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Evaluating How Physical Activity Affects the Perception of Resilience in Box Butte County, Nebraska

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Evaluating How Physical Activity Affects the Perception of Resilience in Box Butte County, Nebraska

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CPH 529: Capstone Experience

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Abstract

Physical activity is one of the modern hallmarks for good health in individuals and the public, in general. Resiliency is a growing concentration in all levels of disaster preparedness where the focus is on how to deal with the growing number of disasters stemming from global climate change. This research project's aim is to look at the possible relationships between physical activity and resiliency in a rural Nebraska population. This was done with the use of a cross-sectional study utilizing a fifteen-question survey to gather demographics, assess the amount of physical activity, and then apply a perception of resilience tool called the Brief Resilience Scale (BRS) in Box Butte County, Nebraska. The survey link was open from September 1st, 2022, to September 30th, 2022. This resulted in 57 respondents from the general population of Box Butte County, Nebraska.

The survey results indicated a positive association with types of physical activity, the average amount of weekly physical activity, and activity tracker usage. The mean BRS score for all respondents was 3.73, with those engaging in more than 181 minutes of exercise having a mean BRS score of 3.93. More research should be done to assess correlations and cause of leisure physical activity on resiliency.

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Background and Literature Review

Physical Activity in Box Butte County

Physical activity (PA) is a mainstay in modern public health. Leisure physical activity (LPA) is defined as “all of the behavior connected with physical activity that people engage in in their freely disposable time” (Steinbach & Graf, 2008, p. 849). LPA is just as vital to the health of a community as smoking cessation and healthy diets in controlling non-communicable diseases (Bauman et al., 2006). According to the Physical Activity Guidelines from the U.S. Department of Health and Human Service, the minimum amount of weekly physical activity adults should be getting is 150 minutes of light to moderate aerobic activity such as walking, gardening, or slow bike riding; or 75 minutes of vigorous aerobic activity such as jogging, running, or cycling. It also recommends two days of resistance training, such as weightlifting, per week (2018).

Every agency from the global World Health Organization (WHO) to the local Panhandle Public Health District (PPHD) who serves Box Butte County, has PA initiatives operating. PPHD has an initiative called Activate Alliance, which is a task force of local officials, hospital wellness providers, and private citizens who are trying to increase walkability, safe biking, and increase PA in Alliance, Nebraska.

Beyond the public health department, the county has many avenues for physical activity. There are multiple fitness facilities in the area. The Alliance Recreation Center is the largest of them, with approximately 90,000 visits per year (Andersen, 2022). There is a wellness center located within Box Butte General Hospital and another smaller fitness facility in Hemingford called The Body Shop. Hemingford is a town twenty-five miles north of Alliance. There are walking and biking trails throughout the towns of Alliance and Hemingford.

Physical Activity and Disaster Response

The physical aspect of the general public's ability to respond to a disaster does not have a lot of attention. The current available research literature regarding physical activity and disasters is typically focused on the military and first responders' physical fitness. The U.S. Army has a fitness assessment called the Army Combat Fitness Test. This assessment will be officially introduced into service in October of 2022 (2022).

Molloy, Robertson, and Ciottone proposed the use of the Chester Step Test to determine the physical fitness of medical staff in disaster medical assist teams. The test is simple. It uses a submaximal load to determine aerobic capacity of the individual doing the test. The test starts with a beginning step rate of 15 beats per minute onto a variable height box. A metronome is used to measure the rate and every two minutes the tempo increases by five steps per minute. The test completes when the individual reaches 80% of maximum heart rate (2017). The simplicity of this test lends itself to not only testing disaster responders, but also volunteers and the general public. The Chester Step Test could be combined with resiliency testing to better determine levels of physical fitness and how they relate to resilience in different groups.

Physiological and Mental Adaptations Due to Physical Activity

Mental and physical stresses are pervasive during disasters, affecting both individuals and whole communities (Sandifer et al., 2022). When stress is rampant it can lead to increasing allostatic load. Allostasis is how the body responds to external stressors as it works to remain in homeostasis or a state of balance (McEwen, 1993). The overburdening of these homeostatic systems is called Allostatic Load. When the load on these systems is chronic or overwhelming, such as during disasters, the system can be overloaded which can lead to physical and mental

damage. This damage may increase the risk of mental illness, chronic diseases, and inflammation (McEwen, 2000; Sandifer et al., 2022; Sandifer & Walker, 2018).

Since allostasis is how the body responds to stress, one can surmise that the body can learn to respond better. Physical activity has been shown to reduce the accumulation of allostatic load (Gay et al., 2013). Consistent PA might mean one can handle more, or particularly, sudden stressors. PA has shown an increase in an individual's ability to handle stress (Tsatsoulis & Fountoulakis, 2006). It has also shown increases in people's emotional regulation which can lead to better cognitive decision-making during an emergency. Another positive is that people who meet minimum PA guidelines have lower rates of depression, anxiety, and overall stress (Bernstein & McNally, 2018). All these areas can be consequential when dealing with emergencies and disasters (McFarlane & Williams, 2012).

In a study done during the SARS-CoV-2 pandemic, Hungarian researchers summarized their findings thusly, "Frequent moderate exercise is associated with better mental and physical well-being and lower prevalence of AO (allostatic overload)" (Eöry et al., 2021, p. 1). Even though the study did have a higher percentage of female respondents, it can still be useful in helping to explore how physical activity affects AO and how those effects can translate to increasing disaster resiliency.

LPA plays a significant role in preventing, reducing, and alleviating metabolic disorders like diabetes, insulin sensitivity, and obesity. In conjunction with the metabolic disorders, PA also helps with cardiovascular ailments and certain types of cancers (McTiernan et al., 2019; Tsatsoulis & Fountoulakis, 2006).

According to the 2020 Panhandle Community Health Improvement Plan, 13% of the Panhandle population have had frequent mental health distress in the past thirty days, which includes depression symptoms. Further, 35% of adults are obese, and 26.5% report no leisure-time physical activity (Irvine & Koppenhafer, 2020). While these statistics are not disaster-specific, they do trend towards a reduction in community resilience among those living in the Panhandle and Box Butte County.

Resilience

The British Department of International Development, now the Foreign, Commonwealth and Development Office (FCDO) defined resiliency as “the ability of countries, communities, and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses - such as earthquakes, drought, or violent conflict - without compromising their long-term prospects” (The British Department of International Development, 2011, p. 6). To simplify, it is the ability for an individual or community to prevent, respond to, and adapt to adverse events.

Resiliency has numerous definitions, and as many procedures for strengthening it. Increasing resilience is a global initiative exemplified by the United Nation’s Sendai Framework on Disaster Risk Reduction (Aitsi-Selmi et al., 2015). That includes the rural areas of Nebraska. When it comes to rural resilience, there are several factors to consider. Community disaster resilience (CDR) as defined by Cox and Hamlen is “the ability of a community to survive and thrive in the face of uncertainty; is the foundation of rural life” (Cox & Hamlen, 2015, p. 221).

Physical Activity as Part of Community Resilience

Rural community resilience (RCR) is predicated on the innovative and strategic uses of human capital, social capital, and economic capital, all of which are in shorter supply compared

to their urban counterparts (Cox & Hamlen, 2015; Cutter et al., 2016). While rural segments of the county have limited resources, they do have infrastructure advantages that can be leveraged to improve community resilience. In Box Butte County, specifically, there is a large train depot at the southern end of Alliance. This could allow for the easy movement of resources into the area during and after a disaster. The internet infrastructure in both Alliance and Hemingford are quite modern. Both towns have access to gigabit fiber optic internet with extensive coverage of each town. This would allow rapid access to communications from the Nebraska Emergency Management Agency (NEMA), as well as access to up-to-date information (Allo, 2022; Mobius, 2021).

More areas need to be explored to find out how to increase RCR which would allow these remote communities to recover more rapidly and even thrive following disasters. One area that may be useful to rural communities, especially, is finding out if the recreational and physical activity areas can be used for increasing resiliency. Specifically, the question is if increasing PA can amount to increases in individual capital and social capital reserves; thus community resilience.

