Editorial

The Effects of Rest in Bed and of Exercise on Cardiovascular Function

A MAJOR CONTRIBUTION to the understanding of the relationship of physical activity to cardiovascular function has been published as a supplement to the November Circulation, entitled “Response to Exercise After Bed Rest and After Training.” by Saltin, Blomqvist, Mitchell, Johnson, Wil-denthal, and Chapman. Cardiac output at work intensities that elicit maximal oxygen intake varied from 14.8 L/min after rest in bed to 22.8 L/min at the end of an intensive conditioning program which followed rest in bed. The maximal oxygen intake paralleled changes in cardiac output closely, increasing from 2.43 L/min after bed rest to 3.86 L/min at the end of the training program.

In 1926, Hill stated that maximal oxygen intake is reached when oxygen intake per unit time has attained “its maximum and remains constant owing to the limitations of the circulatory and respiratory systems.” Saltin and his colleagues have documented part of this statement over a wide range of fitness and have made the key observation that the range of the arteriovenous difference at maximal oxygen intake at the several stages of fitness is narrow, thus making it clear that the principal determinant of maximal oxygen intake is the cardiac output. Hill, in his original analysis of the maximal oxygen intake, included the respiratory system as a limiting factor, but examination of the problem with modern methods has ruled out pulmonary function as an important limiting factor in the absence of chronic pulmonary disease. Saltin and his colleagues have shown an increase in the diffusion capacity, measured with carbon monoxide, which is related to the quantity of blood in the pulmonary capillaries which increases after training.

In 1928, Bock and his collaborators at the Harvard Fatigue Laboratory studied Clara-
cardiovascular performance which can be attained by training young men is described by a maximal oxygen intake of roughly 65 ml/kg/min. Elite cross-country skiers and distance runners have maximal oxygen intakes of 75 to 85 ml/kg/min. Another difference between the men trained for a short period and the champion athletes is the stroke volume, which is substantially larger in the athletes. It seems unlikely that physical training alone can account for the observed differences. But since the currently available data are confined to short-term training (9 months or less), systematic studies over a period of years will have to be done to settle the point.

Cumming has recently discussed physical fitness and pointed out some of the unanswered questions which remain regarding the relationship of cardiovascular fitness to health. Saltin and his co-workers have documented modification of physical activity as a powerful tool, which the physician can use to achieve substantial alterations in the functional capacity of the cardiovascular system. It remains to be demonstrated that specific levels of cardiovascular fitness are related to cardiovascular health.

HENRY L. TAYLOR
Minneapolis, Minnesota

References
The Effects of Rest in Bed and of Exercise on Cardiovascular Function
HENRY L. TAYLOR

Circulation. 1968;38:1016-1017
doi: 10.1161/01.CIR.38.6.1016
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1968 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/38/6/1016.citation

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/