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Physical Activity Research in Nursing

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Abstract

Purpose: To present exemplars of physical activity research in nursing, illustrate the importance of physical activity research across the lifespan, and recommend directions for theory development and research.

Methods: Studies of physical activity and exercise currently being conducted by nurse investigators were reported and critiqued by attendees of the Midwest Nursing Research Society 2000 Preconference session entitled "Promoting Physical Activity Among Diverse Groups Across the Health Continuum." Physical activity and exercise literature during the past decade was reviewed. Databases searched included Medline, CINAHL, Wilson, and ERIC.

Findings: Investigators have emphasized the need to evaluate the effects of theory-based physical activity interventions designed to alter key correlates of physical activity identified through descriptive research.

Conclusions: Regular physical activity is necessary for health promotion and disease prevention for all populations. Continued research in this important area of health behavior is critical to identify the most effective interventions to increase physical activity among diverse populations.

Key words

physical activity, health promotion, intervention, exercise, nursing research

Levels of physical activity remain low in many countries, even though physical inactivity is one of the most prevalent risk factors for the development of obesity and cardiovascular disease (Popkin, Paeratakul, Ge, & Fengying, 1995; U.S. Department of Health and Human Services [USDHHS], 1996). In the United States (US) in 1997, only 20% of adolescents and 15% of adults reported engaging in at least 30 minutes of sustained physical activity, such as brisk walking, five or more times per week (USDHHS, 2000). Studies in Taiwan have shown that less than 50% of adults and only 25% of youth report regular physical activity (Huang, Chiang, Lan, Fang, & Kwei, 1991; Liu, 1995). In response to the prevalence of physical inactivity and escalating obesity, many countries are developing health promotion plans to address this problem. In the US, Healthy People 2010 includes the objective for both adolescents and adults to increase to at least 30% engaging regularly, preferably daily, in moderate activity for a minimum of 30 minutes per occasion.

Physical activity across the lifespan can be promoted by designing and testing theory-based interventions, and by identifying people or groups successful in adopting and maintaining regular moderate or vigorous physical activity (Conn, Valentine, & Cooper, 2000). A recent national survey showed that only 58% of 606 adult nurse practitioners reported routinely advising clients to engage in

moderate intensity physical activity for a total of 30 minutes on most days of the week (Burns, Camaione, & Chatterton, 2000). Although insufficient time was cited as a reason for lack of physical activity counseling, research indicates that counseling can be accomplished in a reasonable amount of time and that such counseling has positive effects on client physical activity levels (Bull & Jamrozik, 1998).

The purpose of this article is to present examples of physical activity research in nursing and to recommend directions for future theory development and research as a basis for improving physical activity counseling by nurses.

Nursing Research on Physical Activity

Examples of nursing research focused on increasing physical activity among children, adolescents, women in midlife, and older adults are presented in this section. These studies have been based on: social cognitive theory (SCT; Bandura, 1986; 1997), the theory of planned behavior (TPB; Ajzen, 1985), the transtheoretical model (TTM; Prochaska & DiClemente, 1984), and the health promotion model (HPM; Pender, 1996).

Physical Activity Research Among Children and Adolescents

Identification of the factors influencing physical activity among youth is prerequisite for design of effective interventions. In a recent comprehensive analysis of 108 studies, the correlates of physical activity among children ages 3-12 were: being male, having been active in the past, having parents who were not overweight, having a preference for active rather than sedentary pursuits, intending to be active, seeing few barriers to physical activity, consuming a healthy diet, reporting access to programs or facilities, and spending time outdoors. Among adolescents ages 13-18, being male, being White, being in early adolescence, perceiving self to be competent in physical activity, having been active in the past, intending to be active, engaging in community sports, sensation seeking, not being sedentary after school or on weekends, getting support from parents and peers, having active siblings, and having opportunities to be active were consistently associated with higher levels of physical activity (Sallis, Prochaska, & Taylor, 2000).

Harrell and colleagues (1999) examined the effects of interventions designed to reduce cardiovascular disease risk factors among third and fourth graders. Students in six schools were randomly assigned to each of the following groups: (a) a classroom-based intervention including all students in the two grades; (b) a risk-based approach which included only students at risk for health problems; or (c) a control group. All children in the classroom-based intervention participated in physical activity classes three times per week with 20 minutes of aerobic activity. In the risk-based intervention, only children at risk for cardiovascular disease participated in the classes. After the 8-week intervention, cardiovascular risk profiles were improved for both groups but the classroom-based intervention yielded greater health benefits for the overall population.

