Blue Collar Workers Physical Activity Study:

Examining the Relationship between Occupation and Physical Activity

Christina S. Larkins

ECU Honors College Signature Honors Project

Dr. Bhibha M. Das

East Carolina University Department of Kinesiology

March 2020

ABSTRACT

Blue collar workers may suffer numerous health disparities, including lack of health education and low access to adequate health care. Blue collar workers are workers that perform manual labor, including electricians, housekeepers, and more. Studies have demonstrated that blue collar workers often are vulnerable to occupational hazards and resultant health strains due to their socioeconomic status and lack of access to adequate healthcare. Research links physical activity to a myriad of positive health outcomes, but there is limited evidence on the relationship between physical activity and physical, mental, and occupational health outcomes in blue collar workers. This cross-sectional study will examine that relationship in blue collar workers.

Twenty-two blue collar workers (62% male; 76% Caucasian, 19% African-American, and 5% mixed descent; 33% aged 20-29, 24% aged 30-39, 24% aged 50-59) were recruited, with the inclusion criteria of being at least 18 years old and currently being an employed blue-collar worker with internet access. Using only the blue-collar working staff kept the sample size small and helped to identify occupational differences and experiences between other staffs. This study was completed via an online survey assessing the following measures: demographics, activities of daily living, stress levels, pain, occupational satisfaction, and more. To examine the relationship between physical activity and various health outcomes, statistical analysis was run using frequencies, standard deviations, and correlations.

Slight relationships were found between physical activity measured by the IPAQ and physical, mental, or occupational health. These relationships include a positive relationship between walking and sleep quality ($r=0.34$), vigorous physical activity and social functioning ($r=0.36$), total physical activity levels and social functioning ($r=0.25$). Other relationships were found but were low.

INTRODUCTION

Worksites are an excellent avenue for health promotion programs. One subsector of the working population that is often under-studied are blue-collar workers. The term "blue-collar worker" describes someone whose occupation requires them to perform manual labor (Wickman, 2012). Examples of this would include mining, sanitation, manufacturing, and housekeeping, which make up a total of roughly 14% of all jobs in the United States. These jobs are both physically and psychologically demanding and have been linked with various adverse health outcomes (Elser et al, 2018). The United States blue collar worker demographics are more racially diverse than it has been in decades, comprised of 86.2% whites, 7.6% African Americans, 31.9% Latinos, and 2.2% Asians. Most blue-collar workers do not have a bachelor's degree and make an average of $14.68 an hour, which totals a median salary of $30,524 (Bureau of Labor Statistics, 2019). Since the average cost of living in the United States is $20,194, blue collar workers thus are exposed to numerous health disparities, which puts them at a disadvantage for finances, general health, and social support (Bureau of Labor Statistics, 2019).

This research study aimed to examine the relationship between physical activity and physical, mental, and occupational health outcomes in blue collar workers. Findings from this study can be used to develop physical activity programming for blue-collar worker populations. The selected population equals to roughly 22 million Americans. If this information is disseminated to employers, it could improve overall workplace satisfaction and public health as well by developing interventions that can be tailored to this specific population. Since there is currently a shortage of blue-collar workers in the United States, being able to increase quality of life for those current workers can lead to more people being inclined to work in a blue-collar job.

Understanding further how occupation affects health of blue-collar workers is extremely important and can lead to improved health-related quality of life.

REVIEW OF LITERATURE

Physical Activity Guidelines

According to the tenth edition of the American College of Sports Medicine Guidelines for Exercise Testing and Prescription, adults aged 18-65 years old should participate in moderate intensity aerobic physical activity for a minimum of thirty minutes, five days a week, or vigorous intensity aerobic activity for a minimum of twenty minutes, three days a week (ACSM, 2018.). Adults should also strive to perform muscle-strengthening activities for at least two days per week as well. These basic guidelines have been backed up by the Center for Disease Control, and the American Heart Association, making them accurate starting points for physical activity. It has been shown that there is a dose-response relationship between physical activity and premature mortality, coronary artery disease, and obesity, so increased levels of physical activity lead to decreases of those states listed above (Paffenberger et al, 1999; Rockhill et al, 2001; Tanasescu et al, 2002; and Yu et al, 2003).

Consequences of Inactivity

Unfortunately, sedentary behavior is a global pandemic, identified as one of the four leading contributors to premature mortality (Hallal et al, 2012; Kohl et al, 2012). According to the U.S. Department of Health and Human Services and the Physical Activity Council, 28% of Americans aged six and older are physically inactive, which equals around 80.2 million people (Physical Activity Council, 2014). Being a sedentary individual has been shown to increase rates

of premature mortality, cancer, cardiovascular disease, hypertension, thirteen types of cancer, type two diabetes, and many more (Garber et al, 2011; Moore et al, 2016; Physical Activity Guidelines Advisory Committee, 2008).

