

1 **Relationships Between Physical Activity Across Lifetime and Health Outcomes in Older**
2 **Adults: Results from the NuAge Study.**

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23 Running Head:

24 Lifetime PA and health at older age.

25 **ABSTRACT**

26 **OBJECTIVES:** This study aims to (1) describe participation in four physical activity (PA)
27 domains across life and (2) examine the influence of PA during adolescence, early, mid-life, and
28 later adulthood on health variables at older age.

29 **DESIGN:** Retrospective, observational, population-based cohort.

30 **SETTING:** Longitudinal study Nutrition as a Determinant of Successful Aging study

31 **PARTICIPANTS:** 1 378 healthy older adults (667 men; 711 women; aged 67-84 yrs at
32 baseline)

33 **MEASUREMENTS:** Using a modified version of the interviewer-administered Lifetime Total
34 Physical Activity Questionnaire (LTPAQ) and life events calendar to facilitate the recall,
35 participants reported the frequency, duration, and intensity of occupational (OPA), commuting
36 (CPA), household (HPA), and leisure time (LTPA) they participated in at the ages of 15, 25, 45,
37 and 65 years and at the first follow-up (aged 68-85 yrs at follow-up). Fat mass, lean body mass,
38 body mass index, waist to hip ratio, fasting glucose, systolic and diastolic blood pressures, self-
39 reported chronic diseases, and socio-demographic were assessed at baseline.

40 **RESULTS:** Changes in PA differed across sex and PA domain. However, there was a general
41 decline in all PA domains among both sexes after the age of 65. In multiple regression analyses,
42 current LTPA was systematically associated with more favorable waist to hip ratio and fat mass
43 in both sexes, whereas CPA, OPA, and HPA across life were not consistently associated with
44 health variables.

45 **CONCLUSION:** PA domains during adolescence, early adulthood, and mid-life were not
46 directly related to health variables at older age, while current LTPA was, suggesting it is never
47 too late to start.

48 **Key words:** Leisure-time, Physical activity history, Body composition, Aging.

49

50 **INTRODUCTION**

51 Reducing the burden of cardiometabolic risk factors is a major public health challenge. Regular
52 physical activity (PA) has been shown highly effective to treat and prevent cardiometabolic
53 disease (1). Despite public health efforts to promote PA, only 15% of Canadian adults (2) reach
54 the weekly recommended minimum of 150 minutes of moderate-to-vigorous PA (3).

55 Although signs of cardiometabolic diseases generally manifest later in life, it is now understood
56 they can start developing during childhood (4), strengthening the importance of early adoption
57 and maintenance of physically active lifestyle. Nevertheless, PA declines throughout
58 adolescence, into adulthood, and during the transition toward older age (2,5). While leisure time
59 physical activity (LTPA) patterns over time have been well described (6–8), a very limited
60 number of studies has examined variations in other PA domains, such as commuting (CPA),
61 occupational (OPA), and household (HPA) (9) and this after the age of retirement (10). Given
62 determinants of PA are domain-specific (11) and susceptible to change over the life course (12),
63 decline in PA could take place at different critical periods for each domains. A more
64 comprehensive understanding of age- and domain-related changes in PA may help identify
65 strategies to tailor interventions to promote the maintenance of PA throughout life.

66 To our knowledge, there are no studies examining associations between domain-specific PA at
67 various ages and health outcomes in older adults. Since little is known about the long-term
68 effects of earlier PA on later health status, more studies are needed to improve primary
69 prevention strategies. Finally, the importance of addressing all domains, and not only LTPA, has
70 been highlighted, as each domain may have different effects on health (13).

71 This study aims to (1) describe participation in four PA domains (LTPA, HPA, OPA, CPA)
72 across life and (2) examine the influence of PA during adolescence, early, mid-life, and later
73 adulthood on health status at older age.

74 **METHODS**

75 **Participants**

76 Nutrition as a Determinant of Successful Aging (NuAge) is a 5-year observational study of 1 793
77 community-dwelling men and women recruited in three age groups (70y; 75y; 80y) from a
78 random sample of the Quebec Health Insurance database (RAMQ). Participants were in
79 apparently good health and were functionally independent at recruitment in 2003, as previously
80 published (14).

81 Participants were annually tested for biopsychosocial measurements by trained staff using
82 computer-assisted personal interview methodology (William^{MD}, ©Multispectra, 1997-2004)
83 following standardized procedures. All participants signed an informed consent form approved
84 by the Institutional Review Boards at the Institut universitaire de gériatrie de Sherbrooke and
85 Montréal.

