

Original Research Article

Physical activity and energy expenditure among older adults


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Abstract

Physical activity and exercise for older helps improve mental and physical health, both of which will help you maintain your independence as you age. This study aimed find the type and level of physical activity and energy expenditure from physical activities done by older adults. 42 participants were approached from different residential area of Surat and IPAQ (Gujarati) was used to measure Physical activity in adults and for energy expenditure. Energy expenditure was measured by using equation $EE = MET \times 3.5 \times \text{Weight (kilograms)}/200$. For total vigorous activity PA \pm EE were 7260 (MET-min/week) \pm 648.75 (Kcal/week), total moderate activity PA was 72382.5 (MET-min/week) and EE was 624 (Kcal/week), total walking activity PA and EE were 31775 (MET-min/week) and 404.49 (Kcal/week) respectively, total sitting activity PA \pm EE were 136800 (MET-min/week) \pm 96.12 (Kcal/week) and total driving activity PA and EE were 5410 (MET-min/week) and 96.11 (Kcal/week) respectively. In older adults, sitting and walking have found most common type of PA with less EE and more EE found with less vigorous and moderate activity.

Key words

Adults, Elderly, Older adults, Physical activity, Energy expenditure.

Introduction

The term 'Elderly' is applied to those individuals belonging to age 60 years and above [1]. Elderly people or old age refers to ages nearing or

surpassing the life expectancy of human beings, and is thus the end of the human life cycle [2].

Increasing age is associated with declining physical activity and with changes in a number of physiological parameters [3]. Elderly people are more prone to disease, syndromes, injuries, and sickness than younger adults. Globally, the population is aging rapidly. Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double, from 12% to 22%. Mental health and well-being are as important in older age as at any other time of life [4, 5]. There are 77 million older persons in India according to the 2001 census, of which 37 million are males and 40 million are females. At present, 19 million elderly women are widows, 80 percent of them live in villages, a majority in the unorganized sector with no pension plans, provident fund, gratuity or medical cover as security in trying times [6].

The elderly population is outsized in general and growing due to the advancement of health care education and technology. This group is faced with numerous physical, psychological, and social role changes that greatly challenge their sense of belonging and capacity to live a better life [7]. Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure. PA in daily life can be categorized into occupational, sports, conditioning, household, or other activities [8].

The benefits of PA for health maintenance have been well documented, especially in the prevention and management of chronic diseases such as some cancers, type 2 diabetes, and cardiovascular disease [9]. PA, including the reduced prevalence of common chronic conditions, improved mental health, quality of life, increased physical function, decreased cognitive decline, and reduced mortality rates [10]. PA refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health. Popular ways to be active include walking, cycling, wheeling, sports, active recreation, and play, and can be done at any level of skill and for enjoyment by

everybody [11]. Physical inactivity is recognized as one of the leading risk factors for overweight, obesity, non-communicable diseases (NCDs), and chronic conditions. It has been identified as the fourth leading risk factor for global mortality [12]. Physical inactivity speed up the aging process in many people, whereas increased PA slows it down in others [13].

The PA recommendations for exercise for older adults are minimum of 150 min of moderate-intensity or 75 min of vigorous-intensity physical activity per week, or an equivalent combination of moderate and vigorous physical activity [14]. WHO recommendations, Aerobic activity should be performed in bouts of at least 10 min duration. For additional health benefits, undertake up to 300 min of moderate-intensity or 150 min of vigorous-intensity aerobic activity, or an equivalent combination [15]. Exercise for older adults includes both aerobic exercise and strength exercise as well as balance exercise to reduce the risk of falls. If older adults cannot do exercise because of chronic condition, they should be as active as their ability to do exercise [16].

Regular physical activity, such as walking, cycling, wheeling, doing sports or active recreation, provides significant benefits for health [16]. The benefits of physical activity for older adults include, reduced risk of obesity, maintain functional ability, prevent or reverse disability, and extend years of active independent living, improve mood and sense of well-being [17, 18]. Regular exercise and increased aerobic fitness are associated with a decrease in all-cause mortality and morbidity, improve quality of life [19]. Physical activity is key characteristic of primary and secondary health prevention [20]. Regular physical activity can improve muscular and cardiopulmonary fitness, improve bone and functional health, reduce the risk of hypertension, coronary heart disease, stroke, diabetes, various types of cancer, and depression, reduce the risk of falls as well as hip or vertebral fractures and help in maintain a healthy body weight.

