

Determinants of Employee Participation in Physical Activity

Critical Review of the Literature

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RESEARCH ABSTRACT

The purpose of this article is to provide a review of research literature related to factors that influence employee participation in physical activity. Eleven published studies investigating physical activity in samples of adult employees were included in this review. Across these studies, self-efficacy, or belief in personal ability to perform this health behavior, was the best predictor of physical activity among employees. Perceived benefits of physical activity and perceived health status were also found to influence participation in physical activity. Occupational health nurses could offer self-care classes and intervention programs that assist employees in improving their perceptions of self-efficacy to perform physical activity. Additionally, occupational health nurses should continue to reinforce the benefits of physical activity in all health promotion venues.

Regular physical activity is an important component of a healthy lifestyle that improves not only physical but also psychological health (Sullum, Clark, & King, 2000). Physical health benefits of regular physical activity include increased muscle and bone strength, decreased body fat, improved weight control, and aerobic fitness (Volek, Vanheest, & Forsythe, 2005; Vuori, 1998). Regular physical activity also enhances a sense of well-being, reduces the risk of developing depression and anxiety, and improves mood (U.S. Department of Health and Human Services, 2000). Physical activity has been demonstrated to improve the health status of individuals with diabetes, hypertension, congestive heart failure, obesity, and depression (Brunet, Plotnikoff, Raine, & Courneya, 2005; Coats, 2005; Sallis & Owen, 1999; Stewart et al., 2005). Physical activity is defined as all movements involving large muscle groups of the body; exercise is considered a subset of physical activity (Sallis & Owen, 1999).

Despite the enormous benefits of regular physical

activity, much of the U.S. population remains sedentary (Marcus, King, Clark, Pinto, & Bock, 1996; Sallis & Owen, 1999). The U.S. Department of Health and Human Services (2000) reported that only 15% of adults in 1997 engaged in the recommended type, duration, and intensity of physical activity (occupational, lifestyle, and leisure-time activities) and 40% of adults did not engage in leisure-time physical activity. The 1990 National Health Interview Survey of adult employees found that approximately half reported no leisure-time physical activity and more than half reported no strenuous physical activity during the workday (Centers for Disease Control and Prevention, 2000).

Determinants of employee participation in physical activity have not been the focus of previous literature reviews. Understanding the factors related to physical activity (occupational, lifestyle, and leisure-time activity) among employees is essential to establishing effective intervention programs. The design of intervention programs must be based on knowledge of factors that influence employee adoption of physical activity.

This article provides a detailed review of the latest research literature related to factors that influence the level of employee participation in physical activity. Through an analysis of studies and a discussion of implications for occupational health research and practice, the review will

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Applying Research to Practice

Although the benefits of physical activity are generally known, questions remain about how best to increase employee participation in physical activity. Occupational health nurses are in an excellent position to motivate employees to adopt healthy lifestyles. Understanding factors that influence physical activity may give occupational health nurses direction in assessing employees' beliefs about their capacity to perform physical activity. In addition, occupational health nurses can use this information to develop pilot programs and projects promoting employee physical activity.

add new understanding about the factors that influence employee participation in physical activity.

METHODS

Relevant articles from Medline and the Cumulative Index to Nursing and Allied Health Literature were identified using the key words "physical activity," "exercise," "employee," "workers," "working adult," and "employed adult." Articles meeting the following criteria were included:

- Published in English between 1990 and 2002.
- Studies were descriptive.
- Participants were adult employees.
- Determinants, factors, or variables related to physical activity or exercise participation were examined.

Eleven studies met the inclusion criteria. A summary of the sample, study design and procedures, instruments, theoretical framework, and major findings from each of the 11 studies is provided in the Table. The studies varied by sample size, sample characteristics, cognitive-psychosocial variables measured, and instruments used. In addition, the studies used different definitions and measures of physical activity (Table). Findings are discussed according to the major categories of physical activity determinants, and factors associated with inconsistencies in study findings are identified.

RESULTS

Physical Activity Measures

Measures of physical activity varied in the 11 studies. Three studies (Biddle, Goudas, & Page, 1994; Blue, Wilbur, & Marston-Scott, 2001; Boutelle, Murray, Jeffery, Hennrikus, & Lando, 2000) used the Leisure Time Exercise Questionnaire developed by Godin and Shephard (1985). In this questionnaire, respondents indicate the number of times per week they engage in strenuous, moderate, or light activity. A total activity score is calculated by multiplying strenuous responses by 9, moderate responses by 5, and light responses by 3. The weightings correspond to metabolic equivalents (METs). No validity and reliability data were reported in the studies by Biddle

et al. and Boutelle et al. The study by Blue et al. (2001) reported a concurrent validity of 0.64, with physical fitness criteria and test-retest reliability of 0.96 for strenuous activity, 0.46 for moderate activity, 0.48 for light activity, 0.74 for total energy expenditure, and 0.64 for the entire measure. Two other studies (Duffy, Rossow, & Hernandez, 1996; Pender, Walker, Sechrist, & Frank-Stromborg, 1990) used the Health Promoting Lifestyle Profile (Walker, Sechrist, & Pender, 1987) to measure exercise. This instrument included a 5-item exercise subscale with a reported reliability of 0.86. Responses on a Likert scale ranged from 1 ("never") to 4 ("routinely").

Another study (Desmond, Conrad, Montgomery, & Simon, 1993) used a 21-item index of work, leisure, and sports activity (Baecke, Burema, & Frijters, 1982). Items were answered on a 5-point scale of "never" to "always," and an overall physical activity score was calculated by totaling the three scales. Test-retest reliability was 0.88 for the work scale, 0.81 for the sports scale, and 0.74 for the leisure scale.

