Prescription of Physical Activity: A Paradigm Shift

William P. Morgan

Despite the remarkable advances in our understanding of the many health-related benefits of physical activity, adherence figures in formal exercise programs have continued to average about 50% over the past three decades. It is proposed in the present paper that a paradigm shift is needed since traditional exercise prescription models have been ineffective. The proposed paradigm shift calls for the adoption of (a) an idiographic approach as opposed to the conventional nomothetic model in place at the present time, (b) preferred exertion rather than a given percent of maximum in the prescription of exercise intensity, and (c) purposeful physical activity as opposed to the nonpurposeful approaches characteristic of many formal exercise programs. A summary of ten cases is presented, and this qualitative research reveals adherence figures ranging from 5 to 79 years. The remarkable adherence of 100% is characterized by adoption of purposeful physical activity by these individuals.

Why do strong arms fatigue themselves with frivolous dumbbells?
To dig a vineyard is worthier exercise for men.

Marcus Valerius Martialis, 38-103 AD

There is now an extensive body of literature demonstrating that regular physical activity is associated with numerous health benefits of both a physical and mental nature, and much of this research has been cited elsewhere in this special issue of Quest. In addition to the health benefits of physical activity, it has been recognized for a number of years that “quality of life” is also associated with an active lifestyle (Morgan, 1985). Despite the recognized beneficence of physical activity, it is remarkable that physical inactivity continues to be a major public health problem since only 25% of the adults in the U.S. are physically active and only 10% are active enough to experience gains in fitness (Dishman, 2001). Furthermore, it has been recognized for the past three decades that activation of previously sedentary individuals is often problematic since many of these individuals...

The author is with the Department of Kinesiology at the University of Wisconsin-Madison, 2000 Observatory Drive, Madison, WI 53706-1189. Email: <wmorgan@education.wisc.edu>.
return to a sedentary lifestyle within a short period of time (Heinzelmann & Bagley, 1970).

In an earlier summary of the adherence problem, I reported that "the actual proportion who drop out or discontinue their involvement (in physical activity) varies from 30 to 70 percent across time" (Morgan, 1977, p. 244), and comprehensive updates of this problem by Dishman (1988, 1994, 2001) and Dishman and Buckworth (1997) suggest that the problem of adherence to physical activity continues to be a significant problem today. It has been commonly reported that "...about 50% of adults who start an exercise program will drop out in a few months" (Dishman, 2001, p. 280). However, it is also recognized that some individuals not only adhere, but they can develop what is viewed as an exercise addiction (Mandell, 1979; Morgan, 1979). The syndrome of exercise addiction or dependence can be viewed as the converse of the recidivism problem, but it will not be possible to address this important topic in the present discussion. An overview of this syndrome is presented in a companion paper (Morgan, 2001a).

While the adherence figure of 50% is the most commonly reported, it should be recognized that this proportion represents an average across many studies, and some investigators have reported lower (e.g., 20%) or much higher (e.g., 100%) figures. In a 25-year longitudinal study of aging marathon runners, for example, Morgan and Costill (1995) reported an adherence figure of 100%. This sample represents a rather unique group of exercisers, and it is unlikely that these findings can be generalized to settings involving traditional adult fitness programs. Other examples of exceptional adherence will be found in the present volume, and Kasch (2001) also reports an adherence figure of 100% for a group of men involved in a longitudinal exercise program across 33 years. Further, O'Neal and Blair (2001) report an adherence figure of ~80% across shorter durations (e.g., 6 months). Despite these encouraging results, the average adherence figure of 50% reported by Dishman (1988, 1994, 2001) continues to possess currency.

It is clear that investigators concerned with the study of physical activity are very much aware of the problem of adherence, and this has led to the development of programmatic strategies designed to enhance adherence. One approach to increasing compliance to physical activity has relied on the use of walking for exercise (CDC, 2000). Another strategy has involved the use of "lifestyle" physical activity, and this has been compared with structured interventions of the type recommended by the American College of Sports Medicine (ACSM, 2000) and the joint recommendation issued by the Centers for Disease Control (CDC) and the ACSM (Pate et al., 1995). One of the most frequent reasons given by exercise recidivists for discontinuing physical activity programs is the lack of time. This has led to the evaluation of multiple short bouts of exercise versus one continuous bout on exercise adherence (Jakicic, Wing, Butler, & Robertson, 1995). There is a need for continued research on the physical and mental outcomes associated with such approaches since increased adherence in the absence of desired outcomes would not represent an advance. There have also been evaluations of mass-media campaigns designed to promote physical activity (Owen, Bauman, Booth, Oldenburg, & Magnus, 1995). However, cognitive approaches to the modification of health behaviors suggest that knowledge alone is usually not sufficient in efforts to change behavior (Dishman, 2001). There is no discussion in this research literature of Factor P (i.e., purpose) and its potential impact on adherence, and this will be discussed in more detail in a later section of this paper.
It has also been proposed that adoption and maintenance of physical activity is a unique health behavior that cannot be approached in the same way that one might address drug, alcohol, or tobacco cessation efforts (Dishman & Buckworth, 1997). Support for this view can be found in the exercise literature where investigators have employed various psychological models (e.g., Health Belief Model, Transtheoretical Model, Relapse Prevention Model, Theory of Reasoned Action, Theory of Planned Behavior) developed for use in weight management programs, treatment of alcohol and drug abuse, and so on. While these models have sometimes been of value in characterizing adherents and recidivists in exercise programs, they have not been shown to be effective in increasing adherence in a systematic manner. This in no way diminishes the efficacy of these models for use in the areas of application for which they were developed. Furthermore, as noted for the above research literature, these models have been adopted without first considering the potential role of Factor P (i.e., purpose).

