Sedentarism: A Concept Analysis

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TOPIC. *Concept analysis of sedentarism.*

PURPOSE. *To analyze the concept of sedentarism and provide a definition and model of sedentarism to guide practice and research.*

SOURCES. *Published literature.*

CONCLUSIONS. *Prevention and treatment of sedentarism is a priority for healthcare providers serving all developmental groups. Research is urgently needed to describe the prevalence, risk factors, and consequences of sedentarism, and to identify the most effective intervention strategies and public policy changes to promote a physically active lifestyle.*

Search terms: *Concept analysis, physical activity, sedentarism, sedentary behavior.*

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Introduction

The increasing incidence of sedentarism over the last three decades is a growing health concern for the U.S. population. It is estimated that 35% of deaths from coronary heart disease (CHD), 32% of deaths from colorectal cancer, and 35% of deaths from diabetes can be directly attributed to sedentarism and overweight (Powell & Blair, 1994). In 2000, the U.S. Department of Health and Human Services reported that sedentarism is a major public health burden, and its eradication is one of the prime objectives to improve health across all ages of the U.S. population. It is alarming that children have adopted many of the deleterious behavior and lifestyle patterns of the adult population, and are becoming increasingly sedentary and overweight (Davidson & Birch, 2001; Hunter, Bamman, & Hester, 2000). Obesity and sedentarism are intricately linked conditions. Together, they are responsible for a large number of chronic diseases, impaired physical functioning, and decreased quality of life. Obesity and sedentarism lead to over 300,000 premature deaths per year and result in over $90 billion per year in direct health

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costs (Manson, Skerrett, Greeland, & VanItallie, 2004). The problem of sedentarism is not limited to the United States. In the World Health Organization's "Global Burden of Disease Study," sedentarism is identified as a major risk factor threatening global health (Ezzati, Lopez, Rodgers, Vander Hoorn, & Murry, 2003).

Aims and Purposes of Analysis

Using the framework for concept analysis developed by Walker and Avant (1995), the concept of sedentarism will be examined, with a specific aim to explore the relationship of sedentarism to the concepts of overweight and obesity. Although causality between sedentarism and overweight or obesity has not been proven, numerous studies support a correlation between sedentarism and overweight and obesity (Jebb & Moore, 1999; Kyle, Morabia, Schutz, & Pichard, 2004; Slentz et al., 2004).

Review of All Discovered Uses of the Concept

The word *sedentary* is defined in Webster's dictionary (Merriam-Webster, 2004) as "accustomed to sit much or long, requiring much sitting, inactive, motionless, sluggish, calm, and tranquil." The Collins English Dictionary defines sedentary as "characterized by or requiring a sitting position, tending to sit without taking much exercise, moving about very little, and birds that are not migratory." The English word *sedentary* is derived from the Latin verb *sedere*, which means to sit. Sedentarism is frequently confused with inactivity, but there are clear differences in the meanings of each concept. Inactivity is defined in Webster's as "the state of being inactive or inert as in the inactivity of matter." An individual can be sedentary while being very mentally active, such as reading a book, playing a board game, or having a stimulating conversation while sitting at the dinner table. In contrast, an individual who is inactive is not disposed to action or effort, and is idle and not participating. For example, an individual who is sleeping, comatose, or anesthetized is considered inactive.

Using the search terms sedentary activity, sedentary behavior, sedentary lifestyle, sedentarism, functional physical activity, physical activity, and physical inactivity, over 200 publications were identified through a literature search in PubMed, ERIC, and CINAHL. Sedentarism was defined in a variety of ways by the disciplines of nursing, physical and occupational therapy, exercise physiology, medicine, anthropology, and education. However, the concept of sedentarism was repeatedly measured across disciplines in one of five ways: (1) objective measurements of total energy expenditure, (2) self-reported subjective perception of levels of inactivity and physical activity, (3) questionnaires to quantify level of inactivity and physical activity, (4) reporting and/or measurement of the level of physical activity performed during leisure time activities, and (5) amount of time spent in vigorous exercise.

