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DEVELOPMENT OF A COMPUTER MANAGED INSTRUCTION COMPANION TO THE HEALTH-RELATED PHYSICAL FITNESS TEST

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DEVELOPMENT OF A COMPUTER MANAGED INSTRUCTION COMPANION TO THE HEALTH-RELATED PHYSICAL FITNESS TEST

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DEVELOPMENT OF A COMPUTER MANAGED INSTRUCTION

COMPANION TO THE HEALTH-RELATED

PHYSICAL FITNESS TEST

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ABSTRACT

DEVELOPMENT OF A COMPUTER MANAGED INSTRUCTION COMPANION TO THE HEALTH-RELATED PHYSICAL FITNESS TEST

by James Bowling Key

The purpose of this nontraditional dissertation was to develop a computer program that would assist in managing the data collected with the Health-Related Physical Fitness Test. The program was designed to accept student biographical and raw score test data and convert it into individual and class records. The raw scores are converted to percentile scores by the computer in a colorful bar chart presentation. The program was designed to store the records on a disk, and to be able to print out either an individual or class record. Short educational modules were included in the program to help students better understand their scores. A user's guide was developed to simplify operation of the program and is included in chapter 4. A simulated execution of the program is included in the Appendices to explain how the program operates. The program was written in Applesoft BASIC on an Apple IIe computer with 64 kilobytes of memory, 1 disk drive, and a printer.

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J.B.K.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Figure Page

LIST OF APPENDICES

Chapter I

Introduction

> Perhaps the most overt manifestation of the physical education profession's reaffirmation of the importance of health fitness is the development and adoption of the American Alliance of Health, Physical Education, Recreation and Dance (AAHPERD) Health Related Physical Fitness Test (HRPFT). It seems likely that this new test will serve as the catalyst for a fundamental reorientation of the approach to fitness taken in many physical education programs. (Pate & Corbin, 1981, p. 36)

The AAHPERD Youth Fitness Test has seen much service throughout the profession and has provided many beneficial results. Based on a different philosophical rationale, the HRPFT emphasizes that one does not have to be an athlete to be fit (Plowman, 1981). The test designers recognized that fitness can be defined differently for each individual and at various stages of

life for the same individual. The minimum fitness level was that level which was found to be compatible with optimal health.

It has been estimated that billions of dollars are lost yearly by individuals and corporations due to preventable health problems (Cooper, 1982, chap. 11). Chief among these were cardiorespiratory dysfunctions, stress, and back injuries. These problems were often the result of poor health habits learned early in life. Through diagnosis and exercise prescription, physical education practitioners (in conjunction with trained medical personnel) have been able to identify and correct existing or potential health risks. The key has been to help students create a healthier lifestyle by teaching them why the test is given and just what the results mean in regards to their current and future well being. However, many physical educators have not incorporated HRPFT in their programs.

Physical educators have been inundated with a multitude of responsibilities in addition to teaching. There are committees on which to serve; sports to coach; and the managerial aspects of teaching, such as record keeping, counseling, and grade reporting with which the practitioner must be concerned. The time that these activities require has been one discouraging reason the

HRPFT has not been adopted in many programs. Several school systems throughout the country have access to large computer systems which help alleviate some of these time consuming tasks, but for most schools the lack of availability, expertise, and the great expense of computer time has left Computer Managed Instruction (CMI) impractical. However, in recent years more and more educators have been computerizing their teaching. In 1975, the Altair personal computer was made available to the public, suddenly and drastically reducing the cost of computing. The cost of computing has continued to decline through the years, which has caused many school systems to not only consider adding computerized instruction but to actually do it. Microcomputers have been utilized in classrooms of all disciplines throughout the nation but the physical education discipline has notably lagged behind in the implementation of this technology, except in institutions of higher education. The microcomputer has seen extensive use in these institutions, primarily in the exercise science laboratory. Software universality has been a problem because almost all the software was developed locally for local use. Software for use in elementary and secondary school physical education has been virtually nonexistent, and few at this level have the skill and time to develop

software for their own use. AAHPERD announced the development of a directory of computer software in the allied areas for computer users who are members ("Computer Software Wanted," 1984).

Statement Of The Problem

Many physical education practitioners have not implemented HRPFT because of the time and effort required in organizing, administering, recording, and interpreting the test results. By developing a computer program to aid the managing of the test data, implementation of the HRPFT will become easier and more appealing and will reinforce the desirable understanding of the importance of health-related fitness.

Purpose Of The Study

The purpose of the study was to develop a computer program that would aid the processing of data collected with the HRPFT. It is hoped that the program will promote the concept of health-related fitness as an important part of the physical education curriculum by providing immediate feedback to both the teacher and student and by providing efficient and compact storage of test results.

Delimitations

The computer program was authored on an Apple IIe computer with 64 kilobytes of memory, 1 disk drive, and a

printer. The program was written in the Applesoft BASIC computer language. The program was limited to the implementation of the norms specified in the Health Related Physical Fitness Test Manual published by AAHPERD.

Definition of Terms

BASIC - An acronym for Beginners All-purpose Symbolic Instruction Code; a high-level programming language designed to be easy to learn and use.

Computer Managed Instruction - The use of computer technology to collect, analyze, and report information concerning the performance of students in an educational program.

Disk - An information-storage medium consisting of a flat, circular, magnetic surface on which information can be recorded in the form of small magnetized spots, similarly to the way sounds are recorded on tape.

Program - A set of instructions, conforming to the rules and conventions of a particular programming language, describing actions for a computer to perform to accomplish some task.

Chapter II

Review of Literature

A review of the literature was conducted in three areas: the Health-Related Physical Fitness Test, computers in education, and computers in physical education. The review has been organized under these three headings for presentation here.