The first scholarly volume to be published on the topic of exercise adherence was an edited book by Dishman (1988), and this appeared about a decade following the initial review paper describing this problem (Morgan, 1977). Despite the fact that a number of studies had been published on the subject of exercise adherence during the ten-year interim, the adherence figure of 50% reported in 1977 had not changed by 1988, and the same was noted in a more comprehensive and updated volume edited by Dishman in 1994. In other words, despite the appearance of numerous studies dealing with exercise adherence, the problem of recidivism has not been solved. One of the reasons for this dilemma has been the general reliance on descriptive inquiry. While this research has been valuable in the sense that it has provided reasonably consistent explanations as to why people discontinue exercise programs, this literature does not provide parameterization that can be used in efforts to perform interventions. A review of the edited volumes by Dishman (1988, 1994) and the many empirical reports and review articles appearing over the past three decades suggest that exercise recidivists, compared with adherents, are more likely to (a) be smokers, (b) be blue collar workers, (c) score low on the psychological trait known as self-motivation, (d) lack social support (e.g., spouse), (e) possess high percent body fat, and (f) lack easy access to exercise facilities. This descriptive data has been useful in predicting who will be likely to drop out of an exercise program, and this information can also be used to explain why some individuals drop out while others continue in an exercise program. But this information does not lend itself to interventions designed to enhance adherence for the most part, and this extensive research literature fails to consider the potential role of Factor P (i.e., purpose).

Other investigators have suggested that selected “barriers” are responsible for exercise recidivism, and examples of commonly cited barriers are (a) lack of time, (b) inclement weather, (c) disruptions in routine, and (d) dislike of vigorous exercise (Dunn et al., 1999). While the understanding of how various barriers might influence adherence is important, it is difficult to perform interventions based on the elimination of these barriers (i.e., providing “more” time, eliminating inclement weather). Also, why not “make time” if there is a lack of time? Why let the weather dictate your existence? Why not have exercise become your routine rather than thinking of exercise as disrupting your routine, and is it not true that “all pain leads to pleasure,” and if this is not true, why pursue vigorous exercise in the first place? Where is there strong evidence that light or moderate exercise is not equal
or superior to vigorous exercise? And, why has the absence of Factor P (i.e., purpose) not been considered a barrier? It is also surprising that efforts to cognitively restructure these perceived barriers does not exist. I happen to reside in a climate where the weather is not only inclement at times, but it can be regarded as hostile or extreme on some occasions. The Madison (Wisconsin) Metropolitan School System, for example, issued the following extreme weather guideline for the 2000-2001 school year:

Madison Public Schools will automatically close if the wind chill index falls below minus 60 degrees Fahrenheit.

The publication of this guideline in the local newspapers was followed within days by a series of “Letters to the Editor,” and the following is one example of a dissenting view:

I think it is ludicrous to close schools just because there is a minus 60 wind chill. We never had school closings with cold weather when I was a kid, and it just doesn’t make any sense.

This writer probably walked uphill to and from school with strong headwinds in both directions!

Cold weather, snow, and icy conditions can be viewed as barriers to physical activity, but these same conditions can mean that it is time to get the skates, skis, bobsleds, and snowshoes out of storage for the coming months of purposeful transportation and “fun” that lies ahead. Sigurd Olson, the famous environmentalist, described a jaunt into the North Country woods on snowshoes as follows:

The snow means a return to a world of order, peace, and simplicity. Those first drifting flakes are a benediction and the day on which they come is different from any other in the year. One morning after this first heavy snowfall, I took to the woods. . . . As the sun came over the ridge it changed the snow and the purple shadows to sparkling silver. The temperature was zero and the trees were crisp and starchy with frost. There was no sound but the soft swish-swish of the snowshoes and the cracking of the thongs as I broke trail. (Olson, 1956, p. 193)

The account by Sigurd Olson makes no mention of heart rate, METS, percent of VO$_{2}$max, and other such mind-numbing metrics that possess the potential for insuring recidivism. This is merely one example of an experience that has been repeated by others many times over the thousands of years that we have inhabited the planet earth. Another classic example is the essay by Henry David Thoreau, titled “Walking,” which was presented as a lecture and published after his death. This essay is regarded as one of the seminal works of the environmental movement, and it is available at the EcoTopia web site <http://www.ecotopia.org/ehof/thoreau/walking.html>. Thoreau’s prescription for walking also lacked the mind-numbing metrics found in today’s exercise apothecaries, and in his transcendentalist tradition he said this:

If you are ready to leave father and mother, and brother and sister, and wife and child and friends, and never see them again—if you have paid your debts, and made your will, and settled all your affairs, and are a free man—then you are ready for a walk.
Thoreau also stated in this same essay that

I think that I cannot preserve my health and spirits, unless I spend four hours a day at least—and it is commonly more than that—sauntering through the woods and over the hills and fields, absolutely free from all worldly engagements.

The American Heart Association (AHA) has identified physical inactivity as an independent risk factor for cardiovascular disease, and the following “tips for exercise success” were listed on the AHA web site <http://www.americanheart.org> in 1998: (a) choose activities that are fun, not exhausting; (b) add variety; (c) wear comfortable, properly fitted footwear and comfortable loose-fitting clothing; (d) find a convenient time and place to do activities; (e) use music to keep you entertained; (f) surround yourself with supportive people; (g) share your activity time with others; (h) don’t overdo it; and (i) keep a record of your activities, and reward yourself at special milestones. At first glance, these “tips” may seem logical or sort of common sense, but is there any evidence that adoption of them will lead to increased adherence? Where can we find evidence that activities should be fun? Why should exercise not be exhausting? Why should there be variety? What’s wrong with mindless, boring, repetitive, ritualistic exercise? Is the selection of footwear and comfortable clothing meant to imply that activities such as swimming are inappropriate? What if the exerciser does not have time . . . how does he or she find a convenient time? Would it not be better to “listen” to one’s body than listen to music? Would listening to music rather than one’s body not be high risk from the standpoint of health and safety? Why should you share exercise time with others . . . what if you would prefer to exercise alone? What is meant by not overdoing it, and how much is too much? Why keep a record of activities, and what kind of rewards are okay? In short, where has the evidence been published in support of these tips, and why is there no mention of Factor P (i.e., purpose)?

