

DOCUMENT RESUME

ED 219 386

SP 020 732

AUTHOR Jackson, John J., Ed.; Turkington, H. David, Ed.
 TITLE Quality Programming in H.P.E.R. Selected Papers Presented at the Convention of the Canadian Association for Health, Physical Education and Recreation (British Columbia, Canada, June 10-13, 1981). Physical Education Series Number 2.

INSTITUTION Victoria Univ. (British Columbia).
 PUB DATE Jun 81
 NOTE 143p.; For related document, see SP 020 751. Grants from Air Canada, the Canadian Association for Health, Physical Education and Recreation, the Government of Canada, and the Strathcona Trust facilitated the production of this book.

EDRS PRICE MF01/PC06 Plus Postage.
 DESCRIPTORS *Athletics; Curriculum Development; Dance; Educational Trends; Elementary Secondary Education; Homosexuality; Lifetime Sports; Obesity; *Physical Education; Physical Fitness; *Physical Health; Program Development; Psychomotor Skills; Public Health; *Recreational Activities; Wheelchairs
 IDENTIFIERS Canada

ABSTRACT

These papers, presented during the 1981 convention of the Canadian Association for Health, Physical Education and Recreation, addressed eight major topics: (1) the physical education and sport profession in Canada; (2) physical fitness (community agencies, radiology, aging and physical activity, the effective physical education program, aerobic fitness, obesity in elementary school, lifetime fitness); (3) motor learning (task difficulty and activity selection); (4) elite athletics (subsidization of athletes, education and training of the highly talented athlete, an analysis of wheelchairs used at the 1980 Olympic Games for the Disabled); (5) the male dancer and homosexuality; (6) administration (the study of physical education and sport administration, formal and informal structure usage in a voluntary sport organization); (7) history of British Columbia's Provincial Recreation program; and (8) curriculum (Japanese judo in the high school required physical education curriculum, and theory and practice of curriculum implementation).
 (JD)

 * Reproductions supplied by EDRS are the best that can be made *
 * from the original document. *

ED219386

CANADIAN ASSOCIATION
FOR HEALTH, PHYSICAL EDUCATION
AND RECREATION
1981 CONVENTION PAPERS



Quality Programming In H.P.E.R.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

DAVE TURKINGTON

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Editors
JOHN J JACKSON AND H DAVID TURKINGTON



Physical Education Series
UNIVERSITY OF VICTORIA

**U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)**

- This document has been reproduced as received from the person or organization originating it
- Minor changes have been made to improve reproduction quality
- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy

020075
ERIC
Full Text Provided by ERIC

Quality Programming in H. P. E. R.

*Selected papers presented at the Convention
of the Canadian Association for Health,
Physical Education and Recreation
held at the University of Victoria, British Columbia, Canada
June 10-13, 1981*

Convention Steering Committee

Robert D. Bell, Maureen C. Hibberson, Monty Holding,
John J. Jackson (Chairman), Fred L. Martens, R. Anne McLaughlin,
H. David Turkington, Geraldine H. Van Gyn, Wayne Van Osterhout

Editors

John J. Jackson and H. David Turkington



UNIVERSITY OF VICTORIA
Physical Education Series Number 2
1981

Generous grants from Air Canada, CAHPER, The Government of Canada, and The Strathcona Trust facilitated the publication of this book by the University of Victoria [CAHPER '81 Convention Steering Committee, School of Physical Education].

© University of Victoria, British Columbia, 1981.

Designed and printed in Canada by
MORRIS PRINTING COMPANY LTD.
Victoria, British Columbia

CONTENTS

PREFACE

- John J. Jackson and H. David Turkington, University of Victoria 5

PROFESSIONAL

- Chapter 1 The need for a unified physical education and sport profession in Canada 7
Earle F. Zeigler, The University of Western Ontario

FITNESS

- 2 The impact of community agencies on physical fitness in British Columbia 14
Martin L. Collis, University of Victoria
- 3 The radiologist's opportunity to teach bone dynamics 29
C. Stuart Houston, University Hospital, Saskatoon
- 4 Freedom to move 37
Robert D. Bell, University of Victoria
- 5 The effectiveness of a four period per week physical education programme 43
Lorne J. Verabioff, Dalhousie University
- 6 The many faces of aerobic fitness 55
Howard A. Wenger, University of Victoria
- 7 Treating obesity in the elementary school 63
Robert P. Pangrazi, Arizona State University
- 8 Teaching fitness for life in the schools 69
Charles B. Corbin, Kansas State University

MOTOR LEARNING

- 9 Task difficulty and implications for activity selection 74
Geraldine H. Van Gyn, University of Victoria

HISTORY

- 10 British Columbia's Pro-Rec: The ingredients for success 84
Barbara Schrodt, The University of British Columbia

ELITE ATHLETICS

- 11 The subsidization of athletes 90
John J. Jackson, University of Victoria and Benjamin Lowe, Governors State University, Illinois
- 12 The highly talented young athlete: An international overview of education and training 101
Eric F. Broom, The University of British Columbia
- 13 An analysis of wheelchairs used at the 1980 Olympic Games for the disabled 106
Colin Higgs, Memorial University of Newfoundland

DANCE

- 14 The male dancer and homosexuality 112
Grant Strate, Simon Fraser University

ADMINISTRATION

- 15 A project for the study of physical education and sport administration 117
Barry Mitchelson and Trevor Siack, The University of Alberta
- 16 Formal and informal structure usage in a voluntary sport organization 124
Trevor Williams, The University of Alberta and John J. Jackson, University of Victoria

CURRICULUM

- 17 Japanese judo in the high school required physical education curriculum 130
Masao Higashi, Kanazawa University, Japan
- 18 Theory and practice of curriculum implementation 135
H. David Turkington, University of Victoria and F. Alex Carre, The University of British Columbia

PREFACE

The 1981 Convention of the Canadian Association for Health, Physical Education, and Recreation was unique in that it also included the Bi-National Elementary Physical Education Conference (U.S.A.-Canada) and the Annual British Columbia Physical Education Conference.

This volume contains selected papers which were presented during the Convention. We are very grateful to the authors for their expertise and for meeting the publication deadline which was several months before the Convention. Thus, these chapters are sometimes abridged versions of what was verbally presented and, also, do not necessarily represent the views of CAHPER, The University of Victoria, or ourselves. Nevertheless, stimulating ideas are presented which illuminate the wide diversity of our field and suggest quality programming needs to be an important consideration.

John J. Jackson and H. David Turkington
University of Victoria
March 1981

CHAPTER 1

THE NEED FOR A UNIFIED PHYSICAL EDUCATION AND SPORT PROFESSION IN CANADA

EARLE F. ZEIGLER

There are many reasons to believe that the field of physical education will need to define its role much more carefully in the 1980's, and then take strong, positive action during this decade to guarantee possible future status as a recognized profession in Canada. My diagnosis of the present situation is that physical education—as we have known and promoted it—has not grown and developed as rapidly and strongly as it should have in a world where the idea of “change” is now as monotonously regular as those of “death” and “taxes.” Many people recognize that something is wrong, but most of them don't appear to understand the extent of the malady that has gradually infected our field. If they do, either they think the symptoms will go away, or they don't want to face up to the steps that will need to be taken to make our “sick” field well again.

These are not simple or easy words for me to speak. The late Adlai Stevenson, an outstanding political statesman who ran for the U.S. presidency in 1952 and 1956 on the Democratic ticket, reportedly quipped after his defeat at the polls, “funny thing happened to me on the way to the White House.” A “funny thing” happened to Julius Caesar on the way to the Roman Forum—he was assassinated! Now, after working conscientiously in the field of physical education and sport for exactly forty years, a funny thing is happening to me on the way to retirement—my field seems to be disintegrating under my feet. This was brought home to me most forcibly when I was asked to present a paper to the Maryland Association for Health, Physical Education, and Recreation last October. The assigned topic was: “Physical Education: Dead or Quiescent?” After I recovered from the initial shock of this request, I decided to accept the invitation with the proviso that I would be permitted to change the title slightly to read, “Physical Education: Dead, Quiescent, or Undergoing Modification?”

The Situation in Canada

When I accepted the invitation to deliver this paper, my first thoughts were about the status of the field in Canada today because of the close, but far from identical, situation that usually prevails on the North American scene. Are things really that bad in the States, and are we far behind (or should I say "far ahead")? Immediately I thought of the opportunity I had been given at The Mill of Kintail in 1974 to offer some views on "An Evolving Canadian Tradition in the New World of Physical Education and Sport" (Zeigler in Davidson and Blackstock, eds., 1980). At that time only seven years ago, I expressed the opinion that there was "indeed an evolving Canadian tradition in physical education and sport, one that is swiftly moving Canada into the vanguard on the world scene" (p. 61). I stated further that the world scene was changing very rapidly, and my considered opinion was that Canadians should become somewhat more optimistic, assertive, and experimentally inclined. I still believe these words, as do I believe that there is absolutely "no need for any inferiority complex or an identity crisis in most directions in which one chooses to look—and this is certainly true for the field of physical education and sport" (*Ibid.*).

In that address I described also what Walter Kaufmann has called decidophobia or the fear of making autonomous decisions. He explained that in his opinion modern man does have many difficult choices to make in a relatively short period of time. My analysis of physical education and sport in the United States concurred with his diagnosis that a severe case of decidophobia did indeed exist, and that such a condition was placing inordinate stress and strain on the profession. I based my analysis on ten "conditions" or "stances" that "would have to go" before the profession there could hope to get a better focus on its main task, reunify to a reasonable degree, and move ahead again. Then in the McKenzie Lecture I made a comparison between the status of those stances in the United States and Canada. I was able to report that Canada was in a better position in at least eight of the trouble spots that were causing "professional trauma" in the States. For example, I argued that we were better off in regard to the relationship between highly competitive athletics and physical education within the educational system. As another example, I was able to point out that "Canada at this moment seems to be approaching the question of disciplinary definition with a much broader outlook, although some imbued with an earlier dominating bio-science outlook are finding it difficult to view this topic more broadly" (p. 59).

In conclusion at that point, I reasoned, "All of this leads me to the firm belief that Canadian physical education and sport is gradually moving into a most enviable position," that there was indeed "an evolving Canadian tradition" in this field; that we could "be proud of the progress that has been made in the past"; and the "future should be bright in all respects if we are but equal to the task" (pp. 61-62). Being "equal to the task," I argued, made it essential that "we maintain our courage and vision, and that we 'do the right' as we see it regardless of so-called political interests of a self-serving nature" (*Ibid.*).

The Situation in the United States

Please allow me to return to the present time now, and I will put aside the matter of whether we still have our "courage and vision," whether we are "equal to the task," and whether we are prepared to "do the right" regardless of pressures to conform to "self-serving political interests." So here I was preparing a talk for people in the state of Maryland in which I was asked to reveal whether education was "dead, quiescent, or [as I had added] undergoing modification." I recalled immediately the literary figure who, upon reading his death notice, stated that "the rumour of my death has been grossly exaggerated." I checked out the word "quiescent" also, the synonyms of which are inactive, still, or dormant. That didn't seem to represent a generally accurate description of our profession either, so I began to think of other words that might describe our present status more accurately—words such as miscast, misnamed, misunderstood, confused, overworked, divided, abused, struggling, etc. I wondered whether we were travelling under an assumed name—that is, did we mistakenly adopt a name for our field, *physical education*, that implies a "disjointed" organism subdivided into mind, body, and spirit, one which every day seeks to refute the "unified organism" concept that the field of psychology affirmed indisputably over half a century ago?

Then I asked myself whether I really did have a bit of an inferiority complex about my chosen life work, and whether such a statement might not still characterize the field as a whole. Can you imagine another field where a substantive percentage of its membership is seeking different names and terminology by which to describe to others what they do for their paycheck? Or can you think of another field where people with doctoral degrees in that subject can't be bothered to attend the national convention of their country's professional association in said field and give every indication that it is "beneath them"

with their "great knowledge" to take time to associate with professional practitioners in their chosen profession? Just go to a meeting of the American College of Sport Medicine, and notice how many people with physical education doctorates are wearing tags designating an identification other than physical education. And the ironic fact here is that this "august organization" would never have gotten off the ground without physical educators, and it would be in big trouble still today if the physical educators were to suddenly vanish from its midst. How crass can some of us be, especially since we know down deep that others regard us as what we really are. Finally on this point, you know that I am using "exercise physiologists" only as an example here, and that many in our other sub-disciplines are doing the same thing elsewhere. Full understanding of why this is happening might put us in a better position to do something to attempt to rectify a truly disturbing development.

I do confess freely that this splintering of our field that has occurred really bothers me greatly—so much so that I intentionally have a whistle hanging from my neck when I present papers at conferences despite its apparent eccentricity. I believe that we do the field of physical education, now called "sport and physical education" in the National Association for Sport and Physical Education in the U.S. for example, a great disservice when we fall into a trap like this. Unless the person involved has his/her highest degree in the other discipline, or for some reason is employed primarily by the other department, in my opinion he or she is "fooling the public," taking money from physical education departments under false pretenses, and doing serious damage to our profession all at the same time (Zeigler, 1980a)!

Having said all of this, however, and knowing that what I have said is essentially true, I am now forced to ask, "What good does it do to "wail and gnash my teeth" about colleagues who for some reason feel it necessary to commit such "sins either of omission or commission?" There must be some *bona fide* reason why they are doing it that I don't fully recognize or am unwilling to admit to myself. If there is a reason, or if there are good reasons, why our field is facing this and other serious problems at present, I want to get to the bottom of the situation and discover if there is anything that can be done to restore or regain what we once presumably had. Of course, with such an approach we must understand that it is impossible to turn back the clock, that many social forces and factors will continue to force significant change upon us, and that society's increased complexity brings with it even greater role differentiation than we have had before.

Moving Ahead Into the 1980's

My analysis of the present situation has led me to a number of conclusions about the direction that this field of physical education and sport should take in the years immediately ahead. At this point I would like to present one thought for serious consideration and possible action at an early time. I believe that this field—profession, if you like—must move strongly and positively to become just that—a full-fledged profession that requires licensed practitioners on a province-by-province basis. This means that we have to move swiftly—if it is not already too late—to have society recognize our profession as the one that is *primarily* responsible for the teaching and coaching of human motor performance in sport, play, and exercise. This means that we must take steps to encourage provincial legislation for the certification of all those people who are working in our field *outside* of the formal educational structure—those men and women who are instructing and coaching people of all ages in exercise and sport skills.

I want to make it very clear that we are quite willing to accept various types of assistance from the other professions and/or disciplines. The point is that *we* must take the lead. This is why, for example, that in a forthcoming introductory text we have included discussion of five *sub-disciplinary* areas and three *sub-professional* areas of our work without once using a disciplinary name that belongs to, or is recognized as belonging to, another subject-matter. Thus, it is not exercise physiology; the section is called “functional effects of physical activity.” It is not “sociology of sport” or “psychology of sport” here; this section is called the socio-cultural and behavioural aspects of sport and physical education. The point is—let *them* call it by their names, but *we* should place the emphasis on, and give the recognition to, our own profession. It's that simple and yet—I admit—that complex.

Finally, then, the following is being recommended: that we recognize that there are now a number of *allied* professions. It is not now a question of bringing them back to our field again; they are gone forever. However, we must keep them as closely allied as possible. What is basic and crucial right now is that we seek to bring about a recognizable state of REUNIFICATION within what the world now seems ready to accept—a field that calls itself “physical education and sport” (or “sport and physical education”). I maintain that we must figure out the ways and means of unifying the various aspects of *our own* profession to at least a reasonably and recognizable degree. Here I am referring to human movement or human motor perform-

ance in sport and exercise (at least!) as a profession for those who are qualified *and* officially recognized *and* certified in the theory and practice of such movement—be they performers, teachers, coaches, teachers of teachers (coaches, scholars and or researchers, practitioners in alternative careers, or other professional practitioners not yet envisioned (Zeigler, 1980b).

By working for a unified profession, we will be re-asserting our “will to win.” These developments of the past twenty years have undoubtedly created divisiveness and a serious feeling of uneasiness within our field. Earlier I have referred to people within the emerging profession who are telling us in various ways that they have doubts about our ability to gain the highest type of professional status. To these people we must show our dedication and determination to discover much more concisely and precisely just what it is that we are professing. This is no time for indecision, for half-hearted commitment, for imprecise knowledge, and for an unwillingness to stand up and be counted in debate with our colleagues within our own field, with those who are tending to move toward other disciplines, with professors and practitioners from other disciplines, and with the general public.

As we strive to improve our present situation, we will need a model or taxonomy for decision-making that will provide us with a sound approach to resolve conflicts and other problems that may arise along the way. May I recommend a model developed by March and Simon that can be of great assistance to us in the days, months, and years immediately ahead? When conflicts and/or difficult problems arise that demand resolution so that continual progress may be made, they recommend four major processes as follows: (1) *problem-solving*, where the persons involved have agreed-upon objectives, and these objectives are operational (i.e., their presence or absence can be tested empirically), then it is possible to search together for alternative courses of action leading to the desired goal or objective; (2) *persuasion*, when the operational goals are not shared completely, but the differences are not so great that mediation cannot bring about a sufficient amount of agreement so that a return to problem-solving (the *first* process) may be made; (3) *bargaining*, when problem-solving and/or persuasion have failed, the elements or groups concerned make an effort to reach a compromise understanding that a portion of the original claim of each may well be surrendered; and (4) *politicking*, where the situation has reached the stage where it is no longer possible to concentrate on the issue at stake, and each element is

forced to attempt to resolve the matter through the implementation of one or more techniques of what has come to be known as "power politics" (March and Simon, 1958). As I understand the situation at present in Canada, no recent attempts have been made to resolve the issue of divisiveness through a joint effort whereby one or more of these decision-making processes has been implemented.

Finally, may I leave you with this thought? I believe that our professional task is fully as important as any in society. If we don't believe that assertion, we will never resolve our present problems and reach our potential. If we continue to stand by and watch a vacuum developing in the public and private sectors where we should be functioning, others will move in and fill that void with more or less success. Our mission for the 1980's is to move forthrightly and as rapidly as possible toward the development of a *unified*, first-class profession.

REFERENCES

- March, J. C., and Simon, H. A. *Organizations*. New York. John Wiley and Sons, 1958.
- Zeigler, E. F. An evolving Canadian tradition in the new world of physical education and sport. In *The R. Tait McKenzie Memorial Addresses* (S. A. Davidson and P. Blackstock, eds.). Ottawa. The Canadian Association for Health, Physical Education and Recreation, 1980.
- Physical education dead, quiescent, or undergoing modification. *Maryland Journal of Health, Physical Education, Recreation, and Dance* (Fall 1980), 8-11. (1980a).
- Sculpturing the future. our challenge for the 80's. *Maryland Journal of Health, Physical Education, Recreation, and Dance* (Fall 1980), 14-15. (1980b).

CHAPTER 2

THE IMPACT OF COMMUNITY AGENCIES ON PHYSICAL FITNESS IN BRITISH COLUMBIA

MARTIN L. COLLIS

Fitness in British Columbia, 1980

To paraphrase Charles Dickens, "It is the best of times and the worst of times." The recent B.C. Assessment of Physical Education (1979) documents that the majority of our children are overweight, weak and relatively unskilled, and yet the sickness seems to be spawning a cure, and across the province 20 school districts are promoting programmes of quality daily physical education. Canadians have been portrayed by Participaction as 'soft' and unfit, contentions which have been borne out by cardiovascular testing in Victoria and Vancouver. However, the good "sitizens" of Participaction are now participating in physical activity in record numbers and it can only be a matter of time before the running, racquetball, and roller skating begin to have an impact on the cardiovascular health of the province. Physician preparation at the province's only medical school includes but one lecture on physical fitness in the four year curriculum. Despite this, medical support of physical activity has been strong, and has been evident in many areas, including fitness related research, conference organization, and committee work. Physicians are displaying an increased interest in the role of physical activity in preventive and behavioural medicine. The responsibility for fitness within the Provincial Government has ricocheted among ministers and ministries far too fast for anyone to grasp its complexities and implications, but facilities have been built, research has been funded, organizations such as Action B.C. created and innovative fitness delivery programmes supported. The greatest fitness resource in the province has been the large numbers of creative and dedicated individuals who have helped foster an environment in which fitness can flourish. At times they have received organizational support, at others they have

succeeded in spite of community agencies, but in any endeavour, it was ever thus.

The apparent paradox of a measurably unfit populace seemingly dedicated to physical activity can be explained by looking at 1980 as a watershed. The 1970's have been a decade of increasing awareness and exploration into the benefits of physical activity, the 1980's will be the decade of programming, when the provision of public and private facilities, the training of professionals, and the activity of the populace will start to pay off.

The Evolution of Fitness Awareness in B.C.

In 1970 the prospects of a major lifestyle change towards increased physical activity among British Columbians were not promising. There was no Seawall Race in Vancouver, as the Seawall was not yet complete. Fitness had low priority within government, and medical practice was traditional, with a heavy emphasis towards intervention rather than prevention. The YM/YWCA's were endeavouring to shake their image of "muscular christianity," but were still perceived by many as being irrelevant to the needs of the average urban British Columbian. Citizens were getting a poor return for their tax dollars in terms of recreational facilities. For example, Victoria had one 50-year-old pool with little to commend it except nostalgia, and Vancouver was likewise poorly served. Rays of hope lay in the emergence of two new Universities to complement the already established programmes at U.B.C. The University of Victoria offered a traditional programme of teacher preparation, based in a converted World War II drill hall, while Simon Fraser, in its mountain top Erickson designed campus, had instituted a degree programme in Kinesiology which looked at the whole spectrum of human movement. Pockets of energy and inspiration existed, but were not reflected in community programmes, school curricula, and general lifestyle.

Ten years later, the fitness landscape in British Columbia, far from reflecting the indifference of 1970, is in a continuous state of evolution and growth. The following observations highlight the importance of physical fitness in British Columbia in 1980 and indicate its pervasiveness in touching the lives of people at work and at play, in sickness and in health. However, as St. Exupéry noted, "What is important is often invisible to the eye" and there are undoubtedly forces at work other than those mentioned below.

Participation in running is an accurate barometer of total physical activity involvement, and the number of runs and runners can there-

fore be used as one index of fitness participation in the province. Distance running is now handled by the Seawall Society which is of sufficient strength to publish its own high quality professional journal, *The B.C. Runner*. The Seawall Race began with 106 male finishers in 1971 and has grown yearly to in excess of 2000 finishers of both sexes. The first Vancouver Marathon in 1972 had 32 finishers, in 1980 the number of finishers is expected to be well over one thousand. This kind of growth pattern alone would be significant, but of greater importance is the number and variety of runs available. Across the province there are hundreds of fun-runs, jogathons, road races, and cross-country races. Participants in the CHQM YMCA Fun Run are measured in thousands, and large entries are expected for two new 1980 events—The Royal City Marathon in Victoria and the Labatts 24-Hour Relay in Vancouver. In the words of Alexander Pope, "The increasing prospect tires our wondering eyes Hills peep o'er hills and Alps on Alps arise." As previously suggested, the growth in running is not an isolated phenomenon, but is a well documented and visible reflection of general activity involvement. Tennis, squash and racquetball are all booming, downhill and cross-country skiing are attracting record numbers, soccer has captured the imagination of tens of thousands of participants and the masters' (over 40) movement is a feature of many sports. Organized classes in fitness, dance and various combinations of music and movement now fill many pages of the YM YWCA catalogues and flourish in municipal recreation centres, school gymnasias, employee fitness centres and other locations where a combination of floor space and showers can be found. The classes out of West Vancouver Recreation Centre conducted by Sue Hills have acted as a blueprint for many aerobic activity classes across the province. These classes accommodate 200 people at a time and are always fully booked. The number of indoor pools in the province has increased many-fold as have the numbers of swimmers.

From the above it is clear that individual sports, and activities that have a fitness component, are attracting participants in large numbers. The growth in team sports with the exception of soccer, has been less dramatic.

The growth of fitness in British Columbia can be characterized by the success of specific events, by creation of agencies and executive positions, and by the fiscal strength of the movement.

In 1978 Wendy Robertson was appointed to be Fitness Co-ordinator for the province. She took as her main responsibility the development of Community Fitness Festivals which would provide a

forum for physical activity and fitness awareness in towns throughout the province. In 1978 six Festivals were organized, and in 1979 the number had grown to 20, involving 22,000 people. As planned, government initiative is being withdrawn in 1980, to allow the Festivals autonomy to exploit local strengths and resources to grow accordingly.

Other fitness gatherings include the Corporate Cup established in 1979 by Action B.C. which acts as a fun and fitness focus for employee groups. Such is the success of this event that the idea is being taken up Federally and in 1980 five more Corporate Cups will take place across the nation. Another successful participatory event which began in 1979 was the B.C. Government Fit-Fest which attracted 3000 of the 8000 Victoria-based government employees. The Fit-Fest was co-ordinated by the Employee Fitness Director of the B.C. Government.

The release of the B.C. Assessment of Physical Education in 1979 underlined the importance of a 1978 document in support of quality daily physical education in schools, which was signed, not only by leading physical educators and fitness co-ordinators, but the presidents of the B.C. Teachers' Federation and the B.C. Home and School Federation, by the Executive Director of the B.C. Registered Nurses' Association and by the Chairpersons of the B.C. Medical Association Athletics and Recreation Committee and the Department of Family Practice at U.B.C. In response to studies from the three provincial universities and growing pressure from health and education leaders, daily physical education is now being implemented or mandated in at least 20 of the school districts of the province. Specialist and generalist teachers are being called upon to respond to the measured physical needs of children as learning is increasingly seen to depend upon the physical as well as the mental state of the child.

Employee opportunities increase steadily with full-time fitness teachers at Alcan, B.C. Tel and the B.C. Government, many professionally led part-time programmes, and increasing use of pre-employment fitness screening for firemen, police personnel, and employees in primary industry such as mining and forestry. The movement towards pre-employment testing has been triggered partly by the rejection of body weight as a selection device by the Human Rights Commission but primarily in an attempt to reverse spiralling Workmen's Compensation costs.

With the advent of PAR-Q (1974) (Physical Activity Readiness

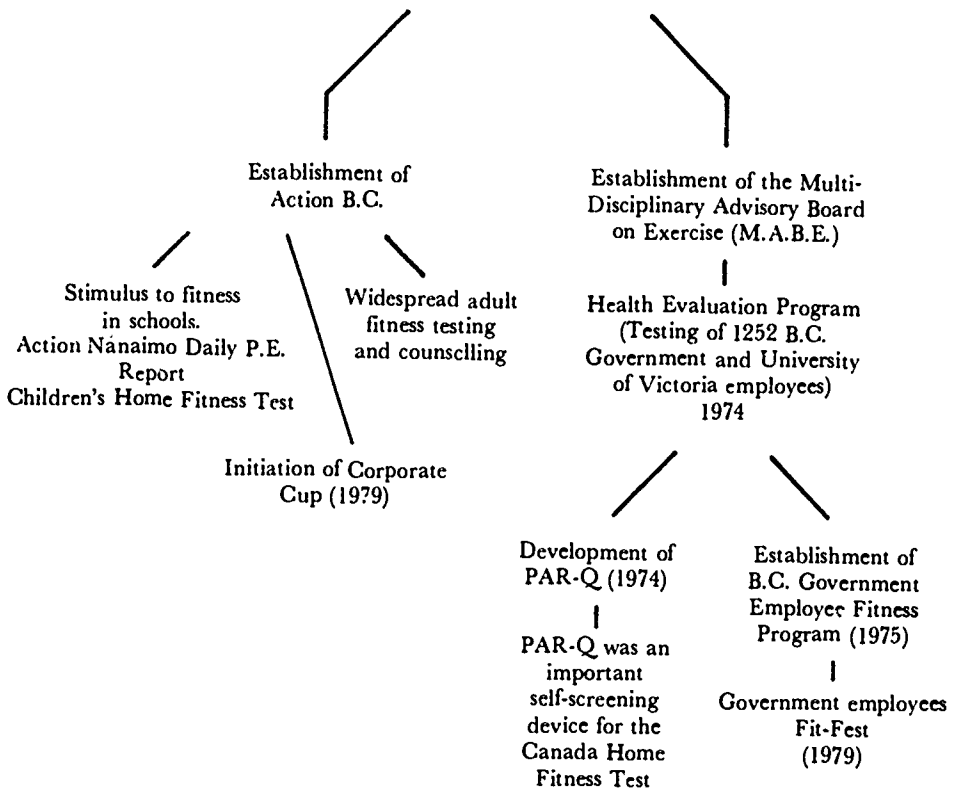
Questionnaire, fitness testing became demedicalized, accessible, multi-dimensional, and computerized. Currently Simon Fraser, U.B.C., and the University of Victoria all offer sophisticated fitness assessment packages to the general public; fitness testing is also available at the YMCA's who have made extensive use of Dr. D. Bailey's computerized L.I.F.E. package. Action B.C., community colleges, employee fitness centres and municipal fitness programmes offer a wide spectrum of tests ranging from the sub-maximal Canada Home Fitness Step Test to automated cycle ergometry. All the above groups recognize the limitations of testing in isolation, and are devoting increasing amounts of energy to post-test counselling, exercise prescription, and long-term follow up. Later in 1980, results will be available from U.B.C.'s Buchanan Fitness and Research Centre and from the Minoru Fitness Assessment Programme in Richmond on the current fitness status of recipients of testing and counselling over the past two years.

The preparation of fitness leaders will change in the 1980's. Currently structured fitness leader development is available only through the YMCA and Capilano College. Leaders have emerged from the Universities with an eclectic academic background while others have succeeded by the time-honoured method of apprenticeship and trial and error, with a blanket of enthusiasm to cover any theoretical deficiencies. However, with the establishment of the Fitness Branch of the B.C.R.A. (1980), fitness now has a focus, and after an initial survey, they will have to address themselves to the question of leader preparation and possibly of leader registration.

A decade that began with fitness as almost a non-issue, has finished with fitness in the forefront of recreation, media interest, education, behavioural medicine, employee health and personal lifestyling. In 1979 Government funding to recreation facilities and to the Physical Fitness and Amateur Sport Fund was in excess of \$16,000,000 with half the money to Fitness and Amateur Sport originating from lotteries. Dr. J. Larson (1979) reported that in five years, 1975-79, the number of recreation professionals increased by 77 percent in British Columbia. There are six hundred thousand registrants to the Sport Governing Bodies, nearly a quarter of the population. Almost every index be it fiscal, participatory, facility development or awareness, points toward growth.

