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Article

Physical Activity Behaviour in 50- to 74-Year-Olds: Differences between Employed and Retired Individuals

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Abstract: (1) Objectives: The study aimed to examine data from Malta's Health Interview Survey (HIS) to assess differences between persons in employment and those retired, across different time periods. (2) Methods: A repeat cross-sectional design was adopted. Data that were collected over a period of 12 years included three cross-sectional HIS waves (2002, 2008 and 2014). Data were analysed cross-sectionally and longitudinally using multilevel analysis. (3) Results: In total, 4690 participants between the ages of 50 and 74 years provided data on physical activity (PA). A statistical difference was found between those employed and retired, with the latter undertaking less PA MET min per week in 2002 and 2008. There was no difference in 2014. When adjusting for covariates, people in employment carried out less PA MET min per week (OR-0.16--0.02) compared to retired individuals. Using multilevel modelling, this study shows that individual factors such as BMI and long-standing illness are predictors of PA behaviour as opposed to time trends. (4) Conclusion: Retirement can increase PA measured in MET minutes per week. Individual factors such as BMI, long-standing health problems and self-rated health could be causing the higher levels seen in the employed population during the studied period.

Keywords: physical activity; public health; aging; retirement



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1. Introduction

Participation in physical activity (PA) is beneficial for almost all facets of health in older adults. Regular and sustained PA behaviour in older adults has been associated with a reduction in the risk of cardiovascular disease, some cancers, type 2 diabetes and functional decline [1]. Not meeting PA recommendations in older age has serious health implications, including, for example, an increased risk of falls, dementia, and lower bone density [2–4]. Major life events such as the death of a spouse, a change in job status or a change in residence have been shown to impact the PA behaviour of individuals [5,6].

Retirement is a life event which is of interest because it is a social process which working individuals experience [7]. Globally, there is no standard age at which people retire from paid work. For this study, we defined retirement as receiving a retirement pension as it presented an exit from paid employment. Until 2008, in Malta, people receiving a retirement pension were unable to work in gainful employment. Transitioning from work to retirement can cause changes in lifestyle and is an opportunity whereby PA can be increased as new life adjustments are taking place [8,9].

Research highlights that leisure time PA, walking and domestic activities increase after retirement, but transport and total PA behaviour decrease [10]. There is also a preference

for the intensity of PA to be of light and moderate intensity [11]. There is inconclusive evidence as to whether changes in PA during and after this major life event are maintained. Longitudinal studies on retirement indicate an initial increase with subsequent declines or stabilization of PA behaviour thereafter [11]. Differences in reported findings are attributed to the aspect of PA domains being examined and sex differences. Socio-economic status (SES) has been identified to influence the transition into retirement in different ways. After retirement, people in a lower SES tend to engage in lower moderate and vigorous PA levels [12]. This was associated with increased reports of illness, disability, and chronic disease. There are a number of barriers and facilitators to PA in older adults which differ between those nearing retirement age and those who have retired [13]. Those nearing retirement were found to find difficulty in regulating their PA behaviour and were motivated by fitness goals. Individuals in retirement age were motivated by the social aspect of PA and lacked belief in their ability to be physically active.

Surveillance data for Malta identified just 28% of older adults aged 65 years or older achieve the recommended level of PA [14]. Every five years the Department of Health Information and Research (DHIR) in Malta conducts a Health Interview Survey (HIS), which collates data on employment status and health determinants together with PA. If employment status is associated with a change in PA behaviour it would be expected that PA behaviour between those in employment and those retired due to statutory age differs. Studies investigating changes with employment status [15–20] used longitudinal data which are currently not available in Malta. The aim of this study was to (a) use the data from the HIS to obtain information on how PA might have changed over time in older adults around the time of retirement age and (b) assess any differences in PA with employment status across different time points.

2. Materials and Methods

Applying a repeat cross-sectional study design, data were obtained from the published HIS in Malta for the years 2002, 2008 and 2014. Permission to carry out the study was obtained from the DHIR and ethical clearance from the Sheffield Hallam ethics committee, reference number ER5441966.