86 For the purpose of this secondary study, data from 711 women and 667 men who completed the
87 Lifetime Total physical Activity Questionnaire (LTPAQ) were used.

88 **Assessment of Physical Activity**

89 Daily PA levels at the ages of 15, 25, 45, and 65 years and at the first follow-up of the NuAge
90 study (75.2 ± 4.2 years; range from 68-85 yrs) was obtained through a modified version of the
91 LTPAQ, administered once during the regular clinical examination of the first follow-up. The 8-
92 week test-retest correlations have been reported for lifetime PA (0.74), OPA (0.87), HPA (0.77),
93 and LTPA-CPA (0.72) (15). A recall lifetime calendar focusing on major life events was used as
94 a memory aid.

95 For each domains (LTPA, HPA, OPA, CPA) and targeted ages, the LTPAQ assessed nature,
96 average time/week, duration, and frequency (52, 26, or 0 weeks) of the reported activity.

97 Examples for each domain were provided to participants. As regards OPA, the three main jobs
98 were taken into account, and for each job, a maximum of two activities could be reported at each
99 age. When two activities were reported for one job, the main activity was estimated to account
100 for 75% of PA level related to this job, and the second, for 25%. As regards LTPA, six activities
101 most frequently performed at each age were taken into account. Intensities of LTPA and OPA,
102 expressed in MET, were obtained from the Compendium of Physical Activities (16). HPA were
103 fixed at 5 METs and CPA (walking, running, biking) were respectively fixed at 4, 15, and 9
104 METs (16).

105 Average number of hours/week spent in each activity domain at each age (i) was calculated as
106 follows: $[\sum Frequency_i \times Duration_i] / 52$, where *frequency* is the yearly average number of
107 weeks for this activity and *duration* its weekly average duration in hours. We then estimated the
108 average domain-specific PA volume in MET-hours/week, by multiplying the average number of
109 hours/week by the relevant MET value. PA volumes were standardized to a 16-hour waking day
110 to account for differences in reported active time. As such, participants reporting less than 16
111 hours of total PA per day were assigned a non-active behaviour score that is for every hours with
112 no information, we added 1.5 METs, corresponding to sedentary behaviours (17). All domain-
113 specific volumes were summed into a 16-hour standardized score for each age period
114 representing a whole year.

115 **Sociodemographic and Clinical Variables**

116 Sociodemographic information, household income, and lifestyle habits were evaluated at
117 baseline using a validated questionnaire developed from previously published questionnaires
118 (18).

119 Blood pressure and blood sample were obtained in the morning after a 12-hour fasting period.
120 Systolic and diastolic blood pressures were measured using an automatic Dinamap monitor
121 (Critikon, Johnson & Johnson, Tampa, FL). Participants had to be at rest for the previous five
122 minutes and not talking during the two measurements. Plasma glucose was analysed by the
123 clinical laboratory of the Sherbrooke University Hospital Center (Quebec, Canada).
124 Body weight and standing height were measured with participant wearing only light clothes (19).
125 Body mass index (BMI) was calculated [body weight (kg) / height² (m)]. Waist and hip
126 circumferences were measured at the narrowest circumference of the trunk and the greater
127 trochanter, respectively.
128 Total fat mass (FM) and lean body mass were measured using DXA (Lunar Prodigy; GE
129 Medicals, Madison, WI) in a subset of participants living in Sherbrooke (367 men, 362 women).
130 Coefficients of variation for repeated measures (1 week apart) of FM and lean body mass in 10
131 adults are 5.7% and 1.1%, respectively.
132 Burden of disease was measured by assessing reported chronic conditions, using the OARS
133 Multidimensional Functional Assessment Questionnaire (20). Level of burden of seven self-
134 reported chronic conditions (polyarthritis, arthritis, emphysema, hypertension, cardiac problem,
135 circulation problem, diabetes) was summarized from a 3-point rating scale of each conditions;
136 higher score indicating greater burden of disease.
137 Participants' risk of cardiometabolic disease was represented by summing the presence (1) or
138 absence (0) of each of the following risk factors: BMI ≥ 25.0 kg/m² (21); waist circumference
139 ≥ 102.0 cm in men or ≥ 88.0 cm in women (21); WHR ≥ 90.0 in men or ≥ 85.0 in women (21);
140 fasting glucose ≥ 6.1 mmol/L (22); systolic and diastolic blood pressures $\geq 140/90$ mmHg (23).
141 Higher score indicates greater number of risk factors.

