Gender and Age Differences in Types of Physical Activity among U.S. Adults

Background

Past research has established that older people are less physically active than younger people, and that females are less active than males. However, it is not clear whether females and older people engage in different types of physical activity compared to males and younger people, or they engage in the same types of physical activity, just with less time allocated to them. Understanding these differences is important for educators and policymakers to evaluate the differential effectiveness of public health efforts promoting physical activity among men and women of different ages.

Method

In this study we analyze data from 5,343 respondents age 25-64 from the NHANES 2003-2006 waves to answer our research question. We utilize the interview module of physical activity data, which includes an extensive array of questions related to daily activities and detailed information about specific leisure-time activities.

Physical activities are often classified into domains that reflect the purpose of the activity. A common four-category classification is: (1) occupational (work-related), (2) domestic (housework, yard work, physically-active child care, chores), (3) transportation (walking or bicycling for the purposes of going somewhere), and (4) leisure-time (discretionary or

recreational time for hobbies, sports, and exercise)

(http://www.cdc.gov/physicalactivity/professionals/data/explanation.html). While NHANES has

a question related to occupational physical activity, the recommended MET scores for all four

levels of occupational physical activity are below the typical moderate to vigorous activity level

of 2.5 to 3. Thus, we focus only on domestic physical activity (domestic PA), transportation

physical activity (transportation PA), and leisure-time physical activity (leisure PA) in this paper,

with leisure PA further classified into more detailed categories.

For domestic PA, NHANES asks the question: "Over the past 30 days, did you do any

tasks in or around your home or yard for at least 10 minutes that required moderate or greater

physical effort? By moderate physical effort I mean, tasks that caused light sweating or a slight

or moderate increase in your heart rate or breathing, such as raking leaves, mowing the lawn or

heavy cleaning." If the answer is yes, then data are collected on the frequency and duration (in

minutes) of domestic PA in the past 30 days.

For transportation PA, NHANES asks the question: "Over the past 30 days, have you

walked or bicycled as part of getting to and from work, or school, or to do errands?" If the

answer is yes, then data are collected on the number of times walked or bicycled per day, week,

or month, and how many minutes per day.

For leisure PA, NHANES collect data on 48 types of moderate to vigorous activities over

the past 30 days, with detailed information on number of times, average duration of activity in

minutes, and MET score for activity. To the data analyses to be feasible, we combine some of the

activity types such as grouping basketball, football, baseball, softball, hockey, soccer, and

volleyball into a team sports category. In addition, for any leisure PA category with less than 2%

participating rate, we combine them into a category titled "other leisure PA."

In sum, 15 leisure PA categories are created: (1)walking, (2) dancing and aerobics, (3) treadmill and stair climbing, (4) bicycling, (5) running and jogging, (6) team sports, (7) weight lifting, (8) yoga and stretching, (9) hiking, (10) swimming, (11) golfing, (12) fishing and hunting, (13) tennis and racquetball, (14) bowling, and (15) other leisure PA. Adding domestic PA and transportation PA, we have a total of 17 PA categories.

Both participation rates and average weekly minutes for the past 30 days are computed for each of the 17 PA categories. Weighted descriptive statistics are computed for the whole sample and for women and men separately. To tease out the effects of gender and age, we first conduct Probit regressions on the probability of participating in each of the 17 PA categories controlling an array of socioeconomic and demographic variables. We then use Tobit analyses to estimate the marginal effects of gender and age on average weekly minutes reported for each of the 17 PA categories. Tobit analyses are used to account for the truncated nature of the average weekly minutes PA measures. In these regressions we control for marital status (married vs. not married), education levels (less than high school, high school graduates, some college, and college graduates), race/ethnicity (white, black, Hispanic, and other races/ethnicity), income to poverty ratio, self-rated poor or fair health (poor/fair health vs. not poor/fair health), and smoking status (smoking vs. not smoking). SAS 9.2 Proc Surveymeans and Proc Qlim are used for these analyses.

Results

Descriptive statistics for the 17 PAs are presented in Table 1.