Energy expenditure is the amount of energy that a person needs to carry out physical functions such as breathing, circulating blood, digesting food, or exercising. Energy is measured in calories, and your total daily energy expenditure (TDEE) is the number of calories you burn each day. To prevent weight gain, energy intake must be balanced with energy expenditure [21]. Daily EE can vary according to numerous factors, such as age, sex, body composition, clinical condition and PA [22]. EE may decrease with aging due to reductions in both the BMR and PA, or it can increase due to rising metabolic turnover and the hyper metabolic effect of fever or medications [23, 24 25]. Energy is needed by the body to stay alive, grow, keep warm and move around. Energy requirements vary from one individual to another, depending on factors such as age, sex, body composition and physical activity level. Energy expenditure is the sum of the basal metabolic rate (the amount of energy expended while at complete rest), the thermic effect of food (TEF, the energy required to digest and absorb food) and the energy expended in physical activity. Due to aging PA and EE also decreased because of these factors. Active participation in later life is very important for healthy life with or without co morbidities. So this study is to find the activity level and energy expenditure among older people to know the level of their participation in daily life.

Materials and methods

The study was a part of under graduate programme, so no separate ethical clearance has been taken. Cross sectional study was conducted in Surat city. Community dwelling older adults above 55 years were selected by personal contacts and through family members, friends and relatives by convenient sampling. The study was conducted for six months. Complete preliminary examinations were done for the subjects using assessment form. Subjects were selected whose MMSE was more than 7 and both males and females were included. Older adults who can write and read Gujarati were taken in study. Elderly who were severely bed ridden,

severely affected with musculoskeletal disorder or having visual and learning disability have been excluded from the study.

The procedure was fully explained to the subjects in simple language which he/she could understand and written informed consent was taken for the same. The student researchers approached and contacted participants individually for the study. Out of the 50 subjects approached, 44 subjects were included on basis of inclusion criteria. Gujarati IPAQ has been used for the physical activity after taking prior permission from the author [26]. International physical activity questionnaire (Gujarati version) was used for evaluation of physical activity and energy expenditure among older adults. This questionnaire has five sections that included, job related physical activity, driving related physical activity, house-hold activity, and leisure time activity and sitting time respectively. As it is self-administered questionnaire, the copy of questionnaire has been given to the participants to fill. If participants have any query to understand any point in the questions, it was solved by student researcher. It was one time survey so participant has been called only once for all process. Out of 44, 2 subjects submitted incomplete forms and refused for further cooperation. So, 42 responses were collected and analyzed for the results.

Results

This study was aimed to find the PA and EE among elderly older adults. Total 42 records had been selected for the analysis. Descriptive characteristic of age, height and weight had been done using Microsoft excel 2016. Mean and SD had been done for age, height and weight (**Table – 1**). Gender distribution was as per **Figure – 1**. PA was expressed in (MET-min/week), while EE was expressed in (Kcal/week).

PA was count by using equation,

$$PA = (\text{min/week})/\text{MET}$$

EE was count by using equation,

$$EE = MET \times 3.5 \times \text{Weight (kilograms)}/200$$

630 (MET-min/week) and 336.39 (Kcal/week). For household vigorous activity PA and EE were 6630 (MET-min/week) and 312.35 (Kcal/min).

The values used for MET was given by Jack Wilmore and David Costil in the book physiology of sports and exercise. For job related vigorous activity MET was 7 that indicate Shoveling, for household vigorous activity we MET was 6.5 that indicate chopping wood. For job related vigorous activity PA and EE were

PA and EE for vigorous activity, moderate activity, walking, driving and sitting was as per **Table – 2, Figure – 2 to 6**. Total PA and EE for vigorous, moderate, walking, sitting and driving activity were as per **Table – 3 and Figure – 7**.

Table - 1: Descriptive statistics.

	Mean	SD
Age (year)	62.98	2.20
Height (cm)	164.64	10.02
Weight (kg)	65.38	9.00

Figure - 1: Gender distribution.

