronary heart disease (CHD) which is a major cause of mortality in several countries. Prospective studies such as those of Pell and D'Alonzo (1961) and Kennelly (1982) have tended to correlate elevated levels of body fat and serum lipids with the occurrence of CHD. It is widely conceived that physical training may reduce susceptibility to CHD by lowering adiposity and altering plasma lipid levels. Wilmore et al (1977) reviewed several studies which compared body fat values among athletes and non-athletes. These authors observed low body fat ranging between 6.3 and 7.5 percent for distance runners and comparatively high body fat of 16.8 percent for untrained men.

Available evidence from research studies concerning the influence of physical training on serum cholesterol and triglyceride levels have been conflicting. In some studies, fasting values of serum cholesterol (Lehtonen and Viikari, 1978) and serum triglyceride (Farrel and Barboriak, 1980) were found to have declined signif-

icantly due to training. However, Altekruze and Wilmore (1973) and Ballantyne et al (1978) gave contrary findings.

This study attempts to examine the influence of different levels of distance running on percent body fat and serum lipids in a group of male students of the University of Ife, Nigeria. A comparative analysis of the influence of different jogging schedules on body fat and serum lipid levels may serve as a useful guide in prescribing physical activities for the prevention of CHD and the maintenance of cardiovascular fitness.

MATERIALS AND METHODS

Subjects

Subjects of the study were a total of 40 untrained male students with a mean age of 24.1 ± 3.0 years and an average body weight of 65.2 ± 5.6 kg. Before jogging began, subjects responded to a self-report questionnaire which was used to collect information about their involvement in physical activity and medical history of cardiovascular disease. A medical screening of subjects

was undertaken. All subjects were given a detailed description of the experiment and procedures to be used and gave written informed consent. Subjects were assigned randomly to one of four treatment groups as follows: Group 1 (control), Group 2 (1.6 kilometre joggers), Group 3 (3.2 kilometre joggers) and Group 4 (4.8 kilometre joggers). There were ten subjects in each study group.

Training Programme

Subjects within the exercise groups jogged the prescribed distances three times a week for 12 weeks. The control subjects were instructed not to participate in any vigorous physical activity during the training programme. A pilot study was undertaken before jogging started to ascertain the procedures of each exercise regimen.

In order to ensure the intensity of jogging, subjects were made to work at about 85% of their maximal heart rate (HR max) as suggested by Fox and Mathews (1981). Because of the difficulty of monitoring the heart rate while jogging, a 10-second post-exercise heart rate was used periodically to cross-check the intensity of each exercise bout. The caloric costs of jogging during the entire programme were estimated for each exercise group based on the data from Howley and Glover (1974). Subjects' body weight was multiplied by calorie cost of the activity to estimate their total energy expenditure. Each jogging session was conducted as follows: initial warm-up exercise involving calisthenics (5 minutes), jogging 1.6 kilometres (5-10 minutes), jogging 3.2 kilometres (12-18 minutes), jogging 4.8 kilometres (18-25 minutes) and warm-down activities (5 minutes). Subjects used canvas shoes for jogging on the 400-metre cinder track of the University of Ife Sports Centre. During the entire experiment period the atmospheric temperature ranged between 29°C and 32°C and relative humidity ranged from 64% to 76%.

Data Collection

The data for the study were collected from all subjects through standardised anthropometric and biochemical procedures before and after the jogging programme. Subjects' chest, abdomen and thigh skinfold measurements were made using the Harpenden skinfold calliper. The procedures suggested by Katch and Katch (1980) were observed in estimating skinfold thicknesses. Percent body fat was calculated according to the formula of Baun et al (1981). Fasting serum cholesterol (Roschlau et al, 1975) and triglyceride (Rice, 1970) concentrations were estimated enzymatically using the assay kits obtained from Boehringer, Mannheim, Germany. A pilot study was embarked upon before the initial biochemical measurement to ascertain the reliability of blood test procedures. Reliability determination involved the presentation of supposedly different but duplicate blood

samples of five persons for analysis. Within-run precision ranging from .04 to .11 standard deviation were obtained for serum cholesterol and serum triglyceride estimations, respectively. Reproducibility of subjects' blood constituents was also ascertained following each set of ten estimations during the pre- and post-training measurements. The formula suggested by Youden (1951) was used to calculate the reproducibility of biochemical estimations.