It seems to me that the following quote from the Book of Yaaq by Bass (1996), while concerned with various environmental problems, has direct relevance to the problem of adherence to physical activity: “I didn’t know so many of us could be this wrong” (Bass, 1996, p. 171). I think we have taken the wrong approach in our efforts to deal with the problem of adherence, and the remainder of this paper will deal with a proposed paradigm shift based on the concept of purposeful physical activity, or what I have elected to label Factor P.

**Paradigm Shifts**

...just as with men’s bodies one is in good condition without exercise at all, another after a short walk, while another requires running and wrestling and hard training, and there are yet others who however hard they worked themselves could never secure this good, but only some substitute. (Aristotle, *On The Heavens-Book II*)

It is generally accepted that progress in science normally occurs as a consequence of conceptual reformulations or paradigm shifts (Mcfadyen, 1989), and the way scientists conceptualize their field undergoes major change from time to time. When a scientist is faced with a new way of viewing phenomena, he or she can elect to maintain the conventional view, make a radical shift to the new position,
or make an effort to integrate the old and new (Baker, 1989). When Kuhn (1962) first highlighted the concept of paradigm shifts in 1962, he wrote: “Such changes, together with the controversies that almost always accompany them, are the defining characteristics of scientific revolutions” (p. 6). It seems to me that we need to begin thinking about exercise prescription and the problem of adherence to physical activity in a very different sort of way. In short, our traditional approaches have not been effective, and we need to consider a paradigm shift.

I am not making a plea for a new “prescription paradigm” simply because existing approaches have failed, or just for the sake of a new paradigm. Otherwise, we run the risk of joining the “march of paradigms” that Cohen (1998) warned against in his thoughtful paper published in Science. Cohen (1998) reported that “The number of grants and papers invoking the term ‘new paradigm’ has been growing by leaps and bounds, yet most seem to have little impact” (p. 1998). The warning advanced by Cohen (1998) is not of an isolated nature, and Fuller (2000) has questioned many of the assumptions originally advanced by Kuhn (1962). Indeed, Fuller urges that the concept of paradigms be rejected and that a less formal and more open way of thinking about ideas be adopted. Nevertheless, there are recent examples of paradigm shifts in various fields that seem to offer considerable potential for major advances.

The paradigm shift underway in stem cell research, according to Lewis (2000), is “... upsetting the long-held view that in animal embryogenesis, position is everything” (p. 1). It was once accepted that a cell’s fate was sealed once it became part of the ectoderm, mesoderm, or endoderm, but recent observations “… that brain (ectoderm) can become bone marrow (mesoderm), that bone marrow can become liver (endoderm)” (Lewis, 2000, p. 18) challenges many conventional views involving embryogenesis. This paradigm shift has generated controversy among scientists as well as ethicists and politicians, and it has forced scientists to think about embryogenesis in a different sort of way.

Another contemporary example comes from the field of hypnosis where there has been an on-going debate for the past three decades based upon the “state” versus the “non-state” theories of hypnosis. While this debate has generated an enormous amount of research, investigators in this field have been largely concerned with efforts designed to prove and disprove the competing theoretical frameworks. A relatively recent proposal by Barber (1999) involves a new, multidimensional, paradigm of hypnosis, and Barber emphasizes the following:

Like all new scientific paradigms, the new hypnosis paradigm is a reformulation and reconstruction of a field of inquiry that shifts its basic problems and questions, its research areas and research methods, and its theoretical and theoretical possibilities. For instance, the new paradigm restructures the basic question, Is hypnosis an altered state of consciousness? by postulating three hypnoses, each with its own state of consciousness. (p. 37)

This new hypnosis paradigm has the potential for advancing the field of hypnosis in several ways, and perhaps the most significant is the dampening effect that it will have on the state versus non-state debate.

It has been reported by Kandel (1998) that the field of psychiatry has undergone a dramatic change over the past three to four decades in the sense that academic psychiatry “... transiently abandoned its roots in biology and experimental
medicine and evolved into a psychoanalytically based and socially oriented discipline that was surprisingly unconcerned with the brain as an organ of mental activity” (p. 457). In this particular paper, Kandel (1998) proposes a new intellectual framework for psychiatry, and this is not only an effort to change psychiatric thinking, but it also suggests a new training paradigm for future psychiatrists that emphasizes the centrality of modern biology. Positions of this type not only can alter the way in which investigators conduct research, but it also has the potential of redirecting an entire field of practice.

It is my sense that we need to give very serious consideration to reformulating our approach to the prescription of physical activity. I have presented examples of contemporary paradigm shifts underway in the divergent fields of embryogenesis, hypnosis, and psychiatry, and I have also attempted to provide cautionary and opposing views regarding the call for paradigm shifts (Cohen, 1998; Fuller, 2000).