Health-Related Physical Fitness

In reviewing the literature concerned with health-related physical fitness, the literature discussed the following areas: the status of health and physical fitness in America, valildity and reliability of the HPRFT, and student and teacher attitudes toward the test and their comprehension of the rationale behind the test.

Pollock and Blair (1981) assessed the status of health and physical education and noted that during the 1950s, 1960s, and early 1970s the fitness levels of American youth and young adults were considerably lower than groups of comparable composition from other countries. They also noted that these lower levels were associated with poorer scores of performance in activities requiring endurance. Significant decreases in

cardiorespiratory function along with increases in the amounts of body weight and fat, blood fats and sugar, and blood pressure were noted as the subjects increased in age.

Blair (1979) and Stamler (1978) completed surveys that indicated Americans are becoming more health conscious and are increasing the amounts of activity in their lifestyles. The reports indicated that blood cholesterol levels are declining and Americans are becoming better able to control hypertension. Although these reports are encouraging, millions of Americans are precariously inactive and live dangerously unhealthy lifestyles.

Pate (1978) observed that since World War II the physical education profession has primarily focused on performance-related physical fitness but indications are that in recent years the emphasis has changed. He attributed this to increasing dissatisfaction with the limitations and weaknesses of motor perfomance testing.

Testing physical peformance is influenced by factors such as class size, length of the class period, number of test items, organization of testing stations, and familiarity with the test on the part of students and administrators (Nelson & Dorociak, 1982). These authors noted two problems associated with the endurance run item

in fitness tests: (a) the subjects may not be in suitable condition for the test resulting in sore muscles, unfavorable attitudes, and possible injuries, and (b) questionable validity of test results due to subjects' unfamiliarity with pace causing the subjects to "burn out" too soon or save too much for the end and not achieving a maximal effort. They also cite that certain administrative criteria (time, equipment, number of trials, number of testers, etc.) or the lack of them, ensure or reduce the reliability and validity of the test. They concluded that by allowing sufficient rehearsal by the subjects in order to ensure familiarity with the test improves test reliability and validity, and decreases administration time.

Meyers (1980) discussed violations of essential principles and practices of measurement that produce invalid information from which erroneous decisions are made which may have detrimental effects during or after the testing. These violations include not allowing subjects to become familiar with the test items, permitting subjects to be tested who are not physically ready to be tested, lack of sufficient motivation for testees to perform maximally, negative influence of tester's behavior, and lack of competive emphasis to beat one's own best score. Meyers also encourages proper training and orientation of all testers and assistants.

Lohman and Pollock (1981) were concerned with the design of skinfold calipers and the training of test administrators in the use of the calipers in relation to the reliability and validity of the body composition item of HRPFT. In a pilot study, inexperienced and experienced testers measured triceps and subscapular skinfolds of 15 children between the ages of 8 and 14 using two inexpensive calipers costing less than $20 and one caliper priced at $150. The study indicates that experienced testers can get similar results with a calibrated caliper and certain inexpensive uncalibrated calipers. When inexperienced testers use inexpensive calipers, they may not record accurate or reliable skinfold measurements. The study also indicates that training and practice in the measuring of skinfolds is needed to record accurate and reliable measures.

The importance of identifying and treating childhood obesity is believed to be great in its control in adult life. Lohman (1982) stated that this requires valid laboratory methods to establish norms and standards for percentage of fat in children and that practical field methods are required by practioners to estimate body composition in children within tolerable limits of error and without extensive training of the practitioner. Lohman said that the most often used laboratory methods are based on the assumption that children are chemically

mature and current methods are likely to overestimate the percentage of body fat when based on density. He also concluded that at the present, the most valid approach in predicting body composition in children in the field is to use normative data as has been adopted for use in the AAHPERD HRPFT. Future research should lead to the development of norms for body fatness and methods to convert anthropometric dimensions to body fat content.

Teacher attitudes toward the test was the subject of a survey conducted by Safrit and Wood (1983). The most often cited reasons for using HRPFT by the subjects were (a) to motivate students, (b) to diagnose individual fitness, (c) to educate students about health-related fitness, and (d) to evaluate the extent that the physical education program met its fitness objectives. The most often cited reasons for not using HRPFT were (a) too unfamiliar with test, (b) too little equipment, and (c) too time consuming. Similar results were obtained in a survey of Texas physical education administrators on the district level (Rainey, 1982). The authors concluded that more publicity is needed about the test at the local level and that training for potential users of the test is needed.

Because of test unfamiliarity on the part of potential users, Plowman, Hastad, and Marrett (1983) suggested that workshops are an effective way of training

practitioners. Recommended training included the techniques of test administration, such as measurement, record keeping, and dissemination of results. Nelson and Dorociak (1982) developed techniques that reduce the administration time of HPRFT which has been cited as a major reason the test is not implemented more. The authors also stated that a lack of administration time made the test results unreliable and invalid.

After completing the preceding review of literature, the following conclusions were made: (a) the public in the United States is becoming increasingly conscious of the need for health-related fitness, (b) the physical education profession is shifting its emphasis away from performance-related fitness toward health-related fitness, (c) the HRPFT is considered to be a valid and reliable measure of health-related fitness, (d) the practitioner in the schools is generally unfamiliar with the test itself and specifically with the technique for collection of data in the body composition item, and (e) many practitioners perceive severe time limitations in administering the test and in the proper handling of the data.

Computers in Education

The literature concerning computer use in education is diverse and extensive. This review is limited to a review of the history of computing and to recent surveys

concerning the use of microcomputers in the schools of this country.