142 **Statistical Analysis**

143 Assumption of normality of variables was statistically verified with the Kolmogorov–Smirnov
144 test. Variables not normally distributed were transformed in R using the Box-Cox power
145 transformation. Since neither systolic nor diastolic blood pressures met the assumption of
146 normality after transformations, their product “systolic X diastolic” was used in analyses. Mann-
147 Whitney U tests (continuous variable) and chi-square tests (categorical variable) were performed
148 to compare baseline characteristics. Two-way ANOVA with factors defined as “sex” and
149 “periods of life” were used to compare PA volumes and intensities between sexes and across life
150 periods, using Bonferroni *post hoc* test when significant.

151 Further analysis examining PA in relation to health variables were sex-specific because of
152 significant interactions ($p < 0.05$) between PA and sex. A two-block multiple linear regression
153 analysis was performed to identify domain and life period that were best associated with health
154 variables at older age. Age was forced into the first block because current PA was measured over
155 a wide range of ages (68-85 years). In the second block, domain- and time-specific measures of
156 PA were entered in a stepwise procedure given the large number of potential correlates
157 considered. A thorough residual analysis was carried out and multi-collinearity issues were
158 addressed in the final model. Adjusting for marital status, household income, education, cigarette
159 smoking, and alcohol consumption did not change associations and thus, these results are not
160 shown.

161 Analyses were conducted using the SPSS statistical software package version 17.0 (Chicago, IL)
162 and p -values < 0.05 were considered statistically significant.

163 **RESULTS**

164 **Participant Characteristics**

165 Mean age of participants at baseline was 74.2±4.2 years with 51.6% as women. Men were
166 generally at higher risk with respect to cardiometabolic profile as compared to women (Table
167 1). Women reported a higher number of chronic diseases and more favorable health habits
168 regarding alcohol and tobacco consumption.

169 **Domains of Physical Activity Across Life**

170 Participation in all domains declined between 65 years and “present” for both sexes (Figures 1A
171 and 1B). OPA was the highest contributor to overall PA at all-time points, except at “present”
172 where LTPA was (Supplementary Material). Women had lower levels of LTPA, HPA, and OPA
173 across all-time points, but similar CPA compared with men.

174 Mean LTPA and OPA intensities were higher in men than women. Intensity of LTPA decreased
175 with advancing age in both sexes. Intensity of OPA peaked at 25 years, and decreased after the
176 age of 65 in women and after 45 years in men. The lack of variability in intensities of CPA, HPA
177 and non-active-behaviours within participants did not allow the two-way ANOVA.

178 **Physical Activity in Relation to Health Variables**

179 In linear multiple regression models, OPA and non-active behaviours were generally positively
180 associated with health variables, whereas LTPA, HPA, and CPA tended to be negatively related
181 to these variables (Table 2).

182 Although many PA domains at various ages were statistically significant correlates, the
183 magnitude of these relationships was small. Final age-adjusted models explained less than 10%
184 of the variability of health variables, except for LBM in men, and metabolic health variables had

185 the smallest explained variance. Models also explained more variance among men than women
186 for anthropomorphic variables.

187 LTPA at “present” was retained as a significant correlate of most health variables in both sexes.
188 In general, standardized regression coefficients of PA at “present” were among the highest of all
189 significant correlates. More specifically, higher LTPA was associated with higher BMI and
190 glucose and lower WHR and FM in men while in women higher LTPA was associated with
191 lower BMI, WHR, and FM. Linear multiple regression between PA at younger age and fasting
192 glucose or blood pressure at older age showed no consistent pattern.

193 **DISCUSSION**

194 This study provides the longest longitudinal description of domain-specific PA trajectories
195 documented to date. Results showed that PA declined after 65 years in all four domains,
196 although variations within periods of life are domain-specific.

197 Our study is also the first to investigate associations between all four domains at multiple periods
198 of life and health at older age. We found the strongest evidence for beneficial effects of PA on
199 health in the relationship between LTPA at “present” and WHR and FM in both sexes. A recent
200 meta-analysis investigating associations between various domains and all-cause mortality
201 reported that, compared to CPA and OPA, LTPA showed the strongest associations with
202 mortality (24), suggesting dissimilar impact on health. There is evidence that higher PA intensity
203 is more effective in enhancing cardioprotection, and its association to health is stronger than PA
204 volume (25,26). In our study, despite lower PA volume, we generally found LTPA to be of
205 higher intensity than other domains, except HPA intensity because assigned MET values may
206 have been too high (27). PA recommendations should thus focus more on LTPA than any other
207 domains in order to achieve sufficient intensity to impact health status.

