

# INTRODUCTION

During the early 1970's my company, Exxon (now Exxon Mobil), announced the availability of an exercise program for its executives. Research was showing that proper exercise could reduce the risk of heart attacks. My father had died at age 45 and both grandfathers were gone by 62, all from cardiovascular diseases. I immediately signed up for the program.

We first took a test on a treadmill. It was exhausting. I was so tired out that I could not concentrate the rest of the afternoon. Six months later we took another treadmill test. This one was easy. Puzzled, I asked my doctor what was the purpose of the easy test. He replied, "Forrest, this is the same test you took before!"

I could not believe it! It seemed incredible that a test that had been so exhausting had become so easy after a few months of not difficult regular exercise. I was walking the mile from the commuter train to Rockefeller Center each day faster, and was moving up stairs much faster and easier. I was feeling better and more alive. I now know that this experience was a turning point in my life. I became fascinated with the potential value of regular exercise and have spent much of a following three decades reading, studying, doing research and writing about its importance.

I am a post-graduate chemical engineer and scientific analyst. For most of two decades I headed a group of engineers and scientists that were engaged in full-time analysis of key parts of Exxon's overall research data produced by groups located throughout the world. This highly competent group had pioneered some of the earliest successful use of computers and mathematical methods of analysis that required computers.

I was involved in analyzing complex research not only on chemicals and petroleum but in areas as different as business economics, meteorology, marketing, advertising and health. I was assigned to analyze the research results on what probably was the largest-then research project on the environmental chemical carcinogens that produce cancer. With this background in health research and scientific analysis, I wanted to learn about the exercise I needed to do reduce risk of the disease that had felled my father at such an early age.

## The Company Exercise Program

This early program tracked how cardiofitness improved as different kinds and amounts of heart-rate-monitored exercise were done. I use the single word cardiofitness to simplify the tongue-twisting cardiorespiratory fitness now used by researchers. Also, most of what follows in this book is not about respiratory fitness. Cardiofitness directly measures the physical condition of our heart and its associated cardiovascular system. It measures how effectively our heart can distribute blood, oxygen and other nutrients throughout the thousands of miles of arteries, veins and capillaries in this incredible system. The fitness of our cardiovascular system can be far more important to our future health and life than the fitness of any other body muscle.

With help of the project manager I computerized the program data and developed how different exercise heart rates over time produce different levels of cardiofitness. This early program on 265 men for two years may have produced one of the better sets of research data relating exercise heart rates to cardiofitness.

It was obvious even then that higher heart rates during exercise were far more effective in producing cardiofitness than were low heart rates. Cardiofitness did not develop simply from physical activity that is measured by overall calories of exercise. Rather, calories at higher exercise intensity were much more effective than were calories at low level exercise.

After 30 years of more research, scientists are still arguing about the effects of exercise time and intensity on cardiofitness. I see statements like “You don’t have to exercise in the gym. Just walk and you will get the same benefit” and “You do not need to do heart-rate exercise; you can get to the same fitness by just living a good lifestyle.” This and much other advice about exercise that we hear today is incredible nonsense.

## The Early Research

The key question back in the 1970’s was: “What benefit does exercise contribute to our health?” The health establishment then was focused on cholesterol and dismissed the role of exercise in reducing risk of heart disease as either nothing or trivial. Having had experience with fallible health research, I visited the medical libraries to learn for myself what the research really had found out about exercise. This project started only as a personal one; I wanted to learn what exercise I needed to do.

I was astounded by the amount of research. Every kind of exercise

seemed to reduce heart disease, sometimes very substantially. The few studies that found no effect were of little significance. I ended up with a pile of nearly 50 research papers that included 90 comparisons about exercise and heart disease that nearly all said the same thing: Exercise helps, and more exercise helps more. Keep in mind that this project was done back in the middle 1970's. Even then, a lot of research had been done on exercise and health.

I originally assumed that this project would take a couple of weeks. It actually took two full years to read, understand, digest, and seriously analyze the research results in those 50 papers. This may explain why no one else seemed to have seriously analyzed this research.