Statistical Analysis

The scores obtained by subtracting the post-test from the pre-test mean scores for the treatment groups were used for statistical analysis. A one-way ANOVA with four levels was computed according to SPSS procedures (Nie et al, 1979) to test for significant differences in the dependent variables among the various treatment groups.

Newman-Keul's post hoc method (Hinkle et al, 1979) was used for further analysis where F-ratio was significant ($p < 0.05$).

RESULTS

As shown in Table II, there was a significant F-ratio for percent body fat ($F_{3,36} = 8.77$; $p < 0.05$). Most pronounced reduction in percent fat value was found in subjects of the 4.8 kilometre group (Table I). Newman-Keul's post hoc analysis of the F-ratio showed that there was no significant variation in percent fat among the training groups. However, the exercise groups had significantly lowered percent fat values as compared to the control group. This presents a decrease of 6%, 5%, 8% for the 1.6, 3.2 and 4.8 kilometre joggers, respectively (Table I).

A non-significant F-ratio ($F_{3,36} = 1.55$; $p > 0.05$) was found for serum cholesterol (Table II). This value shows an insignificant difference in serum cholesterol concentration among subjects in the various groups. More reductions in serum cholesterol were observed in the training groups compared with the control group. A slight increase of 0.4% was observed for the control subjects. However, decrease of 2.3%, 2.1%, 2.9% were noted for the 1.6, 3.2 and 4.8 kilometre joggers, respectively (Table I).

Serum triglyceride levels showed varying amounts of reductions in the exercise groups (1.6 kilometre joggers 5.3%; 3.2 kilometre joggers 11.1% and 4.8 kilometre joggers 9.4%). A significant F-ratio ($F_{3,36} = 3.6$; $p < 0.05$) was obtained for serum triglyceride. Newman-Keul's post hoc analysis showed that only the serum triglyceride level of subjects within the 3.2 kilometre group was significantly lowered in comparison with those of other exercise groups.

TABLE I

The percent body fat, serum cholesterol and serum triglyceride concentrations for the four groups before and after the 12 weeks of training (Mean $\pm$ SD)

Variable	Exercise Groups											
	Control (n = 10)			1.6 Kilometres (n = 10)			3.2 Kilometres (n = 10)			4.8 Kilometres (n = 10)		
	Pre	Post	% Diff.	Pre	Post	% Diff.	Pre	Post	% Diff.	Pre	Post	% Diff.
Percent Body Fat												
Mean	16.2	16.5	1.85	16.8	15.8	-5.95	16.5	15.7	-4.85	17.0	15.6	-8.24
SD	1.5	1.3		1.5	1.7		1.0	1.4		1.6	2.2	
Serum Cholesterol (mmol/l)												
Mean	4.77	4.79	0.4	4.71	4.60	-2.3	4.79	4.69	-2.1	4.80	4.66	-2.9
SD	.31	.24		.31	.25		.20	.17		.27	.22	
Serum Triglyceride (mmol/l)												
Mean	2.19	2.13	-2.7	2.25	2.13	-5.3	2.34	2.1	-11.1	2.23	2.0	-9.4
SD	.31	.34		.33	.28		.29	.20		.22	.17	

TABLE II

One-way ANOVA summaries on percent body fat, serum cholesterol and serum triglyceride