208 To our knowledge, there is a very limited number of studies assessing past PA in relation to
209 current health status. However, a 27-y follow-up study showed no relationship between past or
210 current LTPA and health in adults aged 40, but found the latter moderately associated with
211 cardiorespiratory fitness at age 13 (28). Since PA appears to be one of the most important
212 contributor to cardiorespiratory fitness (29), physical fitness may mediate the relationship
213 between PA and health (25). Whilst fitness is measured objectively, PA is often self-reported and
214 thus, inevitably leads to misclassification and attenuated associations with health (30). Further

215 prospective studies using objective measures of PA and cardiorespiratory fitness through life
216 course will produce more accurate estimates of PA potential benefits in older adults.

217 The lack of strong associations within past PA mainly suggests an absence of direct relationship
218 with current health. For instance, PA at younger ages is related to health status during young age
219 (31) which is an important predictor for health status in adulthood (4). Moreover, being
220 physically active during adulthood helps maintaining high PA levels at older age (32), which
221 appears to be strongly associated with better health at older age. Therefore, PA levels across the
222 life course seem all important because of substantial benefits through indirect pathways. Future
223 studies should investigate repeated assessments of domains and health outcomes across life in
224 order to determine direct relationships and relative contributions of PA across life on later health.

225 Noteworthy, our results suggest OPA might be unfavorable for long-term health. Since
226 physically demanding jobs are often associated with health problems (33), we examined if higher
227 OPA at age 25 was related to lower “current” PA levels and found no association. Thus, work-
228 related environmental factors such as unhealthy lifestyle (34) and underprivileged life
229 circumstances (12) could potentially explain disadvantageous health outcomes and should be
230 further investigated.

231 The lack of association between PA and blood pressure in our study is in agreement with
232 previous observational studies (28,35), but contradicts randomized controlled trials (36).

233 Differences in methods of PA assessment and confounding factors such as nutrition (37) or stress
234 (38) could partially explain these ambiguous results.

235 Several limitations must be considered. Our PA measures relied on participants’ recall,
236 potentially affected by social desirability. Recall of current participation in PA may be more
237 accurate than past activities, thus assessing less distortion in current PA participation and

238 explaining stronger associations with outcomes. Finally, given PA was measured at first follow-
239 up, PA measures were assessed within a year after health variables. Lack of changes in
240 anthropomorphic variables between baseline and second follow-up (data not shown) allowed us
241 to assume health variables did not change at first follow-up as well.

242 Despite the above limitations, our study has several strengths. PA was assessed over one-year
243 periods, accounting for seasonal variations in PA choices (39). PA measures were in all four
244 domains, which is important for gaining insights into general patterns of PA throughout life.
245 Even though recall periods are a limitation, habitual PA patterns are more accurately reported
246 than irregular ones (40), allowing us to identify regular behaviours, unlike accelerometers or
247 questionnaires that may capture more punctual behaviors.

248 In conclusion, PA levels were higher among men at all-time points, and declined for both sexes
249 after the age of 65 in all domains. Moreover, health-PA relationships are domain-specific.
250 Among past and present PA domains, LTPA at older age may represent the most effective
251 domain to improve anthropomorphic variables at older age.

252 Taken together, these results suggest that sustained PA levels should be maintained across life.
253 More importantly, it seems that significant health benefits could be achieved by practicing LTPA
254 at older age, irrespective of past inactivity. From a public health perspective, older adults aged
255 around 65, especially women, should be encouraged to engage in LTPA, regardless of their
256 history.

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264 **Conflict of Interest**

265 None.

266 **Authors' Contributions**

267 HP, IJD: study concept and design, acquisition of data. HP: recruitment of subjects. MA, MB,
268 KBV: analysis and interpretation of data; KBV: preparation of the manuscript. All authors
269 revised the manuscript for the important intellectual content and read and approved the final
270 manuscript.

271 **Sponsors' Role**

272 None.

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TABLES

Table 1. Baseline Characteristics of the NuAge Cohort Subset Participants (N=1378)

* p-value from Mann-Whitney U test, unless stated otherwise.

† p-value from Chi-square test.

