A QUESTIONNAIRE FOR THE ASSESSMENT OF LEISURE TIME PHYSICAL ACTIVITIES

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Abstract—A questionnaire is presented for evaluating energy expenditure in leisure time physical activity (LTA), along with information about its validity. Administered by trained interviewers, the Minnesota LTA questionnaire is valid for use in longitudinal studies in North America of the relationship of physical activity to disease, in weight control clinics, and in other researches in which leisure time physical activity is of interest.

INTRODUCTION

MORRIS and colleagues recently found that leisure time activities of 7.5 kcal/min or more are associated with low incidence of future CHD [1, 2]. This has focused attention on the need for an instrument to classify leisure time activity on an intensity scale of calorie expenditure.

We describe here a new questionnaire for evaluation of energy expended in leisure time activities. Validity is established against the reference of physical work capacity.

PRIOR PHYSICAL ACTIVITY QUESTIONNAIRES

Leisure time physical activity of Morris' subjects was classified by a diary filled out the day it arrived without warning, by mail. Activities recorded were those carried out on a specified weekend day and a specified week day. Participants were asked to record activities in 5 min intervals for the 24 hr of each specified day.

The Morris questionnaire was further developed and investigated by Yasin [3], and Yasin et al. [4] in the population in which it was to be applied, i.e. desk-bound male British civil servants 40-64 yr of age who had completed secondary school. Validation was in reference to skinfold thickness and calorie intake estimated from a week's dietary survey in which food was weighed. Active men had thinner skinfolds and consumed more daily calories/kg body weight than inactive men. Stability of customary activity level was demonstrated by interviewing a group of 117 men 4 times within a year. In terms of three activity categories, active, middle, and inactive, and comparing the first weekend day to all 8 survey days, gross misclassification occurred in only three cases of the 117. Seventy of the men were consistently classified inactive, middle, or active using either 1 day or 8 days [4]. Rank order correlations of 0.8 were obtained for total activity scores based on 2 days vs 8 days [3].

Documentation is rare in efforts to study physical activity and its relationship to coronary heart disease. This was noted by Heinila et al. [5] who published the results

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of a survey about questionnaires on physical activity on the occasion of the International Symposium on Physical Activity and Heart Disease held at Helsinki in 1964. Karvonen [6] reported to that conference the almost universal absence of reliability and validity data on such questionnaires.

However, Morris' study population can be considered to have special skills in answering questionnaires. Because of their education, work experience, and awareness of the potential relationship of the questionnaire to public health policy, these British civil servants were surely better equipped than most to provide reliable and valid information. While their use of the questionnaire was 'successful', the general population might not have the same ability and motivation to deal with this or similar questionnaires.

Two other questionnaires have been developed, used, and extensively analyzed. One in the population study of Tecumseh, Michigan [8], and another in the Health Insurance Plan of New York [9]. The Tecumseh questionnaire was used as a self-administered instrument to assess physical activity [10]. Misconceptions of the respondents, despite attempts to clarify the questions by pre-tests, led to the conclusion that in populations whose occupational and educational status are widely disparate, a personal interview was necessary to obtain accurate data. The Tecumseh questionnaire as finally developed consisted of 36 occupational and 63 leisure time activities. Each activity was classified by its intensity, a measure of the rate of energy expenditure typically required to perform it, standardized for body size.

The Tecumseh questionnaire, administered to 1600 participants, called for interviews conducted by trained and experienced personnel. It required 1.0–1.5 hr. Its objective scoring system had a high consistency [7]. It measured (1) the intensity of the activity, (2) an estimate of the number of occasions the activity was performed, and (3) the average duration of activity on each occasion. The result was expressed as hours per week that the activity was performed, averaged over a year. The data collected by this method in a general population demonstrated statistically significant negative correlations with body fatness and blood pressure [8].

The Health Insurance Plan (HIP) of New York developed separate questionnaires for assessment of physical activity at work and at leisure [9]. These questionnaires were suited for self-administration in 5–10 min. The leisure time questions identified participation in a number of activities under a few general questions. For example, the question, Have you played games which require a ball for play? included participation in baseball, basketball, golf, squash, tennis, bowling and volleyball. Hodgson [11] studied in this institution the maximal oxygen intake in men aged 45–55 yr, classified by the HIP questionnaire. Clear differences appeared between sedentary and active classes in the leisure time categories but no difference was seen between three leisure activity classes. On the other hand, in four classes of job-connected physical activity there was an increment of maximal oxygen intake with each increase in activity class.

Buskirk and colleagues applied both the Tecumseh questionnaire and the HIP questionnaire to the same population [12]. Their interviewer was trained by Montoye of Michigan to ensure comparability of data with the published findings in Tecumseh [8]. However, correlations between the two approaches were low, though statistically significant. Activity at work evaluated by the HIP questionnaire was related to the Tecumseh occupational activity score \( r = 0.5 \). Leisure time activity classes of the two methods were also related \( r = 0.4 \). The two questionnaires measured related and partially overlapping aspects of leisure time physical activity.

**INTENSITY OF LEISURE TIME ACTIVITIES AND AN ACTIVITY METABOLIC INDEX**

Energy expended in a specific activity is estimated as the product of the intensity code \( I \) and the duration of exercise in minutes for a year \( D \). In the Minnesota LTA questionnaire, the ratio of metabolic rate during work to the basal metabolic rate provided an intensity code. That formulation, originally suggested by Dill [13], was adopted
by Montoye and colleagues [7]. The ratio has the advantage of being independent of body weight.

Following the terminology of Buskirk et al. [12] an Activity Metabolic Index (AMI) is designated for any given activity:

\[ \text{AMI} = I \times D. \]  

In the specific case in which the basal metabolic rate is 60 kcal/hr, the intensity code will equal the kilocalories expended per minute. The intensity value multiplied by time (in minutes) gives kilocalories expended over stated time. This relationship is useful as an intuitive guideline to interpret energy expenditure during leisure time physical activity. The interpretation: 1 intensity unit = 1 kcal/min is not exact, however. Dill [13] pointed out that basal metabolism varies from 50 to 80 kcal/hr. In addition, there is considerable uncertainty in assigning an intensity value to certain kinds of specific activities. For instance, dependent on the speed of swimming, the values of the intensity code can be 4.0-10.0 [12]. Finally, there are problems in estimating precisely the duration of an activity. Balancing this imprecision against intuitive appeal for the interpretation of kcal/day energy expenditure, kcal/day is used here in units of AMI. Montoye and colleagues skirt this issue by reporting data as the duration of participation in activities grouped by classes of intensity [14].