Frenn and Porter's (1999) program of research began with a qualitative study to understand perspectives of low- and middle-income urban adolescents regarding healthy eating and exercise. Words from the qualitative transcripts were used to indicate constructs of the HPM and TTM to be incorporated in the data collection instruments.

A group of culturally diverse urban middle-school students attended four 45-minute sessions to improve their nutrition and exercise. Interventions included becoming aware of the amount of physical activity needed for health and reflecting on one's current level of such activity. Benefits and barriers were addressed by brainstorming lists of benefits and by using group discussion to plan ways to overcome barriers the students had identified. Compared with pretest levels, posttest fat in food was significantly less for the intervention group compared with the control ($t=2.018$; $df\ 99$; $p=.046$). Duration of exercise also was significantly higher for the intervention group as compared with the control group ($t=2.925$; $df\ 81$; $p=.004$). Frenn concluded that schools are important environments for intervening with young people to promote active lifestyles.

Wu and Pender (in press) examined the determinants of physical activity among 939 Taiwanese junior high school youth 12-15 years of age as a basis for developing a culturally appropriate intervention based on the HPM to increase physical activity. Factors related to greater physical activity included social support from peers, positive perceived self-efficacy, greater perceived benefits and fewer perceived barriers to being physically active. An unexpected finding was that peers were the most important source of interpersonal influence to be physically active, even in a culture where parental expectations exert substantial influence on the behaviors of adolescents in academics and the arts. Wu concluded that intervention studies were needed among Taiwanese adolescents to determine the effects of augmenting peer support and role modeling of physical activity, increasing children's sense of competence (self-efficacy) in being active, raising consciousness of the benefits of activity, and decreasing social and environmental barriers to physical activity.

Physical Activity Research in Midlife Women

A recent literature review of intervention strategies directed at changing physical inactivity in community-based women showed that women benefited from strategies that provide external reinforcement to exercise delivered face-to-face or via telephone and prefer home-based to group-based programs (Krummel et al., 2001). Additionally, a literature review of the determinants of physical activity in ethnically diverse women indicated that ethnic and cultural background, health status, and past experience with physical activity influenced perceived barriers to being active (Eyler et al., 2001).

Based on findings with focus groups, Nies and colleagues contended that women should not be studied as a homogeneous group in physical activity research. Important differences include racial and ethnic backgrounds, obese and nonobese, healthy women and women with chronic conditions, and women above and below the poverty level (Brady & Nies, 1999; Nies, Buffington, Cowan, & Hepworth, 1998).

Results from work conducted by Wilbur and colleagues (1999) indicated that women might be able to achieve recommended levels of activity by combining occupational, household, and leisure activities. Findings showed that cardiovascular benefits, particularly for lipid profiles, may be obtained from even small increases in women's occupational activity. In another study by Wilbur, Miller, and Chandler (2001), strong beliefs in self-efficacy to overcome barriers to walking at the start of a home-based walking program were found to be unrealistic after participation was initiated. These findings showed that planned interventions were needed to assist both African American and Caucasian midlife women in overcoming unanticipated barriers to activity even when initial self-efficacy was high. Because

participants occasionally lapsed because of health and family circumstances, helping them to anticipate these lapses is important (Wilbur, Chandler, & Miller, 2001).

Physical Activity Research Among Older Adults

A high prevalence of physical inactivity exists among older adults despite the fact that appropriate intensity activity on a regular basis improves feelings of well-being, balance, strength, and endurance for activities of daily living (Shepherd, 1994). Older adults can achieve significant gains in cognitive and physical functioning as a result of participating in aerobic exercise and resistance training programs (Milesky, Topp, Wigglesworth, Harsha, & Edwards, 1994; Topp, Mikesky, Dayhoff, & Holt, 1996).

A recent meta-analysis indicated that older adults do increase physical activity in response to interventions, particularly those focusing exclusively on activity, incorporating self-monitoring, consisting of moderate intensity activity, and delivered in groups (Conn et al., 2000). The modest effect size across studies indicated that further development and testing of interventions is essential to increase physical activity among older adults.