	Men (n=667)	Women (n=711)	Sex differences
	Mean±SD	Mean±SD	p-value*
Sociodemographic status			
Age, yrs	74.0±4.1	74.4±4.2	0.055
Married, %	76.8	44.3	<0.001†
Education, yrs	12.0±5.1	11.4±3.9	0.368
Household income, k\$	45.1±23.6	34.6±20.3	<0.001
Anthropomorphic measures			
Body weight, kg	79.6±12.9	66.8±12.2	<0.001
Fat mass, kg	22.1±8.6	26.0±8.8	<0.001
Lean body mass, kg	53.9±7.1	37.5±4.3	<0.001
BMI, kg/m ²	28.1±4.0	27.7±4.9	0.012
Waist circumference, cm	101.7±11.4	89.9±11.8	<0.001
Waist to hip ratio	0.97±0.06	0.84±0.05	<0.001
Metabolic profil			
SBP, mmHg	133.3±16.6	131.8±17.1	0.111
DBP, mmHg	70.1±9.6	68.9±9.0	0.048
Fasting glucose, mmol/L	5.7±1.3	5.4±1.3	<0.001
Burden of disease score (/21)	1.9±1.6	2.2±1.7	<0.001

Sum of risk factors (/6)	2.7±1.3	2.2±1.4	<0.001
Health habits			
Current smoker, %(n)	7.8 (52)	4.2 (30)	<0.001 [†]
Past smoker, %(n)	58.6 (391)	27.6 (196)	
Never smoked, %(n)	33.6 (224)	68.2 (485)	
Occasional drinker (<1 alcoholic drink/day), %(n)	12.4 (83)	23.9 (170)	<0.001 [†]
Moderate drinker (1 alcoholic drink/day), %(n)	13.8 (92)	29.3 (208)	
Regular drinker (≥ 2 alcoholic drink/day), %(n)	73.8 (492)	46.8 (333)	

BMI, Body mass index; DBP, Diastolic blood pressure; SBP, Systolic blood pressure.

Table 2. Beta Estimates of the Relationship Between Levels of LTPA, OPA, HPA, and CPA at Different Periods of Life and Health Variables in Older Adults Obtained from Stepwise Linear Regressions, Age-adjusted Models.

* p<0.05

† p≤0.01

‡ p≤0.001

Men correlates	Standardized-β	Women correlates	Standardized-β
Body mass index	F: 7.32 [‡]	Body mass index	F: 9.58 [‡]
<i>(BMI^{-1/2})</i>	Adj. R ² : 0.071	<i>(Log[BMI])</i>	Adj. R ² : 0.046
Non-active bhv, 65 yrs	0.268	LTPA, present	-0.188
OPA, 65 yrs	0.182	HPA, present	-0.078
LTPA, present	0.150	CPA, present	-0.076
HPA, present	0.149		
Non-active bhv, 45 yrs	-0.125		
OPA, 25 yrs	-0.124		
OPA, 15 yrs	-0.091		
Waist to hip ratio	F: 6.38 [‡]	Waist to hip ratio	F: 4.76 [†]
	Adj. R ² : 0.052		Adj. R ² :0.012
OPA, 15 yrs	0.159	LTPA, present	-0.116
Non-active bhv, 65 yrs	-0.125		
LTPA, present	-0.100		
Non-active bhv, 15 yrs	0.090		
Non-active bhv, 45 yrs	0.086		

Fat mass	F: 11.50 [‡]	Fat mass	F: 7.42 [‡]
<i>(FM%²)</i>	Adj. R ² : 0.083	<i>(FM^{1/2})</i>	Adj. R ² :0.035
LTPA, present	-0.243	LTPA, present	-0.204
HPA, present	-0.145		
Lean body mass	F: 20.75 [‡]	Lean body mass	F: 7.26 [*]
	Adj. R ² :0.101	<i>(LBM^{-1/2})</i>	Adj. R ² :0.018
OPA, 15 yrs	0.113	CPA, 15 yrs	0.106
Fasting glucose	F: 4.48 [†]	Fasting glucose	F: 5.99 [‡]
<i>(Glucose⁻²)</i>	Adj. R ² :0.016	<i>(Glucose⁻²)</i>	Adj. R ² :0.028
LTPA, present	0.101	HPA, 15 yrs	-0.105
HPA, 25 yrs	-0.077	Non-active bhv, 25 yrs	-0.089
		HPA, 45 yrs	-0.075
Blood pressure	F: 3.24 [*]	Blood pressure	F: 3.405 [†]
<i>([SBP•DBP]^{-1/2})</i>	Adj. R ² :0.010	<i>([SBP•DBP]^{-1/2})</i>	Adj. R ² :0.014
CPA, 45 yrs	0.091	OPA, 45 yrs	0.189
CPA, 15 yrs	-0.083	Non-active bhv, 45 yrs	0.157
		LTPA, 45 yrs	0.091