Intensity codes are based on experimentation in which rates of oxygen consumption (VO₂) were measured while people performed various specific activities [15-19]. For many activities VO₂ is a function of the rate of movement (walking, swimming) or the frequency of repetitions of an activity done at a constant rate (shoveling). Activities differ in customary lengths of pause and all these factors depend on individual vagaries. Empirical distributions of many of these factors have been obtained in highly standardized experimental situations, but are rarely available for the free-living situation. Judgment must therefore be exercised in choosing intensity codes, aiming for a reasonable representation of each activity as typically performed. An important part of this judgment was the consistency of the intensity codes used here with those employed by Montoye [7].

**THE MINNESOTA LEISURE TIME PHYSICAL ACTIVITY QUESTIONNAIRE**

It was our desire to develop a format for testing the hypothesis that exercise sufficient to produce a conditioning effect on the cardiovascular system is a mechanism of protection against coronary heart disease, either directly or through alteration of other risk factors. Intensity of physical activities (as measured in the Tecumseh questionnaire) served to classify people who performed vigorous exercise, and made it possible to test the validity of questionnaires against physiological measurements.

The Tecumseh questionnaire required such a detailed and lengthy interview that it was inappropriate for studies in which other considerations demanded much participant time. Accordingly, an attempt was made in the Minnesota LTA questionnaire to structure the interview. Activity coding was based on standardized definitions of specific activities.

A typical section of the questionnaire is shown as Fig. 1. A complete list of activities queried, with appropriate intensity codes, is given in Table 1.

Detailed instructions for completion of the questionnaire are given in the appendix. The respondent partially fills out the form alone, indicating activities during the past year. A trained interviewer then spends an average of 20 min per individual filling out detailed information for each activity checked. The specific months and their number \( M \) in which the activity was performed, the average number of occasions in each such month \( F \), and the average duration of activity on each such occasion \( T \) are all queried.
LEISURE TIME PHYSICAL ACTIVITIES

Listed below are a series of Leisure Time Activities. Related activities are grouped under general headings. Please read the list and check "yes" in column 2 for those activities which you have performed in the last 12 months, and "no" in column 1 for those you have not. Do not complete any of the other columns.

Table 1: Activities and Intensity Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Activity</th>
<th>Intensity code</th>
<th>Code</th>
<th>Activity</th>
<th>Intensity code</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>Walking for pleasure</td>
<td>3.5</td>
<td>440</td>
<td>Softball</td>
<td>5.0</td>
</tr>
<tr>
<td>015</td>
<td>Walking to and from work</td>
<td>4.0</td>
<td>450</td>
<td>Badminton</td>
<td>7.0</td>
</tr>
<tr>
<td>020</td>
<td>Walking during work break</td>
<td>3.5</td>
<td>460</td>
<td>Paddle ball</td>
<td>6.0</td>
</tr>
<tr>
<td>030</td>
<td>Using stairs when elevator is available</td>
<td>8.0</td>
<td>470</td>
<td>Racket ball</td>
<td>7.0</td>
</tr>
<tr>
<td>040</td>
<td>Cross-country hiking</td>
<td>6.0</td>
<td>490</td>
<td>Basketball; non-game</td>
<td>6.0</td>
</tr>
<tr>
<td>050</td>
<td>Back packing</td>
<td>7.0</td>
<td>500</td>
<td>Basketball; officiating</td>
<td>7.0</td>
</tr>
<tr>
<td>060</td>
<td>Mountain climbing</td>
<td>8.0</td>
<td>510</td>
<td>Touch football</td>
<td>8.0</td>
</tr>
<tr>
<td>115</td>
<td>Bicycling to work and/or for pleasure</td>
<td>4.0</td>
<td>520</td>
<td>Handball</td>
<td>12.0</td>
</tr>
<tr>
<td>125</td>
<td>Dancing—Ballroom and/or square</td>
<td>5.5</td>
<td>540</td>
<td>Soccer</td>
<td>7.0</td>
</tr>
<tr>
<td>150</td>
<td>Home exercise</td>
<td>4.5</td>
<td>560</td>
<td>Mowing lawn walking behind power mower</td>
<td>4.5</td>
</tr>
<tr>
<td>160</td>
<td>Health club</td>
<td>6.0</td>
<td>570</td>
<td>Mowing lawn pushing hand mower</td>
<td>6.0</td>
</tr>
<tr>
<td>180</td>
<td>Jogging and walking</td>
<td>6.0</td>
<td>580</td>
<td>Weeding and cultivating garden</td>
<td>4.5</td>
</tr>
<tr>
<td>200</td>
<td>Running</td>
<td>8.0</td>
<td>590</td>
<td>Spading, digging, filling garden</td>
<td>5.0</td>
</tr>
<tr>
<td>210</td>
<td>Weight lifting</td>
<td>3.0</td>
<td>600</td>
<td>Raking lawn</td>
<td>4.0</td>
</tr>
<tr>
<td>220</td>
<td>Water skiing</td>
<td>6.0</td>
<td>610</td>
<td>Snow shoveling by hand</td>
<td>6.0</td>
</tr>
<tr>
<td>235</td>
<td>Sailing</td>
<td>3.0</td>
<td>620</td>
<td>Carpentry in workshop</td>
<td>10</td>
</tr>
<tr>
<td>250</td>
<td>Canoeing or rowing for pleasure</td>
<td>3.5</td>
<td>630</td>
<td>Painting inside of house, includes paper hanging</td>
<td>4.5</td>
</tr>
<tr>
<td>260</td>
<td>Canoeing or rowing in competition</td>
<td>12.0</td>
<td>640</td>
<td>Carpentry outside</td>
<td>6.0</td>
</tr>
<tr>
<td>270</td>
<td>Canoeing on a camping trip</td>
<td>4.0</td>
<td>650</td>
<td>Painting outside of house</td>
<td>5.0</td>
</tr>
<tr>
<td>280</td>
<td>Swimming (at least 50 ft) at a pool</td>
<td>6.0</td>
<td>660</td>
<td>Fishing from river bank</td>
<td>3.5</td>
</tr>
<tr>
<td>295</td>
<td>Swimming at the beach</td>
<td>6.0</td>
<td>670</td>
<td>Fishing in stream with</td>
<td>6.0</td>
</tr>
<tr>
<td>310</td>
<td>Scuba diving</td>
<td>7.0</td>
<td>680</td>
<td>Wading boots</td>
<td>6.0</td>
</tr>
<tr>
<td>320</td>
<td>Snorkeling</td>
<td>5.0</td>
<td>690</td>
<td>Hunting pheasants or grouse</td>
<td>6.0</td>
</tr>
<tr>
<td>340</td>
<td>Snow skiing, downhill</td>
<td>7.0</td>
<td>700</td>
<td>Hunting rabbits, prairie chickens, squirrels, raccoon</td>
<td>5.0</td>
</tr>
<tr>
<td>350</td>
<td>Snow skiing, cross country</td>
<td>8.0</td>
<td>710</td>
<td>Hunting large game: deer, elk, bear</td>
<td>6.0</td>
</tr>
<tr>
<td>360</td>
<td>Ice (or roller) skating</td>
<td>7.0</td>
<td>370</td>
<td>Bowling</td>
<td>3.0</td>
</tr>
<tr>
<td>390</td>
<td>Bowling</td>
<td>4.0</td>
<td>400</td>
<td>Volleyball</td>
<td>4.0</td>
</tr>
<tr>
<td>410</td>
<td>Table tennis</td>
<td>4.0</td>
<td>420</td>
<td>Tennis, singles</td>
<td>8.0</td>
</tr>
<tr>
<td>430</td>
<td>Tennis, doubles</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1. A typical section of the questionnaire.
In equation (1) above, $D = M \times F \times T$. The overall AMI is:

$$\text{total AMI} = \sum (I \times M \times F \times T).$$

$\Sigma$ indicates summation over all activities.

For standardization across studies, it is desirable to use the questionnaire as presented here. However, the intensity codes we used, and the list of activities, are based predominantly on experience in middle-aged, middle-class American men. While the list of activities covered is long, it does not cover every American population and many activities not on this questionnaire are carried out in other populations: i.e., housewives, children, and cultures outside North America. The format is useful in populations, except in young children and the elderly, but specific activities may need to be added or deleted, and intensity codes changed.

**CLASSIFICATION OF INDIVIDUALS BY INTENSITY OF ACTIVITY**

Investigators have frequently in the past classified individuals by light, moderate, or heavy activities for both occupational and leisure time activity. To characterize men in this way with the Minnesota LTA, light AMI is defined by summing, as in equation (2), but only over those activities having intensity codes 2.0, 2.5, 3.0, 3.5, and 4.0. Moderate AMI is obtained by summing over activities with intensity codes of 4.5, 5.0, and 5.5 while heavy AMI is defined by summing over all activities having intensity codes $\geq 6.0$.

The cutting point 6.0 of the intensity code used to discriminate between activities designated moderate, and heavy was selected to be greater than 50% of maximal oxygen intake. For example, the mean maximal oxygen intake of men, aged 45–54, selected from a probability sample of a Minneapolis suburb [20] was found by Hodgson to be 30.1 ml/kg/min which is 10.8 kcal/min [11]. The average 50 year old man in the United States Railroad Study [21] weighed 74.1 kg and was 163 cm in height. The computed basal metabolic rate on this average man is 1.1 kcal/min [22]. Maximal oxygen intake for this man would therefore be achieved at an intensity code of about 10. The cutting point 6.0 is then about 60% of maximal oxygen intake for this average man. Of course, maximal oxygen intake varies by age and sex as well as by habitual physical activity. It follows that the limits of categories by intensity code will vary according to the population studied.

Conditioning of the cardiovascular system is accompanied by an increase in maximal oxygen intake and other measures of cardiovascular performance. Conditioning occurs when non-athletes work at a rate which is larger than 50% of their maximum oxygen intake [23]. This relationship has been investigated by a number of authors. For example, Shephard [24] provided some quantitative answers to questions of how long, how often, and at what intensity has one to exercise to produce an improvement in cardiovascular performance. He studied 39 young men randomly assigned to one of 27 training programs of different combinations of intensity $I$, frequency $F$, and duration $D$. The training was 5 times per week for 3 weeks, or 3 times per week for 4 weeks, or once per week for 6 weeks. The results are described by an equation which serial multiple regression analyses of the data demonstrated to be optimal for predicting a change in maximal oxygen intake ($\Delta VO_{2\text{max}} - 1/min$):

$$\Delta VO_{2\text{max}} = 1.27 + 0.0132I + 0.0502F - 0.0359 VO_{2\text{max}}.$$ 

Intensity of the activity (ml/kg min of oxygen consumed), frequency of participation (number of training sessions per week) plus initial level of maximal oxygen intake (ml/kg/min) account for the observed change in maximal oxygen intake.

Shephard studied exercise durations of 5, 10, and 20 min: within this range of duration there was no statistically significant difference in training effect. Longer periods do contribute to improvement in cardiovascular fitness but periods of actual activity (not including pause time) for a great many leisure time activities fall in the 5–20 min range.
Thus intensity and frequency are the major contributors to fitness in situations where ‘busy’ schedules preclude long periods of activity.

Pollack [25] reviewed the literature on conditioning by programs employing 50% or more of VO\textsubscript{2\text{max}} of middle aged men. He listed 14 other studies which employed a total of 257 subjects aged 40 to 55. The average improvement in VO\textsubscript{2\text{max}} was 5.89 ml/kg or 118% of one standard deviation for populations of middle-aged men. This suggests that men who participate in activities having intensity codes of ≥6.0 will have larger aerobic capacities than men who participate in activities having intensity codes <6.0. It also follows that codes for heavy AMI should correlate more closely with physical work capacity than codes for moderate, light, or total AMIs.

VALIDATION OF MINNESOTA LTA QUESTIONNAIRE RESULTS AGAINST TREADMILL PERFORMANCE

The Minnesota LTA questionnaire was studied in a group of men derived from a Twin Cities population sample [26, 27]. In addition to their questionnaire replies, they undertook a graded exercise test [28] carried to a self-determined point of exhaustion. Means and standard deviations for the various physiological measurements for these men are given in Table 2.