I was deeply disturbed. How could our health establishment, which is presumed to serve the public interest, claim no or little benefit from exercise in the face of such extensive research findings? This was wrong. Did the establishment confuse something for decades that could have saved or prolonged millions of human lives?

I decided that someone should at least try to tell the truth about the importance of exercise to health, and wrote a book about it. The book was published as *The Pulse Point Plan* in 1982 with the excellent help of Random House. It was peer-reviewed and introduced by the highly regarded authority on exercise, Dr. Samuel Fox of Georgetown University. The book showed that as above:

The primary health benefit of exercise in reducing risk of heart disease was obtained by improving the physical condition of the heart and cardiovascular system by what we now call cardiofitness. This cardiofitness can be a very important protector of health and life. The physiologists and exercise researchers had been promoting this theory, but it was then uncorroborated. Cardiofitness is measured by an exercise test called "VO2 Max." Values of this measure are of little use to the public because they vary too much for those of different ages and gender.

I proposed a simple index of VO2 Max I now refer to as the Cardiofitness Ratio, or CFR. The CFR approximates the ratio of a person's VO2 Max to an average population VO2 Max for age and gender. The ratio is multiplied by 100 to develop whole numbers rather than decimal numbers. A CFR of 100 refers to an average cardiofitness for age and gender. A CFR of say 120 directly shows a cardiofitness that is much better than and 20% higher than usual for age. A CFR of 80 immediately reveals a very deficient cardiofitness that shows a high health risk.

During the 1970's physiologists and other researchers were promoting the cardiofitness theory and advising rather vigorous heart-rate-monitored

exercise. An opposing group claimed that benefits of exercise were related simply to calories of exercise done. No study had been published as of that decade that directly measured the effect of cardiofitness on the risk of heart disease or any other disease.

I thus examined every published study in depth, and estimated the likely differences in both exercise calories and cardiofitness in CFR of the groups that exercised and those that did not exercise. This was a tiresome task that took months to complete. The results were overwhelmingly significant.

There was no useful relation between calories of exercise and risk of heart disease. In contrast, cardiofitness seemed to explain remarkably well the results obtained from the fifty useful data sets from the research on exercise and heart disease published before 1980. Differences in risk of heart disease ranging up to more than five times were clearly explained by differences in cardiofitness. This study published in my 1982 book provided (as noted in the Prologue) what I feel was a first scientific confirmation that cardiofitness is the key exercise factor that protects against heart disease.

The first studies of risk as related to actually measured amounts of cardiofitness started to become available in 1983, about 5 years after my work for the book had been done. These studies confirmed almost exactly my work that had established a relationship of cardiofitness reducing the risk of heart disease. I reproduce results of my first analysis and results of those early and subsequent studies in Appendix 7.

This was enormously exciting! It confirmed that the relationship between exercise defined by the CFR of cardiofitness and heart disease was scientifically fundamental and casual. Health research nearly always compares results on two or more groups of people that do different things. Such studies usually show only associations that may or may not have useful value. A Holy Grail of research is to forecast a relationship from scientific theory that is later found to be correct by direct measurement. The Cardiofitness Ratio, or CFR, met this difficult test.

Starting about 1995 a major change was made in recommendations for exercise. The former concept of cardiofitness and heart-rate-monitored exercise was suddenly abandoned and people were advised mostly to walk 30 minutes daily. A recent update of the advice made in 2007 did suggest doing some “vigorous” exercise, but again there was no adequate recognition of cardiofitness. More about this later.

## Today's Confusion

Sadly, I feel that the entire subject of exercise and health is now in disarray. The idea that exercise is important is no longer controversial. A mass of research shows exercise to be increasingly important. But the public still has not been provided a really useful guide as to what amount and kind of exercise will produce little, good, or excellent health benefits. Every article on health today admonishes you to exercise. This really tells us nothing very useful.

Most books about exercise have been entitled Physical Activity. This is the wrong focus. Amounts of physical activity can have little to do with the exercise that produces cardiofitness. Thousands of calories per day of occupational physical activity can produce only very small improvements in cardiofitness. Just 125 calories or only 30 minutes a week of the correct exercise can produce a better cardio benefit.