The HIS for each year studied contains data from around 4000 persons across all age groups representing an adequate random sample of the Maltese population. The estimated population during these years ranged from 405,000 to 420,000 inhabitants. The total sample size (16 years and older) of the HIS, from which the data were extracted ($n = 5510$ in 2002; $n = 5500$ in 2008; $n = 4086$ in 2014), was based on a stratified sample calculation carried out by the DHIR. Participants were randomly selected by computerized methods from a population register provided by the National Statistics Office. The selected participants were individuals aged 15 years and older. All data collected were anonymous, as no personal identifiers were collected. A recruitment letter was sent to potential participants by mail which was followed by a telephone call. Those who consented undertook a structured interview at their home.

Based on previous research on PA correlates [21] for the purpose of this study, the variables analysed were age, gender, employment status, education, body mass index (BMI), marital status, self-rated health, various chronic conditions, activity limitation due to health problems, smoking and PA. Employment status was measured in six categories: unemployed, boarded out, retired, gainfully employed, homemaker and other (Table A1). Employment status was based on the person's self-assessment [22]; no set of criteria was used to categorise participants as being retired. Data was collected on three different PA intensities (walking, moderate and vigorous intensity), duration per day and per week. Data on sedentary behaviour was not available and hence not analysed. Questions used were very similar to the International Physical Activity Questionnaire—Short form (IPAQ) [23]; however, the questionnaire psychometric properties in Maltese language had not yet been tested [24]. For the purposes of this study, data was taken from a stratified sample of the participant population that fell within the ages of 50 and 74 years. The

statutory age of retirement in Malta for the years studied was between 61 and 64 years and it was decided to include the 10 years prior and following the retirement age. This age range is similar to inclusion criteria adopted by Baxter et al. [9].

Data and Statistical Analysis

Analysis of the data was carried out in a cross-sectional manner for each surveyed year by examining age as a continuous variable. Data was analysed longitudinally using multilevel analysis with repeated cross-sectional data [25–27]. The categorical variables of work status and education background were merged as the limited number of participants did not allow for statistical analysis. As the survey progressed, more detailed information was gleaned on educational level such as Bachelors, post-graduate diploma, masters, and PhD (Appendix A Table A1). These were grouped together under tertiary education. In the work domain, data in six categories were collected: (1) unemployed, (2) other, (3) retired, (4) gainfully employed, (5) domestic work and (6) boarded out. The six categories were group into four groups: (1) employed, (2) retired, (3) domestic and (4) unemployed + other (Appendix A Table A2). Chronic diseases were analysed by summing the total number of diseases recorded.

Data analysis for PA was carried out in accordance with the IPAQ guidelines since the data collected via the HIS questionnaire was similar [23,28]. Both questionnaires collect data on PA behaviour including walking, moderate, and vigorous intensity PA of more than 10-min bouts at a time and number of days per week. Using the same system as IPAQ ensured a standardized approach which allowed for comparison with other studies. Three categories of PA intensity were extracted: walking, moderate and vigorous intensity PA. Data on the different intensities and durations were processed into Metabolic Equivalents (MET) minutes per week as per IPAQ guidelines. When summed up, these three intensities provided the total MET minutes per week score that was suggestive of the overall PA. MET minutes per week of PA categories were determined as low, medium or high based on IPAQ classification [23].

PA categories were statistically analysed as categorical variables for within-year variation. MET values were assessed for normal distribution using the Kolmogorov–Smirnov test. Data which were not normally distributed were transformed using $\text{Log}_{10}(x + 1)$ and rechecked for their distribution. When normal distribution was not obtained, non-parametric tests were used to analyse the data. Mean and standard deviation were presented for continuous variables. The Pearson correlation, Chi-square, ANOVA, or their non-parametric equivalents were used for the analysis between variables.