This paper aims to understand if the physical activity of residents in Box Butte County can affect their perceptions of their ability to recover from disasters and affect their resilience to stress. This could inform later research to explore the role PA can play in increasing community resilience, and how best to integrate it to get the most benefits with the limited resources in rural areas.

Methods

To assess the possible role of PA on perceived resilience, a questionnaire was distributed to the towns of Alliance and Hemingford in Box Butte County, Nebraska. The survey used a voluntary sampling method to elicit responses from the general public over 19 years of age. Leaders of economic development, local nonprofits, Panhandle Public Health District, and the Chamber of Commerce in both towns were approached to share the survey on their social media platforms. Fliers were designed and posted in high traffic areas including restaurants, movie theaters, and grocery stores in the towns. The fliers introduced the researcher, described the purpose of the research survey, and listed a QR code for easy access to the survey from a mobile device.

The survey consisted of a total of fifteen questions ([Appendix A](#)). The survey began with basic demographic questions regarding the age range of the respondent, gender identity, ethnicity, income range, and employment status. The subsequent questions pertained to the leisure physical activity (LPA) of the respondents. The first LPA question was a multiple option question on the types of leisure physical activity the respondent did. They were able to select as many options as they wanted. The average weekly length of time (in minutes) they engaged in LPA over the past three months followed. The final LPA based question asked if the respondent used an activity tracker such as an Apple Watch, Fitbit, or similar device to monitor their physical activity.

The last section of the survey utilized the Brief Resilience Scale (BRS). BRS is a six-question tool to measure a person's ability to "bounce back." The six questions are formatted in a 5-point Likert Scale and follow a positive and negative statement flow, with questions 1, 3,

and 5 being positively worded and 2, 4, 6 being negatively worded. Scoring for the BRS is done by reverse coding questions 2, 4, and 6, and finding the mean of the combined answers. The scores range from 1-5, with a score closer to 5 showing a higher perceived ability to bounce back (Smith et. al., 2008). This scale was chosen for three main reasons:

1. The low number of questions was a positive aspect to keep the full survey shorter in hopes of eliciting a larger number of respondents completing the survey.
2. The BRS is structured with questions 1, 3, and 5 being positively worded and 2, 4, and 6 being negatively worded. This aids in keeping the answers consistent.
3. In Smith et al.'s study into the viability of the BRS, the researchers used multiple samples to gauge the usability of this tool. In one of the samples, a question regarding the number of days of physical activity was added. This small addition to their sampling hinted that it could be used with further physical activity questioning (2008).

Finally, the answers from the completed surveys were analyzed using descriptive statistics and the scores for the BRS. Mean and frequency of selections for the main demographic areas of age, income, gender, ethnicity, and employment status were analyzed. The types of physical activities that were selected over 20 times were compared to the demographic answers, the average weekly amount of LPA over the prior three months, and the use of an activity tracker. Also, frequency of average amount of weekly LPA was compared to activity tracker usage.

The BRS was scored with reverse coding questions 2, 4, 6 and then finding the mean of all six questions. The BRS score means were compared to the means of the demographic-based questions. Then the BRS score means were compared with the most frequently selected types

of activities including walking, biking, weightlifting, and gardening. The BRS means were compared to the frequency of selected time ranges for the average amount of weekly time spent in physical activity over the previous three months, and with the results of the use of activity trackers. The statistical analysis was done using IBM SPSS version 28 and graphs were made using Microsoft Excel.

Results

Study Population

The population focus in this study was anyone over 19 years of age and living or working in Box Butte County, Nebraska. The total population of the county, according to the 2020 US Census, was 10,842 persons (United States Census Bureau, 2022). Further, the population of those under 18 was 25.2%. This produced an eligible study population figure of approximately 8,110 persons. The survey resulted in 57 respondents, a response rate of 0.7% of the target population.

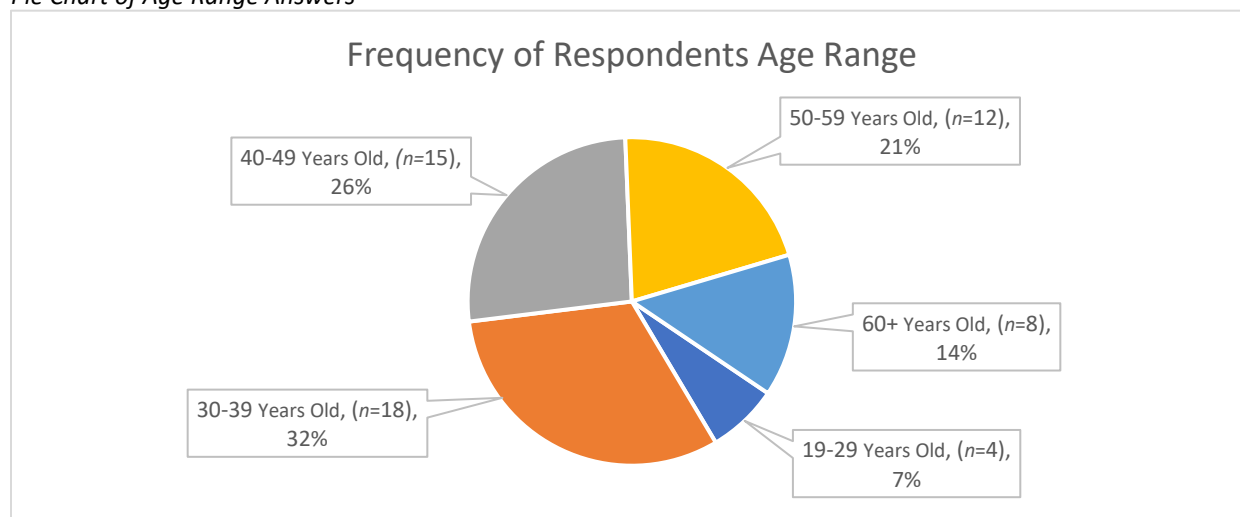
Demographic Data

Age

The survey resulted in all five age categories reporting selections (19-29, 30-39, 40-49, 50-59, 60+). The largest group was the 30-39 group with 18 responses (31.58%). That was followed by 40-49 with 15 (26.32%) and 50-59 with 12 (21.05%). Next, the 60+ range had eight (14.04%) and there were four (7.02%) in the 19-29 range. The median for age ranges equaled 3.00, which is within the 40-49 range. Figure 1 gives a breakdown of age responses.