[Insert Table 1 about Here]

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The first three number columns in Table 1 show the participation rates for each type of PA. For both men and women, domestic PA has the highest participation rate at about 73%. Men have slightly higher participation rate in transportation PA, compared to women. For leisure PAs, walking is by far the most popular, with 46% of women and 32% of men participating. For women, the top five leisure PAs by participation rate are (1) walking, (2) dancing and aerobics, (3) treadmill and stair climbing, (4) biking, and (5) Yoga and stretching. For men, the top five are (1) walking, (2) team sports, (3) biking, (4) running and jogging, and (5) treadmill and stair climbing. Percentage participating in weightlifting is a close number six for both men and women.

Number columns 4-6 present the mean weekly minutes devoted to each activity for those who participate, titled "conditional means" as these means are based on the condition of participation. Note that for those who participate, the average weekly minutes are the most for fishing and hunting, followed by golfing and domestic PA. Gender differences exist in how much time one spends on these activities. Compared to female participants for the same activity, male participants spend more time on walking, team sports, weightlifting, golfing, fishing/hunting, other leisure PA, and transportation PA, while female participants spend more time on dancing/aerobics, treadmill/stair climbing, hiking, and bowling.

The last three columns in Table 1 present the mean weekly minutes for everybody regardless of participation status. For these unconditional means, domestic PA, walking, and transportation PA have the highest average weekly minutes, followed by dancing/aerobics and treadmill/stair climbing for women, and team sports and golfing for men. Men and women are not statistically different in only four of the 17 categories: hiking, swimming, tennis, and

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bowling. Note that domestic PA accounts for about 40% of all PA minutes measured in this study, transportation PA about 10%, and leisure PA about 50%.

Table 2 shows average marginal probability of gender and age on the probability of participating in each of the 17 PA types, together with P-values, controlling for marital status, education, race/ethnicity, income-poverty ratio, self-rated health, and smoking status. Holding these factors equal, compared to women, men are 13% less likely to walk, 13% less likely to dance and do aerobics, 5% less likely to use treadmill and stair climbing, and 5% less likely to practice yoga and stretching. On the other hand, men are 12% more likely to engage in team sports, 9% more likely to golf, 7% more likely to go fishing and hunting, and 6% more likely to run and jog.

[Insert Table 2 about Here]

Compared to younger people, older people are less likely to participate in most types of PA, with the exception of four categories: walking, golfing, fishing/hunting, and domestic PA. In these four categories the impact of age on the probability of participation is statistically insignificant. The PA categories that show the most impact of age are team sports (6% less likely to participate for every 10 years of age), running/jogging (5% less likely), dancing/aerobics (3% less likely), and other leisure PA (3% less likely).

Table 3 presents Tobit parameter estimates and average marginal effects estimates for gender and age on average weekly minutes spent on the 17 PA categories.

[Insert Table 3 about Here]

Holding other things equal, compared to women, men spend about 20 minutes per week less on walking, 18 minutes less on dancing/aerobics, 7 minutes less on treadmill/stair climbing, and 5 minutes less on yoga/stretching. There is no statistically significant difference in four of

the 17 categories: hiking, swimming, bowling, and domestic PA. For the remaining 9 categories, men spend more time than women. Specifically, men spend 23 minutes per week more on golfing, 21 minutes more on team sports, 20 minutes more on fishing/hunting, 11 minutes more on transportation PA, 7 minutes more on running/jogging, 6 minutes more on weightlifting, 5 minutes more on other leisure PA, 4 minutes more on biking, and 1 minute more on tennis, holding other things equal.

Table 3 also presents the marginal effect of age on weekly minutes spent engaging in each of the 17 PA categories. Two PA categories stand out: for every 10 years of age, people spend about 15 minutes more per week engaging in domestic PA, while spending 10 minutes less per week participating in team sports. Out of the 15 leisure PA categories, the only activity that increases with age is walking, where every 10 years of age increases average weekly minute spent walking by 4 minutes.

To further explore if the impact of age is different by gender, we estimate Probit and Tobit models separately for men and women while estimating the statistical significance of such gender differences by interaction models. Our preliminary results show that for about 1/3 of the PA categories, the effect of age is different for men and women. These six categories are: walking, dancing/aerobics, weightlifting, hiking, swimming, and domestic PA. This stage of the analysis is still undergoing.