The missing ingredient in our conventional models of exercise prescription is the concept of purpose. That is, contemporary exercise prescriptions are largely of a nonpurposeful nature in the sense that walking or running on a treadmill to nowhere, climbing stairs to nowhere, cycling and rowing ergometers to nowhere (and so on) has become the norm. Is it any wonder that most sedentary individuals who embark on such exercise programs become recidivists within a short period of time? The proposal I am advancing is not very unique, and the quote at the beginning of this article from Martialis (38-103 AD) reveals that others have commented on this two centuries earlier. And, some might argue that I have merely restated what others have come to describe as “lifestyle” physical activity, but I regard much of the physical activity that is labeled as “lifestyle” as being nonpurposeful in nature. Much of the lifestyle physical activity being promoted today not only lacks purpose, but it would be predicted that such practices would lead to recidivism. An example of nonpurposeful lifestyle activity would be the recommendation that an individual park his or her vehicle in a remote or distant parking facility in order to walk to a given destination (e.g., market, job site). This could be quite dangerous unless the walking route was protected from a large number of risks such as vehicular and bicycle traffic as well as assailants (i.e., muggers, rapists), and in addition to the issue of safety, the added distress of bodily sweat and odor when arriving at one’s destination could be problematic. In short, while some lifestyle physical activity might be purposeful (e.g., gardening, housework), it is also apparent that an equal number of lifestyle activities could be viewed as both dangerous and nonpurposeful.

Preferred Exertion

If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health. (Hippocrates, 460-377 BC)

The idea of personalizing physical activity in such a way that each individual receives the optimal amount represents an ideal that is difficult to achieve if one elects to employ conventional exercise prescriptions. The idea that each person should exercise at a given percent of maximum, for a given number of minutes, and a given number of days per week, should in theory lead to recidivism rather
than adherence. And, that is undoubtedly one of the reasons why adherence in physical activity programs has been a problem for many years. A distinction is often made between nomothetic and idiographic models in the field of psychology (Hall & Lindzey, 1957), and these concepts are defined as follows:

**Idiographic:** Emphasis is placed upon the unique nature of the individual.

**Nomothetic:** Emphasizes principles of behavior derived from the study of groups.

There has been a general tendency to employ *nomothetic models* when advancing recommendations for physical activity, and in one sense, this can be viewed as a "one-size-fits-all" approach. That is, prescriptions are often advanced in terms of a given percent of the individual's predicted heart rate maximum or estimated maximal oxygen uptake. While these "doses" might be quite reasonable for any given group of individuals, it is possible that the percent of maximum is inappropriate for some or all individuals in a group. There have been a number of studies that have directly or indirectly suggested that idiographic models should be superior to nomothetic models in efforts to optimize the prescription of physical activity.

In a very instructive paper by the late Michael L. Pollock and his colleagues, an attempt was made to evaluate the influence of training aerobically two days per week at different intensities. In this study, 22 men ranging in age from 30 to 45 years (Mean = 38.7 yrs) were randomly assigned to one of two experimental groups. One group trained at 90% of maximum heart rate while the other trained at 80% of maximum heart rate, twice per week for 20 weeks. A control group comprised of 12 individuals did not experience any changes in fitness across the 20-week experiment. Both of the experimental groups had significant increases in $\bar{V}O_{2max}$ ranging from 14% to 19%, but the two groups did not differ in the amount of improvement. This, of course, was contrary to expectations since Pollock et al. (1972) hypothesized that training at 90% of maximum heart rate would result in a greater gain in aerobic power. A serendipitous finding involving "preferred" exertion was made in this study, and the investigators reported that it was necessary throughout the study to encourage the 90% group to maintain the prescribed intensity, while at the same time it was necessary to encourage the 80% group to slow down. It appeared that an intensity of 85% was optimal since there was an unintended regression toward an intensity of 85% of maximal heart rate in the two groups. It appears that a preferred exertion resulting in a training intensity of 85% was responsible for the observation of no difference in outcomes for the prescribed intensities. This is probably the first demonstration in the literature involving research on adult fitness suggesting that intensity based upon preferred exertion might offer promise.

In a later investigation, Morgan (1973) evaluated a group of male college students at five power outputs on a bicycle ergometer, and they were asked to select which of the five intensities (50, 100, 150, 200, or 250 W) they would prefer if exercising for 30 minutes. The mean preference was found to be 120 W (i.e., nomothetic value) for this sample, but there was considerable individual variability across participants tested in this study. Furthermore, the idiographic values were significantly correlated with personality structure in the sense that preferred intensity was correlated with the trait of extroversion ($r = 0.70, p < 0.01$). Borg's
Model of Perceived Exertion (1973, 1998) conceptualizes effort sense as a “Gestalt” or configuration of many inputs such as heart rate, oxygen uptake, ventilatory minute volume, catecholamine production, lactate production, circulating glucose, glycogen stores, personality structure, age, training status, gender, and so on. Hence, the finding of a significant correlation between personality structure and rating of perceived exertion (RPE) is consistent with predictions derived from Borg’s theoretical formulations as well as Eysenckian Theory (Eysenck, 1987; Hall & Lindzey, 1957). Furthermore, Morgan & Borg (1976) have demonstrated that maximal physical capacity can be predicted with greater accuracy using sub-maximal ratings of perceived exertion (RPE) compared with the more conventional approach of using predictions based upon sub-maximal heart rate.

It has also been reported by Koltyn & Morgan (1992) that training intensity based upon perceived exertion (i.e., preferred exertion) was superior to a prescribed target heart rate in terms of endurance development. This study involved women of college age and one group trained aerobically for one semester by monitoring heart rate, while a second group trained at an intensity each individual perceived as being equivalent to an intensity ranging from 13 to 15 on Borg’s original 6–20 category scale (Borg, 1973). In other words, preferred exertion based upon perception of effort was found to be superior to prescribed exertion based upon a percent of maximum heart rate.

