

Intensity levels of occupational activities related to hotel housekeeping in a sample of minority women.

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Occupational Physical Activity Research

Recommendations of physical activity to combat chronic health problems find their roots in antiquity^{1,2}. However, the first quantitative analyses confirming the health benefits of a physically active lifestyle only began to appear in longitudinal analyses of physically active occupations during the 1950s⁴. Subsequent research—mainly on leisure-time physical activity—has linked physically active lifestyles to lower incidences of all-cause mortality^{3,4}, stroke^{5,6,7}, diabetes^{8,9,10}, coronary heart disease^{7,11}, certain types of cancer⁴, musculoskeletal problems and obesity¹². However, increased mechanization and declining habitual physical activity is leading researchers to examine new ways to incorporate the promotion of physical activity into our daily lives^{13,14}.

One area emerging as an important field of study is the role occupational activity may play in accumulating daily recommended levels of physical activity. Stemming from the initial work of Professor Jeremy Morris with double-decker bus workers in London¹, other researchers have sought to understand the link between physically active occupations and associated health benefits. Recent studies directly link increased occupational physical activity with lower incidences of several chronic health problems^{3,5,15-18}. Other studies have found no significant health benefits of occupational physical activity or heavy housework^{3,19,20,21}.

Despite conflicting conclusions, one commonality exists among nearly all of these studies—recall bias and misclassification of physical activity may be confounding results^{3,5,15-18,21}. Research shows social desirability and social approval affect self-reports of physical activity²². These biases are particularly problematic when studying lower intensity levels of physical activity or habitual forms of activity, generally leading to overestimation²³.

Purpose

The current project seeks to develop a tool for objectively assessing physical activity among free-living populations. By combining wireless measurement of heart rate (HR) with real-time annotation of activities, we are able to directly link a HR with a specific occupational activity. This report details pilot testing and initial results of monitoring activity levels among housekeeping employees at a US hotel.

Subjects

- Five female housekeepers working at a major US hotel chain
- Mean age=43 years old
- 50% of Hispanic origin
- Mean resting HR=67 bpm

	Age	Resting Heart Rate	Max HR for Age	Target HR to reach "moderate" intensity
S102	61	52	159	94.8
S104	31	76	189	121.2
S106	39	72	181	115.6
S107	46	67	174	109.8
S108	41	66	179	111.2

Data Collection

- Subjects were monitored during the performance of their normal, daily cleaning responsibilities at the hotel
- HR data were wirelessly transmitted to a computer at 1 second intervals
- Direct observation was used to code the following activities:

Table 1. Coding Categories for Direct Observation

Activity	
Bed making	Emptying trash cans
Mopping	Vacuuming
Scrubbing	Wiping/dusting
Stacking of shelves	Other
Sweeping	

- Coding data was recorded on a handheld computer (PDA) synchronized with the HR data collection (see picture below)
- Approximately 27 hours of HR data were coded and used for analysis

One of our research assistants wearing the backpack containing the laptop computer used to wirelessly collect and store the HR data from participants.



Hand held computer used to electronically record annotations of participant's activities. This device was synched with the laptop computer used to collect and store the HR data. This tool allows us to directly link a specific HR to its activity.

Analyzing the Data

- HR data and time were compiled according to its labeled activity category
- Periods of transition or other "noisy" sections of data were deleted—vacuuming was dropped for the present analysis due to inaccurate data collection caused by electromagnetic interference
- Descriptive and summary statistics were calculated for each subject
- Percent of heart rate reserve (%HRR) was calculated
- %HRR=(mean HR – resting HR)/(max HR for age – resting HR)*100
- See Table 2 for ranges of intensity levels as defined by %HRR

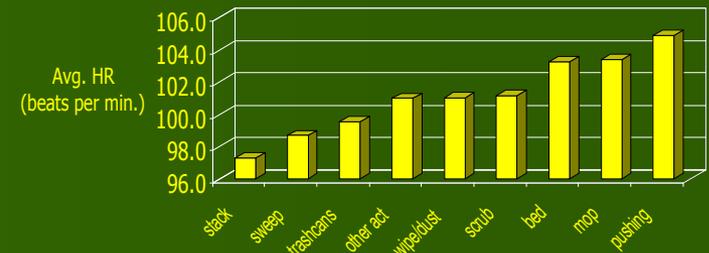
Table 2. %HRR Ranges for Activity Level Categorization²⁴

%HRR	Activity Level
>60%	Vigorous
40%-59%	Moderate
20%-39%	Light
<20%	Very Light

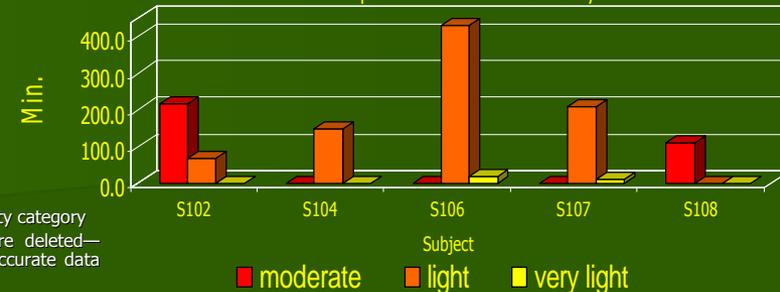
Results

The majority of participants' time was spent making beds (37%) and wiping/dusting (26%). Average HR across all activities ranged from 94-113 beats per minute (bpm). Average HR [standard deviation] for each activity was: pushing carts 104.9 [7.9], mopping 103.4 [7.6], bed making 103.3 [9.4], scrubbing 101.2 [8.7], wiping/dusting 101.0 [9.2], other 100.1 [9.8], emptying trash 99.6 [8.6], and stacking 98.7 [5.5]. The majority of activities did not reach a moderate intensity level defined as 40%-59% of heart rate reserve.

Average Heart Rates across activities



Time spent at each level of intensity



Conclusion

This was the first study to measure HR during occupational physical activity with real-time annotation of activities. This permitted us to objectively and precisely determine which activities produced which heart rates. Low variation in HR was found among the activities and the intensity levels were lower than expected. These findings suggest that housekeeping activities contribute less to health outcomes than previously thought.