If there was a turning point in the 1970's it came in November of 1973 when the multi-disciplinary B.C. Conference on Health and Physical Activity was Sponsored by the B.C. Ministry of Health. This conference had far reaching results.

B.C. Conference on Health and Physical Activity (1973)



Before looking at future trends of fitness within the province, the evolution of fitness enterprise can best be summarized by looking at exemplary organizations. The YMCA is a microcosm of the fitness movement, and as such reflects much of the creative energy and programme development involved in delivery. Leadership training has traditionally been a strength of the YMCA and their National Fitness Instructor package was the first complete programme available in the province. It would take many pages to do justice to the complete range of YMCA programming but the following list will show its scope and outreach potential.

1. *Employee Fitness*

Fourteen companies are currently served either at the Vancouver YMCA, or on an on-site basis. In the coming months the YMCA will work as an agent for Participation in distributing the highly funded "Fitness: The Facts" package to major employee groups.

2. *Fitness Testing*

Fitness assessment has been available in many forms for many years at the "Y". The most interesting test has been the computerized L.I.F.E. (Lifestyle Assessment Fitness Evaluation) package which was developed by Dr. D. Bailey. Thirty thousand Vancouver school children are tested annually by 600 volunteers on the soon to be revised CAHPER Test.

3. *Cardiac Rehabilitation*

Seven programmes of cardiac rehabilitation are currently operating in the province out of YMCA's.

4. *"T's" Way to a Healthy Back*

This is a packaged and copyrighted programme designed to strengthen the back and alleviate many of the common forms of low back pain.

5. *Weight Loss*

In addition to a selection of calorie consuming activity classes, the Y offers the M.E.C.A. (Metabolic Energy Control Assessment) for the clinically obese.

6. *Running*

Currently two marathon clinics are underway in Victoria and Vancouver, and many fun-runs are sponsored annually, including the huge CHQM/Vancouver Parks/ YMCA Fun Run in May.

7. *Sports*

Adult sports leagues in softball, volleyball, and basketball. Children's programmes in the above sports with an emphasis on fair play and participation.

8. *Aquatics*

A full range of aquatic activities are available from 'Learn to Swim' to competitive swimming and from 'Aquabics' (water calisthenics) to SCUBA diving.

9. *Pre-Ski*

Significant in the number of people attracted to what is essentially a prevention oriented programme.

10. *Camps*

The YM/YWCA's both maintain permanent camps which form a basis for a wide range of outdoor activities.

In the 1960's and early '70's the YM/YWCA had an 'image' problem. They were associated with physical activity and christianity in a sedentary, non-church going society. The staff were low paid and thus turn-over was high, and the price for leading the fitness movement was that many facilities were out-of-date. It would have been hard to imagine a leading pop group in the late '60's dedicating a song to the 'YMCA' and yet in 1979 the Village People not only recorded a song by that name but made it one of the biggest selling records of the year, providing millions of dollars of free advertising to the 'Y' movement.

In 1980 the YM/YWCA movement provides a key delivery system for fitness within the province at no direct cost to the tax payer. As a non-profit organization it can be supported by funding agencies such as United Way, but has to generate most of its own revenue. The disadvantage of this is that YM/YWCA memberships are financially out of reach of most lower income groups and that it is difficult to compete with the salary scales offered in other public and private agencies delivering fitness programmes. However, the independent status of the 'Y' gives it flexibility to attract corporate dollars by allowing companies to associate their name with specific 'Y' programmes. Also special considerations can be obtained from government groups, exemplified by the new "Recycled School" concept, in which Inglewood High School is being rented from the Municipality of West Vancouver and the local School Board for one dollar per year and refurbished to deliver community programmes. The significance of this can be seen demographically in predictions that show zero growth in the 0-19 year old population by year 2001, but approximately 100 percent growth in the 40-59 age bracket.

Richmond Community Programmes

Municipal Recreation Centres are responsible for the delivery of many fitness related programmes. The success of these centres is directly proportional to their ability to respond to community needs and their ability to interact with key community groups. The Richmond Board of Directors has representatives from groups such as Public Health, Home Care, Physicians' and Nurses' Associations, and all programmes offered from the recreation centres are approved and continually reappraised by the Board.

The indoor and outdoor facilities at Minoru Park are superb and enable a complete spectrum of fitness activities to be offered. Further programming is offered through five satellite centres.

The powerful triad of education, health, and fitness recreation has enabled Richmond to build many model programmes such as:

1. The overweight children's programme (often referred to by the participants as the "Fat Brats").
2. Cardiac Rehabilitation Programme.
3. Overweight adults' programme.
4. Pre/post Natal Programmes.
5. Sports injury and rehabilitation clinic.
6. The H.E.L.P. (Heart Emergency Lifesaver Programme) which has made Richmond the most well prepared municipality in the province to deliver C.P.R. in an emergency situation.

Co-operation with I.B.M. has led to a computerized testing facility, which has already serviced more than 2000 people at the Fitness Centre. A model fitness programme has been designed for firefighters, and another employee fitness programme is conducted for airport workers (the Municipality's biggest employee group).

An exciting aspect of the Richmond approach to fitness delivery is that they feel, that in spite of already reaching 20 percent of their 100,000 citizens, that their programme is just beginning. The unity of purpose of multiple groups means that fitness will be within reach of everybody, physically and financially. A current project involves paving the West Dyke to create another 'seawall' and making new trails for walkers, runners, and cyclists, in addition to special trails for horsemen. When teachers, doctors, and nurses funnel citizens into community activity centres, those centres are in a powerful position to make a positive influence on the lifestyle of that community.

Action B.C.

Although announced in 1973, Action B.C. was not operational until 1974. Since that time its funding from the Ministry of Health has tripled to \$380,000 and its permanent staff raised from three to twelve. Unlike the YM/YWCA's and municipal recreation centres, Action B.C. is oriented towards lifestyle awareness rather than programme delivery. The mandate of Action B.C. goes beyond fitness to include smoking cessation, nutrition, stress reduction and general

lifestyle improvement. Where Action B.C. has involved itself in programmes it has been on a pilot study basis, and its main function in testing and counselling is to channel people into existing programmes.

A feature of the ABC testing teams is their mobility, which enables them to act as a 'guerilla force' with access to all areas of the province. In 1979 36,000 people (1.5 percent of the province) made use of Action B.C.'s fitness testing, counselling, nutrition analysis, and Health Hazard Appraisal programmes. Accessibility is the key word, and ABC has been available at the P.N.E., Fitness Festivals, B.C. Summer/Winter Games, schools, shopping malls, conferences, and industrial centres.

As noted earlier in the paper the ABC sponsored Corporate Cup has attracted many companies to friendly athletic competition. But the key role ABC plays is in inter-agency co-operation, which allows it to extract expertise from some agencies and enhance other groups.

In 1979 ABC co-operated with the following groups in the delivery of health promotion programmes.

- Provincial Ministries (Health, Education, Provincial Secretary, Agriculture)
- B.C. Cancer Society
- B.C. Heart Foundation
- Public schools, colleges, universities
- B.C. Dietetic Association
- B.C. Dairy Council
- B.C. Physical Education Society
- National Council on Smoking & Health (& related agencies—20 of them)
- Federal Government (Health & Welfare's Operation Lifestyle and Promotion and Prevention)
- Kiwanis and other service clubs
- Recreation Departments throughout the province
- Armed Forces
- YM/YWCAs

Action B.C. also uses the printed word to spread its message and in 1979 produced the first issues of the quarterly magazine *Optimum*, which has a circulation of 5000 and is distributed to recreation commissions, libraries, teachers, public health nurses, nutritionists, physiotherapists, business leaders, and other potential change agents within the province.

The Universities

The three B.C. universities have provided an important human and academic resource to fitness in the province, in addition to developing sophisticated fitness testing facilities.

All have modified their structures to allow the training of adult exercise professionals to take place alongside teacher education. The University of Victoria has three streams within its School of Physical Education: (a) Teacher Education; (b) Human Performance; (c) Leisure Studies. The University of B.C. has recently reorganized and subdivided the School of Physical Education and Recreation into: (a) Sport; (b) Sport Science; (c) Professional studies; (d) Recreation and Leisure Studies. Simon Fraser University recently established a University Institute of Human Performance to subsume some of the outreach endeavours previously taken on by its Department of Kinesiology and Extension Services.

"The Institute, while not compromising the University's primary academic goals, would allow an independent, partly service-based operation. The opportunity for research on methods, techniques or materials in many areas relating to sport, fitness, ergonomics, and lifestyle will inevitably occur. The opportunity to test the commercial or practical use of new experimental or theoretical ideas within the University context is obvious. The Institute will help bridge the gap between the University and society, and between theory and practice."

In general the three Universities have worked well in co-operating with both public and private agencies. The final stage of co-operation which would add strength to all three institutions would be intra-university co-ordination in the areas of fitness and lifestyle research and programme delivery.

The Role of the Provincial Government

For the past seven years the responsibility for fitness has been passed among ministers like a hot potato, and seven ministers have held the fitness portfolio in seven years. There have been advantages in changes of Ministry and ministerial perspective, as a number of brilliant minds from the areas of health, education, and recreation have influenced Government policy on fitness. However, with ephemeral leadership there have inevitably been breakdowns in federal-provincial-municipal relationships and gives one sympathy for the following comment of R. Dion in describing the recreation delivery system (1974).

There is virtually no evidence of a systematic approach between and among governments for the provision of recreation services in Canada. There is a multitude of agencies at all levels of government rendering recreation services. Viewed in totality they resemble a swarm of water bugs, each one vigorously active, darting purposefully in a number of directions, but collectively adrift on the surface of a changing society, tangled in the weeds of federal-provincial-municipal relationships, prey to the whims of strong interest groups, the waves of national pride, the pressures of regional and provincial self-interest and the vagaries of political winds.

A recent decision has been made to move the responsibility for fitness to the Ministry of Health where it will come under the Executive Director of Health Promotion. A 'Fitness Policy for B.C.' has been commissioned and will hopefully lend some stability to government fitness initiatives. The Ministry of Health is currently responsible for the Action B.C. budget and the fitness mandate sits well in Health Promotion. However, it is hoped that close contact will be developed with the Ministry of Education and the Provincial Secretary (Recreation Branch) who will still have a vital role in the delivery of fitness programming.

The Future

"We've only just begun." (The Carpenters)

The need for structured physical activity experiences for children and adults has no historical precedents and the terrain that lies ahead is thus uncharted. As we consider the possibilities for fitness delivery in the 1980's we are moving into the unknown. Analysis of the past, which lends itself to measurement, is often more appealing to researchers than prediction of the future.

And makes us rather bear those ills we have
Than fly to others we know not of. W. Shakespeare

But growth calls for vision as well as analysis and thus this paper will reflect the use of the crystal ball as well as the microscope.

Future Government planning will have to include development and implementation of Article 22.10 from the current Master Agreement between the Government of B.C. and the B.C. Government Employees' Union.

The Union and the Employer acknowledge that a program of employee physical fitness is a positive contribution to the health of the employees. The parties therefore agree to establish a joint committee to investigate the feasibility of expanding the fitness program to appropriate areas of British Columbia.

Currently 1 percent of the cost of all new Government buildings is required to be involved in the aesthetics of the building. Future legislation could require a certain percentage of the cost of a new building to be allocated for the provision of showers, changing rooms, bicycle storage facilities, and exercise areas.

Formulas might be generated for the guidance of municipalities in planning the percentage of their tax base which should be allocated to recreational facilities. All such plans would have to be contingent upon the population projections for the year 2001 which would indicate a 100 percent increase for adults in the mature years, and a zero increase for people in the pre-adult years.

The most exciting and far-reaching developments in the province are currently taking place within the Government-funded agency of Sport B.C. Sport B.C. has 600,000 (a quarter of the province) registered in some capacity with its sport governing bodies. Traditionally these have been a disparate group with only tenuous links to the parent body. However, the advent of the silicon chip means that in future years these hundreds of thousands of people can be identified, grouped and regrouped by age, interest, and location. The commercial potential of such a group is enormous and sponsors have suddenly become interested in supporting sporting endeavours. A group of 600,000 can also wield considerable political clout in lobbying for improved facilities and an increased percentage of lottery profits.

The power of Sport B.C. is reflected in some of its recently launched projects:

1. The Sport B.C. Insurance Agency. This is of international significance in that it places a dollar value on physical activity and lifestyle. Working with the Vancouver based insurance company, Seaboard, Sport B.C. will offer premium reductions for non-smoking, membership in Sport B.C., and *regular physical activity*. For a 35-year-old male who fits the above categories this would reduce his annual premium on a \$100,000 policy from approximately \$260 at current rates to \$160 with Sport B.C. Insurance Agency. Subsequently it is hoped to add further reductions based on fitness testing, once suitable centres have been designated. As people start to realize the tangible benefits of fitness the impetus for activity will undoubtedly increase.
2. "Particimotion." Wendy Robertson, the former Provincial Fitness Co-ordinator, is planning a massive day of activity, sponsored by Overwaitea Supermarkets. Each store is promoting a

recreational walk/jog/run, with winners drawn at random. Communities with the highest percentage of participation will be awarded vans for help with transportation to sporting and cultural activities. This is literally bringing fitness into the marketplace and is a likely model for future initiatives involving commercial concerns.

3. Sport B.C. Travel Agency. This agency is designed to provide the best possible travel rates for the thousands of athletes in the province.
4. Sport B.C. Newspaper. The form and format have yet to be established, but an editor has been employed, and with a potential circulation of 250,000 its impact will be considerable.

Schools

The B.C.P.E. Society recently published a booklet "It's Time to Grow" which provides a clear and simple message in support of quality daily physical education. The word is now out, and multidisciplinary support has been indicated; what is now required is a firm commitment from the Minister of Education. Given this, in-service training can be set in motion so that teachers, like children, can enjoy the pleasure and the privilege of daily physical activity.

Children may well be provided with a cumulative developmental record at school so that parents can be appraised of their progressive status in fitness, skill acquisition, and anthropometric growth. Rehabilitative programmes will develop for children with correctible physical deficiencies.

General Projections

With the existence of a powerful athletic lobby, municipalities will be under considerable pressure to develop facilities such as bicycle paths and jogging trails.

Fitness testing will expand dramatically and the number of trained exercise scientists employed in the province will likewise increase. Many companies and employee groups will demand specialized pre-employment fitness tests to pinpoint any physical and possibly biomechanical deficits in potential employees. Employees will be retested on a regular schedule. It is possible that the Workman's Compensation Board could require evidence that an employee had been tested as being fit to work before it would pay compensation

benefits. As insurance benefits become increasingly available for those with good cardiovascular fitness, fitness testing centres will become a familiar part of the fitness landscape.

Medical student training will have to change to provide more information about the benefits of exercise, and the therapeutic use of physical activity. Exercise will play an increasing role in stress-management regimens and in the prevention and rehabilitation of low-back problems. The visible trend from crisis intervention to preventive medicine will continue.

Commercial sponsorship of sport and fitness is already much in evidence in the province, and will continue to grow. Access to large amounts of commercial money will make sporting and fitness activities less dependent on Government funding and will facilitate the delivery of many major events and programmes. As activity oriented organizations become aware that they are part of a \$150 billion world-wide business they will inevitably develop their financial acumen and transfer their accounting procedures from the shoebox to the computer.

Interagency and intergroup co-operation will be the key to the success of future fitness endeavours. Permutations of government, medical, private, commercial, and educational agencies will combine to make fitness a high-profile part of lifestyle in the remaining years of the twentieth century.

The number of people whose living is related to the delivery of fitness and sport will increase considerably. Employment opportunities will expand in sports medicine, equipment manufacture and sales, facility design and management, fitness testing and exercise prescription, fitness and sports journalism, media presentations and all aspects of teaching and activity leadership from pre-school to senior citizens. The end result of this will be an improvement in the collective cardiovascular system of British Columbians and a society that regards physical activity as an integral part of daily life.

CHAPTER 3

THE RADIOLOGIST'S OPPORTUNITY TO TEACH BONE DYNAMICS

C. STUART HOUSTON

The complex genetic and biochemical mechanisms that regulate bone formation are well taught by biochemists, physiologists, endocrinologists, and geneticists. When a child is seen with a rare heritable bone dysplasia, or when an adult presents with decreased bone density from malabsorption of vitamin D, or overproduction of parathormone, the hospital buzzes with excitement. The average medical student not surprisingly thinks that the shape of bone is entirely the result of predetermined genetic factors, and maintains a conviction, deeply ingrained in grade school, that the density of bone relates mainly to milk consumption.

Since such teaching ignores the most important influence on bone density, physical stress, I believe that radiologists have a responsibility to redress the imbalance by offering a more realistic perspective.

The day-to-day practice of every radiologist is little concerned with the complex and intricate biochemical mechanisms that rarely go awry. Instead we see that activity and muscle forces substantially determine the shape of bones during growth. Intermittent, energetic compression of the entire growth cartilage, through gravity, weight-bearing and muscle contraction, is indispensable to keep children's bones growing at the required rate.¹⁷ Activity also determines the strength of bones at all ages. An inactive person soon loses bone density to an obvious degree, no matter what his age or how much milk has been consumed.

The Shape and Size of Bone

Stimulated by Dr. Neuhauser at the Boston Children's Medical Centre, I studied inactive children who spent their lives in the horizontal position.¹⁰ Such children had high vertebral bodies with

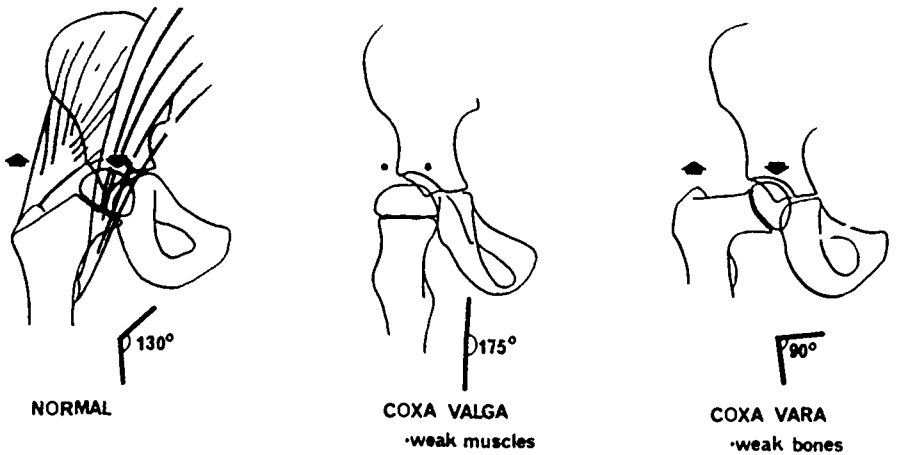


FIGURE 1

Schematic diagrams. A. Normal hips, B. Coxa Valga, C. Coxa Vara.

narrow disc spaces, while those with intermediate activity in the upright position had square vertebral bodies. Similarly, increased neck-shaft angles of the femur resulted from inactivity and decreased weight-bearing.¹⁰ As early as 1952, Stevenson¹⁵ had shown that children, with a leg immobilized for treatment of tuberculosis of the knee, developed unilateral coxa valga. Coxa valga results when the adjacent muscles are weak or when weight-bearing on the femoral head is diminished (Fig. 1B). On the other hand, if these bones are weak but the muscles are strong, the normal weight pushing down on the acetabulum and the normal strength of the iliopsoas and glutei pulling upwards on the trochanters will constitute more force than can be resisted by the weak bones, resulting in coxa vara (Fig. 1C).

A comparison between a normal and a paralyzed side shows that stress, and not genetic disposition, determines the neck-shaft angle. Four years after a bullet passed through the L2-3 disc on the right, with the almost complete paralysis of the right leg, this 7-year-old boy had an unstable hip, shrunken muscles from disuse, a horizontally placed capital epiphysis, and a femoral neck-shaft angle of 178° (Fig. 2)

The 34-year-old woman shown in Figure 3 lost her left ring finger when she caught her hand in a cream separator at the age of 21 months. Without a finger beyond for muscle forces to act upon, the fourth metacarpal grew very little thereafter. Similarly, one can

compare the width of the first and fifth metatarsals between a 13-year-old girl bearing weight on the inner aspect of an everted foot and a 10-year-old girl bearing weight on the outer aspect of an inverted foot (Fig. 4).

How bone size, once achieved, may diminish with disuse is shown dramatically by comparison of the radiographs of a normal 19-year-old boy (Fig. 5A) with a 47-year-old woman who had all her teeth extracted when she was only 29 years old and who chose not to endure the discomfort of wearing dentures (Fig. 5B). The woman developed a fatigue fracture of her pencil-thin mandible and required a rib graft to replace her mandible.

On the other hand, bones subject to unusual stress may become larger than normal, as shown by an infant born with a single bone in the lower leg (Fig. 6A). When asked to name the single bone, most medical students say it is too large for the fibula and must be the tibia, but others with less conviction ask whether its lateral position might not suggest that it is the fibula. Merely from the stress of fetal movements in utero, the unaccompanied fibula was already heavier than expected. The orthopedic surgeons moved the fibula centrally at 2 years of age (Fig. 6B). When the patient was 3½ years old, after 16 months of weight-bearing, the fibula, having done the work of the tibia, assumed essentially the size, shape and strength of the tibia (Fig. 6C).

Such examples demonstrate how bones grow, develop and regress in relation to the stress placed upon them.

The Density of Bone

Bone loss in disuse osteoporosis, so commonly seen in every radiology department, results from the complex interaction of many factors.²⁵⁶⁷ Many experimental studies have produced osteoporosis through inactivity, both in experimental animals and in man, including astronauts. Studies of poliomyelitis patients¹³ and paraplegics¹ showed that both ambulation and muscle activity were necessary to prevent bone loss. Burkhart and Jowsey⁴ found that osteoporosis of disuse occurred only in experimental dogs that had intact parathyroid and thyroid glands. Moreover, there is a diurnal variation in calcium metabolism towards a negative balance during sleep.¹²

Why does immobilization cause such severe and rapid deterioration of bone, particularly in those patients who do not wiggle their fingers or toes when in a plaster cast? Little¹¹ has described how immobilization induces a sudden decrease in the rate of blood flow

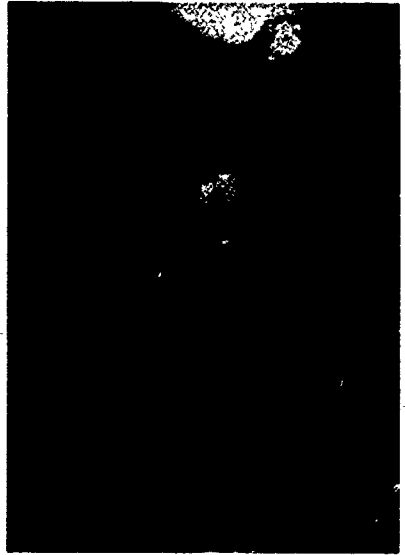
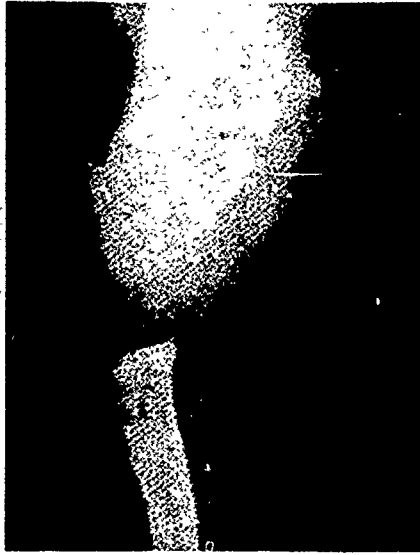


FIGURE 6

Congenital absence of tibia. A. At 4½ months. B. At 2 years, following surgical centering. C. At 3¼ years, after 16 months of weight-bearing. The fibula has assumed the size, shape and cortical thickness of a normal tibia.

through bones and initially an increased pressure within bone. The stagnation of blood leads to excess carbon dioxide within bone. The production of phagocytic osteoclasts is stimulated and bone-producing membranes may be damaged. The lower amount of available oxygen reduces osteoblast activity and less new bone is formed.

In contrast, exercise increases the local blood flow as muscular action pumps blood out of the bone, decreasing the pressure within it, avoiding stagnation, and lessening the chance of blood clot formation. A suction effect on the marrow bed in turn ensures a refill by oxygenated blood. The raised blood flow stimulates osteonal remodelling and the additional oxygen stimulates new bone to form.¹¹ Muscle contraction improves lymphatic flow as well as blood flow and prevents retention of tissue fluid.⁹ Exercise is equally necessary for the maintenance of cartilage. Trueta¹⁷ has shown that inadequate use is also the commonest cause of cartilage degeneration and vascular invasion, leading to osteoarthritis.

The trabecular pattern of the femoral neck is the classic demonstration of Wolff's law, which has been rephrased as follows: "The form of bone being given, the bone elements place or displace themselves in the direction of functional forces, and increase or decrease the mass to reflect the amount of functional forces."³ The trabeculae forming the stress lines of weight-bearing fan downwards from the point of impact at the top of the femoral head (Figs. 7A, 7B). Essentially at a right angle to these are the tensile lines, both sets of trabeculae so situated as to give maximum strength within minimum mass. It is interesting that the sloth, which lives upside down, has a femur with a homogenous trabecular pattern, lacking the stress and tensile lines seen in upright animals.¹⁶

The disappearance of trabecular lines in the human femur is a reliable indicator of osteoporosis.¹⁴ The first stage is resorption of many thin trabeculae (Fig. 7B), which somewhat obscure the main trabeculae. Tensile trabeculae become reduced in number and strength with senile osteoporosis and finally as the compression trabeculae are diminished, the risk of intertrochanteric fracture increases. A look at these trabeculae offers a good estimate of bone density and hence of bone strength. The pelvis in Figure 8 is that of an active 89-year-old man, whose greatest activity is the 20-mile walk twice yearly to raise pledge money for crippled children. After this radiograph he suffered a very bad fall from the top step of a bus onto the icy street but did not break any bones.

A pronounced example of physiologic bow-legs in a 13-month-old

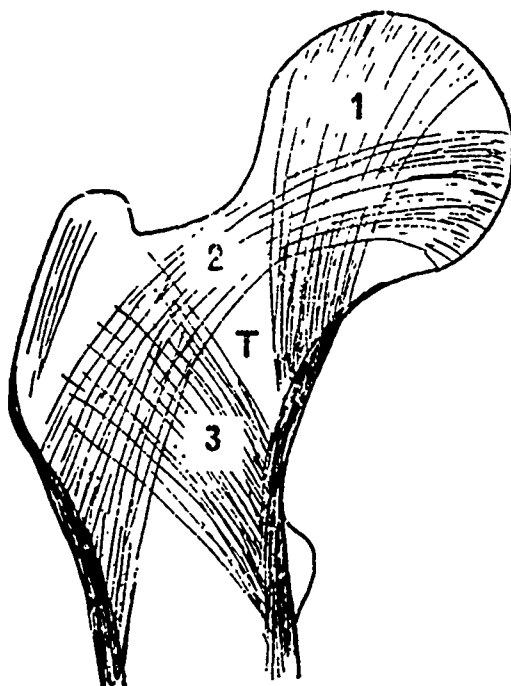


FIGURE 7

Stress and tensile lines in femoral neck. A. Diagrammatic representation, from *Normal Radiological Anatomy, Radiological Optics and Film Interpretation*, by Henry Tillier, translated and edited by Roman O'Rahilly. Charles C. Thomas, 1968. With permission of Dr. Roman O'Rahilly and the publisher. 1) Stress lines 2) Tensile lines 3) Arching trabeculae of greater trochanter.

girl (Fig. 9A), demonstrates the thickening of the medial cortex that results when the weight vector is medial to the bone. Spontaneous correction occurred 12 months later, although thickening of the medial cortex persisted (Fig. 9B).

Amputations offer instructive examples of disuse. An 18-year-old boy had a hindquarter disarticulation because of an osteogenic sarcoma of the distal femur. Five months later, a radiograph of his pelvis was obtained (Fig. 10). His orthopedic surgeon noted the obvious bone loss on the right and suspected recurrent malignancy, without appreciating that these severe changes were due to simple disuse osteoporosis.

A 47-year-old man who had amputations of both lower limbs

following a land-mine explosion, required a high above-knee amputation on the left and a below-knee amputation on the right. There is only slightly diminished density of the right femur, comparable in density to the right ischium (Fig. 11). On the left, it is possible to predict the type of prosthesis the patient wears. There is a discrepancy between the density of the left ischium, even allowing for the density of the overlying penis, and that of the osteoporotic left femur. The prosthesis is connected to the left ischial tuberosity and the weight is borne on the tuberosity rather than on the left femoral shaft.

A boy of 10, 7 years after amputation following a crush fracture of the distal extremity, showed atrophy of both bone and muscle since a prosthesis was not fitted (Fig. 12).

Similarly, amputation for gangrene in 2 heavy smokers in their early 50's is instructive. The man was fitted with a prosthesis soon after surgery (Fig. 13A). The woman required a second, higher amputation and was unable to wear a prosthesis (Fig. 13B). Without the stress of weight-bearing and muscular activity, her muscles atrophied and her bone was reduced to a mere shadow of its former self, in startling contrast to the man who continued weight-bearing on his stump.

The changes so resulting from inactivity are so gross that they are readily appreciated on routine radiographs, even though more than 25 percent of bone mineral and bone protein must be lost before osteoporosis is apparent.⁸ Feist has stated that "the experienced radiologist's in vivo ("nondestructive") estimate of bone density is generally more reliable and relates more accurately to clinical circumstances in the living patient than any other simple method of measuring the density of bone." More accurate measurements of this loss by photon absorptiometry and computed tomography are not necessary to identify and appreciate the severe degrees of this ubiquitous process.

The amount of calcium a patient ingests does little to prevent osteoporosis. Only activity will restore bone to normal density and strength. As the proportion of older people increases one can predict that fractures, especially those of the upper femora, will become more and more of a social and economic burden. In our affluent and sedentary society, lack of exercise may be more serious than lack of adequate nourishment. The medical profession must encourage all ages to be more active. The radiologist is the best person to teach these concepts to our future doctors and future teachers, using examples from daily practice.

ACKNOWLEDGEMENTS — I wish to thank Doctors H. P. Kent, Martin H. Reed, Germain Beauregard and Stanley C. Houston for constructive criticism, Dr. Donald A. Bailey for encouragement, Jean McGregor for preparing the diagrams, David Mandeville for the photography, and Joan Matlock for secretarial assistance. This paper first appeared in *J. Can. Ass. of Radiologists*, 29, Dec. 1978. See the original article for the complete series of figures.

