

Short Communication

The repeatability of self reported physical activity patterns in rural South India

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The objective of this study was to develop a physical activity assessment questionnaire for use in poorly educated and low socio-economic rural communities in developing countries and assess the repeatability of the measurements over a one-year duration. Physical Activity Level, as a composite measure of daily physical activity (PAL = estimated 24 hour energy expenditure / estimated basal metabolic rate) was derived from the semi-pictorial, interviewer based questionnaire assessing physical activity over the previous 1 week. PAL of both men and women was unchanged across the different seasons of the year. Correlations between the first physical activity questionnaire and the mean of at least 4 questionnaires administered during the course of one year were generally high (males: PAL 'r' = 0.69, individual domains 'r' between 0.57 and 0.82; females: PAL 'r' = 0.7, individual domains 'r' between 0.41 and 0.76, all $p < 0.05$). Within- individual % coefficient variations (CV) across 4 physical activity questionnaires were low for sleep duration and PAL (< 14%) but high for the other domains of physical activity (77-100%). The data, at least in this community, suggest that while within-individual variations in specific domains of physical activity may be considerable, the questionnaire that we designed can rank individuals in terms of their PAL or individual domains of physical activity fairly consistently. A single physical activity assessment using this instrument may therefore be adequate to rank individuals.

Key Words: Physical activity, methods, rural, India, questionnaire

INTRODUCTION

In rural areas of many parts of India, a large number of people are illiterate or have minimal education¹ and often do not use watches.² This precludes the use of self administered physical activity questionnaires. In order to overcome these unique problems, we developed an interviewer-based semi-pictorial physical activity instrument (Figure 1).

MATERIALS AND METHODS

Seventy seven healthy subjects (36 male, 41 female; age range 35-70 years) from a village (Chittoor District of Andhra Pradesh; 140 km from Bangalore city) in South India, and engaged in a variety of agricultural occupations were recruited. Subjects who reported availability for repeated visits over the next year and gave informed consent were included. This study was done as part of the validation of instruments for a larger study, The Prospective Urban and Rural Epidemiology (PURE) Study, and was approved by the Institution Ethics Review Board of St John's Medical College and Hospital. The questionnaire assesses physical activity over the previous 1 week by combining a pictorial design with a physical activity inventory (Figure 1). For the respondent to provide information in a time sequence, the pictorial design categorizes a 24 hour period into night and day. The time-line divided into 24 rows, each representing a single hour allows interviewers to indicate events of the day which is subsequently used to chart out the domains of physical

activity and individual activities as well. Since a substantial number of the activities involved physical labour; integrated energy indices (IEI) for the activities were applied which are essentially METs obtained from published sources³ but corrected for rest periods.⁴ Physical activity level (PAL = estimated 24 hour energy expenditure / predicted basal metabolic rate (BMR)), a composite measure of overall daily physical activity and 24 hour energy expenditure was estimated as described elsewhere.⁵ Statistical analysis was done using SPSS program (version 13.0, SPSS, Chicago, IL). Results are presented as Mean \pm SD. Student's t test was used to compare the anthropometric characteristics and for pair-wise seasonal comparison of physical activities. The repeatability of the physical activity patterns reported one year apart was assessed using Pearson's correlation coefficient. Mean of 4 recalls obtained during the course of a year and coefficient of variation were computed for all subjects who had at least 4 recalls. For those individuals who had more than 4 recalls the first, last and 2 random intermediate recalls

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How many hours in a day do you sleep?							
How many days in the last week did you work?		Time	Time of day	Broad activity			
When you work, how many hours do you work in the day?		4					
		5					
		6					
		7					
List the most important activities that you do as part of your work: 1. 2. 3. 4. Enter IEI here:		8					
		9					
		10					
		11	☀				
		12					
		1					
		2					
		3					
		4					
		Do you rest intermittently while you are doing work ?	Yes / No	5			
				6			
		How much of the total time that you spend in work, would you rest?		7			
8							
Do you do housework (domestic chores)	Yes / No	9					
How many hours do you do housework?		10					
List the most important household activities that you do: 1. 2. 3. 4.	IEI:	11					
		12					
		1					
		2					
		3					
Do you perform special exercises / play games: Yes / No (circle) If Yes, indicate in the table below the activities that you perform:							
TYPE OF ACTIVITY		Daily	Weekly			Monthly	
(over the last month)	Rough Duration (mins)		1	2-4	5-6	1	2-3
Sports / games / exercise							
1.							
2.							
3.							
4.							
5.							