Shin (1999) explored the effects of an outdoor walking program on cardiorespiratory function, flexibility, and emotional states of 27 elderly Korean women between the ages of 60 to 75 years. A pretest-posttest control-group design was used to assess the effects of the program. The women exercised at 40% to 60% of their target heart rate for 50-60 minutes three times a week on an outdoor track for a period of 8 weeks. Cardiorespiratory function as measured by maximal oxygen uptake (VO₂ max) and flexibility as measured by the "sit and reach" test showed greater improvement in the experimental compared to the control group. In the experimental group, as measured by the Profile of Mood States, anxiety and depression decreased and vigor increased significantly more than in the control group. Shin concluded that regular physical activity had highly important benefits for elderly Korean women in enhancing their functional capacity and positive emotional states.

Physical Activity Research With the Chronically Ill

Recent evidence from a meta-analysis showed that interventions targeted at chronically ill populations may be highly effective (Conn et al., 2000). Neuberger, Smith, Black, & Hassanein (1993) found that participants with rheumatoid arthritis receiving an intervention, which included practice time, nurse-patient contracting, and an individualized self-instructional program, scored significantly higher than did those not receiving the program on posttest knowledge of arthritis, demonstrations of range-of-motion exercises and joint protection practices, and use of joint protection practices at home.

In another study, participants with rheumatoid arthritis having moderate to high participation in a 12-week low-impact aerobic exercise program reported significantly less fatigue at the end of the exercise intervention than did those with low participation. Significant improvement in aerobic fitness and hand-grip strength was also noted along with a significant decrease in pain and time to walk a given distance. Of particular clinical significance is that the exercise did not worsen measures of disease activity (Neuberger et al., 1997). Results of a recent systematic review indicated that dynamic exercise therapy was effective in increasing muscle strength, joint mobility, and aerobic capacity with no adverse effect on disease activity and pain (Van den Ende, Vliet Vlieland, Munneke, & Hazes, 1998).

In a subsequent randomized clinical trial testing the same low-impact aerobic exercise program in a larger sample of clients with rheumatoid arthritis (N=175), Neuberger and colleagues (2000) found that the class-exercise and the homeexercise groups who completed the study during the first 3 years had functional improvements not seen in the control group. After 12 weeks of exercise (three times weekly) both the class-exercise and the home exercise groups decreased the number of seconds to walk 50 feet compared to the control group who increased the number of seconds to walk 50 feet. In addition, the exercise groups had increased leftgrip strength compared to the control group. Findings also indicated that exercise did not increase measures of disease activity, such as laboratory measures of inflammation sedimentation rate, C-reactive protein, and the total number of tender and swollen joints. These findings indicate further support that people with rheumatoid arthritis can participate in appropriate weight-bearing exercise without increasing disease activity. Data analyses continue on the 4 years of data collection for a total sample of 220 study participants with rheumatoid arthritis,

Recommendations for Research on Special Population Groups

Descriptive researcher has identified many key correlates of physical activity; however, less attention has been given to evaluating the effects of interventions designed to alter these variables. This section includes research recommendations to assist nurses in designing and testing interventions with various population groups to reduce the threat of sedentary lifestyles to public health.

Research on Children and Adolescents

Emphasis is currently being placed on beginning physical activity interventions early in life, preferably during the elementary school years, and continuing through the middle and high school years (Harrell et al., 1999). Parental support has been found to be a significant predictor of physical activity among children of all ages (Armstrong & Welsman, 1997). Research is needed on active lifestyle interventions for families with infants and preschool children. This approach would foster a developmental rather than a remedial approach to the promotion of physical activity. As children enter the school years, peers influence their level of physical activity (Anderssen & Wold, 1992). Promoting cooperative group activities may create peer pressure for participation (Armstrong & Welsman, 1997). School-based interventions have been found to be more effective than are interventions conducted outside the school setting (Contento et al., 1995). However, design and evaluation of innovative interventions is needed for after-school activity programs in schools, community organizations, neighborhoods, and homes (McKenzie, 1999). The appropriateness of integrating Internet-based physical activity assessment and counseling into schools, after-school programs, and clinics serving youth requires evaluation to determine the potential of computerbased interventions to promote active lifestyles.