Multilevel analysis was used to model PA as a continuous variable. Predictors were included in the model based on theoretical knowledge. This analysis was used to consider the data longitudinally. Assumptions for homoscedasticity and linear relationship between variables were assessed visually using scatter plot diagrams. Individual attributes were considered as level 1 analysis (employment status, BMI, number of chronic diseases and educational level) and survey years as level 2 analysis. PA as a continuous variable was considered the dependent variable [29]. Within the multilevel analysis, only employment and retirement status were considered.

A Microsoft Excel© spreadsheet was developed to store and analyses the data. IBM SPSS© (version 26) was used to complete the inferential statistical analysis. Statistical significance was accepted if $p < 0.05$.

3. Results

The number of included participants for the three years was 4690. The proportion of males and females was 47% and 53%, respectively. A higher proportion of retired individuals was present in 2002. The absence of any chronic disease was reported by 18% of the participants, whilst 10% reported more than five chronic diseases. The level of educational was higher in the 2014 survey. Table 1 provides a descriptive analysis of the variables collected and the significant differences between the survey years.

Table 1. Demographics by year of survey for the total population.

Demographic per Survey Year	2002 <i>n</i> (%)	2008 <i>n</i> (%)	2014 <i>n</i> (%)	<i>p</i> Value
Sex				
Male	682 (46.2)	654 (46.9)	859 (47.5)	0.76
Female	795 (53.8)	741 (53.1)	951 (52.5)	
Employment status				
Employed	414 (28) ^a	421 (30.1) ^a	538 (29.7) ^a	
Retired	498 (33.6) ^a	369 (26.4) ^b	544 (30.1) ^{a,b}	<0.001 *
Other	100 (6.8) ^b	83 (5.9) ^{a,b}	81 (4.5) ^b	
Domestic	462 (31.2) ^a	489 (34.9) ^b	646 (35.7) ^b	
Marital status				
Single	174(11.9) ^a	192 (13.7) ^a	243 (13.4) ^a	
Married	1125 (76.7) ^a	1048 (75) ^a	1263 (69.8) ^b	<0.001 *
Widowed	122 (8.3) ^{a,b}	101 (7.2) ^b	174 (9.6) ^a	
Other	46 (3.1) ^a	57 (4.1) ^a	130 (7.2) ^b	
BMI (mean)	28.1	28.0	28.3	0.31
BMI categories				
Underweight	143 (10.4) ^a	307 (23.3) ^b	302 (17.8) ^c	
Healthy weight	394 (28.6) ^a	294 (17.8) ^b	395 (23.3) ^b	<0.001 *
Overweight	440 (32) ^a	395 (30) ^a	488 (28.8) ^a	
Obese	399 (29) ^a	320 (24.3) ^b	510 (30.1) ^a	
Non-smokers	1220 (82.7) ^a	1087 (78) ^b	1433 (79.5) ^{a,b}	<0.001 *
Self-rated health				
Good	818 (55.3) ^a	947 (67.7) ^b	1250 (69.7) ^b	
Fair	590 (67.7) ^a	397 (28.4) ^b	479 (26.7) ^b	<0.001 *
Bad	71 (69.7) ^b	55 (3.9) ^a	65 (3.6) ^a	
Education				
No school + special schools	82 (5.6) ^a	30 (2.1) ^b	13 (0.7) ^c	
Primary	789 (53.5) ^b	604 (43.2) ^b	626 (34.6) ^c	<0.001 *
Secondary	519 (35.2) ^c	647 (46.2) ^b	1010 (55.9) ^c	
Tertiary	84 (5.7) ^a	118 (8.4) ^b	159 (8.8) ^b	
Mean self-reported chronic illness	3	2	2	<0.001 *
Long-standing illness (yes)	553 (37.6) ^a	686 (49.5) ^b	911 (50.4) ^b	<0.001 *
Activity limitation (no)	1324 (89.5) ^a	949 (67.8) ^b	1664 (92) ^c	<0.001 *
PA behaviour				
Low	803 (54.3) ^a	733 (52.4) ^a	910 (50.3) ^a	
Moderate	398 (26.9) ^a	480 (34.3) ^b	785 (43.4) ^c	<0.001 *
High	279 (18.9) ^a	187 (13.4) ^b	115 (6.4) ^c	
PA total MET minutes per week (mean)	1932	1169	943	<0.001 *

* indicates significance at the 0.05 level. BMI = Body mass index; PA = Physical activity behaviour. ^{a, b, c} identifies statistical difference between columns.