Bernstein, Morabia, and Sloutskis (1999) studied 919 residents in Geneva, Switzerland, evaluating daily energy requirements and basal metabolism and postulated a definition of sedentarism. They proposed that individuals are sedentary when they expend less than 10% of their daily energy expenditure in the performance of moderate and high-intensity activities (at least four times the basal metabolism rate). They posited that it is not only the lack of daily physical activity (energy expended) that defines sedentarism, but in addition, the lack of intensity (metabolic equivalents) of the daily activities. Equations for determining basal metabolic rates were derived from the World Health Organization's 1986 Consensus Report, which provides a detailed list of basal metabolic rate multiples (WHO, 1986). According to Bernstein et al. (1999), individuals are considered sedentary if they do not perform at least 3 hr per week of endurance-type physical activity on a regular basis. By addressing minimal levels of intensity (metabolic equivalents) of physical activities, the Bernstein et al. definition may more appropriately define fitness rather than sedentarism, and is an important topic for future research.

Others have defined sedentarism using self-reports of the number of times and the intensity with which individuals participated in one or more predetermined physical activities (such as walking, gardening, running, swimming), and determined that sedentarism occurred when these specific physical activities were not performed at a predetermined threshold of intensity. According to Nelson, Reiber, and Boyko (2002), individuals were classified as sedentary if they did not engage in any of the following activities five or more times per week during the previous month: walking, jogging, bike riding, swimming, aerobics, dancing, calisthenics, gardening, and lifting weights.

In anthropology, sedentarism has been defined in a strikingly different way. For anthropologists, sedentarism describes cultural practices that are based on stationary patterns of human existence (colonization and nonmigratory). For example, individuals and groups that settle and remain in a geographic area for long periods of time are considered sedentary, in contrast to groups that move frequently and refuse to settle in any one country or geographic location, and are considered nonsedentary or nomadic (Scheinsohn, 2003).

Defining Attributes

Although sedentarism has been described and defined by many authors, as yet, there is no universal definition of the concept. Because sedentarism is often inferred from the absence of physical activity or persistent inactivity (Jebb & Moore, 1999), a review of the definitions of physical activity and physical inactivity assists in identifying some of the defining attributes. Physical activity is defined as any bodily movement produced by skeletal muscle that results in energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical inactivity has been defined as a state in which body movement is minimal (Deitz, 1996). These definitions highlight some important concepts that consistently appear in the literature concerning sedentarism. Energy expenditure, skeletal muscle use, and physical inactivity are key components of sedentarism. There is a critical threshold of energy expenditure and muscle use that when not met, leads to muscle atrophy, and the individual can be defined as sedentary. If there is caloric intake that exceeds energy expenditures, overweight and obesity result. Therefore, the defining attributes of sedentarism include

- Expending less than 10% of daily energy in the performance of moderate and high-intensity activities in which the metabolic rate increases at least four times from baseline (Bernstein et al., 1999)
- Not engaging in one or more of the following activities five or more times per week: walking, jogging, bike riding, swimming, aerobics, dancing, calisthenics, gardening, or weight lifting (Nelson et al., 2002)
- An inactive state in which there is minimal leisure time physical activity (Amisola & Jacobson, 2003)
- Not performing at least 3 hr per week of endurance-type physical activity in which the metabolic rate increases at least four times from baseline.

For the purposes of this paper, sedentarism is defined as not engaging in walking, jogging, bike riding, swimming, aerobics, dancing, calisthenics, gardening, or weight lifting five or more times per week. This definition offers an objective and clinically useful method of measuring sedentarism, and incorporates activity that occurs in the course of work and leisure. However, it is limited by the fact that the intensity and length of time the individual engages in an activity is not addressed in this definition. Recently, achieving 10,000 steps per day has received informal (deSa, 2001) and scientific (Hill, Wyatt, Reed, & Peters, 2003) support as an index for minimum level of physical activity to achieve energy balance. Wearing a pedometer has become popular internationally, particularly in Japan, where families incorporate step counts from daily activities such as housework, home-related activities, job-related walking, and leisure time activities to achieve 10,000 steps per day.

Sedentarism: A Concept Analysis

Model Case

Jim is a 19-year-old in his first semester of college life. He lives on campus in the freshman residence hall. He is a computer science major and spends 4 to 5 hr per day playing computer games and surfing the Internet in his room. After class, Jim usually does homework in the library or his room, taking a break for dinner in the all-you-can-eat cafeteria. Jim's residence is adjacent to the computer science building and he always uses the elevator to get to and from his classes. There is a cafeteria in the basement of the computer science building and Jim never skips a meal. He often snacks on vending machine foods, particularly when studying late at night. If not doing homework, Jim can be found either on his computer or watching the television is his room.

On the weekends, Jim spends all day playing computer games and doing homework in his room. Jim is often alone in his room because his roommate is a music major and spends many hours in the music building practicing on the saxophone. Jim has not gone to the physical fitness center since the beginning of the semester. Jim wanted to play intramural sports, but missed the deadline to sign up. He used to play baseball in high school but he was cut from the team in his junior year and has not played since. Jim notices that his pants have become much tighter since the semester started 3 months ago, and he frequently wears sweatpants to class and around the residence hall.

