*Methods, Issues, and Results in Evaluation and Research; Fitness*

# A New Measure for Assessing the Physical Activity Behaviors of Persons With Disabilities and Chronic Health Conditions: The Physical Activity and Disability Survey

*James H. Rimmer, PhD; Barth B. Riley, PhD; Stephen S. Rubin, PhD*

***Abstract***

***Purpose.*** *Assess the psychometric properties of the Physical Activity and Disability Survey (PADS), a new physical activity measure for persons with disabilities and chronic health conditions.*

***Design.*** *Cross-sectional and pre-post designs were employed.*

***Setting.*** *A Midwestern university fitness center.*

***Subjects.*** *Participants were 103 individuals with disabilities and/or chronic health conditions.*

***Measures.*** *The Physical Activity and Disability Survey (PADS), peak oxygen uptake (peak $VO_2$), maximum workload (MW), and time to exhaustion (TE) during exercise.*

***Results.*** *Factor analysis revealed a four-factor model that generally corresponded to PADS subscales. Cronbach alpha coefficients ranged from .67 (Exercise) to .77 (Time Indoors). Test-retest reliability (1-week interval) ranged from .78 (Time Indoors) to .95 (Leisure Time Physical Activity). Interrater reliability ranged from .92 (Household Activities) to .99 (Exercise, Leisure Time Physical Activity, Total Activity). Significant ($p < .05$) correlations were found between PADS subscales and absolute peak $VO_2$ (Leisure Time Physical Activity, Household Activity, Total Activity), relative peak $VO_2$ (Exercise, Time Indoors), MW (Time Indoors, Household Activity), and TE (Household Activity, Total Activity). Analyses of variance revealed that, unlike controls, health promotion program participants evidenced significant pre-post gains as measured by the Exercise subscale and Total Activity score.*

***Conclusions.*** *The findings lend support for the reliability and validity of the PADS as a measure of physical activity of groups who are sedentary and disabled. (Am J Health Promot 2001;16[1]:34–45.)*

**Key Words:** Physical Activity Measurement, Exercise, Disability, Chronic Health Conditions

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*Submitted March 7, 2000; revisions requested September 13, 2000, and February 5, 2001; accepted for publication February 21, 2001.*

*Am J Health Promot 2001;16(1):34–45.*
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*0890-1171/01/$5.00 + 0*

## INTRODUCTION

As a result of several landmark studies that have shown a graded, inverse relationship between physical fitness and the incidence of morbidity and mortality, public health officials and federal agencies are recommending that all Americans, including persons with disabilities, engage in a minimum of 30 minutes a day of moderate aerobic activity.[1] Despite strong endorsements for this initiative from the Centers for Disease Control and Prevention,[2] the National Institutes of Health,[3] the Surgeon General's Office,[4] and the Centers for Disease Control and Prevention and American College of Sports Medicine,[5] most Americans are still not obtaining the recommended amount of activity that is necessary for improving health, and the level of inactivity among persons with disabilities is higher than the general population.[6,7] This represents a significant public health issue, as approximately 54 million Americans are reported to have a disability.[8]

The *Healthy People 2010* [2] and *Healthy People 2000* [9] reports have emphasized the importance of increased physical activity participation among all Americans. *Healthy People 2010* contains a separate chapter on improving the health of persons with disabilities, with specific goals and objectives for increasing physical activity and fitness.[2] With the increased emphasis on tracking physical activity levels among persons with disabilities,

there is a strong need to understand the physical activity behaviors of various subgroups of the disabled population.

Several physical activity instruments have been validated on specific subgroups of the general population (e.g., children, adults).[10–14] These instruments often focus on specific types of physical activity that have little or no relationship to the lifestyles of many people with disabilities (e.g., "During the past month, did you participate in any physical activities such as walking, jogging, calisthenics, golf, or gardening for exercise?"). One function of a survey instrument is to capture baseline measures of physical activity so that it can be tracked over time. Instruments that start at relatively higher levels of physical activity than that generally observed in disabled populations (e.g., walking, sport and recreational activities, gardening), will miss lower levels of physical activity (e.g., stretching a weak limb) and are therefore limited in terms of discriminating between various levels of physical activity among different types of disabilities.[7] The purpose of this study is to assess the psychometric properties of a new measure, the Physical Activity and Disability Survey (PADS), which is designed specifically to measure the physical activity behavior of persons with disabilities and chronic health conditions. In addition to assessing internal consistency and reliability, the study sought to determine whether the PADS is significantly associated with measures of cardiovascular fitness, including peak oxygen uptake and time to exhaustion.

## METHOD

### Design

A cross-sectional design was employed to assess the internal consistency, reliability, and validity of a new measure, the Physical Activity and Disability Survey (PADS). In addition, a two (health promotion program vs. control) by two (pre vs. post) factorial design was used to assess the ability of the instrument to detect changes in physical activity before and after a health promotion intervention. The health promotion intervention consisted of a 12-week program that included the following components: exercise, nutrition, and health behavior. The exercise intervention consisted of (1) warm-up flexibility exercises, 5 to 10 minutes; (2) aerobic activity, 20 to 30 minutes; (3) strength activity, 15 to 20 minutes; and (4) cool down flexibility exercises, 5 to 10 minutes. The duration of exercise varied from 45 to 70 minutes depending on how the participant felt on any given day. Measures recorded at both pretest and posttest included measures of strength (e.g., leg press, bench press, hand grip), flexibility (e.g., sit and reach test), and cardiovascular endurance (e.g., peak oxygen uptake, time to exhaustion, maximum workload). Cardiovascular endurance variables were used to assess the concurrent and predictive validity of the PADS instrument.