People have been concerned with means of computing since humans first associated values and relationships with their fingers and toes. In 1835, Charles Babbage designed a machine which has been recognized as the first computer. In 1946 the first all-electronic computer, ENIAC, was unveiled. The computer had 18,000 vacuum tubes, weighed 30 tons, and cost $10 million, yet was slower and less efficient than many recent microcomputers costing less than $1,000. The ENIAC computer was the first mainframe computer and succeeding computers were designed along the same lines incorporating new innovations and technology as it was available. One of these innovations was the concept of timesharing. Computers cost so much that only large corporations could afford to own one. In order to defray costs these companies sold computer use time to other operations, schools and colleges were first able to access computers in this way. Following the mainframe computers came the minicomputers. These smaller yet large computers were able to incorporate transistor technology which cut down on size and maintenance of vacuum tubes. In the mid-1970s, the microcomputer was invented. These new computers used microchip technology, small integrated circuits that cost approximately $26 and were the size of

a fingernail. These early microcomputers were sold in kit form which made them very affordable for hobbyists and schools. Many schools purchased kits and allowed students to assemble them as part of a math, science, or computer science curriculum (Edwards, Ellis, Richardson, Holznagel, & Klassen, 1978).

Almost as soon as the electronic computer was available educators discoverd ways to apply it to educational purposes, primarily in math and research. Within the last 25 years computer use has been established in almost every discipline of education. Edwards et al. (1978) described five major areas in which computers are used in instruction. These areas and their subareas included:

1. Computer as instructor
    a. tutorial
    b. drill and practice
2. Computer as laboratory
    a. data analysis
    b. problem solving
    c. simulation
3. Computer as calculator
4. Computer as object of instruction
    a. computer literacy
    b. computer science and programing
    c. data processing

5. Computer as instructor's aide

    a. Computer-Managed Instruction (CMI)

    b. generation of instructional material

    c. information storage and retrieval

Ingersoll, Smith, and Elliot (1983) conducted a national survey of school microcomputer use in the school year of 1981-82. Results of this study indicated that during this school year, microcomputers were in use in nearly one-third of the nation's public schools. They also reported that the dominant market share for school-based microcomputers was held by Apple, followed by Tandy-Radio Shack and Commodore. While some teachers had misgivings about the role of microcomputers in instruction, an overwhelming proportion of the responding teachers and administrators held postive attitudes toward microcomputers in the classroom.

Simpson (1983) reported a study conducted by Hinsdale Elementary District 181 in Northern Illinois. This district with the aid of the Institute of Educational Research documented computer use for 1 month by students in the seven K-6 schools and 1 junior high that comprised the school district. The purpose of the study was to collect data in order to plan for future puchase and programs. The data collected had to do with the length of time students spent working on the computers, size of the group, that is either individually

or with partners, and what type of activity such as drill, programming, or simulation was used and in what subject areas. By far math was the subject involved most in student use (46%). Just-for-fun activities were second (15%) with language arts and reading third (14%) in occupying student-use time at the computer. The study revealed about 80% of the staff were enthusiastic about computer use and 78% of the respondents said they knew how to use the computers. About 90% of the teachers agreed that computer literacy should be included as a goal in the elementary school curriculum but a universal definition of the term was unavailable. Simpson said that other school systems need to do detailed studies of how their computers are used in order to more clearly define solutions to problems of using the microcomputer in schools.

Dye (1983) conducted a survey of Indiana schools. He discovered that computer decisions are most often made by the principal or the computer teacher. He also discovered that Apple and Radio Shack are the most widely used and are the most considered microcomputers for future purchase. The most used peripherals are printers, disk drives, cassette recorders, color monitors, and networks. Dye determined that computers are most often used in the subject areas of math, business, and science. The most prevalent language is BASIC. Noninstructional

uses were usually for word processing, grade records, scheduling classes, scheduling buses, and accounting and budgeting. The survey indicated that there was a need for in-service and credit workshops emphasizing BASIC, word processing, data bases, and programs using computer-aided instruction.

A John Hopkins University study reported by Becker (1983) surveyed 1,600 public, private, and parochial elementary and secondary schools across the United States. There was a 70% return rate of the questionnaire. Some significant results include the information that at least 53 percent of all schools in the United States had at least one microcomputer for instruction of students. Secondary schools were more likely to have a microcomputer than elementary schools. The two primary uses apart from general computer literacy were programming and drill and practice. The former dominated the secondary school activities, while the latter was preferred in elementary schools. Of the schools that provide at least a few students with 30 hours or more of programming instruction, 98% teach BASIC and 5% each teach using FORTRAN, Logo and Pascal. The author said that the survey contained little data to help determine the most effective use of microcomputers in the schools.

From the preceding review of literature concerning computer use in education the following conclusions were made: (a) a majority of schools in the United States have on their premises at least one microcomputer; (b) the most prevalent brand of microcomputers in the schools are Apple and Tandy-Radio Shack and software written for educational purposes should be compatible with one of these machines; (c) the subject areas that tend to use computers the most are math, business, and science; (d) the most common instructional uses of the microcomputer are drill and practice, tutorial, and programming; and (e) noninstructional uses include word processing, grade recording, scheduling, and information storage and retrieval.

Computers in Health and Physical Education

There has been a shortage of literature concerning computer use in physical education until recently. The AAHPERD Convention in Houston marked the first effort on a national scale to discuss computers and their usefulness in physical education (Londeree, 1983). In October 1983, Health Education printed a special issue which was concerned with the applications of computers in health instruction. The November/December issue of the Journal of Physical Education, Recreation and Dance included as its theme computers in physical education and

dance. The following represents a review of this and other literature concerned with computers in physical education and the allied fields.