REFERENCES

- ¹ Abramson, A. S., and Delagi, E. F. Influence of weight-bearing and muscle contraction on disuse osteoporosis. *Arch Phys Med Rehabil* 42:147-151, 1961.
- ² Ascenzi A., and Bell, G. H. Bone as a mechanical engineering problem. In *The Biochemistry and Physiology of Bone*. Bourne, G. H., ed. New York: Academic Press, 1971, pp. 311-346.
- ³ Bassett, C. A. L. Biologic significance of piezoelectricity. *Calcif Tissue Res* 1:252-272, 1968.
- ⁴ Burkhart, J. M., and Jowsey, J. Parathyroid and thyroid hormones in the development of immobilization osteoporosis. *Endocrinology* 81:1053-1062, 1967.
- ⁵ Currey, J. D. Strength of bone. *Nature* 195:513-514, 1962.
- ⁶ Evans, F. G. *Mechanical Properties of Bone*. Springfield Charles C. Thomas, 1973, pp. 219-310.
- ⁷ Feist, J. H. The biologic basis of radiologic findings in bone disease. *Radiol Clin North Am* 8: 183-206, 1970.
- ⁸ Fraser, T. R. Diagnostic procedures in bone disease. *Proc R Soc Med* 50:21-23, 1957.
- ⁹ Geiser, M., and Trueta, J. Muscle action, bone rarefaction and bone formation. An experimental study. *J Bone Joint Surg* 40B:282-311, 1958.
- ¹⁰ Houston, C. S., and Zaleski, W. A. The shape of vertebral bodies and femoral necks in relation to activity. *Radiology* 89:59-66, 1967.
- ¹¹ Little, K. *Bone Behaviour*. London. Academic Press, 1973, pp. 109, 302-303, 357.
- ¹² No din, B. E. C., Young, M. M., Bulusu, L., and Horsman, A. Osteoporosis re-examined. In *Osteoporosis*. Barzel, U.S., ed. New York: Grune & Stratton, 1969, pp. 47-63.
- ¹³ Plum, F., and Dunning, M. F. The effect of therapeutic mobilization on the hypercalcaemia following acute poliomyelitis. *Arch Intern Med* 101:528-536, 1958.
- ¹⁴ Singh, M., Nagrath, A. R., and Maini, P. S. Changes in trabecular pattern of the upper end of the femur as an index of osteoporosis. *J Bone Joint Surg* 52A:457-467, 1970.
- ¹⁵ Stevenson, F. H. The osteoporosis of immobilization in recumbency. *J Bone Joint Surg* 34B: 256-265, 1952.
- ¹⁶ Tobin, W. J. The internal architecture of the femur and its clinical significance. *J Bone Joint Surg* 37A:57-72. 1955.
- ¹⁷ Trueta, J. *Studies of the Development and Decay of the Human Frame*. Philadelphia. W. B. Saunders, 1968, pp. 123, 352.

CHAPTER 4

FREEDOM TO MOVE

ROBERT D. BELL

The title of this brief paper is not meant to imply a particular political stance, pathological state or societal condition, but rather to denote a desired and attainable physical state. Freedom to move is concerned with the preservation or rejuvenation of movement capacities in the aging human organism at a level which will enhance such daily tasks as stretching, getting into and out of chairs, bending, and climbing stairs. Those very essential tasks accomplished so carefreely when young and so carefully when old. Nor should "old" be equated with any specific chronological age since it is a relative term which infers a particular physical state featuring amongst other things decreased strength, fragility of bone structure, joint stiffness, vision and hearing loss, reduced co-ordination, lessened cardio-respiratory efficiency, balance irregularities, and slowed mental-motor performance. Being "old" is accomplished through a combination of natural, hypokinetic (inactivity induced), pathological, and societal processes which by their very nature create an individualized aging career such that one may be relatively "old" at 40 or, conversely, relatively "young" at 70.

Pathological and societal influences aside, it is a fact that both structural and functional alterations in the systems of the body normally accompany the aging process. Generally speaking these changes are of a lessening or reduced nature and are usually incurred at a very gradual, at times even imperceptible rate. Included in the systems affected by these changes are the musculo-skeletal system, the nervous system, and the cardiovascular system. That change occurs is conceded, but what of the rate and extent of change? Can these be influenced? The answer is an unequivocal YES! To explain, by way of example, let us consider human movement in the aging process. The phenomenon of movement is made possible through the interaction of muscles (including tendons and fasciae), bones (including ligaments), and cartilage around the joints of the body. Bone, connec-

tive tissue proper (ligaments, tendons, fasciae) and cartilage are major forms of connective tissue in the human body and all contain amongst other things collagenous fibres. These fibres are essentially non-elastic and are usually arranged in wavy bundles which allow movement until the slack of these bundles is taken up. Such fibres are rich in the protein collagen (Holland, 1968). Collagen may be considered the main constituent of connective tissue stiffness and therefore, the greater the collagen content, the greater the "stiffness" content and subsequently the less mobile the structure. The quantity of collagen in connective tissue increases with age (Walls, 1970; Wright, 1973). However, it also increases with muscle atrophy which in turn increases with muscle disuse (Booth and Gould, 1975).

Now consider the lifestyle or activity career of most humans. Youth is usually marked by an abundance of vigour in which physical activity and exertion play a key role. The energy level of the young is often depicted as "endless," and "boundless," etc. With increasing age one "graduates" from the somewhat unrestricted world of schooling and enters the working community. In the normal chain of events the pressures of work, family, and society tend to mould the activity pattern of the aging human organism into one of fewer and fewer physical exertions. In other words it seems that the older one gets, the less active he/she tends to become. Relating this to the physiological implications of inactivity it is noted that inactivity leads to muscle atrophy which in turn leads to increased collagen content, resistance to movement, and so on. The implications are obvious.

The inactivity induced (hypokinetic disease) effect is not restricted to the muscle, bone, cartilage components of human movement. It is also evident in the cardiovascular aspects. The circulatory system serves to transport the fuel (oxygen) to the muscles of the body for all movement. Physical exertion, or the lack of it, affects the walls of the arteries of the system. As stated by Fischer:

"Systematic physical activity alters the stable elastic properties of the arterial walls in an opposite manner than does aging... The changes of arterial elasticity in physically active persons contribute to the higher transport capacity of the arteries in senescent persons... The favorable effect of physical activity on arterial elasticity can be maintained by systematic training up to the eighth decade of life" (Fischer, 1977:93).

Again, the implication is obvious, one remains "free to move" through a lifestyle featuring vigorous physical activity. No doubt there are activities other than physical which may enhance the aging process, however, no other activity offers the direct, measurable evi-

dence that physical exercise does. We are all familiar with the cautions of exercise for the "old" including such items as a pre-exercise medical, identification of appropriate "starting" levels, gradual increments for increasing exercise dosages, the learning of self-monitoring techniques and the recognition of danger signs. All of these "cautions" would seem to point to the necessity of a watered down or less than taxing exercise regimen as desirable for the "old" individual. "A walk in the park" approach so to speak. Do not be misled. The preceding cautions should be exercise prerequisites for all individuals regardless of age, who live an otherwise sedentary lifestyle. When looking for optimal personal results, exercise is no different from other pursuits. One gets out just about the equivalent of what one puts in.

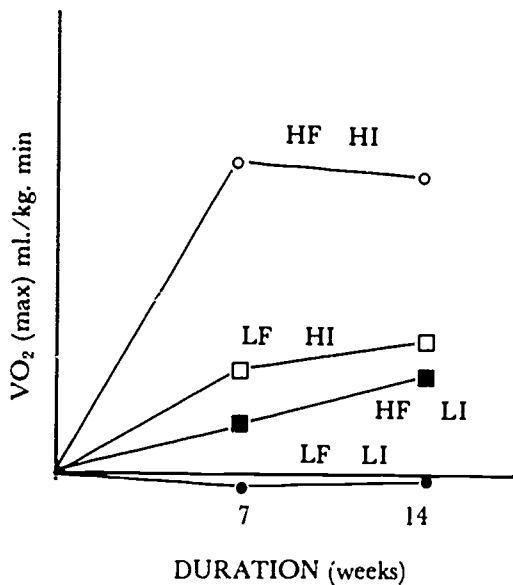


FIGURE 1

Changes in predicted maximum oxygen intake of four groups of elderly subjects electing respectively a high frequency/high intensity (HF HI), low frequency/high intensity (LF HI) high frequency/low intensity (HF LI) and low frequency/low intensity (LF LI) training regimen. (Reproduced from Shephard, *Physical Activity and Aging*. Figure 5.2:186.)

The work of Sidney and Shephard on the effect of exercise on aspects of the cardiovascular system is interesting in this regard. Maximum oxygen intake (Max VO_2) is considered to be a most fundamental determinant of work capacity and thus cardiovascular capacity. In Figure 1, the increase in Max VO_2 with training, is compared for subjects with differing intensity and frequency exercise dosages. The intensity measure was estimated high or low intensity on the basis of observation and pulse counts. The frequency measure was recorded as high or low based on the number of training sessions

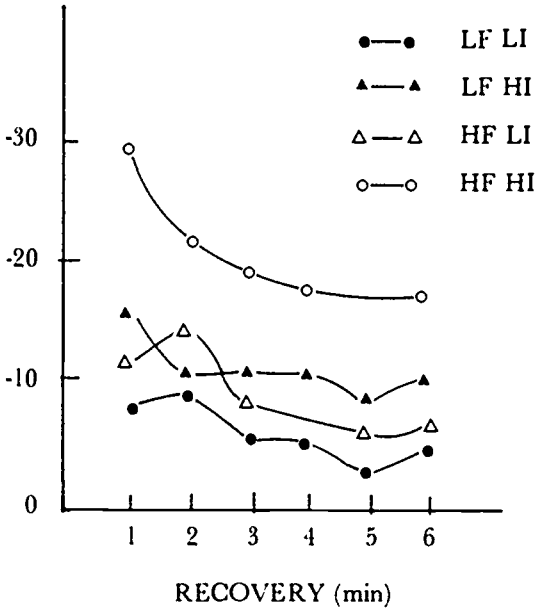


FIGURE 2

Influence of fourteen weeks endurance training on the recovery heart rate following submaximal effort on the bicycle ergometer for four groups of elderly subjects who elected respectively low frequency low intensity (LF LI), low frequency high intensity (LF HI), high frequency low intensity (HF LI) and high frequency high intensity (HF HI) training. Difference of heart rate (Δf_h) between initial and fourteen week tests. (Reproduced from Shephard, *Physical Activity and Aging*, Figure 5.3:189.)

subjects participated in per week. The high frequency subjects averaged 3.3 training sessions per week. The low frequency subjects experienced 1.5 training sessions per week for the first seven weeks and 1.0 training sessions per week thereafter.

Further evidence of the frequency-intensity link with beneficial exercise results may be seen in another experiment by Sidney and Shephard. They found that following a fourteen week period of training the heart rate of elderly subjects during the first six minutes of recovery was some nine to seventeen beats/minute slower than at the beginning of the experiment. In other words, the recovery of heart rate to "normal," a recognized sign of cardio-respiratory accommodation was, fast as a result of an exercise regimen. The results are presented in Figure 2.

The positive inference of high frequency, high intensity exercise is understood. One should find no difficulty in identifying that which constitutes a high frequency. Clearly, to exercise four to five times/week would be considered by most to be a high frequency. However, the picture is not as clear in the case of what constitutes high intensity. Without the use of scientific monitoring equipment and the carefully controlled atmosphere of a physical testing laboratory the intensity question becomes somewhat clouded. It has been reported that self-perception of intensity is a relatively (though not absolutely) successful measuring device (Borg, 1971). By being watchful for or sensitive to body warning signs such as pain, and by learning to self-monitor heart beat by taking the pulse, perhaps one may successfully approximate the intensity measurement. It is hoped so.

A consideration of qualities to enhance human movement in the aging process would not be complete without some mention of strength, a basic component of movement capacity. Nor should the aging individual be overly concerned about muscle hypertrophy through strength oriented exercise. It is probable that the main benefit of this type of exercise, while perhaps reflected in an increased strength score, will accrue from an improved central nervous system activation and not increased bulk (de Vries, 1977). Since muscle power is a primary component in ambulation, improved strength through exercise would no doubt facilitate movement capabilities including those requiring flexibility.

The fact that suppleness; a major determinant of ones ability to bend down, reach high places, get into and out of comfort positions such as sitting and lying; may be improved through specific conditioning exercises has been well established. Substantial gains in flexi-

bility through exercise have been recorded by elderly subjects for most parts of the body. Specifically, significant gains have been reported for the ankle, lower back, hips, trunk, and shoulder (Frekany and Leslie, 1976; Clarke, 1975; Smith, 1981).

"Aging" represents a combination of natural, pathological, and environmentally induced forces which interact to produce an "individualized" aging career. The knowledge and utilization of exercise as a positive influence on this career is of paramount importance to all.

REFERENCES

- Bloom, W., and D. Fawcett *A textbook of histology*. 8th ed., Philadelphia Saunders, 1962
- Booth, Frank W., and E. W. Gould "Effects of training and disuse on connective tissue." *Exercise and sport sciences reviews*, 3:83-112, 1975.
- Borg, C. The perception of physical performance. In *Frontiers of fitness* R. J. Shephard, ed., Springfield, Illinois: Thomas, 1971.
- Clarke, H. H. "Joint and body range of motion," *Physical Fitness Research Digest*, 5, No. 4, October 1975.
- DeVries, Herbert A. "Physiology of physical conditioning for the elderly." In *Guide to fitness after 50*. R. H. Harris and L. J. Frankel (eds.), New York: Plenum Press, 1977.
- Frekany, George, and David K. Leslie. "Effects of an exercise program on selected flexibility measurements of senior citizens," *The Gerontologist*, 16:182-184, May 1976
- Holland, George J. "The physiology of flexibility a review of the literature," *Kinesiology Review*, 49-62, 1968.
- Shephard, Roy J. *Physical activity and aging*. London: Croom Helm, 1978.
- Smith, Denis E. "A comparison of static and ballistic stretching technique for improving the range of motion about selected anatomical joints of 55 to 75 year old females." Unpublished Master's Thesis, University of Victoria, January 1981.
- Walls, E. W. "The anatomy of aging," *Physiotherapy*. 56:528-533, December 1970.
- Wright, V. "Stiffness. a review of its measurement and physiological importance," *Physiotherapy*, 59:107-111, April 1973.

CHAPTER 5

THE EFFECTIVENESS OF A FOUR PERIOD PER WEEK PHYSICAL EDUCATION PROGRAMME

LORNE J. VERABIOFF

Fitness in childhood is increasingly seen as a prerequisite for achieving optimum health. The importance of physical exercise has generally become accepted as one factor in the prevention of cardiovascular disease. For children, the need for physical activity is necessary for normal growth and development. Espenchade (cited in Goode, 1979) summarizes this need as follows:

... Regular physical activity produces organic changes particularly in the lungs and circulatory system, some of which improve function for normal living and are protective against stress and strain... Regular physical activity will eventually increase density of the bones of the body and increase their resistance to stress and strain.

The reduced activity level in modern society brings about a decrease in physical fitness which reflects unfavourably on the functional state of the organism.

Several epidemiological studies present evidence that physically more active people are less likely to fall victim to coronary heart disease (Balke, 1972). Bailey (1973) has presented data to suggest that children's aerobic capacity begins to decline when they start school. With spontaneous free play diminishing, it is not surprising that the fitness level of children should decline as well. Enhanced aerobic capacity as reflected via maximum oxygen intake is an expected outcome resulting from regular participation in vigorous physical activity. However, when voluntary activity patterns of children are studied, it is found that the majority of children do not engage in sufficient aerobic activity to have any training effect on the cardio-respiratory system (Hovell *et al.*, 1978; Seliger *et al.* 1974).

It has been suggested that one way to deal with this problem of low activity participation of children is to increase the number of physical education periods. Since every child must attend school, it would

seem that the school should provide daily activity for the children if they do not engage in it voluntarily. However, studies that have examined the effect of physical education classes on aerobic capacity found that the regular classes had little effect on the aerobic capacity (Baggley and Cumming, 1972; Cumming, Goulding and Baggley, 1969; Goode *et al.*, 1976).

Studies that have examined the effects of five versus three classes per week have produced conflicting results. Johnson (1969) who compared the effects of five classes per week versus two and three classes found that the daily programme did bring about a significant gain in skill, fitness and fat reduction. However, Kemper *et al.* (1976), in comparing five versus three classes per week, found no difference between the two programmes on physiological variables. The only change was on progress in gymnastic skills where the five period group performed better.

There is also conflicting evidence that specific training programmes during regular physical education classes will improve cardiovascular fitness of children. Eckblom (1969) found that additional training sessions did improve the maximum oxygen intake by 15 percent in the training group. Gatch and Byrd (1979) found that adding 12 minutes of interval training did significantly improve cardio-respiratory function as measured by PWC₁₇₀ test. However, Daniels and Oldridge and Bar-Or and Zwiren (cited in Cunningham, 1979) found no changes in aerobic capacity with training.

The idea that increasing the number of physical education periods will increase the amount of physical activity has been questioned by Verabioff (1980). Simply adding more time for physical education will not bring about improvement in cardio-respiratory function unless student behaviour and class organization procedures change. Moffatt *et al.* (1977) suggest that the intensity of training is the key to successful enhancement of aerobic capacity. They also state "With respect to frequency... assuming a high, constant intensity, three day per week training may be as effective as five, two day per week training may be as effective as four, etc." (p. 351).

Goode *et al.* (1976) demonstrated that six minutes of large muscle activity at a heart rate between 150-160 beats per minute can bring about improvement in cardiovascular fitness. Cunningham (1979) has suggested that physical activity programmes may be effective if the intensity is high and the period of training lasts several months.

The purpose of this study was to compare a four period per week programme with a two period per week programme in terms of its

effect on aerobic capacity. In addition, student activity behaviour and activity intensity were considered as variables that needed to be part of the analysis, since intensity of activity has been suggested as a critical factor in cardio-respiratory improvement.

Methodology

Two primary to six elementary schools were selected for the study. The experimental school instituted a programme of four 30-minute periods per week, while the control school continued with the regular two period a week programme. At the experimental school the classroom teachers taught the additional two periods, while at the control the physical education teacher taught the two periods per week to all grade four to six classes. The primary to three grades were taught by the classroom teacher.

From each school a random sample of 32 subjects was selected. Consent forms were sent to parents and 31 were returned from the experimental school while only 20 were received from the control school. Due to dropouts during the year 26 subjects (13 male, 13 female) remained at the experimental school and 16 (9 male, 7 female) at the control school.

Each subject was tested for maximum oxygen intake in October, March, and June of the school year. To measure the effect of the summer holidays, subjects were retested in September of the following school year.

At each school a subsample of nine subjects was selected for a special eight week conditioning programme. This was a high intensity interval training programme conducted at each school four times a week for 45 minutes. The training started in the second week in January and finished the first week in March.

During the physical education class each subject was monitored via telemetry to record heart rate as a measure of activity intensity. Heart rate was recorded every 30 seconds for 20 minutes. In addition to the heart rate recording, each subject's activity was recorded using a 10 second time sampling interval. Activity observed was classified into one of the following four categories:

Stationary Activity

maintenance of posture in a still or stationary manner.

Limited Base Activity

feet are stationary with the upper body used to rotate, give or receive impetus to objects.

Walking

alternating action of the two lower limbs whereby the total body is moved from place to place.

Vigorous Activity

use of big muscle activity to give impetus to one's own body.

Each school carried out its own testing programme during September, December, March and June of the school year. The test items were the nine minute run, one minute sit ups, standing long jump and flexibility (sit and reach).

TABLE 1

*Fitness Data for Experimental and Control Schools^a
Males and Females Combined*

<i>Variable</i>	<i>Test Date</i>			
	<i>Oct</i>	<i>March</i>	<i>June</i>	<i>Sept.</i>
<i>Age (yrs.)</i>	8.6+ .41 ^b	8.0+ .44	9.1+ .44	9.1+ .40
	9.4+ .50	9.8+ .50	10.3+ .50	10.6+ .44
<i>Height (cm)</i>	132.0+2.60	134.5+2.60	134.1+2.70	133.4+2.50
	137.7+3.10	140.3+3.20	142.9+3.80	143.9+3.60
<i>Weight (kg)</i>	30.7+1.67	32.2+1.80	32.4+1.90	31.6+1.80
	33.8+2.50	35.6+2.60	38.3+3.20	39.1+3.10
<i>VO₂max ml/kg</i>	46.3+1.40	47.7+1.70	45.6+1.60	45.0+1.40
	45.0+1.40	48.0+1.70	46.3+2.10	48.4+1.50
<i>% fat</i>	19.4+ .70	17.5+ .60	18.4+1.00	17.8+ .90
	20.9+1.50	18.1+1.00	19.7+1.20	19.1+1.10

^a The first value for each variable is for the experimental school (N=25), the second value is for the control school (N=19).

^b ± = standard error of the mean

Results

Mean results for the two schools in table 1 show no significant change in maximum oxygen intake (max VO₂) during the year.

TABLE 2
Maximum Oxygen Intake for Trained and Nontrained Groups^a

<i>Group</i>	<i>Test Date</i>			
	<i>Oct.</i>	<i>March</i>	<i>June</i>	<i>Sept.</i>
Trained				
(N=17)	45.54+1.72 ^b	*47.84+1.72	46.02+2.07	46.97+1.53
Nontrained				
(N=18)	45.66+1.29	46.99+1.68	46.52+1.61	46.36+1.59

^a Male and female data has been combined

^b ± = standard error of the mean • p = .05

TABLE 3
Percentage of Time Spent in the Various Activity Categories

<i>Activity Category</i>	<i>Experimental</i>	<i>Control</i>	<i>Pilot Data</i>
Stationary	44 (16-68) ^a	44 (8-82)	**57 (33-83)
Limited Base	29 (1-48)	21 (2-57)	*18 (4-53)
Walking	9 (1-47)	10 (0-18)	11 (0-47)
Vigorous	18 (1-58)	25 (1-57)	*14 (2-29)

^a Numbers in brackets indicate range of activity in percent. • p < .05 ** p < .01

However, the training group that experienced the additional eight week interval training period did show a significant increase in max VO_2 . It can also be seen in table 2 that once the training programme finished in early March, the regular programme did not maintain the level of fitness achieved. The decrease in max VO_2 in June for the trained group suggests the regular physical education programme was ineffective in maintaining the fitness level.

Table 3 summarizes the activity observations. In comparison to the pilot data, both schools significantly decreased the amount of stationary activity. The percentage of time spent in vigorous activity was higher in the control school, but the difference was not significant.

TABLE 4

Average Heart Rates During Class

	<i>Total Sample</i>	<i>Experimental</i>	<i>Control</i>	<i>Pilot Data</i>
	(N=42)	(N=26)	(N=16)	(N=46)
Average	138 (17) ^a	135 (15)	*142 (19)	136 (15)
Activity Heart Rate	148 (17)	146 (17)	153 (17)	148 (15)
Vigorous Heart Rate	158 (18)	156 (18)	162 (18)	162 (15)

^a Numbers in brackets is the standard deviation.

• $p < 05$

Class heart rate data in table 4 shows that the control school had a significantly higher average heart rate, indicating that more intense activity occurred during the class period. Figure 1 shows the minute by minute heart rates to confirm the higher intensity at the control school.

The comparison of activity intensity for physical education and classroom teachers at the experimental school is found in figure 2. In general, the physical education teachers did achieve a more intense level of activity during the first nine minutes of the class period.

Table 5, which shows the school testing results, indicates there was significant improvement in only the nine minute run for both schools. Figure 3 gives a clearer picture of the nine minute run performance.

Although the experimental school was significantly better in performance, the improvement for both schools was almost identical. The experimental school showed an 86 (6%) meter improvement from September to June, while the control school had an 81 (5%) meter improvement. In sit ups, as seen in figure 4, the control school had a higher level of performance in September, however, the school just maintained its performance during the year. On the other hand, the experimental school made a significant improvement in sit ups. The school emphasized this item during the year and it seemed to pay off. Performance in standing long jump and flexibility did not improve in either school during the year.

TABLE 5

Mean School Test Results for Grades 4, 5 and 6

<i>Test Item</i>	<i>Experimental</i>			<i>Control</i>		
	<i>School x</i>	<i>M</i>	<i>F</i>	<i>School x</i>	<i>M</i>	<i>F</i>
9 Minute Run (Meters)						
September	1558	1593	1523	1487	1564	1409
December	1648	1700	1597	1494	1564	1423
March	1640	1765	1515	1552	1642	1462
June	1644	1668	1620	1568	1650	1486
Standing Long Jump (cm)						
September	146.9	138.8	155.0	154.0	150.0	158.0
December	142.2	142.9	141.6	143.7	144.7	142.8
March	160.5	152.9	168.1	139.2	138.7	139.7
June	149.5	151.2	147.7	151.8	151.1	152.4
Sit Ups						
September	29	29	29	37	39	36
December	35	36	33	39	41	37
March	38	38	38	38	46	37
June	40	40	41	39	40	39
Flexibility (cm)						
September	40.8	37.8	43.7	41.9	38.6	44.3
December	42.2	39.3	45.1	40.8	37.9	43.7
March	41.9	37.5	46.4	41.8	38.9	44.7
June	42.0	39.6	44.5	41.9	38.7	45.1

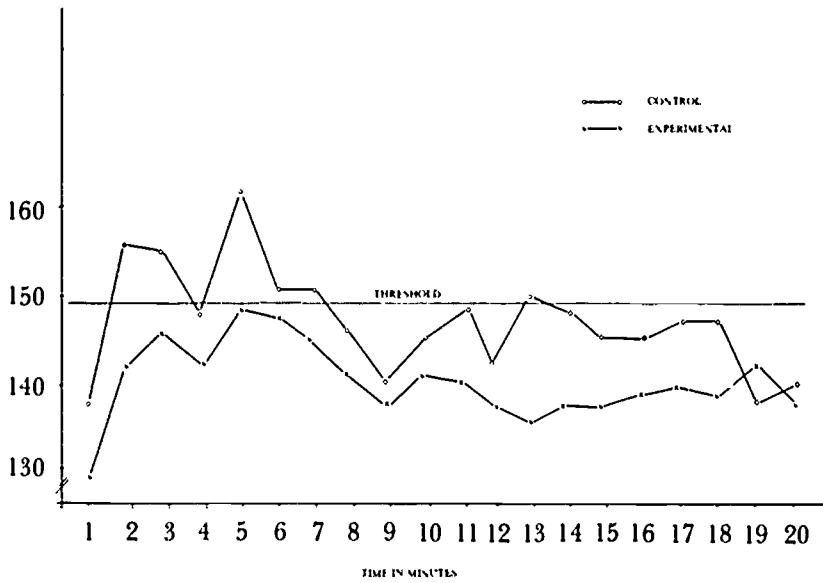


FIGURE 1

Mean Minute by Minute Heart Rates For Schools

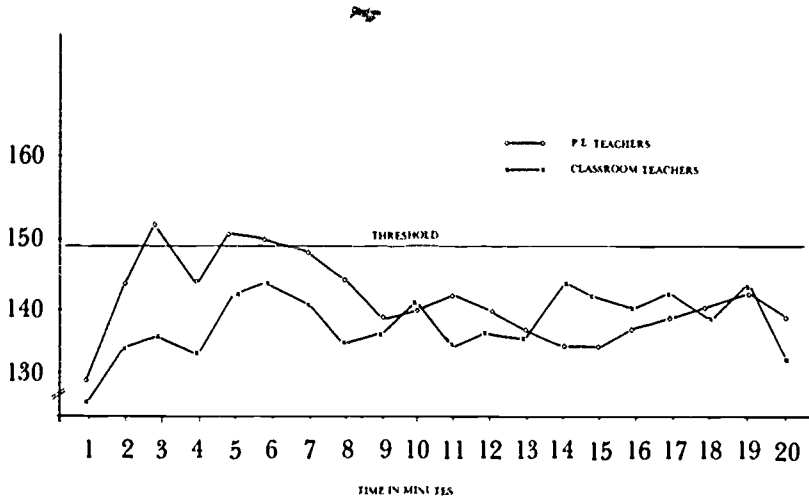


FIGURE 2

Mean Minute by Minute Heart Rates for P.E. and Classroom Teachers

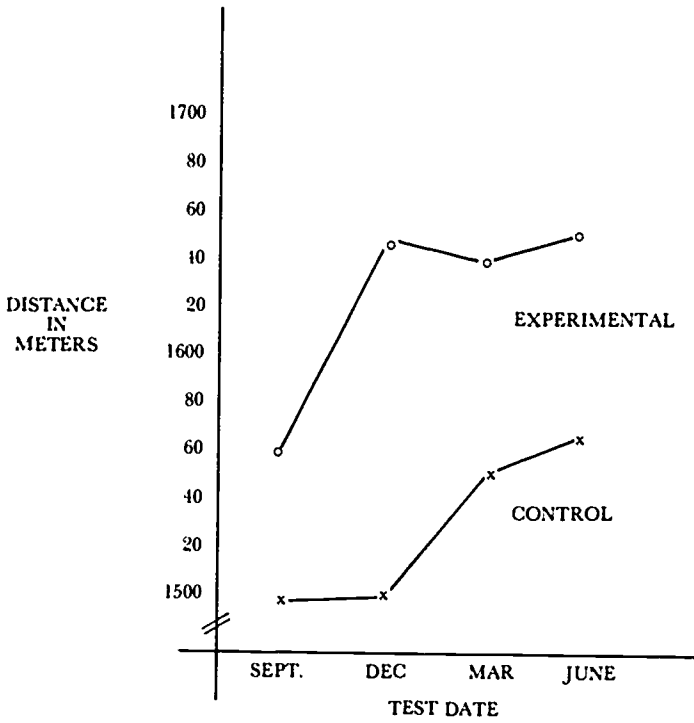


FIGURE 3

Mean scores for 9 minute run.