### Sample

Participants were 103 individuals comprising a subset of adults with disabilities and chronic health conditions participating in a 3-year federally funded intervention (exercise, nutrition, health behavior) aimed at reducing secondary conditions (i.e., low physical fitness, depression, social isolation) in persons with disabilities. Participants were recruited from local hospitals and clinics in the Chicago area by posting flyers and contacting physicians about the study. A description of the program is provided elsewhere.[15] Participants' mean age was 53.9 years (SD = 9.7). Eligibility criteria included (1) age 30 to 70 years, (2) ability to walk a minimum of 50 feet with or without an assistive aid, (3) primary disability of stroke or type 2 diabetes, (4) physician permission, and (5) successful completion of a graded exercise test screening out participants with contraindications to exercise.

### Measures

***Physical Activity.*** The PADS is a new measure that was designed to assess low-level physical activity among persons with physical disabilities and chronic health conditions. The original version of the PADS consisted of 46 items. Though it can be used as a questionnaire, it was designed primarily as a semistructured interview. The PADS was developed with the assistance of three individuals with a physical disability and two experts in physical activity and survey design methodology. Questions were developed by the investigators after an extensive review of published physical activity instruments,[10,16,17] physical activity methodology,[12,18] and items contained in the Physical Activity and Fitness chapter of the *Healthy People 2000* report.[9] After the survey questions were constructed, they were examined for clarity by four individuals with a physical disability. Questions that were ambiguous, unclear, or confusing were reworded or eliminated. After several revisions of the instrument, eight pilot telephone interviews were conducted to determine the feasibility of completing the survey by persons with a disability. After the pilot interviews were completed, minor changes were made to nebulous questions.

The PADS included three subscales (Exercise, Leisure Time Physical Activity, Household Activity) and two sections on Respondent Information and Screening Items. The *Exercise* subscale contains eight items pertaining to participants' interest in exercise and exercise status. Examples of questions include: "Do you currently exercise?" and "What kinds of exercises do you like to do?" If participants responded that they currently exercise, they were asked to list the types of exercises they performed along with the number of minutes per day and number of days per week that these exercises were performed.

The *Leisure-Time Physical Activity* subscale consists of seven items pertaining to general leisure-time physical activity that would not necessarily be as structured as an exercise program. This included taking occasional walks or participating in recreational activity such as bowling and tennis.

The *Household Activity* subscale consists of 16 items pertaining to general activity behaviors. The Household Activity scale assesses time spent indoors and time spent sitting

or lying down as well as the level of indoor and outdoor household activity.

The *Respondent Information* and *Screening* sections consist of eight and four items, respectively. The Respondent Information section includes questions concerning age, race, level of income, educational status, type of residence, marital status, disability benefits status, and living arrangement (living alone or with someone else). The Screening section, which consists of four preinterview screening items, was used to determine the person's primary disability and the extent to which the respondents were physically affected by their disability.

The PADS was administered by trained research assistants during the first screening visit to the Center on Health Promotion Research for Persons with Disabilities. The interview lasted 30 to 40 minutes. Interrater and test-retest reliability were evaluated on a randomly selected subsample (n = 30). Each participant was contacted by phone and administered the PADS on two occasions. During the first administration, each respondent was rated by two independent raters. One of the raters served as the interviewer, while the other listened to the respondent on a second phone. Each rater rated and recorded the respondents' answers. The second administration of the PADS occurred 1 week later and was given by one of the two raters present during the first administration.

***Fitness Measures.*** A symptom-limited graded exercise test (peak $VO_2$) was performed on an electronically braked upright stationary cycle (SensorMedics ergo-metrics 800s, Yorba Linda, California). Lying, seated, and standing blood pressure and resting heart rate were recorded prior to peak $VO_2$ testing. These physical measures were recorded to ensure that the participant was medically stable before performing the graded exercise test. Peak $VO_2$ was assessed with a SensorMedics 2900 Metabolic Cart (Yorba Linda, California) under the supervision of a physician and exercise physiologist. The measures were recorded before each graded exercise test, which occurred before and after the exercise program. Height, weight, and body mass index (BMI) were recorded by a trained tester using the procedures of Lohman, Roche, and Martorell.[19]

### Analysis

Statistical analyses were performed using SPSS for Windows, version 9.0. Statistical analyses were conducted in four phases: (1) assessment of the underlying correlational structure and internal consistency of the PADS, (2) test-retest and interrater reliability, (3) concurrent and predictive validity; and (4) sensitivity to change.

During phase 1, in order to determine the underlying correlational structure of the PADS, an exploratory factor analysis was performed using the maximum-likelihood (ML) method of extraction and Promax (oblique) factor rotation. Like other forms of common factor analysis, ML factor analysis is useful in identifying latent variables or constructs by analyzing common variance among a set of variables. An oblique method of factor rotation was chosen since it was hypothesized that the various types or aspects of physical activity measured by the PADS would be intercorrelated. The Kaiser-Guttman rule (eigenvalues greater than 1.0), scree plots, and interpretability were the criteria used to determine the number of factors. Following exploratory factor analysis, item analyses were performed, including the calculation of Cronbach alphas for each scale, item-total correlations and alpha-if-item-removed coefficients. Items that lowered the overall Cronbach alpha (by .05 or greater) and/or had low corrected item-total correlations (less than .40) were removed from the instrument.

