Examining the relationship between sport and health among USA women: An analysis of the Behavioral Risk Factor Surveillance System

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Abstract

Background: Research has been conducted linking sports participation and health in childhood and adolescence; however, little is known about the contribution of sport to women’s health. The purpose of this study was to examine the relationship between sport and women’s health in the USA by analyzing data from the Behavioral Risk Factor Surveillance System (BRFSS).

Methods: This study was a secondary data analysis of the 2013 national BRFSS survey. Unlike the BRFSS core component from previous years, in 2013, participants were questioned extensively about their physical activity behaviors. Seventy-six different activities were identified by the participants. Two researchers categorized the 76 activities as sport, conditioning exercise, recreation, or household tasks based on previously identified categories. Logistic regression was utilized to calculate odds ratios and adjusted odds ratios for chronic diseases based on physical activity category.

Results: Women who participated in sport had better health outcomes with significantly lower odds for all chronic diseases except asthma and better general health than women who participated in conditioning exercise, household tasks, or recreation, and many of the significant differences remained after controlling for demographic characteristics.

Conclusion: Sport participation was associated with more positive health outcomes among women in the USA compared with the other categories. As a means to improve health of women, the USA could focus on efforts to increase sport participation among women.

Keywords: Chronic diseases; Conditioning exercise; Leisure-time physical activity; Recreation; Sport participation; Women’s health

1. Introduction

Regular physical activity (PA) reduces the risk for chronic disease and improves overall health.1–4 Aerobic exercise helps reduce the incidence of cardiovascular disease (heart disease and stroke) and reduces risk factors for cardiovascular disease such as obesity, diabetes, high blood pressure, and high cholesterol in adults.1,3,6,7 It has also been shown to improve pulmonary function, bone density, body image, and self-esteem.3,7–10

Specific to women, examples of positive outcomes from engaging in regular PA include improved survival after diagnosis of breast cancer and possible reduced risk of breast cancer and colon cancer, reduced risk of osteoporosis and cardiovascular disease, improved perceived health status and feelings of vitality, and reduced risk of metabolic syndrome.4,11–17 For example, Manson and colleagues17 found that women who walked briskly for 3 or more hours per week were significantly less likely to have a nonfatal or fatal myocardial infarction when compared with women who exercised infrequently.

Leisure-time PA can be divided into 4 categories, including sport, conditioning exercise, household tasks, and other (recreation).18 Sport can be further defined as “a human activity of achieving a result requiring physical exertion and/or physical skill which, by its nature and organization, is competitive and is generally accepted as being a sport”.19 Research examining the health benefits of sport for children and adolescents is quite extensive.20–24 However, in adults, most research compares people who are physically active with people who are not physically active. Additionally, some research has examined the health benefits of leisure-time PA based on its intensity, which...
can be measured as metabolic equivalents (METs).\textsuperscript{25–29} PA that has a higher intensity produces a greater MET value, and a MET value of 6 or greater is associated with vigorous PA.\textsuperscript{30,31} People who engage in vigorous PA (e.g., sport) are more likely to reap the health benefits associated with being physically active than those who engage in PA associated with a lower MET value.\textsuperscript{25–29} The majority of previous research has not attempted to parse out the health benefits of sport from other forms of leisure-time PA, nor has it focused on women.\textsuperscript{19}

Research has been conducted to understand the difference in motivational factors for participation in sport compared with conditioning exercise in adults. People who participate in sport are more likely to be intrinsically motivated, whereas people who participate in exercise are more likely to be extrinsically motivated.\textsuperscript{32–36} Intrinsic motivators of improved health, enjoyment, challenge, and competence are highly associated with sport participation, whereas the extrinsic motivators of physical appearance and weight loss are highly associated with exercise. Because the primary motivators for sport participation are intrinsic, researchers have concluded that sport participation might be a more sustainable form of PA, with a greater likelihood that those involved will meet the PA recommendations for improved health from Centers for Disease Control and Prevention (CDC).\textsuperscript{32}

Increasingly, many countries including the UK and Australia are focused on growing women’s sport as a strategy to improve health among women.\textsuperscript{37,38} Despite an emerging understanding of the importance of PA for women’s health, little is known about the contribution that sport makes to women’s health in the USA. Lamb and colleagues\textsuperscript{39} examined the health outcomes of sport participation in Britain and found that women who participated in sport had lower blood pressure, lower resting heart rate, lower body mass index, and better perceived health. Liechty and colleagues\textsuperscript{40} found that participating in tackle football improved body image among the women who participated. Interestingly, no large-scale studies on the impact of sport on women’s health have been conducted in the USA.

The Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in 2013 provided a large, national dataset for the analysis of this relationship. By analyzing BRFSS data, this study examined the relationship between sport and women’s health in the USA. We wanted to see whether women who participate in sport reported fewer chronic conditions and better health than women who participated in other forms of PA. Our hypotheses were the following:

1. Women who report participating in sport will be significantly less likely to report chronic diseases than women who report participating in conditioning exercise, household tasks, or recreation, and differences will remain after adjusting for demographic characteristics including age, income, education, and race/ethnicity.

2. Women who report sports participation will be significantly more likely to meet the recommended amount of exercise per week and achieve a higher MET value compared with women who participate in conditioning exercise, household tasks, or recreation.

2. Methods

2.1. Ethics approval

This study was deemed as excluded by the University of Nevada, Las Vegas, Institutional Review Board because it was a secondary data analysis of de-identified data.

2.2. BRFSS

This study was a secondary data analysis of the 2013 BRFSS, which is the largest survey of adults in the USA. The survey is a collaborative effort between the CDC and each state and territory of the USA (Guam, Puerto Rico, and the Virgin Islands).\textsuperscript{41} It began in 1984 and was conducted every year. The BRFSS is a random digit dial telephone survey that includes noninstitutionalized adults who are 18 years or older. Disproportionate stratified sampling is employed to provide an adequate sample size for smaller demographic areas.\textsuperscript{41} Data are weighted for population attributes and nonresponse.\textsuperscript{41} Beginning in 2011, cellular telephones were added to landlines in the survey to maintain generalizability, coverage, and validity in data collection. The BRFSS has been found to have high reliability (test–retest comparisons) and validity (compared with other surveys, participant logs, accelerometers, or other PA measures) for the PA questions, especially for those who report high levels of PA.\textsuperscript{42}

The core component of the BRFSS questionnaire includes questions that are asked of all respondents about their demographics, preventative health practices, chronic diseases, and health risk behaviors. Unlike the BRFSS core component from previous years, in 2013 participants were questioned extensively about their exercise behaviors.\textsuperscript{41} The initial exercise question was, “During the past month, other than your regular job, did you participate in any physical activities such as running, calisthenics, golf, gardening, or walking for exercise?”\textsuperscript{39} Participants who answered “yes” to this question were then asked more specific questions about their exercise. The next question was, “What type of physical activity or exercise did you spend the most time doing the past month?”\textsuperscript{39} This was an open-ended question, and participants could only identify 1 activity or exercise for this question. Seventy-six different activities were identified by the participants. Next the participants were asked, “How many times per week or per month did you take part in this activity during the past month?”\textsuperscript{39} followed by “and when you took part in this activity, for how many minutes or hours did you usually keep at it?”\textsuperscript{39}

Based on the answers to the exercise questions (activity, duration, and frequency), the CDC calculated variables for each participant regarding their PA category (highly active, active, insufficiently active, or inactive) and whether they met the recommendations for the amount of aerobic exercise. PA levels set by the CDC for the BRFSS were determined as follows: highly active—respondents who reported doing enough PA to meet the recommended 300 min of aerobic activity or 150 min of vigorous aerobic exercise; active—respondents who reported doing 150–300 min of aerobic activity (or the vigorous equivalent); insufficiently active—respondents who reported doing insufficient PA (11–149 min of aerobic activity); and inactive—respondents who reported doing no PA.\textsuperscript{39} The recommended amount of aerobic exercise was defined by the CDC for the BRFSS as “meeting
aerobic recommendations” (respondents who reported doing 150+ min (or vigorous equivalent) of aerobic exercise) or “not meeting aerobic recommendations” (respondents who reported doing insufficient PA (0–149 min of aerobic exercise)).\(^{23}\) Additionally, based on the answer to the exercise question, the CDC assigned a METs value to the activity.