Figure 1

Pie Chart of Age Range Answers



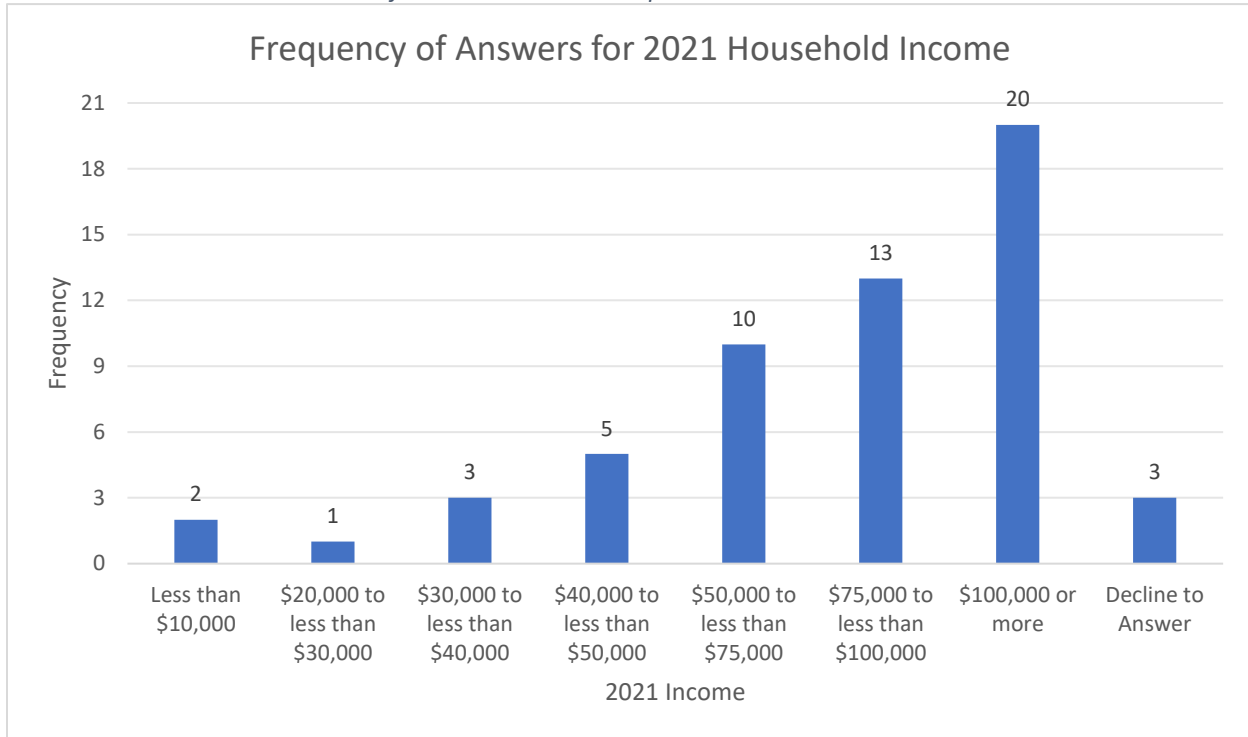
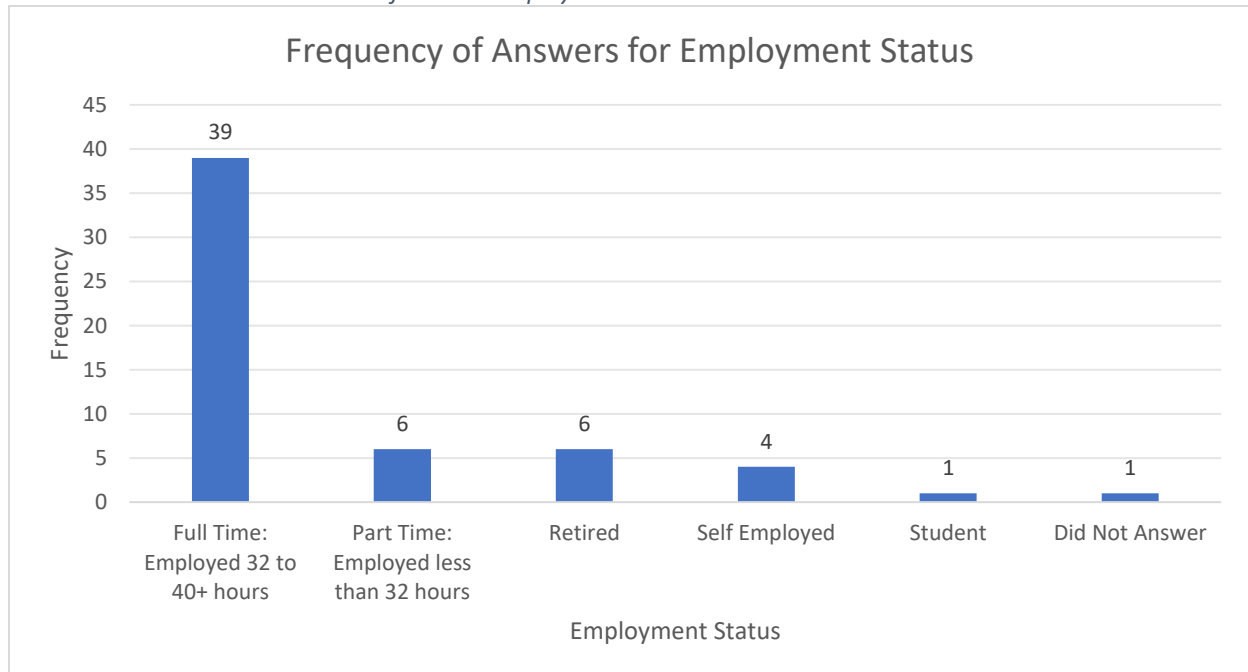
Gender and Ethnicity

The most frequent selection for gender was female with 40 (70.18%) responses. Male was the only other selection, chosen by the remaining 17 respondents. There were no selections for non-binary, transgender male, or transgender female.

The respondents' ethnicity was overwhelmingly white with 56 (98.25%) responses. There were three responses that indicated they were Hispanic or Latino. There was one (1.75%) participant/response indicating multiple ethnicities.

Household Income and Employment

The question on household income in 2021 was answered by 54 respondents, with the remaining three declining to answer. Of those that did answer, a majority reported incomes of \$50,000 or more ($n=43$, 79.62%) in 2021. Figure 2 shows the full breakdown of the income responses. Most respondents were employed full time ($n=39$, 69.64%). Figure 3 gives a breakdown of respondents' employment status.

Figure 2*Bar Chart and Answer Breakdown of Household Income Responses***Figure 3***Bar Chart and Answer Breakdown of Current Employment Status*

Physical Activity

Types of Leisure Physical Activity

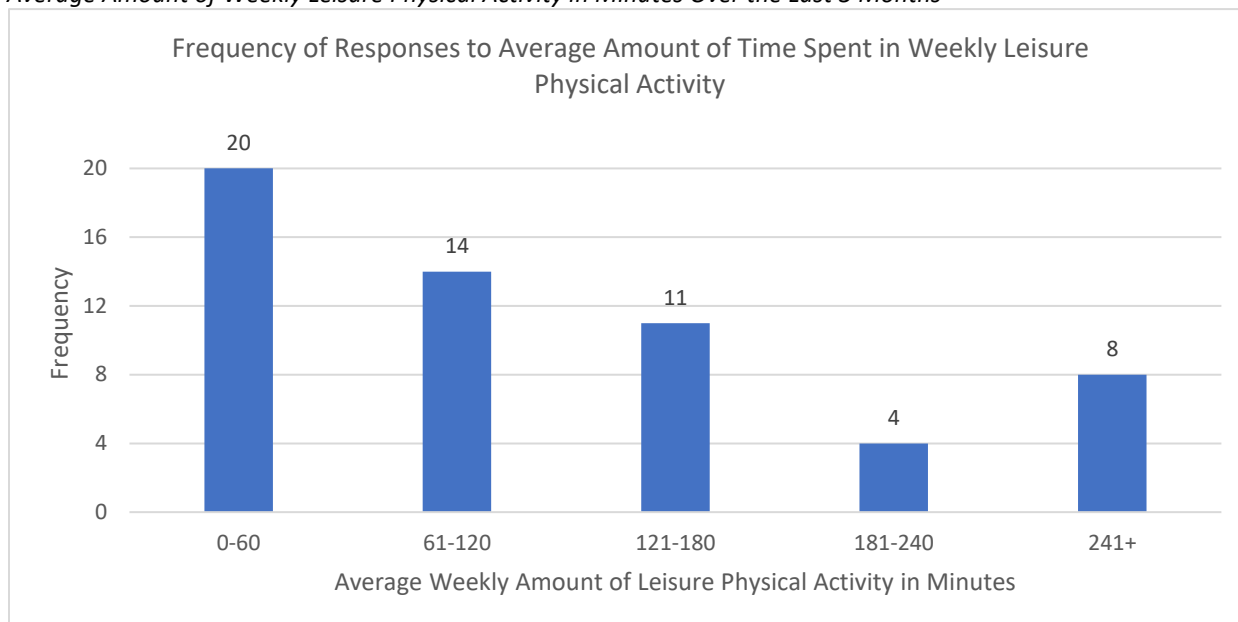
The physical activity portion of the survey started with a question on what types of activities the participants did. The survey respondents were able to choose as many activities as they wanted and could add any that were not listed in the question. All 15 original options were selected at least once, and three were added: elliptical, recumbent biking, and ranching. One respondent indicated doing none and another one did not specify any physical activities. Table 6 has a breakdown of all choices and frequency of selection. There were four activities that 20 or more participants selected. Those were, in alphabetical order, Biking ($n=20$), Gardening ($n=24$), Walking ($n=45$), and Weightlifting ($n=23$).