During phase 2, intraclass correlations were performed to assess the test-retest reliability of the PADS, and Pearson correlations were performed to assess interrater reliability. For phase 3, Pearson correlations were performed in which PADS subscales were correlated with measures of cardiovascular fitness, including (1) absolute and relative peak oxygen uptake, (peak $VO_2$ in mL/min and mL/kg/min, respectively), (2) time to exhaustion, and (3) maximum workload. During phase 4, the ability of the PADS to detect changes in physical activity over time resulting from a health promotion intervention was assessed. In this phase, the PADS was evaluated in the context of a larger health promotion program outcomes study. Results from this study presented by Rimmer et al.[15] indicated that the health promotion program, which included an exercise component, had significant and positive effects on peak oxygen uptake, time to exhaustion, and maximum workload during exercise. We therefore wanted to assess the ability of the PADS to reflect these changes in physical activity across time. A two (health promotion program vs. no program) by two (pre vs. post) mixed factorial multivariate analysis of variance (MANOVA) was performed using each of the PADS subscales and a total scale score as dependent measures.

## RESULTS

### Sample Demographics

Table 1 presents sample demographics. Most participants were female (75.7%) and African-American (72.8%). Slightly over half of the sample (52.4%) was diagnosed with stroke as their primary condition, and 47.6% of participants were diagnosed with type 2 diabetes. Mean age of participants was 53.91 years (SD = 9.71). Mean body mass index (BMI) was 36.67 (SD = 9.72). Chronic conditions most commonly reported by participants included hypertension (64.1%), back pain (50.5%), arthritis (49.5%), hyperlipidemia (43.7%), depression (35.9%), and muscle spasms (31.1%). The sample was very deconditioned based on their initial level of fitness. Mean peak oxygen uptake was 12.73 mL/kg/min (SD = 3.54), and mean time to exhaustion was less than 6 minutes ($M$ = 347.17 seconds, SD = 179.99) With respect to assistive device use, 41.7% of participants reported using canes, 16.5% reported using leg braces, 11.7% reported use of a walker, and 7.8% used wheelchairs.

### Exploratory Factor Analysis

Exploratory factor analysis was performed using 13 of the PADS

items. Items that were used to create a skip pattern in the questionnaire or that had zero variance were omitted from the analysis. The analysis resulted in a four-factor model. The model accounted for 53.8% of the variance. Table 2 presents rotated (Promax; an oblique factor rotation method) factor loadings of each of the PADS items on the four factors. Factor 1 loadings were highest on five items related to indoor and outdoor household activity, with the absolute values of factor loadings ranging from .50 to .83. Factor 2 consisted of three items related to time spent indoors and time spent sitting or lying down, with factor loadings ranging from .65 to .82. Factor 3 consisted of three items pertaining to physical exercise, with loadings ranging from .54 to .96. Factor 4 consisted of two items pertaining to leisure time activity, with factor loadings of .99 and .70. Factor intercorrelations were generally nonsubstantive ($r <$ .10), with the exception of the correlation between factors 2 and 3 ($r =$ $-.28$).

Based on the results of exploratory factor analysis, four subscales were developed: Household Activity (factor 1), Time Indoors (factor 2), Exercise (factor 3), and Leisure Time Physical Activity (factor 4).

**Table 1**

**Sample Demographics**

| Variables | Mean | SD |
|---|---|---|
| Age | 53.91 | 9.71 |
| BMI (kg/m$^2$) | 36.67 | 9.72 |
| Peak $VO_2$ (mL/kg/min) | 12.73 | 3.54 |
| Maximum workload (w) | 70.84 | 30.57 |
| Time to exhaustion (s) | 347.17 | 179.99 |
| | ***n*** | **%** |
| Gender | | |
| Male | 25 | 24.3 |
| Female | 78 | 75.7 |
| Diagnostic group | | |
| Stoke | 54 | 52.4 |
| Diabetes | 49 | 47.6 |
| Ethnic group | | |
| African-American | 75 | 72.8 |
| Hispanic | 7 | 6.8 |
| Caucasian | 6 | 5.8 |
| Not reported | 15 | 14.6 |
| Chronic condition* | | |
| Hypertension | 66 | 64.1 |
| Back pain | 52 | 50.5 |
| Arthritis | 51 | 49.5 |
| High blood cholesterol | 45 | 43.7 |
| Depression | 37 | 35.9 |
| Muscle spasms | 32 | 31.1 |
| Assistive devices | | |
| Walker | 12 | 11.7 |
| Braces | 17 | 16.5 |
| Cane | 43 | 41.7 |
| Wheelchair | 8 | 7.8 |

*Each participant may have multiple chronic conditions.