The Nurses' Health Study Activity Questionnaire (Wolf et al., 1994) was used to measure physical activity in a study by Piazza, Conrad, and Wilbur (2001). Frequency and duration of 8 vigorous activities and 4 sedentary activities were reported for 1 week. METs were calculated for each activity multiplied by frequency then summed, resulting in a total activity score of METs per week. Construct validity was established by correlating the Nurses' Health Study Activity Questionnaire with self-report recall (0.79 to 0.83) and activity diaries (0.59 to 0.62). No reliability data were reported.

Burn, Naylor, and Page (1999) used a physical activity index consisting of 4 items with 5-point Likert scales. The items measured walking for relaxation, exercise that causes exertion, participation in other sport or fitness activities, and participation in active hobbies. A test-retest reliability of 0.96 during a 2-week period was reported.

Three studies (Burton & Turrell, 2000; Gebhardt & Maes, 1998; Rabinowitz, Melamed, Weisberg, Tal, & Ribak, 1992) used investigator-developed instruments to measure physical activity. Burton and Turrell (2000) asked participants to report walking, moderate exercise, and vigorous exercise in the past 2 weeks. A score was calculated by multiplying the number of sessions performed by the average time of each session by the intensity in METs (3.5 = low; 5 = moderate; and 9 = highest or vigorous). The instrument used in the study by Gebhardt and Maes (1998) measured respondent participation in leisure-time physical activity. With an affirmative response, the respondent also reported frequency and duration and was classified as a non-exerciser with no reported exercise, exercising for less than 20 minutes per session, or exercising for 20 minutes or more at least 3 times per week. Rabinowitz et al. (1992) developed an instrument that required respondents to indicate on a 6-point scale their weekly exercise from "no leisure exercise" to "more than 2 hours per week." No reliability and validity assessments were reported on the instruments developed by the investigators in the three studies.

Eight of the studies used standardized instruments with adequate psychometric properties to measure physical ac-

Table
Studies of Factors Influencing Physical Activity Participation Among Employees

| Study | Sample Characteristics | Study Design | Instruments | Theoretical Framework | Major Findings |
|--------------------------|---|---|--|---------------------------------------|---|
| Pender et al. (1990) | <i>N</i> = 589: 318 men, 271 women; full-time clerical, operations, and managerial employees in the Midwest (enrolled in workplace health promotion programs); mean age = 38 years (<i>SD</i> = 10.1 years); 83% white; 65% married; 35% to 37% with family income of \$20,000 to \$60,000; 83% attended and 50% completed college | Descriptive, cross-sectional study; questionnaires completed on-site at the study's start and 3 months after initial testing and enrollment in a health-promoting program | Demographics: age, gender, marital status, education, and income; six cognitive–psychosocial variables: importance of health (Health Value Survey), <i>TR</i> = 0.92; perceived control of health (internality, powerful others [externality], and chance [externality]), <i>IC</i> = 0.84 to 0.85; perceived personal competence, <i>TR</i> = 0.80 and <i>IC</i> = 0.78; definition of health (wellness and clinical), <i>TR</i> = 0.84 and <i>IC</i> = 0.89 to 0.95; perceived health status and behavioral factors, <i>TR</i> , <i>IC</i> , and <i>V</i> not reported; and HPLP (self-actualization, health responsibility, exercise, nutrition, interpersonal support, and stress management subscales): total scale, <i>TR</i> = 0.93 and <i>IC</i> = 0.93; subscales, <i>TR</i> = 0.81 to 0.91 and <i>IC</i> = 0.68 to 0.89 (<i>V</i> not reported) | Health Promotion Model (Pender, 1987) | 31% of the variance in HPLP was explained by the importance of health, perceived personal competence, definition of health, perceived health status, perceived control of health, demographics, and behavioral factors at initial testing; 25% of the variance in HPLP obtained 3 months after testing was explained by the initial measures of cognitive–perceptual and modifying variables. |
| Rabinowitz et al. (1992) | <i>N</i> = 46: 9 men, 37 women; blue collar employees of a manufacturing plant; mean age = 34.6 years (range = 17 to 54 years) | Descriptive, correlational, cross-sectional study; questionnaires completed on-site | Four cognitive–psychosocial variables: beliefs, exercise self-efficacy, health locus of control, and the life orientation test (<i>TR</i> , <i>IC</i> , and <i>V</i> not reported); leisure-time exercise and dietary practices (<i>TR</i> , <i>IC</i> , and <i>V</i> not reported) | Social Cognitive Theory | Pearson correlations between engagement in leisure-time exercise and beliefs in the contribution of exercise activity to health and to a general feeling of well-being were <i>r</i> = 0.34 and <i>r</i> = 0.45, respectively; none of the other predictor variables correlated significantly with leisure-time exercise. |