Borderline Case

Pasquale is a 70-year-old man who has been retired for 5 years. Since his wife died 2 years ago, he does not go out of the house often. The neighbors drop by to see him daily and to deliver any groceries or items he needs from the store. He has a car and a driver's license but the car remains in the driveway of his home for weeks at a time. Pasquale's favorite time of the year is the spring and summer when he tends to his garden of tomatoes, peppers, cucumbers, and eggplants. During the spring and summer, Pasquale waters the plants in the garden three times per week, pulls weeds daily, and stakes the plants as they begin to grow. During the late summer and fall harvest, he goes out early before the temperature gets too hot to pick the ripe tomatoes and vegetables, and frequently gives away many of the vegetables to his neighbors.

Antecedents

A common thread in sedentarism in adults and adolescents is a low level of self-efficacy for participation in physical activity. Qualitative and quantitative studies support the importance for goal achievement and sustained behavior change of an individual's belief and degree of confidence that they are capable of achieving the desired goal (Stutts, 2002; Trost, Owen, Bauman, Sallis, & Brown, 2002). A perception that one is incapable of becoming more physically active or unable to reduce caloric intake reinforces continued sedentary behavior. For example, lack of time, lack of childcare options, and lack of finances to participate in physical activity or eat a well-balanced diet.

A common thread in sedentarism in adults and adolescents is a low level of self-efficacy for participation in physical activity.

Behaviors such as time spent in front of a screen (TV viewing, computers, gaming devices), so-called screen time, place individuals at risk for sedentarism. Possible reasons for increased screen time, especially

among children, are accessibility of televisions, increased number of TV programs targeting children and adolescents, lack of monitoring of screen time by parents, lack of outdoor play areas, unsafe communities and playgrounds, and the planned use of television as a substitute for interaction with childcare providers or parents. Children and adolescents in the United States view an average of 3 hr of television each day, and the amount of time spent in front of computer, television, and game screens is increasing (Faith et al., 2001).

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Behaviors associated with sedentarism include sleeping, eating, standing still, sitting, television viewing, playing games involving a screen, working on a computer, talking on a phone, and riding in a train, plane, or car. The prevalence of screen time (TV, computer, screen games) has been studied the most and has been identified as the greatest single contributing factor to sedentarism (Deitz, 1996; Tudor-Locke & Myers, 2001).

A decision to be sedentary is based in part on individual access to active and sedentary alternatives and on one's motivation to become active in physical activities. Sedentarism is easy, whereas physical activity requires work and may be accompanied by some amount of discomfort and sweating. Little is known about what determines an individual's motivation to be physically active, but some individuals clearly enjoy participating in sports or other forms of physical activity. These behavioral differences are not unique to physical exercise and can be seen in many other preventive health areas such as eating, smoking, and substance abuse. There is some evidence that if environments are modified to increase the proximity and convenience of physical activity, individuals will be less sedentary (Speakman, 2004). In addition, in certain populations (children through young adult), it has been shown that if access to sedentary activities is removed or reduced (television, computers, and games on handheld devices), physical activity increases (Epstein & Roemmich, 2001).

Consequences

There are a number of severe health-related consequences of sedentarism. In a report from the National Institutes of Health on the identification and treatment of overweight and obesity, sedentarism was identified as a major risk for obesity, cardiovascular disease, and diabetes (U.S. Department of Health and Human Services, 2000). Sedentarism is reported to increase cancer risk as much as smoking does, and sedentarism has been associated with an increased incidence of breast, endometrial, prostate, colorectal, kidney, and gallbladder cancers. (Bergstrom, Pisani Tenet, Wolk, & Adami, 2001; McTiernan, 2000; Thune, 2000; Zhang, Xie, Lee, & Binns, 2004). In addition, sedentarism is a risk factor for skeletal and cardiac muscle atrophy (Ziemba et al., 2003).

Empirical Referents

Several techniques, including heart rate monitors, pedometers, and accelerometers, are available for the objective measurement of the level of physical activity. Heart rate monitoring relies on the linear relationship between heart rate and oxygen consumption and is not as robust at the lower (sedentary) end of the physical activity spectrum. Further, during sedentary periods, an individual's heart rate can be affected by factors other than body movement, including caffeine

and medications. Pedometers are used to estimate mileage walked or the number of steps taken over a period of time, and are limited by the inability to differentiate type, frequency, duration, and intensity of physical activity. Accelerometers measure the rate and magnitude of body mass acceleration during activity, and convert this into a quantitative measure of energy expenditure (Lamonte & Ainsworth, 2001; Sirard & Pate, 2001).