Sydrow (1978) described physical education applications on a timesharing computer at the Total Information for Educational Systems (TIES), a regional cooperative network in Minnesota. He stated that at the present time drill and tutorial have few uses in physical education. Tournament scheduling, facilities scheduling and similar tasks are problem solving uses of the computer. Data analysis in sports is a primary use of the computer in an allied field. Simulations of games such as golf, softball, and volleyball are useful in teaching strategy. CMI is a supportive application of the computer. Sydrow reported that there is a program that stores results, assigns percentile ranks, computes a fitness index, and prints reports of student performance available on the TIES computer. Another useful application is the homogeneous grouping of students in teaching skills. The status of students in respect to certain skills or objectives is monitored. If the teacher wishes to group all students needing special attention in an area, the computer groups them in a very short time. Each of the applications mentioned above are available on the TIES computer.

Cicciarella (1983) discussed several uses of the computer in physical education and its implications for the future of the profession. He stated that the first task that computers are given is instruction of students. He also stated that some of the software available in this area is good but most of it is poor. A second application in this area is the interfacing of the computer with other instruments or equipment such as videodisks, audiotape players, and similar instructional devices. Cicciarella indicated that noninstructional computing is widespread in physical education. These applications are generally record keeping, test creation evaluation, and analysis. He projects that the decreases in time and cost of education will place demands for expanded programs on the profession as has never before been experienced and the profession may not be able to meet the demand.

Barlow and Bayalis (1983) discussed the applications of computers in physical education at the University of Delaware. Students at Delaware have access to various computer systems such as the PLATO Network, micro PLATO, and Apple. The students work through interactive instructional programs in the areas of fitness, raquetball strategy, mechanics of muscular contraction, basic math and film motion analysis. These programs are grouped under the name of Computer Facilitated Learning.

Kelly (1981) developed a Computer Aided Instruction (CAI) program for use in prescription in adaptive physical education. The program was authored on an Apple computer and is consistent with the I CAN materials that are also in use in adaptive programs. Lease (1981) authored a CAI series to be used as an aid to curriculum methodology in physical education. This series was designed to run on the mainframe computer at Texas Women's University.

Exercise and movement science research are areas in which the computer has seen perhaps the most use in physical education. Donnelly (1983) reported the interfacing of a microcomputer with an electrocardiograph and a motor-driven treadmill for use in physiology and fitness testing. Ariel (1983) interfaced a computer with a variable resistance strength training machine for diagnostic and programed workout purposes. W. Osness (personal communication, December 22, 1983) stated that AAHPERD will soon market a program that produces a fitness profile similar to one currently in use at the University of Kansas. Lacy and Marshall (1984) reported on a pilot program conducted in the Tulsa, Oklahoma schools that produces a fitness report card called Fitnessgram. The Fitnessgram program is currently undergoing further field tests in the whole state of Oklahoma and is scheduled to be implemented nationwide by

1985. Felts, Feldman, and Dotson (1983) discussed an exercise prescription program entitled Exerfit. The Exerfit program is consistent with the guidelines proposed by the American College of Sports Medicine and the American Heart Association. Key (1983) developed a program to aid students in understanding their scores on the HRPFT and how to improve their level of fitness.

After reviewing the previous literature the following conclusions can be made: (a) the greatest area of computer implementation in the profession is in exercise and movement research, (b) there is a shortage of commercially available software written for physical education, and (c) computer implementation is likely to change the scope of the profession in the future.

Chapter III

Procedures of the Study

The study was designed to develop an interactive microcomputer program to assist physical educators in the management of the HRPFT. This chapter describes the procedures implemented in the study under the following headings: (a) preliminary procedures; and (b) computer program development.

Preliminary Procedures

Prior to proposing the study, certain preliminary procedures were performed. Among these was a survey of information pertinent to the study. A review of that literature was presented in chapter 2 under the headings of The Health-Related Physical Fitness Test, computers in education, and computers in physical education. In addition, a tentative proposal was developed for presentation to the members of the dissertation committee for revision and subsequent approval.

Computer Program Development

The design and development of the proposed program involved six stages: (a) determination of the output content and format desired from the program, (b) identification of the data components needed by the

program to produce the desired output and organizing them into a system of data files, (c) reorganization and translation of the norms included in the Health-Related Physical Fitness Test Manual into sequential text files, (d) development of a flow chart of the program logic and then translating it into Applesoft BASIC code, (e) debugging the program and making it flexible to user input, and (f) writing a user's manual to provide proper documentation for implementation of the software. The procedures that were involved in each of these stages are described below.

The first step in developing the computer program was to identify what content needed to be produced as output. AAHPERD has produced record keeping forms for the HPRFT and it was decided that the output should be compatible and consistent with these individual and class record sheets.

The second step in development was to identify the data components needed by the program to produce the desired output. An analysis of the HRPFT Manual indicated that biographical information such as name, age, height, and weight were pertinent data to be recorded. Raw scores for each of the test items were also needed as were the norms published in the manual.

The third step was to convert the norms for the various items of the test to sequential text files.

These files can be easily accessed for comparison to student performances on the test and show how the performance relates to the national norms.

The fourth step was to develop a flowchart that described the general program logic. Once the program logic had been designed it was translated into BASIC code which was stored in data files which then were saved on diskettes to allow for compact storage.

The next step in developing the program was to test all aspects of the program for proper functioning. Error catching routines were included to facillitate execution and reduce the possibility of producing erroneous results and the possibility of malfunctioning of the software due to user input errors.

The final step was to prepare a manual to accompany the software which will aid the user in operating the program. The manual describes various aspects of the program such as data entry, handling, and printing. The manual provides external documentation in addition to the internal documentation encoded with the program.