Table

Studies of Factors Influencing Physical Activity Participation Among Employees (Continued)

| Study | Sample Characteristics | Study Design | Instruments | Theoretical Framework | Major Findings |
|-----------------------|---|--|--|---------------------------------------|---|
| Desmond et al. (1993) | <i>N</i> = 325; male employees at a large Midwestern public utilities company; mean age = 37.5 years (range = 20 to 62 years); fewer than 1% with < 12 years of education; 83% annual income \geq \$40,000; 70% physical job and 25% management | Descriptive, cross-sectional study; questionnaires completed on-site | Demographics: age, education, income, and job category; three cognitive-perceptual factors: perceived health status (TR and IC not reported); physical self-efficacy scale, IC = 0.61 to 0.84; and perceived barriers, IC = 0.66 to 0.85 (V not reported for any variable); three types of physical activity: work index, leisure-time index, and sports activity index, TR = 0.74 to 0.88 | Health Promotion Model (Pender, 1987) | Approximately 30% of the variance in overall physical activity was explained by job category and self-efficacy; 56% of the variance in occupational activity was explained by income and job category; 6% of the variance in sports activity was explained by perceived health status; approximately 14% of the variance in leisure-time activity was explained by self-efficacy and job category. |
| Biddle et al. (1994) | <i>N</i> = 131: 63 men, 68 women; full-time employees on university campus; age and occupational group not reported | Descriptive, cross-sectional study; questionnaires using mail survey | Seven cognitive-psychosocial variables: intention, IC = 0.94; perceived control, IC = 0.81; self-efficacy, IC = 0.91; attitude, social norms, benefits, and barriers, TR and IC not reported (V not reported for any variable); and self-report physical activity: work activity, home, and free-time activities in average week (TR, IC, and V not reported) | Theory of Planned Behavior | 32% and 38% of variance in strenuous physical activity were explained by all seven cognitive-psychosocial variables for women and men, respectively; intention and self-efficacy were the best predictors of strenuous physical activity for women and intention and attitude for men; attitude, perceived control, benefits, and self-efficacy were the best predictors of intention for women; attitude was the best predictor for men. |

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| <p>Duffy et al. (1996)</p> | <p>N = 397 full-time (91%) or part-time employed Mexican American women (working outside the home); mean age = 36 years (range = 19 to 70 years); 85% high school or more; 56.7% married; average annual income, \$29,000; 44% registered nurses or allied health workers</p> | <p>Descriptive, cross-sectional study; questionnaires using mail survey</p> | <p>Demographics: age, education, marital status, annual household income, and occupational status; three cognitive-psycho-social variables: Multidimensional Health Locus of Control Scale-Form A, IC = 0.67 to 0.84; current health (health perception questionnaire), IC = 0.84; self-efficacy, IC = 0.70 to 0.94 (all variables, V not reported); and HPLP (self-actualization, health responsibility, exercise, nutrition, interpersonal support, and stress management subscales): total scale, IC = 0.94; subscales, IC = 0.76 to .0.91; V reported (factor analysis: six major components accounted for 47.1% of the variance and one major factor, health-promoting lifestyle, was identified)</p> | <p>Not stated</p> | <p>Participants who had higher levels of personal belief in their competency, good to excellent current health, and personal control of their health (regardless of age, education, marital status, income, or occupation) were more likely to report regular practice of all health promotion activities; participants who had poor health, older age, less education, and a belief that powerful others were in control of their health reported less frequent practice of regular exercise.</p> |
| <p>Gebhardt & Maes (1998)</p> | <p>N = 980; the care staff of 7 nursing homes in the Netherlands; gender, age, or other demographics not reported</p> | <p>Descriptive, cross-sectional study; questionnaires completed on-site</p> | <p>Leisure-time exercise measured using frequency and duration of exercise per week: activities outside of the home and in the home, social activities, and self-development activities developed by investigators; personal goals within each of the domains of activities measured using instrument developed by investigators (all variables, TR, IC, and V not reported)</p> | <p>Health Belief Model</p> | <p>Non-exercisers reported more activities in the home conflicted with exercise ($F_{2,977} = 6.22; p < .01$); both non-exercisers and those who exercised < 3 times a week assumed that exercising at the norm would interfere with more social activities than those who already exercised at the norm ($F_{2,977} = 9.45; p < .01$); non-exercisers expected more activities to be hindered by exercise at the norm than those who exercised at the norm ($F_{2,977} = 3.13; p < .05$).</p> |

Table
Studies of Factors Influencing Physical Activity Participation Among Employees (Continued)

| Study | Sample Characteristics | Study Design | Instruments | Theoretical Framework | Major Findings |
|------------------------|---|--|---|----------------------------------|---|
| Burn et al. (1999) | <i>N</i> = 709: 249 men, 460 (65%) women; employees from a government office in Britain; mean age = 39 years (<i>SD</i> = 10.97 years); mean BMI = 24.27 kg/m ² (<i>SD</i> = 3.69 kg/m ²); adjusted means and <i>SD</i> s: age (precontemplation = 45 ± 10 years, contemplation = 41 ± 11 years, preparation = 39 ± 10 years, action = 34 ± 11 years, maintenance = 38 ± 11 years) | Descriptive, cross-sectional study; questionnaires completed on-site | Stage-of-exercise behavior scale, <i>TR</i> = 0.78, <i>V</i> reported with a Seven-Day Recall Physical Activity Questionnaire; exercise self-efficacy, <i>TR</i> = 0.90; physical activity index, <i>TR</i> = 0.96; dietary habits (5-item standard instrument); smoking and alcohol use (single item); stress (anxiety and depression from Goldberg inventory) (<i>TR</i> , <i>IC</i> , and <i>V</i> not reported); BMI; blood pressure (sphygmomanometer); blood cholesterol (finger-prick test using a handheld Accutrend meter [Boehringer Ingelheim, Ingelheim, Germany]); urine tested for the presence of sugar, blood, and protein with urine test strip | Transtheoretical Model of Change | Significant differences were found among stages of change for BMI, aerobic exercise, dietary habits, exercise self-efficacy, and stress when controlling for age; participants in the precontemplation stage reported a significantly lower level of aerobic activity than did those in the action stage. Similarly, a significant difference was found between the contemplation and maintenance stages; dietary habits and exercise self-efficacy differed significantly across the stages. |
| Boutelle et al. (2000) | <i>N</i> = 9,043: 4,136 men, 4,907 women; employees in 24 worksites in the Minneapolis–St. Paul metropolitan area; demographics of men and women described by quartile of leisure-time exercise | Descriptive, cross-sectional study; questionnaires completed on-site | Demographics: weight status (defined by BMI), age, education, job category (professional, white collar, or blue collar), marital status, and ethnicity; other health behaviors: fat consumption (Block Fat Screener), stress (Perceived Stress Scale), smoking behavior, daily alcohol use, seat belt use, and health; leisure-time physical exercise (Leisure Time Exercise Questionnaire) (<i>TR</i> , <i>IC</i> , and <i>V</i> not reported for any variable) | Not stated | Both gender participants in the highest activity quartiles were more educated and younger. Men with high levels of activity were more likely to be unmarried; higher levels of leisure-time exercise were positively associated with seat belt use and negatively related to smoking, dietary fat intake, reported stress, and obesity; leisure-time exercise was positively associated with daily alcohol use for women. |