Participants provided demographic data including age, employment, education, race/ethnicity, income, and marital status. They were also asked about chronic conditions, including previous heart attack, cardiovascular disease, stroke, high blood pressure, high cholesterol, asthma, skin cancer, other cancers, chronic obstructive pulmonary disease, arthritis, depression, kidney disease, and diabetes. Answers to chronic disease questions were “yes”, “no”, “I don’t know”, or “refused to answer”.

For this study, women who answered “no” to the initial exercise question (“During the past month, other than your regular job, did you participate in any physical activities such as running, calisthenics, golf, gardening, or walking for exercise?”), who refused to answer the second exercise question (“What type of physical activity or exercise did you spend the most time doing the past month?”), and men were excluded from our analysis. Two researchers, one with a background in sport and one with a background in PA, reviewed the 76 different activities and independently placed them into 4 predetermined leisure-time PA categories of sport, conditioning exercise, household tasks, and recreation (Table 1). The 4 categories were a modification of the 4 categories provided and described by Caspersen et al.,\(^{18}\) which included sport, conditioning exercise, household tasks, and other. We used Caspersen et al.’s descriptions as well as the definition of sport provided earlier to categorize the different activities and to differentiate sport from the other forms of activity. We agreed on the categories 96% of the time. The 3 activities that we did not agree upon were discussed, and we were ultimately able to agree on their categorization. Participants could indicate only 1 activity or exercise in answer to the question and could not be counted in multiple categories.

2.3. Statistical analyses

SAS Version 9.2 (SAS Institute Inc., Cary, NC, USA) was used for statistical analyses of demographic characteristics and chronic conditions by exercise category. Weighted descriptive statistics were obtained to describe the demographic characteristics of the 4 exercise categories by gender, age, race, education, income, employment, and marital status. To determine statistically significant differences in demographic characteristics, PA level, and aerobic recommendation achieved by exercise category, \(\chi^2\) tests were performed using PROC SURVEYFREQ in SAS to test Hypothesis 2. Additionally, PROC SURVEYMEANS in SAS was used to calculate the mean number of minutes and the mean METs associated with the activity for each of the PA categories along with a 95% confidence interval (CI) to compare groups. If the 95%CI did not overlap, then the groups were significantly different. Chronic conditions were dichotomized as “yes” or “no”, with “I don’t know” and “refused” coded as missing. Logistic regression was used to calculate crude and adjusted odds ratios for chronic conditions by exercise category, with sport as the reference category. Because there were significant differences between exercise groups for all the demographic variables, we controlled for all demographic variables when calculating adjusted odds ratios. PROC SURVEYLOGISTIC was used for this analysis to test Hypothesis 1.

3. Results

In 2013, 290,498 women participated in the BRFSS survey. In total, 180,523 women reported participating in some form of leisure-time PA, with 14,985 (8.3%) participating in sport, 143,389 (79.4%) in conditioning exercise, 5282 (2.9%) in recreation, and 16,867 (9.4%) in household tasks. Demographic characteristics of the participants can be found in Table 2. There were significant differences between groups, with the group who reported participating in sport having a higher percentage of women who indicated that they were college graduates, in the 18–24 or 25–34 age range, earning more than USD75,000 per year, and employed. Although women who participated in sport were more likely to be married and White, when compared to the other PA groups, sport had a higher percentage of single and Hispanic participants.