Chapter IV

Results of the Study

This chapter has been developed in the format of a user's guide to the software. This guide was designed to help the user understand the operation and functions of each part of the software. The guide also contains instructions for program modifications useful for those with larger computer systems. There is also a guide for solving problems with loading the software.

A Guide to the Program

The Health Fitness Records Manager program is a record storage tool for the Apple II computer. It can be used to record student performances on the AAHPERD Health-Related Physical Fitness Test. In fact, it is so easy students can enter their own scores to save time and energy. The program can be used to print individual student report cards and a composite record of class performance on the test.

The Record Manager is written in Applesoft BASIC and runs on the Apple II+ or IIe. Special features of the program include color graphics, music, and a short educational module to help the student interpret his

or her scores. All student and class records can be stored on compact 5 1/4 in. floppy disks.

Loading the Records Manager Master Disk

There are two ways to load the Health Fitness Manager into the computer. The first is that while the computer is still off, put the program disk into Drive 1 making sure the drive door is closed. Next one should turn on the computer and the program will start up automatically.

The second method is to use direct keyboard commands, if the computer is already in use. Put the program disk into Drive 1 then type either "PR#6" or "IN#6" (or to whichever slot number the drive is connected). If the computer is a model IIe, an alternate method is to press the following keys in order until all are down: "Open-apple," "Control," and "Reset." Then release the keys in reverse order. The program will then start automatically.

The Main Menu

If the loading process is performed correctly, the first image to be seen on the screen is a title page. Shortly after this the screen will fill with what is called the Main Menu.

The Main Menu lists 5 options which will be given greater individual attention later in this guide. One may select an option by typing its number and pressing

the key marked "Return." Briefly, these options are:

1. Enter Data. This option allows one to enter biographical and raw score data. The data will be processed and a graphic display of percentile scores will be shown. The user will then be given the option of saving the data on a disk.

2. Review Data. This option allows one to review an individual student's record that has been saved on a disk.

3. Print Reports. The print option allows the user to print an individual or class record that has been saved on a disk.

4. Education Module. This option helps the teacher and the student to interpret what the student's percentile scores mean in relation to health-related fitness. It also gives some background information about the test to enhance student understanding concerning the need for physical fitness.

5. Instructions. This option will remind the user to enter the data correctly and how to correct mistakes.

Entering Data

If Option 1, Enter Data, is selected, the user will hear a beep and then will be asked for his or her last name. A beep will sound each time one is asked to enter data. It is important that when asked to enter numeric data that one enter numeric characters only. If the

error message, "? REENTER" appears, retype the answer using only numbers.

When all of the questions have been answered, one will see a flashing message. When the message disappears, the percentile scores have been calculated and a bar graph will be displayed showing how well the student performed compared to the national norms (see Figure 1).

Saving Records

When the user decides to leave the bar graph, one may save the data in a file. Type "Y" for yes or "N" for no then press the "Return" key. If the user chooses not to save the data, it will be erased from memory and the Main Menu will reappear.

When saving the data, one will be instructed to put a records disk into the disk drive and press any key. The user must supply the disk to be used for records. The computer will save the student's biographical data, raw score data, and percentile score data on the disk. The computer will also add the biographical and percentile data to a class record that will be designated by grade and trial number. When the record saving is complete, one will be instructed to place the program disk into the disk drive again. Pressing any key will return to the Main Menu.

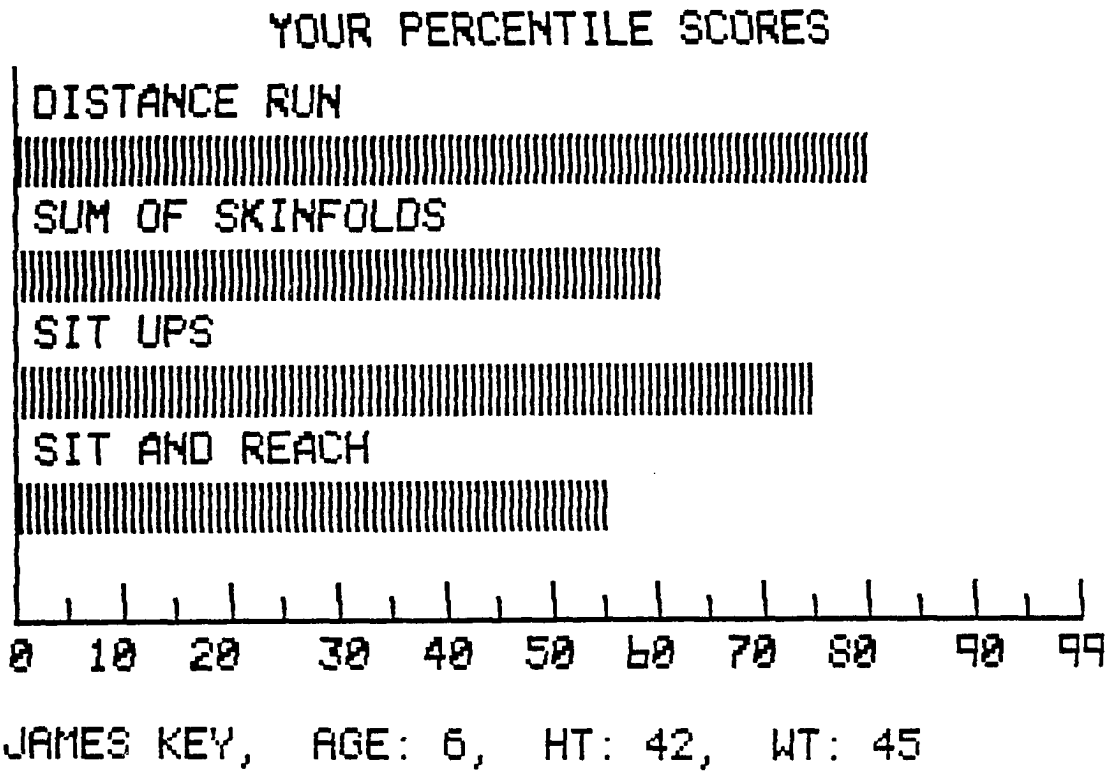

Figure 1. Screen display of percentile score in chart form.