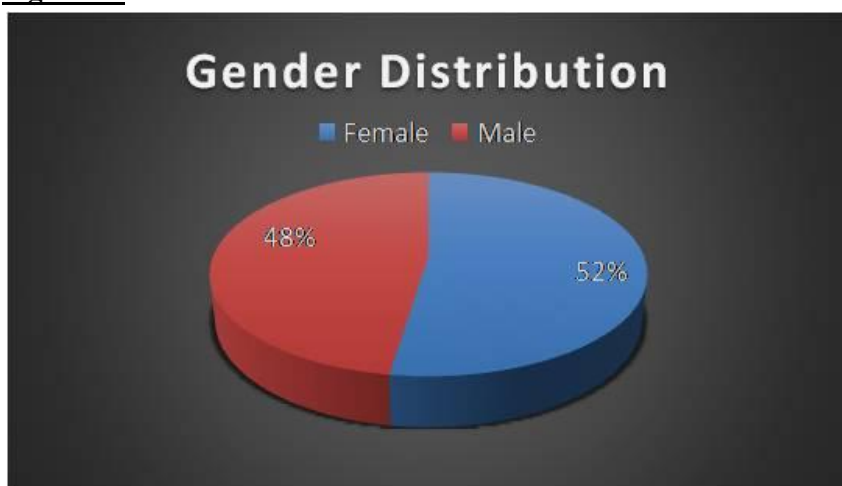


Figure - 2: PA and EE for Vigorous activity.

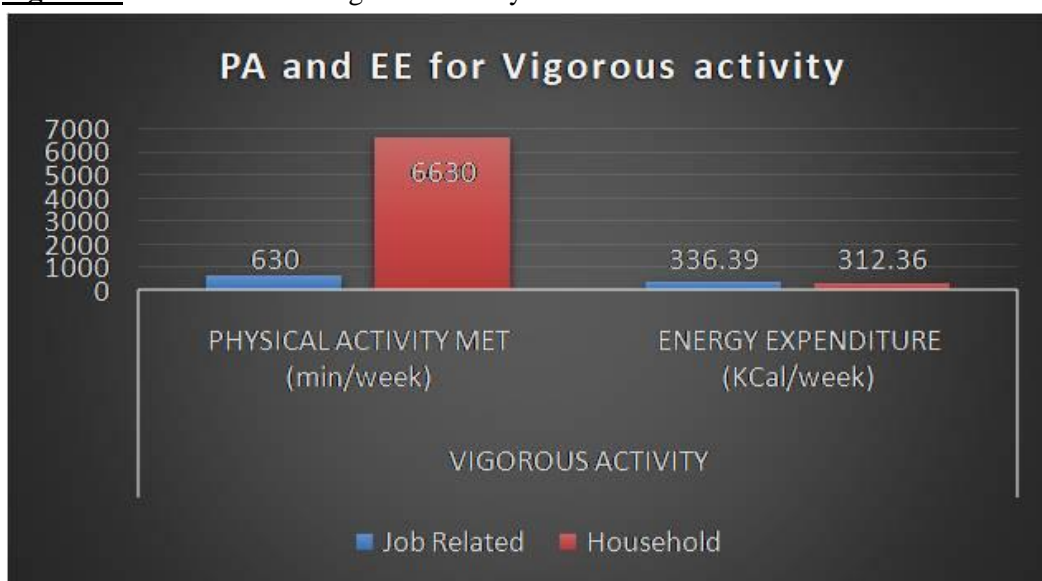
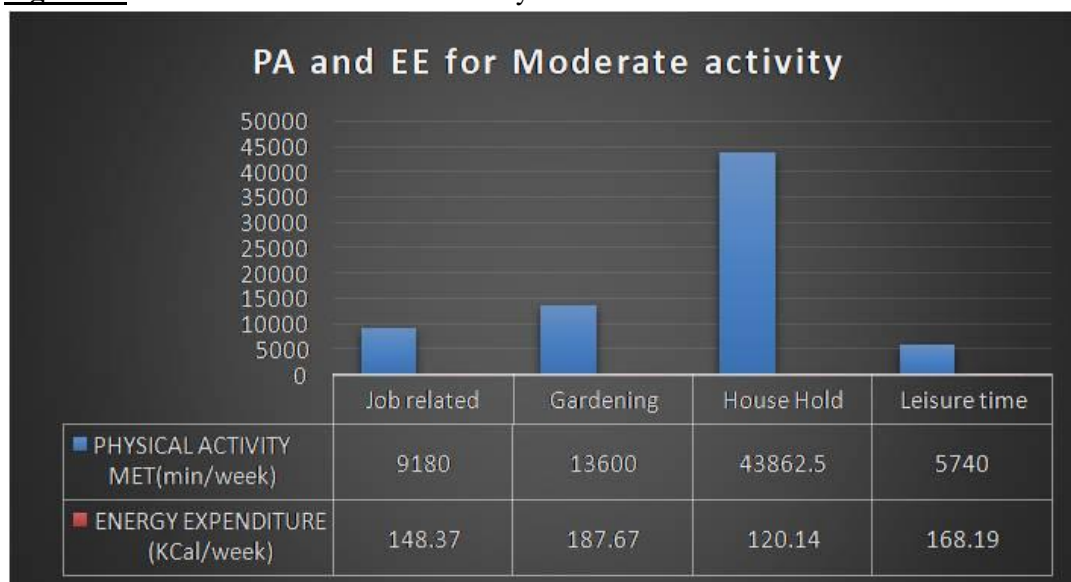