When comparing general health and PA levels by categories (Table 3), there were significant differences, with a higher percentage of women who reported participating in sport reporting good to excellent health. However, women who reported participating in recreation or household tasks were more likely to be categorized as highly active and meeting aerobic exercise

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**Table 1**

| Category         | Activities                                                                 |
|------------------|-----------------------------------------------------------------------------|
| Sport            | Badminton, Basketball, Bicycling, Boxing, Golf, Handball, Hockey, Lacrosse, Mountain climbing, Racquetball, Running, Rugby, Rock climbing, Soccer, Softball/baseball, Squash, Tennis, Touch football, Volleyball, Wrestling |
| Conditioning exercise | Active game device (i.e., Wii), Aerobics class, Bicycle machine, Calisthenics, Dancing, Elliptical machine, Inline skating, Jogging, Karate, Pilates, Rope skipping, Rowing machine, Scuba diving, Skateboarding, Skating—ice, Snow skiing, Snowshoeing, Stairmaster, Surfing, Swimming—laps, Tai Chi, Walking, Weightlifting, Upper body cycle |
| Recreation       | Backpacking, Boating, Bowling, Canoeing, Fishing, Frisbee, Hiking, Horseback riding, Hunting—small and large game, Paddleball, Snorkeling, Stream fishing, Swimming—not laps, Table tennis, Waterskiing |
| Household tasks  | Carpentry, Child care, Farming/ranching, Gardening, Housework (vacuuming), Mowing lawn, Painting house, Raking lawn, Snow blowing, Snow shoveling, Yard work |
Table 2
Demographic characteristics by exercise type-weighted percentages.

| Marital status       | Total, n (%) | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|----------------------|--------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Married              | 180,523 (100)| 14,985 (8.3)        | 143,389 (79.4)   | 5282 (2.9)              | 16,867 (9.4)    | 1965    | <0.01     |
| Single               | 24,238 (13)  | 43.16               | 19.14            | 10.43                   | 14.61           |         |           |
| Divorced             | 26,504 (15)  | 11.45               | 11.45            | 10.43                   | 14.61           |         |           |
| Widowed              | 28,163 (16)  | 8.90                | 9.14             | 14.61                   |                 |         |           |
| Separated            | 3781 (2)     | 2.84                | 1.54             | 1.54                    |                 |         |           |
| Partnered            | 4844 (3)     | 5.44                | 2.72             |                         |                 |         |           |

| Educational attainment | Total, n (%) | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|------------------------|--------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Did not graduate high school | 11,225 (6)   | 7.05                | 12.05            | 6.70                    | 11.60           |         |           |
| High school graduate   | 46,247 (26)  | 18.81               | 25.47            | 24.21                   | 30.36           |         |           |
| Some college           | 52,372 (29)  | 34.62               | 33.14            | 34.50                   | 35.21           |         |           |
| College graduate       | 70,679 (39)  | 39.52               | 29.34            | 34.59                   | 22.83           |         |           |

| Race/ethnicity         | Total, n (%) | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|------------------------|--------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| White                  | 143,087 (79) | 64.77               | 66.45            | 80.57                   | 79.87           |         |           |
| Black                  | 14,138 (8)   | 8.28                | 11.83            | 3.35                    | 6.78            |         |           |
| Other                  | 6873 (4)     | 8.13                | 5.70             | 4.83                    | 3.65            |         |           |
| Multi                  | 3200 (2)     | 1.71                | 1.47             | 1.58                    | 1.05            |         |           |
| Hispanic               | 11,823 (7)   | 17.11               | 14.55            | 9.67                    | 8.65            |         |           |
| Missing                | 1402 (0)     |                     |                  |                         |                 |         |           |

| Income (USD1000)       | Total, n (%) | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|------------------------|--------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| <10                    | 8770 (5)     | 6.32                | 7.34             | 5.55                    | 5.55            |         |           |
| 10–25                  | 35,338 (20)  | 18.19               | 22.94            | 19.71                   | 23.90           |         |           |
| 25–50                  | 40,312 (22)  | 20.38               | 24.39            | 23.66                   | 28.02           |         |           |
| 50–75                  | 25,265 (14)  | 14.02               | 15.51            | 17.32                   | 16.64           |         |           |
| >75                    | 45,369 (25)  | 41.09               | 29.82            | 33.76                   | 25.89           |         |           |
| Missing                | 25,469 (14)  |                     |                  |                         |                 |         |           |