Amount of Leisure Physical Activity and Activity Tracker Usage

The average amount of weekly leisure physical activity in the prior three months was the next area of interest. A majority of the responses ($n=34$, 59.6%) were less than 120 minutes a week. The highest frequency of answers came in the 0–60-minute range ($n=20$, 35.09%). There were 12 survey respondents (21.06%) who did more than 180 minutes of exercise per week. Figure 4 has a breakdown of all of the responses to average weekly physical activity. A majority of respondents said they used an activity tracker, like an Apple Watch, Fitbit, or similar device ($n=33$, 57.89%).

Figure 4

Average Amount of Weekly Leisure Physical Activity in Minutes Over the Last 3 Months



Demographic Analysis

Amount of Leisure Physical Activity (LPA)

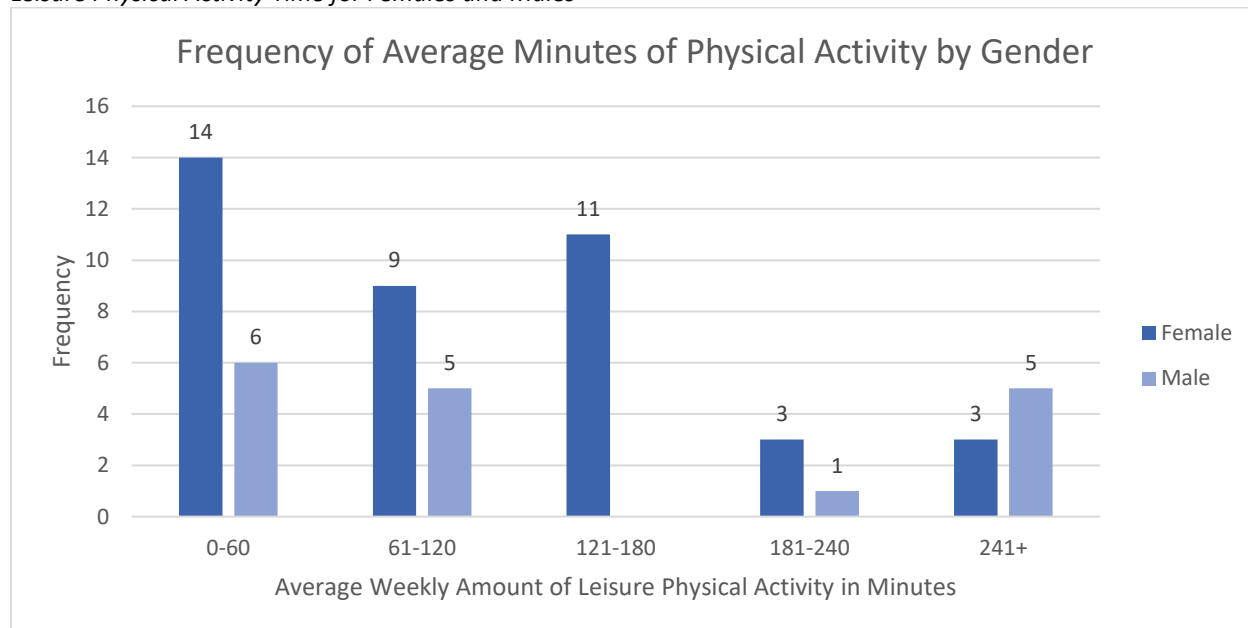
Every age range had at least one respondent doing more than 60 minutes of LPA per week. The age ranges of 30-39 and 40-49 had the most respondents exercising longer than 180 minutes per week. The age ranges of 30-39 and 40-49 had the most respondents exercising longer than 180 minutes per week. The 30-39 category was also the largest group who exercised less than 120 minutes per week. Sixty percent of respondents ($n=34$) noted exercising less than 120 minutes per week. See Table 1 for a breakdown of the data.

Table 1*Age Range and Leisure Physical Activity Time in Minutes*

Age Range	Weekly Leisure Physical Activity Time in Minutes					Total N
	0-60	61-120	121-180	181-240	241+	
19-29	2	1	1	-	-	4
30-39	3	7	4	1	3	18
40-49	6	3	2	2	2	15
50-59	5	3	2	1	1	12
60+	4	-	2	-	2	8
Total N	20	14	11	4	8	57

Note Age Range broken up by average amount of weekly leisure physical activity in minutes.

LPA was under 120 minutes for a majority of both men and women. Most women exercised for less than 180 minutes ($n=34$, 85%). An equal number of men and women worked out more than 180 minutes a week on average ($n=6$), though a higher percentage of men worked out more than 180 minutes (M 35%, F 15%). See Figure 5 for more data.

Figure 5*Leisure Physical Activity Time for Females and Males*

Regardless of income and employment, many respondents indicated exercising for less than 120 minutes a week ($n=34$). The groups that had more than 240 minutes of physical activity were working full time and earned more than \$50,000 in 2021. Two retired respondents indicated engaging in more than 240 minutes a week of physical activity. See Table 2 for breakdowns of 2021 income and leisure physical activity time and table 3 for employment status and leisure physical activity time.

Table 2
2021 Income and Leisure Physical Activity Time in Minutes

2021 Income	Weekly Leisure Physical Activity Time in Minutes					Total N
	0-60	61-120	121-180	181-240	241+	
Less than \$10,000	-	2	-	-	-	2
\$10,000-\$20,000 ^a	-	-	-	-	-	0
\$20,000 to less than \$30,000	1	-	-	-	-	1
\$30,000 to less than \$40,000	1	-	2	-	-	3
\$40,000 to less than \$50,000	3	1	-	1	-	5
\$50,000 to less than \$75,000	2	2	2	3	1	10
\$75,000 to less than \$100,000	3	3	3	-	4	13
\$100,000 or more	9	6	2	-	3	20
Decline to Answer	1	-	2	-	-	3
Total N	20	14	11	4	8	57

Note. The table shows frequency of leisure physical activity compared to 2021 income.

^a *No data available.*

Table 3*Employment Status and Leisure Physical Activity Time in Minutes*

Employment status	Weekly Leisure Physical Activity Time in Minutes					Total N
	0-60	61-120	121-180	181-240	241+	
Full Time ^a	13	11	6	3	6	39
Part Time ^b	1	2	2	1	-	6
Self Employed	3	-	1	-	-	4
Not Employed ^c	-	-	-	-	-	0
Student	-	1	-	-	-	1
Retired	3	-	1	-	2	6
Decline to Answer ^c	-	-	-	-	-	0
Total N	20	14	10	4	8	56

Note. The table shows frequency of leisure physical activity compared to employment status.

One respondent skipped answering the employment status question.

^a 32 to 40+ hours per week ^b Less than 32 hours per week ^c No data available

Activity Tracker Usage

An activity tracker was used by a majority of participants ($n=33$, 58%). Of those who used one, 21 were female and 12 were male. The ratio of women who used an activity tracker to those who did not, was close to even (Used $n=21$, 52.5%/Not Used $n=19$, 47.5%). Men's use of an activity tracker was more than double that of non-use ($n=12/70.6\%$, $n=5/29.4\%$). Only 40% of respondents over the age of 50 ($n=8$ of 20) indicated not using an activity tracker; all were female. Table 4 has the full breakdown of activity tracker usage by gender and age ranges.

Activity tracker use versus non-use was almost even for close to all employment status and 2021 incomes. The main outlier was those working full time and making over \$100,000 which had twice the rate of usage compared to non-usage ($n=11$, $n=5$). Table 5 has a breakdown of activity tracker usage by employment status and 2021 income.

Table 4*Activity Tracker Use by Gender and Age Range*

Female						
Uses an Activity Tracker	Age Range					Female Total N
	19-29	30-39	40-49	50-59	60+	
No	2	4	5	4	4	19
Yes	2	7	5	4	3	21
Total N	4	11	10	8	7	40

Male						
Uses an Activity Tracker	Age Ranges					Male Total N
	19-29	30-39	40-49	50-59	60+	
No	-	4	1	-	-	5
Yes	-	3	4	4	1	12
Total N	-	7	5	4	1	17

Note. Use of an activity tracker like an Apple Watch, Fitbit, or similar device, stratified by gender and age ranges of survey respondents.