**Internal Consistency**

Cronbach alpha coefficients and item analyses were performed for each of the PADS subscales. Items with corrected item-total correlations of less than .40 and/or that led to a marked decrease in coefficient alpha (.05 or more) were removed. Using these criteria, one item (Hours spent sleeping/lying down excluding sleeping) was removed from the Time Indoors subscale (raising alpha from .41 to .77), and another item (Household activities performed by whom?) was removed from the Household Activity scale (raising alpha from .65 to .70). All corrected item-total correlations were positive and ranged from .47 to .72. Cronbach alphas for the PADS subscales were .67 (Exercise), .70 (Household Activity), .77 (Time Indoors), and .74 (Leisure Time Physical Activity).

A revised (i.e., following factor and item analyses) version of the Physical Activity and Disability Survey is presented in the Appendix. The revised survey contains 28 items, including screening, respondent information and skip pattern items. The Household Activity subscale represents the total number of minutes of household physical activity performed during a 1-week time interval. The Time Indoors subscale is computed by summing the two Likert-type items pertaining to time spent indoors. The Exercise and Leisure Time Physical Activity subscales represent the total number of minutes of exercise and leisure activity, respectively, over a 1-week period. In addition, a Total Activity score was computed by summing the Exercise, Household Activity, and Leisure Time Physical Activity subscales and dividing by seven in order to obtain a measure of total daily physical activity.

**Scale Descriptive Statistics and Distributions**

Table 3 presents descriptive statistics for the PADS subscales and Total Activity score, including mean, standard deviation, skewness, and kurtosis measures. Measures that evidenced marked skewness (i.e., $\leq -2.00$ or $\geq 2.00$) were transformed using either log or power transformations. All but one (Time Indoors) of the PADS subscales required data transformation. Among the transformed measures, all except Leisure

**Table 2**

**Rotated Factor Loadings from Exploratory Factor Analysis of PADS Items**

| PADS items* | Factors 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Indoor household #1 (min/wk) | 0.83 | | | |
| Indoor household #2 (min/wk) | 0.65 | | | |
| Household activities performed by whom? | −0.61 | | | |
| Indoor household #3 (min/wk) | 0.60 | | | |
| Outdoor household #1 (min/d) | 0.50 | | | |
| Time indoors: weekends | | 0.82 | | |
| Time indoors: weekdays | | 0.77 | | |
| Hours spent sitting/lying down excluding sleeping | | 0.65 | | |
| Exercise #2 (min/d) | | | 0.96 | |
| Exercise #1 (min/d) | | | 0.65 | |
| Exercise #3 (min/d) | | | 0.54 | |
| Leisure activity #2 (min/d) | | | | 0.99 |
| Leisure activity #1 (min/d) | | | | 0.70 |

*Items are arranged by factor and by descending order of factor loadings.

Time Physical Activity were found to have acceptable levels of skewness and kurtosis. Figure 1 presents a frequency distribution of the PADS Total Activity score following data transformation. The figure indicates that a substantial number of participants (20.9%) reported *no* physical activity (Total Activity score equal to 1.0) as measured by the PADS. Comparisons between participants who reported no activity with their active counterparts found that the nonactive had significantly lower peak oxygen uptake than persons in the active group ($t_{88} = -2.04$, $p < .05$). Group differences on time to exhaustion were not significant.

Table 4 presents intercorrelations among the PADS subscales. The only significant correlation among the subscales was observed between the Exercise and Time Indoors subscales ($r = -.26$, $p < .01$).

## Reliability

Interrater and test-retest reliability were evaluated with a sample of 30 participants randomly selected from our cohort. Intraclass correlations were calculated in order to assess both interrater and test-retest reliability. Interrater reliability ranged from .92 for the Household Activity subscale to .99 for the Exercise and Leisure Time Physical Activity subscales and Total Activity score. Test-retest reliability coefficients were .83 for the Exercise subscale, .84 for the Household Activity subscale, .95 for the Leisure Time Physical Activity subscale, and .78 for the Time Indoors subscale. The Total Activity score had a test-retest reliability of .85.

## Concurrent and Predictive Validity

The concurrent and predictive validity of the PADS was evaluated by correlating PADS subscale scores at baseline with other fitness measures obtained at baseline or at 12-week follow-up (Table 5). The Exercise subscale was significantly and positively correlated with relative peak oxygen uptake at baseline ($r = .28$, $p < .01$). Leisure Time Physical Activity was positively correlated with absolute Peak $VO_2$ ($r = .22$, $p < .05$). The Time Indoors subscale was significantly and negatively correlated with relative peak oxygen uptake at baseline ($r = -.32$, $p < .01$) and follow-up ($r = -.29$, $p < .01$). Time Indoors was also significantly and negatively correlated with maximum workload at baseline ($r = -.33$, $p < .01$) and follow-up ($r = -.23$, $p < .05$). The Household Activity subscale correlated significantly with absolute Peak $VO_2$ at both baseline ($r = .23$, $p < .05$) and follow-up ($r = .24$, $p < .05$), with maximum workload at baseline ($r = .22$, $p < .05$) and follow- up ($r = .26$, $p < .05$) and with time to exhaustion at baseline and follow-up ($r = .26$ and .25, $p$-values $< .05$). The Total Activity score was significantly and positively associated with absolute peak oxygen uptake at baseline ($r = .23$, $p < .05$) and follow-up ($r = .22$, $p < .05$) and with time to exhaustion at baseline ($r = .23$, $p < .05$). No other significant correlations were observed.