| Employment             | Total, n (%) | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|------------------------|--------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Employed               | 87,026 (48)  | 60.25               | 50.57            | 49.13                   | 41.42           |         |           |
| Unemployed             | 9222 (5)     | 5.25                | 7.58             | 5.99                    | 6.68            |         |           |
| OLF                    | 74,218 (41)  | 33.60               | 36.14            | 41.32                   | 46.25           |         |           |
| Unable to work         | 10,057 (6)   | 0.85                | 5.71             | 3.56                    | 5.65            |         |           |

| Abbreviations: CE = conditioning exercise; HT = household tasks. |

Table 3
General health and exercise amounts by exercise type.

| General health                  | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|---------------------------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Excellent/very good, good       | 95.14               | 84.99            | 87.97                   | 82.93           | 384    | <0.01     |
| Fair/poor                       | 4.86                | 15.01            | 12.03                   | 17.07           |         |           |

| Physical activity level         | Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|---------------------------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Highly active                   | 49.74               | 36.74            | 62.76                   | 67.65           | 1392   | <0.01     |
| Active                          | 25.86               | 27.50            | 19.96                   | 16.36           |         |           |
| Insufficiently active           | 23.44               | 33.71            | 14.93                   | 14.13           |         |           |
| Inactive                        | 0.96                | 2.05             | 2.36                    | 1.86            |         |           |

| Aerobic exercise recommendations| Sport, weighted (%) | CE, weighted (%) | Recreation, weighted (%) | HT, weighted (%) | $\chi^2$ | $p$ value |
|---------------------------------|---------------------|------------------|-------------------------|-----------------|---------|-----------|
| Met aerobic recommendations     | 76.40               | 65.18            | 83.14                   | 84.32           | 597    | <0.01     |
| Did not meet aerobic recommendations | 23.60               | 34.82            | 16.86                   | 15.68           |         |           |

| Abbreviations: CE = conditioning exercise; HT = household tasks. |
recommendations (i.e., exercising more) than women in the sport or conditioning exercise groups. These unexpected findings will be elaborated on in the discussion. When comparing the means and 95%CI for minutes and METs, women who participated in recreation or household tasks spent significantly more time in their activities; however, women who participated in sport had significantly higher METs or worked at a higher intensity during their activities (Table 4).

Odds ratios and adjusted odds ratios are reported in Table 5. Women who participated in sport were used as the reference category. Compared with women who participated in sport, women who participated in conditioning exercise, recreation, or household tasks were significantly more likely to report all chronic conditions except asthma. When controlling for demographic variables (i.e., age, income, and education), the significant differences remained, with women who participated in conditioning exercise, recreation, or household tasks reporting higher rates for many of the chronic conditions.

In sum, the first hypothesis was confirmed, demonstrating that (1) women who report participating in sport were significantly less likely to report chronic diseases than women who report participating in conditioning exercise, household tasks, or recreation, and (2) differences in chronic diseases remained after adjusting for demographic characteristics including age, income, education, and race/ethnicity. Surprisingly, the second hypothesis, that women who report sports participation are significantly more likely to meet the recommended amount of exercise per week compared with women who participated in conditioning exercise, recreation, or household tasks, was not supported.

### 4. Discussion

Studies looking at motivations for participating in sport point to health as a primary motive. With health acknowledged as an impetus for sport participation, we wanted to see whether women who participated in sport had fewer chronic conditions and better health than women who participated in other forms of PA. This was the first large-scale study to consider the impact of sport on the health of women in the USA.

Key findings suggest a relationship between sport and the health of women in the USA. A higher percentage of women who said that they participated in sport reported good to excellent health. Relatedly, compared with women who participated in sport, women who participated in conditioning exercise, recreation, or household tasks were significantly more likely to report all chronic conditions except asthma. When demographic variables were controlled for, many of the differences remained. Our findings are similar to those from studies on the benefits of sport participation in mixed-gender samples. For example, Hoffman and Krishnan examined the health implications of ultramarathon running among a group of runners including both genders. They found that ultramarathon runners had a low prevalence of cancers, coronary artery disease, seizure disorders, diabetes, and human immunodeficiency virus infection.