Table 5*Activity Tracker Use by Employment Status and 2021 Income*

Employment and Income	Use of an Activity Tracker		
	No	Yes	Total N
Full Time ^a	17	22	39
\$20,000 to less than \$30,000	1	-	1
\$30,000 to less than \$40,000	-	1	1
\$40,000 to less than \$50,000	2	1	3
\$50,000 to less than \$75,000	3	3	6
\$75,000 to less than \$100,000	4	5	9
\$100,000 or more	5	11	16
Decline to Answer	2	1	3
Part Time ^b	3	3	6
Less than \$10,000	1	-	1
\$30,000 to less than \$40,000	-	2	2
\$40,000 to less than \$50,000	-	1	1
\$75,000 to less than \$100,000	2	-	2
Retired	2	4	6
\$40,000 to less than \$50,000	1	-	1
\$50,000 to less than \$75,000	1	2	3
\$75,000 to less than \$100,000	-	1	1
\$100,000 or more	-	1	1
Self Employed	2	2	4
\$50,000 to less than \$75,000	1	-	1
\$75,000 to less than \$100,000	-	1	1
\$100,000 or more	1	1	2
Student	-	1	1
Less than \$10,000	-	1	1
Grand Total N	24	32	56

Note Use of an activity tracker; Apple Watch, Fitbit, or similar device, stratified by employment status and 2021 income. One answer was omitted for no data on employment status. Other categories for income were omitted due to an absence of data and for table clarity.

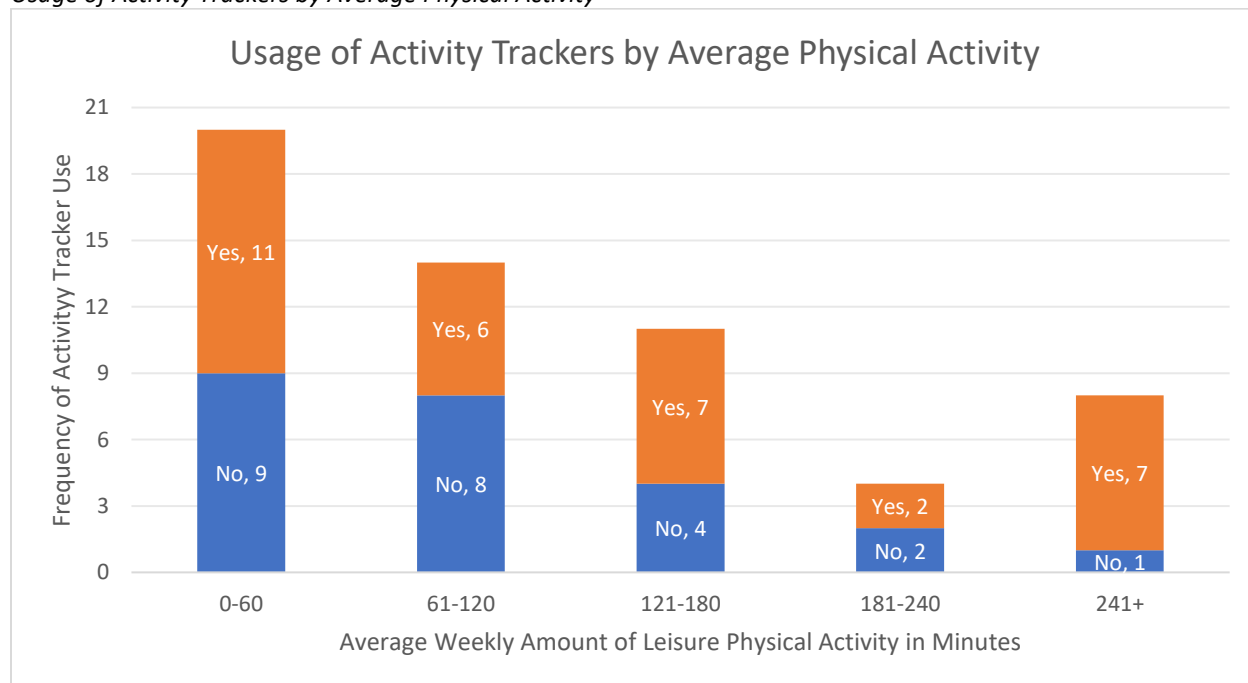
^a 32 to 40+ hours per week ^b Less than 32 hours per week

Chosen Physical Activities and Activity Tracker Usage

I selected the top four chosen physical activities and compared them to average leisure physical activity (LPA) per week. The least amount of LPA was spent Gardening (148 minutes, $n=24$) and Walking (152 minutes, $n=45$) which were both within four minutes of each other. Weightlifting (196 minutes, $n=23$) had the most LPA time spent on average and Biking (171 Minutes, $n=20$) had the second most LPA time. Leisure physical activity time was also compared to activity tracker usage. The largest group indicating they used an activity tracker also did less than 60 minutes of LPA per week (0-60, Yes $n=11$). The largest proportion of users to non-users of activity trackers was exhibited in those who exercised for more than 241 minutes per week (Yes $n=7$, No $n=1$). Figure 6 has a full breakdown of activity tracker usage and average LPA.

Figure 6

Usage of Activity Trackers by Average Physical Activity

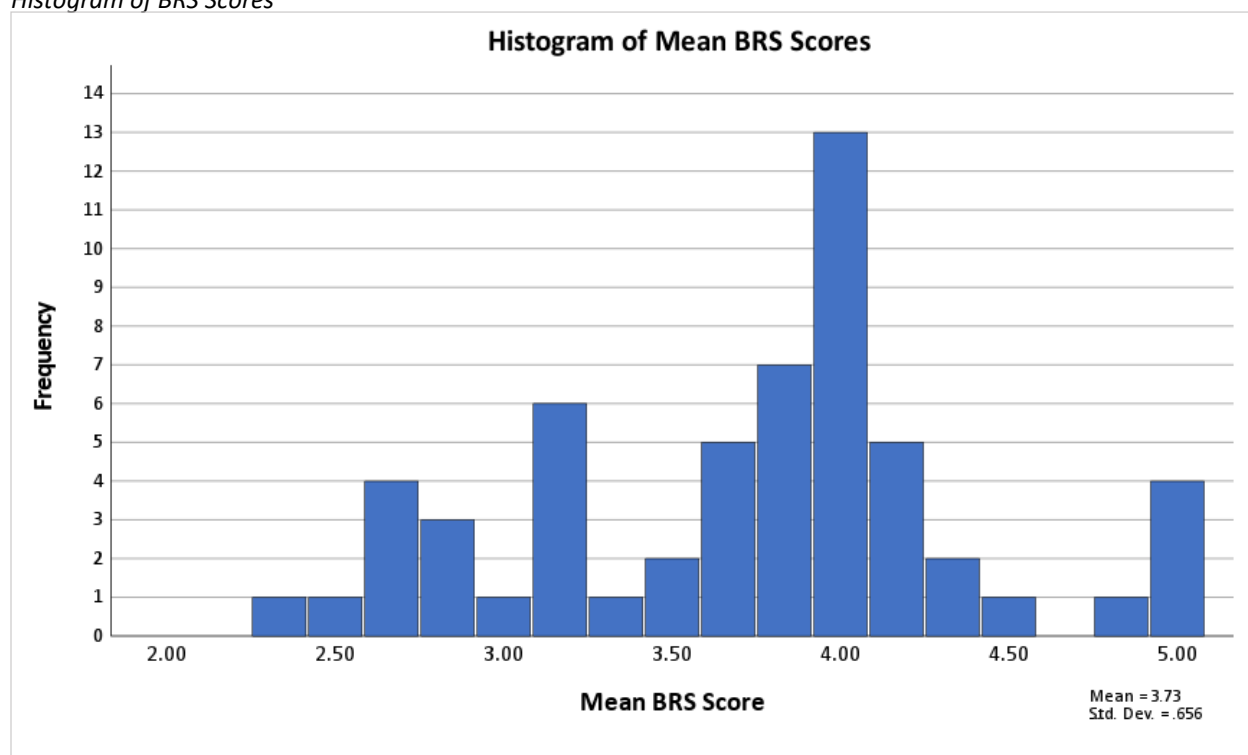


Note. Numbers after yes or no indicate number of respondents, n .