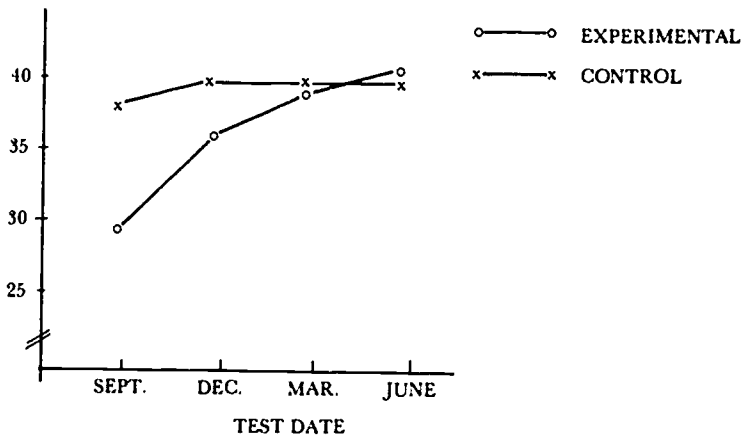


FIGURE 4

Mean scores for sit ups.

Discussion

The idea that increasing the amount of time for physical education will also increase the amount of activity may be questioned. In examining the percentage of time spent in the various activity categories, both schools were identical in stationary activity and walking. However, the control school had considerably more time in vigorous activity. In addition, the control school had more intense activity during its physical education classes. In spite of the higher intensity and more vigorous activity, there was no change in max $\dot{V}O_2$ during the year. The experimental school, with a less vigorous activity period, but with a higher frequency of activity also had no change in max $\dot{V}O_2$ during the year. When one examines the heart rate data in figure 1 it becomes clear that the intensity level is not sufficient to have a training effect. Shephard (1968), Fox *et al.* (1975) indicate that exercise intensity is the main factor in influencing the extent of training. Goode *et al.* (1976) have suggested that a heart rate of 150 beats per minute is needed to achieve cardio-respiratory improvement in children. The intensity obtained in both schools on average was below the minimum of 150. Although the vigorous heart rate for both schools exceeded 150, the duration of that stress was too short to have any training effect.

It is interesting to note that the training group which had eight weeks of interval training did improve its max $\dot{V}O_2$. This result seems to confirm that the activity intensity is crucial to improvement and maintenance of aerobic capacity. The training group trained four days a week at a heart rate exceeding 150 beats per minute. Although the increase in max $\dot{V}O_2$ is encouraging, what was disappointing was that when the group returned to the regular programme in March, by June its max $\dot{V}O_2$ had declined to almost pretraining level. It seems that the regular programme did not have sufficient intensity to maintain the gains made in max $\dot{V}O_2$.

Failure to produce change in $\dot{V}O_2$ does not mean the programme was ineffective. When one looks at the nine minute run results, it is obvious that there has been some benefit. It has been suggested by Lamb (1978, p. 244) that training at low heart rates should improve endurance but may not increase $\dot{V}O_2$. This appears to have happened. Both schools increased their nine minute run performance 6 percent during the year. Since both schools had an almost identical improvement, the additional periods at the experimental school were insignificant.

In view of these results, physical educators must be careful what rationale they use to justify additional time for physical education. The mere addition of extra periods per week will not necessarily result in more activity or increased fitness. If fitness improvement is the goal, then activity intensity must increase to bring about the needed training effect. The use of classroom teachers to teach physical education may also need re-examination. There is some indication that classroom teachers do not have as intense activity level when compared to physical education teachers. The need for inservice training is necessary to make teachers aware of activity intensity and ways that it may be achieved.

If physical education is to live up to its contention that it is an activity subject, some changes are necessary in teacher behaviour. The need to reduce stationary activity is vital if vigorous activity is to be increased. Students must be taught what vigorous activity is and how to monitor their own activity intensity.

Conclusions

As a result of this study the following conclusions seem warranted.

1. The addition of extra physical education periods has no effect on aerobic capacity.
2. Activity intensity is not sufficient during physical education classes to improve nor maintain aerobic capacity.
3. It is possible to change teacher behaviour during physical education classes, as evidenced by the reduction of stationary activity in both schools.
4. Physical educators must be cautious what rationale is used to justify increased physical education classes.

REFERENCES

- Bagley, G. and Cumming, G. R. Serial measurement of working and aerobic capacity of Winnipeg school children during a school year. In G. R. Cumming, D. Snidal, A. N. Taylor (Eds.), *Environmental effects on work performance. Fifth Pan American Congress on Sports Medicine*, Winnipeg: 1972, 173-186.
- Bailey, D. A. Exercise, fitness and physical education for the growing child—a concern. *Canadian Journal of Public Health*, 1973, 64, 421-430.
- Balke, B. Regular physical activity: A factor in the prevention and treatment of cardiovascular disease. In G. R. Cumming, D. Snidal, A. N. Taylor (Eds.), *Environmental effects on work performance. Fifth Pan American Congress on Sports Medicine*, Winnipeg: 1972, 187-190.

- Cumming, G. R., Goulding, D., and Baggle, G. Failure of school physical education to improve cardio-respiratory fitness. *Canadian Medical Association Journal*, 1969, 101, 69-73.
- Cunningham, D. A. Childhood physical activity and the development of cardiovascular fitness. In R. C. Goode and R. Volpe (Eds.), *The child and physical activity proceedings*, Toronto University of Toronto, 1979, 36-54.
- Eckblom, B. Effect of physical training on adolescent boys. *Journal of Applied Physiology*, 1969, 27, 350-355.
- Fox, E. L., Bartels, R. L., Billings, C. E., O'Brien, R., Bason, R., and Mathews, D. K. Frequency and duration of interval training programs and changes in aerobic power. *Journal of Applied Physiology*, 1975, 38, 481-484.
- Gatch, W., and Byrd, R. Endurance training and cardiovascular function in 9 and 10 year old boys. *Archives of Physical Medicine and Rehabilitation*, 1979, 60, 574-577.
- Goode, R. C. The child and physical activity. In R. C. Goode and R. Volpe (Eds.), *The child and physical activity proceedings*, Toronto. University of Toronto, 1979, 20-35.
- , Virgin, A., Romet, T. T., Crawford, P., Duffin, J., Pallandi, T., and Woch, Z. Effect of a short period of physical activity in adolescent boys and girls. *Canadian Journal of Applied Sport Science*, 1976, 1, 241-250.
- Hovell, M. F., Bursick, J. H., Sharkey, R., and McClure, J. An evaluation of elementary students voluntary physical activity during recess. *Research Quarterly*, 1978, 49, 460-473.
- Johnson, L. C. Effects of 5 day a week versus 2 and 3 day a week physical education class on fitness, skill, adipose tissue and growth. *Research Quarterly*, 1969, 40, 93-98.
- Kemper, H. C. G., Verschuur, R., Ras, K. G. A., Snel, J., Splinter, P. G., and Tavecchio, L. W. C. Effect of 5 versus 3 lessons a week physical education program upon the physical development of 12 and 13 year old schoolboys. *Journal of Sports Medicine*, 1976, 16, 319-326.
- Lamb, D. R., *Physiology of Exercise Responses and Adaptations*, New York MacMillan Publishing Co., 1978.
- Moffatt, R. J., Stamford, B. A., Weltman, A., and Cuddihoe, R. Effects of high intensity aerobic training on maximal oxygen uptake capacity and field test performance. *Journal of Sports Medicine*, 1977, 17, 351-359.
- Seliger, V., Trefny, Z., Bartunkova, S., and Pauer, M. The habitual activity and physical fitness of 12 year old boys. *Acta Paediatrica Belgica Supplement 1*, 1974, 28, 51-59.
- Shephard, R. J. Intensity, duration and frequency of exercise as determinants of the response to a training regime. *Int. J. Angew. Physiology*, 1968, 26, 272-278.
- Verabioff, L. J. Student behaviour and activity intensity during physical education classes. Paper presented at CAHPER Conference, St. John's, Newfoundland, July 1980.

CHAPTER 6

THE MANY FACES OF AEROBIC FITNESS

HOWARD A. WENGER

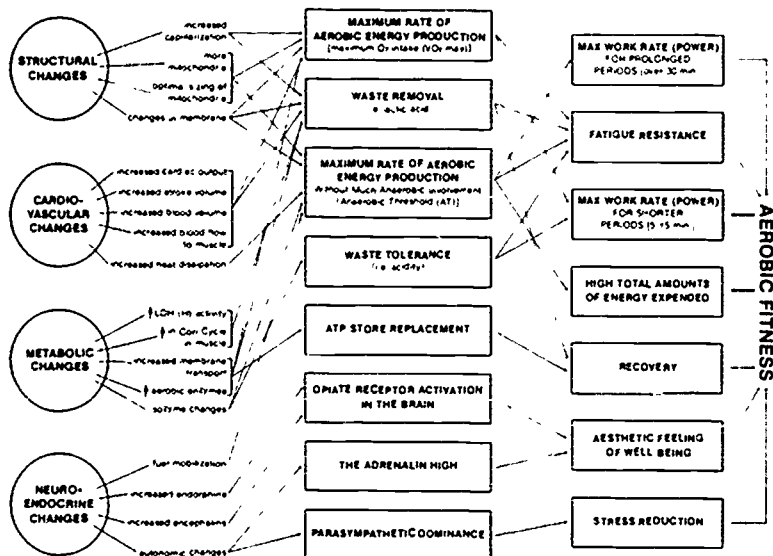
Introduction

The words "aerobics" and "aerobic fitness" are no longer solely within the trade jargon of physical educators, fitness enthusiasts, and coaches. Many North Americans are now using these terms to describe their recent pursuit of a physically active lifestyle.

People are pursuing aerobic fitness for a wide variety of reasons. There is some consensus that it "allows you to work without undue fatigue, to retain enough energy to enjoy hobbies and recreational activities, and to make optimal use of your body" (Higdon, 1977). Certainly many people are involved because of the cosmetic benefits which accrue from chronic prolonged exercise. A major cosmetic benefit is fat reduction because the total caloric expenditure from aerobic work is higher in comparison to the more intense, short duration efforts. An added benefit gained due to the high energy expenditure of aerobic exercise is that the caloric intake can be increased with no increase in fat storage. This, for some, means an increase in the quality of their life. The attainment of aerobic fitness also allows one to work for longer periods of time on tasks which have a substantial physical component or to perform at even higher loads over similar time frames. Some find aerobic exercise to be therapeutic or, find that it masks the perception of pain. Others find it exhilarating and a means to inner peace or, as a means to stress reduction (Sheehan, 1978). Still others continue because of a "positive addiction" to exercise after prolonged involvement (Glasser, 1976).

Athletes attempt to hone their aerobic fitness for similar or different reasons than the general public. A highly developed level of aerobic fitness is critical for prolonged, relatively low intensity performance such as middle and long distance running, cycling, skiing, and swimming events. It is also critical for performing relatively high

THE MANY FACES OF AEROBIC FITNESS



intensity work for as long as possible and, for the rapid recovery necessary between repeated bouts of extremely high levels of power output. The well-developed aerobic base is also thought to enhance the power training phases in the training calendar because it enhances recovery and thus permits more high intensity intervals. As well, aerobic exercise is used to maintain an optimal playing weight during the off-season.

The purpose of this paper is to present the physiological rationale for why aerobic fitness can enhance both the quality of life and the quality of the elite athletic performance.

What is aerobic fitness?

The term "aerobic" means "with oxygen." Aerobic exercises encompass those types of activity in which the energy supplied within the muscles to perform the work is chemically produced "with oxygen" involved. The oxygen is extracted from the environment by the respiratory system, transported to the muscles via the cardiovascular system, and utilized within the muscles by the enzymes of the oxidative energy production system. The respiratory, cardiovascular and muscular systems are collectively referred to as the oxygen transport

system and their combined efficiency in performing the oxygen transport function is often referred to as "aerobic fitness." However, the importance of the oxygen transport system goes beyond just the transport of oxygen. The cardiovascular component must supply fuels and hormones both to muscles and to fuel storage depots; it must also act to flush out metabolic waste products from the muscle and transport them to the liver, kidney, lungs, or other muscles wherein they can be excreted or altered. The muscular component must have a significantly well-developed, oxidative energy production system (aerobic metabolism) to supply energy at a high enough rate to meet the demand. This avoids the provision of substantial amounts of energy by "anaerobic" (without oxygen) means which results in acid metabolites (e.g., lactic acid) and rapid fatigue. The aerobic metabolism in the muscle can also be used following anaerobic work to convert lactic acid into non-fatiguing carbohydrate fuel (Hermansen and Vaage, 1977) and thus aid in recovery. As well, many sub-cellular structures must function optimally to permit an enhanced state of "aerobic fitness."

Thus, aerobic fitness is not a simple, unidimensional characteristic but rather a complex multifactoral mosaic. Each individual's "aerobic fitness" will have different components developed to different extents and hence permit or restrict certain types of endurance activities.

Figure 1 illustrates the complex interaction between seven different attributes of aerobic fitness and the physiological, metabolic, and structural properties which influence them.

The Faces of Aerobic Fitness

1. *The capability to work at relatively high rates for prolonged periods (over 30 minutes).* This has traditionally been the one which has been associated with aerobics. We possess two different types of energy supply systems to meet the energy demands during exercise. The aerobic process which provides energy at a low rate but for extended periods of time and the anaerobic process which can provide energy at a high rate but only for short intervals. Thus, the capability to work at as high a rate as possible for long periods is dependent upon providing energy aerobically at as high a rate as possible without a significant involvement of the fast fatiguing anaerobic processes. The rate of work or the oxygen consumption at which anaerobic systems

become substantially involved in energy supply is referred to as the anaerobic threshold (AT). This threshold is often expressed as a percentage of maximum oxygen consumption ($\dot{V}O_2 \text{ max}$). Therefore, in order for one to possess a high capability to work for prolonged periods, both a high $\dot{V}O_2 \text{ max}$ and a high AT are ideal (Davies and Thompson, 1979). However, it is possible to possess the same effective capability by having either AT or $\dot{V}O_2 \text{ max}$ developed to a greater extent.

Both the AT and $\dot{V}O_2 \text{ max}$ are influenced structurally in the muscles by the number and size of the mitochondria (Cosmas and Edington, 1975), wherein the aerobic energy supply occurs, and by membrane characteristics (Thomas *et al.*, 1977) which shuttle fuels into the mitochondria to permit higher rates of aerobic energy production. Additionally, the number of capillaries per cross-sectional area (Saltin *et al.*, 1977) of muscle would be more critical for $\dot{V}O_2 \text{ max}$ when oxygen and fuels may be limiting rather than for the sub-maximal AT. Similarly, maximal cardiac output (\dot{Q}), stroke volume (SV), blood volume (BV) and muscle blood flow (MBF) would all play a greater limiting role in $\dot{V}O_2 \text{ max}$ rather than AT. However, the ability to dissipate heat is certainly important in prolonged work and the cardiovascular system is the vehicle for heat convection from muscle to skin. Therefore, the upper limits SV, BV, \dot{Q} and MBF will dictate the reserve and hence will influence prolonged efforts—especially in warm environments (Gisolfi *et al.*, 1977).

The activity of the aerobic enzymes which are involved in aerobic energy production do play an important role in determining $\dot{V}O_2 \text{ max}$ (Ivy *et al.*, 1980) and thus influencing the prolonged work rate. These enzymes are associated with fat oxidation, Krebs Cycle, and oxidative phosphorylation in the mitochondria and include such markers as B hydroxyacyl Co-A dehydrogenase, succinate dehydrogenase, and cytochrome oxidase (Holloszy, 1975).

The mobilization of fuels would seem to have more effect at AT than on the $\dot{V}O_2 \text{ max}$ since, at AT greater fat mobilization could spare glycogen as a fuel and thus allow longer performances. This mobilization of fat is accomplished through many hormones of the endocrine system such as growth hormone, cortisol, epinephrine, and adrenocortico-trophic hormone (Hartley *et al.*, 1972). Their interplay with the glucose regulators, insulin and glucagon, in the supply of fat and sugars as fuels for work plays an integral role in prolonged exercise.

Thus, prolonged work at a relatively high rate is dependent upon

both the AT and the $\dot{V}O_2$ max and these in turn are influenced by some common and some unique structural, metabolic, cardiovascular, and neuro-endocrine changes.

2. *The capability to resist fatigue.* Fatigue resistance is illustrated in Figure 1 as being influenced by the $\dot{V}O_2$ max, the anaerobic threshold, the waste removal systems, and the capability of the muscle to tolerate wastes. The metabolic, structural, cardiovascular, and neuro-endocrine factors which influence $\dot{V}O_2$ max and AT (see 1 above) will certainly increase fatigue resistance by increasing the rate of work which can be accomplished without lactic acid build-up. As well, the increased capillarization and elevated blood flow, stroke volume, and cardiac output will assist in flushing the muscles of metabolic wastes (i.e., CO_2 and lactic acid) and thus guard against fatigue. The isozyme changes in some key rate-limiting enzymes (i.e., PFK) may also enhance the ability to provide energy under highly acid conditions and thus offset tiredness. In conjunction with this, increases in the activity of the enzyme LDH(H) can catalyze the breakdown of lactic acid aerobically (Karlsson *et al.*, 1975) while other enzymes can serve rapidly to resynthesize glycogen in the muscles from lactate residues (Hermansen and Vaage, 1977). Collectively, they enhance the removal of lactate and hence augment fatigue resistance.

3. *The capability to work at high rates for shorter periods (5-15 minutes).* When one works at rates demanding maximum oxygen consumption ($\dot{V}O_2$ max) the duration of the effort usually lasts from five to fifteen minutes. Although these power outputs result in the maximum oxygen intake, a substantial involvement of anaerobic glycolysis occurs in order to augment the energy supply. This results in the production of high lactate levels which prevent these work rates from being continued longer (Wenger and Reed, 1975). Since the aerobic energy production system is working maximally, all the factors which affect $\dot{V}O_2$ max (see 1 above) will affect this type of work. As well the ability of the muscle to tolerate the highly acid conditions will play an important role. This adaptation to acidity (decreased pH) is exhibited as changes in acid sensitive enzymes and possibly as membrane alterations (Thomas *et al.*, 1977) to Na^+ permeability which would permit muscular excitation. Thus, both high rates of aerobic energy production and tolerance to high acidity are necessary for this type of fitness.

4. *The capability to expend high total amounts of energy.* For many people, aerobic fitness revolves around their need to maintain a negative caloric balance or an equilibrium which permits a higher than normal intake. This capability is related to the ability to perform prolonged work and especially the anaerobic threshold. The key to total energy expenditure is the duration of the effort. Even though high rates of work are enhausting, the duration is so short that the total caloric cost is minimal. The advantage to low intensity, long duration exercise is that even though the rate of expenditure of energy is low, the non-fatiguing nature of this type of work permits very long durations and hence high total amounts of calories expended. Therefore, those factors which influence the anaerobic threshold (see 1 above) will also dictate the extent to which this type of fitness can be achieved.

5. *The capability to recover from high rates of work effectively.* Many high power athletes and individuals whose occupations demand repeated intervals of work at high resistances or at high speeds perceive aerobic fitness as the ability to recover between work sessions and hence perform more intervals. Certainly the aerobic energy systems are crucial for the replacement of stored high energy substances (ATP and creatine phosphate, following short bursts (5-30 seconds) of activity (Fox, 1979). As well, following longer intervals (5-2 minutes) the ability to remove wastes aerobically is very critical in extending the number of intervals (Fox, 1979). The factors which accomplish this are discussed in 2 above. Therefore, even though there is minimal aerobic involvement in the actual work bouts, aerobic fitness is instrumental in the ability to recover.

6. *The perception of well-being.* "When I'm fit I feel better" is often heard when people describe fitness. These feelings of well-being are localized in the brain and probably result from the activation of opiate receptors by the morphine-like neuro-chemicals the B endorphins and encephalins (Iverson, 1979). Presently, there is the suggestion that the levels of these two substances are increased following exercise. It is also suggested that some individuals experience a positive addiction to the elevated adrenalin levels during exercise and hence must pursue high levels of activity to satisfy their "habit." This "face of fitness" is certainly the most ambiguous but has an exciting future as the mysteries of the brain and exercise begin to unravel.

7. *The capability to reduce the detrimental effects of stress.* An often perceived adaptation to chronic aerobic exercise is a reduction in heart

rate at rest and at submaximal loads. This is a manifestation of a decrease in sympathetic neural activity and an increase in parasympathetic tone. The benefits, however, go well beyond the reduced heart rates. There is less activation of the adrenal medulla, therefore lower adrenalin levels and lower metabolic activity. There is greater activation of mucous glands in the stomach and intestine and hence more protection from digestive juices. There is less vasoconstriction in the periphery and hence lower peripheral resistance and an ability to resist elevated blood pressure. Thus, aerobic fitness can mean both stress reduction and an ability to cope with or resist physical or psychological stress.

Although the one term, "aerobic fitness," is often used to describe many different physical states which result from a chronic exposure to exercise, this paper and Figure 1 have attempted to demonstrate that the physiological, biochemical, and anatomical adaptations have some degree of overlap but also reflect a unique profile for each "face" of aerobic fitness.

REFERENCES

- Cosmas, A. C., and D. W. Edington "Mitochondrial distributions in hearts of male rats as a function of long-term physical training." In *Metabolic adaptation to prolonged exercise* Howald and Poortmans, editors, Lausanne, Birkhauser Verlag Basel, pp 390-396, 1975
- Davies, C. T. M., and M. W. Thompson "Aerobic performance of female marathon and male ultramarathon athletes," *Eur J Appl Physiol.*, 41 233-245, 1979.
- Fox, E. L. *Sports physiology* Toronto: W. B. Saunders, 1979.
- Gisolfi, C., N. C. Wilson, and B. Claxton "Work-heat tolerance of distance runners." *Ann N Y Acad Sci*, 301 139-150, 1977.
- Glasser, W. *Positive addiction* New York: Harper and Row, 1976
- Hartley, L. H., J. W. Mason, R. P. Hogan, L. G. Jones, T. A. Kotchen, E. H. Mougey, F. E. Wherrey, L. L. Pennington, and P. T. Ricketts. "Multiple hormonal responses to prolonged exercise in relation to physical training," *J Appl Physiol*, 33,5) 607-610, 1972.
- Hermansen, L., and O. Vaage "Lactate disappearance and glycogen synthesis in human muscle after maximal exercise," *Am J Physiol. Endocrinol Metab Gastrointest. Physiol.* 2(5):E 122-E 129, 1977
- Holloszy, J. O. "Biochemical adaptation of skeletal muscle to prolonged physical exercise." In *Metabolic adaptation to prolonged exercise* (Howald and Poortmans, editors,) Lausanne, Birkhauser Verlag Basel, pp 438-447, 1975
- Hugdon, H. *Fitness after forty* Mountain View, CA: World Publications, 1977
- Iversen, L. L. "The chemistry of the brain," *Scientific American*, 241 137-149, 1979
- Ivy, J. L., D. L. Costill, and B. D. Maxwell "Skeletal muscle determinants of maximal aerobic power in man," *Eur J Appl Physiol*, 44, 1-8, 1980
- Karlsson, J., B. Jodin, A. Thorstensson, B. Hulten, and K. Frith "LDH isozymes in skeletal muscles of endurance and strength trained athletes," *Acta Physiol Scand.*, 97 150-156, 1975.

- Saltin, B. J. Henriksson, Else Nygaard, and P. Andersen. "Fibre types and metabolic potentials of skeletal muscles in sedentary man and endurance runners," *Ann NY Acad. Sci.*, 301:3-29, 1977
- Sheehan, G. *Running and being The total experience* New York, Warner Books, 1978.
- Thomas, T. R., B. R. Londeree, K. O. Gerhardt, and G. W. Gehrke "Fatty acid profile and cholesterol in skeletal muscle of trained and untrained men." *J. Appl. Physiol. Respirat Environ. Exercise Physiol.*, 43(1):709-713, 1977.
- Wenger, H. A., and A. T. Reed "Metabolic factors associated with muscular fatigue during aerobic and anaerobic work." *Can J. Appl. Sports Sci.*, 1(1):13-18, 1976



CHAPTER 7

TREATING OBESITY IN THE ELEMENTARY SCHOOL

ROBERT P. PANGRAZI

A large number of adjustment problems are caused by obesity or obesity related syndromes in elementary school age children. Therefore, it is important to deal with the problem in a fashion that assures the best possible opportunity for success. The approach offered here deals with increasing the amount of activity the child partakes in during the day at school and home. Researchers (Corbin *et al.*, 1968), have found a relationship between the activity patterns of children and obesity levels.

Data is gathered from evaluation of obese students and a success profile developed before decisions are made in terms of probable success in treating the youngster. Only those youngsters with scores that give them a high chance for success are selected for inclusion in the treatment programme.

The programme has been developed for elementary school physical education teachers who have a full teaching load and very little time to devote to this area of concern. This approach minimizes the opportunity for failure in treatment. This is critical as these students have had much interest shown them about their "problem" with little success in treatment of the problem. Another failure in this programme may convince them that their problem is untreatable and hopeless. When the child and teacher agree that they have failed, they usually agree that there is no use in trying any longer. Thus the need for the success profile to aid in identifying youngsters who will be successfully treated.

The most obese youngster is a poor candidate for this approach. They, indeed, are in need of assistance, but their problem is one of severity and demands a much more comprehensive approach. The severely obese require medical, nutritional, and emotional aid which is usually far beyond the capabilities of the teacher and school system.

In summary, this system advocates gathering objective and subjective data about the youngster under consideration and developing a success profile for each candidate. Once the child is selected, the teacher will feel that there is a strong opportunity for success and proceed in that frame of mind. After evaluation has been undertaken, parents become an integral part of the treatment approach and aid the youngster throughout the term of treatment. Treatment takes the form of additional activity assignments carried out by the youngster during after school hours. The following is an abbreviated description of the approach advocated.

Evaluation of Candidates

The following data are collected to aid in making a meaningful appraisal of the candidate to see if the physical education teacher can have an impact in reducing the child's amount of body fat. Each area should be evaluated and data gathered for developing the "success profile" on each candidate.

1. *Height and weight.* The child should be accurately weighed and measured and the data recorded. This information, when compared on a height and weight chart can be converted to a percentile ranking. This is useful for sharing the information with parents so they can easily understand where their youngster stands in relation to other youngsters. Weight is usually a poor indicator of whether the child is reducing the percent body fat, so a student's success should not be gaged by scale fluctuations.
2. *Skinfold measurement.* Two skinfold measurements should be taken, the triceps and the subscapular. Both measurements should be made on the right side of the body for consistency. For a complete description of the skinfold measurement technique, refer to the study by Seltzer and Mayer (1965). The measurements can then be converted to percent body fat using the formula developed by Parizkova (1961).
3. *Attitude toward physical activity.* The CATPA attitude inventory (Simon and Smoll, 1974) is administered to diagnose whether the student has a positive feeling about physical activity.
4. *Physical self-concept.* Osgood's semantic differential technique (1957) is administered to evaluate the student's feelings about his or her physical self.

5. *Physical fitness status.* The following items are administered to each candidate: Bench push-ups, curl-ups, squat jumps, and 600 yard run-walk (Bruno, 1966). Even though the 600 yard run-walk is not as valid in predicting cardiovascular efficiency as longer distances, it is used to prevent overstressing the obese child.

Selection of Candidates

When data have been collected on the subjects, selection for participation in the programme is based on the following criteria:

1. *The student is moderately obese.* Generally, boys carrying approximately 20 to 25 percent body fat and girls with 25 to 30 percent fat are in a range that is treatable through an increased exercise programme.
2. *Success profile score.* Data gathered through the evaluation is used to determine which of the students carrying the stated amount of body fat will be selected for treatment. The decision is a relative one in which overweight candidates are compared against one another. The student who is moderately obese, and has high scores on the success profile will likely have the greatest opportunity for success.
3. *Teacher attitude toward candidates.* The physical education specialist must sincerely want to work with the chosen candidates. In some cases, the teacher does not have a good relationship with certain students and this severely hampers the potential for success.
4. *Health related personnel assessments.* The collected data should be shared with other school personnel such as nurses, counsellors, and principals. In some cases, information and advice may be received that will influence the selection of students.

After the above steps have been taken, students are selected for probable inclusion into the programme. Final acceptance into the programme is not made until the conference with the youngster's parents has been undertaken.

Conference with Parents

Parents should be notified by telephone that their child is being considered for inclusion into a programme for moderately overweight youngsters. At this conference, the data that has been gathered on each child can be shared with parents. If possible, it is beneficial to gather all parents for a single conference to discuss the programme

in a question and answer format. When parents are together, they are usually more at ease when they realize that other youngsters have weight control problems. During the conference, parents should be made aware of the objectives of the programme, the responsibilities of the student and parents in implementing the programme, and the need for follow-up conferences with parents.

At the end of the conference, parents are asked to take home a written contract in which they agree to help their youngster as outlined. If they desire their youngster to be in the programme, they sign the contract and have their child return it immediately. At this point, the student is considered to be part of the programme. If the contract is not returned, the issue is no longer pursued and the student is dropped from consideration.

Implementing the Programme

When youngsters have been selected for the programme, a weekly conference time should be arranged for each student. This time should be a scheduled commitment so the youngster realizes that this meeting is important and necessary for success of the programme. The meeting should not be arranged during the student's recess, lunchtime, before or after school, as it becomes similar to a punishment. The following points might be considered when meeting with students:

1. The conference should take 15 to 30 minutes. The student should not feel rushed so that he or she leaves with the feeling that the teacher is concerned and enjoys the meeting.
 2. Conferences can be carried out with two or three students if they are compatible. This should be done only if it enhances the experience for the student. The programme deals with small number of students and there should be ample time for each.
 3. Each student should be given a notebook which becomes his/her property. It should be taken home each week so parents can sign it and be brought back to school for the conference. Within the notebook should be the following: a description of the activities to be performed at home, physical fitness test record sheet, daily fitness card, weekly progress report, and a progress report to parents.
4. Students are assigned activity which they will perform at home outside of school hours. During the conference, the notebook should

be checked to see if the student and parents are carrying out their assignments.

5. Testing of the child's fitness and skinfold levels should be done every third week so that all involved can be aware of the state of the situation.

6. Before the child leaves the weekly conference, he/she should be clear about the new exercise assignment for the coming time frame. The teacher might demonstrate, send home a piece of equipment for motivation, or answer any questions the child has.

Assigning activity for the participant

When assigning activity for students, the following guidelines should be considered:

1. The activity assigned should be aerobic in nature. The emphasis of the programme is on increasing the activity level rather than focussing on diet and/or counselling. Exercise and increased levels of activity are the only areas in which most physical education teachers have expertise.

2. The activity assigned should not be in lieu of activity already performed by the student. The teacher should conduct an analysis of the type and amount of activity the youngster is involved in and supplement this activity in order to surpass the present dosage.