Ironically, women who reported participating in recreation or household tasks were more likely to be categorized as highly active and meeting aerobic exercise recommendations for time compared with women in the sport group; however, women

### Table 4

| Exercise time (min) | Sport (95%CI) | CE (95%CI) | Recreation (95%CI) | HT (95%CI) |
|--------------------|--------------|-----------|--------------------|-----------|
| 198.61 (192.30–204.92) | 184.62 (181.36–187.89) | 279.79 (256.23–303.36) | 443.14 (419.39–466.39) |
| METs (mL/min/kg) | 6.18 (6.15–6.21) | 3.85 (3.83–3.87) | 5.36 (5.29–5.43) | 4.79 (4.77–4.81) |

### Table 5

| Chronic condition | CE OR | 95%CI | AOR | 95%CI | OR | 95%CI | AOR | 95%CI | OR | 95%CI | AOR | 95%CI |
|-------------------|-------|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| High blood pressure | 4.58* | 4.15–5.05 | 1.80* | 1.61–2.02 | 3.92* | 3.37–4.55 | 1.61* | 1.35–1.91 | 6.82* | 6.07–7.65 | 1.71* | 1.49–1.97 |
| High cholesterol | 2.75* | 2.50–3.02 | 1.37 | 1.23–1.53 | 2.69* | 2.31–3.12 | 1.31* | 1.10–1.58 | 3.92* | 3.50–4.39 | 1.47* | 1.29–1.68 |
| Heart attack | 6.18* | 4.49–8.51 | 1.81* | 1.19–2.75 | 5.82* | 3.85–8.78 | 1.76* | 1.08–2.88 | 8.11* | 5.65–11.65 | 1.72* | 1.08–2.74 |
| CVD | 4.84* | 3.98–5.87 | 1.44* | 1.14–1.81 | 4.37* | 3.35–5.69 | 1.37* | 1.01–1.86 | 6.55* | 5.26–8.16 | 1.37* | 1.05–1.78 |
| Stroke | 3.91* | 2.93–5.21 | 1.15 | 0.84–1.60 | 3.19* | 2.13–4.80 | 1.08 | 0.69–1.71 | 4.68* | 3.40–6.42 | 1.06 | 0.73–1.52 |
| Asthma | 1.10 | 1.00–1.21 | 1.21* | 1.09–1.35 | 1.15 | 0.97–1.38 | 1.17 | 0.96–1.43 | 1.05 | 0.92–1.19 | 1.26* | 1.09–1.46 |
| Skin cancer | 2.27* | 1.96–2.63 | 0.88 | 0.75–1.04 | 2.67* | 2.17–3.28 | 0.84 | 0.66–1.06 | 3.73* | 3.14–4.42 | 0.89 | 0.73–1.09 |
| Other cancers | 2.93* | 2.49–3.43 | 1.29* | 1.08–1.54 | 3.10* | 2.44–3.93 | 1.27 | 0.97–1.67 | 4.02* | 3.36–4.81 | 1.23* | 1.01–1.51 |
| COPD | 3.81* | 3.10–4.68 | 1.96 | 1.55–2.48 | 3.93* | 2.97–5.23 | 2.24* | 1.64–3.07 | 5.76* | 4.58–7.29 | 2.26* | 1.73–2.95 |
| Arthritis | 4.12* | 3.74–4.54 | 1.62* | 1.45–1.82 | 4.61* | 3.99–5.34 | 1.88* | 1.58–2.24 | 7.71* | 6.86–8.65 | 2.01* | 1.74–2.31 |
| Depression | 1.69* | 1.55–1.84 | 1.50* | 1.36–1.65 | 1.87* | 1.60–2.18 | 1.71* | 1.43–2.03 | 2.07* | 1.85–2.31 | 1.85* | 1.62–2.11 |
| Kidney disease | 2.34* | 1.75–3.14 | 1.47* | 1.05–2.05 | 2.09* | 1.36–3.21 | 1.34 | 0.81–2.20 | 2.29* | 1.64–3.21 | 1.15 | 0.79–1.67 |
| Diabetes | 4.42* | 3.23–6.04 | 2.00* | 1.33–3.01 | 2.48* | 1.45–4.26 | 1.21 | 0.63–2.33 | 5.73* | 3.86–8.52 | 1.55 | 0.94–2.55 |