## Pre-Post Treatment Differences

A two (health promotion program vs. control) by two (pre vs. post)

**Table 3**

**Descriptive Statistics of Original and Transformed PADS Subscales and Total Score**

| PADS subscales | Original Mean | SD | Skewness | Kurtosis | Transformed Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|
| Exercise | 68.97 | 199.82 | 5.94 | 42.78 | 1.90 | 2.27 | 0.61 | −1.15 |
| Household activity | 474.51 | 752.32 | 2.92 | 11.61 | 5.30 | 4.04 | 0.24 | 0.47 |
| Leisure activity | 24.94 | 136.74 | 7.81 | 66.89 | 0.13 | 0.37 | 2.93 | 7.80 |
| Time indoors | 4.53 | 1.46 | −0.45 | −1.25 | — | — | — | — |
| Total activity score | 83.68 | 112.99 | 2.53 | 8.45 | 2.49 | 1.08 | 0.04 | −0.93 |

**Figure 1**

**Frequency Distribution of Power-Transformed PADS Total Score**

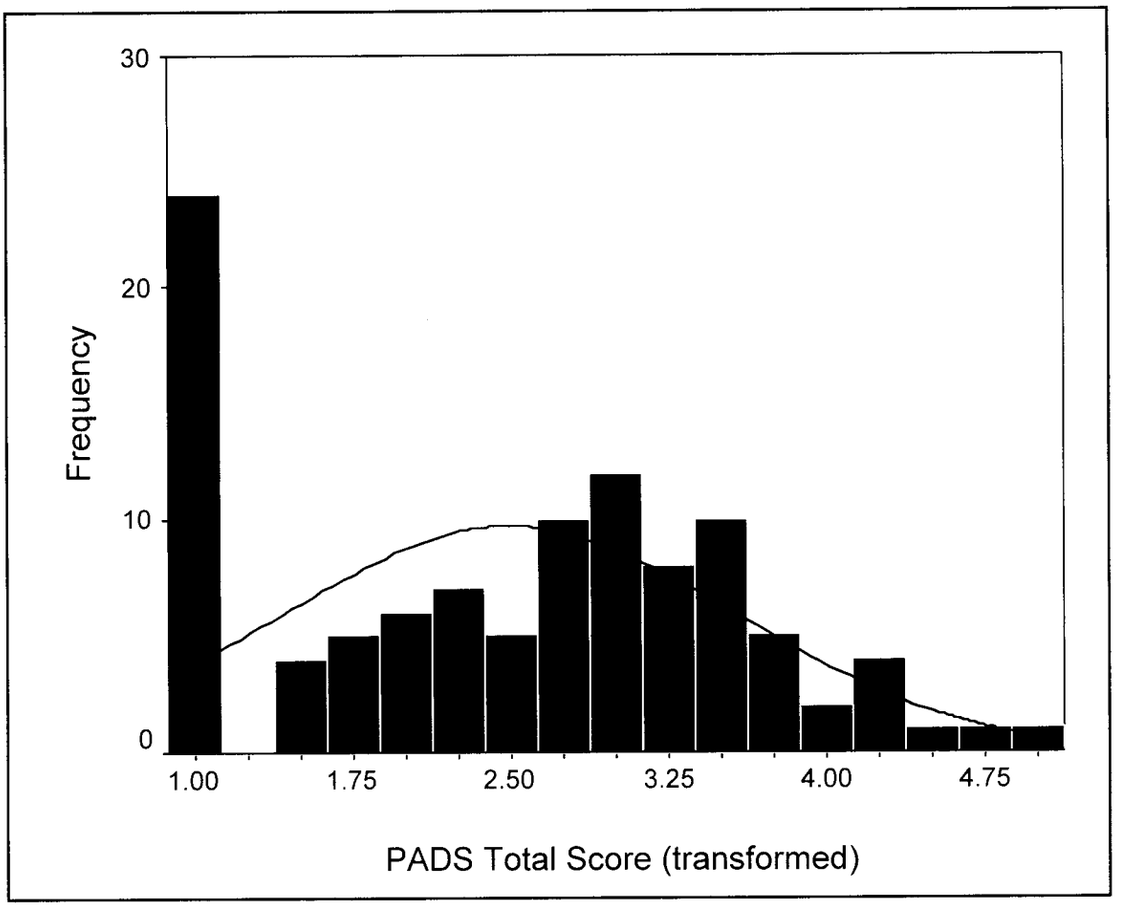


**Table 4**

**PADS Subscale Intercorrelations**

| PADS scales | Exercise | Leisure | House-hold | Indoors |
|---|---|---|---|---|
| Exercise | — | | | |
| Leisure activities | 0.09 | — | | |
| Household activities | 0.01 | 0.10 | — | |
| Time indoors | −0.26* | 0.01 | 0.07 | — |

*$p < 0.01$.

mixed factorial MANOVA was performed to assess the ability of the PADS to detect changes in physical activity over time as a result of an exercise intervention. It was hypothesized that participants who took part in the health promotion program would show a significant increase in their physical activity level between baseline and follow-up compared to the control group. Specifically, we hypothesized that there would be a significant Group by Time interaction effect on each of the PADS subscales.