The 175 men ranged in age from 36 to 59 years. Blood pressure averaged 120/80 mmHg. Height averaged 69 in, and weight 180 lb. Heart rate at rest averaged 66.5 beats/min. Forty-four of the men had never smoked cigarettes, and 74 had quit smoking. Using the HIP job activity classification [9], 58% of the men had sedentary occupations (class I), 25% and 13% were in the two intermediate classes, and only 4% were in occupations requiring strenuous activity (HIP class 4). The group may be regarded as relatively sedentary and homogeneous in on-the-job activity.

Each individual is characterized by 4 AMI scores, one for each class of activity intensity and their sum total:

Total AMI = Light AMI + Moderate AMI + Heavy AMI. (3)

Of the total 240 kcal/day reported expended in leisure time physical activity, 42% was classed as heavy intensity, 29% as moderate intensity, and 29% as light intensity. These figures correspond to approximately 15, 14, and 23 min/day reportedly spent on heavy, moderate, and light intensity physical activities of leisure, respectively.

Results of the relationship of LTA scores and various exercise endpoints are given in Table 3.

Workload 150 is defined as the time in minutes of a standardized progressive treadmill test to reach a heart rate of 150 beats/min, and is undefined for individuals who did not reach a heart rate of 150 during that standard exercise. Workload for other heart

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>48.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Sitting SBP (mmHg)</td>
<td>129.3</td>
<td>13.6</td>
</tr>
<tr>
<td>Sitting DBP (mmHg)</td>
<td>80.4</td>
<td>9.7</td>
</tr>
<tr>
<td>Height (in)</td>
<td>69.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>180.0</td>
<td>25.9</td>
</tr>
<tr>
<td>Body Mass Index (kg/m\textsuperscript{2})</td>
<td>26.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Resting Heart Rate (beats/min)</td>
<td>66.5</td>
<td>10.9</td>
</tr>
<tr>
<td>Cigarettes (No.)</td>
<td>7.5</td>
<td>13.0</td>
</tr>
<tr>
<td>Total AMI* (kcal/day)</td>
<td>240.4</td>
<td>203.6</td>
</tr>
<tr>
<td>Light AMI (kcal/day)</td>
<td>68.8</td>
<td>76.1</td>
</tr>
<tr>
<td>Medium AMI (kcal/day)</td>
<td>69.5</td>
<td>77.5</td>
</tr>
<tr>
<td>Heavy AMI (kcal/day)</td>
<td>102.1</td>
<td>127.3</td>
</tr>
</tbody>
</table>

*Activity Metabolic Index.
Kcal/day are exact units for AMI for individuals with basal metabolic rate exactly 60 kcal/hr; otherwise these units are inexact, but provide a useful guideline for interpretation of the AMI.
Table 3. Descriptive statistics and correlations with leisure time physical activity scores

<table>
<thead>
<tr>
<th>Exercise endpoint</th>
<th>No.</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Multiple correlation coefficient with AMIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workload—155 (min)</td>
<td>125</td>
<td>8.11</td>
<td>1.17</td>
<td>0.437</td>
</tr>
<tr>
<td>Workload—150 (min)</td>
<td>149</td>
<td>7.91</td>
<td>1.18</td>
<td>0.409</td>
</tr>
<tr>
<td>Workload—145 (min)</td>
<td>160</td>
<td>7.55</td>
<td>1.20</td>
<td>0.358</td>
</tr>
<tr>
<td>Workload—140 (min)</td>
<td>164</td>
<td>7.15</td>
<td>1.20</td>
<td>0.327</td>
</tr>
<tr>
<td>Workload—135 (min)</td>
<td>167</td>
<td>6.75</td>
<td>1.22</td>
<td>0.323</td>
</tr>
<tr>
<td>Treadmill duration (min) (all men)</td>
<td>175</td>
<td>8.62</td>
<td>1.34</td>
<td>0.448</td>
</tr>
<tr>
<td>Treadmill duration (min) (men with workload 150)</td>
<td>149</td>
<td>8.80</td>
<td>1.23</td>
<td>0.516</td>
</tr>
<tr>
<td>Treadmill heart rate at minute 6 (beats/min) (all men)</td>
<td>172</td>
<td>123.4</td>
<td>14.0</td>
<td>0.335</td>
</tr>
<tr>
<td>Treadmill heart rate at minute 6 (beats/min) (men with workload 150)</td>
<td>149</td>
<td>124.7</td>
<td>13.5</td>
<td>0.398</td>
</tr>
</tbody>
</table>

Rates is similarly defined. Other exercise endpoints are: total treadmill duration and heart rate after 6 min of standard exercise. Most of the men (149/175) reached heart rate 150 in an average of 7.91 min. Those men reaching heart rate 150 had an average total treadmill test endurance of 8.80 min, slightly longer than the 8.62 min average total treadmill duration for all 175 men.

Table 3 also gives correlation coefficients for the relationships between various exercise endpoints and the three AMI questionnaire classes considered jointly. The multiple correlation coefficient is the result of multiple linear regression of each exercise endpoint on the three AMI classes simultaneously. The correlation coefficient drops progressively as lower heart rate criteria are considered. This decrease in strength of the LTA–work capacity relationship presumably reflects the lack of relationship between low level habitual activities and cardiovascular fitness. Total treadmill duration has a somewhat higher correlation (multiple r) with activity scores than have individual workload endpoints. This may, however, reflect only the willingness of individuals accustomed to regular exercise to push themselves further on a standard exercise test. A clear and statistically significant relationship is found between each exercise endpoint and energy expenditures estimated by the Minnesota Leisure Time Activity Questionnaire.

For the more detailed analyses to follow, only the workload 150 endpoint is considered. Results for other work capacity endpoints are similar. Table 4 shows the relationship between each component of the LTA score and work performance.