In 2014, 6.4% of the participants reported high PA behaviour, which is less when compared to 2008 (13.4%) and 2002 (18.9%). However, the number of people reporting moderate PA behaviour was greater in 2014 (43%) compared to 2008 (34%) and 2002 (27%). Higher mean MET min per week scores were observed in 2002, and the lowest scores were observed in 2014. Based on ANOVA test with Dunnett's correction, the difference was statistically significant between years ($p < 0.001$). A higher variability in total MET min per week was obtained in 2002, and the lowest variability in total MET min per week was seen in 2014.

When comparing people in employment and those in retirement, there was a statistical difference in 2002 and 2008 but not 2014 (Table 2). What is noticeable is a decrease in the mean MET min per week in both groups. Employed individuals had statistically significant higher vigorous activity MET minutes per week than those in retirement in 2002 and 2008 (Table 3). In 2014, the mean vigorous activity MET minutes per week was still slightly higher in those in employment but the difference was not statistically significant ($p = 0.36$).

Table 2. Interquartile ranges for total MET min per week employed vs. retired.

Year	Total MET min per Week								p Value
	Employed				Retired				
	n	25th	50th	75th	25th	n	50th	75th	
2002	414	99	693	2966	99	498	693	2310	0.03 *
2008	421	132	693	1893	165	369	657	1386	<0.001 *
2014	538	264	660	1316	198	544	671	1320	0.86

* indicates significance at the 0.05 level. MET = metabolic equivalent.

Table 3. Mean PA at different intensities comparing employed and retired individuals.

Year	Employment Status	Mean Total Walk	p Value	Mean Total	p Value	Mean Total	p Value
		MET min per Week		Moderate MET min per Week		Vigorous MET min per Week	
2002	Employed	446	0.26	459	0.75	485	<0.001 *
	Retired	465		455		432	
2008	Employed	386	0.21	407	0.64	405	0.02 *
	Retired	406		382		384	
2014	Employed	539	0.75	547	0.36	544	0.36
	Retired	544		536		539	

* indicates significance at the 0.05 level.

Analysis of the IPAQ categories across the three surveys shows that 52.2% ($n = 2446$) of the participants reported low PA behaviour and 12.4% ($n = 581$) reported high PA behaviour. The findings in each PA category were similar for employed and retired persons (Table 4). The variables which were consistently significantly associated with total PA MET minutes per week across the three surveys were the presence of a long-standing illness, activity limitation, self-rated health, BMI and number of chronic conditions. Age, employment status and education were not always statistically related to PA categories (Table 5). Analysis with independent variable with walking, moderate and vigorous intensity PA as dependent variables are present in Appendix B.

Statistical modelling was carried out for the dependent variable of PA as a continuous variable. Total PA data were skewed, so data transformation was carried out to achieve data normalization. Initial model testing was carried out between total PA (dependent variable) and survey year as a second-level model [29]. The intercept within the model was not statistically significant ($p = 0.364$). The interclass correlation co-efficient for the level-2 model was 0.006. Testing with level 1 (individual data) was included in the model. The model intercept of level-1 data was statistically significant ($p < 0.001$). Data are presented in Table 6.

Table 4. Physical activity IPAQ categories with employment status.