Another form of indirect evidence for the efficacy of preferred exertion was illustrated in an investigation by Farrell, Gates, Maksud & Morgan (1982). These investigators evaluated six well-trained endurance athletes on a treadmill test performed for 30 minutes at 60% and 80% of VO\textsubscript{2max} on separate days. These same individuals were tested on a third day while running for 30 minutes at a preferred intensity, and it was found that the mean percent of VO\textsubscript{2max} was 75% during the preferred trial. The ratings of perceived exertion (RPE) during the preferred intensity fell between those values obtained at the lower (60%) and higher (80%) intensities. Nevertheless, there was considerable variability in the individual values for the preferred intensity, and once again it can be seen that an idiographic approach would be preferable to a nomothetic one. It has also been reported by Dishman, Farquhar & Cureton (1994) that an individual’s activity history may represent an important factor in studies of preferred exertion. Indeed, in their study, RPE was identical in the high-active and low-active participants even though the groups differed in relative intensity, and these investigators recommended that additional studies of preferred intensity and effort sense ratings are warranted.

The concept of purpose is the central component of the proposed paradigm shift being advanced in this paper. The related topics of “perceived exertion” and “preferred exertion” have been addressed since preferred exertion is an important dimension of purposeful physical activity. This is especially true where one walks or cycles as a means of transportation, does yard work or gardening activities, performs household chores, engages in recreational activities such as ballroom dance, hunting, fishing, surfing, scuba diving, and so on. In other words, the pace at which the individual performs these physical activities is governed almost entirely by his or her preferred exertion. This is quite different than first completing a test of maximal aerobic power and then performing physical activity (e.g., jogging, walking, cycling) at a selected percentage of this maximum by monitoring heart rate or using a prescribed pace based upon the exercise prescription. There is
also evidence that RPE has added utility under certain environmental conditions (e.g., underwater) since maximal testing, as well as heart rate monitoring, is difficult, unreliable, and largely irrelevant. The regulation of pace by means of monitoring effort sense has considerable utility in such cases (Morgan, 2001b).

We have completed pilot research involving perceptual, cardiovascular, and affective responses during and following physical activity in ecological restorationists engaged in brush cutting (Stotesbery, Stegner, & Morgan, 1996). In this pilot work, volunteers performed brush cutting in the University of Wisconsin Arboretum using small bow saws and loppers on two separate occasions. Heart rate was measured continuously via a small transmitter and recorder worn by the participants, perceived exertion ratings were obtained at 15-minute intervals, and affective measures (anxiety, depression) were obtained before and following the sessions. This research revealed that volunteers select an intensity that is characterized by both a cardiovascular (i.e., heart rate) and perceptual (RPE) steady state, and these response patterns are quite consistent across a one-week interval. The 45-minute session of brush cutting is associated with a reduction in both anxiety and depression, and these responses are consistent with those observed under controlled, laboratory conditions. The study of physical activity patterns and responses in a naturalistic setting of the type employed in this pilot research demonstrates that exercise prescription based on preferred exertion is feasible, and it represents an alternative method of prescribing physical activity.

**Hunting, Gathering, and Farming**

I have drunk from wells I did not dig,
I have been warmed by fires I did not build. (Anonymous)

It was common for our ancestors to first search for a natural spring when deciding where to build a cabin, and the site for such housing was always close to an ample supply of trees for building and heating the cabin. A good portion of the summer was spent cutting and splitting wood for the winter fires. Carrying water from springs, and perhaps digging wells later on, was a way of life in earlier times. But we seldom give any thought today as to where our water comes from, or the source for our heating and cooling—we simply adjust the thermostat when we are too cold or hot. We almost need to enter a sort of time warp in order to think about the energy expenditure associated with cutting and splitting 10–20 cords of wood for the coming winter. Nevertheless, that is precisely what many of our ancestors did a few generations back. The famous naturalist, Aldo Leopold (1949), wrote in his *Sand County Almanac* that

If one has cut, split, hauled, and piled his own good oak, and let his mind work the while, he will remember much about where the heat comes from, and with a wealth of detail denied to those who spend the weekend in town astride a radiator. (p. 6)

The wood splitting Leopold speaks of possesses a purposeful component, but he also implies that such activity may have cognitive and affective outcomes as well.

It has also been emphasized by Apps (1997) that those of us living in the Midwest are only a few generations off the farm, and he also points out that “in the
1930s, half the people in the nation lived on farms, and now that’s about 2 percent” (p. 15). There can be little question about the amount of physical activity performed by members of a farm family during the time described by Apps (1997), and a modern-day parallel is that of Old Order Amish (OOA) here in the United States. Investigators from the University of Maryland Medical School have been studying diabetes in the OOA, and it has been reported that the prevalence of diabetes in the OOA is about one half that observed in Caucasians who took part in the Third National Health and Nutrition Examination Survey (Hsueh, et al., 2000). This is an important observation since type 2 diabetes has reached epic proportions here in the United States. A majority of the men in this study were farmers (40%) and laborers (33%), and a majority of the women were also engaged in purposeful physical activity. A small proportion (13%) of the participants in this study engaged in leisure time physical activity. Given the energy costs of the respondent’s occupations, it is not surprising that 87% reported that they did not take part in leisure physical activities. These men and women all engage in many purposeful physical activities throughout the day, and the investigators have proposed that one explanation for the low incidence of type 2 diabetes in this population is the high level of daily energy expenditure. Adherence to regular physical activity approximates 100% in settings of this nature where the physical activity is uniformly of a purposeful nature.