Table 4 Linear regression analysis

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Univariate coefficient</th>
<th>t value</th>
<th>Adjusted for other AMI coefficients</th>
<th>t value</th>
<th>Adjusted for other AMIs and clinical factors*</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy AMI</td>
<td>27.1</td>
<td>5.0</td>
<td>27.1</td>
<td>4.6</td>
<td>1/5</td>
<td>5.1</td>
</tr>
<tr>
<td>Moderate AMI</td>
<td>6.8</td>
<td>1.2</td>
<td>-4.8</td>
<td>-0.8</td>
<td>-0.2</td>
<td>-0.1</td>
</tr>
<tr>
<td>Light AMI</td>
<td>14.2</td>
<td>2.5</td>
<td>9.9</td>
<td>1.8</td>
<td>4.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Total AMI</td>
<td>25.1</td>
<td>4.6</td>
<td>not applicable</td>
<td></td>
<td>16/8</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Standardized regression coefficients and corresponding t values; the coefficients indicate predicted number of seconds increase in workload 150 for one standard deviation increase in the corresponding independent variable. N = 149

*Clinical variables: No. of cigarettes/day; never smoked = 0; ever smoked = 1. HIP job class; age in years. sitting DBP in mmHg. body mass index kg/m². resting heart rate. beats per min
Standardized regression coefficients are given; this slope indicates the expected change in workload 150 when the independent variable changes by 1 standard deviation. A \( t \) value greater than 2 suggests a statistically significant finding (at \( p = 0.05 \)). Scores for both the Total AMI and the Heavy AMI are seen in Table 4 to be statistically significantly related to workload 150 even when taking into account the other two AMI classes and a series of clinical factors also related to treadmill performance. The regression analysis predicts an increase of about 17 sec duration of workload 150 for an increase of 125 kcal/day of heavy activities.

The value of workload 150, expressed as time on the treadmill, depends on the exercise protocol used. A predicted change in workload 150 may be interpreted by using oxygen consumption (\( VO_2 \)) which is a standard measure of work performance, independent of the test protocol used. Bruce reports \([29]\) that \( VO_2 = 4.5 + 3.3 \) time on treadmill, using the exercise protocol employed here. An increase of 17 sec to reach heart rate 150 therefore implies a 3% increase in \( VO_2 \); that is, a 3% increase in the capacity for physical work at heart rate 150.

Table 5 gives means and standard errors for workload 150 and three AMI variables within eight analytical cells determined by cut points of AMI into high and low categories relative to the appropriate median. Thus one can look at variation in average workload 150 for one AMI variable categorized as low or high, while the other two AMI averages remain relatively undisturbed.

For example, as one looks from cell A to cell B, average scores for Light and Moderate AMI classes change little, but Heavy AMI varies greatly from low to high scores, and average workload 150 increases by 0.89 min. Other changes in average workload 150 associated with variation in Heavy AMI are 0.42, 1.15, and 0.97 min, averaging 0.86 min over the four values. When Moderate scores for AMI are categorized as low or high (at relatively constant levels for the other two AMIs) the average workload 150 changes by 0.03, -0.43, 0.11, and 0.30 min, averaging 0.003 min. In a similar consideration of Light AMI scores, the corresponding changes in average workload 150 are -0.42, -0.15, -0.15, and 0.39 min (averaging -0.08 min). This illustrates what has already

### Table 5: The Relationship of the Leisure Time Physical Activity Scores to Workload 150

<table>
<thead>
<tr>
<th></th>
<th>Heavy AMI ≤ 57.3</th>
<th>Heavy AMI &gt; 57.3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cell A</td>
<td>Cell B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Moderate AMI</td>
<td>31</td>
<td>7.55</td>
</tr>
<tr>
<td>AMI ≤ 46.9</td>
<td>19.54</td>
<td>2.07</td>
</tr>
<tr>
<td>AMI &gt; 46.9</td>
<td>20.77</td>
<td>2.20</td>
</tr>
<tr>
<td>AMI ≤ 46.9</td>
<td>18.92</td>
<td>2.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light AMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell C</td>
<td>Cell D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Moderate AMI</td>
<td>16</td>
<td>7.58</td>
</tr>
<tr>
<td>AMI ≤ 46.9</td>
<td>24.44</td>
<td>3.71</td>
</tr>
<tr>
<td>AMI &gt; 46.9</td>
<td>102.21</td>
<td>12.14</td>
</tr>
<tr>
<td>AMI ≤ 46.9</td>
<td>37.43</td>
<td>3.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light AMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell E</td>
<td>Cell F</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Moderate AMI</td>
<td>13</td>
<td>7.13</td>
</tr>
<tr>
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<td>35.86</td>
<td>5.20</td>
</tr>
<tr>
<td>AMI &gt; 46.9</td>
<td>15.10</td>
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</tr>
<tr>
<td>AMI ≤ 46.9</td>
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<td>17.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light AMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell G</td>
<td>Cell H</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Moderate AMI</td>
<td>14</td>
<td>7.43</td>
</tr>
<tr>
<td>AMI &gt; 46.9</td>
<td>33.43</td>
<td>5.50</td>
</tr>
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<td>AMI ≤ 46.9</td>
<td>99.04</td>
<td>9.28</td>
</tr>
<tr>
<td>AMI &gt; 46.9</td>
<td>111.80</td>
<td>23.56</td>
</tr>
</tbody>
</table>

Means of workload 150 and of the AMI variables grouped above and below the median of each AMI variable
been shown using the regression: Heavy AMI has a much stronger relationship to workload 150 than do either of the other two activity classifications.

USE OF THE MINNESOTA LTA QUESTIONNAIRE IN FEMALE ATHLETES AND NON-ATHLETES

Lewis [30] and Lawrence [31] studied LTA and diet calories in 8 female swimmers and 8 female non-athletes at Minnesota. The women, college students aged 18–24, had stable relative weights, ranging from 86 to 110%. Caloric intake was assessed using means of two 3 day food records. Leisure time physical activity, including and excluding swimming for the swimmers, was assessed for a 12 month period using the Minnesota questionnaire. The questionnaire discriminates effectively the energy expenditure for the two groups. Mean ± standard deviation is 329 ± 430 kcal/day for the non-athletes, 624 ± 718 kcal/day for athletes including swimming. Using the Minnesota LTA questionnaire, the athletes are found to have statistically significantly more caloric expenditure, exclusive of swimming, than the non-athletes. The questionnaire further tends to agree with caloric intake determined by food records. The estimated daily caloric intake for athletes was 2283 kcal/day and for non-athletes was 1573 kcal/day. If it is assumed (1) that caloric expenditure other than that measured by the questionnaire is approximately equal for athletes and non-athletes, and (2) that the bias in the dietary records is equal for the two groups, then the difference in caloric intake during leisure time physical activity should be equal to the difference in caloric expenditure. This condition holds: compared to the non-athletes, the athletes reported 710 more kcal/day eaten, and 676 kcal/day expended.