Research on Women

Because more women than men report no leisure-time physical activity (USDHHS, 2000), interventions designed specifically for women are necessary. Among women, family and friend support has been found to be an important predictor of physical activity (Sallis, Hovell, & Hofstetter, 1992). The effectiveness of social support in sustaining desirable changes in physical activity deserves exploration.

Research is essential to test interventions designed for lesseducated and low-income women who tend to be less active (Dunn, 1996). These interventions must be culturally-specific and should be based on the women's needs and resources (Nies, Vollman, & Cook, 1998; 1999). Activities women participate in

most frequently, such as walking and dancing, do not require expensive equipment and can be done in and around the home (Wilbur, Holm, & Dan, 1993). Developing tailored physical activity interventions for diverse groups is imperative because a "one-size-fits-all" approach is obsolete with advances in information technology (Kreuter, Farrell, Olevitch, & Brennan, 2000). Future research is recommended to test strategies for increasing women's engagement in household, leisure time, and occupational physical activity that is moderate in intensity.

Research on Older Adults

A population-based random-digit-dialed survey showed prevalence of inactivity to be highest among adults aged 65 years and older. Neighborhood safety was identified as a major barrier to walking for exercise. A critical need exists to explore safe alternatives for promoting physical activity among older adults (Centers for Disease Control [CDC], 1999). Creative strategies for overcoming other reported barriers to physical activity, such as lack of time and access to convenient facilities, must also be incorporated into the design of interventions (Jones & Nies, 1996).

Further, the high intensity of some physical activity programs may discourage participation of older adults. Encouraging moderate activity for short periods at repeated intervals throughout the day is likely to be more attractive to older adults than are longer bouts of vigorous activity (Conn, Burks, Rantz, & Knudsen, in press). Two metaanalyses have indicated that interventions with less vigorous forms of exercise may result in greater changes in behavior (Conn et al., 2000; Dishman & Buckworth, 1996). However, vigorous physical activity provides even greater health benefits (USDHHS, 1996).

Currently, the trend is toward the development of multilevel interventions that incorporate individual, environmental, and policy components (Glasgow, Vogt, & Boles, 1999). For example, Internet capabilities can bring physical activity programs into an older adult's home, senior citizen centers can offer group activity programs, and city administrators can create natural, safe walking environments. Research is needed to evaluate the effectiveness of these ecologic interventions (Glasgow et. al., 1999).

Research on the Chronically III

Similar to healthy people, people with chronic conditions can derive clinically significant benefits from increasing physical activity. Research is needed to determine optimal physical activity interventions for people with chronic conditions. Some evidence indicates that the presence of a chronic illness may increase adult receptiveness to physical activity interventions (Conn et al., 2000). The long-term effects of aerobic exercise on disease progression and functional ability warrant investigation (Van den Ende et al., 1998). Limited knowledge exists about the proper exercise prescription in various phases of an illness (McArdle, Katch, & Katch, 1996). Longitudinal studies of the physiologic effects of exercise on chronic illness are needed. Evaluating the effectiveness of delivering physical activity prescription and counseling to people with chronic illness in clinical settings is another research priority.

New Directions for Physical Activity Research

Regular physical activity is essential to maintaining health and avoiding illness throughout the life span. A critical analysis of the findings of physical activity research to date indicates the following directions for theory development and research.