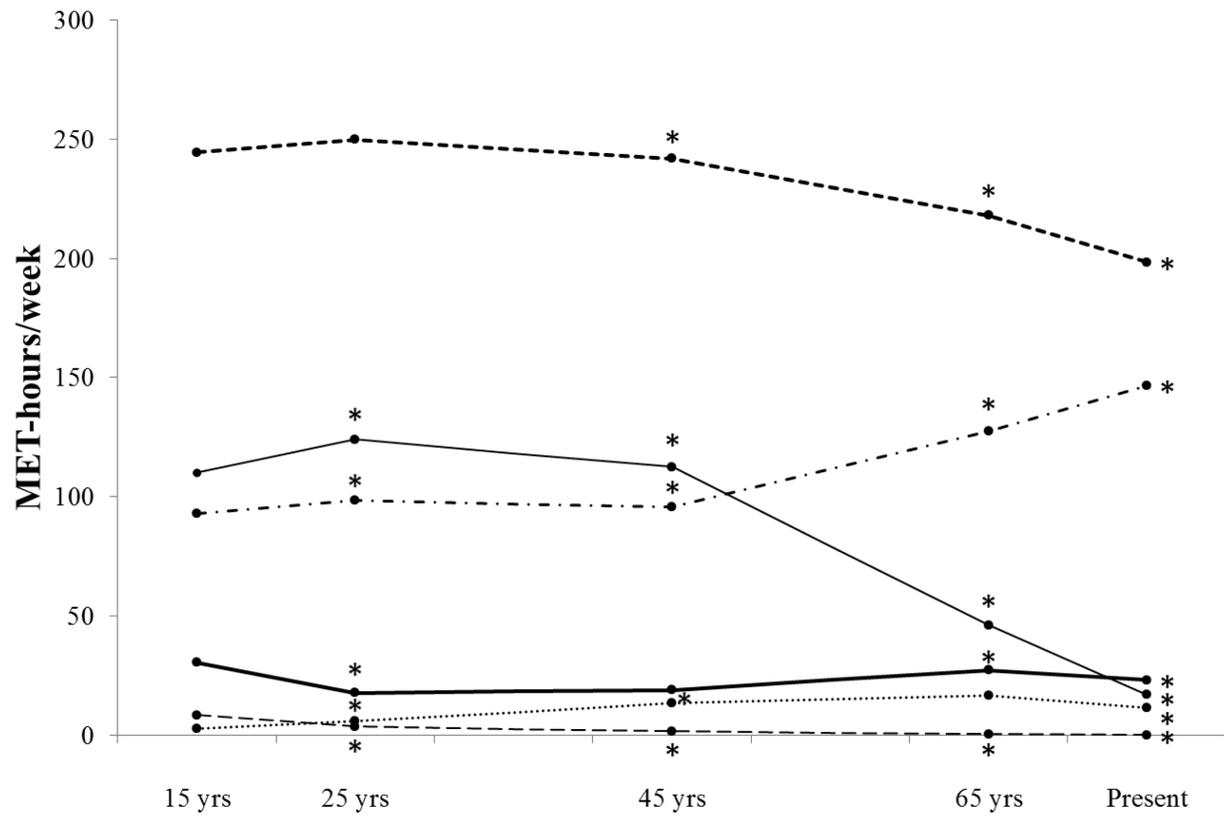
β, Standardized beta coefficient; Bhv, Behaviors; BMI, Body mass index; CPA, Commuting physical activity; DBP, Diastolic blood pressure; FM, Fat mass; FM%, Fat mass percentage [Fat mass (kg)/body weight (kg)]; HPA, Household physical activity; LBM, Lean body mass; LTPA, Leisure time physical activity; OPA, occupational physical activity; SBP, Systolic blood pressure.