Health Disparities

The Center for Disease Control describes health disparities as preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations (CDC, 2008). They often result from numerous factors, including inadequate access to health care, poverty, and educational inequalities. Health disparities are not a protective health behavior, meaning that they often lead to higher levels of obesity, substance abuse, and injury.

Occupational Stressors

Occupational stressors can be defined as serious threats to the health and well-being of employees. These stressors can cause physical, mental, and social illness within employees who suffer from them. There is currently a strong inverse relationship that can be found between occupational stress and employees' quality of working life, morale, motivation, job satisfaction, and organizational commitment (Machin et al, 2004). Occupational stressors come from numerous factors and vary between professions, also affected by socio-cultural factors. Within blue collar workers, some occupational stressors that have been reported are supervisor conflict, job security, insufficient training, and changes in technology. These vary from white collar workers, who often report excessive workload, job security, too much responsibility, and a lack of social support (Nydegger et al, 2011).

METHODOLOGY

Participants

Inclusion criteria were that the participants be 18 years or older and be currently employed as a blue-collar worker. They had various occupations, including mechanics, housekeepers, and more, but all were considered to be blue-collar workers. Some participants were recruited from a previous study conducted by study members at East Carolina University "The Healthy Housekeepers Initiative". These participants were contacted via email, word of mouth, phone, and flyer in Greenville, NC. The sample size for this study was projected to be 22 participants.

Measures

Measures were used to examine the relationship between physical activity and physical, mental, and occupational health outcomes. A list of all measures can be found in Figure 1.

Mental Health. Mental health was measured using multiple questionnaires including the Satisfaction with Life Scale and the Hospital and Depression Scale. Stress was measured using the Perceived Stress Scale (PSS) and the Stress in General Scale (SIG). The Satisfaction with Life scale presents five statements to the participant, asking them to respond using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

The PSS questionnaire assesses the degree to which situations in everyday life are perceived as stressful (i.e., unpredictable, uncontrollable, or overloading). Participants were asked to respond to 10 questions on a 5-point Likert scale ranging from 0 (never) to 4 (very often), indicating how often they have thought or felt a certain way in the past month. Scores range from 0 to 40, and higher scores indicate greater perceived stress.

The SIG scale measures the degree of stress at work. Participants responded to eight adjectives about work and were asked which ones described their current job, from “yes”, “no”, and “?” if they couldn’t decide. The more adjectives that participants felt described their job, the more stress they were facing at work.

Physical Activity. Physical activity was measured subjectively via two self-report questionnaires and objectively through an activity tracker. The self-report measures included the 30-Day Physical Activity Recall (30-Day PAR) and the International Physical Activity Questionnaire (IPAQ). The 30-Day Physical Activity Recall asks participants to select their level of physical activity over the last 30 days on a zero to seven scale.

The IPAQ-Short Form was also used to assess self-report physical activity. Participants were asked to report their time spent walking, in moderate-intensity activity, and in vigorous-intensity activity over the past seven days. Responses were used to estimate each participant’s metabolic equivalent (MET) minutes per week, to compare them to national averages. The IPAQ-Short Form was used predominately to measure correlations between participants’ physical activity and various health outcomes.

Physical Health. Physical health was measured subjectively via four parts of the PROMIS SF v.10 assessment, including Pain Intensity, Pain Interference, Fatigue, and Sleep Disturbance. The PROMIS Pain Intensity test asks participants to rate both their pain over the previous seven days as well as their current pain levels. The PROMIS Pain Interference assessment measures the negative effects of pain on social, cognitive, emotional and physical activities. This assessment looks at pain interference over the past seven days.

Occupation. Occupation factors were measured using five different questionnaires. The Work Limitation Questionnaire used eight questions from a standardized questionnaire that

addressed employee health and work. It asked how the participants' health has affected them at work during the past two weeks. It focused on physical health or emotional problems, as well as medical conditions.

The Trust in Management Survey (TIM) from Bowling Green State University used adjectives or phrases to describe the senior-level management and executives in the participants' job. The participant answered identified each word or phrase as 'Yes' it described their management, 'No' it did not describe their management, or '?' if they could not decide.