Tentative Conclusion

This study aims to answer the question if females and older people engage in different types of physical activities compared to males and younger people, or if they engage in the same types of physical activities, just with less time allocated to these activities. Our results show that

females do engage in different types of physical activity compared to males, in that females are more likely to participate in and spend more time on walking, dancing/aerobics, treadmill/stair climbing, and yoga/stretching, while males are more likely to participate in and spend more time on golfing, team sports, fishing/hunting, and running/jogging, ceteris paribus. The PA activities that are gender neutral are hiking, swimming, bowling, and domestic PA, although there are still some detailed gender differences in some of these activities, such as females being less likely to hike than males but spending more time hiking if they do hike.

Holding other things equal, older people spend less time on most types of PA activities. The exceptions are time spent on biking, golfing, and fishing/hunting, which is not age-sensitive, and time spent walking and domestic PA, which increases with age.

We temper our conclusions with several caveats. First, self-reported physical activity measures are known to have reporting bias, in that people tend to overestimate their physical activity amount and intensity level. In fact, we compare the self-reported total weekly minutes with objectively measured accelerometer data for the subsample with valid data (n=3650), and found the objectively average weekly minutes to be only 52 minutes if the modified 10 minute bouts definition is used for moderate and vigorous physical activity (MET>=3). If the definition is relaxed to 1 minute or more with MET>=3, then the total average daily minutes is 186, which is about half of what people have reported. However, if men and women, younger people and older people overestimate their PA in similar manner, then the results of this analysis regarding gender and age difference are still valid. Second, many recent studies have shown neighborhood environment to affect physical activity. We initially tried to use housing age as a proxy for neighborhood walkability, but abandoned that approach given that about 60% of our sample had missing value on that variable. While incorporating neighborhood environment is possible with

NHANES through accessing restricted data, it is beyond the scope of this analysis. If neighborhood environments have differential effects on men and women, then our estimates may be biased due to the lack of control of neighborhood environments. Third, time constraint is a major factor affecting physical activity time. While NHNANES 2003-3004 has occupation data that can be used as proxies for time constraint, such data are not released for NHANES 2005-2006. Due to the low participation rates for of some types of PA activity, we opted for keeping both waves of data to maximize our sample size. Combining more waves of NHANES data may present different opportunities of controlling for the effects of time constraint.

Despite these limitations, our results suggest that public health efforts promoting physical activity may have differential impact on men and women of different ages. Efforts promoting walking are likely beneficial for a highest percentage of the population, women more so than men, and older people more so than younger people. Developing publicly subsidized golf courses and relaxing fishing/hunting restrictions, on the other hand, will benefit men more than women. Domestic PA presents an interesting paradox that is illustrative of the conflict between public health goals and economic development goals. With economic development, more and more products are available to reduce people's domestic chore burdens. Given domestic PA is the only other PA activity that increases with age aside from walking, such modern conveniences come at the cost of reduced domestic PA and associated negative health consequences, especially for older people.

Table 1. Weighted Participation Rates and Average Weekly Minutes Spent on Various Physical Activity (PA) Types

PA Type	% Participating			Weekly Minutes Conditional Mean			Weekly Minutes Unconditional Mean			Significance Level for Gender Difference
	All	Women	Men	All	Women	Men	All	Women	Men	
Walking	39%	46%	32%	143	129	162	55	59	52	*
Dancing+Aerobics	15%	22%	9%	100	103	90	15	23	8	***
Treadmill+Stairclimbing	15%	17%	12%	100	110	86	15	19	11	***
Biking	14%	12%	15%	86	83	88	12	10	14	**
Running+Jogging	11%	8%	14%	94	95	93	10	8	13	***
Team Sports	10%	5%	16%	127	89	138	13	4	23	***
Weight Lifting	10%	9%	12%	100	78	116	10	7	14	***
Yoga + Stretching	9%	11%	6%	77	76	79	7	9	5	***
Hiking	7%	6%	8%	99	121	81	7	7	7	
Swimming	7%	7%	7%	81	90	73	6	6	5	
Golfing	6%	2%	10%	204	142	216	13	3	22	***
Fishing + Hunting	6%	2%	9%	218	150	235	13	4	22	***
Tennis	2%	2%	3%	96	96	96	2	2	3	
Bowling	2%	2%	2%	89	102	79	2	2	2	
Other Leisure PA	8%	7%	10%	101	78	116	8	5	12	***
Domestic PA	73%	72%	73%	200	191	209	145	138	153	*
Transportation PA	25%	23%	26%	145	128	159	36	29	42	***
Total Reported PA	89%	88%	90%	415	379	451	369	334	404	***