Table 6 presents means and standard deviations for each of the PADS subscales and Total Activity score for treatment and control groups at baseline and follow-up. As hypothesized, a significant Group by Time multivariate interaction was observed ($F_{5,74} = 7.93$, $p < .01$). Significant univariate interaction effects were found on the Exercise subscale ($F_{1,78} = 37.67$, $p < .001$) and the PADS Total Activity score ($F_{1,78} = 4.76$, $p <$

**Table 5**

**Concurrent and Predictive Validity: Correlations of PADS Subscales with Cardiorespiratory Fitness Measures at Baseline and 12-Week Follow-Up**

| | Absolute peak $VO_2$ | | Relative peak $VO_2$ | | Maximum workload | | Time to exhaustion | |
|---|---|---|---|---|---|---|---|---|
| PADS scales | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Exercise | 0.12 | 0.04 | 0.28** | 0.18 | 0.04 | −0.01 | 0.09 | 0.09 |
| Leisure activities | 0.22* | 0.16 | 0.07 | 0.03 | 0.12 | 0.10 | 0.09 | 0.15 |
| Time indoors | −0.14 | −0.14 | −0.32** | −0.29** | −0.33** | −0.23* | 0.19 | −0.16 |
| Household activity | 0.23* | 0.24* | 0.16 | 0.17 | 0.22* | 0.26* | 0.26* | 0.25* |
| Total activity score | 0.23* | −0.22* | 0.21 | 0.18 | 0.18 | 0.19 | 0.23* | 0.21 |

*$p < 0.05$, **$p <$ 001.

.04). The treatment group participants significantly increased their level of exercise ($t_{61} = -11.63$, $p <$ .01), whereas exercise levels did not change significantly among controls ($t_{19} = .03$, $p > .05$). With respect to the PADS Total Activity score, treatment group participants increased their total physical activity, but this change did not reach statistical significance ($t_{68} = -1.68$, $p < .10$). However, the Total Activity score significantly decreased among control group participants ($t_{33} = 3.14$, $p < .01$). No other significant Group by Time interactions were observed.

## DISCUSSION

The lower levels of physical activity evidenced by persons with disabilities and chronic health conditions presents a number of challenges concerning the reliable and accurate measurement of physical activity in this population. In light of these difficulties, the present findings are promising because they demonstrate the ability of the PADS to provide reliable and accurate information concerning the physical activity behaviors of persons with disabilities and chronic health conditions. The PADS employs a semistructured interview approach that allows respondents greater flexibility in describing the type and level of their physical activity. This is particularly important since many physical activities prevalent in the general population may be infrequently reported by persons with disabilities (e.g., walking or jogging, attending a health club, gardening). Moreover, a few of the participants with stroke noted that they stretch their weak side (the side affected by the stroke) at various times during the day, which would not have been recorded on standard physical activity instruments developed for the general population.[10]

The present findings indicated that the PADS had adequate internal consistency. Subscale intercorrelations were generally low, with the exception of the relationship between the Exercise and Time Indoors scales. Hence, the PADS appears to measure generally independent dimensions of physical activity.

This study also provided support for the reliability of the PADS. Interrater reliability was high for all subscales and the PADS Total Activity score, and the temporal stability of the PADS subscales and Total Activity score were adequate. The present findings also lend support for the concurrent and predictive validity of the PADS. This is particularly true with the Household Activity and Time Indoors subscales, which evidenced the highest correlations with peak oxygen uptake and maximum workload. The negative correlations between Time Indoors and Peak $VO_2$ and maximum workload suggest that the Time Indoors subscale reflects the level of one's sedentary activity and provides useful information concerning one's cardiovascular fitness.

**Table 6**

**Group Means and Standard Deviations on PADS Subscales at Baseline and Follow-Up**

| | Treatment group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Post | | Pre | | Post | |
| PADS subscales | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Exercise* | 1.91 | 2.30 | 5.22 | 0.83 | 2.43 | 2.45 | 2.42 | 2.59 |
| Leisure activity* | 0.20 | 0.44 | 0.23 | 0.53 | 0.00 | 0.00 | 0.05 | 0.27 |
| Household* | 6.05 | 4.19 | 5.99 | 3.93 | 4.66 | 3.89 | 4.40 | 3.84 |
| Time indoors | 4.70 | 1.40 | 4.22 | 1.36 | 4.65 | 1.60 | 4.60 | 1.50 |
| Total activity* | 2.62 | 1.06 | 2.85 | 0.96 | 2.22 | 1.07 | 1.71 | 1.01 |

*Transformed to correct for nonnormality.

This finding is consistent with research conducted by Prochaska, Sallis, and colleagues, who found that watching TV was an indicator of sedentary behavior and was negatively associated with physiological indicators of fitness.[20] A review by Sallis, Prochaska, and colleagues also indicated that time spent *outdoors* has been consistently associated with level of physical activity.[21] Leisure Time Physical Activity had a low but significant correlation with peak oxygen uptake at baseline. On average, leisure time physical activity accounted for approximately 3.8% of all activity reported by participants on the PADS. Whereas the Leisure Time Physical Activity subscale may provide a reliable and accurate measure of one's recreational activity, such a low level of physical activity is likely to have little, if any, effect on cardiovascular fitness. Thus, unlike members of the general population, nonrecreational activities may have greater relevance for persons with disabilities and chronic health conditions with respect to their cardiovascular fitness. It should be noted, however, that our cohort was from an urban setting and lived in an environment where there was limited space (i.e., apartment, two-family unit) and access to outdoor activities such as gardening, golf, and tennis. Therefore, the present sample may not be representative of the larger population of individuals with disabilities.