3. The following are activities that can be used to increase the activity level of the student. They appear in approximate order of difficulty so that the teacher can select from the top of the list and progress toward more energy consuming activities as the child's fitness level increases: walking, skateboarding, roller or ice skating, bike riding, hiking, unorganized sport activities, running in place, orienteering, jogging, swimming, and rope jumping.

4. Activity assignments should be made in terms of minutes per day. A suggested starting point is ten minutes per day, increasing at a rate of two minutes per week to a maximum of 30 to 40 minutes per day. The critical point to remember is that the teacher is attempting to establish lifestyles that focus on activity rather than sedentary pre-occupations.

5. The weekly activity assignment should contain two or three choices so the youngster can fulfill the activity requirement in several ways.

Parents should receive some type of communication on a bi-weekly basis. This can be a phone call or visit to the home of the parents. During the visit, a discussion of the strengths and weaknesses of the treatment should occur as well as results of the re-evaluation.

Summary

The described programme advocates changing the activity level of the obese youngster rather than altering diet or self-concept. Since physical educators are qualified to offer and monitor exercise and activity, only those moderately obese students who show a propensity for success should be treated. The selection process is based on both objective data and the professional judgment of the teacher. The programme offers a comprehensive schedule for a few students rather than treating a large number superficially. Hopefully, through positive experiences with the specialist and an increased activity level, the youngster will alleviate the problem of excessive body fat for a lifetime.

REFERENCES

- Bruno, L. *Physical fitness test manual for elementary schools*. Olympia, Washington: State Department of Public Instruction, 1966.
- Corbin, C., and P. Pletcher. Diet and physical activity patterns of obese and non-obese elementary school children. *Research Quarterly*, 39 4, 922-928, 1968.
- Johnson, M., B. Burke, and J. Mayer. The prevalence and incidence of obesity in a cross-section of elementary and secondary school children. *American Journal of Clinical Nutrition*, 4:3, 231-238, 1956.
- Osgood, C., G. Suci, and P. Tannenbaum. *The measurement of meaning*. Urbana, Illinois: University of Illinois Press, 1957.
- Pangrazi, R. P. The long range effect of an innovative elementary physical education program. Doctoral Dissertation, Washington State University, 1973.
- Parizkova, J. Total body fat and skinfold thickness in children. *Metabolism*, 10 794-807, 1966.
- Seltzer, C. C., and J. Mayer. A simple criterion of obesity. *Post Graduate Medicine*, 38:2, A 101, 1965.
- Simun, J., and F. Smoll. An instrument for assessing children's attitudes toward physical activity. *Research Quarterly*, 45:4, 407-415, 1974.



CHAPTER 8

TEACHING FITNESS FOR LIFE IN THE SCHOOLS

CHARLES B. CORBIN

For years physical education programmes for children of school age, whether in public or private schools, have focussed on the teaching of games and sports. All too often, however, what children learn is not particularly applicable for use later in life. The sports skills vary from country to country, or province to province, but the result is the same. The rich (the fit and the skilled) get richer, and the poor get poorer.

If our goal is to help all people to be fit and active for a lifetime, new and innovative approaches must be attempted. Central to any new approach must be a commitment to helping every person succeed. We must help eliminate the phenomenon of "learned helplessness" among school age children and adults as well. "Learned helplessness" is a term used to describe people who "give up" their ambitions because they believe that there is no hope of success. In physical education classes, learned helplessness is promoted when skill or fitness levels are used as determiners of grades. Kids who try hard but still fail or receive poor grades say, "Why try when the outcome is already determined?" In the final analysis, performance is *NOT* of greatest concern; behaviour is! Kids or adults who are active, regardless of their ability, are the ones who are fit. Their *efforts* are far more important than their performances.

Programme objectives

Part of the problem is that we have not clearly identified our objectives, especially in the physical fitness domain. Too often, we concentrate on low order objectives and disregard higher order objectives. Fitness for Life programmes are based on the taxonomy of objectives shown in Table 1.

TABLE 1

A Taxonomy of Physical Fitness Objectives

Low Order Objectives	<ul style="list-style-type: none"> • Physical Fitness Vocabulary • Exercising • Achieving Fitness • Establishing Regular Exercise Patterns • Evaluating Fitness
High Order Objectives	<ul style="list-style-type: none"> • Exercise and Fitness Problem Solving

The second two levels are those commonly emphasized in schools. We may teach fitness vocabulary but more likely we concentrate on getting children to exercise and getting them fit. But what good is fitness at one point in a child's life if he or she does not continue to exercise? To be sure exercise and fitness (for now) is important, but not if achieved at the expense of fitness for a lifetime. If kids learn to be helpless, learn to hate exercise, or choose to opt out of activity early in life because of our classes, we may have *won the battle but lost the war*.

As children exercise and achieve fitness in our programmes, we should make sure that they enjoy what they are doing. They should learn that exercise is something to be enjoyed, not dreaded. But even in schools with "good" programmes in which children are taught to enjoy exercise, the education often stops when a level of fitness is achieved. If we are to get people to be active and fit for a lifetime, higher order objectives must be achieved. We must help people establish regular *personal* exercise patterns, we must help them learn to evaluate *their own fitness*, and we must teach them to solve *their own* exercise and fitness problems. The emphasis shifts from teachers telling students what to do, to students learning to help themselves. The Fitness for Life programme focusses on these higher order goals. Specifically, Fitness for Life programmes are designed to teach students the *why, what, and how* of exercise and fitness.

- *Why* One purpose is to help students learn why health related physical fitness is important. Learning the *why* of physical fitness and exercise is necessary as part of the process of learning to solve personal exercise and fitness problems.

- *What* A second purpose is to help students learn *what* their individual physical fitness needs are. Evaluating physical fitness is a high order objective and something people must be able to do if they are to become effective problem solvers.
- *Hou* The third purpose is to help students learn *hou* to exercise correctly. There is a correct way to exercise. To learn the value of specific exercises is essential to developing patterns of regular exercise.

Implementing the Programme

To teach the *why* of exercise and fitness, several different approaches can be used.

In a Fitness for Life class, some class periods or parts of some class periods are devoted to lectures or class discussions, films, or slide presentations designed to teach the facts about physical fitness and exercise.

Topics often covered in a Fitness for Life class differ substantially from those normally included in a traditional physical education class. A sample list of topics from the textbook *Fitness for Life*, a worktext for junior and senior high school students, is included below (Corbin and Lindsey, 1979):

- Fitness for All
- Parts of Fitness
- Threshold of Training
- Cardiovascular Fitness
- Strength
- Muscular Endurance
- Flexibility
- Exercise and Fat Control
- Exercise and Good Health
- Skill Related Fitness
- Correct Way to Exercise
- Physical Activity for a Lifetime
- Fitness Through Sports
- Planning Your Exercise Programme
- Attitudes About Fitness

To teach the *what* of exercise and fitness the principal technique is to teach students to evaluate their own fitness levels. Teachers will not always be around to test them, so students need to learn to test themselves for all of the important parts of fitness. They need to learn to interpret their own fitness test results. Many class periods devoted to self fitness evaluations are often necessary.

To teach the *how* of exercise, students may do laboratory experiments. For example, students do experiments to help them determine personal thresholds of training. In addition, students sample many different popular exercise programmes, such as XBX, 5BX, and aerobics. Also, informal programmes, such as jogging, rope jumping, and bicycling are attempted. The culminating activity for the class is the development and implementation of personal exercise and physical fitness programme which can be used for a lifetime.

Programme Approaches

In recent years, many schools have implemented Fitness for Life programmes. Three different organizational plans seem to be most popular. Because every school has its own unique needs, the best approach will vary depending on such needs and the overall teaching-learning environment. The individual learning approaches are discussed briefly below.

Unit or modular approach. This approach is used in most colleges. It seems to be most effective with high school students who are relatively high achievers. In this approach, a specific period of time, six weeks, nine weeks, a semester, or full year, is set aside exclusively for a unit or module.

The integrated approach. This approach merely integrates the why, what, and how into the regular physical education programme. On specific days, Fitness for Life material in the form of lectures, discussions, films, slides, self evaluations, experiments, and sample exercise programmes are used. On other days, material from the more typical skill oriented programme is presented. This kind of approach seems to be effective in large schools and those which have been more traditional in their physical education programmes prior to introducing the Fitness for Life programme.

The mini lecture approach. This is a modified form of the integrated approach. The essential difference is that at no time is a full class period used for lecture or discussion. Rather, short segments of several

periods are used for mini lectures or short presentations concerning important exercise and physical fitness topics.

Programme Advantages

The goal of Fitness for Life programmes is to teach higher order exercise and fitness objectives. It is not meant to be a substitute for more traditional skill oriented programmes. It is meant to complement and supplement sound programmes of lifetime sports. Some of the advantages of a Fitness for Life programme are listed below:

Accountability. In this age of cut backs in spending, physical education programmes in many schools are under attack and many programmes have been cut or curtailed. This is partly due to the fact that many adults do not believe that physical education has much value over the course of a student's lifetime. The Fitness for Life programmes offer physical educators an opportunity to demonstrate accountability by fulfilling the need to achieve significant high order objectives. It offers physical educators the chance to lead the exercise and physical fitness parade rather than allowing it to pass them by.

Co-educational instruction. The Fitness for Life programme is and should be co-educational. In life, people exercise co-recreationally. The well planned Fitness for Life class more than meets the guidelines of equal opportunity legislation.

Education for all people. A Fitness for Life programme can easily be adapted to meet the needs of all kinds of special people, including the physically handicapped. It can also meet the needs of those who have been labelled as having "learned helplessness." Such a course can help all people learn that there is some form of exercise for everybody.

Summary

The Fitness for Life approach to physical education is not a cure for all of physical education's problems nor is it guaranteed to work in all situations. No programme can be better than those who teach it, organize it, and administer it. There is, however, evidence that this type of programme, which focusses on the health related aspects of fitness, can be effective in helping Canadian youth learn to exercise and be fit for life.

REFERENCE

Corbin, C. B., and Lindsey, R. *Fitness for life: Physical education concepts*. Glenview, Ill: Scott-Foresman, 1979

CHAPTER 9

TASK DIFFICULTY AND IMPLICATIONS FOR ACTIVITY SELECTION

GERALDINE H. VAN GYN

Introduction

Motor activity selection for specific age groups, has for the most part, been based on the developmental stage of the child. Extensive research has been done on the learning of motor skills as it is related to maturational age and there is an abundance of literature on appropriate fundamental skills for specific age groups. Most skills, however, are not performed in isolation but within the context of a game, a drill, or against a background of the noise and activity of other children performing the same skill. This, then, adds to the skill the further dimensions of speed, performance evaluation, strategy, and focussed concentration on the skill.

The actual motor performance demand of the skill, that is, the sequencing and timing of all underlying movements into a co-ordinated motor action, can be referred to as the *complexity* of the motor task. As the child's motor system develops and his motor control becomes more refined he is capable of increasingly more complex motor tasks (Espenchade and Eckert, 1967). However, as previously mentioned, many skills are performed in a dynamic environment. Poulton (1957) classified these types of skills as open skills and states that some of the critical cues for the successful performance of an open skill lie in the continually changing environment. Examples of open skills are those performed within the context of a game such as tennis or basketball. At the other end of the skill continuum are closed skills in which the critical cues for successful performance lie in the skill itself and the performance environment is static. If a closed skill is simple and well learned, the skill performance is said to be automatic and the probability of success is high. However, if the skill is very complex and/or novel the performer may have to monitor and evaluate his performance as it progresses in order for success to be achieved. Examples of these types of skills are gymnastics, diving, and darts.

The task demands of an open skill involves not only the motor demands of structuring skill itself (task complexity) but also the demand of monitoring the environment for critical cues and choosing the appropriate motor skill necessary to meet the demands of the environment. This type of demand will dictate the difficulty of the task.

In a closed skill the major task demand usually arises from the sequencing and timing of the skill but there may also be a demand to monitor the performance as it progresses. This demand appears to be a function of the speed and accuracy requirements of the task. However, this demand may decrease as the skill becomes well learned. These type of demands are also associated with the difficulty of the task. Therefore, any skill which requires some interpretation of the skill environment for successful performance will have some level of difficulty associated with it. In general, the difficulty of motor tasks arises out of two basic demands, (a) a demand for speed of decision which is measured by reaction time (RT). RT is defined as the time interval between the onset of a signal (an indication to initiate the skill) and the actual initiation of that skill, and (b) a demand for speed of movement, measured by movement time (MT), which is defined as the time interval between the initiation of the skill and its completion.

Task Difficulty and Speed of Decision

The speed of decision or choosing a plan of action is directly related to the amount of uncertainty associated with the environment and or the number of possible responses available to the performer, necessary to meet the demands of the environment. In an open skill the performer must deal with the following sources of uncertainty:

(a) *Event uncertainty.* What will happen? (e.g., will the opponent shoot or pass the ball?) In this instance the performer must make a decision concerning what he thinks *probably* will happen and act appropriately. As the number of possible events increases, so does the uncertainty of the situation and the *difficulty* in making a fast and correct decision.

(b) *Spatial uncertainty.* Where will the event happen? (where will my opponent place the next tennis shot?) In this instance the performer must try to predict where the event will take place in order to place himself in the appropriate position. This factor of uncertainty is extremely important in any type of ball skill where the performer must predict the flight path of a ball in order to make effective contact

with it. The larger the space in which the event happens, the greater the uncertainty of where it will happen and then the greater the difficulty in arriving at a decision.

(c) *Temporal uncertainty.* When will it happen? (am I ready to receive the next tennis shot?) The performer must try to anticipate and predict when an event is going to occur in order to prepare himself to initiate a response. If the occurrence of an event is fairly random (i.e., no regular predictable pattern to its occurrence) then the uncertainty increases. If the time interval within which the event can occur is increased, then the uncertainty is also increased and consequently the difficulty of the task.

(d) *Response uncertainty.* What response to choose to meet the demand of (a), (b), and (c)? (If my opponent places the next shot in the centre of the tennis court do I respond with a forehand or backhand shot and how much force do I apply to place it in the backcourt, etc.) The performer is confronted with a further decision concerning his own actions. He will have to decide the appropriate response and also initiate the appropriate parameters of his motor response such as force, speed, direction, etc. As the performer's response repertoire increases, the uncertainty of the situation will also increase if the performer has not learned what is an *appropriate* response. As he learns to match the appropriate response with the event that occurs, uncertainty and difficulty will be reduced.

Each of these sources of uncertainties are magnified by a time stress, in that the performer is forced to make a decision within a limited amount of time. It is then the speed requirement compounded with the sources of uncertainties which define the level of difficulty of an open skill.

In order to deal with these uncertainties the performer must process information related to what he perceives in the environment. The greater the uncertainty associated with the task, the more information the performer must process. The performer must also rely on past experience to try and predict what will happen in the environment. The more extensive his past experience, the better able the performer is to reduce these uncertainties by prediction and therefore will be required to process less information about the task at hand.

Processing of information from most sources takes time and attention (Broadbent, 1971). Attention, a cognitive activity, requires that the performer allocate some portion or in some cases, all of his limited capacity for processing information, to the task at hand. The per-

former is limited in that he has an upper ceiling on the amount of information he can process per unit time. As the amount of information to be processed increases, so too, does the attention demand to the point at which the performer is incapable of attending to any more information from the same source at that time.

In this instance the performer faced with an excess of information (i.e., an amount beyond the limits of his information processing capacity) may be forced to ignore some portion of the information. Since, in an open skill, the critical cues for successful performance may lie in the environmental information to be processed, it may be that the performer will be forced to ignore information critical to the skill performance and as a result choose an inaccurate response. Therefore, in the event of a skill which demands a great deal of information processing (i.e., the amount of uncertainty associated with the motor skill is large) the performance is generally characterized by slow and/or possibly inaccurate responses (Marteniuk, 1976). Note that the speed referred to here is the speed of response initiation or reaction time and not necessarily the time taken to complete the response.

Children are much less proficient than adults at processing information (Farnham-Diggory, 1972) and it appears that from early childhood through to adolescence, children show an increasing ability to handle more information in the same time period or to process equivalent amounts of information in less time (Chi, 1976). Consequently, a skill requiring a specific information load may be handled with ease by an adult but yet may be beyond the capabilities of a child purely due to his reduced information processing capacity. The child may be developmentally capable of performing the motor action required by the skill but incapable of performing it within the context of the various sources of uncertainty. In addition, it was previously stated that past experience or prior learning reduces uncertainty since the experienced performer may rule out events or categories of events which have a low probability of occurring (Kay, 1970). The child, however, may not have the experience to enable him to reduce the number of possible likely events or sources of uncertainties and may, in fact, give attention to or process, information which is irrelevant to the successful completion of the task at hand. As information processing takes time, the response would be very slowly initiated.

Chi (1976) cites evidence that the processing deficit or decreased ability to process adult-equivalent amounts of information per unit time associated with younger age groups is generally attributed to

some type of short-term memory (STM) limitation. The STM limitation appears to arise from deficits in (movement) repertoire, speed, and strategies used by children. Children have less information stored in long-term memory on which to base predictions and comparisons, they process information more slowly and their control processes or strategies for retaining information (rehearsal, naming, grouping categories, etc.) are fairly undeveloped.

In addition to these capacity limitations of the child, it appears that young children may be less task-oriented than the adult (Connolly, 1970). His ability to focus attention is poor and, in fact, selection of information may be done in a rather indiscriminant fashion. Given an array of related and unrelated stimuli in the skill environment, the child may not focus on the relevant stimuli necessary for the successful completion of the skill. This factor combined with the child's limited information processing capacity will result in a lower probability of success on a skill which an adult with equal amount of previous experience may perform with ease.

Task Difficulty and Speed of Movement

Fitts (1954) proposed a way of measuring the difficulty of a motor task based on the task dimensions. The method can predict the maximum time required for the task or minimum movement time. Movement time is not related to reaction time but does reflect another source of task difficulty (Fitts and Peterson, 1964). This method of measuring difficulty is based on the ratio of the accuracy requirement to amplitude or distance of the movement. The index of difficulty (ID) is defined as:

$$ID = \log_2 2A/W$$

where A is the amplitude of the movement and W is the total tolerance for error in terminating the movement (e.g., if one is aiming at an 8" target the maximum error, if one is to hit the target, is the radius or 1/2 the diameter or 4"). Therefore, W = diameter of target and in computing the ratio of amplitude to error one half W is used resulting in the fraction:

$$A/1/2W \text{ or } 2A/W$$

By varying A and W, Fitts (1964) varied the difficulty of the task and his results indicated a linear relationship between difficulty as measured by ID and MT, with MT getting longer as the task difficulty increased (i.e., as the accuracy requirement increased and/or as the distance to be moved increased). Marteniuk (1976) suggests that

the greater the task difficulty, as measured by ID, the greater the number of corrections will occur within the performance of the task. Expanding on this concept, as the difficulty of the movement task is increased, the performer must pay attention or monitor his progress more closely and as errors occur, correct them. This creates another source of information that the performer must deal with. This source is called feedback and arises from the consequences of the performer's actions.

Monitoring of feedback is most crucial in a serial motor task in which there is a series of movements linked together to form one continuous movement skill. In such a skill the performance of the latter part of the skill is dependent on the successful completion of the initial parts of the skill. Therefore the performer must continuously monitor his performance by evaluating the feedback from the ongoing skill. This feedback could be visual (seeing the error) or kinesthetic (feeling the inappropriateness of the action). He, then, may correct or adjust for any errors he has produced and continue with his performance. A skill that is continuous in nature but appears as only one movement act is that type of skill requiring movement to a target (e.g., throwing darts, pitching a baseball). In fact, these aiming skills involve an initial movement then a series of corrections which eventually lead the body part to the desired position (Martenuik, 1976). Presumably, the greater the accuracy or distance demands of this skill, the more feedback information must be processed to maintain a level of success in the motor skill. As previously stated, processing of information may take time so that the processing of feedback for error correction may result in a longer MT but a more accurate performance.

When we subjectively observe children performing skills in most cases, the speed of the performance is noticeably slower and usually less accurate than an adult's. Research (Kerr, 1975; Salmoni and Pascoe, 1978) has shown that for children, like adults, movement time increases as the difficulty (as measured by ID) of the task is increased. However, Connolly, Brown and Basset (1968) found that older children performed faster on a serial dotting task but with the same accuracy than younger children. They postulated that the older child viewed the task as continuous in nature and possibly was not monitoring the consequence of each action. This implies that the older child is processing less information per skill, completing it in less time but still being as accurate as the younger child who processed more information. McCracken (1975) using film analysis of eye movements confirmed this hypothesis in that younger children had a

greater number of eye movements indicating increased processing of visual feedback from their movements as compared to older children. Sugden (1980) replicated Kerr's 1975 findings and also showed an increased capacity of the motor system to handle larger amounts of information as the child increased in age. Sugden's study indicated that the absolute motor capacity of a 12 year old just overlapped the minimum capacity of adult subjects tested in Fitt's (1951) study. In other words, the child's overall capacity for performing movements demanding speed and accuracy, is lower than that of an adult's. Therefore, given the same level of difficulty as measured by ID, the adult should be more successful than the child. Again, even though the child may be developmentally capable of performing the basic skill, with the added speed and accuracy demands performance success may not be possible. The problem does not lie in the motor capabilities of the child but in his cognitive capacity or his capacity to process information quickly and efficiently.

Implications for Activity Selection

It would seem obvious from the previous discussion that activities with a high difficulty component would be inappropriate for younger children. The probability of successful performance is fairly low and in terms of effective learning, the child must experience success. However, to actually measure difficulty becomes an impossible task. The teacher should, however, by recognizing that the task has several difficulty dimensions and by modifying an activity along these dimensions, be able to select activities with an appropriate difficulty level for the target age group.

From what we now know of task difficulty, the teacher should consider the following when selecting activity to promote skill learning:

(a) If the activity involves an open skill (e.g., basketball), the teacher should make sure that the child has mastered the component skills (e.g., dribbling, passing, etc.) in the activity before introducing additional uncertainties such as opponents, strategy, time stress, to react, etc. If we look at dribbling, for example, until the child has learned the skill well, he will be forced to monitor visually his performance (eyes on the ball). Once this skill, which in isolation can be regarded as a closed skill, has been well enough learned, the child is then able to focus his attention on his position on the court, the actions of his opponent, etc. Before this time, if the child is forced to monitor both his progress in dribbling and the other game factors, either his

dribbling performance will deteriorate (in order to play "heads up" basketball) or he will pay only fleeting attention to his surroundings and his play performance will be poor. In either case because of the difficulty factor he is not learning much about dribbling or playing skills.

(b) The environment in which the child is learning the skill can affect the difficulty of that skill. Background noise, both auditory and visual, can create uncertainty either as a result of distraction or if some of the relevant cues in the skill are visual or auditory. For example, if the child is trying to learn any catching skill or a skill in which he must attend to the flight path of an object (ball, shuttlecock, etc.) the teacher must try to make the object stand out against the background. A brightly coloured, highly visual object has less uncertainty associated with it than one that is of a similar colour to the gym walls and ceiling. If there are a number of children practising these catching skills, the teacher should position them so that only one object is in the child's visual field. If there are numerous balls in the air at once the child will have a difficult time focussing on the appropriate one. Because the child is not good at selecting relevant information about the skill and his attention may be fairly diffuse, the teacher should try to structure the environment so that there are minimum distractions and a minimum number of irrelevant stimuli.

(c) The task demands should be analyzed to determine if there is a speed and/or accuracy component. We know that the accuracy demand increases difficulty (due to the need to process feedback) and reduces speed (MT). The teacher should then modify the skill in the early learning stages so that either (i) speed is stressed but accuracy in the modified skill is maintained, or (ii) accuracy is stressed and speed can be introduced once a required level of accuracy is reached.

For example a child may be introduced to throwing skills by tossing bean bags at a target area on the gym wall. First, of course, referring back to (a) we would ensure that the child has mastered the throwing action without the necessity of hitting a target. Secondly, the teacher would then present a fairly large "bulls-eye" for the child and position the child fairly close. The child is able then to concentrate to a certain degree on the throwing action but with this added accuracy variable which introduces minimum difficulty. Progress from this point would involve decreasing the size of the target and moving the child further away. A reduction in target size or target distance would come about when the child is able to consistently hit the target while exhibiting reasonable throwing form.

(d). A drill or game situation will increase task difficulty of a skill by increasing event, spatial and temporal uncertainty. In a game, the player strives to be unpredictable so that opponent can not anticipate his play (event and temporal uncertainty). In addition, the number of players (event uncertainty) and the size of the playing areas (spatial uncertainty) contribute to the difficulty of the game skills.

In introducing game skills the teacher should begin with a modified version in order to keep difficulty to a manageable level. Obvious examples of appropriate modifications are: (i) reduced number of players, (ii) reduced playing area, (iii) reduced number of rules, and (iv) larger equipment (large headed tennis racquet, bigger and lower basketball hoop, bigger soccer net, etc.) which reduces the accuracy stress. In the learning of game skills, it would appear that there is a priority in the learning process. First, the child must master the component skills, secondly, the child will learn to perform the skills within a drill or "play" situation in which he co-operates with other players (predictability of other player's action is high); thirdly, the child will learn to perform the skills within a competitive game situation where rules and probabilities of opponent movement are introduced; and lastly, the child will be introduced to game strategy. With the introduction of each of these game skills the teacher may start with a modified version, reducing difficulty to a level that the performance may be successful, yet still present a challenge.

REFERENCES

- Broadbent, D. E. *Decision and stress*. New York: Academic Press, 1971.
- Chi, M. Short-term memory limitations in children: Capacity or processing deficits? *Memory and cognition*, 1976.
- Connolly, K. J. Response speed, temporal sequencing and information processing in children." In K. J. Connolly, Ed., *Mechanisms of motor skill development*. London: Academic Press, 1970.
- , Brown, K. J., and Basset, E. "Developmental changes in some components of a motor skill." *British Journal of Psychology*, 1970, 61, 259-266.
- Espenshade, A. S., and Eckert, H. M. *Motor development*. Columbus, Ohio: Charles E. Merrill, 1967.
- Farnham-Diggory, S. "The development of equivalence systems." In S. Farnham-Diggory, Ed., *Information processing in children*. New York: Academic Press, 1972.
- Fitts, P. M. "The information capacity of human motor system in controlling the amplitude of movement." *Journal of Experimental Psychology*, 1954, 47, 381-391.
- , and Peterson, J. R. "Information capacity of discrete motor responses." *Journal of Experimental Psychology*, 1964, 67, 103-112.
- , and Posner, M. I. *Human performance*. Belmont, Ca: Brooks Cole, 1969.
- Kay, H. "Analysing motor skill performance." In K. J. Connolly, Ed., *Mechanisms of motor skill development*. London: Academic Press, 1970.

- Keele, S W *Attention and human performance*. Pacific Palisades, Ca. Goodyear, 1973
- Kerr R "Movement control and maturation in elementary school children," *Perceptual and Motor Skills*, 1975, *41*, 151-154.
- Marteniuk, R G *Information processing in motor skills* Toronto. Hold Rinehart and Winston, 1976
- Megaw, E. D "Fitts tapping revisited " *Journal of Human Movement Studies*, 1975, *1*, 163-172.
- McCracken, H D "Continuity and discontinuity in boy's eye movement strategies " Unpublished Master's Thesis, University of California, Los Angeles, 1973
- Salmon, A W, and Pascoe C "Fitts reciprocal tapping task a developmental study " In C. G. Roberts and K. M. Newell (Eds), *Psychology of motor behaviour and sport*. Champagne, Illinois Human Kinetics, 1978.
- Sugden, D A. "Movement speed in children," *Journal of Motor Behaviour*, 1980, *12*, 2, 125-132
- Wallace, S A, Newell, K. M., and Wade M. G. "Decision and response times as a function of movement difficulty in preschool children," *Child Development*, 1978, *45*, 509-513

CHAPTER 10

BRITISH COLUMBIA'S PRO-REC: THE INGREDIENTS FOR SUCCESS

BARBARA SCHRODT

In 1934, the Province of British Columbia inaugurated a programme of physical recreation that was the first of its kind in the British Empire. Originally called "Provincial Recreation," it soon became known as "Pro-Rec," and is still fondly recalled by many members who once enjoyed its activities. The programme was halted in 1953, and in its final years was the subject of criticism and opposition. But during the 1930's, it was a resounding success, and served as a model for other provincial programmes and for the eventual federal acts that drew Canada into the field of national physical fitness. This paper discusses those early years of Pro-Rec, and examines some of the ingredients for its success.

Pro-Rec was administered by the Recreational and Physical Education Branch of the Adult Education Division of the Department of Education, and was created by the Cabinet of the British Columbia Government as a partial answer to some of the social needs arising from the Great Depression. The primary objective of the programme was to counteract some of the effects of enforced idleness among unemployed young men. Initial response was so strong, however, that within weeks of its creation, it was made available to all citizens over the age of fifteen not attending school. Membership during the first year was 2,700 and by 1939 had risen to 26,800. The enrollment of women was particularly significant; in the second year of the programme, it exceeded enrollment for men, and remained in that position throughout Pro-Rec's history. The number of centres—that is, the halls and schools where Pro-Rec classes were held—started out at a modest nineteen in the first season and by 1939 had increased to 135, located throughout most of British Columbia (*PSR*, 1938-39).

The chief activity of the Branch was the provision of Pro-Rec classes, which were operated free-of-charge to participants and fully-funded by provincial grants. These classes were generally afternoon

or evening sessions, presented twice a week, during a winter programme conducted from October to March. A typical class was two to three hours in length, with an average of thirty members in attendance. To some extent, the facilities and available equipment determined the content of the class, but most Pro-Rec activities could be conducted in any of the halls or gymnasiums used by the Branch. The class opened with mass exercises or calisthenics, followed by gymnastics activities on mats and apparatus. Group games completed the programme for men, but women's classes also included dancing.

The complete offerings of Pro-Rec were very extensive in nature, and during the 1930's, moved into every available sphere of physical recreation and sport that the Branch budget would allow. Although Danish and Swedish gymnastics and Keep-Fit exercises were the activities for which Pro-Rec was best known, special groups were also organized to provide teams and events in such activities as cricket, soccer, swimming, field hockey, track and field, and tennis. Social events were also included, conducted at each centre by a committee of members. An annual centre display highlighted the close of each winter season, and the Mass Display in Vancouver was a popular demonstration of Pro-Rec activities. And an extensive summer programme was organized in major cities to provide instruction and competition in the full range of outdoor activities. Many other sports and recreational activities benefited from the Pro-Rec programme. Youth hostelling was initiated and administered by Pro-Rec personnel during the 1930's, and cricket received particularly strong support from Pro-Rec. Gymnastics was firmly established as a competitive sport in B.C. because of Pro-Rec emphasis on this activity.