Table - 2: PA and EE for vigorous activity, moderate activity, walking, driving and sitting.

Activity type	Vigorous activity	
	Physical activity MET (min/week)	Energy expenditure (Kcal/week)
Job related	630	336.39
Household	6630	312.36
Activity type	Moderate activity	
	Physical activity MET (min/week)	Energy expenditure (kcal/week)
Job related	9180	148.365
Gardening	13600	187.67
Household	43862.5	120.14
Leisure time	5740	168.19
Activity type	Walking activity	
	Physical activity MET (min/week)	Energy expenditure (Kcal/week)
During job	2750	120.14
From one place to another place during job	1400	120.14
Leisure time	27387.5	164.21
Activity type	Driving activity	
	Physical activity MET (min/week)	Energy expenditure (kcal/week)
Driving	5410	96.11
Activity type	Sitting activity	
	Physical activity MET (min/week)	Energy expenditure (kcal/week)
From Monday to Saturday	116640	48.05
On Sunday	20160	48.05

Figure - 3: PA and EE for Moderate activity.



Discussion

The present study was done to find out the physical activity and energy expenditure among older adults. Regular physical activity in older

adults is known to be associated with decreased mortality, as well as prevalence of metabolic risk factors, diabetes mellitus and cognitive impairment.

Figure - 4: PA and EE for walking activity.

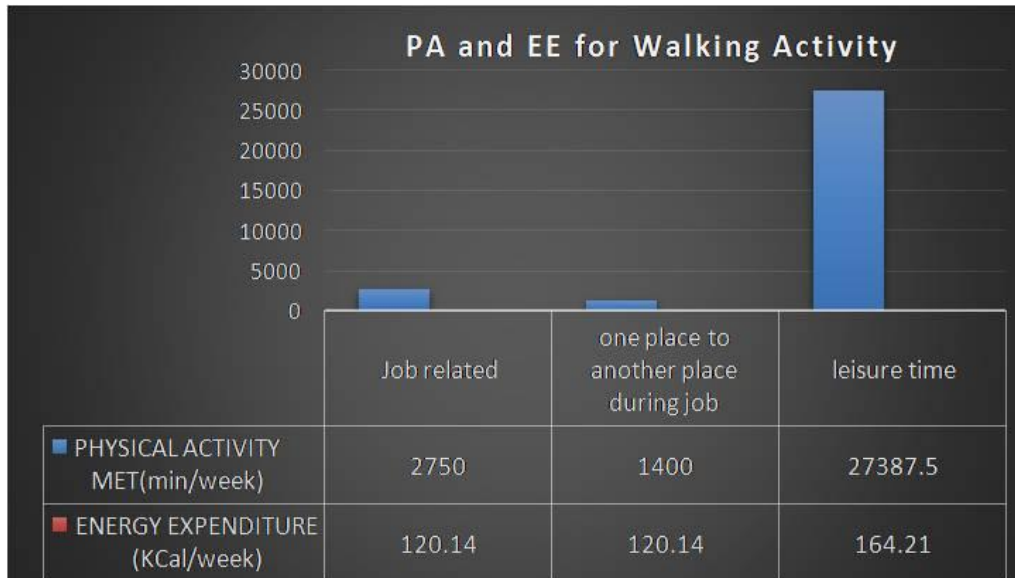


Figure - 5: PA and EE for driving activity.