Reviewing Data

By choosing the second option from the Main Menu, one can review an individual student's record. To look at a class composite record one must use the print option. The user will be instructed to put the records disk into the disk drive. The user must next enter the name of the record to be reviewed exactly as it is written on the disk. If unsure of the way it is recorded, one may type a "?" to see all the record titles on a disk.

When the name of the record has been entered, the screen will fill with the information contained in the record (see Figure 2). The student's name, age, height, and weight along with the date of the test and the trial number appear in the top half of the screen. The bottom portion of the screen shows the raw score and percentile score for each test item. When finished with this record, put the program disk into the disk drive and press any key. This causes the Main Menu to reappear.

Printing Reports

By choosing Option 3, Print Records, one may elect to print individual records or class records. When the choice is made, the user must put the records disk into the disk drive and make sure the printer is on and connected to slot Number 1 of the computer. Enter the name of the record to be printed. When the record has

CHRISTIAN KEY DATE: 5/17/84

GRADE: 1 TRIAL #: 1

AGE: 5

HEIGHT (IN INCHES): 39

WEIGHT (IN POUNDS): 39

	RAW SCORE	PERCENTILE
DISTANCE RUN		25
9-MIN RUN	1000	
MILE RUN	0:0	
SKINFOLDS		
TRICEPS	7	
SUBSCAPULAR	7	
SUM OF TWO	14	30
SIT-UPS	21	65
SIT AND REACH	24	40

Figure 2. Screen display for reviewing records.

been printed, put the program disk into the disk drive and press any key to return to the Main Menu.

Educational Module

When one chooses the Educational Option, one will see another menu. Each of the first 5 options will display a short text about the selected option. Option 1 gives some general information concerning the Health-Related Physical Fitness Test. Options 2-5 are designed to help the student evaluate his or her level of physical fitness based on his or her percentile scores for each test item. The text for these options can be found in Appendix A.

To help read the text easily, one may stop the scrolling of the text by pressing the "Control" and "S" keys simultaneously. Pressing any key will cause the text to again scroll upward. When the text has reached an end, press any key to return to the module's menu. Selecting Option 6 will return the program to the Main Menu.

Making Backup Copies

Although this program is copyrighted, one can make a copy for archival purposes by using the CopyA program on the DOS 3.3 System Master disk that came with the Apple computer. The steps to copy the Health Fitness Records Manager program are as follows:

1. Insert the System Master disk into Drive 1. Then type "RUN COPYA" and press the "Return" key.

2. When the program is running, one will see "Apple Disk Duplication Program" on the display. Press the "Return" key 3 times. The computer will ask which drive to use for making the duplicate. Type in "1."

3. Press "Return" to begin copying. The user will be asked to alternately insert the original and duplicate disks into Drive 1. Make sure the door is closed each time the disks are exchanged. Continue this process until the computer asks, "Do you wish to make another copy?"

4. Be sure to label the new copy appropriately.

Two Disk Drive Modification

If the computer system has more than one disk drive, one may want to consider modifying the program to run using two drives. This will require some rewriting of program lines. To make the changes, one must start the program using the backup copy. Then one should follow these instructions:

1. When the Main Menu appears press "Control-Reset"

2. Type DEL 5210,5222

3. Next type, 5230 PRINT D$;"OPEN ";F$;" ";L$;" ";A,D2

4. Now type, 5300 PRINT D$;"OPEN GRADE ";Z$;" TRIAL ";A,D2

5. Type this next, 5310 PRINT D$;"APPEND GRADE ";Z$;" TRIAL ";A,D2

6. Type, 5350 HOME

7. Type, DEL 5360,5370

8. Next type the statement, UNLOCK PERSONAL DATA

9. Type, SAVE PERSONAL DATA

10. Finally type, LOCK PERSONAL DATA

These are only one third of the necessary changes. It is a good idea to check one's work now. The user should make sure that all the spaces and punctuation have been included. Now one may continue by issuing these commands:

1. LOAD REVIEW

2. 3015 INVERSE : PRINT "PUT RECORDS DISK IN DRIVE 2" : NORMAL

3. 3030 PRINT D$;"OPEN ";N$,D2

4. Type 3270

5. UNLOCK REVIEW

6. SAVE REVIEW

7. LOCK REVIEW

There are only a few more changes to be made, but first, the work should be checked again. If everything is correct, one should use these commands to make the final changes:

1. LOAD PRINT

2. 7Ø1Ø INVERSE : PRINT "PUT RECORDS DISK INTO DRIVE 2" : NORMAL

3. 7Ø9Ø PRINT D$;"OPEN ";N$,D2

4. 733Ø

5. 751Ø PRINT "PUT RECORDS DISK INTO DRIVE 2"

6. 757Ø PRINT D$;"OPEN ";N$,D2

7. 769Ø

8. UNLOCK PRINT

9. SAVE PRINT

1Ø. LOCK PRINT

The program is now modified to use two disk drives rather than one. This should speed up execution by cutting down on the number of times one must exchange disks. Before use, it should be checked to make sure all of the changes are correct.