It is also of interest that hunting and gathering has comprised the principal means of survival for over 99% of the time that humans have lived on the planet earth, and it has been estimated that 100% of the world’s inhabitants were hunter gatherers when the world population was 10 million. This percentage decreased to 0.001% by the time our world population had increased to 3 billion (Lee & DeVore, 1976). There have been reports of primitive Amazon tribes being discovered as recently as the year 2001. These tribes live mainly by hunting and fishing, but they sometimes cut and burn small areas in order to raise crops. We have gone from a point in time when 100% of the inhabitants of the planet earth were hunter-gatherers, to the point where living by hunting and gathering is now almost completely nonexistent. Furthermore, Hawkes, O’Connell, and Rogers (1997) have reported that many contemporary hunters actually have recent farming or herding ancestors. As a consequence of this historical complexity, Hawkes et al. (1997) have indicated that “...many anthropologists have begun to see modern foragers ...as members of a world-wide, dispossessed ‘rural proletariat’ which is of no special interest to those studying the distant past” (p. 29).

Inhabitants of the planet earth have been hunter-gatherers for most of history, and even as recently as the 1930s, most individuals living in the United States performed various types of physical activity (e.g., farming) as a way of making a living. This has changed rather dramatically in the last half century; we now have large numbers of physically inactive individuals, and this inactivity is associated with heart disease and reported epidemics of both obesity and diabetes. How can we become modern day hunter-gatherers and farmers? That is, how can we return to our biological and sociocultural roots where regular physical activity was a way of life? I believe the answer is very simple—we need to adopt forms of purposeful physical activity. One example of such an approach is the volunteer restoration work described earlier in the pilot work by Stotesbery et al. (1996), and additional examples of purposeful physical activity will be summarized in the next section.
Purposeful Physical Activity (Factor P)

The terms *purpose* and *meaning* are often used as synonyms, but there are times when authors make an implicit or explicit distinction between these words. In the present call for a paradigm shift in the prescription of physical activity, the situation is further complicated by the observation that appropriate terminology in this area can change with time. In a general sense, the prescription of exercise in the form of walking or running on a treadmill to nowhere, or biking, rowing, swimming, stair climbing, skiing, and lifting dumbbells, for example, can be regarded as nonpurposeful physical activity. This sort of physical activity not only lacks purpose, but it is also devoid of meaning to a large degree. This is arguably the case at the outset of an exercise program when a sedentary individual first elects to become physically active.

It is possible that nonpurposeful physical activity lacking in meaning could become meaningful to an exerciser at some point in the future. However, it has been reported that approximately 50% of all sedentary individuals who take up exercise programs quit within a short period of time (Dishman & Buckworth, 1997). In other words, one should not expect sedentary individuals who adopt nonpurposeful exercise programs to continue (i.e., adhere) these meaningless activities. In a lay or everyday sense, these traditional forms of exercise can be viewed as pointless. Nevertheless, there is a subset of those individuals who become habitual exercisers for whom the purpose-meaning typology proposed above does not apply. Indeed, physical activity that may start out as nonpurposeful and meaningless (e.g., running in circles), may evolve into a type of ritualistic behavior that has profound meaning for the individual. An example of this sort of metamorphosis is illustrated in the following narrative provided by Arnold J. Mandell, a psychiatrist, who describes his daily run as follows (Mandell, 1979):

The first thirty minutes are tough ... creaks, twinges, pain, and stiffness. A counterpart of breathless, painful self-depreciation. ... Thirty minutes out, and something lifts. Legs and arms become light and rhythmic. ... The fatigue goes away and feelings of power begin. I think I'll run twenty-five miles today. I'll double the size of the research grant request. I'll have that talk with the dean. ... Then, sometimes into the second hour comes the spooky time. Colors are bright and beautiful, water sparkles, clouds breathe, and my body, swimming, detaches from the earth. A loving contentment invades the basement of my mind, and thoughts bubble up without trails. I find the place I need to live if I'm going to live. The running literature says that if you run six miles a day for two months, you are addicted forever. I understand. A cosmic view and peace are located between six and ten miles of running. (p. 57)

The subject of meaning as it relates to physical activity is addressed by Kretchmar (2001) elsewhere in this special issue of Quest, and this subject has also been examined in an earlier paper by Fahlberg and Fahlberg (1994). In addition, philosophers, psychologists, psychiatrists, transcendentalists, and lay people have wrestled with the concept of meaning for centuries (Wong & Fry, 1998). Does life have real meaning? Is it worth living? In Tuesdays With Morrie, Albom (1997) quotes Morrie as saying "... and devote yourself to creating something that
gives you purpose and meaning” (p. 43). While I have tried to make the case that physical activities such as running, at least in the early stages of a new exercise program, represent nonpurposeful physical activity, it is clear from Mandell’s above narrative that his daily running possesses enormous purpose and meaning. In a sense, he has created something that has purpose and meaning as recommended by Morrie (Albom, 1997).

There are probably many forms of physical activity that possess a wealth of purpose and meaning for the individual, and one final example is that of surfing. It has been stated by Pezman (1997) that surfer’s experience a detachment from “land-based concerns” when they enter the ocean and paddle out. The surfer “reads” the ocean surface in an effort to detect incoming swells and try to be in a position where it will be possible to “catch” the best wave in a set of waves. Pezman (1997) reports that

With enough practice, perseverance, and luck, once or twice in a surfer’s life all forces will align for a brief instant and the wave will throw out over the surfer’s head as the surfer streaks along through its hollows, encompassing the very essence of flight. (p. 52)

The space in time described by Pezman is referred to as being in the “Blue Room” by surfers and these individuals regard the act of riding waves as a pure form of spending time. Surfing is nonproductive, but it is at the same time a nondepleting activity, and it is “...the epitome of the here and now... spiritual... personal... a dance on a liquid stage” (p. 52).