The WHO Health and Wellness Survey and Health and Work Performance Survey asked participants to list how many hours they worked on average in the past week and how many hours that their employer expected them to work in the past week. Then it questioned participants to see how many days of work they missed because of physical or mental health issues. The remainder of the survey used a 10-point Likert scale to measure work performance from 0 being 'worse performance' to 10 being 'top performance', both of most workers in the job, compared to the participants' view of their own performance.

Table 1

Study measures

Mental Health Measures
Stress in General Scale (SIG)
Perceived Stress Scale (PSS)
Hospital and Depression Scale (HADS)
Satisfaction with Life Scale
SF-12 Mental Health
Physical Activity Measures
30-Day Physical Activity Recall
Rating Activities of Daily Living
IPAQ Short Form
Physical Health Measures
PROMIS SF v1.0 (Pain Intensity, Pain Interference, Fatigue, Sleep Disturbance)
General Measures

Demographics – Health History
General Health Form
Lifestyle Health Related Self Concept
Occupation Measures
Work Limitation Questionnaire
Trust in Management Survey (TIM)
WHO Health and Wellness Survey
WHO Health and Work Performance

Procedures

This quantitative, cross-sectional study used an online survey program called Qualtrics. Participants completed the informed consent and then completed the survey, which assessed stress levels, diet, physical activity, occupation, and demographics. These questions ranged from multiple-choice questions, rating scale questions, and short answer questions and were based off accredited surveys such as the Perceived Stress Scale and the World Health Organization (WHO) Health and Work Performance scale. No personal identifiers except for date of birth were taken from participants, which established confidentiality. Participants received a $75 Amazon electronic gift card.

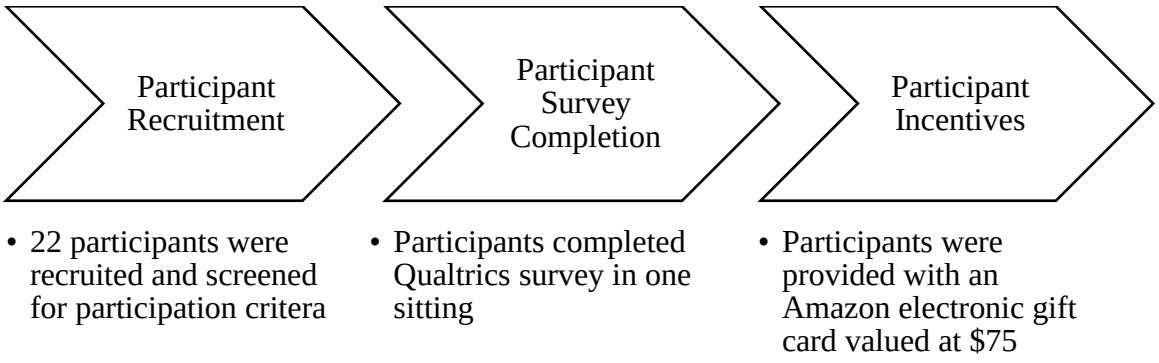

Figure 1. Study timeline

RESULTS

Participant Characteristics

Most participants were male (n=13, 62%) and Caucasian (n=16, 76%). The remaining participants identified as African American (n=4, 19%) and of mixed descent, including African American, Caucasian, American Indian, and Alaskan Native (n=1, 5%). Additionally, one participant also identified as being Hispanic or Latino (5%). Age frequencies are listed in Table 2.

Table 2
Age frequencies

Age	Frequency	%
20-29	7	33.3
30-39	5	23.8
40-49	2	9.5
50-59	5	23.8
60-69	2	9.5

Most participants reported a total gross annual income of $25,000-34,999 (n=7, 33%). The lowest total gross income reported was $0-14,999 (n=1, 5%) and the highest total gross income reported was $75,000-99,999 (n=4, 19%). Regarding family total gross income, most participants reported either $75,000-99,000 (n=5, 24%) or $100,000 or greater (n=5, 24%). Within the participants' families, adult dependents within the home ranged from 0 (n=3, 14%) to 4 (n=1, 5%), with the average being 1.4 dependents. All participants worked full-time (more than 35 hours per week), (n=21, 100%). Income statistics are listed in Table 3.

Table 3
Gross annual income

Personal Gross Annual Income	Frequency	%
$0-14,999	1	4.8
$15,000-24,999	0	0

$25,000-34,999	7	33.3
$35,000-49,999	2	9.5
$50,000-74,999	6	28.6
$75,000-99,000	4	19.0
$100,000 or greater	0	0
Family Gross Annual Income		
$0-14,999	0	0
$15,000-24,999	0	0
$25,000-34,999	2	9.5
$35,000-49,999	4	19.0
$50,000-74,999	2	9.5
$75,000-99,000	5	23.8
$100,000 or greater	5	23.8

Within the 21 participants, 52.4 percent (n=11) graduated high school and completed some college. Two participants completed other kinds of education, including post high school vocational school and an automotive certification program (n=2, 9.5%). Educational status of participants is listed in detail in Table 4.