Under laboratory conditions, the doubly labeled water (DLW) method is the most accurate way to quantify energy expenditure over time. However, because of its expense and impracticality, DLW is not a useful method to measure sedentarism in the general population (Lamonte & Ainsworth, 2001).

Empirical evaluation of sedentarism extends beyond simply measuring the levels of physical activity and energy expenditure. Sedentarism is a multifaceted phenomenon, and is best studied using both quantitative and qualitative research methods to explore not only sedentary behavior, but also its physical, psychological, and social correlates.

Model of Sedentarism

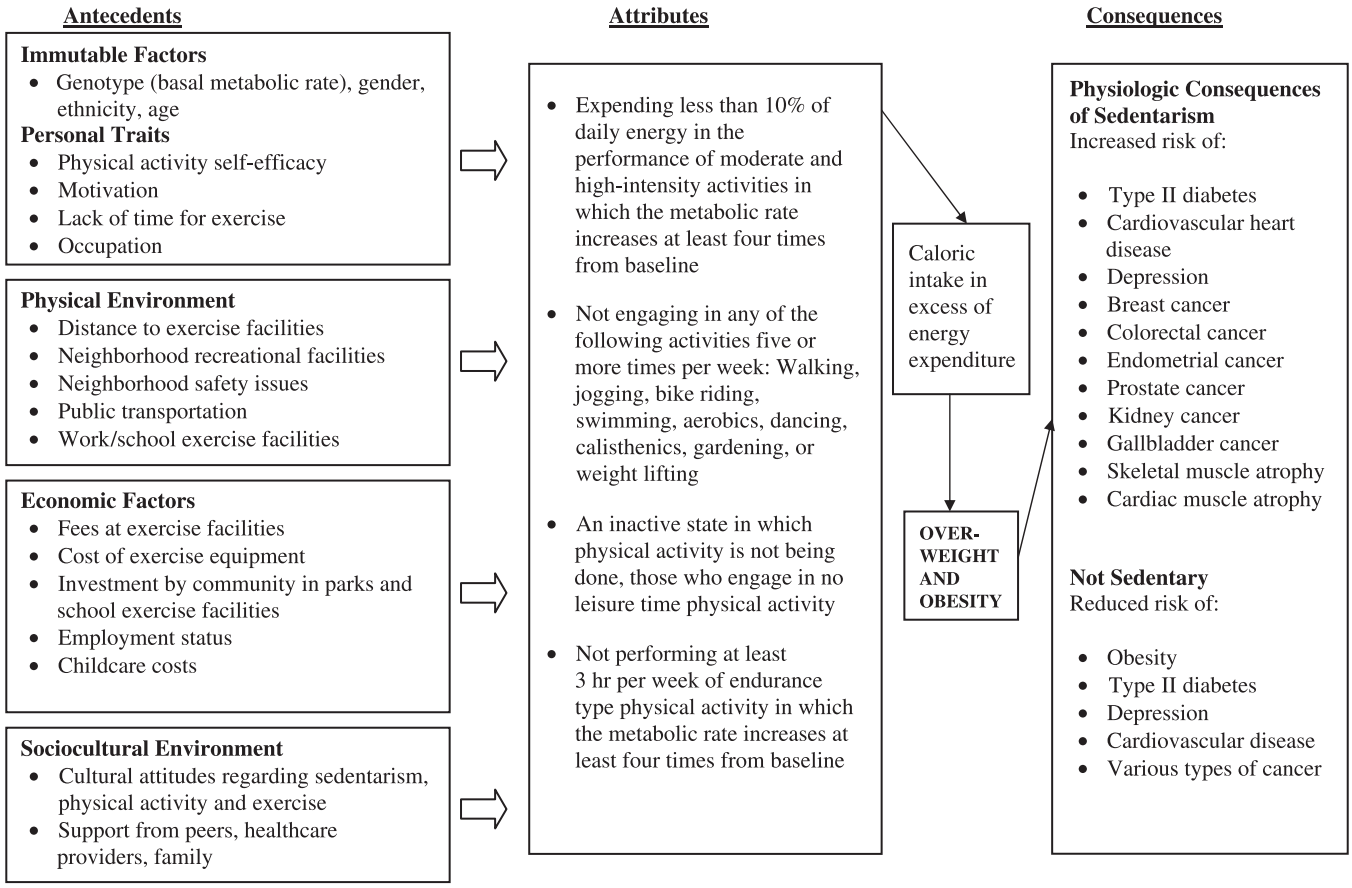
When examining the antecedents, attributes, and consequences sedentarism, a model of the concept can be depicted as in Figure 1.