Program Listings

The Health Fitness Records Manager program is actually made up of several programs that are linked together by commands in Applesoft BASIC code written into the programs. Each program has a specific function to perform in the execution of managing the data that is collected with the Health-Related Physical Fitness Test. Figure 3 is a diagram of the program logic. Appendix B contains an on-paper execution of the program.

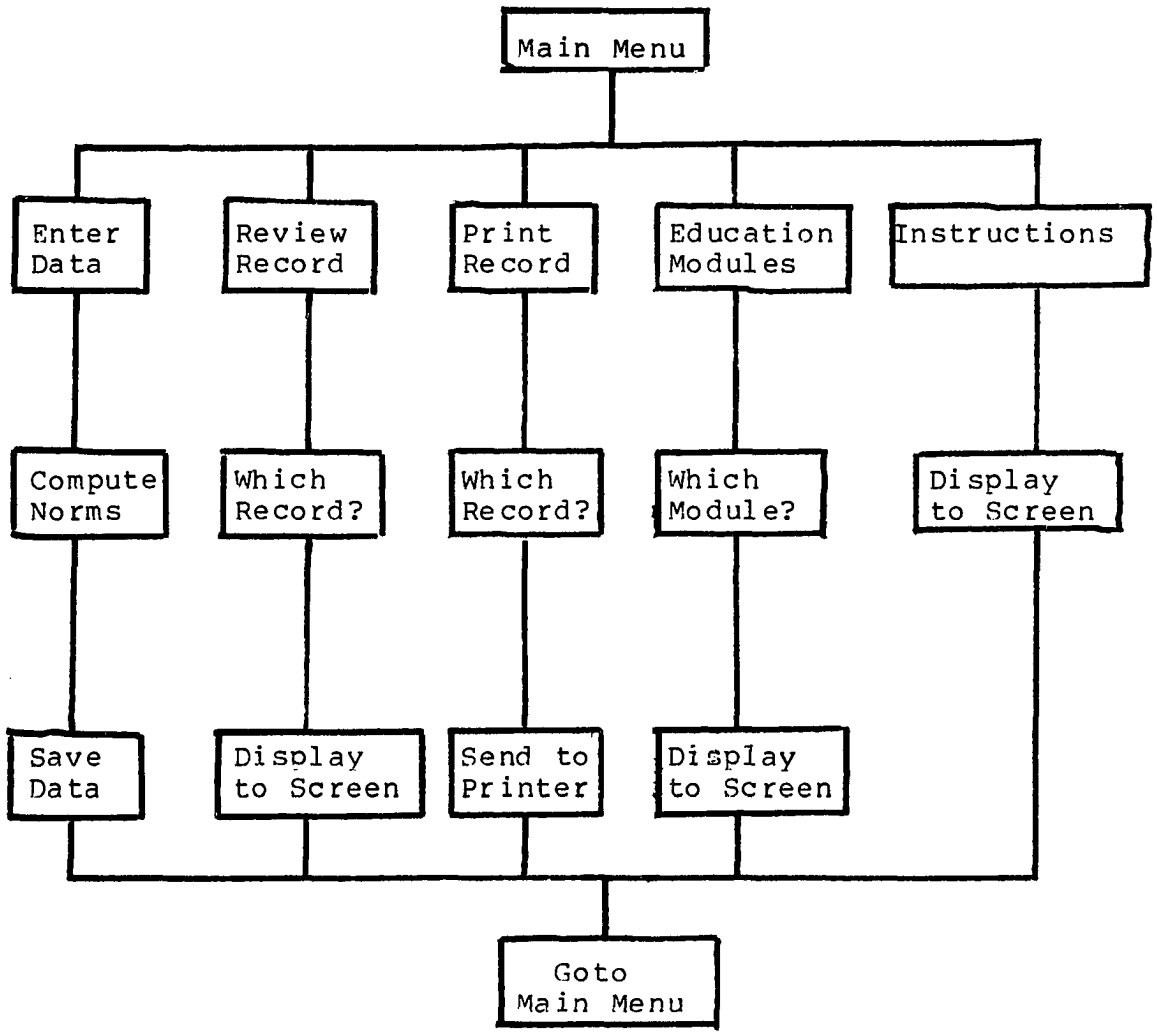

Figure 3. Flow chart of program logic.

Troubleshooting

If there are problems starting the program, this section will suggest what areas to investigate. Usually the problem will be easy to solve.

If the power indicators or display screen do not light up, one should check to see if:

1. The power switches are in the on position
2. The power cord is plugged into the socket and securely connected to the computer.
3. The wall socket has power.
4. The cable to the video monitor is securely attached at both ends.
5. The brightness or contrast, may need adjusting.

If there are strange sounds from the disk drive or it just keeps whirring, one should try opening and then closing the drive door. It should click shut.

Chapter V

Summary, Conclusions, and Recommendations

Summary

A review of the professional literature revealed that during the last 30 years, the youth of this nation have proven to be less physically fit than young people of other countries. This same search revealed that Americans are becoming more conscious of health and exercise in daily living (see Blair, 1979 and Stamler, 1978). It was also noted that the physical education profession is shifting its emphasis towards health-related physical fitness but many physical educators are not implementing the HRPFT. Unfamiliarity with the test and its procedures and perceived limitations in time may account for this. The literature search indicates that a majority of schools in the United States now have at least one microcomputer (Becker, 1983), but physical educators presently have little opportunity or software to use on them.

The purpose of the study was to develop a computer program that would aid in the processing of the data collected with the HRPFT. Implementation of this program

should make the job of managing that data easier and faster. It was hoped, too, that the concept of health-related fitness as an important part of the physical education curriculum would be reinforced as the students and teachers use this program.