Table 4
Education status

Highest Level of Education	Frequency	%
High school graduate/GED	6	28.6
High school graduate/some college	11	52.4
Completed undergraduate degree	2	9.5
Completed graduate degree	0	0
Other	2	9.5

Physical Activity

Physical activity. Physical activity statistics for each of the measures from the IPAQ can be found in Table 5.

Table 5
IPAQ physical activity

Physical activity	Mean	SD	Minimum	Maximum
Walking MET-minutes per week	1805.6	2095.1	99	10098
MPA MET-minutes per week	2461.5	2308.5	20	7240
VPA MET-minutes per week	2744.8	4891.6	0	19200
Total physical activity MET-minutes per week	7009.9	6619.9	396	23076

Note: MPA = moderate intensity physical activity, VPA = vigorous intensity physical activity, PA = physical activity.

Physical Activity and Physical Health

Physical health. Descriptive statistics for each of the physical health measures are found in Table 6.

Table 6
Physical health variables

	Mean	SD
Fatigue	9.8	5.2
Sleep quality	11.4	1.6
Pain intensity	6.1	2.4
Pain interference	7.4	3.3

IPAQ physical activity and physical health correlations. No significant relationships were found between physical activity measured by the IPAQ and physical health. Correlations between IPAQ physical activity and physical health can be found in Table 7.

Table 7
IPAQ physical activity and physical health correlations

	Pain intensity	Pain interference	Sleep quality	Fatigue
1. Walking	0.13**	0.064**	0.34**	0.20**
2. MPA	0.077***	-0.001***	-0.16***	0.19***
3. VPA	0.066*	-0.016*	0.14*	-0.06*
4. Total PA	0.12***	0.0080***	0.16***	0.085***

Note: MPA = moderate intensity physical activity, VPA = vigorous intensity physical activity, PA = physical activity; *p < 0.05, **p < 0.01, *** p< 0.001

Physical Activity and Mental Health

Mental health. Descriptive statistics for mental health variables can be found in Table 8.

Table 8
Mental health variables

	Mean	SD
Stress	37.6	6.7
SF-12 mental health	13.7	2.2
Hospital and Depression Scale	39.3	7.6

IPAQ physical activity and mental health. A slight relationship was found between vigorous intensity physical activity measured by the IPAQ and SF-12 mental health. The remaining relationships were not significant. Correlations between physical activity measured by the IPAQ and mental health variables can be found in Table 9.

Table 9
IPAQ physical activity and mental health correlations

	Stress	SF-12	Depression
1. Walking	-0.054**	-0.080**	-0.18**
2. MPA	-0.083***	0.031***	0.057***
3. VPA	0.17*	0.36*	0.20*
4. Total PA	0.082***	0.25***	0.11***

Note: MPA = moderate intensity physical activity, VPA = vigorous intensity physical activity, PA = physical activity; *p < 0.05, **p < 0.01, *** p< 0.001

Physical Activity and Occupational Health

Occupational health. Descriptive statistics for occupational health variables can be found in Table 10.1 and Table 10.2.

Table 10.1
Occupational health variables - means

	Mean	SD
Work limitation	13.9	6.8
Work performance[b]	24.2	8.4

Note: [b]From WHO Health and Wellness and WHO Health and Work Performance questionnaires

Table 10.2
Occupational health variables - frequencies

Trust in management	Frequency	%
Knows what's going on	4	20
Loyal to employees	4	20
Unpredictable	9	45
Change mind often	9	45
Qualified	11	55
Can't be trusted	6	30
Treats employees fairly	5	25
Concerned for employee's welfare	2	10
Unethical	5	25
Dishonest	4	20
Incompetent	4	20
Consistent	4	20

IPAQ physical activity and occupational health. Correlations between IPAQ physical activity and occupational health can be found in Table 11. Correlations could not be found for the Abridged Descriptive Job Index or the Trust in Management survey due to the manner of the surveys.