Year	PA Category	Employed n (%)	Retired n (%)	p Value
2002	Low	213 (51.4) ^a	254 (51) ^a	0.44
	Moderate	109 (26.3) ^a	147 (29.5) ^a	
	High	92 (22.2) ^a	97 (19.5) ^a	
2008	Low	207 (49.2) ^a	183 (49.6) ^a	0.025 *
	Moderate	141 (26.3) ^a	139 (37.7) ^a	
2014	High	73 (17.3) ^a	47 (12.7) ^b	0.79
	Low	271 (50.4) ^a	263 (48.3) ^a	
	Moderate	227 (42.2) ^a	240 (44.1) ^a	
	High	40 (7.4) ^a	41 (7.5) ^a	

* indicates significance at the 0.05 level; ^{a, b} identifies statistical difference between columns.

Table 5. Total MET min per week and independent variables.

Variable	2002 (n = 912)	2008 (n = 790)	2014 (n = 1082)
Activity limitation ^	-5.796 **	-2.611 **	-4.972 **
Long-standing health problems ^	-5.539 **	-2.773 **	-7.065 **
Smoking ^	-0.508	-0.523	-1.678
Sex (male) ^	-3.334 **	-2.869 *	-0.441
Self-rated health ~	<0.001 **	<0.001 **	<0.001 **
Education ~	0.014	<0.001 **	0.010 *
Employment ~	0.181	0.004 *	0.832
Chronic conditions +	-0.104 **	-0.106 **	-0.136 **
BMI (kg/m ²) +	-0.111 **	-0.097 **	-0.161 **
Age (years) +	-0.043	-0.093 **	-0.043

^ Mann-Whitney U test used the Z score. ~ Kruskal-Wallis H test used the p value. + Spearman correlation used the correlation co-efficient r. * indicates significance at the 0.05 level. ** indicates significance at the 0.01 level.

Table 6. Multilevel analysis includes level 1 (individual) and level 2 (survey year).

	Level 1 Variable	Std Error	t	95% CI	p Value
	Intercept	0.45	14.81	2.21-4.03	<0.001
Employment status	Employed	0.334	-2.67	-0.16--0.02	0.007 *
	Retired				
Sex	Male	0.03	2.35	0.01-0.11	0.19
	Female				
	BMI	0.02	-4.11	-0.01- -0.004	<0.001 **
	Age	0.002	-2.35	-0.01- -0.001	0.03 *
Marital Status	Single	0.06	-1.19	-0.18-0.04	0.25
	Married	0.05	-1.12	-0.15-0.04	0.27
	Widowed	0.06	-0.78	-0.17-0.08	0.43
	Divorced				
Self-Rate health	Very good	0.14	2.51	0.07-0.63	0.02 *
	Good	0.14	1.70	-0.04-0.51	0.09
	Fair	0.14	0.449	-0.02-0.34	0.63
	Bad	0.16	-0.083	-0.43-0.17	0.41
Education	Very Bad				
	No school	0.12	0.29	-0.66-0.90	0.77
	Primary	0.14	0.35	-0.63-0.90	0.72
	Secondary	0.12	0.31	-0.63-0.88	0.75
	Tertiary	0.15	0.37	-0.62-0.91	0.71
Longstanding health problem	Special schools				
	Yes	-0.05	-1.99	-0.09- -0.001	0.04 *
	No				
	Level 2 Variable				
	Survey year	0.004		-0.0004- 0.032	0.363

* indicates significance at the 0.05 level. ** indicates significance at the 0.01 level.

4. Discussion

The aim of this study was to assess differences in PA behaviour between people retired due to old age and those in employment. Data from three cross-sectional surveys in Malta were used. In the studied population throughout the years, there was an increase in the proportion of people participating in moderate PA behaviour and a decrease in high PA behaviour, which was found to be statistically significant. The proportion of people who

had a low level of PA behaviour remained not significantly different throughout the years. Consistent with trends reported in other countries such as Australia and the USA [30], a higher proportion of people within the total population reached moderate PA behaviour in each of the survey years.