I would now like to comment briefly on ten men and women who have pursued regular physical activity of a purposeful nature for many years, and their adherence has been 100%. This summary relies on a qualitative research design, and these cases represent a convenience sample that I have studied in an effort to better understand the nature of long-term adherence to physical activity. The ten cases are summarized in Table 1.

It is possible that fundamental differences exist in the personality structure and underlying motivation that characterize men and women who walk for the purpose of transportation as opposed to those who walk comparable distances in order that their dogs receive adequate exercise. While there is little reason to think that physical and mental benefits associated with walking in these two examples should differ, the issue of pet ownership complicates the situation somewhat. This could be a confounding variable since there is a research literature demonstrating that pet ownership per se is associated with health benefits. Nevertheless, walkers are included in this analysis on the basis of having a purpose for walking as opposed to others who might engage in nonpurposive walking, that is, walking that does not have an immediate or apparent objective (i.e., to get from here to there).

The anonymous summaries listed in Table 1 represent individuals I have interviewed over the past several years, and it will be noted that most of these individuals walk on a daily basis, although some cycle and one canoes, for the purpose of transportation. In a few of these cases, individuals consider personal auto use or public transportation if the weather is extreme, but this is the exception rather than the rule. Perhaps the most unique of these cases is Bob, the 40-year old man who combines canoeing on the Fox River in Wisconsin with cycling on a daily basis to reach his office. Three of these individuals walk on a daily basis with
Table 1  Selected Cases of Men and Women Engaged in Various Forms of Purposeful Physical Activity (N = 10)

<table>
<thead>
<tr>
<th>Name</th>
<th>Current age</th>
<th>Adherence years</th>
<th>Purpose of activity</th>
<th>Type of activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annie</td>
<td>85</td>
<td>~79</td>
<td>Transportation</td>
<td>Walking 4-8 mi/dy</td>
</tr>
<tr>
<td>Herman</td>
<td>62</td>
<td>~26</td>
<td>Transportation</td>
<td>Walking 8 mi/dy</td>
</tr>
<tr>
<td>Maggie</td>
<td>60</td>
<td>~24</td>
<td>Transportation</td>
<td>Walking 6 mi/dy</td>
</tr>
<tr>
<td>Pat</td>
<td>60</td>
<td>~10</td>
<td>Dog walker</td>
<td>Walking 3 mi/dy</td>
</tr>
<tr>
<td>Joseph</td>
<td>70</td>
<td>~20</td>
<td>Transportation</td>
<td>Cycling 15 mi/dy</td>
</tr>
<tr>
<td>Blanche</td>
<td>55</td>
<td>~15</td>
<td>Dog walker</td>
<td>Walking 4 mi/dy</td>
</tr>
<tr>
<td>Sybil</td>
<td>35</td>
<td>~5</td>
<td>Dog walker</td>
<td>Walking 6 mi/dy</td>
</tr>
<tr>
<td>George</td>
<td>50</td>
<td>10</td>
<td>Transportation</td>
<td>Cycling 10 mi/dy</td>
</tr>
<tr>
<td>Bob</td>
<td>40</td>
<td>15</td>
<td>Transportation</td>
<td>Canoeing/Cycling 12 mi/dy</td>
</tr>
<tr>
<td>Laura</td>
<td>70</td>
<td>35</td>
<td>Transportation</td>
<td>Walking 8 mi/dy</td>
</tr>
</tbody>
</table>

their dogs, and these individuals report that they do this primarily because their dogs must have exercise. The famous Norwegian psychiatrist, Dr. Egil Martinsen, suggested in a colloquium he presented at the American College of Sports Medicine several years ago, that if a patient is considering the purchase of an exercise machine, a dog would make for a good selection! Consider the situation where one awakens to discover that it is raining, snowing, or perhaps he or she just does not feel so well. It is very easy to put off a daily run or walk under these circumstances, but if the individual has a date (pact) with his or her dog, skipping the daily exercise is simply out of the question.

It will be noted that men and women listed in Table 1 ranged in age from 35 years to 85 years at the time this qualitative survey was performed, and it will also be noted that the regular physical activity pursued by these individuals ranged from a low of 5 years to a high of 79 years. This is remarkably different from the typical exercise study reported in the literature that might run for a few months, or perhaps up to a year, with little or no follow-up across the ensuing years. In other words, investigators have typically evaluated adherence or attendance across several months or a year or so at the most. It will also be noted that the amount of walking reported by these individuals ranges from 3–8 miles per day, and this represents a minimum of five days per week in each case.
One of the most remarkable individuals listed in Table 1 is Annie, who was 78 years of age when first interviewed, and she had been walking for 4–8 miles per day for the past 79 years. She was working as a cashier in a local market when I first met her, and she would walk from her apartment to the store five days per week, and she would walk to her church and the shopping center on weekends. She reported that she walked to and from school, a distance of approximately 3 miles each way, from the time she was six years old until she graduated from high school. She was raised on a farm, and she was always expected to do chores before and after school along with other members of her family. It is fair to say that she possesses an impressive work ethic, and walking as a form of transportation is simply part of her lifestyle. As a matter of fact, she would customarily decline offers for a ride home or to work or church from those who knew her from the neighborhood. While she has since retired from her job as a cashier, where she worked until 80 years of age, she continues to walk daily for the purpose of transportation. It is not possible to describe each of these cases in comparable detail, but the following narrative is presented in order to highlight the consistency of her physical activity pattern across time.