People today, including doctors and health professionals, still do not know their level of cardiofitness by a measure such as the CFR. Our health establishment has evidenced little interest in helping our population measure their cardiofitness or understand what it can mean to them.

## Global Analysis of Exercise Done for this Book is Different

Today's research on the benefits of our health habits is a world of statistics and statistical associations. Each study produces a statistical ratio of a disease suffered by two groups that do something differently. These study statistics have high error margins. Health experts usually try to develop conclusions and yo-yo their advice by looking mostly at just some of the more recent of these studies. Such statistics suggest things that may be good to do, but they fail to tell us what we need to do to get a useful benefit.

Global Scientific Analysis uses the methods of engineering and physical science to probe more deeply into the entire body of available research. Global Analysis aims to learn more about and quantify the underlying mechanisms. These more sophisticated analyses show far more accurately how we really need to exercise to obtain useful reductions in the risk of major diseases. They also show that much advice on how to exercise has been seriously wrong.

Chapters 2 and 3 provide specific examples of Global Scientific Analysis that organize results from available research on how cardiofitness reduces risk of heart disease. These analyses convert often confusing statistics to values that can be understood and used by people. Global Scientific

Analysis often provides a new and exciting view of what research has really learned. Important and fascinating new findings are specifically revealed in these and following chapters, were not found by the original researchers.

Each new finding about exercise and cardiofitness in this book is verified either in peer-reviewed papers or in my papers published at <http://www.lifeahead.net>. Each major finding in this book is demonstrated and confirmed by an analysis of most or all of the actual available research results. Many of these papers include the actual research data.

Proper and adequate exercise can substantially reduce our risk of heart attack, cancer, and other major diseases. But no exercise or diet or other health habit can completely prevent a disease. But I suggest to use the advice of your doctor in planning your exercise. If good exercise habits do not prevent a major disease from happening, they probably will defer this event for many years.

*Part One* in the book shows how the kinds and amounts of exercise develop measured levels of cardiofitness and protection of our health. As example, I show how different levels of walking pace and duration done each week reduce our health risk. Incredibly, and despite all of the talk about walking for health, I find no evidence that this seemingly elementary analysis has ever been properly done and published. These results should shock many in the world of exercise. I show for the first time in the Master Tables how exercising at different levels will produce specific levels of cardiofitness and improvements in health. These results also will surprise the experts.

The new CARDIO 120 program shows how you can develop desirable goals and possibly even very high goals for cardiofitness from a variety of moderate exercise programs. Managed Cardio shows you the exercise times and heart rates needed to reach any feasible cardiofitness goal. The new and simple Cardiofitness Point method shows how you can exercise usefully and move toward really useful goals for health.

*Part Two* shows how cardiofitness can reduce risk of major diseases and death far more than has been previously realized. It shows from extensive but easy to understand scientific analysis how our level of cardiofitness may be more important to our future health and life than is any other major health risk factor.

*Part Three* tells much more about the fascinating measure of our cardiofitness called the CFR. As example, how it can differ for populations and how it has changed historically, with age, with lifestyle, and with exercise. Few people have known their cardiofitness because existing tests

have been too demanding and expensive. I describe new simple tests for measuring your CFR that nearly everyone should be able to take. Everyone should know his or her CFR and what it means.

*Part Four* tells the truth about some exercise associations that have been a source of recent controversy. These include the effect of different kinds of exercise on body weight; and the health benefit of resistance-type exercise and the health value for doing the new fad of Step Counts.

*Part Five* answers many questions people have had about their exercise. It shows some of the many additional benefits of exercise found in research. I tell more about the many exercises that can produce your cardiofitness and their advantages and shortcomings. I suggest some facts and ideas that I hope can help motivate you to do your exercise regularly.

*Appendix sections* provide the guides that show you how to exercise effectively, how to take the new tests for cardiofitness, and how the free Life Ahead computer program on the internet can help you establish exercise goals and benefits. It tells more about how exercise develops its health benefits, and provides further scientific support of some key new ideas in the book. Chapter 1 tells about the research we now have on exercise that shows the remarkable importance to our health and life of our cardiofitness.