DISCUSSION

An interviewer-administered questionnaire to evaluate energy expenditure in leisure time physical activity has been developed. The Minnesota LTA questionnaire has been partially validated in several studies. It is currently used in the Multiple Risk Factor Intervention Trial, a collaborative prevention trial sponsored by the National Heart, Lung, and Blood Institute [32, 33]. Energy expenditure is expressed as scores for an Activity Metabolic Index, i.e. Total AMI, Light AMI, Moderate AMI, and Heavy AMI. The Total AMI score is believed to be closely associated with total kilocalories expended on leisure time physical activity, a value of particular relevance in weight control.

The Minnesota LTA questionnaire produces data by which participants may be classified in longitudinal studies to test the hypothesis that vigorous activity protects against the development of future coronary heart disease. The Heavy AMI scores are particularly relevant in this case, as suggested by the data and by the hypothesis that men who participate in heavier intensity activities should have larger aerobic capacities than their counterparts who participate to a lesser extent in such activities.

The association of the heavy activity score with treadmill performance is consistent with physiological theory and experience. On the other hand, the association does not constitute a complete validation of the instrument. For example, it is possible that high level leisure time physical activities are reported with more accuracy than moderate or low activities. Reproducibility studies are needed and validation is difficult. However, recent advances in estimating activity levels from pulse rate and from reliable recording devices, acceptable to participants, provide the technical means to obtain information on activity intensity free of the uncertainties of questionnaire data [34, 35].

It is concluded that the Minnesota Leisure Time Activity Questionnaire can be used in most urban U.S. populations when investigators wish to examine the effects of conditioning on the cardiovascular system.

Those investigators interested in studying relationships with physical activity should be aware that among those involved in industry in Tecumseh, light industrial work made a substantial contribution to the relationship of physical activity to fatness [8]. It would, therefore, appear wise to screen populations first for occupational physical activity using the questions devised by the HIP [9]. In those cases where it is warranted
by occupational activity, the Tecumseh occupational questionnaire would then be used, followed by the Minnesota LTA questionnaire.

Acknowledgements—The authors gratefully acknowledge the contribution of Mavonne Thomasberg, who administered the questionnaire, Allan Womelsdorf and Peter Hannan for computer programming, Nancy Sanders for typing the manuscript, and John Vlandre for administering the exercise stress tests. Thanks are due to Drs. A. Oberman (University of Alabama), H. Montoye (University of Minnesota), and G. Bartsch (University of Minnesota) who participated in the development of this questionnaire for use in the Multiple Risk Factor Intervention Trial.

REFERENCES
11. Hodgson JL: Age and aerobic capacity of urban midwestern males. A thesis submitted to the Graduate Faculty of the University of Minnesota, 1971
30. Lewis A: The effects of habitual activity patterns on the body composition and maximal aerobic capacity of young women. A thesis submitted to the Graduate Faculty of the University of Minnesota, 1977
Notes for Interviewers Using the Leisure Time Physical Activity Questionnaire

Interview technique

The administration of the physical activity questionnaire requires that special attention be paid to interviewing technique to limit bias in the data and to prevent the interview from becoming ponderous and irritating for both the participant and the interviewer. It is difficult for most people to remember what they did the previous year especially when it comes to an activity such as walking. Some participants tend to give up and do not try to make an estimate. Other participants take the task very seriously and try too hard to be dragged out the interview unnecessarily.

As an interviewer you should establish rapport during the introduction, perhaps exchanging a few pleasantries. Stressing the importance of the data can be achieved by emphasizing keywords. Instructions should be given in a slow, clear manner. From this point on you should take the initiative and set and maintain the pace in a very matter of fact way. Extraneous talk should be avoided. Though a participant should not be hurried, if he is spending undue time trying to recall detail, you should interrupt with ‘Remember we’re interested in an average or an estimate not an exact time’ or ‘In general what would you say’?

If a participant rambles you should politely cut in and remind him that you are interested in months and average times.

For any participant, challenge anything that seems exaggerated.

Example. A participant states that he swims one hour a week at the YMCA. Make sure that hour does not include changing time and socializing. In fact, the actual swimming time may be only 20 min.

If a participant states that he performs an activity more than 8 times a month (which would average twice a week) translate it into weeks to verify it.

Example: Participant states he plays softball 16 times a month. The interviewer should state ‘on the average you play softball 4 times a week’.

If a participant says he does something during the summer months, do not assume which months he means. Probe ‘Which months are you referring to?’

It is known that people tend to overestimate time spent at a particular activity. If a participant says ‘2 or 3 hours’, record 2. If the range given is large, ‘5 to 10 times’, ask that he try to be more specific. If an activity is performed very frequently, ‘number of times/month’ may be a difficult time reference. Suggest that the participant think in terms of number of times/week.

If an outdoor activity is performed every month, probe ‘Is your activity the same in summer as in winter?’ Expect that an average interview will last 10-20 min. Your goal is to get estimates as accurate as possible while maintaining a moderate to brisk interesting pace. The more experience you get interviewing, the easier these techniques will be. Hearing tapes of your own interviews would be extremely helpful in developing style. Plan to interview and record at least six respondents (staff members are fine) as practice. Evaluate the style and how situations might have been handled differently—perhaps more information needed, an unchallenged questionable response, or a little faster pace, etc.

Sample introduction

Start with an introduction to the relationship between physical activity and coronary heart disease. It is very important that we collect physical activity data for each participant. Use this form and ask you to make the best estimate you can in answering the questions.

Sample instruction

In this column we have listed different kinds of physical activities (point). In this column you checked whether you did or did not perform an activity in the last year. Is that right? So these activities with a check in the ‘Yes’ column (point) are activities which you performed sometime between now and last June (appropriate month). For each of these activities, I’d like you to tell me in which months you performed them (point), then I’d like the average number of times per month (point) and lastly the average time you spent at the activity each time you performed it.

Optional

For example, suppose you had checked backpacking. First you would give the months. Let’s say July and August. Then you would tell me the average number of times per month. If it was once in July and 3 times in August, you would tell me twice. Then you would tell me the average time you spent at the activity each time you backpacked.

This may sound confusing but once we start a routine, it will be quite easy. (A positive attitude and manner here is very important!)

For the first one or two activities checked, you will have to go through the steps verbatim.
Example: ‘You've checked that you've done backpacking. In which months did you backpack? What was the average number of times each month?’. etc.