The success of the Pro-Rec programme must be examined in the light of the social circumstances of the Depression because the programme was created to meet needs generated by these unique circumstances. Hence, the common reference to the Pro-Rec in later years as a "depression-years measure" (Fairey, 1952). From the strong and immediate response to Pro-Rec during the 1930's, it would appear that the programme met a number of needs among British Columbians. For unemployed men, this meant a place in which to spend enforced leisure time, and for housewives, a regular means of escaping the routine demands of housework. It also gave its members an opportunity to improve personal physical condition and sports skills, to enjoy a social occasion, and to participate on an organized team in a sport. It was clear that many individuals could only have these needs met if there were no personal costs involved, and the

feature of free physical recreation was fundamental to Pro-Rec's success (Schrodt, 1979, p. 325).

Pro-Rec administrators also aimed at educating the people of British Columbia about the importance of physical fitness, to make them more conscious of this feature of positive health. The programme contained a strong element of paternalism, with the implication that Pro-Rec's approach to physical fitness through European gymnastics was the best approach, and that the leaders of Pro-Rec knew best what the people needed, and how it should be organized and taught. While that attitude would become less acceptable in the 1950's, it was quite appropriate for the mid-30's. People were prepared to be told what to do and how to do it, for anything that would help them in any way was only too welcome, after five years of economic and social problems. In fact, well into the late 1940's, Canadians tended to accept the pronouncements of authorities without question, and certainly during the Depression, they looked for guidance to any person or organization which could provide the comfort of paternal leadership. Also, the kind of activities provided at Pro-Rec centres—gymnastics and calisthenics—were familiar to most Canadians at that time, for the school physical education programmes were still composed, in the main, of military drill and gymnastics as encouraged by the Strathcona Trust Fund. Therefore, members of the general public were strong supporters of the Pro-Rec programme.

Pro-Rec also stressed the provision of activities for the ordinary person—the unskilled and the unfit. The programme was aimed at the majority of the population, those who did not have opportunities for physical recreation, either because they could not afford it or because their communities did not provide similar programmes, and publicity releases and reports constantly stressed the philosophy of activities for the many, rather than for the few (Eisenhardt, 1938).

One important feature of Pro-Rec's success was its strong appeal to women who wanted some form of Keep-Fit activities. During the Depression, many women were confined to their homes by the demands of housekeeping and motherhood, and by the reduction of income which precluded many forms of social activity. In addition, the economic pressures of the times meant that working women were forced back into the home, so that available positions could be taken by men. Pro-Rec gave many of these house-bound women an opportunity to escape from their routine chores for a while, and to have some social life that was otherwise denied them (Schrodt, 1979, p. 333). The other source of appeal to women lay in the opportunities

for sport and exercise which were not readily available during the late 1930's. The 1920's and early 1930's had been periods of high and prominent participation by Canadian women in sports, but as the bad times of the Depression continued, there was a resurgence of conservative ideas about women in sports, and a hostile view became evident. As a result, women were discouraged from involvements in sports in the mid-1930's (Cochrane, 1977, p. 51). It is probable that many young women who would have participated in organized sport took advantage of the Pro-Rec programme as a source of physical recreation.

The ingredients for success detailed thus far—a free programme of activities that met needs and had a wide appeal—were supported by three other important features of Pro-Rec: its public relations and promotional endeavours, its leadership, and its political associations.

One of the most prominent promotional activities was the display, a demonstration of activities given by members for the public. The display portrayed work done at the centres, and the usual activities were gymnastics stunts on apparatus and mats, mass exercise routines accompanied by music, and dances. It was the declared policy of Pro-Rec that each centre should present a display at least once a year, not only to give members a goal toward which to work, but also to publicize the programme and encourage others to join.

The most important demonstration, and the one that made Pro-Rec so well-known to British Columbians, was the annual mass display staged in Vancouver each year, starting in 1935. Extensive advance publicity, front-page newspaper reports, and numerous large photographs in the daily papers annually drew the Pro-Rec programme to the attention of the public-at-large. The first three mass displays were staged in armouries in Vancouver, but by 1938, the demand for spectator seating had outgrown these facilities and the display was moved to the Vancouver Forum, where two thousand participants performed for the public. The 1938 attendance of six thousand in a single night was the highest in Pro-Rec's history (*PSR*, 1938-39).

The Mass Display bore a marked resemblance to the mass outdoor gymnastics festivals staged in European countries at this time. All Pro-Rec centres in Vancouver and communities within commuting distance were encouraged to send as many participants as possible to the display. The more skilled members were featured in individual performances, such as gymnastic apparatus routines, but everyone was given a place in at least one routine, and the less proficient per-

formers could find satisfaction in participating in the simple fundamental exercise routines or in one of the mass dance numbers.

These displays were intended to achieve a number of objectives, the most important of which was the promotion of the programme to the general public, showing audiences how government funds were being put to good use. A more subtle objective was the need to generate positive publicity so that funding would be increased. Finally, the displays served as a means by which new members were recruited.

In addition to the publicity generated by the Mass Displays, Pro-Rec received excellent newspaper coverage, and articles published in provincial and national magazines added to the prestige of the programme. The Branch also published its own newspaper, *The Gymnast*, until 1940. An innovative radio broadcast was inaugurated, and weekly programmes carried talks by staff members, news of centres, and eventually a "Gym of the Air," with exercises for the home listener. Promotional films were also produced and shown in Pro-Rec centres and across the country. In all, during the 1930's, the public promotion of Pro-Rec was very intensive, and was responsible for much of the success of the programme.

The quality of leadership is critical to the success of a programme such as this, and four individuals should be credited with providing Pro-Rec with outstanding leadership in its formative years. The lion's share of this credit must go to Ian Eisenhardt, the creator and first director of Pro-Rec. He strongly believed in the benefits of physical recreation and transmitted this belief with idealistic fervour to the public and to all levels of government. He was a hard worker, and an innovator, although he stepped on a number of sensitive toes and antagonized some people, he was an excellent salesman, and a good administrator. At a time when British Columbians needed and wanted to be told that something in their lives held the potential for great benefit, he gave them the message about Pro-Rec. Eisenhardt initiated plans for expansion of Pro-Rec to all parts of the country as early as 1936, and his first success at the federal level was realized with the inclusion of physical fitness among projects funded under the 1937 *Unemployment and Agricultural Assistance Act* (Schrodt, 1979, pp. 173-74).

Serving directly under Eisenhardt were Jerry Mathisen and Hilda Keatley, supervisors of the men's and women's programmes, respectively. These two individuals were as committed as Eisenhardt was to the purposes of Pro-Rec. Mathisen's Norwegian training in gymnastics led him to implement, and encourage a high level of achievement

in, the Danish system of Niels Bukh, while Keatley's English training produced a modification of the Swedish gymnastics of Ling. Together, they inspired their instructions to provide programmes at Pro-Rec centres that met the needs of the members.

One of the unique features of Pro-Rec, and another reason for its success in its formative years, was the close association of the agency with the Minister of Education, George Weir, and with the government of the day, the British Columbia Liberal party. Weir, the fourth important leader, viewed Pro-Rec as a personal pet project, and retained close and direct ties with the Branch. His support ensured that Pro-Rec funds would increase each year, and his standing as a highly-respected educator and politician advanced the fortunes of Pro-Rec considerably.

Finally, the mutually beneficial relationship between Pro-Rec and its supporting institution, the provincial government, should be noted. The Liberal party had come to power in 1933, pledged to alleviate some of the devastating effects of the Depression. Because the necessary federal co-operation was often not forthcoming, many provincial social plans were delayed or discarded. By 1934, the Liberals needed to produce something that would appeal to the public and yet be very inexpensive. Pro-Rec met these conditions, and the government quickly capitalized on it; it was the only thing that the Liberal government could offer to the public during this time and it served that purpose well. In return, the Liberals always supported their "party project"; it was viewed as a Liberal creation from its beginning to its end, and as long as the Liberals were in power, Pro-Rec's future was assured.

Thus, during its first five years, Pro-Rec rode the crest of widespread popularity—with a timely programme, strong political support, an excellent public relations campaign, and outstanding leadership as the ingredients for its success.

REFERENCES

- Cochrane, Jean, *et al. Women in Canadian life: Sports*. Toronto: Fitzhenry and Whiteside, 1977.
- British Columbia Department of Education. *Public schools report, 1938-39*.
- Eisenhardt, Ian. Growth of provincial recreation centres. Printed publicity release, Vancouver, 1938.
- Fairey, F. I. Report of the Recreation and Physical Education Branch, Commonly Known as 'Pro-Rec'. Mimeographed, Victoria, 1952.
- Schrodt, Barbara. A History of Pro-Rec: The British Columbia Provincial Recreation Programme—1934 to 1953. Unpublished Ph.D. Thesis. The University of Alberta, 1979.

CHAPTER 11

THE SUBSIDIZATION OF ATHLETES

JOHN J. JACKSON AND BENJAMIN LOWE

At the 1978 XI Commonwealth Games held in Edmonton, athletes from Australia, Canada, and England were asked this question: "Do you approve of government or commercial subsidization (direct or indirect) of athletes?" Of 234 responding to the question, 228 replied affirmatively, and six replied in the negative. Empirical support for the further analysis of factors influencing the loading of the positive responses was gathered both at Christchurch (1974) and at Edmonton (1978) in the belief that long-range sport development plans would raise the issue of subsidization. The realization of athletic potential involves time and place commitments beyond those of normal community life, and the significance of elite athletic performance only becomes recognized in the broader provincial and national sphere of life.

Subsidization

Before entering a discussion of the bases for subsidization, it is worth making a few comments on the nature of subsidy for this will have some bearing on discussions of time-release from work and other aspects considered in the empirical inquiry. Subsidization, as a concept applied to sport, suffers from a negative valency; the idea that an athlete should receive money for demonstrating athletic skills runs counter to a cultural inheritance of Olympian values and ideals. The principle of negative value-loading attaching to subsidization is expressed by the catch-phrase "under-the-table payments" and similar. The popular journalism carries many reports of this behaviour (as divulged to reporters by athletes), and the European track-and-field scene has been categorized by many as a hot-bed for this sort of practice. Perhaps the most notorious disclosure of cash payment to an athlete outside the domain of league franchised sport is the case of Karl Schranz being banned from the 1972 Winter Olympics.

Acceptable forms of subsidy do exist. The history of intercollegiate athletics in the U.S.A. shows that scholarships guaranteeing the payment of tuition, residence fees, and costs incurred in athletic performance have been standard practice for many years (Resick and Erickson, 1975; Jackson and Lowe, 1978; Rooney, 1980). Controls over such subsidies are arduous, and there is a growing history of infringements and abuses reported by the National Collegiate Athletic Association.

Athletic equipment companies and similar commercial enterprises offer alternative forms of subsidy in the provision of equipment and clothing. In another sphere of life, namely the military, athletes will find all costs for athletic participation absorbed in the military budget, from which source they also earn their wages as soldiers, sailors, or airmen in the service of their country. Civilian social control agencies such as police departments and para military organizations provide encouragement of athletic performance by ensuring time, place, and economy subsidies parallel to those listed above.

Turning to the bases for subsidization of the elite athlete, arguments rest on several sociological (demographic and socio-economic) foundations. Consider, for example, that the amount of time an athlete spends at his training is predicated to a great extent on the time he must spend travelling to and from the most accessible training facility (Table 3). Domicile, family, education, and a host of other factors variously affect the life of the athlete and have direct influence on his training routine. This is true regardless of the age of the athlete, whether still living with parents, single adult, or married and is equally true for both the novice and veteran national representative.

For the employed athlete, employer permissions for release from work for training or for competition focus direct attention on the investment potential of the athlete as a production worker. An employer expects a return for giving employment; a large corporation can absorb some of the costs of time release. The question of loss of earnings may enter when the employer is less than philanthropic in granting time off for training or competition. Tax relief granted by the government to employers employing athletes would be an incentive subsidization of a different calibre. Risks of employing athletes reside in communications problems when the athlete may see his training and competition as more important than his employment (as has been reported happening in the United States Olympic Committee Job Opportunity Programme).

Compounding the issue of "loss of earnings" for the employed athlete—and no less significant for the family-dependent athlete—are expenditures for special foods, equipment, and travel costs among other personalized items relative to the particular sport (Jackson and Lowe, 1978). Each of these factors deserves special attention in empirical inquiry.

Methodology

A fundamental paradox exists when considering the collection of data purposeful to the analysis of the social role of the elite athlete. Other than the fact that the information generated cannot be generalizable, there remains the fact that as much as officials, coaches, and other sports leadership personnel are deeply concerned with a better understanding of their charges (elite athletes), efforts to obtain data are not met with encouragement. This may be due to the fact that the elite athlete is viewed as a very special person, one who, at the most critical point of his career, namely international competition venues, should not be approached or otherwise disturbed from the business in hand by any form of intrusion. The collection of data from athletes at times of Games is viewed as such intrusion by many officials, coaches, and others. This was true at both recent venues of the Commonwealth Games, and the problem is singularly epitomized by the fact that New Zealand (the host nation) disallowed collection of data from any of her athletes. The co-operation of Australia, Canada, and England in Christchurch set the restrictions on which nations would be invited to co-operate at Edmonton in this longitudinal study of elite athletes (Lowe, Hill, and Roberts, 1975).

Compounding any question of protectiveness on the part of officials and coaches, there remains the agreeableness of the athlete. The highly sensitive nature of the Games, from the athlete's point-of-view, is well understood, and any distraction at all from athletic performance is likely to have some perceived psychological disadvantage—even at the conclusion of events when winners and losers are in vastly differing psychological states.

The questionnaire which was developed for completion by the athletes kept in consideration length of time to complete, necessity for written as against checked responses, and overall appearance of presentation. Questions demanding information on employer permissions for time-release from work, on dollar expenditures for foods, equipment, travel and other costs, and on loss of earnings were built into the questionnaire. Such questions were strategically placed after

questions seeking more general demographic and socio-economic information, and prior to a series of questions seeking responses about athlete-to-coach functions (accessibility, availability, etc.) and questions of future career expectations related to sport (Lowe, Hill and Roberts, 1975; Jackson and Lowe, 1978).

The descriptive data providing the answer to the question about how many athletes co-operated, broken down by sex and by country, and given for each year that the data were collected, are provided in Table 1.

TABLE 1

Descriptive Data of Athletes Providing Information at the Games

<i>Country</i>		<i>Male</i>	<i>Female</i>	<i>Combined</i>
Australia	1974	33	31	64
	1978	24	10	34
Canada	1974	34	20	54
	1978	86	38	124
England	1974	52	26	78
	1978	43	6	49

Results

Without the benefit of knowledge of the response rate of athletes at Edmonton in 1978, Jackson and Lowe (1978) spoke of "the possibility of spurious results," adding the apology that in the absence of other data, their findings were offered as a "best estimate." This cautionary note is repeated here, as is advised upon the response rate now known.

The major categories of analysis have been suggested in the opening commentary on subsidization. Briefly, these comprise:

- i) Time athlete spends training;
- ii) Distance travelled to training facility;
- iii) Expenditures on travel;
- iv) Employer permissions for time-release; and,

v) Loss of earnings.

However, to give significance to the meaning of the above categories, it should be kept in mind that over 70 per cent of Commonwealth athletes invest from six to 15 years of their lives in their chosen sport by the time they represent their respective countries. Since the tabled results indicate expenditures or losses of income per annum (in 1978 dollars), the amount of real dollar costs to the athlete become a multiple of given estimates according to the years of athletic performance.

The investment of time alone as a function of athletic career has been documented previously (Jackson and Lewy, 1978). The data presented in Table 2 is interesting from several standpoints in respect of reported time commitments to sport. To select Canada for observation, it is noted that a shift occurred towards a greater time commitment, and this may be interpreted as a recognition on the part of the athlete that such a time-demand was necessary for Canada to rank well in the won-loss standings ("national consciousness"), or for the

TABLE 2

Time Athlete Spends Training by Country (in percent)

Country		Time in Hours Per Week			
		Less than 10	11 - 20	21 - 30	Over 30
Australia	71	7.8	57.8	25.0	9.4
		5)*	(37)	(16)	(6)
	78	30.3	57.6	12.1	0
		10)	(19)	(4)	
Canada	71	13.0	53.6	27.8	5.6
		7)	(29)	(15)	(3)
	78	3.2	47.2	42.4	7.2
		1)	(59)	(53)	(9)
England	71	21.1	60.3	14.1	1.2
		19)	(47)	(11)	(1)
	78	22.1	57.1	14.3	6.1
		(11)	(28)	(7)	(3)

* Actual number responding

athlete to maximize the "home-court advantage." Other interpretations exist for Canada, as for example, the introducing of legislation on a national level which could have had positive reinforcing effects for the athlete as to his role in the community and the support shown to him by his government. On the other hand, accounting for the apparent reduction in time commitment to sport for the Australians demands an alternative perspective.

Although the elite athlete resides predominantly in large cities where, presumably, access to the best facilities should not necessarily present travel difficulties, the majority report having to travel distances in excess of four miles. In an urban setting, even access by private automobile (not to mention dependency on occasional public transport) to those facilities in a range of five miles consumes much valuable time and expense. The distances travelled by the Commonwealth athletes is graphically illustrated in Table 3. The data indicate

TABLE 3

Distance Travelled to and from "Most Frequently Used" Training Facilities by Country (in percent)

Country		Distance in Miles (One Direction)				
		Less than 1 mile	1 - 3	4 - 9	10 - 25	Over 25
Australia	74	6.3 (4)	15.9 (10)	49.2 (31)	23.8 (15)	4.8 (3)
	78	5.9 (2)	23.5 (8)	44.1 (15)	17.6 (6)	8.8 (3)
Canada	74	13.2 (7)	32.1 (17)	35.8 ()	18.9 (10)	0.0
	78	19.5 (24)	15.4 (19)	36.6 (45)	17.9 (22)	10.6 (13)
England	74	14.3 (11)	24.7 (19)	33.8 (26)	16.9 (13)	10.3 (8)
	78	14.3 (7)	18.4 (9)	28.6 (14)	28.6 (14)	10.2 (5)

travel to "most frequently used," which need not mean the best quality of facility—a fundamental necessity for the elite athlete. Therefore, if an athlete reports travelling over 25 miles to his most frequently used facility, the chances are that he is not training at the facility most conveniently located to his home. He is, in fact, investing more of his time and energy in getting to and from the facility (and perhaps resident coach) which optimizes his performance. This function needs to be considered more seriously in respect of the analysis of time and money spent on travel as an ancillary function of athletic performance. The data in Table 3 is reinforced to a great extent by the data presented in Table 4 which gives actual cost estimates of travel as reported by athletes. To test whether the athlete typically gives an over-estimation or an under-estimation (as opposed to a precise or accurate estimation) of real dollar costs for travel, a simple exercise may be undertaken in which the hypothetical "average" athlete, reporting 11 to 25 hours per week training

TABLE 4

Expenditure per Annum on Travel by Country (in percent)

Country		Dollar Equivalent Expenditure			
		Less than \$500	501 - 1000	1001 - 1500	More than \$1500
Australia	74	67.5 (34)	9.5 (5)	11.5 (6)	11.5 (6)
	78	50.0 (15)	16.7 (5)	26.7 (8)	6.7 (2)
Canada	74	78.2 (36)	15.3 (7)	6.5 (3)	0.0
	78	39.8 (43)	22.2 (24)	10.2 (11)	27.8 (30)
England	74	93.2 (66)	3.0 (4)	1.6 (2)	2.2 (3)
	78	62.5 (30)	27.1 (13)	8.3 (4)	2.1 (1)

schedule travels a 10-mile round trip to train. If he trains 16 hours at four times four-hour sessions (on four different days), and is driven to and from his facility by a parent, or even by himself, and his vehicle consumes one gallon of gas per 20 miles . . . Well, the exercise example does not need to be over-indulged. The point is patently clear that the real dollar cost to the athlete is manifest, and since he spends on his sport on a weekly income-outflow basis, he is not likely to notice the overall annual cost to him, except in gross terms.

Disregarding the hypothetical "average" athlete in respect of cost estimations (an exercise for government accountants to pursue more diligently), 40 percent or more of all athletes claim that their travel costs fall below an annual expenditure of \$500. Allowing for seasonal adjustments in the training regimens of the elite athlete, this still comes to little more than \$10 per week. However, an interesting

TABLE 5

Employer Permissions Obtained for Training and Competition by Country (in percent)

Country		Employer Permissions		
		Competition Only	Both Training and Competition	Neither Training Nor Competition
Australia	74	36.0 (18)	32.0 (16)	32.0 (16)
	78	40.7 (11)	33.3 (9)	25.9 (7)
Canada	74	42.5 (17)	27.5 (11)	30.0 (12)
	78	33.8 (24)	33.8 (24)	32.4 (23)
England	74	73.4 (47)	18.8 (12)	7.8 (5)
	78	55.6 (25)	51.1 (14)	13.3 (6)

function seems to emerge from a comparison of costs on a year differential basis. If this differential can be accounted for in terms of national patterns of inflation, then clearly the athlete is not immune to the need to find that extra dollar for his sport. The data provided in Table 4 serves the purpose of highlighting actual costs as are applicable equally to the purchase of special foods, equipment, and other personal needs according to each particular sport.

Employer permissions obtained to provide time-release from work (for the employed athlete) for training or for competition. Presented in Table 5, do not necessarily reflect an economic impact upon the athlete. However, the data presented in Table 6, showing loss of earnings, are directly applicable because such earnings loss is bound to compound the difficulties faced in expenditures discussed above.

TABLE 6

Loss of Earnings per Annum by Country (in percent)*

Country		Dollar Equivalent Loss		
		Less than \$500	500 - 1000	Over 1000
Australia	74	81.9 (32)	12.9 (5)	5.2 (2)
	78	50.0 (14)	21.4 (6)	28.6 (8)
Canada	74	32.5 (9)	32.5 (9)	35.0 (10)
	78	58.3 (46)	6.3 (5)	35.4 (28)
England	74	78.3 (43)	9.0 (5)	12.7 (7)
	78	81.2 (39)	6.3 (3)	12.5 (6)

* 'Loss of earnings' can only apply to those athletes who are employed, thereby excluding data from athletes who are students at school, college, university or other subsidized educational scheme (for example, industry-sponsored apprenticeships).

Regarding permissions from employers for time-release (Table 5), British athletes seem to fare consistently better than their Commonwealth fellow-athletes when the time-release is required for competition only. But even the singular nature of competition need not necessarily inspire the employer to provide wages while the athlete competes. Again, it is unlikely that the employer will provide wages for those athletes to whom he grants time-release for both training and competition. But these issues are speculative only, and again, a closer scrutiny must be paid to them in future research with the elite athlete.

Allowing that "loss of earnings" can only apply to those with the potential for earning, the greater majority of Commonwealth athletes claim to forfeit *relatively* little of their earnings in the pursuit of their sport. The loss of \$500 or less may not seem much to the average worker who earns \$15,000, but since most athletes are younger men and women, and therefore most recently entered into the work-force, their earnings are more likely to be far below the hypothetical average of \$15,000. Thus, even a loss of \$500 from earnings constitutes a measurable sacrifice, a sacrifice which is unwarranted in light of outlay expenditures on other sport-related functions described above. To dramatize the issue of loss of earnings a little further, a closer inspection shows that, for 28 Canadian athletes reporting losses of earnings in excess of \$1,000 for 1978, 16 of these reported loss of earnings in excess of \$2,500. But any athlete who reports a loss of earnings over \$1,000 is demonstrating a dedication to excellence in his sport which he must feel has its own rewards built into the systems of competition and tournament. On the other hand, he could believe that present loss of income will be offset by return at a future date in real cash value, if he is one of those athletes who take time to think sufficiently far ahead to questions of job security and the like. On another level, bearing in mind these real cash losses to the employed, who carries the burden of such loss for the unemployed, the student-athlete, and others?

Conclusion

It has been shown that elite athletes approve of their being subsidized by government or commercial organizations. Empirical data demonstrates that they do bear a considerable financial burden in times when the term "amateur" is objectively outmoded. If Canada is going to continue elite sport programmes, the time seems ripe to give adequate financial support to athletes.

REFERENCES

- Jackson, J. J., and Lowe, B. *Sport as a career*. CAHPER Sociology of Sport Monograph Series. Calgary: University of Calgary, 1978.
- Lowe, B., Hill, P., and Roberts, J. "A cross-cultural study of athletes representing four countries in the Commonwealth Games." *Australian Journal of Health, Physical Education, and Recreation*, 70: 20-25, December 1975.
- Resick, M. C., and Erickson, C. E. *Intercollegiate and interscholastic athletics for men and women*. Reading, Mass: Addison-Wesley, 1975.
- Rooney, J. R. *The recruiting game. Towards a new system of intercollegiate sports*. Lincoln: University of Nebraska, 1980.

NOTE

This research was supported by a grant from the University of Victoria Research Fund and the assistance is gratefully acknowledged.

CHAPTER 12

THE HIGHLY TALENTED YOUNG ATHLETE: AN INTERNATIONAL OVERVIEW OF EDUCATION AND TRAINING

ERIC F. BROOM

Since 1960 increasing attention has been directed towards educating and training the highly talented young athlete. This paper will review developments in two socialist countries, the U.S.S.R. and the G.D.R. (East Germany), France and Great Britain.

One of the basic tenets of socialist education is that all children should have opportunity to develop their natural gifts, and that talent in sport should be regarded no differently from talent in mathematics, science, music, or art. The sports school structure was, therefore, established to ensure that children with the potential to become world-class athletes, for that was a central objective, could combine the standard academic curriculum with intensive, time-consuming training necessary to attain higher levels of sports performance.

In the socialist countries the typical sports school structure is pyramidal in nature. At the base are the sports day schools, which operate independently of the regular schools, and at the apex are the sports boarding schools which provide both general education and sports education.

The most common sports day school in the U.S.S.R., for example, is the Children's and Young People's Sports School, of which there were more than 5,000 in 1979, attended by 1.75 million members. Approximately half the schools are under the jurisdiction of local school boards, and the others are operated by sports clubs such as those of the armed forces, police, and trades unions. For example, each of the sixteen 1st Division and twenty 2nd Division soccer clubs in the U.S.S.R. run a junior soccer school. The first schools offered up to ten sports, but today most concentrate on no more than three.

Only a few sports day schools have their own facilities. Those run by school boards rarely use normal school facilities, which, in the main, are inadequate, but more often use rented accommodation.

Schools associated with a club use club facilities. In all cases the sports day schools are administered separately from the normal school. The sports schools are staffed by full-time professional coaches, who, in some instances, also work in the adult sports clubs. They are quite separate from teachers in the regular schools.

Enrolment at a sports day school follows a recommendation from a physical education teacher, and is based on sport attainment, tests to determine sport potential, and satisfactory academic standards. Children usually start at eleven years of age, but in some sports as young as seven years.

Attendance is after normal school hours, which are usually from 8:00 a.m. to 1.00 p.m., on six days each week. Younger children have three, two hour sessions a week, which increase until at age sixteen they have daily sessions of three hours. Instruction is in small groups, starting with twelve children and decreasing with maturity.

At the apex of the sports school structure are the sports boarding schools, which were first developed by the G.D.R. in 1952. Each of East Germany's nineteen schools is attached to one of the twenty-seven elite sports clubs, which have been established to produce champion athletes. The developing youngsters are thus motivated by rubbing shoulders with some of the world's finest athletes. The schools are generously equipped and staffed by the nation's best coaches.

The success of the G.D.R. schools led to their adoption by other socialist states. In the U.S.S.R. the first school opened in 1962, several years after similar schools for music, ballet, and fine arts.

Based on performance at Regional and National School Games, children between seven and eleven years of age are invited to a school for a ten day examination. Successful applicants spend an average of ten hours per six day week at twelve years of age, increasing to twenty-four hours at eighteen years of age, on sports practice. In addition, they study history, philosophy, and psychology of sport. Schools offer only Olympic sports, and confine themselves to no more than three. Excellent coaches are attracted to the schools, and in 1978 more than half of the U.S.S.R.'s 60,000 full-time coaches were working in sports schools.

Children spend approximately twenty-five hours a week on standard subjects. It is considered important that the requirements of the standard curriculum are maintained, and with the advantages of small classes and good teachers it is claimed that academic standards are above the national average.

In the socialist countries the sports school system brings together

the best available resources in young sports talent, coaches and facilities. The talent-seeking net is cast wide to cover every corner of the country, and re-cast at intervals for late developers. Programmes are structured to ensure that youngsters who attend the sports schools can adhere to heavy training schedules, and at the same time obtain an education suited to their aptitude, interests, and career objectives. Within the socialist countries sports schools are regarded as one of the vital keys to international sporting success.

The French Youth Elite Athlete Programme, which started in 1978, is based at *L'I.N.C.E.P.*, the National Sports Institute. Selection of highly talented young athletes from those recommended by the National Sports Federations takes place between eleven and thirteen years of age.

By 1980 the programme included seven sports; track and field, swimming, cycling, table tennis, judo, fencing and gymnastics, and some three hundred athletes between the ages of eleven and twenty-five were in residence at the Institute. The programme employs five National Coaches full-time, and a further twenty-five part-time.

Young athletes spend four hours a day in training and four hours in academic study. The academic programme is flexible. During pre-competition training, academic work could occupy as little as one hour a day, and during competition it could cease completely. Missed classes are made up under the guidance of tutors. Overseas competition is encouraged as part of the education of both athletes and coaches.

At eighteen years of age the non-sport segment of the programme is geared to the aptitude and interests of the athlete. Arrangements are made for eligible students to attend a nearby university, and for others to be apprenticed in the neighbourhood or employed at the Institute.

All expenses of athletes attending the Institute are paid by the National Sports Federations. In addition, athletes receive grants from the National Sports Ministry.

The overall objectives of the Youth Elite Athlete Programme are to develop world class athletes, and to further the development of elite coaches, but also, in the case of the athletes particularly, to balance these aims with intellectual and social development.

The concept of a school which combines academic education and sport in roughly equal proportions is widely regarded as an East German development of the 1950's. However, the English Public Schools, which despite their name are private, fee-paying institutions,

preceded the G.D.R. sports schools by more than a century. Students at English Public Schools in the mid-nineteenth century spent from three to five hours a day on sport, using good facilities and guided by knowledgeable, enthusiastic teachers. Sport in the Public Schools was, and is, an integral part of education. The objectives throughout have been the development of character and leadership. Winning and the creation of records have never been a major consideration.