When considering the total sample across the years, there was a decrease in the mean total MET minute per week which could be attributed to less people reaching high PA behaviour. There are less people who have high PA behaviour and more who have moderate PA behaviour. Statistical differences found when measuring PA categorially or in MET minutes per week were not congruent. IPAQ categories are based on a mix of days per week, duration and MET minutes per week, whilst continuous PA scores are in MET minutes per week; therefore, both parameters measure different aspects of PA behaviour.

There was a difference in the PA behaviour between retired and employed in the years of 2002 and 2008, when measured using MET minutes per week. This difference was only present in 2008 when grouping PA behaviour according to IPAQ categories. The difference in MET minutes per week is attributed to the amount of vigorous PA carried out by employed individuals which was significantly higher than those who retired for 2002 and 2008. Results indicate that there was a decrease in PA intensity in retired individuals, a difference that was not present in 2014. Studies found that there is a gradual decrease in the amount of vigorous PA, starting at the age of 40 years which continues to decrease in old-age retirees, even when adjusting for covariates (BMI, SES, limiting long-standing illness) [31,32]. The percentage of employed individuals reaching high levels of PA behaviour decreased by 14.8% from 2002 to 2014 in our data.

During the 12 years, the difference in MET minutes per week between retired and employed decreased, and any future data will be able to indicate whether there is a trend with retired individuals becoming more physically active than those in employment. However, these differences were not present when PA behaviour was analysed using IPAQ PA categories. A higher proportion of the retired individuals attained moderate PA behaviour compared to those employed. Leisure time PA activity has been shown to increase after retirement, which might be of vigorous or moderate intensity [10]. Similarly, our results indicate that there is a shift in the intensity level.

Leisure time PA tends to be higher in people with higher SES [31]. Education was used as a proxy for SES. The education levels in the studied cohorts increased with the surveyed years. This study found no correlation between education and PA intensities. A possible explanation is that SES is a non-static construct, and cross-sectional education might not ascertain these differences [33].

There was a trend for people in retirement to undertake more walking behaviour measured in MET min per week when compared to those in employment, but this did not reach statistical significance. Other studies have found a significant increase in walking activity after retirement [31,34,35]. These studies followed people across their retirement and looked at individual difference in PA behaviour. Malta exhibits a car culture with 80% of the population using a car to commute, even for the shortest distances with trips that could be walked in 10 min [36]. This might explain why no statistical difference was found between those employed and unemployed for car use, being high across all age groups.

In analysing the data on total MET minutes per week, for employed and retired people, longitudinally using multilevel modelling and considering survey years as a 2nd-level analysis, the data were found not to be statistically significant. One possible reason for this is the skewness in PA behaviour which required data transformation. In using data transformation, this could have influenced the statistical relationship [37]. Individual level (1st level) factors, i.e., being retired, male, low BMI, young age and good self-rated health, were found to predict PA behaviour. However, these predictors were not strong in explaining PA behaviour. This could mean that there are other variables, such as food intake and sleep, for which data were not collected but can predict PA behaviour better and should be measured in future studies.

Similar to other studies [38], when examining PA behaviour with age this was only found to predict PA behaviour in the multilevel model. Having a long-standing health problem was associated with PA behaviour in all three survey years and within the model. In all three surveys a long-standing health problem was the most significantly associated factor with total MET. The presence of a long-standing health problem was related to the presence of activity limitation and self-rated health. These covariates might influence PA behaviour differently due to the interaction between these different factors when including them all together within the multilevel model, which would cause interaction between the variables as they measure conjoint factors. In old age, self-rated health is influenced by a person's outlook with respect to any concurrent abilities, whilst activity limitation is dependent on the person's physical abilities [39]. Self-rated health can influence the type of PA behaviour undertaken, as it reflects a person's outlook of self-ability [40,41]. However, given that the study age range was fixed throughout the three surveys, the correlation between age and PA behaviour could have been influenced.

Any increase in PA after retirement is believed to be short lived, and a decrease in PA is expected thereafter [11]. This study indicates that there are other important factors which influence PA behaviour when retired. Retirement is a process with no universally accepted start date [42,43]. Taking a resource-based dynamic process towards retirement explains why other variables such as history of PA and self-efficacy might be more important predictors of PA post-retirement rather than employment status. Retirement adjustment is influenced by the person's resources [43] and differences might not be present when analysing data at a population level.