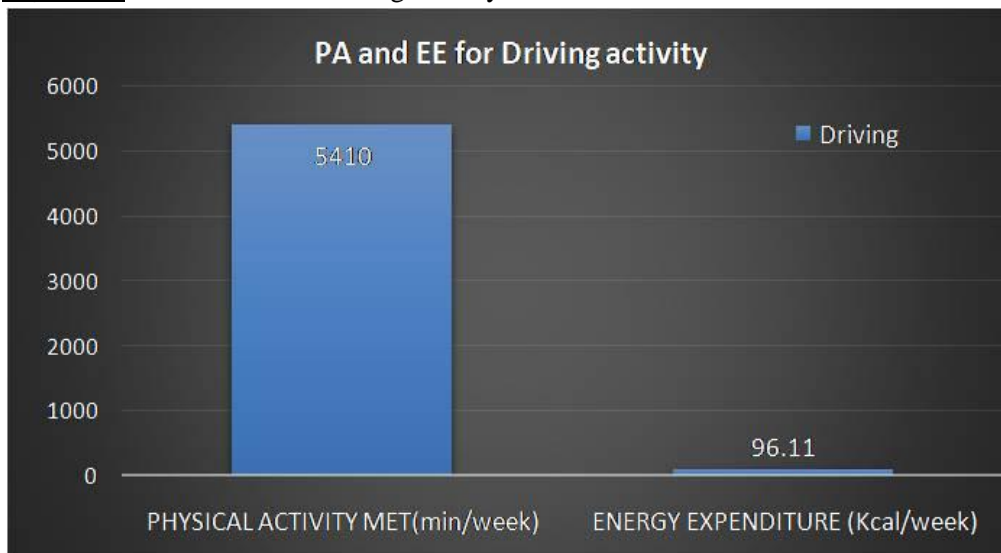


Figure - 6: PA and EE for sitting activity.

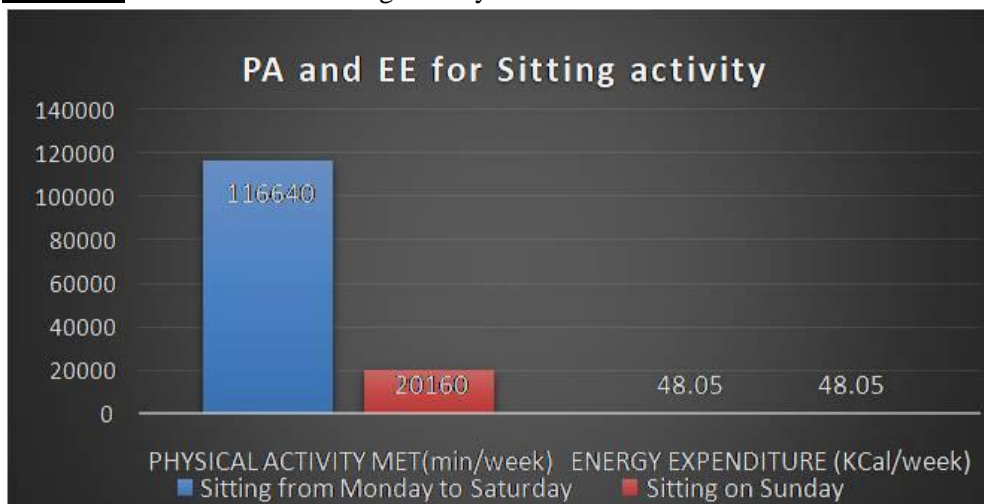
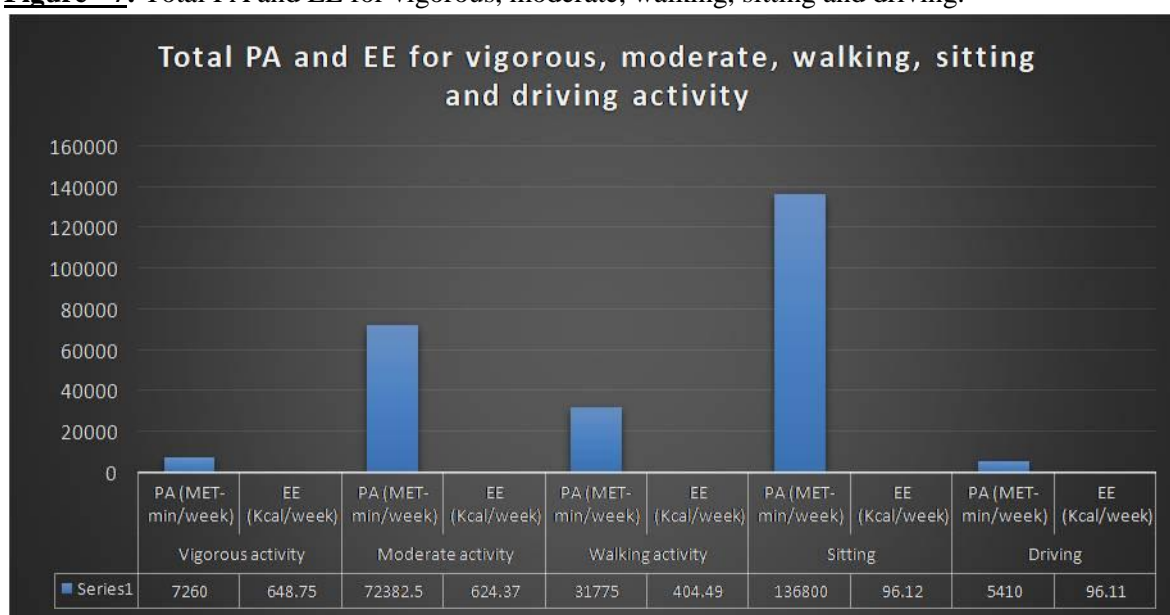