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|-------------------------|---|--|---|---------------------------------------|--|
| Burton & Turrell (2000) | N = 24,454: 55% men, 45% women (Australian); age range, 18 to 64 years; blue collar: 18% women, 48% men; white collar: 52% women, 16% men; professional: 30% women, 36% men; most worked \geq 30 hours per week | Descriptive, cross-sectional study; secondary analysis of data collected during face-to-face interviews using questionnaires | Demographics: occupation (professional, white collar, or blue collar) and hours worked; confounding and mediating variables: living arrangement, smoking status, BMI, self-reported health, and age; leisure-time physical activity: walking, moderate exercise, and vigorous exercise classified into groups: insufficiently active and sufficiently active for health (TR, IC, and V not reported for any variable) | Not stated | Most participants were classified as having insufficient activity (67.7%); the rate of insufficient activity was higher for women than for men; those in blue collar occupations were 71% more likely to be classified as insufficiently active for health. |
| Piazza et al. (2001) | N = 225; female AAOHN members in a Midwestern state; mean age = 47.7 years (range = 27 to 71 years); 51.5% occupational health nurses, 18.4% nurse managers; 1.5% to 7.3% positions such as staff nurses and coordinators; most had a family income of \geq \$40,000 | Descriptive, cross-sectional study; questionnaires using mail survey | Demographics: age, employment position, education, and income; two cognitive-psychosocial variables: physical self-efficacy, TR = 0.69 to 0.85 and IC = 0.61 to 0.84; and perceived health locus of control (internal, powerful others, and chance health locus of control), IC = 0.67 to 0.77; exercise behavior measured using the NHS Activity Questionnaire, V ($r = 0.59$ to 0.83, NHS Activity Questionnaire and past week recall as well as activity diary) | Health Promotion Model (Pender, 1987) | Approximately 7% of the variance in exercise was explained by age, self-efficacy, and health locus of control; age and self-efficacy had significant negative and positive effects on exercise behavior, respectively, but perceived health locus of control was not significant. |
| Blue et al. (2001) | N = 468; 73% men; 98.7% full-time, employed in skilled craft, service, maintenance, storage, transportation, or custodial services departments of a Midwestern state university; mean age = 44.1 years (range = 20 to 69 years); 67.4% married; 94.7% white; 90% had completed high school and 20% had completed some college | Descriptive, cross-sectional study; questionnaires completed at meeting or returned by campus mail | Four cognitive-psychosocial variables: indirect attitude, IC = 0.74, and direct attitude, IC = 0.90; indirect subjective norms, IC = 0.77, and direct subjective norms, IC not reported; indirect perceived control, IC = 0.86, and direct perceived control, IC = not reported; and intention, TR, IC, and V not reported; Leisure Time Exercise Questionnaire, TR = 0.46 to 0.94, V = significant association with physical fitness criteria | Theory of Planned Behavior | 61.7% of the variance of intention was explained by attitude toward exercise and perceived behavioral control; 51.3% of the variance of exercise behavior was explained by intention and perceived behavioral control; subjective norm was not a significant predictor of intention to exercise. |

TR = test-retest reliability; IC = internal consistency (alpha); V = validity; HPLP = health-promoting lifestyle profile; AAOHN = American Association of Occupational Health Nurses, Inc.; NHS = Nurses' Health Study; BMI = body mass index.

tivity. Three studies used investigator-developed instruments without reliability and validity assessments. The Leisure Time Exercise Questionnaire, developed by Godin and Shephard (1985), was the most frequently used measure, although it was used in only three of the studies.

Theoretical Framework Contributing to Determinants of Physical Activity

Eight of the studies identified a theory or model as an organizing framework. The models or frameworks were Pender's Health Promotion Model (3 studies), Theory of Planned Behavior (2 studies), the Transtheoretical Model of Change (1 study), the Health Belief Model (1 study), and Social Cognitive Theory (1 study).

In three studies (Desmond et al., 1993; Pender et al., 1990; Piazza et al., 2001), the Health Promotion Model (Pender, 1987) was specified as the theoretical framework. The 1987 version of the Health Promotion Model identified cognitive perceptual factors in the individual that, when modified by situational, personal, and interpersonal characteristics, result in participation in health-promoting behaviors, including physical activity. The reviewed studies based on the Health Promotion Model focused on different variables selected from the model as determinants of physical activity participation, including importance of health, perceived control over health, perceived self-efficacy, definition of health, perceived health status, behavioral factors, and perceived barriers. However, revisions in the Health Promotion Model in 1996, after the 1987 version was tested and the results were analyzed, resulted in the deletion of importance of health and perceived control over health (Pender, 1996). Definition of health and perceived health status were repositioned in the model and included in a category of personal factors.