Figure 1. The Semi-pictorial Rural Physical Activity Questionnaire used in this study

were chosen and were compared using repeated measured ANOVA. Two sided p values < 0.05 was considered for statistical significance.

RESULTS

The mean age and Body Mass Index (BMI) were comparable between men and women (Table 1). Women were significantly shorter than the men (152.1 ± 6.8 vs 155.7 ± 7.3 cm, $p < 0.001$) and also had a significantly lower body weight (47 ± 10 vs 55 ± 9 kg, $p < 0.001$). The physical activity level of both men and women was unchanged across the different seasons of the year (Table 1),

although occupational activity in women was significantly lower during the monsoon season as compared to either summer or winter. Similarly, correlations between two physical activity questionnaires (PAL, MET x min in different domains) administered one year apart were moderately high ($r = 0.37$ to 0.52 , $p < 0.05$) and significant with the exception of the duration spent 'at rest' ($r = 0.05$, NS, Table 2). Correlations between the first physical activity questionnaire and the mean of at least 4 questionnaires administered during the course of one year were generally high (males; PAL 'r' = 0.69 , individual domains 'r' 0.57 to 0.82 ; females; PAL 'r' = 0.7 , indi-

Table 1. Seasonal variations in physical activity levels (PAL) and METxminutes in men and women.

	All data	Men	Women
Summer Vs. Monsoon			
Valid Pairs	53	21	32
Summer	1.67 ± 0.27	1.59 ± 0.29	1.72 ± 0.25
Occupational activity (METxmin)	993.7 ± 494.2*	1098.5 ± 516.4	924.9 ± 474.7*
Household chores (METxmin)	528.1 ± 386.5	193.6 ± 285.6	747.7 ± 268.9
Monsoon	1.64 ± 0.29	1.58 ± 0.35	1.68 ± 0.24
Occupational activity (METxmin)	785.8 ± 706.2	1043.8 ± 634.8	616.5 ± 708.5
Household chores (METxmin)	559.5 ± 558.5	155.8 ± 353.3	824.4 ± 509.8
Monsoon Vs. Winter			
Valid Pairs	54	22	32
Monsoon	1.63 ± 0.29	1.56 ± 0.35	1.68 ± 0.24
Occupational activity (METxmin)	771.2 ± 707.7*	996.4 ± 658.3	616.5 ± 708.5*
Household chores (METxmin)	549.1467	148.7 ± 346.3	824.4 ± 509.8
Winter	1.65 ± 0.26	1.63 ± 0.29	1.67 ± 0.23
Occupational activity (METxmin)	1007.6 ± 547.8	1076.3 ± 550.0	960.4 ± 550.0
Household chores (METxmin)	496.7	143.6 ± 186.7	739.5 ± 300.0
Winter Vs. Summer			
Valid Pairs	65	28	37
Winter	1.63 ± 0.27	1.56 ± 0.29	1.69 ± 0.25
Occupational activity (METxmin)	983.0 ± 568.3	983.6 ± 557.5	982.5 ± 584.0
Household chores (METxmin)	449.6 ± 391.2	126.7 ± 176.4	693.9 ± 326.1
Summer	1.61 ± 0.27	1.55 ± 0.32	1.66 ± 0.23
Occupational activity (METxmin)	940.0 ± 535.8	1073.7 ± 547.4	838.9 ± 511.0
Household chores (METxmin)	516.0 ± 389.9	189.9 ± 266.7	762.8 ± 267.6

All Mean ± SD

* Paired t test $p < 0.05$ (between seasons)**Table 2.** The within-subject repeatability of physical activity patterns across multiple activity domains 1 year apart