Brief Resilience Scale (BRS)

The mean BRS score for this survey was 3.73 out of a possible 5.0, with all 57 respondents completing the BRS 95% CI [3.55, 3.90] (SD=0.656). The higher the score indicates a better ability to “bounce back”; or someone’s resiliency. There is, however, no score to separate resilient from not resilient. See figure 7 for the histogram of the BRS scores.

Figure 7
Histogram of BRS Scores

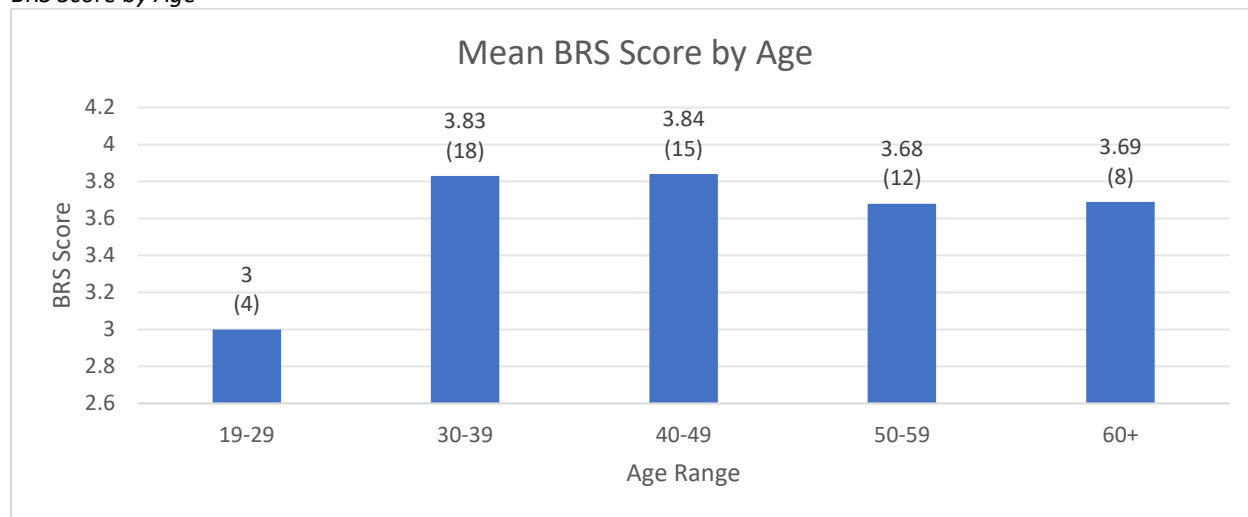


A BRS score can range from 0 to 5.0 and was highest among the two groups between 30 and 49 years of age (30-39 $n=18$, 3.83) (40-49 $n=15$, 3.84). Those groups aged 50-60+ also had similar BRS scores (50-59 $n=12$, 3.68) (60+ $n=8$, 3.69). The lowest score was in the 19-29 range, with a BRS score of 3.00 ($n=4$). Figure 8 has more information. Men had a higher mean BRS score, though with less respondents, than women (Males $n=17$, 3.95 Females $n=40$, 3.63).

The BRS score was highest among those making over \$100,000 in 2021 ($n=20$, 4.03). The two groups making between \$50,000 and \$100,000 had BRS scores that were almost identical

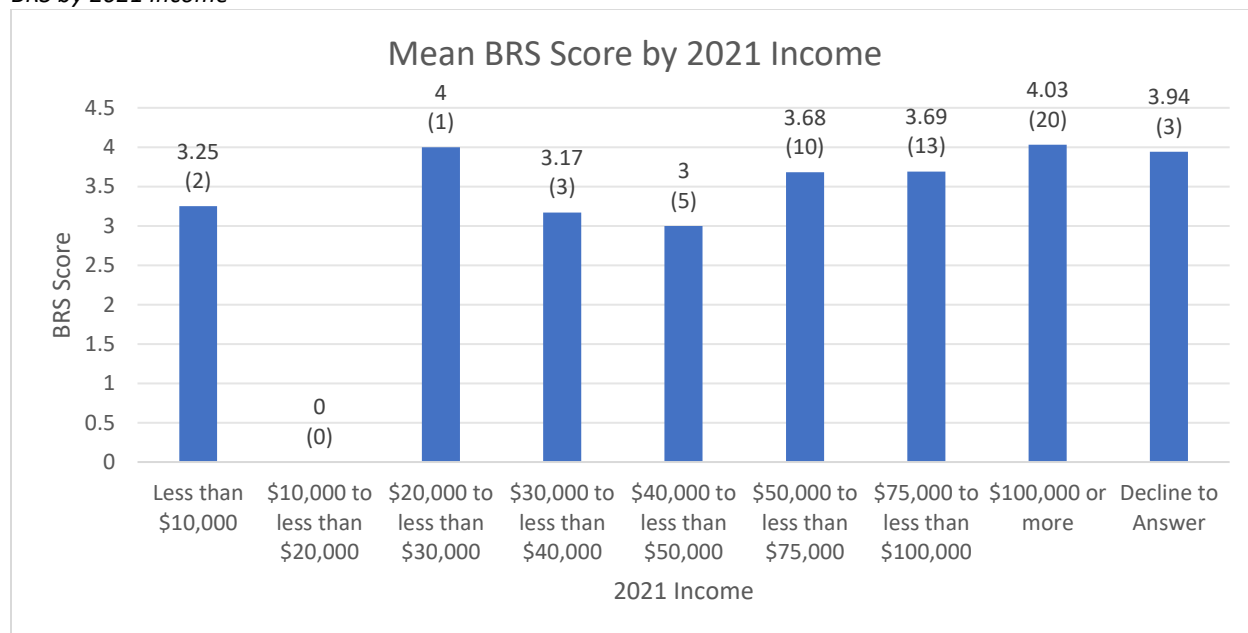
($n=10$, 3.68/ $n=13$, 3.69). The lowest score with responses was \$40,000-\$50,000, scoring 3.00 ($n=5$). Figure 9 has a full breakdown of BRS score and income. The most frequent response was working full time ($n=39$), with a mean BRS score of 3.87. Part Time workers scored the lowest on the BRS ($n=6$, 3.00). Figure 10 has a full breakdown of BRS score and employment.

Figure 8
BRS Score by Age



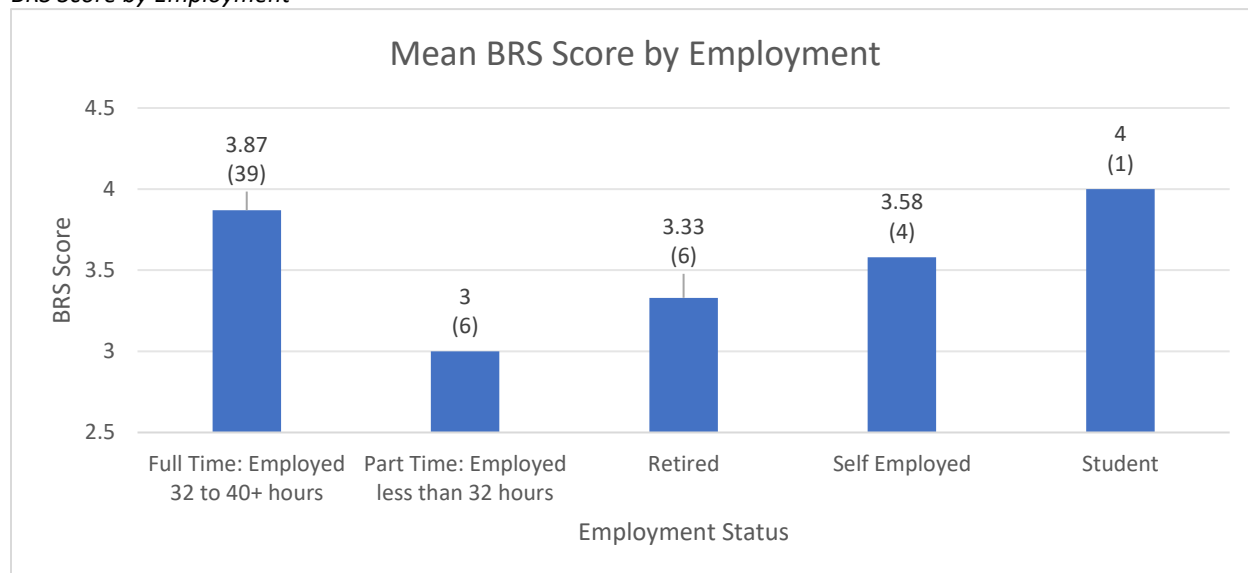
Note. Parenthesis () indicate number of respondents, n .