Biddle et al. (1994) and Blue et al. (2001) used the Theory of Planned Behavior (Ajzen, 1988) as a theoretical framework. The Theory of Planned Behavior proposes that participation in physical activity is predicted by a measure of intention to engage in physical activity that, in turn, is predicted by attitudes toward physical activity, social norms toward engaging in physical activity, and perceived behavior control (Blue, 1995).

Burn et al. (1999) used the Transtheoretical Model of Change (Prochaska & Velicer, 1997), which suggests that an individual's current behavioral status is associated with a personal intention to change or maintain behavioral patterns (Marcus et al., 1996). The Transtheoretical Model of Change describes the following stages of motivational readiness to adopt exercise or other behaviors:

- Precontemplation (not thinking about changing).
- Contemplation (thinking about changing).
- Preparation (ready to change).
- Action (actively engaged in change).
- Maintenance (sustaining change over time) (Marcus, Rossi, Selby, Niaura, & Abrams, 1992).

Burn et al. (1999) explored the relationship between individuals' motivational readiness to adopt exercise and coronary heart disease risk factors.

The Health Belief Model (Becker, 1974) was used by Gebhardt and Maes (1998) as an explanatory framework

for determining the role of personal goals and perceived barriers to physical activity participation. The Health Belief Model proposes that health behaviors are influenced by the individual's perceived susceptibility to developing health problems, the perceived seriousness of the health problems in relation to the individual's quality of life, the individual's belief in the benefits of the health behavior, and the individual's perception of barriers to the behavior.

Rabinowitz et al. (1992) used Social Cognitive Theory (Bandura, 1977) to examine personal determinants of leisure-time exercise. The Social Cognitive Theory suggests that behavior change and maintenance of that behavior are a function of efficacy expectation or self-efficacy (i.e., individuals' beliefs in their capability to perform certain behaviors) and outcome expectations (i.e., individuals' beliefs in the behavior-outcome relationship) (Bandura, 1977). Exercise self-efficacy was a major variable studied by Rabinowitz et al. (1992).

The models or theoretical frameworks used most frequently in the studies were the Health Promotion Model and the Theory of Planned Behavior. Although different theoretical frameworks have been applied in the reviewed studies, no theory or model is sufficient to thoroughly explain physical activity behavior. Further research is needed to contribute to development of a comprehensive theory or model to predict physical activity behavior.

DETERMINANTS OF PHYSICAL ACTIVITY PARTICIPATION

Demographics

Several studies examined the association between the level of physical activity and demographics such as age (Boutelle et al., 2000; Burn et al., 1999; Burton & Turrell, 2000; Desmond et al., 1993; Duffy et al., 1996; Pender et al., 1990; Piazza et al., 2001), gender (Boutelle et al., 2000; Burton & Turrell, 2000; Pender et al., 1990), ethnicity (Boutelle et al., 2000), marital status (Boutelle et al., 2000; Burton & Turrell, 2000; Duffy et al., 1996; Pender et al., 1990), income (Desmond et al., 1993; Duffy et al., 1996; Pender et al., 1990), education (Boutelle et al., 2000; Desmond et al., 1993; Duffy et al., 1996; Pender et al., 1990), hours worked (Burton & Turrell, 2000), and job category (Boutelle et al., 2000; Burton & Turrell, 2000; Duffy et al., 1996).

Five of the seven studies that examined age as a predictor variable found that the level of physical activity decreased with age (Boutelle et al., 2000; Burn et al., 1999; Burton & Turrell, 2000; Duffy et al., 1996; Piazza et al., 2001). These studies included male and female workers, except the studies by Duffy et al. (1996) and Piazza et al. (2001), which included only female workers. Burn et al. (1999) examined the relationship between age and an individual's motivational readiness to adopt exercise among British government office employees and found the stage of motivational readiness to exercise varied significantly by age. Individuals who did not think about adopting exercise were more likely to be older, and those who actively engaged in exercise tended to be younger compared with those in other stages. Pender et al. (1990), however, reported that adoption of a health-promoting lifestyle among female workers increased with age. In contrast to the pre-

viously described studies, Desmond et al. (1993) reported that age was not a statistically significant predictor of participation in physical activity. The researchers suggested that one reason age failed to account for variance was that little variation in age existed among the study sample. In addition, the study sample included only male workers.

Three studies examined the association between gender and level of physical activity among employees. Pender et al. (1990) found that gender influenced health-promoting behaviors including exercise, noting that women had a greater incidence of desirable health behaviors than men. In contrast, findings from two other studies suggested that men were slightly more active than women (Biddle et al., 1994; Burton & Turrell, 2000). One reason for the difference in findings across these studies may be that Pender et al. (1990) examined all health-promoting behaviors, whereas the other two studies focused only on exercise.

Marital status was examined as a predictor of physical activity participation in four of the studies reviewed. Boutelle et al. (2000) conducted their study with U.S. employees and found that men who performed strenuous leisure-time physical activity were likely to be unmarried. Burton and Turrell's (2000) study of employees in the six states and two territories of Australia reported that the highest rate of insufficient leisure-time activity occurred among individuals with dependent children. Having dependent children may result in less time to participate in leisure-time physical activity because of caregiving. Duffy et al. (1996) and Pender et al. (1990) found no relationship between marital status and level of health-promoting behaviors. Marital status may have less effect on physical activity participation than caring for dependent children.