Table - 3: Total PA and EE for vigorous, moderate, walking, sitting and driving activity.

Total vigorous activity		Total moderate activity		Total walking activity		Total sitting activity		Total driving activity	
PA (MET-min/week)	EE (Kcal/week)	PA (MET-min/week)	EE (Kcal/week)	PA (MET-min/week)	EE (Kcal/week)	PA (MET-min/week)	EE (Kcal/week)	PA (MET-min/week)	EE (Kcal/week)
7620	648.75	72382.5	624.37	31775	404.49	136800	96.12	5410	96.11

Figure - 7: Total PA and EE for vigorous, moderate, walking, sitting and driving.



For this study we collected samples from relatives, neighbors, society and adults who visit the park. 42 participants were approached for the study. The researchers approached the subjects and forms were filled manually.

The study shows PA and EE among older adults. Results of this study show energy expenditure during vigorous job time is 336.38 Cal/week and house-hold work is 312.35 Cal/week. EE during sitting activity and during driving EE is less in last 7 days. Previous studies have been conducted to find out PA and EE. Hazzaa M Al-Hazzaa found that prevalence of physical inactivity among older adults is relatively high and physical inactivity increased with advancing age [27]. Wenjun Li found that the levels of physical activity decreased progressively with age [28]. Various studies have measured RMR

directly in older adults, the value approximates 2.7-2.8 ml/kg/min this is ~25% less than the 1 MET = 3.5 ml/kg/min assumed baseline for all adults [29].

Our study shows relatively low physical activities with increasing age. As most of participants were spending time in sitting activities only except few who were spending time daily in 15-20 minutes of walking. By finding the PA and EE in older adults, we can aware the adults to perform the basic physical exercises to increase the level of physical fitness to improve overall health and to increase the level of participation in community in later life.

In this study we have targeted specifically for older adults of Surat city as activities and living style will differ culturally. Physical fitness of

older adults does not depend solely on EE as fitness is based on many factors such as, personal health, diet, living style, mental attitude etc. We have used IPAQ (Gujarati) to find out PA and EE but PA pattern also differ culturally and geographically. So, this will be the limitation of this study. Other limitation includes small sample size and small geographical area. Future study can be conducted with large sample size including other areas as well as different zones of Gujarat and experimental trials.

Conclusion

Older adults are spending more time in activities related to sitting and more commonly walking and very less time spending in vigorous and moderate activities. PA for sitting and walking is highest that is 136800 (MET-min/week) and 31775 (MET-min/week) respectively though vigorous and moderate activities show more EE expenditure 648.75 Kcal/week and 624.00 Kcal/week with very less physical activities. As age increased, the level of PA and EE should be maintained in daily life for healthy ageing. So, proper fitness programme for balancing PA and EE should be implemented in rehabilitation of older people.

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