Figure 9
BRS by 2021 Income



Note. Parenthesis () indicate number of respondents, n .

Figure 10
BRS Score by Employment



Note. Parenthesis () indicate number of respondents, *n*.

Brief Resilience Scale (BRS) and Leisure Physical Activity Comparisons

BRS and Chosen Physical Activities

Mean BRS scores were calculated for the fifteen original physical activities, the two other specified choices, and none chosen. The respondents who did not indicate a choice had the lowest mean BRS score ($n=2$, 3.17). The highest mean BRS score for the original fifteen choices was Golf/Disc Golf ($n=9$, 4.2). A specified choice of Elliptical has the highest overall BRS, though with only one respondent, of 4.5. Of the top four most chosen physical activities only Weightlifting ($n=23$, 3.93), and Biking ($n=20$, 3.81) had scores higher than the overall mean BRS score ($N=57$, 3.73). Walking ($n=45$, 3.7) was quite close to the overall mean BRS, but Gardening ($n=24$, 3.46) was lower. Table 6 has a full list of activities, their frequency of selection, and mean BRS scores.

Table 6*Chosen Physical Activities with Frequency and Mean BRS Score*

Activity	Frequency	BRS Score
Elliptical ^a	1	4.5
Golf/Disc Golf	9	4.2
Martial Arts	2	4.1
Ranching ^a	1	4
Dance	4	3.96
Rodeo	3	3.94
Weightlifting	23	3.93
Rowing	6	3.89
Sports	10	3.89
Fitness Class	8	3.88
Biking ^b	20	3.81
Crossfit/Xfit	2	3.75
Running	10	3.72
Walking	45	3.7
Yoga	7	3.64
Swimming	8	3.48
Gardening	24	3.46
None	2	3.17

Note. Physical activities with their frequency of selection and corresponding BRS score. Arranged by descending BRS score.

^a Answered in the Other (Please Specify) section.

^b Recumbent Biking ($n=1$) was added to the frequency and calculated in the Biking mean BRS Score

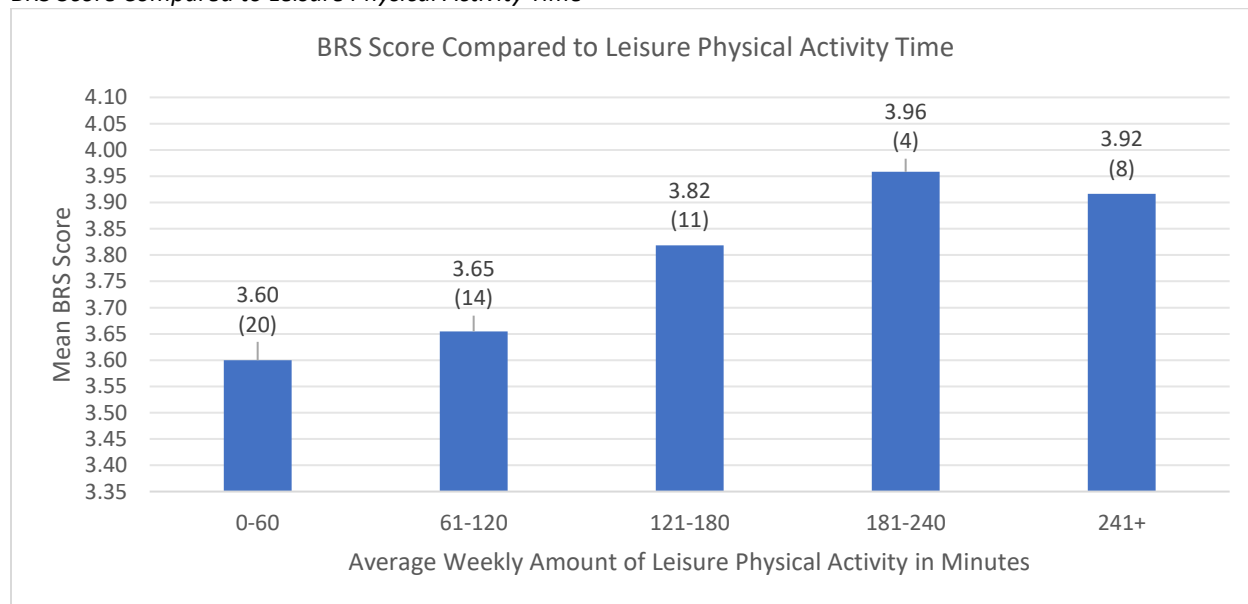
BRS and Amount of Leisure Physical Activity (LPA)

The BRS score does show an increase as average amount of time of LPA goes up through 240 minutes. There is a small drop in BRS score over 241 minutes ($n=8$, 3.92). The lowest BRS score came in the group who did LPA 0-60 minutes per week ($n=20$, 3.60). The highest BRS score was within the 181–240-minute sample ($n=4$, 3.96). Figure 11 has a full breakdown of the mean BRS scores and amount of leisure physical activity.

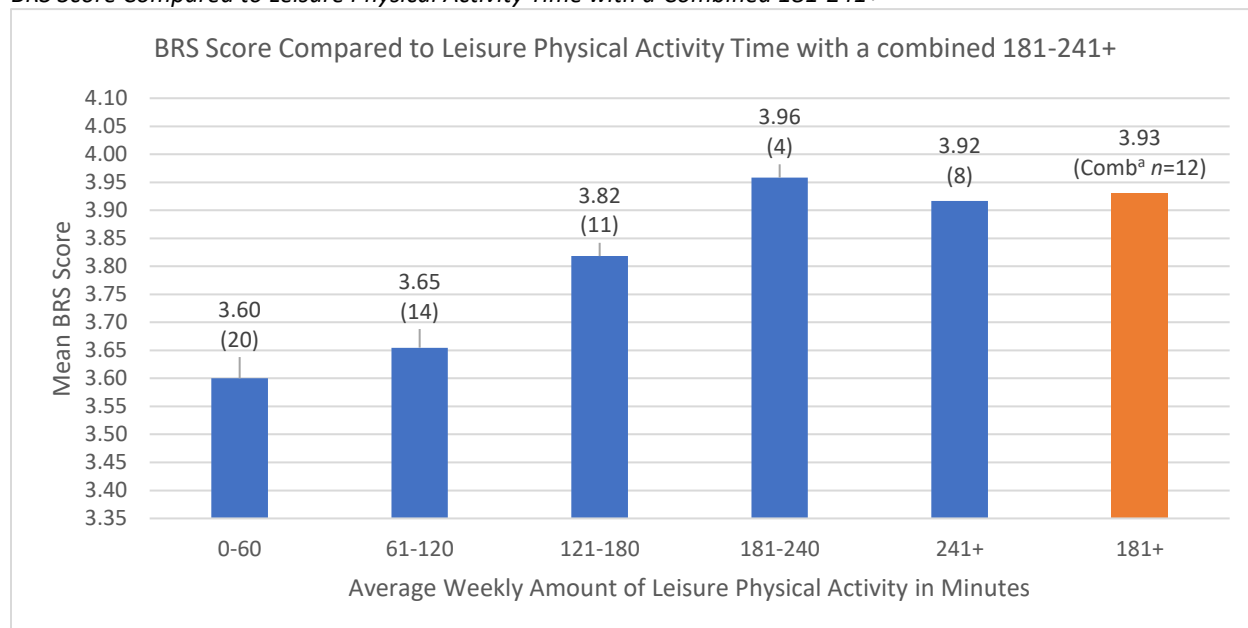
The two samples of 181-240 and 241+ minutes had remarkably similar BRS scores (3.96, 3.92), but had the lowest sample sizes ($n=4$, $n=8$). To better equalize the sample sizes to the other three groups, 181-240 and 241+ samples were combined and the mean BRS score was recalculated for the added 181+ group ($n=12$). The additional group's BRS score was calculated to be 3.93, which was higher than the 241+ group, and was slightly below the 181-240 group. Figure 12 has the added group of 181+ compared to the original groups of average time on leisure physical activity.