Most of the studies reviewed described the ethnicity of the sample, but only one study examined the association between level of exercise and ethnicity (Boutelle et al., 2000). These researchers found no clear relationship between ethnicity and exercise in either men or women. This may be because approximately 94% of this study sample was white.

Three studies examined the association between income and participation in physical activity. Desmond et al. (1993) reported that workers with higher incomes tended to participate more in work-related physical activity, but not in sports activity, leisure-time activity, or overall physical activity. The researchers suggested that this relationship could have been because those with higher incomes may have accumulated more overtime work and thus had more opportunity to participate in work-related physical activity and less opportunity for leisure-time activity. Two other studies found that income was not associated with participation in physical activity (Duffy et al., 1996; Pender et al., 1990).

The association between education and level of leisure-time exercise was examined in four of the studies. Boutelle et al. (2000) found that both male and female participants who had more education engaged in more leisure-time exercise. Duffy et al. (1996) found that the positive association between education and regular exercise existed only for women. However, Desmond et al. (1993) and Pender et al. (1990) found no association between education and participation in physical activity. Approximately 80% to 90% of the two study samples had

attended or completed high school and college, so little variation existed in education level.

Only one study examined the association between hours worked or time spent in paid employment and level of physical activity (Burton & Turrell, 2000). Working more hours was associated with insufficient physical activity among men, but no association was found among women. A reason for this difference could be that women may be constrained by other time demands such as family caregiving activities.

Mixed results have been reported about the relationship between job category and leisure-time exercise. Desmond et al. (1993) found that job category (physical vs. clerical or management) was a significant predictor of physical activity. Employees with more physical jobs participated in more leisure-time exercise than did those with less physical jobs. This finding contradicts the results of two other studies (Boutelle et al., 2000; Burton & Turrell, 2000). Boutelle et al. (2000) reported that the highest level of leisure-time exercise was found among professionals or white collar workers who had less physical jobs compared with blue collar workers. Similarly, Burton and Turrell (2000) found that blue collar workers were more likely than professionals to have insufficient activity. In contrast, Duffy et al. (1996) reported that job category (professional vs. nonprofessional) was not related to exercise participation. Reasons for the difference in findings among these studies may be that the researchers used different instruments and levels of measurement to analyze leisure-time exercise. In addition, Duffy et al. (1996) included only female workers in their study, whereas other studies included male and female workers.

Only 7 of the 11 studies examined demographics. General findings suggested that physical activity usually declined with age, women were more sedentary than men, individuals with higher incomes and more education were more sedentary than those reporting lower incomes and less education, and blue collar workers were more likely to have insufficient activity compared with professionals or white collar workers.

Other Health Behaviors Related to Participation in Physical Activity

Only three of the studies examined correlations between physical activity and other health risk behaviors (Boutelle et al., 2000; Burton & Turrell, 2000; Duffy et al., 1996). Boutelle et al. (2000) demonstrated that higher levels of leisure-time exercise were positively associated with seat belt use and inversely related to smoking, dietary fat intake, reported stress, and obesity. In addition, women with higher levels of leisure-time exercise were more likely to use alcohol every day compared with women with lower levels of leisure-time exercise. This finding might be due to the classification of alcohol use into daily and non-daily drinkers. With use of this classification, it was not possible to compare those who had only one drink per day with those who drank more heavily. Burton and Turrell (2000), in examining the associations between weight, smoking, and health status and leisure-time physical activity, found that rates of insufficient activity were high not only among current smokers and

obese individuals but also among workers in poor health. Similarly, Mexican American women who were in poor health reported less frequent regular exercise than did other minority groups (Duffy et al., 1996).

Major findings from these studies suggested that decreased levels of physical activity were positively associated with smoking, obesity, and poor health status. Physical activity is a healthful alternative behavior associated with lower rates of smoking, decreased body fat, and improved health status. Information concerning the change process for these multiple behaviors is important for establishing effective intervention programs. However, only 3 of the 11 studies examined differences based on these variables. Research is needed to examine the relationships among these multiple behaviors.

Levels of Motivational Readiness to Participate in Physical Activity

The relationship between motivational readiness to adopt exercise and risk factors for coronary heart disease was examined in only one study. Across the stages of exercise adoption, significant differences among participants' body mass index, physical activity, dietary habits, and stress were found after controlling for age as a covariate (Burn et al., 1999). Participants in the precontemplation stage had significantly lower levels of physical activity than did those in the action stage. Precontemplators were defined as those who did not adhere to exercise over time. The measure of physical activity allowed these participants to indicate even rare participation in physical activity. Individuals who were in the action and maintenance stages reported healthier diets compared with those in the precontemplation, contemplation, and preparation stages. However, walking activity did not differ significantly across the stages.

Cognitive–Psychosocial Factors

Perceived Self-Efficacy. Self-efficacy was positively related to physical activity participation in six studies (Biddle et al., 1994; Desmond et al., 1993; Duffy et al., 1996; Pender et al., 1990; Piazza et al., 2001; Rabinowitz et al., 1992). Self-efficacy, similarly defined across the studies, usually referred to confidence, judgment, personal competence, or belief in the ability to perform a given desired behavior. The study by Biddle et al. (1994) of university employees found that self-efficacy was the best predictor of self-reported strenuous activity for women, but not men. Across the stages of exercise adoption, significant differences in self-efficacy were also found (Burn et al., 1999). Individuals in the precontemplation and contemplation stages reported lower levels of exercise self-efficacy than did those in the action and maintenance stages.

Perceived Health Control. Six studies investigated the relationship between health locus of control and physical activity participation. Piazza et al. (2001) found no relationship between perceived health control and exercise among a random sample of female members of the American Association of Occupational Health Nurses, Inc., and Rabinowitz et al. (1992) found that perceived health control did not significantly influence exercise among Israeli blue collar workers. In contrast, Duffy et al.