Variable	Source of variation	Sum of squares	d.f.	Mean Square	F-ratio	Significance of 'F'
% Body Fat	Between Groups	15.1	3	5.04	8.7 ^a	0.001
	Within Groups	20.7	36	0.58	8.77	
	Total	35.8	39			
Serum Cholesterol	Between Groups	6.4	3	2.12	1.55 ^b	0.215
	Within Groups	49.0	36	1.36		
	Total	55.4	39			
Serum Triglyceride	Between Groups	3.8	3	1.26	3.6 ^a	0.023
	Within Groups	12.7	36	.35		
	Total	16.5	39			

a Significant ($p < 0.05$)

b Not significant

DISCUSSION

The exercise groups in this study demonstrated significant reduction in percent body fat than the control group. This finding is consistent with that of Bjorntorp

TABLE III

The average total amount of jogging and estimated energy expenditure for the exercise groups during the 12-week training programme.

Exercise Groups	Amount of Jogging Exercise (km)	Body Weight (Mean $\pm$ SD)	Energy Consumption (Kcal./12 weeks)
1.6 kilometres (n = 10)	57.6	69.3 8.2	3917
3.2 kilometres (n = 10)	115.2	63.4 4.1	7167
4.8 kilometres (n = 10)	172.8	62.8 5.4	10648
Total Joggers (n = 30)	345.6	65.2 5.6	21732

Energy conversions were made according to Howley and Glover (1974).

et al (1973) who reported significant decrease in the percent fat of their subjects after 6 months of physical training. The jogging programme did not have a significant differential effect in lowering percent fat values among the exercise groups. Thomas et al (1981) had earlier reported a similar finding.

In the present study, training did not lower serum

cholesterol concentration significantly. However, a trend toward increase in cholesterol level was found in the control subjects. Conflicting results on the influence of physical training on serum cholesterol have been observed in some earlier studies (Huttunen et al, 1979; Peltonen et al, 1981). Since subjects of this study were normolipidaemic, a probable significant effect of training on their cholesterol levels could be more difficult to accomplish.

The lowering of serum triglyceride level as a result of the jogging programme is in agreement with the findings of Lopez-S et al (1974) and Ballantyne et al (1978). Contrary report was given by Streja and Mymin (1979). The significant reduction in serum triglyceride found in the 3.2 kilometre subjects could be attributed to their

comparatively high pre-training levels. This confirms the findings of Mann et al (1969).

The present data suggest that moderate physical activity has lowering effects on body fat and serum lipids. Generally, the lowering effects of the jogging programme were related to the training distance which represented proportionately different energy consumptions for the exercise groups (Table III). The possibility that the observed changes in this study might be influenced by other factors such as diet and alcohol intake cannot be totally excluded. In this study, participants' diet and alcohol use were not controlled though they were instructed not to alter their feeding habits. Similar studies in future should seek to control such extraneous factors.

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BOOK REVIEW

Title: WRITING A SCIENTIFIC PAPER & SPEAKING AT SCIENTIFIC MEETINGS
Author: Vernon Booth
Publisher: The Biochemical Society, PO Box 32, Commerce Way, Colchester, CO2 8HP, Essex
Price: £2.50 (postage and packing paid) 47 pages

The first and main part of this book describes succinctly all the facets that arise when planning to write a scientific paper. Steps that should be taken before writing, during the actual writing, and in the final presentation are considered. These include notes on: where to start, the use of literary style, and the choice of words in the conveyance of ideas. There are guidelines for punctuation, headings or captions, and the use of abbreviations. Details are given for the preparation of tables and diagrams and for an ultimate revision of the script. Finally there is a guide to correcting the printer's proof; a glossary of printers' terms is included. This part of the book will assist all who aspire to proffer to an editor a really well prepared paper.

The second part of the book describes the craftsmanship needed to make a good presentation when speaking at a scientific meeting. This section contains valuable hints for the preparation of notes as prompter, the importance of deliberate speech, and the use of visual aids. Other practical tips are given which, when they are implemented, will enable every speaker to be better understood by his audience.

The book can be recommended without reserve to all Research Supervisors. It is to be hoped that in their turn they will encourage their students to read it before writing papers or dissertations.

Reductions in the cost of the book are available if ordered in quantity.

Ivan M. Sharman