4.1. Limitations and Strengths

This study is based on the analysis of secondary data, and therefore the data were not specifically collected for the study purpose, which creates limitations of result generalization specific to the effect of retirement [44]. One of the major limitations of the study is the inability to follow participants over time, due to the anonymous nature of the primary data collection. However, the sample size was large enough to be representative of the Maltese population.

The measurement of PA was completed using an in-house questionnaire, so its psychometric properties cannot be ascertained. However, it was similar to the IPAQ short form which has been deemed to be valid and reliable. Measurement of sedentary behaviour would have provided useful data for analysis and should be included in future iterations of the survey. Using questions similar to IPAQ in the older population might not be the most appropriate tool as there are other tools which are more specific to older adults [45]. Using MET minutes per week is a measure of absolute physiological intensity whilst self-reported measures measure relative intensity, which creates a discrepancy within the measurement [46]. This discrepancy occurred across all the populations under study.

The clear strength of this study is that to the authors' knowledge it is the first attempt to identify the possible effect of retirement on PA in the Maltese population. The study was able to distinguish between those in retirement and still employed. The recruited participant sample was representative of the population. The sample was able to assess cross-sectional changes across the 12 years under study. The analysis of PA was based on IPAQ guidelines, an international approved system with frequent use within the literature. This made it possible to analyse PA data in a continuous and categorical format [47].

4.2. Future Research

Given the limitations of secondary analysis, the relationship between PA and retirement should be examined further. Exploring the possible change in PA and its causes during retirement can help support national policy development to support PA promotion during the retirement transition. Future research should use a longitudinal design, measure PA, follow the same participants over time and explore how the experience of retirement might influence PA later in life using qualitative means.

4.3. Practical Implications

The PA behaviour within the population decreased over time due to fewer people reaching vigorous PA behaviour. PA behaviours are expected to decrease with age, so promoting PA levels during retirement may have a beneficial influence on the health of the population [8]. Being in retirement was found to predict positive PA behaviours. An exploration of how retirement can have a beneficial influence on PA behaviour is warranted as well as interventions to encourage more vigorous PA behaviour.

5. Conclusions

This study investigated employment status and PA behaviour at a population and individual level by looking at the data longitudinally using a repeat cross-sectional design. Across the 12 years, based on the statistical model, people in retirement were more active than those in employment. Other factors such as BMI, long-standing health problems, age and self-rated health could be causing the higher levels seen in the employed population during the studied years. Irrespective of these variables, the study found that PA behaviour was similar between retired and employed persons in 2014. The levels of PA may be increasing among the retired population compared to those in employment, and analysis of future data set could be used to indicate whether this is a one-time cohort effect or a developing period trend.

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Data Availability Statement: Data can be made available by request to the Directorate for health information and research, Ministry for Health, Malta. <https://deputyprimeminister.gov.mt/en/dhir/Pages/Introduction.aspx> (accessed on 2 August 2021).

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Appendix A

The Health interview survey collated data on education into seven different categories: no formal education, primary, lower secondary, upper secondary, post-secondary, tertiary first stage, tertiary second stage. The categories were grouped into five groups: no formal education, primary, secondary, and tertiary (Table A1). Work status was grouped into three categories: unemployed, which included boarded-out and permanent disability, domestic work, pensioners or retired and employed (Table A2).

Table A1. Transformation of education categories.

Education Categories Used in Analysis	Education Categories in 2002	Education Categories in 2008	Education Categories in 2014
No Schooling	No Schooling	No formal education	No formal education
Primary	Special schools Primary Secondary	Primary Lower Secondary	Schools for special needs Primary Secondary general Secondary with vocational training
Secondary	Upper secondary	Upper secondary	Foundation and introductory courses at MCAST 1 or less year Post-secondary general Post-secondary vocational courses of 2 years or less Post-secondary vocational courses of more than 2 years
Tertiary	Tertiary	Tertiary first stage Tertiary second stage	University level diploma/certificate of MCAST higher nation Bachelor’s degree or equivalent Postgraduate diploma/certificate Master’s degree PhD

Table A2. Transformation of work categories.