(1996) found that Mexican American women employed outside the home who felt that they were in control of their health reported more frequent regular exercise, and those who believed that powerful others were in control of their health reported less frequent regular exercise. Similarly, Biddle et al. (1994), Pender et al. (1990), and Blue et al. (2001) found that perceived control over exercise participation was positively associated with exercise. Participants in the study by Pender et al. (1990) were clerical, managerial, and operations employees enrolled in workplace health promotion programs. Biddle et al. (1994) conducted their study with employees on a university campus in southwest England, and Blue et al. (2001) conducted their study with U.S. employees of a Midwestern university.

Pender et al. (1990) reported that practicing more health-promoting behaviors was positively related to the perception that health was controlled by powerful others. This contradicts findings by Duffy et al. (1996) and does not support the Health Belief Model's proposition regarding the effect of perceived personal control on health (Pender, 1987). Pender suggested that perception of health as internally controlled, rather than controlled by powerful others and luck or chance, is associated with more health-promoting lifestyles. One reason for the difference in findings suggested by Pender et al. (1990) might be because the study sample included employees enrolling in workplace health-promoting programs. Employees who perceived they were externally controlled (i.e., powerful others and luck or chance) might be likely to enroll in workplace health-promoting programs in which the collegial support of coworkers and professionals is readily available, whereas those who perceived they were internally controlled might seek health-promoting programs independently rather than in group settings.

Perceived Benefits and Barriers. Only two studies assessed relationships between perceived benefits and barriers and exercise participation. Rabinowitz et al. (1992) and Biddle et al. (1994) reported that perception of benefits was the best predictor of exercise. Belief in the contribution of exercise to health as well as to a general feeling of well-being was related to engagement in leisure-time exercise (Rabinowitz et al., 1992). In contrast, perception of barriers was not significantly associated with physical activity (Biddle et al., 1994; Desmond et al., 1993).

Perceived Health Status. Pender et al. (1990) and Desmond et al. (1993) found that perceived health status was associated with physical activity participation. Individuals who perceived their health status to be good reported a higher frequency of physical activity than did those who perceived their health status to be poor. However, Desmond et al. (1993) measured overall physical activity as well as subtypes of physical activity including work activity, sports activity, and leisure-time activity. Workers who reported higher perceived health status participated more in sports activity only, and health status was not a significant predictor of work activity, leisure-time activity, or overall physical activity.

Attitude, Social Norms, and Intention. Biddle et al. (1994) and Blue et al. (2001) examined associations among attitude, social norms, and intention to exercise

and the relationships between those variables and performance of exercise. Blue et al. (2001) examined attitude with two subscales: an indirect attitude referred to beliefs that exercise would lead to positive outcomes that were evaluated favorably, and a direct attitude referred to a favorable attitude about exercising. Measures for normative beliefs were used as indirect and direct subjective norms. An indirect subjective norm referred to beliefs that significant others think one should or should not perform exercise. A direct subjective norm referred to a perception of general social pressure leading to engage or not engage in exercise. Blue et al. (2001) reported intention was the best predictor of performance of exercise.

In contrast, Biddle et al. (1994) found that attitude, social norms, subjective norms, or intention to engage in physical activity did not predict performance of physical activity. When self-report of physical activity was analyzed as strenuous exercise scores, the researchers found that intention and attitude had significant effects on self-report of strenuous exercise for men, but that only intention had a significant effect for women. One reason for the difference in findings between these two studies may be due to the different instruments used for measuring attitude, subjective norms, and intention.

Other Cognitive–Psychosocial Factors. Gebhardt and Maes (1998) examined the relationship between exercise behavior and competing personal goals among employees in seven nursing homes in the Netherlands. The investigators classified participants into three groups: non-exercisers; those who exercised below the norm (exercising once or twice per week or less than 20 minutes at a time); and those who exercised at the norm (exercising 3 times per week or 20 minutes or more at a time). The findings suggested that the three groups differed in the number of activities outside of the home, activities in the home, social activities, and self-development activities. Non-exercisers reported more activities in the home that conflicted with exercising. Both non-exercisers and those who exercised fewer than three times per week were more likely to assume that exercise would interfere with social activities.

Pender et al. (1990) examined definitions of health and the importance of health related to all health-promoting behaviors including exercise. Two subscales—wellness (abilities to perform socially sanctioned roles and adjust to life situations and exuberant well-being) and clinical (absence of disease)—were used to measure definition of health. Importance of health referred to the impact of valuing health on the frequency of health-promoting behaviors such as happiness, self-respect, wisdom, and inner harmony. Pender et al. (1990) found that perceived wellness was significantly associated with the level of participation in all health-promoting behaviors at both the beginning of their study (prior to enrollment in a health-promoting program) and 3 months after enrollment in a health-promoting program. Importance of health was not a significant determinant of health-promoting lifestyles.

Nine (82%) of the 11 studies examined cognitive–psychosocial variables associated with physical activity participation. These studies indicated that perceived self-ef-

ficacy (6 studies), perceived benefits (2 studies), perceived health status (2 studies), and attitude and intention (2 studies) strongly influence the level of participation in physical activity. Perceived health control was examined in 6 studies, but findings varied with positive associations in 4 of the studies. Other cognitive–psychosocial variables, such as personal goals and perceived wellness, were also predictors of participation in physical activity. However, few studies examined these cognitive–psychosocial variables.