Parameter within Activity Domain	First recall	Last recall	<i>p</i> value	Correlation
Occupational activity				
Duration (min)	283 ± 234	222 ± 170	0.03	0.52*
METxmin	859 ± 758	605 ± 505	0.009	0.44*
Household chores				
Duration (min)	170 ± 166	216 ± 166	0.04	0.46*
METxmin	404 ± 452	589 ± 464	0.004	0.46*
Sleep				
Duration (min)	498 ± 58	504 ± 59	0.48	0.38*
Rest				
Duration (min)	57 ± 62	43 ± 47	0.2	0.05
Residual				
Duration (min)	452 ± 242	413 ± 199	0.2	0.37*
Estimated Daily energy expenditure (kJ)	9112 ± 2077	8868 ± 2069	0.3	0.61*
Daily METx min	2348 ± 509	2228 ± 411	0.08	0.43*
PAL	1.63 ± 0.36	1.57 ± 0.27	0.2	0.50*

p value: between first and final recall, * $p < 0.05$ for the correlation between the first and last recall

vidual domains 'r' 0.41 to 0.76, all $p < 0.05$). Within-individual % coefficient variations across 4 physical activity questionnaires were low for sleep duration and PAL (< 14%) but high for the other domains of physical activity (77-100%) and are summarized in Table 3.

DISCUSSION

The data suggests that self reported overall physical activity patterns, expressed as PAL, are significantly correlated over time and across seasons in the study group, for both men and women. This study indicates that the as-

essment of PAL in this group can be adequately captured by a single measurement as this was found to be comparable to the mean of four administrations repeated over a 1 year period. Apart from sleep duration, the other domains of physical activity had a high within-subject %CV but had reasonably high correlations over time, suggesting that this instrument may be reasonable for ranking individuals in terms of their physical activity, even if it cannot adequately quantify physical activity in absolute terms with a single administration. This is important because there are data that suggest that seasonality may af-

Table 3. Physical activity at each recall across multiple activity domains (n=61)

Activity Domain	First recall	Second recall	Third recall	Fourth recall	Overall mean	%CV
Occupational activity METxmin	892.4±764.49	1005.36±644.75	818.3±648.92	725.61±594.6*	860.42±493.64	83
Household chores METxmin	442.78±498.92	449.4±430.48	549.24±435.19	562.26±484.47*	500.93±377.74	77
Sleep Duration (min)	506.55±56.41	510±65.49	494.26±70.48	505.57±51.91	504.1±42.5	9
Rest Duration (min)	57.04±58.85	55.32±46.59	38.36±47.16	53.11±42.91	50.96±32.98	100
PAL	1.65±0.33	1.64±0.33	1.62±0.3	1.61±0.28	1.63±0.23	14

* Repeated measures ANOVA $p < 0.05$

fect physical activity patterns in some developing countries where mechanization is low.⁶ While the effect of seasonality was modest and restricted to occupational activity in women in this data set, it does not preclude the influence of seasonality in other population groups. While self reports to ascertain physical inactivity as a risk factor for chronic diseases have been shown to produce fairly robust conclusions even with simple questions,⁷ determining validity of this questionnaire against objective measures will be important.

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AUTHOR DISCLOSURES

None of the authors report conflict of interests. The study was conducted using intramural funds.

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印度南部鄉村自陳體能活動型態的再現性

此篇研究目的為發展一體能活動量評估問卷，使應用於開發中國家低教育程度及低社經地位之鄉村居民，並且評估一年期間測量之再現性。體能活動程度 (PAL) 是每日體能活動的複合性測量 (PAL = 24 小時能量消耗估計量/基礎代謝率估計值)，由訪員利用半圖示問卷評估前一週之體能活動量。成人之 PAL 未因季節不同而有所改變。第一次體能活動量問卷結果與隨後一年期間至少四次問卷平均值的相關係數均相當高(男性：PAL 相關係數為 0.69，各項活動量相關係數介於 0.57-0.82；女性：PAL 相關係數為 0.7，各項活動量相關係數介於 0.41-0.76， $p < 0.05$)。四次活動量問卷的個體內之變異係數(%CV)，在睡眠時間及 PAL(<14%)較低，但在其他項目活動量的變異係數頗高(77-100%)。這些數據顯示在此社區中，在特定項目的體能活動量，個體內變異可能相當可觀。然而，我們設計的這份問卷，可根據 PAL 或單項體能活動量將受試者做相當一致性之排序。使用這個工具評估單一項體能活動量，即足以用來將個體排序。

關鍵字：體能活動量、方法、鄉村、印度、問卷