FIGURE LEGENDS

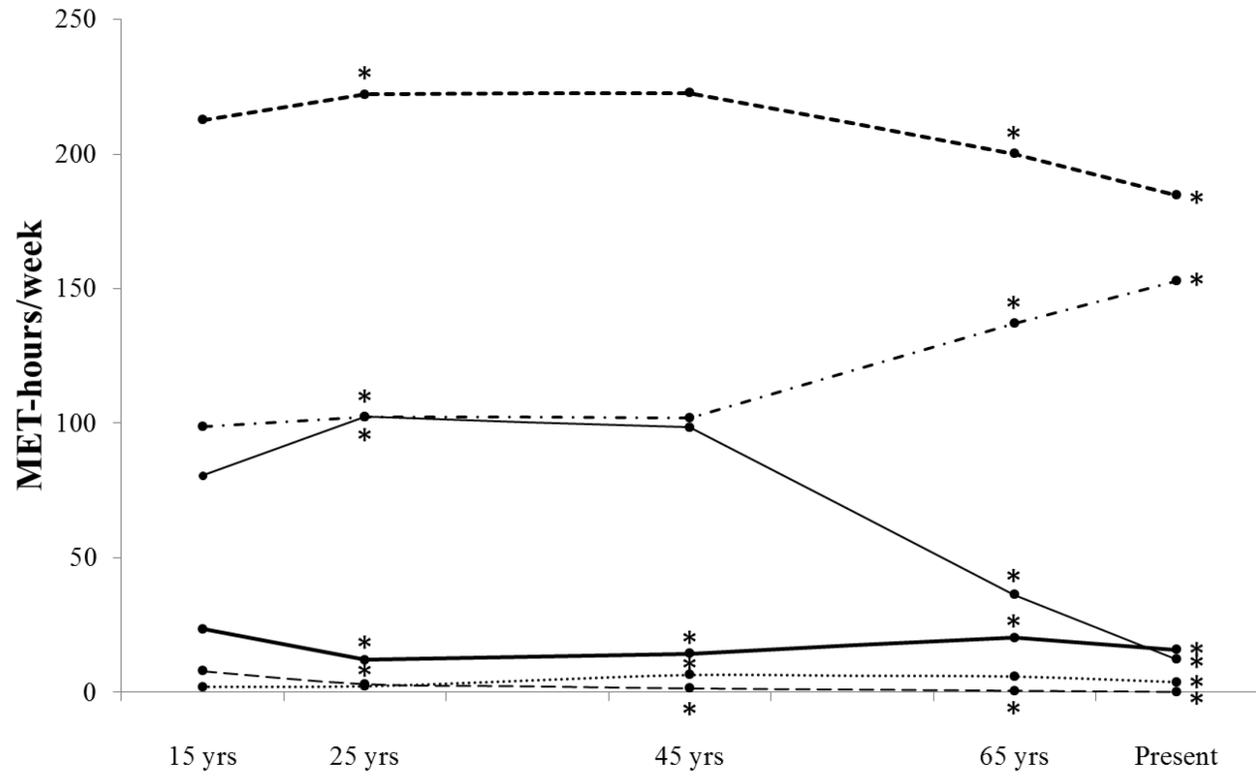
- Leisure time
- Household
- Commuting
- Occupational
- 16-h standardized score
- . - Non-active behaviours

Figure 1. A) Physical activity domain-specific volumes in men across lifespan. B) Physical activity domain-specific volumes in women across lifespan. * denotes significant within-domain changes from the preceding time period. See Supplementary material for more details about physical activity components.

A)



B)



SUPPLEMENTAL MATERIAL FOR ONLINE ONLY

Supplementary Table S1. Physical activity components for each period of life in men and women (N=1378)

^a Significantly different from present; ^b 65 years old; ^c 45 years old; ^d 25 years old; ^e 15 years old.

* p-value from t-test for independent samples, unless stated otherwise.

† p-value for a “Time*Sex” interaction from two-way ANOVA.

Physical activity domain	Men (n=667)		Women (n=711)		Sex difference in volume	Sex difference in intensity
	Volume (MET- hours/week)	Intensity (MET)	Volume (MET- hours/week)	Intensity (MET)	p-value*	p-value*
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
16-hour standardized score					<0.001 [†]	<0.001 [†]
Present	198.4 ± 35.3 ^{bcde}	2.12 ± 0.68 ^{bcde}	184.7 ± 20.8 ^{bcde}	1.83 ± 0.40 ^{bcde}	<0.001	<0.001
65 years old	218.1 ± 48.7 ^{acde}	2.41 ± 0.77 ^{acde}	200.1 ± 33.8 ^{acde}	2.08 ± 0.54 ^{acde}	<0.001	<0.001