The major weakness of the Public Schools sport system is the extreme limitations of the talent pool from which it draws. In contrast to the G.D.R. schools which select from the total population in an age group, the Public Schools draw their students from a very small proportion of an age group, namely the tip of the socio-economic pyramid. Both systems require certain academic standards, but unlike the East German system, which selects on the basis of sports talent, the Public Schools select essentially on the ability of the family to pay the school fees.

Despite this very considerable restriction, the English Public Schools have demonstrated conclusively and consistently over more than a century that excellence in scholarship and sport may be achieved concurrently and have produced many outstanding athletes. It is no coincidence that until World War II, and beyond, when sport became more widely democratized, a large proportion of English national teams, in cricket, rugby, field hockey, rowing and, to a lesser extent, track and field, were products of the Public School and University system.

English Public Schools have continued to adhere to the pattern described above, but several schools, notably Millfield, have charted a new course. Millfield, which has an enrolment of eleven hundred, including four hundred girls, encourages the pursuit of excellence in scholarship, music, visual and performing arts, and sport. The programme offers thirty sports, taught by well qualified teachers in excellent facilities. Millfield has an extensive bursary programme, and while none are awarded purely for sport, outstanding achievement in sport may well be a decisive factor in an award.

In the last fifteen years 137 Millfield students, while still at school, have attained senior international (over 17 years) selection in twenty-two sports, and a further seventy have been junior internationals.

During the early 1970's the education of gifted children became a focus of concern throughout Great Britain. The Government response with regard to sport,¹ was based on the fundamental premise that any individual with potential in sport should be given every

opportunity to develop that talent, but not at the expense of the less gifted. It concluded that the greater the flexibility of educational arrangements, the greater the likelihood of youngsters attaining full potential.

Long before the Government circular many school districts were providing for talented youngsters. Some districts operate up to thirty coaching centres, offering a range of sports, after school hours in school facilities and other premises, such as a drill hall purchased for a gymnastics centre. In at least one area a pyramidal structure has been developed which extends beyond the school district to inter-district and regional schools of sport. Facilities are provided without charge. Most centres accept only children of school age, but some have a youth section up to age twenty-three. Many centres are free, but the trend is towards a fee of \$2.00 for under-eighteens and \$4.00 for over-eighteens, per month. Several districts organize the centres as clubs, thus permitting parents to help with fund raising.

Each centre is administered by a warden, usually a teacher. Coaches are required to hold advanced coaching qualifications. Some districts employ peripatetic instructors, who are not qualified teachers, in such sports as fencing and judo, to work in both schools and centres. Other teachers divide their work-load between school and centre, or work extra hours in a centre, and a small number of full-time coaches are employed in swimming and gymnastics. All coaches and wardens are remunerated for extra work and, when appropriate, these costs are paid by the Youth Service Department.

The centres provide opportunities for gifted performers to progress to a very high standard. Large numbers gain representative honours at both county and national level. Of equal importance are the opportunities offered for social development which is reflected in the standards of appearance, conduct, and self-discipline. The centres in no way interfere with the pursuit of the various centre activities at the schools. Indeed, there is every indication that schools benefit from the system.²

REFERENCES

- ¹ "The development of sporting talent in children of school age," London Department of Education and Science, Circular 16:78.
- ² "Department of Education and Science Report." London, 1975, p. 1.

CHAPTER 13

AN ANALYSIS OF WHEELCHAIRS USED AT THE 1980 OLYMPIC GAMES FOR THE DISABLED

COLIN HIGGS

Introduction

Wheelchair sports have experienced explosive growth during the last decade and this has been reflected in the increased sophistication of the equipment used by top line athletes. The 1980 Olympic games for the Disabled, held at Arnham, Holland during June and July provided an opportunity to assess the current 'state of the art.'

A photographic analysis of 49 wheelchairs used by competitors at the Olympics was undertaken to determine basic construction parameters. The chairs were grouped for analysis into one of five categories dependant upon the level of success achieved in them. The five levels were:

1. Olympic medal winners
2. Olympic finalists
3. Olympic semi-finalists
4. Olympic heat place finishers
5. Those eliminated in the heats.

Additionally, each chair was classified by virtue of the distance over which it was raced. Three classifications were used. Sprints were considered to be races of 400m or less while distance events were the 800m and 1500m. Some chairs were used in both sprint and distance events and these were classed as combined.

Each chair was photographed from the side and the rear, (Fig. 1). The optical axis of the camera was placed at a height equal to the radius of the wheelchair's main wheel. For the side view the camera was placed such that its optical axis passed through both main wheel hubs while for the rear view the optical axis of the camera was concurrent with the long axis of the chair and equidistant from both main

wheel hubs. The diameter of the chair's main wheels was physically measured and recorded, thus giving a reference measure for each photograph. This reference measure was used in the reduction of data from the photographs.

From the photographs obtained, the following chair athlete measurements were made.

- i. The main wheel-front wheel separation, designated functional length (F1).
- ii. The handrim diameter (Rd).
- iii. The distance of the intersection of the seat base and seat back from the centre of the mainwheel hub. The vertical displacement of the intersection was designated (Vd) and the horizontal displacement (Hd).
- iv. The angle of the seat base to the horizontal (Sa).
- v. The angle between the seat base and the seat back (Ba).
- vi. The angle of the main wheels to the vertical (Wa).
- vii. The superior handrim to handrim distance (SHRd).
- viii. The subject's biacromial distance (BAD).

Results

The data were considered in the following groupings: seat parameters and mainwheel parameters. Table 1 gives the mean and standard deviation of each parameter.

Seat Parameters

The seat parameters were considered to be the seat base angle (Sa), the seat back angle (Ba), along with the horizontal and vertical displacement of the seat intersection (Hd and Vd).

Figure 2 shows the mean and distribution (plus and minus one standard deviation) of seat parameter. Data is reported for chairs used by both males and females.

Seat Position. Rear displacement was characterized by no differences between any of the levels of success one through five. However, the sprinters seats were significantly ($t=2.239$, $df\ 36$, 1.688 required at the 0.05 level) closer to the hub than the distance seats, with the combined seats falling between the two not differing significantly from either.

The vertical position of the seat showed significant differences both with the level of success ($F=3.636$, $df 4.44$, 2.57 required at 0.05 level) and with classification by distance raced ($F=3.256$, $df 2.46$, 3.20 required at the 0.05 level). The distance seats were placed lower than the sprinters while the more successful seats were placed lower than the less successful. Within the sprint group it should be noted that the better sprinters (1 & 2) had higher seats than the less successful (4 & 5) racers. This difference approached significance.

Seat Angle. The angle of the seatbase to the horizontal varied significantly with both the level of success (0.05 level) and with race distance (0.10 level). The angle decreasing with decreasing success ($F=4.16$, $df 4.44$, 3.834 required) and with decreased race distance ($F=2.56$, $df 2.46$, 2.43 required).

The seat base angle was characterized by high variability within all groups.

The angle of the seat back showed low variability and no significant differences either with level of success or distance raced.

Wheelchair Frame Parameters

The frame parameters were considered to be the functional length of the chair, defined as the mainwheel-frontwheel separation distance, and the functional width of the chair defined as the handrim to handrim distance. Due to the camber of the mainwheels and handrims (Fig. 1), the distance between handrims varied inversely with the distance above the ground that the measurement was made. As contact with the handrim was made by the athlete at the top of the rim, this superior handrim to handrim distance was selected as the measure of functional width.

Due to the great variations in body dimensions between the athletes it was decided to relate the functional width of the chair to the shoulder width of the athlete using the chair. Thus the functional width ratio (FWR) was calculated. The FWR was defined as $\frac{SHRd}{BAD}$ where BAD was the biacromial width of the athlete.

Figure 3 shows the means and standard deviations for both frame parameters.

Chair Length. For males alone and males and females combined there was no significant difference in the functional length of the chairs used by the groups of differing ability. However, when the females alone were considered, this was not the case. With no female success group three athletes identified, and with low numbers of

female athletes overall, success groups 1 and 2 were combined to give a "successful" group while groups 4 and 5 were combined to give a "less successful" group. The mean functional length of chairs used by the successful group was 47.77 cm while the less successful group had a mean length of 40.11 cm. This difference was significant at the 0.05 level ($F=5.234$, df 1,12, 4.84 required).

When categorized by race length, significant differences in functional chair length were identified. For males alone and for males and females combined, the chairs used by sprinters were significantly shorter than those used for distance races and for combined sprints and distance races ($F=4.06$, df 2,46, 3.20 required at the 0.05 level). No significant difference was found between the distance chairs and the combined chairs.

Chair Width. The functional width ratio was found to vary significantly with both level of success and with distance raced. Relative to body size, the most successful chairs were narrower than those in success groups 2 through 5, ($F=3.01$, df 4,44, 2.60 required at 0.05 level) while chairs used in the distance events were narrower than those used in sprints or in combined ($F=4.13$, df 2,46, 3.20 required at 0.05 level). Those chairs used by the most successful athletes and by the distance racers were characterized by very low functional width ratio variability.

Mainwheel Parameters

The power to drive a wheelchair is transmitted to the mainwheels through a handrim mounted concentrically with it. In an attempt to generate maximum wheeling speed, athletes have angled the main wheels from the vertical. This angle brings the top of the mainwheel into the axilla and allows the athlete to apply force to the handrim in a more efficient manner. This angle away from the vertical is known as wheel camber.

Various handrim diameters were used by the athletes, the diameter determined to a large extent by the athlete's personal preference.

Optimum handrim diameter would appear to be a function of several variables, notable among them the strength and skill of the athlete and the distance over which the chair is to be raced. A small diameter handrim functions as a "high" gear in that a tangentially applied force over a fixed linear distance will cause the chair to travel further than the same force applied over the same distance on a larger rim. This allows relatively easy maintenance of sustained speed, but

requires large force applications to generate a change in speed when compared to a smaller rim. A larger diameter handrim demonstrates opposite traits; that is, a small applied force will generate a larger change in speed than if the same force had been applied to a smaller handrim. In practical terms this means that the large rim is better suited to rapid acceleration and less suited to the maintenance of sustained high speeds.

Figure 4 shows the mean and standard deviation for each main-wheel parameter.

Main Wheel Angle. The main wheel camber, while showing a clear trend of decreasing with decreasing success did not indicate any significant differences. This would appear to be due to the high variability of camber with the less successful chairs. The most successful chairs having a mean camber of 7.166° and a standard deviation of only 1.92° , whilst the least successful chairs had a mean angle of 3.24° and a standard deviation of 5.63° brought about by a large number of chairs in this category being fitted with vertical wheels.

Handrim Diameter. Handrim diameter varied inversely with level of success and showed significant differences for males, females and for males and females combined. For males the mean handrim diameters for the most and least successful chairs were 35.26 cm and 42.93 cm respectively while for females the equivalent rim diameters were 36.88 cm and 43.94 cm. When the males and females were combined, handrim diameters of the most and least successful chairs were 35.71 cm and 43.23 cm. In all cases the differences were significant at better than the 0.01 level.

When the chairs were analysed by distance raced, the mean handrim diameters for males and females combined were 39.34 cm, 35.33 cm, and 37.44 cm for chairs used in sprints, distance events and in the combined category. These differences were significant at the 0.10 level and approached significance at the 0.05 level, ($F=2.85$, $df=2.46$, 3.20 required at 0.05 level, 2.41 required at the 0.10 level).

Conclusions

Even at world class competitive levels where a presumable narrow range of abilities was present, significant differences in chair design occurred. These differences were related to the level of success achieved in the chair and to the distances over which the chairs are raced. When classified by success level it can be seen that the more successful chairs were:

- i. designed so that the seat was lower with respect to the main wheel hub than in the less successful chairs and that the seat base was at a greater angle to the horizontal.
- ii. narrower (expressed in ratio to the athletes biacromial distance) than the less successful chairs.
- iii. designed with greater wheel camber.
- iv. designed with smaller handrim diameters.

Figure 5 shows two chairs with design values equal to the mean scores of the chairs in success group 1 and 5. It should be noted that the variability in scores was far greater in the least successful group.

When classified by the distance over which they were raced the chairs were found to differ in the following ways:

- i. Sprint chairs utilized seats which were placed further forward than those in distance chairs or combined. The distance chairs had the most rearward seats.
- ii. The vertical displacement of the seat was greater in sprint than in distance chairs which were significantly lower. Within the sprint chairs, the more successful chairs had higher seats than the less successful.
- iii. The angle of the seat base to the horizontal was greater in distance chairs than in the sprint chairs. The combined group falling between them.
- iv. The functional length of sprint chairs was significantly less than that of the distance chairs or those used in both sprints and distance combined.
- v. The functional width of chairs used in distance events was significantly less than those used in sprints.
- vi. Handrim diameter decreased with increased race length.
- vii. Main wheel camber was similar for sprint and distance events.

Figure 6 shows chairs with designs based on the mean scores of chairs classed as sprint, distance and combined.

Concurrent investigation of the wheeling techniques of successful sprinters and distance racers suggests that these chair design differences are related to the adoption of different wheeling techniques.

Consult the author for details of figures and tables.

This research was supported by a grant from the Sports Services Division of the Government of Newfoundland and Labrador.

CHAPTER 14

THE MALE DANCER AND HOMOSEXUALITY

GRANT STRATE

Too much and not enough has already been said about the public image of the male dancer. It is foolish to avoid the subject of male homosexuality as it applies to dance, yet responsible writers ignore the topic altogether or take the stand that it is not an issue. I agree that the best of male dancing, or any dancing for that matter, assumes an androgynous character quite above mundane sexuality.¹ It can be said that Frank Augustyn, Mikhail Baryshnikov, Anthony Dowell, among the best of male dancers, achieve in performance a combination of technique and artistry that makes any discussion of sexuality irrelevant. Even so, I contend that dance deserves a more honest understanding and acceptance of the fact that a large proportion of male dancers in our western world regard themselves as homosexual or bisexual. In stating this as fact, I do not believe it should discredit dance as a profession. On the contrary, I believe dance as an art form is now mature enough to look truth in the eye. I am not, however, intimating that all dancers have homosexual tendencies or, as some would have us believe, male homosexuality is a required condition for good dancing. This presentation does not make a case for homosexuality but, rather, encourages an acceptance of its reality so we can get on with the better evolution of the art of dance without pandering to the interests of the voyeurs and gossip-mongers always in dance attendance and without apologizing for a condition which should need no apology.

There are a number of people with a genuine love for dance who take a defensive stance on the subject of sexuality. How often have we heard it said that male dancers achieve the physical prowess of the athlete, as if a jock comparison eliminates suspicion of homosexuality? In my early dancing days I harboured many a resentment at suggestions that a male dancer ranks sexually and physically with the foot-

ball player, not because I disdained athletics, but because such statements are misleading. The psychological and sexual motivations for sports participation is the subject for another fascinating study, but it is not mine. The fact is that sports activity and dance activity are more widely separated than some physical education instructors would have it. Attempts to link the two areas inevitably fall on the rock of aesthetic intention. There are very different reasons for dancing than there are for participating in sports, despite recent ballet competitions and the flirtation with artistic expression now required of gymnasts and figure skaters.

It must be admitted that public attitudes have dictated some need for defensiveness. As much as we might wish it otherwise, society has never been free of sexual or any other kind of bigotry. There are welcome indications that our society is more accepting of homosexuality than at any time in the past, but this is small comfort to most directors of dance companies who still feel compelled to cop out on the subject for box office considerations. There are other directors who wear the badge of homosexuality to encourage support from a new constituency.

In blundering, unwitting, ways dancers, choreographers, dance critics and writers have compounded the negative public attitude toward the male dancer. The male dancer often allows himself to be presented badly to his audience, confirming popular prejudices. Dance writers constantly refer to the dancer as "she." I would like to regard these lapses of gender as feminist revenge but know that it comes from a general public perception of dance as a predominantly female art. Most dance teachers in this country (95 percent of whom are female) capitalize on the commercial drawing power of dance paraphernalia, e.g., tutus, pointe shoes, sequins and glitter, to attract the young girl to a dance studio. The industry stacks itself against the young man who might find dance a meaningful art expression. These same teachers complain of the shortage of male dancers. Despite increased positive publicity in favour of male dancers, this condition has not improved.

In light of all the above it is incongruous that men outshine females in the hierarchy of dancing stars heralded by the media. Rudolf Nureyev was the first of the superstars and hit the covers of most popular magazines. Mikhail Baryshnikov has received incredible publicity. They have not been regarded as unique phenomena as was Vaslav Nijinski, who stood alone among male dancers of his day. There is now a fairly long list of men lauded by the public as excellent

dancers. Obviously the male dancers, homosexual or not, who have gained prominence and have dedicated themselves to their art have come to terms with themselves and dance.

It should be remembered that prior to the nineteenth-century European theatrical dance was first and foremost a male pursuit. The male dancer was supreme in the courts of France. The classical code of ballet emerged from martial postures of dominance² commensurate with the noble position of kings. In its beginnings, classical ballet was the product of court manners and aristocratic tastes. A superficial glance at the ballet in the Court of Louis XIV might seem to confirm the worst suspicions of male dancing, shared by many today. Highly formalistic, decorative, effete, the ballet de cour seems unmanly to our twentieth-century conditioning. The truth is that ballet spectacles, danced by the *crème de la crème* of European nobility, were political exhibitions of power. The ability of any court to mount a lavish, expensive ballet production was regarded a clear indication of that court's potential success in combat. The courage, agility and endurance required of the court dancer was the result of daily dance classes required for the all-male cast of performers.

The Romantic Revolution of the nineteenth-century was so successful in idealizing woman, largely due to a new patron class of *nouveau riche*, that for a time choreographers phased out male dancing entirely in favour of the female in travesty. Throughout dance history male or female dancers have been favoured according to current fashion but only the Romantic Age of ballet discriminated so harshly against men. Theophile Gautier, French writer and ballet scenarist of the mid-nineteenth-century, was frequently vitriolic in his condemnation of the male dancer. He only reflected the opinion of the dance audience of his day. The male dancer has never quite recovered from this historical blow to his ego.

Homoeroticism in dance has become an overworked theme. During the past decade, after years of second class citizenship, the male dancer seems to be striking back, but in self-conscious ways. Glen Tetley, Hans Van Manen, Rudi Van Dantzig, Peter Darell and Vincente Nebrada are but a few of the choreographers who have centred ballets around homosexual or male erotic material. These creations have won some acceptance, but one fears that an important support public may have been alienated in favour of another which seeks easy, sensual gratification rather than aesthetic experience.

Dance has always walked a tight rope between art and entertainment, finding greatest success when both ingredients are mixed care-

fully and well. Sexuality is a powerful component of all dance whether it be the "white" ballets or the stuff of Broadway. The human body is the material, movement the expression of this primary art form, rendering it highly vulnerable to those who will exploit it for its overt sexuality. Elements of eroticism are always present, even within the most abstract of dances. This is as it should be, but eroticism becomes destructive to dance when it becomes the strongest motive for dancing.

Sexuality, like self-therapy, can be a product of effective dancing, but the dancer who dances to put himself into psychological, sexual balance is certain of failure to communicate dance as art. Similarly, the dancer who dances to display his sexuality is in narcissistic danger³ and the dancer who loves himself dancing more than the dance itself indulges in short-circuited art activity. If the dance is the reason for dancing, all benefits are reaped.

Homosexuality in dance is not endemic to the intrinsic qualities of dance. We have no evidence that the homosexual is better suited to dance than the heterosexual. At the product end of the process sexual preference is of no real significance, yet we know that many more homosexuals are attracted to dance than to most professions. There are undoubtedly some psychological reasons to do with body, narcissism, and wish fulfillment that contribute to this sexual imbalance. The art form itself, especially the classical ballet, provides the attraction of femininely decorated fantasy-escape, fitting well within the taste of the homosexual stereotype.

Psychological implications must not be dismissed, but I believe social practical considerations are the strongest factors. Until recently there were few professions where homosexuals could work openly as homosexuals. Role playing is often required of the working gay, so he lives one life at the office and another at home with its consequent schizoid frustrations. Public attitudes have relaxed somewhat but the closet door is only partially and tenuously open. It used to be commonly believed that interior decorators, hairdressers, and ballet dancers were all gay. The reputation lingers on and is corroborated by the fact that homosexuals prefer to be accepted openly as homosexuals and therefore seek out the vocations where it is understood there will be no internal bias against them.

Dancers as artists are socially more accepting of eccentricity. The artist puts himself on the line every time he creates or interprets a work of art. From the first day of study he usually faces an unsympathetic world filled with people who have little appreciation for the

commitment and dedication required of artists. Communities of artists already regard themselves as minority groups outside the mainstream yet acutely conscious of social realities. It is fair to say that sexual and racial prejudices are not generally prevalent among artists and that homosexuals feel less stigmatized with artists than with most social groups.

Many men elect against careers in dance because the financial rewards are so limited. The prospect of security sufficient for the raising of a family is not good except for those men dancing in the few organizations providing reasonable salaries and pension plans. The life style of the performing artist does not encourage domesticity. Men who expect even the average standard of living for married men find it difficult or impossible to exist as a performer. Looked at from this point of view, we should say the dance field is *not* attractive to many heterosexuals rather than the field is attractive to homosexuals but, expressed from either point of view, the consequent reputation of homosexuality certainly acts as another deterrent, particularly to the post-puberty group of dance aspirants.

There are other, deeper motives for men with homosexual tendencies gravitating to dance and these relate to the physicality of dance. We are led then to questions involving contact sports, sports of danger, and any activity which requires extreme physical extensions of mortal capacities. But I leave this topic to psychologists, who are better equipped to treat it.

My point is that homosexuality does exist within communities of dance, that denial is pointless and often insulting to those who have contributed so much to the dance profession. While homosexuality is not a prerequisite to good dancing, neither is heterosexuality. In the same way that an enlightened society is obligated to reduce prejudices on all levels, we are obligated to accept dancers without denying, challenging, or apologizing for sexual differences.

REFERENCES

- ¹ Birdwhistell, R. "The male image." *Dance Perspectives*, Winter 1969. Issue #40
- ² Strauss, G. B. "The aesthetics of dominance." *The Journal of Aesthetics and Art Criticism*, 1978, 37, 73-79
- ³ Schneider, D. E. *The psychoanalyst and the artist*. New York: Farrar, Straus, 1950

CHAPTER 15

A PROJECT FOR THE STUDY OF PHYSICAL EDUCATION AND SPORT ADMINISTRATION

BARRY MITCHELSON AND TREVOR SLACK

Iona Campagnolo, former Minister of State for Fitness and Amateur Sport, in her 1977 Green Paper on Sport expressed her desire for increased effectiveness in the management of amateur sport organizations.

Sound administration is particularly vital to our sports future for two reasons: first, because it has been at times lacking in some sports in Canada, and second, because it ensures that limited funds can achieve effective results. (p. 2)

In her 1979 White Paper on Sport she reaffirmed the indispensable role that volunteers and professionals play in the provision of sporting opportunities for Canadians.

In our complex sports structure with its immense variety of autonomous and semi-autonomous national, regional and local associations, great care must be taken not to blunt or discourage the drive and enthusiasm of the private citizen, whose voluntary work remains a foundation of our system. (p. 7)

Our recent progress has come about in part because of the work of full-time sports administrators, technical experts and coaches... It must be recognized that full-time experts are here to stay; that without their presence it would have been impossible to reach our present levels and will be impossible for further advances to be made. (p. 7)

Thus, the effective utilization of available volunteer and professional manpower and the implementation of appropriate management strategies are two factors which will influence whether ample sport and physical education opportunities exist for all Canadians desiring such opportunities.

It was as a result of recognizing these two concerns that approximately four years ago the Project for the Study of Physical Education and Sport Administration was initiated by staff members who work primarily in the area of administration in the Department of Physical

Education at the University of Alberta. The objectives of the Project are. (a) To develop comprehensive instructional programmes and materials for professional and volunteer physical education and sport administrators, (b) To establish ongoing consultative and facilitative services for organizational development and maintenance of physical education and sport organizations, and (c) To ensure that applied and theoretical research opportunities relating to the administration of physical education and sport programmes are available. The Project has enabled staff members, graduate students, undergraduate students, volunteer sport administrators, and the general public to work co-operatively and with a clearly defined focus to attempt to satisfy the objectives.

In regard to the instructional objective, the Project has prepared instructional materials and has presented the material to volunteer and professional sport administrators at "how to do" management clinics and has planned non-credit management inservice courses for physical educators. The following Physical Education and Sport Management Manuals have been prepared: Moore (1979, Slack (1979), Stockdale (1979), and Windsor (1979). Manuals considering the following topics are being prepared: How to Plan and Schedule Competitions, Planning and Hosting Major Tournaments Meets. and Sporting Events, Recruiting Volunteers, Intragroup Communication, Promotion and Public Relations Strategies, and Decision Making/ Problem Solving Strategies.

In regard to the facilitation and consultation objective, staff and graduate students have acted as consultants and facilitators at numerous organizational development and maintenance workshops for physical education and amateur sport organizations. To assist organizations as they strive to achieve greater effectiveness Haslam *et al.* (1981) manual was prepared.

Manuals considering the following topics are being prepared: Planning for the Involvement of Volunteers in Amateur Sport Organizations and Strategies for Facilitators who Conduct Planning Workshops for Amateur Sport Organizations.

In regard to the research objective, the staff and graduate students working on the Project realized the advantages of attempting to conceptualize and thus develop a model that would give direction to present and future research endeavours in the area of physical education and sport administration. The advantages of creating a model are. (a) taxonomic—a model provides a framework for collecting data, (b) explanatory—through antecedent-consequent relationships

it is hoped that the model will not only describe and order the phenomena of the social-psychological aspects of human behaviour within physical education and sport organizations but also explain and ultimately predict the phenomena, and (c) heuristic—a model helps to identify additional factors or areas to be investigated.

It must be acknowledged that all models have limitations and deal with restricted aspects and oversimplifications of the phenomena one is attempting to codify. The premise of this model is that administration is a *social process* which occurs in a *social system*.* A social system may be characterized by its commitment to a stated goal, the existence of strategies to achieve the stated goal, and the system is manned by people. Thus, each member of an organization perceives and organizes himself and his interrelationships in the organization in regard to his personal needs, skills, goals, and past experiences and the goals and the consequential strategies of the organization. To analyze the administrative process, one can conceive of the social system consisting of two categories of phenomena which are independent yet interrelated: (a) the organization with certain *role expectations* to fulfill the goals of the organization, and (b) the individuals with certain *need dispositions* inhabiting the organization. The observed behaviour in a social system is a function of the interaction between these two factors and administration deals with the attempted fulfillment of both role expectations and need dispositions while the goals of the social system are being achieved.

Further, the observed behaviour in a social system is also affected by the values of the culture or sub-cultures which are the environment for the social system, and therefore it is also necessary to understand the interaction that exists between the social system and the culture.

Congruence

Since administration deals with the attempted fulfillment of both role expectations and need dispositions while the goals of the social system are being achieved, it is important that an administrator be able to identify the types, sources, and consequences of congruence or lack of congruence within the organization. Investigation into the types, sources, and consequences of congruence or lack of congruence within

* The model that is presented was developed from the "Operational Model of Major Dimensions of Social Behavior" model presented by Getzels *et al.*, 1968.

physical education and sport organizations is needed and some of the following areas warrant investigation:

Singular Analysis:

- a between cultural or sub-cultural values and role expectations,
- b between role expectations and personality or need dispositions,
- c between roles or within roles,
- d between cultural or sub-cultural values and need dispositions, and
- e between the perception of role expectations by different individuals within an organization.

Plural Analysis:

- a between cultural or sub-cultural values and the organizational unit,
- b between individuals and the organizational unit, and
- c between individuals and the cultural or sub-cultural values.

It is also imperative to realize that groupings can occur at a subgroup level within physical education and sport organizations as well as at the macro level (i.e., the organizational unit) and the most micro level (i.e., each individual of the organization). Some possible subgroup comparisons would include:

- a administrators
 - i Executive or board as compared to the membership at large.
 - ii Within executive (e.g., the secretaries of associations as compared to presidents of associations).
 - iii Grouping of members (e.g., rural as compared to urban).
 - iv The volunteer as compared to staff.
 - v Different levels (e.g., neighbourhood, local, regional, provincial, national, etc.).
 - vi Between different sports.
 - vii Other factors (e.g., children involved or not involved).
- b similar groupings could be developed for participants, coaches, officials, etc.
- c comparisons between subgroups within and outside physical education and sport organizations.
 - i Involved adults as compared to noninvolved adults.
 - ii administrators as compared to those not involved in administration.

- iii parents whose children are involved as compared to parents whose children are not involved.

Criteria of Organizational Behaviour

A primary concern in the administration of a social system is the development and maintenance of effectiveness, efficiency, satisfaction, rationality and identification. Figure 2 illustrates the inter-relationship among these concepts in relation to the model and the following are brief explanations of each term.

a Effectiveness

The observed behaviour relative to some criterion against which it is evaluated. Judgments of effectiveness and ineffectiveness are impossible to interpret unless both the expectations being applied and the behaviour being observed are known. In terms of the model, effectiveness is a function of congruence between behaviour and expectations.

b Efficiency

Efficiency is a function of congruence between behaviour and need dispositions.

c Satisfaction

Satisfaction is a result of the absence of role-personality conflicts. The criteria of effectiveness and efficiency are irrelevant as satisfaction is a result of the congruence between personality needs—dispositions and role expectations.

d Rationality

Rationality represents the extent to which the expectations of a role are felt to be logically appropriate to the achievement of the stated goals of the organizational unit.

e Identification

Identification represents the degree to which the goals and performance of the organization are congruent with the needs and values of the individuals in the system. If identification is high, the goals of the system become part of the motivational force within the individuals.

Research into the areas of effectiveness, efficiency, satisfaction, rationality, and identification and other areas of congruence as they relate to physical education and sport organizations needs to be undertaken. It is the intention of the Project for the Study of Physical

Education and Sport Administration to examine the types, sources, and consequences of lack of congruence.

One of the first research undertakings of the Project was to identify the type of people who volunteer to become administrators in amateur sport organizations. The two factors examined in the study were: (a) information regarding the biographic and demographic characteristics of the sport administrators and (b) information regarding the degree of involvement of the sport administrator in his sport.