Combination of Factors

The study of physical activity behavior is complex; therefore, a set of demographic and cognitive–psychosocial factors was assessed in most of the studies reviewed. Desmond et al. (1993) found that approximately 30% of the variance in overall physical activity and 14% of the variance in leisure-time activity were explained by job category and perceived self-efficacy. Approximately 56% of the variance in occupational activity was explained by income and job category. Perceived health status explained 6% of the variance in sports activity.

In the study by Piazza et al. (2001), only 7% of the variance in exercise behavior was explained by physical self-efficacy, perceived health control, and age. Because little variance in exercise was explained by these variables, the researchers suggested that other variables needed to be considered when attempting to understand exercise behavior in this population.

Pender et al. (1990) found at initial testing, 31% of the variance in health-promoting behaviors was explained by definition of health, health status, perceived control of health, personal competence, gender, age, and phase of exercise. Three months after the initial testing and after enrollment in a health-promoting program, 25% of the variance was explained by these variables. The significant variables, including definition of health (wellness), health status, perceived control of health (powerful others and chance), personal competence, gender, age, and phase of practice, were identical between two time points, except for believing health to be internally controlled (perceived control of health).

Biddle et al. (1994) found that 32% of the variance in strenuous physical activity among women and 38% among men were explained by attitude, social norms, perceived control, barriers, benefits, and self-efficacy. For women, attitude, social norms, and perceived control, variables within the Theory of Planned Behavior, added little to the prediction of strenuous physical activity after intention scores, with only self-efficacy an added important variable. For men, only attitude added significantly to the prediction model after intention. Blue et al. (2001) reported that attitude and perceived behavioral control explained 61.7% of the variance of intention, but intention and perceived behavioral control explained 51.3% of the variance in the performance of physical activity.

The review of the association among demographics, cognitive–psychosocial factors related to physical activity, and participation in physical activity suggests a modest relationship. The variance in physical activity explained by these variables ranged from 7% to 62%. The differences in variance in physical activity explained in these studies may

be due to differences in variables, sample size, and sample characteristics. Three to 11 variables were included in these studies. The studies included both male and female workers, with sample sizes ranging from 131 to 598.

RESEARCH TO PRACTICE

This review of the determinants of participation in physical activity provides valuable information that can be used to tailor effective workplace health promotion programs. Self-efficacy was the best predictor of physical activity participation among most of the studies reviewed. This finding is consistent with the review of determinants of physical activity by Sallis and Owens (1999). Intervention programs designed to enhance perception of physical self-efficacy or the belief that exercise programs can be accomplished should be considered by occupational health nurses to promote physical activity among employees.

Perceived benefits of physical activity was another strong predictor of physical activity participation, suggesting that intervention programs should also help employees understand the benefits of physical activity. Because physical activity generally declined with age and women reported less physical activity than men, programs should be designed specifically for older women. Thus, intervention programs should be tailored and individualized to address employees' perceptions of self-efficacy, benefits, and interests.

Unlike the review by Sallis and Owens (1999), with limited evidence of an association between health control and physical activity, the current review found some evidence of a positive association in four of the studies. Occupational health nurses should promote the belief that employees have personal control of their health. Classes on self-care and health promotion could emphasize this belief in personal control of health.

Regarding implications for research, three variables—self-efficacy (6 studies), age (5 of 6 studies), and gender (3 studies)—were strong determinants of participation in physical activity across studies. A need exists for further research to assess the relationship between demographics, cognitive-psychosocial variables, and other health behaviors and participation in physical activity. The assessment of the complexity of influences on a health-promoting lifestyle, including physical activity, is best if multiple variables are studied simultaneously (Pender et al., 1990).

Settings varied across the studies; thus, generalization of the data is difficult because a variety of job tasks and work environments may influence participation in physical activity. Job tasks within different occupations can affect the calculation of overall physical activity level. Work environment may also influence behaviors by enforcing commitment to health behaviors (Pender, 1996). Six studies were conducted in the United States and five studies were conducted in England, Australia, Britain, the Netherlands, and Israel. Although research involving individuals from different cultures was reviewed, only three studies provided information related to the ethnicity of the study sample. In two studies, most of the study sample was white (Boutelle et al., 2000; Pender et al., 1990); the study by Duffy et al. (1996) included only Mexican American women. Because most psychological variables are related

to individual beliefs and patterned responses influenced by cultural background (Giger & Davidhizar, 1995), research is needed to examine determinants of physical activity in different settings and diverse cultural groups.

Five studies examined only leisure-time physical activity, and four studies examined all physical activity including leisure-time, occupational, and lifestyle activities. Two studies measured exercise behavior as a subscale of health-promoting lifestyles focusing on duration and frequency of exercise. Assessing physical activity patterns limited to leisure-time physical activity may underestimate the number of individuals who meet the recommended level of physical activity (Centers for Disease Control and Prevention, 2000). However, measurement of each type of physical activity, including occupational, lifestyle, leisure-time, and sports activity, is not always mutually exclusive. For example, individuals could report walking in the leisure-time activity scale and then again in the lifestyle scale. Therefore, future research on physical activity needs to conceptualize this variable in a multivariate way (occupational, lifestyle, leisure-time, and sports activity) and define it clearly so that different types of physical activity can be assessed. Regardless of the type of physical activity, benefits of physical activity occur if adults accumulate 30 minutes or more of moderate-intensity physical activity on most days of the week, as recommended by the Centers for Disease Control and Prevention (2006) and the American College of Sports Medicine (Pate et al., 1995). Occupational health nurses should maximize their unique opportunity to promote these recommendations for physical activity among employees by testing interventions and conducting research on major variables such as exercise self-efficacy and benefits.

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