After this you should strive for word economy and just use words or phrases rather than entire sentences. Pointing with a pen helps.

Example: Sailing. Months? Average times per month? Time per occasion? Once the routine is well established, after starting the activity, a nod of the head and pointing with a pen should elicit a response.

Activities

Several activities will require special probing or clarifying comments for each participant, no matter how the first column has been checked. A definition has been written for each of the activities. You should be familiar with all of these. With the exception of the categories mentioned below, you need not define activities unless a participant has a question.

Four situations in which walking is done from point to point requiring continuous walking for 10 min or more are requested as separate items. Note that time of walking during working hours is not wanted except for long breaks such as lunch.

For using stairs instead of elevator, state ‘For this one activity we will consider your choice of stairs over an elevator at any time, even during your work day’. Then probe in the routine manner.

If a participant has checked home exercise or health club, ask what the specific activities are and record data per instructions in the Definitions of Activities section.

Under home repair activities, state to each participant, ‘Because of space limitations, we couldn’t list all possible home activities. Can you think of any other major repair or maintenance job which you did last year?’ (Note: under the definitions section are procedures for coding the home repair category.)

The lawn-mowing categories require some clarification. If a participant checks walking behind a power mower, state ‘By this we mean a power mower which has to be pushed or a self-propelled mower’. If pushing a hand mower is checked, state ‘By this we mean a mower which has no power.’

The following activities have constraints (see Definitions). If any of these activities are checked, probe to be sure the constraint has been met:

Swimming
Cross-country hiking
Backpacking
Bicycling
Sailing

Standardized times for activities

To insure uniformity we will consider:

- 4 weeks in a month
- 48 work weeks per year
- 240 work days per year
- 22 work days per month
- 100 weekend days per year

Standard times have been established for the following activities:

- 1 flight stairs = ½ min (round up to the nearest minute)
- 1 water ski ride = 5 min
- 1 bowling game or line = 10 min
- Tennis single set = 20 min
- Tennis doubles set = 30 min
- Softball, 7 innings: Pitcher or catcher = 20 min
- Softball, 9 innings: Pitcher or catcher = 25 min
- Other players = 15 min
- Nine holes of golf = 1 hr, 30 min

For these activities the questioning format will change, i.e. do not ask how many minutes you spend on the stairs, ask the number of flights and translate into minutes using standard of ½ min per flight, or how many holes of golf, etc.

Miscellaneous

If the participant has filled out the entire questionnaire, checking months, etc., it will be necessary to validate each activity by reading back to him the information he has put down. Question anything which looks out of the ordinary.

Definitions and comments on activities

<table>
<thead>
<tr>
<th>Code</th>
<th>Title and comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>Walking for pleasure. Since this is the most frequently reported activity, each man should be asked specifically about it.</td>
</tr>
<tr>
<td>015</td>
<td>Walking to and from work. Walking from the bus to work, or the parking lot, etc., may be included in this category if the walking is continuous for 10 or more minutes. Such walking may be repeated in the evening.</td>
</tr>
<tr>
<td>020</td>
<td>Walking during work breaks. Include only walking which is not connected with work, such as walks during lunch hour. Walking which is associated with customary performance of the occupation is not included.</td>
</tr>
</tbody>
</table>
Voluntarily using stairs when elevator or escalator is available. Ask, specifically for the number of trips upstairs. Do not count walking downstairs; count 1 min for each flight (a flight = one story).

Cross-country hiking. Walking continuously on flat or in hilly terrains without backpack for at least 2 hr. Ask for elapsed time and frequency and duration of rest periods and stops for eating. Finally estimate total time spent walking per occasion.

Backpacking. Defined as walking and carrying a pack weighing 20 lb or more containing for instance, gear and supplies for overnight camping. If the activity does not qualify, record time, etc., under 040. Discount stops for rest and eating, etc.

Mountain climbing. Walking trips in which the purpose is to reach a 'high point' which takes several hours or days to accomplish qualify as mountain climbing. No distinction between rock climbing or hill climbing is made. Ask subject to distinguish between actual climbing and rest stops, eating, sleeping, etc. Total time to include both up and down time.

Bicycling. To walk and/or for pleasure. No distinction is made regarding the type of bicycle or the terrain. Ask for actual riding time. The rare individual who engages in medium and long distance racing should be reported under Other Activities under the title of Competitive Bicycling. Obtain data on practice sessions, include races as practice sessions.

Dancing. Ballroom and/or square dancing. Ask for time spent on dance floor.

Conditioning exercises

Setting up exercises, special routines for increasing flexibility or strength, running in place for roughly 3 min, carried out at home or in the health club should be reported under 'Home exercise' or 'Health club'. On the other hand, if a participant concentrates his activities in one area such as jog walk, jogging, running, weight lifting, do not report this under 'Home exercise' or 'Health club' but under the activity (180, 200, 210). If a participant goes to a YMCA for the sole purpose for playing a game of squash or other games listed in the section headed Sports, please list this activity under the specific game rather than under activities at 'Health club'.

If the company which employs the participant offers physical conditioning facilities and exercise routines on company time, these should be reported under 'Health club' or the particular activities listed above.

Home exercise. Ask what kind of exercise is done. Do not include items listed under other codes. Ask for time spent actually exercising.

Health club. Ask what kind of exercise is done at the club. Distinguish between visits for exercise classes and visits to engage in a single specific game (such as volleyball) or specific activity (such as swimming). Report specific activities below. Ask for total time spent in locker room, steam room, etc.

Jogging-walking. Ask for time spent in jogging and walking (most participants who do this will have a good estimate of the time).

Running. Ask for time spent running. 'Running' is defined as continuous running for at least 10 min, using full length strides. Shorter continuous activity is to be reported under jog-walk.

Weight lifting. Ask for time spent in the weight-lifting area. The type of weight lifting is not important for the purposes of this question.

Water activities

Water skiing. To obtain time per occasion ask for the total number of 'rides' per occasion. Multiply the number of rides or trips by 5 and record this as the total minutes of activity Sailing. Only those individuals who sail in racing competition are to be recorded here. Record the number of hours per occasion the participant is either racing or practising.

Canoeing or rowing for pleasure. Record the hours per occasion. Be sure the participant distinguishes riding in row boat from rowing.

Canoeing or rowing in competition. Ask for the number of months of training. Number of training sessions per month. Average time per training session.