Our findings provided partial support for the ability of the PADS to detect intervention-related changes in physical activity. It was hypothesized that individuals who participated in a health promotion program would evidence significant changes in physical activity, whereas control group participants would not. This hypothesis was confirmed for the Exercise subscale and Total Activity score, but not for Leisure Time Physical Activity, Household Activity, or Time Indoors. Since the purpose of the health promotion program was to improve cardiovascular fitness through structured and monitored exercise, it follows that changes in physical activity as a result of participation in the health promotion program would be most readily apparent on the Exercise subscale.

Our results also demonstrated that prior to the health promotion intervention and in control group participants, daily exercise time was extremely low, averaging 10 minutes per day, and leisure time physical activity averaged only 17 minutes per week. As the country begins its next 10-year cycle to improve the health of Americans, as noted in the *Healthy People 2010* report,[2] there is a substantial segment of the population—people with disabilities—who are not achieving enough physical activity to confer health benefits and who are well below the general population in terms of the amount of physical activity they are obtaining on a regular basis. Until greater effort is made on the part of federal funding agencies and public health departments to address the needs of people with disabilities, levels of physical activity will remain low.

The present findings indicate that the PADS is a reliable and valid measure of physical activity designed for persons with disabilities and chronic health conditions. However, it should be noted that the unique nature of the present sample with respect to type of disabling condition, ethnicity, socioeconomic status, and gender may limit the generalizability of the instrument. Furthermore, results obtained from the PADS may be affected by individual differences in self-reporting. Whereas most participants in the present study listed their physical activities in descending order of frequency/duration (i.e., engaged in most often to engaged in least often), persons exhibiting other styles of reporting their physical activity behavior may obtain PADS scores that underestimate their level of physical activity. Additional research is therefore needed to continue to refine the PADS with a more heterogeneous sample of persons with physical disabilities and health impairments. Future efforts should focus on calibrating the instrument with existing and established measures of physical activity (e.g., accelerometers) and to provide scale norms that would enable the use of the instrument as a diagnostic tool.

**SO WHAT? Implications for Practitioners**

The study seems to indicate that the Physical Activity and Disability Survey (PADS), a new measure of physical activity designed specifically for persons with disabilities and/or chronic health conditions, is a reliable and valid measure of physical activity. If these findings hold true, PADS will be a potentially useful instrument for monitoring baseline levels and changes in physical activity among persons with disabilities and/or chronic health conditions, particularly those who are sedentary and deconditioned.

**Acknowledgments**

*The authors would like to thank HyeJung Park for her contribution to this study. This work was supported in part by the Centers for Disease Control and Prevention, Disability and Health Branch, #R04CCR518810-01, and the National Institute on Aging—Midwest Roybal Center for Health Maintenance, PSO AG15890.*

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## Appendix 1

## The Physical Activity and Disability Survey

Respondent ID _____

Interviewer _____

Date _____

Sex of Respondent _____

### PHYSICAL ACTIVITY AND DISABILITY SURVEY (PADS)

INTRODUCTORY GREETING AND INFORMED CONSENT INSTRUCTIONS

Hello, my name is [insert your name] from [insert affiliation]. I want to ask you some questions related to physical activity and exercise. You don't have to answer any question you don't want to, and I'll stop anytime you want me to. There are no right or wrong answers and your responses will be kept anonymous and confidential. Okay? [PROCEED ONLY IF THE RESPONDENT CONSENTS, IF RESPONSE IS, ''NO,'' THEN ASK, ''When would be a good time to call you?'' TERMINATE THE INTERVIEW IF THE RESPONDENT ASKS TO DO SO.]

SCREENING ITEMS

S1 What is your primary disability? _____

**IF NO DISABILITY, STOP HERE—TERMINATE INTERVIEW**

F P N ? r S2 Do you have *Full, Partial,* or *No use* of your arms?

F P N ? r S3 Do you have *Full, Partial,* or *No use* of your legs?

S4 Do you use any of the following assistive aids? Please respond ''yes'' or ''no.''

Y N a. walker

Y N b. braces

Y N c. cane

Y N d. wheelchair

**TERMINATE INTERVIEW IF ANY *ONE* OF THE FOLLOWING CONDITIONS ARE MET:**

- **IF "F" IS CIRCLED IN BOTH S2 *AND* S3**
- **IF "?" IS CIRCLED IN EITHER S2 *OR* S3 (unsure or nebulous response)**
- **IF "r" IS CIRCLED IN EITHER S2 *OR* S3 (refused to answer item)**

### I. EXERCISE

Y ? N 1.00 Do you currently exercise?

**IF NO, GO TO QUESTION 2.00**

1.01 What kind if exercises do you do?

| Activity | min/day | days/week |
|---|---|---|
| 1.011 | | |
| 1.012 | | |
| 1.013 | | |

## II. LEISURE-TIME PHYSICAL ACTIVITY (LTPA)

Y ? N 2.00 Do you currently participate in any sports, recreational, or leisure activities?

**IF NO, GO TO QUESTION 3.00**

2.01 What type of activities to you do?

| Activity | min/day | days/week |
|---|---|---|
| 2.011 | | |
| 2.012 | | |

## III. HOUSEHOLD ACTIVITY

Y ? E 3.00 Are most of your indoor household activities done by You or someone Else?