Implications for Clinical Practice, Research, and Health Policy

For the past several decades, the average American adult and child have become increasingly sedentary, less physically fit, and more overweight and obese. In addition, sedentarism coupled with increased television viewing, with its well-designed commercials marketing high-fat and high-calorie foods, result in poor dietary habits, including more frequent snacking and a tendency to consume high-fat foods (Sothern et al., 1999). Interventions that decrease screen time and encourage the substitution of more physically active pastimes have the potential to both decrease sedentary behavior and decrease caloric intake, resulting in an equilibrium between caloric intake and energy expenditure. There is an abundance of research questions to be answered concerning the concept of sedentarism. For example, at what level of physical inactivity and muscle disuse does an individual develop critically diminished skeletal and cardiac muscle atrophy? What are the patterns of sedentary behaviors within the context of families, geographic location, socioeconomic status, culture, and ethnicity? What exercise and cognitive–behavioral intervention approaches, tailored to developmental group, level of fitness, body mass index, and ethnicity, most effectively help individuals move from sedentary to physical activity? What rewards and feedback mechanisms most effectively reinforce nonsedentary behaviors? For example, can pedometers or accelerometers be used to provide feedback in real time about individuals' level of sedentary behavior and help them set and achieve goals to become more active? What are model intervention approaches that address the economic, sociocultural, physical, and individual trait antecedents of sedentarism that gradually shape individuals' behavior toward including more activity in their daily life? For example, can television be used to help children and adults gradually become more active? What intervention programs targeted at the community level are effective in reducing sedentary behavior? In a society that is so sedentary, what have been the effects of removing physical education classes from the school curriculum? What are the effects of sedentary behavior on occupational and educational productivity? Does productivity in the workplace and at school increase when individuals participate in structured, individualized work, or school-based exercise programs that are integral to the work or school schedule?

Given the financial and human costs of sedentarism and the obesity epidemic, it is important that nurses begin to recognize, treat, and ultimately prevent sedentarism. However, more evidence is needed to design

Figure 1. Model of Sedentarism



best practice approaches. There is an urgent need to test the relationships proposed in this model of sedentarism and to further clarify the concept of sedentarism. Based on the model provided, instruments for evaluating sedentary behavior can be designed. These measures are critical to further theory development and research, and would have important applications in clinical practice.

Greater awareness and understanding of the concept of sedentarism are the foundation upon which nurses can develop ways to prevent and treat it. Practitioners can include discussions of an individual's typical day to help them identify time periods where they may consider incorporating activity. Practitioners can also suggest exercise approaches and programs that are tailored to lifestyle, economics, and current level of fitness and body mass index. Nurses can also provide information that even small activity changes (such as walking just 30 min a day) can make a meaningful change in fitness level and weight management.

In terms of health policy, prevention of sedentarism is a priority challenge for all healthcare providers. For example, in the model case regarding Jim, the college student, nurses can advocate for education regarding physical activity and dietary habits as part of the college entrance physical examinations, improved access to recreational and exercise facilities on campus such as having a exercise room within every residence hall or flexible hours in fitness centers, clean and decorative stairwells that encourage Jim to take the stairs rather than the elevator, an active intramural sports program, healthy food choices in the college dining facility, and programs that make healthy eating and physical activity an active part of the university message to students.

Given the financial and human costs of sedentarism and the obesity epidemic, it is important that nurses begin to recognize, treat, and ultimately prevent sedentarism.

In addition, nurses have an important role in advocating that prevention strategies be developed for all ages and segments of the population, including the underserved.

Prevention of sedentarism must occur early in the lifespan, since recent evidence suggests that sedentarism does not improve with age, and may in fact become more prevalent with the aging process (Hawkins, Cockburn, Hamilton, & Mack, 2004). Controlling and reversing the epidemic of sedentarism requires a multidimensional approach, with collaboration among pediatric and adult healthcare providers, city planners, policy makers, employers, the school system, and the media, entertainment, and food industries. The model of sedentarism provided in this paper can be used to develop a program of research. With further testing and refinement, this model can inform clinical nursing practice and assist nurses to shape public policy.

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