1. Develop and test theories of physical activity that integrate behavioral and biological sciences. Mapping of the human genome and other discoveries in the field of genetics will revolutionize the science of health promotion. Knowledge of the interaction of genetic factors with psychological and environmental factors is critical to understand individual variations in response to exercise as well as health benefits derived from regular physical activity (Bouchard & Perusse, 1994). Genetic factors may have variable effects on physical activity across the life span. Development of integrated models that include genetic characteristics of a person as well as other determinants of physical activity is a promising approach to achieve a better understanding of the complex mechanisms underlying adoption and maintenance of active lifestyles.
2. Focus investigations on the dynamics of behavioral development as well as on the process of behavioral change. Emphasis is shifting in physical activity research toward increased priority on understanding how patterns of physical activity develop early in life. Regular physical activity should be promoted during early childhood, preferably before the age of seven (Corbin, Dale, & Pangrazi 1999). Three reasons for this recommendation are: inactivity early in life correlates with sedentary adulthood (Raitakari et al., 1994); precursors of chronic disease such as coronary heart disease and osteoporosis start at a young age (Corbin, Dale, & Pangrazi, 1999; Harrell et al., 1999), and behaviors learned early in life, such as inactivity, persist and are difficult to extinguish. Research findings have shown that behavioral change is a difficult process and that many adults who repeatedly initiate regular physical activity are unable to maintain it over time to reap health benefits. Thus, nurse researchers should develop multigenerational physical activity programs for children and parents and test their effectiveness in maintaining active lifestyles.
3. Evaluate the efficacy of interventions focused on adoption of moderate and vigorous activity. Consistent epidemiologic findings indicate that some protection from cardiovascular diseases and a reduction in all-cause mortality can be derived from regular participation in short bouts of moderate-intensity physical activity (Jakicic, Wing, & Butler, Robertson, 1995). These findings illustrate the value of increasing physical activity among people who consider vigorous activity as exhausting or aversive. Moderate activity, once adopted and enjoyed, may lead to regular participation in more vigorous physical activity to achieve even greater health benefits (USDHHS, 1996). Longitudinal investigations to explore the levels of intensity required to produce positive health outcomes are essential to prescribe appropriate activity for people of varying age, weight, and fitness.
4. Test the effectiveness of tailored interventions to promote increased activity among people of diverse cultural backgrounds, particularly those most vulnerable. Tailored health communications, an innovative and promising educational strategy, enables the development of highly individualized messages for generating behavioral change (Scharff, Homan, Kreuter, & Brennan, 1999). Use of tailored health communications for interventions is strongly recommended because materials designed for the general population may be perceived as irrelevant by subgroups (Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). Tailored interventions may include a range of technologies, such as printed materials, touch-tone telephones, television, beepers, computers, the World-wide Web, video games, and virtual reality (Marcus et al., 1998). To address health disparities, researchers must design user-

friendly messages based on culture, language, literacy, and developmental level. In this way, physical activity counseling can be appropriate to the person and the life context. Tailored interventions may be much more effective than nontailored interventions in facilitating the adoption and maintenance of an active lifestyle.

5. Evaluate the effectiveness of physical activity interventions. Efficacy-based research has the disadvantage of oversimplifying reality with homogeneous samples and highly standardized interventions in rigorously controlled settings. Although efficacy-based studies can provide valuable information about what interventions actually change behavior, they are of limited value in capturing information about how well the intervention works in complex, imperfect, and uncontrolled real-world settings. Effectiveness is the product of using efficacious physical activity interventions and integrating those interventions into preventive service delivery systems. Counseling prompts for clinicians, databases for tracking interventions, follow-up protocols, and ready availability of educational materials are all critical to enable effective delivery of interventions to promote physical activity (Glasgow et. al., 1999). Increased research on effectiveness will promote identifying practical interventions that can be integrated efficiently into busy clinical or community health care settings.
6. Focus research on both short-term and long-term effects of interventions. Few researchers follow participants longer than 1 year and many studies include participants for only 3 to 6 months to determine the effectiveness of physical activity interventions. Many follow-up investigations of physical activity indicate that the desired behavior ends shortly after the intervention is terminated (USDHHS, 1996). These findings indicate a critical area for nursing research-how to assist people to maintain adequate levels of physical activity over time. Design of strategies that enable health care providers to promote long-term maintenance of physical activity is a priority, along with evaluation of long-term health outcomes of varying levels of physical activity. Nursing research can also determine if maintaining regular physical activity over time results in less likelihood of adopting or continuing damaging behaviors, such as smoking, alcohol use, or unhealthy eating.
7. Compare the effectiveness of ecological, multiple-level, and individual-level interventions. Policy and environmental interventions for promoting physical activity have great potential for increasing the physical activity levels of large population groups. Networking with the leadership of various organizations as well as key community leaders, professionals, and lay volunteers is crucial to implementing comprehensive change (Sallis & Owen, 1999). A critical need exists for researchers to evaluate the effectiveness of these ecologic interventions for their public health or population-based effects (Glasgow, Vogt, & Boles, 1999).

Conclusions

Accumulating research findings indicate that one important strategy for assisting people from diverse cultural and socioeconomic backgrounds to achieve and maintain health is promoting adequate levels of regular physical activity. The work of many researchers from nursing and other disciplines has provided important information for the design of physical activity interventions for various population groups. Continued research is needed to identify the most effective theory-based physical activity interventions for evidencebased nursing practice in clinical and community settings.

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