Table 11
IPAQ physical activity and occupational health correlations

	Work limitation	Work performance
1. Walking	0.26**	0.29**
2. MPA	0.32***	-0.22***
3. VPA	-0.080*	-0.24*
4. Total PA	0.13***	-0.16***

Note: MPA = moderate intensity physical activity, VPA = vigorous intensity physical activity, PA = physical activity.*$p < 0.05$, **$p < 0.01$, *** $p < 0.001$

CONCLUSION

This cross-sectional study examined the relationship between physical activity and physical, mental, and occupational health outcomes in blue collar workers, a historically understudied population. Despite this, slight relationships were found between physical activity measured by the IPAQ and physical, mental, or occupational health. These relationships include a positive relationship between walking and sleep quality ($r=0.34$), vigorous physical activity and social functioning ($r=0.36$), total physical activity levels and social functioning ($r=0.25$). Other relationships were found but were insignificant. While this study did find relationships between various aspects of health, it had a very small sample size, which decreases reliability, statistical power, and reproducibility. More studies with larger sample sizes would need to be used to confirm these relationships as accurate. However, this study was a great starting point for this type of quantitative cross-sectional research, collecting important data that can be used to improve public health by developing interventions for this specific population.

The results of this study can be disseminated to other blue-collar working populations around the country to improve overall workplace health by identifying these relationships where there is a significant correlation. Since many blue-collar workers and like professions experience similar health disparities and stereotypes, workplace efficiency and nationwide public health is subsequently affected, especially because there is a shortage of blue-collar workers in the United States. This data may be used to develop interventions geared toward this population including focusing on the areas where there was a correlation found, to decrease negative health outcomes such as fatigue, depression, and pain intensity. By decreasing these negative health outcomes, health-related quality of life in the United States can be increased.

REFERENCES

American College of Sports Medicine (ACSM). ACSM's: Guidelines for Exercise Testing and Prescription, Tenth Edition. 2018.

Center for Disease Control (CDC). Community Health and Program Services (CHAPS): Health Disparities Among Racial/Ethnic Populations. Atlanta: U.S. Department of Health and Human Services; 2008.

Elser, H., Falconi, A. M., Bass, M., & Cullen, M. R. (2018). Blue-collar work and women's health: A systematic review of the evidence from 1990 to 2015. *SSM - population health*, 2018;8(2):195–244. doi:10.1016/j.ssmph.

Garber CE, Blissmer B, Deschenes MR, et al. American College of Sports Medicine position stand. The quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med Sci Sports Exerc.* 2011:43(7):1334-559.

Hallal PC, Andersen LB, Bull FC, et al. Global physical activity levels: surveillance progress, pitfalls, and psopets. *Lancet.* 2012;380(9838):247-57.

Kohl HW III, Craig CL, Lambert EV, et al. The pandemic of physical inactivity: global action for public health. *Lancet.* 2012;380(9838):294-305.

Machin, M.A., Fogarty, G.J. and Albion, M.J. (2004), "The relationship of work support and work demands to individual outcomes and absenteeism of rural nurses", *International Journal of Rural Psychology*, Vol. 4 No. 1, pp. 1-13.

Moore SC, Lee I, Weiderpass E, et al. Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. *JAMA Intern Med.* 2016;176(6):816-25. doi: 10.1001/jamainternmed.2016.1548

Nydegger R. Occupational stress and job satisfaction in white- and blue-collar workers. *International Business & Economics Research Journal.* 2011;1(12) doi: 10.19030/iber.v1i12.4006

Paffenbarger RS Jr, Lee IM. Smoking, physical activity, and active life expectancy. *Clin J Sport Med.* 1999;9(4):244.

Physical Activity Council. *2014 Participation Report.* Available at: http://www.physicalactivitycouncil.com/PDFs/current.pdf - PDF. 2014.

Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report, 2008.* [Internet]. Washington (DC): U.S. Department of Health and Human Services; 2008. [updated Sep 24]. 683 p. Available from: http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

Rockhill B, Willett WC, Manson JE, et al. Physical activity and mortality: a prospective study among women. *Am J Public Health.* 2001;91(4):578-83.

Tanasescu M, Leitzmann MF, Rimm EB, Willett WC, Stampfer MJ, Hu FB. Exercise type and intensity in relation to coronary heart disease in men. *JAMA.* 2002;288(16):1994-2000.

Wickman, F. (2012, May 1). Why Do We Call Manual Laborers Blue Collar? Retrieved from https://slate.com/business/2012/05/blue-collar-white-collar-why-do-we-use-these-terms.html.

U.S. Bureau of Labor Statistics. (2019, November 27). Retrieved from https://www.bls.gov/.

Yu S, Yarnell JW, Sweetnam PM, Murray L. What level of physical activity protects against premature cardiovascular death? The Caerphilly study. *Heart.* 2003;89(5):502-6.