Work Categories Used in Analysis	Work Categories in 2002	Work Categories in 2008	Work Categories in 2014
Unemployed + other	Unemployed Other	Unemployed Other	Unemployed Other inactive person
Retired	Boarded out Pensioner	Permanent disability Retirement / given up business	Permanent disability In retirement
Employed Domestic	Gainfully employed Homemaker	Working for pay or profit Domestic work	Working for pay or profit Fulfilling domestic tasks

Appendix B

Table A3. Walking MET min per week and independent variables.

Variable	2002 (n)	2008 (n)	2014 (n)
Activity limitation [^]	-4.846 **	-1.635	-4.854 **
Long standing health problems [^]	-3.3733 **	-0.308	-7.289 **
Smoking [^]	-0.556	-1.372	-1.351
Sex (male) [^]	-0.55	-0.555	-0.262
Self-rated health [~]	<0.001 **	<0.001 **	<0.001 **
Education [~]	0.827	0.016 *	0.272
Employment [~]	0.134	0.317	0.981
Chronic conditions ⁺	-0.079 **	-0.35	-0.12 **
BMI (kg/m ²) ⁺	-0.106 **	-0.077 *	-0.135 **
Age (years) ⁺	-0.012	-0.023	-0.28

[^] Mann-Whitney U test used Z score. [~] Kruskal-Wallis H test used p value. ⁺ Spearman Correlation used correlation co-efficient r. * indicates significance at 0.05 level. ** indicates significance at 0.01 level.

Table A4. Moderate MET min per week and independent variables.

Variable	2002 (n)	2008 (n)	2014 (n)
Activity limitation [^]	−3.457 *	−1.791	−2.288 *
Long standing health problems [^]	−3.347 **	−3.751 **	−2.983 *
Smoking [^]	−0.767	−0.071	−1.465
Sex (male) [^]	−2.852 *	−1.285	−2.055 *
Self-rated health [~]	<0.001 **	<0.001 **	<0.001 **
Education [~]	<0.001 **	0.002 *	<0.001 **
Employment [~]	0.306	0.010 *	0.053
Chronic conditions ⁺	−0.025	−0.105 **	−0.088 *
BMI (kg/m ²) ⁺	−0.083 *	−0.053	−0.123 **
Age (years) ⁺	−0.008	−0.084 *	−0.051 *

[^] Mann-Whitney U test used Z score. [~] Kruskal-Wallis H test used *p* value. ⁺ Spearman Correlation used correlation co-efficient *r*. * indicates significance at 0.05 level. ** indicates significance at 0.01 level.

Table A5. Vigorous MET min per week and independent variables.

Variable	2002 (n)	2008 (n)	2014 (n)
Activity limitation [^]	−2.242 *	−0.167	−0.178
Long standing health problems [^]	−4.4116 **	−3.067 *	−0.729
Smoking [^]	−1.355	−0.034	−1.651
Sex (male) [^]	−3.285 *	−1.424	−0.236
Self-rated health [~]	<0.001 **	<0.001 **	<0.001 **
Education [~]	0.005 *	0.229	0.008 *
Employment [~]	<0.001 **	0.063	0.833
Chronic conditions ⁺	−0.084 **	−0.072 **	−0.22
BMI (kg/m ²) ⁺	−0.045	−0.046	−0.071 **
Age (years) ⁺	−128 **	−0.78 **	−0.49 *

[^] Mann-Whitney U test used Z score. [~] Kruskal-Wallis H test used *p* value. ⁺ Spearman Correlation used correlation co-efficient *r*. * indicates significance at 0.05 level. ** indicates significance at 0.01 level.

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