Canoeing on a camping trip. Include the time paddling, whether bow or stern. Also included is associated activities such as portage, setting up camp, and maintaining camp.

Swimming (at a pool). Distinguish between time spent in the sun or by the side of the motel pool (drinking beer or bloody Marys?), time spent 'cooling off', and time spent actually swimming. Was the pool large enough to swim in? Athletic clubs and YMCAs have pools 50-75 ft in length. Verify.

Swimming at the beach or lake. Time spent in sitting on the beach or playing with waterball in 18 in of water is not wanted. Ask if participant swam out into deep water and how long was he swimming in water over his head? Do not include time spent snorkeling.

Scuba diving. Swimming under water while breathing oxygen from a tank strapped to back.

Snorkeling. Swimming with a face mask and breathing tube. Ask for time in water with snorkel gear in place.

Winter activities

Snow skiing downhill. Ask for time spent actually skiing downhill. It may help to ask the participant to estimate the number of runs per occasion and roughly how long each run actually
took. Competitive downhill racing should be reported under ‘Other activities’ with the title
Downhill Ski Racing.

Cross-country skiing. Ask the subject for the average amount of time spent cross-country skiing. If a respondent reports Snow Shoeing, that can also be recorded in this section of the form

Ice or roller skating. Total time spent at rink, minus rest periods and socializing.

Sledging or tobogganing. Ask for time on the slope. Then how much time is spent walking uphill. Report time walking uphill. If mechanical transportation is provided for going back up the hill, do not report activity.

Sports

Bowling. Ask the participant ‘How many games or innings do you bowl on an average night or occasion?’ Multiply the number of games times 10. The answer is time per occasion in minutes.

Volleyball. Ask for and record time spent on court.

Table tennis. Ask for and record total time playing.

Tennis singles. Ask for number of sets. Multiply the number of sets by 30 min. The answer is playing time in minutes. For lessons and volleying, record court time.

Tennis doubles. Ask for number of sets. Multiply the number of sets by 15 min. Record the answer which is playing time in minutes.

Softball. Record the number of games. Ask for innings per game. 7 inning games are considered to last 1 hr. 30 min. 9 inning games 2 hr.

Badminton. Record court time. Report tournament play in Section 1 under the heading of Competitive Badminton activities.

Paddleball. Record court time.

Racketball. Record court time.

Basketball. Record court time.

Basketball game play. Record court time.

Basketball officiating. Record court time.

Touch football. Record time of game.

Handball. Record court time.

Squash. Record court time

Soccer. Record total playing time.

Golf

Identify the method of carrying clubs. Players who employ a caddy can be reported under code 80. Ask for the number of holes played. Count 1/2 hr for every nine holes played.

Riding a power cart.

Walking, pulling clubs in cart.

Walking and carrying clubs.

Lawn and Garden Activities

Mowing lawn. Riding a power mower. Ask for average time to cut lawn. Inquire regarding coffee, coke (or beer’), or rest breaks. Adjust time accordingly.

Mowing lawn. Walking behind a power mower. This classification includes mowers with power applied to cutting blades only and also includes mowers with power applied to wheels and cutting blades. Record time to cut lawn with due regard to rest time.

Mowing lawn. Pushing hand mower. Record time with due regard to rest time.

Weeding and cultivation of garden. This item includes all activities needed to maintain an already planted garden. It can be done several times over the gardening season. Ask the subject to estimate the amount of time it takes with due regard for rest breaks.

Spading, digging, filling in garden. This item refers to the activities needed to prepare a garden for planting. It is usually done only in the spring, and so should not be checked for consecutive months. Ask the subject to estimate the time needed with due regard for rest time.

Raking lawn. Record the time spent raking with due regard for rest time.

Snow shoveling by hand. By checking with the local office of the National Weather Bureau, the Minnesota Center established a snow shoveling rate of 4-6 times per month (for the winter of 1976-7). The criteria used for snow that required shoveling was at least 1 in snowfall within 48 hr. If the subject gives an estimate beyond the 6 times a month limit, he is questioned further to make sure that estimate is valid. It is suggested that each center where snow shoveling would be reported check with their branch of the Weather Bureau and determine a standard to be used.

Home repair activities

This section uses a limited number of specified activities to cover a large cluster of related activities.

In the definition of activities given below, various other home repair activities are listed in addition to the principal heading. A good many home repair projects require from a half to several days of work.
Such activities may be confined to a relatively short portion of the year. To simplify recording it is proposed that all such activities be recorded in one month, usually the vacation period. Days to complete the task should be cumulated, using 8 hr for one day. For example, Mr. Jones rebuilt a porch during his vacation (August) in 8 half-days of work and then built a brick wall spending 3-5 hr on Saturdays for 10 weekends (September–November). To compute number of days in these activities, assume 4 hr per occasion in building the brick wall. There are then 18 half-days which may be recorded under code 640 as nine occasions in August with 8 hr per occasion.

620  Carpentry in work shop. Construction of furniture or comparable objects using hand held or power tools or repair of storm windows or screens or minor repairs inside the house can be included under this code. Record cumulative time spent in shop or doing minor repairs.

630  Painting inside of house or wallpaper hanging. Waxing floors, laying tile, installing or repairing plumbing, installing or repairing interior electric lines may be included under this code. Record time spent performing the task.

640  Carpentry outside of house. Building porches, garages, car ports, fences, etc., laying brick on walls or patios may be included under this code. Report cumulative time necessary to finish the job or jobs.

650  Painting outside of house. Painting outside of house, jobs which require ladders, changing storm windows and screens, washing windows, mixing and pouring cement, laying cement blocks and digging trenches for foundations may be included under this code. Report cumulative time necessary to complete one or more tasks.

Fishing and Hunting

660  Fishing from river bank. Record time (hours) spent on river bank.

670  Fishing in stream with wading boots. Record time (hours) spent actually fishing.

680  Hunting pheasants or grouse. Ask for time (hours) walking through cornfields (for pheasants) or through the woods (for grouse); pool time for both activities.

690  Hunting rabbits, prairie chickens, squirrels and raccoon. Ask for time (hours) spent in the field looking for game.

710  Hunting large game—deer, elk, bear. Record days spent in the field.

Other Activities

There will be the occasional individual who has spent a large amount of time on an activity that is not referred to here. If this time adds up to 8 hr during the year, record under other activities, asking the participant to give a name describing this activity.