* p < 0.05.

Abbreviations: AOR = adjusted odds ratio; CE = conditioning exercise; COPD = chronic obstructive pulmonary disease; CVD = cardiovascular disease; HT = household tasks; OR = odds ratio.
who participated in sport reported better general health. This may be due to the way in which the variables were calculated. Both variables were based on the amount of time that women reported engaging in activities. When compared with sport, recreation activities and household tasks lend themselves to being sustained over a longer period of time. For example, a person is more likely to be able to fish, hunt, hike, or backpack for a longer period of time than they can run, cycle, or play soccer. To be categorized as highly active, a person needed to either participate in aerobic activity for \( \geq 300 \) min or participate in vigorous aerobic activity for \( >150 \) min. On average, women in the household tasks group reported doing 443 min of activity, and this amount of activity automatically places someone in the highly active category regardless of intensity. However, women who participated in sport did so at a significantly higher intensity (METs), and this higher intensity may have resulted in the improved health outcomes observed.

We found that women who participated in sport had an average MET of 6.18, the highest of the 4 groups. They also had decreased odds and adjusted odds of high cholesterol, history of a heart attack or cardiovascular disease, chronic obstructive pulmonary disease, arthritis, or depression when compared with the other groups. This finding is consistent with previous studies, which show greater health benefits associated with vigorous (i.e., higher METs and higher intensity) PA.\(^{25,26,28,29}\) Warburton et al.\(^4\) found a linear relationship between fitness levels and health status, with people who exercised at a higher intensity having the lowest rates of disease. In this study, we found that sport was associated with higher intensity PA, suggesting that sport may be an approach to encourage women to exercise at a greater intensity.

Women who participated in sport reported better health, which means one goal would be to encourage more women to engage in sport as a means of preventing chronic disease and attaining better health outcomes. Other countries are increasingly focused on growing women’s sport as a strategy to improve health among women. For example, the health and sport ministries in the UK and Australia have initiated new programs focused on encouraging sport participation among women. Sport England is investing half a billion pounds to increase sport participation among women over a billion pounds to increase sport participation among women to promote health, status, and income contributes to the socioeconomic status level of education attained (college graduate), employment status, and income contributes to the socioeconomic status warranted for sport participation. If we embrace a model to increase sport participation among women to promote health, a key strategy needed is to insure that sport is affordable and accessible to all women.

There were limitations with this study. Causation cannot be determined because the BRFSS is cross-sectional.\(^{45}\) There was a possibility of bias resulting from self-reported information, and the participants may also have under- or over-reported information if they perceived the response to be socially desirable.\(^{46}\) However, with 180,523 participants, the findings from this initial study merit consideration and point to the need for additional research.

5. Conclusion

Sport participation was associated with more vigorous PA and positive health outcomes among women in the USA. Other countries have nationally organized initiatives to increase sport participation among women. These initiatives may serve as examples to guide efforts in the USA to increase women’s sport participation, which was shown in this study to be associated with positive health outcomes. If we consider a similar initiative in the USA, we need to identify how we can create a model for sport participation among women that satisfies the motives identified but also is affordable and accessible to all women across the lifespan.

Authors’ contributions

JRP and NLL designed the study and coded the PA. JRP conducted the statistical analysis. JRP and NLL drafted the manuscript and approved the final submission. Both authors have read and approved the final version of the manuscript and agree with the order of presentation of the authors.

Competing interests

Neither of the authors declare competing financial interests.

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