A questionnaire was mailed to 238 volunteer administrators of provincial sport governing associations in Alberta, 165 (69%) of the questionnaires were returned.

The analysis of the data revealed that volunteer administrators in sport associations had similar characteristics to volunteers who worked in non-sport related situations. More males than females were involved as administrators and they came predominantly from the middle and upper age brackets. The majority of administrators were married and from the upper socioeconomic levels. A large percentage of the administrators exhibited upwardly intergenerational mobility in terms of occupation. A large number of the administrators had their ethnic background in the British Isles, lived in one of the major cities of the province, and showed stability in their place of residence.

The average length of time the respondents had been involved in their sport in some capacity was 15.5 years, however a large percentage had spent six years or less in an administrative capacity with their provincial association. Fifty-five percent of administrators had held other executive positions prior to their current position, those persons in the senior executive positions having held the most positions. Administration and coaching in their sport consumed most of the administrators' time. A large number of administrators had been players, coaches, or officials when they were first recruited into an executive position. Playing was the most frequently cited area with over half the administrators having played at the provincial level or above. In addition to their administrative involvement with their provincial sport organization, a large number of administrators were still active as players, coaches and officials. Most administrators had some member of their family involved in their sport.

REFERENCES

- Campagnolo, I. *Partners in pursuit of excellence. A national policy on amateur sport*. Ottawa. Queen's Printer, 1979.
- . *Tou and a national sport policy. A working paper*. Ottawa. Queen's Printer, 1977.
- Getzels, J. W., Lipham, J. M., and Campbell, R. F. *Educational administration as a social process*. New York: Harper and Row, 1968.
- Haslam, I., Mitchelson, B., and Moore, K. *Planning, budgeting, and accounting for physical education and amateur sport organizations*. Edmonton. Project for the Study of Physical Education and Sport Administration, Department of Physical Education, University of Alberta, 1981.
- Moore, K. *Personal organization and time management*. Edmonton. Project for the Study of Physical Education and Sport Administration, Department of Physical Education, University of Alberta, 1979.
- Slack, T. *Meeting management*. Edmonton. Project for the Study of Physical Education and Sport Administration, Department of Physical Education, University of Alberta, 1979.
- . *Selected characteristics of volunteer sport administrators*. Unpublished M.A. Thesis, University of Alberta, 1979.
- Stockdale, D. *Fund raising*. Edmonton. Project for the Study of Physical Education and Sport Administration, Department of Physical Education, University of Alberta, 1979.
- Windsor, J. *Constitution and by-law guidelines and strategies*. Edmonton. Project for the Study of Physical Education and Sport Administration, Department of Physical Education, University of Alberta, 1979.

Consult the author for details of figures and tables.

**FORMAL AND INFORMAL STRUCTURE USAGE
IN A VOLUNTARY SPORT ORGANIZATION**

TREVOR WILLIAMS AND JOHN J. JACKSON

Sport in Canada occurs, more often than not, in an organizational context. In amateur sport, organizations are dependent on volunteers, who expend much time, effort, and money in behaviour directed toward achieving organizational and personal goals. However, they do so in spite of an inherent paradox. Much of the literature in the sociology of sport suggests that sport organizations are becoming bureaucratic and, concomitantly, alienative (cf. Ingham, 1975). This poses a practical problem for amateur sport organizations: if they become bureaucratic, they will alienate voluntary members, yet the organizations must assume some aspects of bureaucracy in order to function. Voluntary sport organizations do function and this raises a significant question—how do they resolve the paradox? A Canadian provincial sport organization was the object of an exploratory study. It was reasoned that it was large enough to function with some degree of necessary bureaucratization.

Theoretical Framework

An exchange paradigm was used in the study. In the paradigm social life is seen as a market-place and consensus occurs through negotiation and renegotiation. A voluntary sport organization must utilize such a process in order to function, since the relationship between the elected executives and the membership is, theoretically, a reciprocal one. Moreover, it is based on the conscious or unconscious manipulation of normative power. Without negotiation, the organization would rapidly lose members because the very characteristic which identifies it, its voluntary nature, is predicated on member goal attainment.

The crucial issue in voluntary organizations is maintaining internal democracy (cf. Blau and Scott, 1962, Michels, 1949): in balancing

the goals of the members with the goals of the whole. If the members' own goals are not being met, they will leave, and if the organization's goals are not met, it will cease to exist. Barber (1950) noted that the oligarchical structure of the voluntary organization tilted the balance away from members' goals. To Michels (1949) this was inevitable.

Goals are achieved within and by two types of structures: formal and informal. Traditionally, the two structures have been viewed as complementary. The formal structure is rational and designed to achieve organizational goals. The informal structure is expressive and evolves through interaction between organizational members, promoting personal goals (cf. Miller, 1952).

It could be expected that the formal role a member assumes within the organization will affect his or her usage of either structure. Each collection of roles can be listed according to a common dimension so that a hierarchy is outlined. In a voluntary organization this takes the form of a hierarchy based on the degree of responsibility assumed by a member. As one rises in the hierarchy, interaction demands increase.

Geographical location will affect structure usage in two dimensions. The distance of a member's location away from a high density region will influence usage because of the dominance of that region in a province. High density regions typically contain power positions and usage is, therefore, most likely to be formal. The population density of a region will influence usage because proximity to other members affects structural choice through the effort that has to be expended to interact with those other members. In areas where the population density is low, more effort is required for informal use so that interactions are more likely to be restricted to the formal structure. Where the density is high, informal interaction would require less effort.

Methodology and Results

An arbitrary vertical segment of the organization was selected as appropriate for the drawing of respondents from four hierarchical levels. The levels were identified as Executive, Regional Representative, Coach, and Player. In addition, the province was divided into two geographical regions: high and low population density regions and an equal number of respondents were located in each one. Sixty-three respondents were chosen with the aid of a table of random numbers.

The organization was considered a structured set of well defined binary relations among persons in that organization (cf. Conrath and

Johnson, 1972). Since these relations were exercised through communication, that process was used as an indicator of specific structural usage. A member's purpose for communicating was reflected in the content of the message being transmitted. Organizational purpose was seen in communication involving the formal role of an individual in the organization and was termed formal communication. Communication which did not involve an individual's formal role was considered informal. Thus, formal communication was transmitted in the formal structure and informal communication in the informal structure.

All respondents were interviewed using a structured question, unstructured answer technique. The data were primarily described as the number of interactions per month with any member of the organization. A chi-square statistical test of significance was used on the data and a two-tailed significance level of $p. 05$ was chosen. Anecdotal records augmented the analysis.

The results were that, (a) population density influenced which structure was used; (b) the informal structure was utilized more frequently than the formal structure in upper hierarchical, decision-making levels; and, (c) structure use was primarily vertical at all hierarchical levels except the lowest where it was more horizontal.

Discussion

The organization was found to consist of two parts. A base or local level, at which the Coach and Player members interacted, and a transcended provincial level at which the Executive members interacted. The Regional Representative members were part of the base level and acted as liaisons between the base and provincial levels. Interaction also occurred between all hierarchical levels during competitions. Tournaments were the major competitive form of the organization.

Members who were located in the low density region were at a disadvantage. They were far from the high density region and from each other. The effort needed to interact with members from outside their locales was great. Consequently, such effort was reserved for interaction within the formal structure, especially at the Coach and Player level where financial resources were limited. The corollary to this is that those members located in the high density region had the advantages. They could, and did, interact with each other with less effort and greater frequency because the population density was so high. This was especially true of their interaction in the informal

structure. For both regions the tournament form of competition decreased the overall effort required to interact with *large* numbers of members, on an effort per interaction basis.

It was expected that the administrative operation of the organization would have been more formal than informal for those with upper hierarchical roles. Certainly, the large geographic area of the province and the dispersion of the members would warrant a restriction of effort to interaction in the formal structure. In effect, it was expected that the organization be bureaucratic. The data did not support such an expectation. The informal structure was used more than the formal structure by those members responsible for administering the policies of the organization and, in the majority of instances, developing those policies.

The organizational decision-making, although implemented by the upper hierarchical members, was actually influenced by the interaction within the informal structure. It was in that structure that negotiation and renegotiation occurred: goal consensus was multi-lateral. This was a result of the regular tournament interactions and the feeling inherent in voluntarism. The common cause of the members, including upper hierarchical ones, was allied with the recognition and empathy of personal sacrifices made on behalf of the organization. All members were treated as individuals, while everyone attended to a norm that if a rule applied, it applied to all. The majority considered the "good of the sport" to be a primary justification in rule application or any other organizational function. Goal consensus through the informal rather than the formal structure can be illustrated by the self-selection process of role positions.

When a member volunteered for a role, no mention of any dysfunctionality from unsuitability, incompetence or unpopularity, was made. Rather, the transmission of the norms and expectations of the majority, through the informal structure, resulted in role abdication or avoidance if dysfunctionality was in fact the possible outcome. The consequences were that those in higher organizational positions, where some administrative ability was necessary, tended to be suitable for the roles they occupied. The process was self-selectory in that there was voluntary pursuit or avoidance of the role by the individual, although the choice was influenced by their interaction with other members.

A similar process influenced decision-making as the formal structure was by-passed. The upper hierarchical members became aware of the wishes of the membership via the informal structure and made

their decisions accordingly. Rarely did they take it upon themselves to act in a manner contradictory to the messages received in the informal structure. This was not a rational approach in the way that most people would interpret bureaucracy as 'sticking to the book.' However, the emphasis was on people, not rules. The rules were used to serve people and not *vice versa*.

The formal structure of the organization was oligarchical since the membership delegated authority to the Executive on the understanding that the latter carry out certain duties which kept the organization functioning. This accords with Michels' (1949) and Barber's (1950) assertions on the inevitability of oligarchy in voluntary organizations. However, the organization studied here did not operate oligarchically since the formal structure was by-passed. Oligarchy is predicated on one-way structure usage; from the top, down. The super-ordinates dictate to sub-ordinates. In this case there was two-way structure usage as the membership informed the upper hierarchical levels of its wishes. Thus, internal democracy was maintained and members were not alienated.

The supplanting of the formal structure by the informal structure might account for a phenomena observed by the Committee for the Unification of Sport in Canada. It noted that:

The only generalization that can be fairly made is that by and large the formal organizational structures all seem to work! Obviously some are more cumbersome than others and some have more skill and experience in their systems than others—but generally, the formal structures appear to work in a wide variety of situations.

However, the Committee did not study the informal structure of sport organizations.

Conclusion

The inherent paradox of voluntary sport organizations is resolved by extensive use of the informal structure. Large amateur sport organizations can function with some formality without alienating members. This conclusion lends reasonable grounds for accepting the statement that some large organizations are not bureaucratic and alienative.

REFERENCES

- Barber, Bernard. Participation and mass apathy in associations. In Alvin W. Gouldner (ed.), *Studies in leadership*. New York: Harper and Bros., 1950.
- Blau, Peter M., and Richard W. Scott. *Formal organizations*. San Francisco: Chandler, 1962.
- Conrath, D. W., and G. A. Johnson. Analyzing an organization via its internal communication patterns. Paper presented at the Institute of Management Science International Meeting, Houston, Texas, April 4-8, 1972.
- Michels, Robert. *Political parties*. Glencoe, Illinois: Free Press, 1949.
- Miller, V. Formal and informal human interaction. *Autonomous Groups Bulletin*, Summer-Autumn 1952. Cited in R. L. Case. The communication structure of a Physical Education unit. In Earle F. Zeigler and Marcia J. Spaeth (eds.), *Administrative theory and practice in physical education and athletics*. Englewood Cliffs, N.J.: Prentice-Hall, 1975.

CHAPTER 17

JAPANESE JUDO IN THE HIGH SCHOOL REQUIRED PHYSICAL EDUCATION PROGRAMME

MASAO HIGASHI

I will first describe how Judo developed as a sport in the school physical education programme in Japan. Next I will point out that the teaching of Judo has some problems to be solved and some improvements to be made. And finally I will argue that in order to heighten the educational effect of teaching Judo at School, we must try to increase the physical educators' capacity to teach Judo, lay stress on safety in practising Judo, and make better the way of practising so that Judo can be a perfect sport for physical education.

Jigoro Kano—Founder of Judo

Judo is a modern adaptation of the traditional Jujitsu, one of the martial arts of old Japan. Jigoro Kano, founder of the Kodokan, improved and elevated the old Jujitsu to physical education with a scientific system and called it Judo. He intended it to be suitable for the cultivation of the mind as well as to be proper as a martial art. Furthermore he welded to it a high ideal—an unprecedented achievement in this field. Jigoro Kano learned from the age of four at Jujitsu schools. He established his own school at 23 in 1882, named it the Kodokan, and began to teach his own experience, calling it Judo instead of Jujitsu. At the age of 34 he was appointed President of Tokyo Higher Normal School in 1893, which was the only governmental college for high school teachers in Japan at that time, and continued to be the President for 34 years. And in 1909 he was appointed the first Chairman of the International Olympic Committee of Japan, and acted as Head of the Japanese Delegation for the 5th Olympic Games at Stockholm, Sweden.

Principle of Judo

Kano, who was a Judo man, a philosopher, an educator and a physical educator, completed the principle of Judo. The maximum-effi-

cient-use of mind and body, or the best use of energy, is its principle, he maintained. To master the principle, it is essential to train the body and to cultivate the mind through the practice of Judo. Hence perfection of oneself and contribution to the welfare of the world. That is the ultimate goal of Judo.

The principle of the maximum-efficient-use of mind and body is the fundamental principle governing all the techniques of Judo. But it is something more. The same principle can be applied for the improvement of the human body, and thus constitutes physical education. It can also be applied for the increasing of the mental and moral power, and thus constitutes mental and moral education.

Process of Development of Judo in the Japanese School Physical Education Programme

The first school educational system was instituted in Japan in 1872 and the Japanese people had the obligation to receive school education. But only gymnastics of a Western style was included in that system. Some years later there spread general sentiment in favour of training the morale of the people by Judo and Kendo which had developed in Japan. In 1883 the Ministry of Education ordered the National Institute of Gymnastics to investigate the educational value of martial arts such as Judo and Kendo.

The Institute was established in 1878 as the first Japanese national institute to train the leaders and teachers of physical education and to pursue the study and survey of physical education. Dr. George A. Leland was invited to head the staff. He was an American who graduated from Amherst College in 1874 and after that studied at the Medical School of Harvard University. He came over to Japan through the recommendation of Edward Hitchcock and lead Japanese physical education for the three ensuing years.

The result of the investigation of the martial arts by the Institute revealed that they had a lot of demerits and that they were not proper as sports in the required school physical education programme.

Later on there arose discontent with the prevalence of the light gymnastic exercises of a Western style and it was vehemently argued that it was urgent to build up "a rich country with a strong army." In 1911 the Ministry of Education issued the new Ministerial Ordinance for Junior High School to include Judo and Kendo in the programme of gymnastics. Thus schools which managed to obtain the leaders and the exercise hall were allowed to provide classes of Judo and Kendo. But these were not compulsory in the curriculum in those days.

Twenty years later, in 1931, the Ministry of Education reformed the regulations of Junior High School and Normal School to place Judo and Kendo in the regular curriculum and to make them compulsory. The reason was that in those days, when liberal ideas and demoralization were in serious question, the Ministry thought that in order to improve school education which overemphasized intellectual training it was essential to cultivate the spirits of fortitude and manliness and to train and harden the body through Judo and Kendo which had been handed down from olden times in Japan. As a result, junior high, normal, and vocational schools all over Japan had to be provided with the hall and apparatus for Judo and Kendo. Also, lots of teachers who could instruct. But in those days institutions for the training of the leaders were very few and instructors unlicensed as school teachers had to take charge of Judo and Kendo classes. The teaching method was not established and it required a lot of time to attain the goals of physical education in classes. It was thus some 60 years after Japan's school education began that Judo and Kendo were for the first time placed on the regular compulsory programme of school physical education.

The Chino-Japanese War broke out in 1937 and the Anglo-U.S.-Japanese War, in 1941. Japanese education was getting more and more nationalistic and militaristic. The name of "elementary school" was changed into "national (elementary) school" and the curricula of all levels of schools were drastically changed. More and more importance was attached to Judo and Kendo and the contents of the education of Judo and Kendo were favourably changed, since their merits as an art of hand-to-hand fighting and as a means of training the mind were recognized anew.

In 1945 the Second World War ended and efforts by educational circles were exclusively directed toward democratization of Japan by removing militaristic and nationalistic colouring from the country. In this trend Judo and Kendo were put out of the school physical education programme and practising at school was prohibited.

The persons concerned studied assiduously how to include Judo as a new kind of sport in the physical education programme and in 1950, after five years of prohibition, Judo was again placed in the school curriculum. As by ordinance qualified teachers of physical education had to undertake the task of teaching Judo, it became a problem to find those who had enough capacity to teach it. But various problems like this were solved one by one and at present Judo is a required sport in the curriculum and extensively carried on at all levels of schools: junior and senior high schools, colleges and universities.

Problems Confronting the Teaching of Judo

It has been widely recognized that Judo is one of the best sports for physical education at school that can have an excellent educational effect on body and mind. But it sometimes produces an unfavourable effect if the teaching of Judo, or its management, is not good enough.

The capacity of physical education teachers to teach judo and the training of them. After 1931, when Judo was placed on the school curriculum, those who specialized in teaching Judo were employed as instructors of Judo at school. And after 1950, when Judo was re-established as a school sport after five years of prohibition at school, it was only physical educators with a teachers' license who were allowed to teach Judo as well as ball games and track and field. Then it was, and is, a serious problem that there have been quite a few among school physical educators who have had enough capacity for teaching Judo. This is mainly due to the fact that in many physical education teachers' colleges the students have had only to take one or two credits for Judo. Thus, particular consideration must be given to the increasing of the present capacity of physical education teachers to teach Judo.

The teaching of Judo lacking in due attention to safety. Judo originated from old-time martial arts of Japan with their risks eliminated and emphasis put on safety so as to be proper as a sport for physical education. But if a learner practises Judo misguidedly, it can be attended with danger, the fighting elements of the martial arts emerging, and the practice becoming like a hand-to-hand combat. Consequently it need be emphasized that the learner of Judo must first of all learn to exercise courtesy towards his opponent and never fail to pay respect to him. If a learner begins a competition-like practise without mastering well enough the indispensable breakfall, namely, safe way of falling down, or other basic techniques, then injuries are bound to occur. And attention must be paid to the fact that the Judo club at high school is showing the highest incidence of injury of all sporting clubs. To prevent risk, it is essential to establish the risk-minimized method of teaching Judo, to implant basic techniques before everything, to provide sufficient space for an exercise hall, and to cushion the floor moderately.

Judo as a sport and Judo for physical education at school. Jigoro Kano changes the name of Jujitsu into Judo. *Ju* means 'soft' or 'gentle,' and *do* 'morality' or 'path of righteousness.' The principle of Judo is the maximum-efficient-use of mind and body. Accordingly, the opponents should hold each other softly and practise for the advancement

of skill should be done in a scientifically and dynamically reasonable way. This is, at the same time, a safe way of practising which can serve for physical education.

But Judo, which has now won its way among foreign countries as a modern sport, has been transforming itself into the Judo for the sake of victory. In other words, fighting spirit as involved in a hand-to-hand combat has been overemphasized and softness or skillfulness of Judo is being lost. It is because of an unnatural quick method designed only for a victory in a competition that various evils have attended the club activities of Judo at high school in Japan.

We must aim to teach Judo in the proper way, laying stress on basic skills, and to keep our mind on the Judo which was founded by Jigoro Kano, recognizing its merits anew.

Conclusion

Japan has made a great economical progress and the life of the people has been enriched. But now the younger generation has a number of problems to be solved in their educational aspect, such as their tendency to grow effeminate and seek for an easy way of life, the increase of delinquency and violence at school, the decline of their physical fitness, etc. What seems to have given rise to these problems are their distorted education brought about by the present entrance examination system, their scantiness of opportunity for wholesome types of self-expression, and their lack of exercise caused by modern mechanization. Instead of overstressing intellectual training, the persons concerned with the education of the young are making efforts to form a rich and generous character by advocating more latitude in education. For this aim, sports and physical education have been strongly recommended. Particularly the merits of Judo and Kendo which developed in Japan have been recognized anew and these sports have been occupying an important position in the present school physical education programme.

And a great advance in the scientific study of Judo has been marked in various aspects. That is, many studies from educational, psychological, physiological, and biomechanical points of view have been published. I believe that, by utilizing fully the data achieved by these studies for the teaching of Judo, we can really heighten the educational effect of Judo.

**THE THEORY AND PRACTICE
OF CURRICULUM IMPLEMENTATION**

F. ALEX CARRE AND H. DAVID TURKINGTON

A disproportionately high percentage of research and development resources have been allocated to curriculum development rather than the implementation process itself. Curriculum developers generally agree that curriculum implementation is an essential component of any sound curriculum planning process (Saylor, p. 26). However, while many curricula have been planned, a systematic implementation model is seldom employed. Curriculum implementation consists of the process necessary to put the curriculum to work. This provides a starting point for the development of instructional strategies and the foundation for predicting outcomes (Beauchamp, p. 164). For the purposes of this paper implementation will be taken to mean the *process that occurs when a new programme is introduced and interacts with the institutional setting of a school, district or region* (Thoms, p. 5).

Relationship of Implementation and Curriculum Development

A comprehensive curriculum planning process provides a systematic approach to analyzing ends and means, attends to related factors and data, and provides continuity from beginning to end. Most curriculum development models contain the following components: (See Figure 1)

1. An assessment of needs
2. Development of goals and learning outcomes
3. A curriculum design
4. Curriculum implementation
5. Curriculum evaluation

These components are all necessary to ensure that a viable curriculum is developed which meets the needs of students, teachers, and

educational institutions while at the same time providing the necessary skills, techniques, and resources necessary to provide for effective implementation. Curriculum implementation then becomes a vital link by which theory and practice can be successfully integrated. The primary emphasis here will focus on this phase of the curriculum planning process while recognizing the continuous and interactive nature of all components of the model.

Components of Implementation

Since implementation is vital to the curriculum planning process and not simply an extension of planning and adoption phases it can be considered an area of study in its own right. This analysis can be undertaken in at least five dimensions which involve implementation in practice (Fullan and Pomfret, 336):

1. Changes in materials and resources
2. Changes in organizational structure
3. Changes in role behaviour
4. Changes in knowledge and understanding
5. Changes in value internalization

Implementation, therefore, is seen as a complex area essential to the curriculum planning process which provides the resources necessary to initiate educational change successfully. Fullan and Pomfret's comprehensive review of implementation research indicates that a sound knowledge of the implementation process requires an understanding of four major components. These include:

1. Characteristics of the Innovation (explicitness: what, who, when, how, complexity).
2. Strategies and Methods (in-service training, resource support [time and materials], feedback mechanisms, participation).
3. Characteristics of the Adopting Unit (adoption process, organizational climate, environmental support, demographic factors).
4. Characteristics of Political Organizations outside the Adopting Unit (incentive system, role of evaluation, political complexity). (Fullan and Pomfret, p. 367)

Curriculum change seldom happens as expected however and the most obvious explanation is that educators fail to attend adequately to implementation. It appears that the three implementation factors that seem most often neglected are planning for implementation,

applying change strategies, and conducting staff development (Patterson and Czajkowski, p. 204).

A practical model of curriculum implementation which attempts to resolve these concerns is presented in the next section and takes into consideration all four major implementation components. It should be emphasized however that this model represents a particular set of variables and would require adaptation and modification for use in other systems.

Curriculum Implementation: A Provincial Model

In 1979, British Columbia published a revision of its Secondary Physical Education Curriculum (Ministry of Education, 1980). This curriculum guide represented major intents and contents for physical education which had evolved since its last major revision in 1961. The need for a sound implementation process was recognized by the Curriculum Committee at its very inception and was a prime concern for the committee. With these factors in mind, the authors provide the following provincial implementation model as one means of dealing with curriculum innovation.

To increase the probability of successful implementation of a provincially developed curriculum it is necessary that several factors be taken into consideration.

1. The new curriculum should be presented to as many potential users as is possible by those individuals primarily responsible for its development. However, due to financial and time constraints it may be necessary to present regional workshops to *representatives* of each school district within the region. These individuals should be carefully selected as they will be expected to act as change agents at local district workshops upon their return to the district.
2. All individuals charged with the responsibility to implement the curriculum should be fully informed as to the intents and contents of the curriculum.
3. Every effort should be made to ensure that individual teachers, as well as district and school administrators become involved to some extent in the implementation process. This can be accomplished by following through the various phases of the suggested model.

Provincial advisory body. The need for a provincial advisory body becomes apparent during the curriculum development process. The

guidance and leadership from such a body would facilitate the updating and distribution of relevant curriculum resource material and the identification of knowledgeable resource personnel. This would assist in the implementation process.

Resource specialists. Valuable input and leadership may be gained by involving supervisors, co-ordinators, and university personnel during the implementation phase. Each has an important role to play.

PHASE ONE

Regional Planning Workshops

Purpose

To familiarize invited delegates with the new curriculum guide.

To outline a suggested format for district and individual school implementation.

To assist delegates in acquiring various change agent techniques.

Representation

It is strongly recommended that a minimum of two teachers and one administrator attend from each school district.

Clinicians

Members of the provincial curriculum revision committee and content specialists.

Programme

Suggested topics to be addressed:

1. Historical development of the curriculum
2. Overview of the curriculum
 - Philosophy
 - Structure
 - Goals and Learning Outcomes
 - Content
 - Time Allocation
 - Programme Considerations
 - Teaching Strategies
 - Evaluation and Grading
3. Identification by delegates of positive aspects of the curriculum.
4. Identification by delegates of areas of concern in the curriculum.
5. Delegates and resource personnel address areas of concern; possible solutions are identified.
6. Implementation plans. Delegates react, suggest changes, and formalize plans.
7. Change agents workshop—A very important phase of the regional workshop deals with delegates acquiring various change agent skills. Time spent here will enhance the chance for adoption at the local level.

PHASE TWO

District Planning Workshop

Purpose

To familiarize district administrators, principals, physical education department heads, or school representatives with the new curriculum.

To establish a district implementation plan.

Representation

The physical education department head or representative and an administrator from each school district.

Clinicians

District representatives who attended the regional workshop and content specialists.

Programme

1. Address topics 1-7 that were covered in regional workshop.
2. Establish timetable for district implementation.
3. Formation of district implementation committee.

PHASE THREE

Individual School Planning Workshop

Undoubtedly this workshop will entail a much larger time frame than either the district or regional planning workshops.

Purpose

To familiarize all teachers of physical education with the new curriculum.

To review existing curriculum.

To establish a course of action that will permit implementation of new curriculum.

Representation

All teachers of physical education in the school and the school principal or representative.

Clinicians

School representatives to District Planning Workshop and content specialists.

Programme

1. Address Topics 1-6 that were covered in the regional workshop.
2. Review current programme in light of new curriculum; indicate action needed in order to meet the requirements of the new curriculum.

	Goals and Learning Outcomes
	Programme Content
Suggested	Time Allocation
Content Areas	Programme Considerations—Policy Statements
for Analysis	Staff Expertise

Facilities and Equipment
Financial Implications
Evaluation Policies
Grading Policies

3. Establish specific areas of responsibility—pilot projects, curricular content specialists, etc.
4. Establish procedure to be followed to ensure continued evaluation and updating of curriculum.

Practical Requirements for Successful Curriculum Implementation

Based on the concepts and model presented above, a thorough review of the literature, and personal experience of the authors it is evident that there are a number of factors which are essential for successful curriculum implementation to occur.

1. Attempts must be made to conceptualize and measure the implementation process itself and to determine its effectiveness and determine where modification is required.
2. Organizational and role-relation changes resulting from implementation must be addressed (e.g., student-teacher role changes as a result of curricula advocating learner-directed inquiry).
3. Implementation will proceed at different rates for individuals in each of the four main components of implementation.
4. Teachers, students, administrators, and the public must be made aware of the intents and contents of the curriculum (through inservice sessions—philosophy, values, assumptions, objectives, subject matter, implementation strategy, and organizational components such as role relationships). NOTE: lack of understanding = user confusion = low degree of implementation.
5. Resources must be provided to permit successful adoption of curriculum (e.g., financial, human time) innovation.
6. Users of the curriculum must be committed to the innovation for any real likelihood of change to occur.
7. Curriculum implementation is a continuous long-term process.
8. Teacher behaviour changes (teaching style, skills) are more difficult to change than those involving changes in structure, administrative procedures, and use of materials.
9. Specialized implementation strategies should be developed such

as inservice training, resource support, feedback mechanisms, and participation in decision making.

10. Characteristics of adopting units such as individual staff characteristics, social class, and rural-urban factors are critical in receptivity towards innovative change.

11. Costs of the innovation to teachers must be reduced in terms of extra time, difficulty, and trauma associated with the innovation.

12. Evaluation and criticism of the innovation must occur in an atmosphere free from threat of personal reprisal to the potential user.

13. Initial attempts at promoting innovations should emphasize broad-based programmes and encourage local adaptations of specific forms of implementation.

14. Local user experimentation and participation should be encouraged to develop local system capabilities.

15. Incentive systems for implementation must permit and encourage adoption of innovative changes.

Conclusion

The purpose in this paper has been to outline some of the major concepts involved in curriculum implementation and to provide one model for such a programme. Implementation takes time. Hence, we must be patient and not expect immediate results.

REFERENCES

- Beauchamp, George A. *Curriculum theory*. Wilmette, Illinois: Kagg Press, 1975.
- Fullan, Michael, and Alan Pomfret. "Research on curriculum and instruction implementation," *Review of educational research*, 47 (Winter 1977): pp 335-397.
- Ministry of Education, Province of British Columbia. *Secondary physical education curriculum and resource guides*. Victoria: Ministry of Education, 1980.
- Patterson, Jerry L., and Theodore J. Czajkowski. "Implementation: Neglected phase in curriculum change." *Educational leadership*, 37 (Dec. 1979): pp. 204-206.
- Saylor, J. Galen, and William M. Alexander. *Planning curriculum for schools*. Toronto: Holt, Rinehart and Winston, 1974.
- Thoms, Denis F. "From needs assessment to implementation: A planning and action guide." *Educational technology*, 18 (July 1978):5.

Consult the author for details of figures and tables.

THE EDITORS

John J. Jackson, Ph.D., is Director of the School of Physical Education at the University of Victoria, British Columbia.

H. David Turkington, Ed.D., is Chairman of the Physical Education Teacher Preparation Programme in the School of Physical Education at the University of Victoria, British Columbia.