The design and development of the program involved six stages: (a) determining the output content format desired from the program; (b) identifying the data components needed by the program to produce the desired output and organizing them into a system of data files; (c) reorganizing and translating the norms included in the Health-Related Physical Fitness Test Manual into sequential text files; (d) developing a flow chart of the program logic and then translating it into Applesoft BASIC code; (e) debugging the program and making it flexible to user input; (f) writing a user's manual to provide proper documentation for implementation of the software.

Conclusions

The Health Fitness Records Manager program combines graphic displays and easily understood text to promote understanding of the results of the HRPFT. The computer takes biographical and raw score data and converts it to informative printouts that are compatible to those forms suggested in the HRPFT Manual. The computer compares the raw scores for each item to the national norms and

computes a percentile score for that item. These records are also saved on a disk for permanent storage. A guide to the software is designed to help the user with the program and includes instructions on entering, reviewing, and printing data. The guide also gives instructions for modifying the program to run with a two-disk drive system, and what to look, for when there is a problem.

Recommendations

Computer applications in physical education are lagging behind other disciplines at this time. Based on this study the following recommendations can be made:

1. Software applications of this nature should be made available to the profession on a commercial basis.

2. Until compatability between different brands of computers is accomplished, physical education software should be written in the languages of those computers that are most prevalent in the educational setting.

3. In order to decrease execution time, new editions of available software should be written in the low-level languages of the computers themselves.

APPENDICES

APPENDIX A

EDUCATIONAL MODULE TEXTS

The Test

The philosophy behind the Health-Related Physical Fitness Test recognizes that one does not have to be an athlete to be physically fit and that physical fitness should be considered in terms of one's health for day to day living. The four parts of the Health-Related Physical Fitness Test and their purposes are listed below.

1. The distance run is for the purpose of evaluating the level of aerobic endurance in school age boys and girls. Students with lower percentile scores show a greater risk for coronary heart disease.

2. The purpose of the skinfold test is to evaluate the level of fatness in school age boys and girls. Students with higher percentile scores show a lesser health risk than those with higher scores.

3. The modified sit-ups test is to evaluate abdominal muscular strength and endurance. Students who score in the lower percentiles have a greater risk of developing low back pain and associated problems.

4. The purpose of the sit and reach test is to evaluate the flexibility (extensibility) of the low back and posterior thighs. Poor flexibility in these areas contributes to musculo-skeletal problems.

The percentile norms provide the teacher with two types of general information: (1) desirable levels of

physical fitness for all students; and (2) levels of fitness excellence. These norms should be used to identify students who need remedial programs designed to meet their needs.

Distance Run

If your score in the distance run is above the 50th percentile, then you can say that you are aerobically fit.

If your score is between the 25th and 50th percentiles, you really need to improve your level of fitness.

If your score is below the 25th percentile then you and your teacher need to work to improve your distance run performance.

Low aerobic fitness has been identified as a significant risk factor in the development of coronary heart disease. To improve, choose an activity like jogging, walking, swimming, or biking and do it at least 20 minutes without stopping, 3 to 5 days a week. Switch activities on some days for variety.

Skinfold Test

If your skinfold score is above the 50th percentile, then you have a desirable degree of fatness.

If your skinfold score is below the 50th percentile but above the 25th, then you should maintain your present weight for the current year.

If your score is below the 25th percentile, then you really need to reduce the amount of body fat to a more desirable level. You can do this by increasing your daily physical activity and not eating as much or eating only foods that are good for you.

If your score is above the 90th percentile, it is not wise to lose any more weight.

Sit-Ups

If your sit-up score is above the 50th percentile then you have good strength and endurance.

If your score is above the 25th and below the 50th percentiles, then you can improve your strength, endurance, and flexibility by doing some exercises that your teacher will give you.

If your score is below the 25th percentile, then you need to start doing those exercises. They will help keep you from getting a bad back and poor posture. They will also help you to do work that may be too hard for you now.

Sit and Reach

If your score in the sit and reach is above the 50th percentile, then you have good flexibility.

If your score is above the 25th but below the 50th percentiles then you lack flexibility in at least one of the following areas: back of thighs, low back, or back of hip.

If your score is below the 25th percentile then you have a critical lack of flexibility. You should begin a stretching program with your teacher very soon.

Poor flexibility is a contributing factor in the development of musculo-skeletal problems such as low back pain.

APPENDIX B

SIMULATED PROGRAM EXECUTION

The following pages contain a simulated execution of the Health Fitness Records Manager program. This simulation should clarify the program's operation.

The Main Menu

Choose one of the following and press return

1 Enter data

2 Review data

3 Print reports

4 Educational module

5 Instructions

1

What is your last name?

Key

What is your first name?

James

Are you a boy or a girl?

boy

How old were you on your last birthday?

6

What grade are you in?

1

What is your height in inches?

44

What is your weight in pounds?

48

Choose the distance run test used.

1 Nine minute run

2 One mile run

2

Enter your time for the mile in minutes and seconds.

Minutes?

14

Seconds?

45

Enter your triceps skinfold in mm.

9

Enter your subscapulae skinfold in mm.

9

Sum of skinfolds = 18

How many situps did you do in one minute?

26

What is your score in the sit and reach?

27

ONE MOMENT PLEASE... (a bar chart will be displayed)

PRESS ANY KEY TO CONTINUE

K

Saving this data to a file will make a permanent record of it, otherwise it will be lost.

Would you like to save this data to a file? Y/N

Y

What day was test taken?

6/27/84

Was this trial 1 or 2?

2

Place record's disk into drive 1

Press any key to continue

k (the data is now saved to a disk)

Place master disk into drive 1

Press any key to continue

k (this returns to main menu)

The other options from the menu operate in similar fashion. This simulation should have clarified how the program executes.

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