45 years old	242.0 ± 69.4 ^{abd}	2.67 ± 1.02 ^{abde}	222.7 ± 38.1 ^{be}	2.31 ± 0.54 ^{ab}	<0.001	<0.001
25 years old	249.9 ± 76.7 ^{abc}	2.82 ± 1.25 ^{abc}	222.2 ± 36.9 ^{abe}	2.30 ± 0.57 ^{ab}	<0.001	<0.001
15 years old	244.6 ± 65.7 ^{ab}	2.87 ± 1.05 ^{abc}	212.6 ± 38.5 ^{abcd}	2.36 ± 0.69 ^{ab}	<0.001	<0.001
Leisure time					0.376 [†]	0.155 [†]
Present	23.1 ± 25.5 ^{bcde}	4.10 ± 1.28 ^{bcde}	15.7 ± 17.9 ^{bde}	3.89 ± 1.12 ^{bcde}	<0.001	0.004
65 years old	27.2 ± 29.0 ^{acd}	4.49 ± 1.41 ^{acde}	20.3 ± 21.9 ^{acd}	4.31 ± 1.36 ^{acde}	<0.001	0.032
45 years old	18.9 ± 25.5 ^{abe}	5.25 ± 1.60 ^{abde}	14.4 ± 20.2 ^{bde}	4.74 ± 1.56 ^{abe}	<0.001	<0.001
25 years old	17.7 ± 29.5 ^{abe}	6.68 ± 1.70 ^{abce}	12.0 ± 19.9 ^{abce}	5.02 ± 1.69 ^{abe}	<0.001	<0.001
15 years old	30.4 ± 38.3 ^{acd}	6.53 ± 1.33 ^{abcd}	23.5 ± 32.7 ^{acd}	6.15 ± 1.62 ^{abcd}	<0.001	<0.001
Household					<0.001 [†]	----
Present	11.6 ± 28.1 ^{bde}	5.0	3.8 ± 14.7 ^{bc}	5.0	<0.001	----
65 years old	16.8 ± 33.9 ^{ade}	5.0	5.9 ± 17.8 ^{ade}	5.0	<0.001	----
45 years old	13.3 ± 24.4 ^{de}	5.0	6.5 ± 19.3 ^{ade}	5.0	<0.001	----
25 years old	5.9 ± 19.3 ^{abce}	5.0	2.3 ± 9.7 ^{bc}	5.0	<0.001	----
15 years old	2.5 ± 10.9 ^{abcd}	5.0	2.1 ± 11.3 ^{bc}	5.0	0.443	----
Occupational					<0.001 [†]	0.006 [†]

Present	16.9 ± 36.3 ^{bcde}	2.58 ± 1.46	12.3 ± 27.1 ^{bcde}	2.17 ± 0.75 ^{bcde}	0.009	<0.001
65 years old	46.1 ± 60.0 ^{acde}	2.63 ± 1.38	36.2 ± 48.0 ^{acde}	2.39 ± 0.84 ^{ade}	0.001	0.002
45 years old	112.5 ± 71.3 ^{abd}	2.67 ± 1.39 ^d	98.5 ± 44.1 ^{abe}	2.49 ± 0.75 ^{ae}	<0.001	0.004
25 years old	124.1 ± 78.0 ^{abce}	3.02 ± 1.69 ^{ce}	102.4 ± 45.4 ^{abe}	2.55 ± 0.80 ^{abe}	<0.001	<0.001
15 years old	110.1 ± 69.7 ^{abd}	2.59 ± 1.46 ^d	80.4 ± 42.9 ^{abcd}	2.01 ± 0.75 ^{abcd}	<0.001	<0.001
Commuting					0.295 [†]	----
Present	0.1 ± 0.8 ^{bcde}	4.08 ± 0.36	0.2 ± 0.9 ^{bcde}	4.21 ± 1.02	0.135	0.577
65 years old	0.35 ± 2.0 ^{acde}	4.81 ± 2.31	0.6 ± 2.6 ^{acde}	4.15 ± 0.96	0.034	0.112
45 years old	1.7 ± 6.8 ^{abde}	4.26 ± 1.08	1.5 ± 4.1 ^{abde}	4.17 ± 0.91	0.496	0.521
25 years old	3.6 ± 8.0 ^{abce}	4.41 ± 1.50	3.0 ± 7.3 ^{abce}	4.26 ± 1.09	0.214	0.278
15 years old	8.5 ± 10.9 ^{abcd}	4.48 ± 1.54	7.8 ± 10.2 ^{abcd}	4.18 ± 0.99	0.282	<0.001
Non-active behaviour score					0.010 [†]	----
Present	146.8 ± 20.0 ^{bcde}	1.5	152.8 ± 17.9 ^{bcde}	1.5	<0.001	----
65 years old	127.6 ± 29.8 ^{acde}	1.5	137.2 ± 26.8 ^{acde}	1.5	<0.001	----

45 years old	95.7 ± 17.6^{abd}	1.5	101.8 ± 21.0^{ab}	1.5	<0.001	----
25 years old	98.6 ± 19.4^{abce}	1.5	102.5 ± 20.1^{abe}	1.5	<0.001	----
15 years old	93.0 ± 23.7^{abd}	1.5	98.8 ± 22.6^{abd}	1.5	<0.001	----