*** p<0.01
**p<0.05
*p<0.1

Table 2. Marginal Probability of Gender and Age on Participating in Various Types of Physical Activity (PA): Probit Regression Results

| | Independent Variable | | | | | |
| | Male | | | Age (10 yr.) | | |
PA Activity	Average Marginal Probability	P-Value		Aveage Marginal Probability	P-Value	
Walking	-13%	<.0001	***	1%	0.1177	
Dancing+Aerobics	-13%	<.0001	***	-3%	<.0001	***
Treadmill+Stairclimbing	-5%	<.0001	***	-2%	0.0003	***
Biking	3%	0.0003	***	-1%	0.044	**
Running+Jogging	6%	<.0001	***	-5%	<.0001	***
Team Sports	12%	<.0001	***	-6%	<.0001	***
Weight Lifting	4%	<.0001	***	-2%	<.0001	***
Yoga + Stretching	-5%	<.0001	***	-2%	<.0001	***
Hiking	2%	0.0158	**	-1%	0.0007	***
Swimming	1%	0.4012		-1%	0.0109	**
Golfing	9%	<.0001	***	0%	0.1869	
Fishing + Hunting	7%	<.0001	***	0%	0.3749	
Tennis	1%	0.0432	**	-1%	0.0001	***
Bowling	1%	0.101		-1%	0.0004	***
Other Leisure PA	3%	<.0001	***	-3%	<.0001	***
Domestic PA	0%	0.961		1%	0.3095	
Transportation PA	4%	0.0013	***	-2%	0.0003	***

Note: These Probit regressions control for marriage status, education, race/ethnicity, income-poverty ratio, self-rated health, and smoking status
*** p<0.01
**p<0.05
*p<0.1

Table 3. Marginal Effects of Gender and Age on Average Weekly Minutes Spent in Various Types of Physical Activity (PA): Tobit Regression Results

	Independent Variable							
	Male				Age (10 yr.)			
PA Activity	Coefficient	Marginal Effect	P-Value		Coefficient	Marginal Effect	P-Value	
Walking	-59	-20	<.0001	***	12	4	0.0076	***
Dancing+Aerobics	-125	-18	<.0001	***	-30	-4	<.0001	***
Treadmill+Stairclimbing	-53	-7	<.0001	***	-14	-2	0.0028	***
Biking	31	4	0.0003	***	-5	-1	0.2576	
Running+Jogging	63	7	<.0001	***	-48	-5	<.0001	***
Team Sports	217	21	<.0001	***	-105	-10	<.0001	***
Weight Lifting	55	6	<.0001	***	-34	-3	<.0001	***
Yoga + Stretching	-57	-5	<.0001	***	-15	-1	0.0005	***
Hiking	21	1	0.1267		-21	-1	0.0022	***
Swimming	4	0	0.6957		-13	-1	0.0151	**
Golfing	382	23	<.0001	***	-3	0	0.8269	
Fishing + Hunting	346	20	<.0001	***	-14	-1	0.3332	
Tennis	41	1	0.0516	*	-37	-1	0.0005	***
Bowling	33	1	0.1546		32	-1	0.0052	***
Other Leisure PA	67	5	<.0001	***	-40	-3	<.0001	***
Domestic PA	15	9	0.1389		26	15	<.0001	***
Transportation PA	53	11	0.0001	***	-14	-3	0.0296	**

Note: These Tobit regressions control for marriage status, education, race/ethnicity, income-poverty ratio, self-rated health, and smoking status
*** p<0.01
**p<0.05
*p<0.1