**IF "SOMEONE ELSE", GO TO QUESTION 4.00**

3.01 Please list all the household activities you do and the number of minutes a week you spend on each activity.

| Activity | min/day | days/week |
|---|---|---|
| 3.011 | | |
| 3.012 | | |
| 3.013 | | |

Y ? E 3.02 Do you do any outdoor household activities such as gardening?

**IF NO, GO TO QUESTION 4.00**

3.03 please list all the outdoor activities you do.

| Activity | min/day | days/week |
|---|---|---|
| 3.031 | | |
| 3.032 | | |
| 3.033 | | |

## IV. TIME INDOORS

1 2 3 ? 4.00 From Monday through Friday, how many waking hours a day to you usually spend inside your home? [1] Less than 6 hours a day, [2] 6 to 10 hours a day, or [3] More than 10 hours a day.

1 2 3 ? 4.01 On Saturday and Sunday, how many waking hours a day do you usually spend inside your home? [1] Less than 6 hours a day, [2] 6 to 10 hours a day, or [3] More than 10 hours a day.

4.02 On average, how many hours a day are you sitting or lying down, excluding sleeping? _____

## V. RESPONDENT INFORMATION

5.00 What is your age? _____

1 2 3 4 5.01 Are you [1] White, [2] African-American, [3] Latino, or [4] Asian?

| | | |
|---|---|---|
| 1 2 3 4 5 | 5.02 | Is your household income [1] Less than $7,500, [2] $7,500 to $14,999, [3] $15,000 to $24,999, [4] $25,000 to $50,999, [5] more than $50,000? |
| Y ? N | 5.03 | Do you receive any disability benefits? |
| | 5.04 | What is the last year of school you attended? _____ |
| 1 2 3 4 5 | 5.05 | Are you [1] Married, [2] Divorced, [3] Separated, [4] Widowed, or [5] Single? |
| A ? H | 5.06 | Do you live in an Apartment or House? |
| Y ? S | 5.07 | Do you live with Yourself or with Someone else? |

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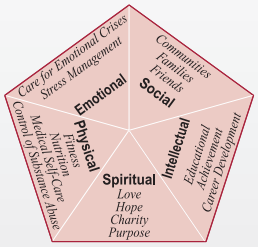


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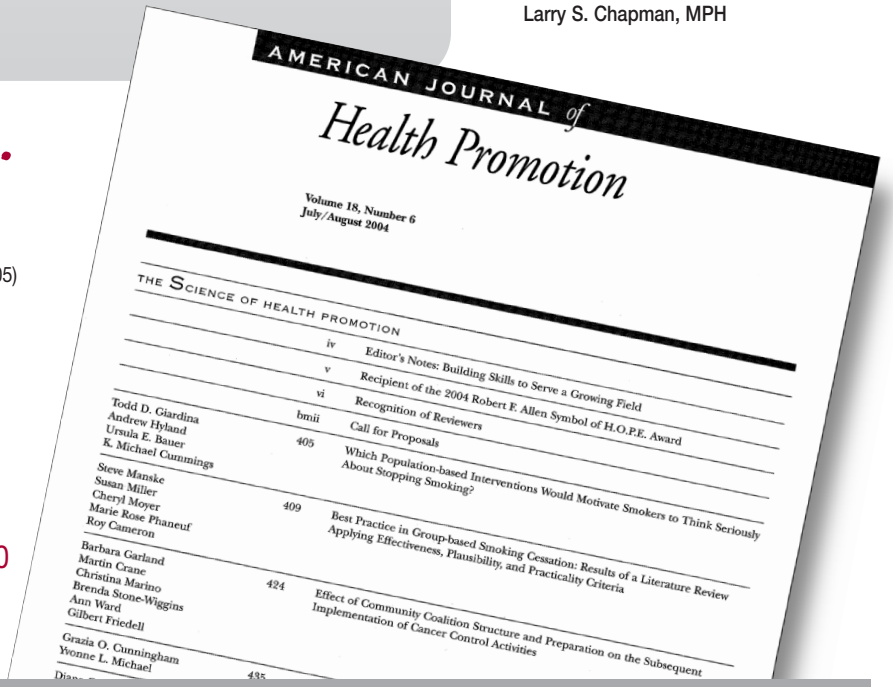
AMERICAN JOURNAL of
Health Promotion
Volume 18, Number 6
July/August 2004
THE SCIENCE OF HEALTH PROMOTION
iv Editor's Notes: Building Skills to Serve a Growing Field
v Recipient of the 2004 Robert F. Allen Symbol of H.O.P.E. Award
vi Recognition of Reviewers
bmii Call for Proposals
405 Which Population-based Interventions Would Motivate Smokers to Think Seriously About Stopping Smoking?
Todd D. Giardina, Andrew Hyland, Ursula E. Bauer, K. Michael Cummings
409 Best Practice in Group-based Smoking Cessation: Results of a Literature Review Applying Effectiveness, Plausibility, and Practicality Criteria
Steve Manske, Susan Miller, Cheryl Moyer, Marie Rose Phaneuf, Roy Cameron
424 Effect of Community Coalition Structure and Preparation on the Subsequent Implementation of Cancer Control Activities
Barbara Garland, Martin Crane, Christina Marino, Brenda Stone-Wiggins, Ann Ward, Gilbert Friedell
Grazia O. Cunningham, Yvonne L. Michael
435

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