It was 10:00 a.m., March 8, 2001, in Madison, Wisconsin, and the outdoor temperature was 31°F with a wind chill factor of 15°F at the time of this interview. The interview was conducted indoors at the Hilldale Shopping Center, and this is the first time I have talked with Annie in several months. She had just entered the mall from the outdoors, and she was dressed for the wintry weather wearing a wool cap, scarf, wool coat, and gloves. She was carrying a canvas shopping bag, and she had walked the 1 + miles to the shopping center from her apartment. She planned to do her daily shopping and then walk back to her apartment. I asked her how she had been doing, and she replied very well. I then asked her what her age was now, and she quickly replied that she had turned 85 in November. Some people are very proud to tell you how old they are, and this women is not offended in the least by such a query. She also mentioned that her brother just turned 87, and he is living with his wife of 60 years on a small farm about 35 miles from Madison. She wanted to be sure that I understood that all of the members of her immediate family were living independently. Her brother has a son who “runs” a University, and his other son is a successful physician. This conversation could have gone on for some time, and I next asked if she was still walking to church and elsewhere every day. She replied that she walks to church most days, and when I asked her if she could estimate how far she walks each day, she replied that she walks about 4 to 5 miles each day. This has been the distance she has traversed on a regular basis over the past 15 years, and I have confirmed the distance with a tachometer. I commented to her that her exercise pattern must date back to her early days on the farm, and she replied “This is true!” In my earlier talks with Annie, she had often talked about walking six miles as a little girl during the school year and from her one-room school in rural Wisconsin. She, as most children raised on farms during that era, also had morning and evening chores during the school day, and they always did their share
of the work on the weekends and during the Summer months. While this physical activity may not have always been "fun," it certainly had a purpose (i.e., Factor P), and her regular physical activity over the past 79 years has been of a purposeful nature. This physical activity is certainly meaningful for her as well. She is very proud about her ability to move about freely and lead an independent existence. She is not only a very spiritual woman, but she keeps up to date with local, state, and national politics, and she has a hobby (collector) that keeps her busy in her leisure time!

All of the cases listed in Table 1 are presented in an anonymous manner, and while some individuals who live in Madison, Wisconsin might be able to speculate as to whom I am referring, I have made every effort to maintain anonymity. There is one additional case that does not require anonymity, and you can read about Dr. Fred Kasch in a feature article appearing in the October, 2000 issue of Wisconsin Natural Resources (Gaumnitz, 2000). You will find a full color page of Fred in this feature article, and it depicts him, at age 87, drawing a longbow. He has not only competed as an archer for decades, he is also an avid hunter, and he makes his own bows and arrows for competition and hunting. In his interview with Gaumnitz (2000), Fred stated: "From the time I was 10 or 12 years old, it was plain logical to me: Exercise and a healthy lifestyle made for good health" (p. 19).

It is not possible for most people today to become the hunter-gatherers that we were intended to be, but Dr. Fred Kasch has effectively done so. He has been stalking deer with a longbow since the 1940s, and he performs a daily routine of calisthenics and aerobic exercise in order to stay in condition to hunt, and he reports that the hunting itself keeps him in good shape. This goal is very well founded since Peterson et al. (1999) have presented empirical data involving the profound metabolic demands of deer hunting. He also enjoys ski, body surf, and dance, and he often drives cross-country on his treks between his homes in California and Wisconsin. He reports that his early scouting experiences helped him develop a comfort with the woods, and he states in this interview that "I'm kind of related to the woods." It is probably the case that Dr. Fred Kasch was not only the oldest speaker at this year's Academy Meeting in Lake Geneva, but it sounds like he may have also been the most physically active!

The late James Dickey, poet in residence at the University of South Carolina for almost 30 years, achieved his greatest fame for the novel and Oscar-nominated movie, Deliverance, and his writings often dealt with man and nature. He emphasized in his writings that people long to exchange their modern frustrations for a more primitive life that has "...more of the truth in it."

It seems to me that Henry David Thoreau and Dr. Fred Kasch have described their search for a more primitive life, one that has more of the truth in it!

**Summary**

It has been reported by Koshland (1988) that Einstein once said, "Science can progress on the basis of error as long as it is not trivial," and it seems to me that the errors we have made with respect to the problem of exercise adherence have been just that—trivial. In this paper I have attempted to make the case that a "onesize-fits-all" model for exercise prescription has been one of the trivial errors we
have made, and in advancing this view, I have maintained that we need to think in terms of rejecting conventional exercise prescriptions (e.g., a given percent of maximum for so many minutes per day). I have made the case that nomothetic models, by definition, should be less likely to facilitate adherence to physical activity compared with idiographic models of exercise prescription. A case is also made for the adoption of a physical activity model based upon preferred exertion, and there is both a strong theoretical basis, as well as empirical research, in support of such a contention. The point that we humans have been hunter-gatherers for almost 99% of the time we have lived on the planet earth, and then farmers until the early part of the twentieth century, has served as the basis for the proposal that we return to purposeful physical activity. A summary of ten cases in which adherence to purposeful physical activity has been 100% for many years is reviewed. It is clear that coronary heart disease, depression, diabetes, and obesity are major public health problems today, and there is strong evidence that a lifestyle involving physical activity is associated with a reduction in the risk of these disease states. The problem is that physical inactivity continues to be a major public health problem in our society, and a large proportion (~75%) of those sedentary individuals who adopt exercise programs become sedentary within a year's time. It is argued that recidivism will continue in physical activity programs that are based upon conventional exercise prescriptions, and a paradigm shift based upon purposeful physical activity is called for in this proposal.

A common reference list is being provided following the last article.

Acknowledgment

The preparation of this paper was made possible by a generous gift from the Donald and Diane Masterson Family, and a grant from the U.S. Department of Agriculture, North Central Forest Experiment Station, Project #144-EK70.