Figure 11

BRS Score Compared to Leisure Physical Activity Time



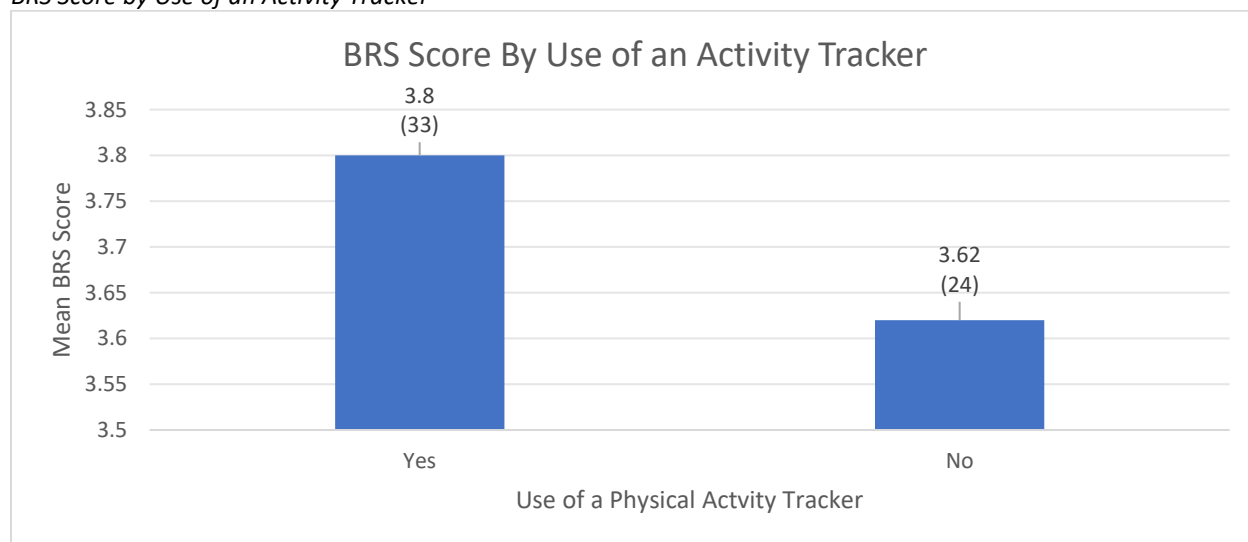
Note. Parenthesis () indicate number of respondents, n .

Figure 12*BRS Score Compared to Leisure Physical Activity Time with a Combined 181-241+*

Note. Parenthesis () indicate number of respondents, *n*. ^a short for combined.

BRS and Use of an Activity Tracker

Those reporting use of an activity tracker had a higher mean BRS score than those not using one (Yes *n*=33, 3.8, No *n*=24, 3.62). Figure 13 has a breakdown of BRS score compared to the use of an activity tracker.

Figure 13*BRS Score by Use of an Activity Tracker*

Note. Parenthesis () indicate number of respondents, *n*.

Discussion

Demographic Review

The response rate of 0.7% is an approximation, as U.S. Census data only breaks down age ranges at 18 years of age instead of 19 years of age for review board approval. The survey resulted in a diverse array of ages participating; with all five age range groups reporting. The median score for age falls within the 40-49 range, which would be in the middle of the age categories (3.00). Median age for Box Butte County is 40 years old (United States Census Bureau, 2022).

Gender and ethnicity were overwhelmingly female (70%) and white (98%); above Census demographics for the county of 90% white and 50.1% female (United States Census Bureau, 2022). Even though Box Butte County has a higher percentage of Caucasian population, a 98% response rate is still considerably above the demographic summary. The lack of inclusion of other races and gender identities reduces the generalizability of the survey; especially for higher diversity areas like major cities or rural areas near the U.S./Mexico border.

Household income and employment status were slanted towards full time and higher incomes, with 79.6% of those who answered indicating making more than \$50,000 in 2021 ($n=43$ out of 54) and 70% working full time ($n=39$ out of 56). There were 37% of respondents who indicated making more than \$100,000 per year. The median household income in Box Butte County is \$61,904, whereas the survey median was in the \$75,000 to \$100,000 category. Low socioeconomic status has been shown to be a detriment to resilience (Combaz, 2014). With a higher percentage of high economic status answers, the results may have a bias towards those who may already have a higher level of resilience.

Physical Activity

Types of Leisure Physical Activity

Respondents reported participating in a variety of leisure physical activities. An unsurprising result was that Biking, Walking, and Weightlifting were the most frequently chosen activities. Both Alliance and Hemingford have robust physical activity facilities and there is a large focus on walking/biking trail development by each town and by Panhandle Public Health District (PPHD).

Amount of Leisure Physical Activity (LPA) and Activity Trackers

The amount of physical activity reported by the participants in the survey showed a majority of 59.6% engaging in less than 120 minutes of LPA per week. That would put them below current medical and public health standards of 150 minutes of aerobic activity and two days of strength training per week (U.S. Department of Health and Human Services, 2018). The survey showed a higher percentage of respondents not meeting the standards than PPHD showed in their 2020 Panhandle Community Health Assessment. In the community assessment, 51.1% did not meet aerobic physical activity recommendations (Irvine, 2020). To be clear, the survey did not ask respondents to specify meeting LPA recommendations. There were 21% of respondents who reported completing/participating in over 180 minutes of exercise per week, which exceeds aerobic recommendations. Of those who did over 180 minutes, three times as many reported use of an activity tracker (Yes $n=9$, No $n=3$).

Demographic Analysis

Amount of Leisure Physical Activity (LPA) and Activity Tracker Usage

According to the data, the amount of physical activity decreased as the respondent's age range increased. Taking the three largest groups, 30-39, 40-49, and 50-59, the ratio of

respondents exercising less than 120 minutes and more than 120 minutes a week increased as older respondents were reporting less physical activity. That culminated in double the respondents in the 50-59 range reporting doing less than 120 minutes of LPA ($n=8$ / >120 $n=4$). Income had a negative association with LPA. In the data, as the reported income for 2021 increased, the number of respondents indicating more than 120 minutes a week of physical activity decreased. There is research to show that women are less active than men, physical activity decreases as people age, and higher socioeconomic countries have higher rates of inactivity (Hallall et al., 2012).

Activity tracker usage in this survey has a higher percentage of users than similar research. Pew research shows a usage rate of 21% of the American population (Vogels, 2020), while the survey results show a 58% total usage rate. Another area of difference is in the rate of rural usage. Pew indicates only 18% of those in rural areas use an activity tracker. These differences could also be explained by this research survey's respondents showing a higher selection of full time, high-income choices, since Pew shows higher rates of usage in those making more than \$75,000 per year (Vogels, 2020).

Brief Resilience Scale (BRS)

The BRS is a shorter form factor resilience scale designed for gauging the ability to “bounce back”. In the original study by Smith et. al., mean BRS scores for their four samples were shown to be between 3.53 and 3.98 with standard deviations ranging from 0.68 to 0.85 (2008). The results from this survey indicated a mean BRS score of 3.73, with a standard deviation of 0.66. This would be in line with the original authors' results when evaluating the validity and usage of the BRS. Other research into translated versions of the BRS including

German, Polish, Greek, and Spanish, all showed reliability and validity in the use of the BRS (Chmitorz et al., 2018; Konaszewski et al., 2018; Kyriazos et al., 2018; Rodríguez-Rey et al., 2016).

This study resulted in similar data as the original BRS study, as well as subsequent research on translated versions of the BRS. There was a negative association with age and BRS score, with those over 50 having a lower mean BRS score. Inverse associations with age and BRS score was shown in the translated versions, but not enough data was presented in Smith's 2008 original BRS research to make the same conclusion. Similarly, women scored lower BRS scores than men in other BRS research showing a divergence between traditional gender identities and BRS score (Chmitorz et al., 2018; Konaszewski et al., 2018; Kyriazos et al., 2018; Rodríguez-Rey et al., 2016; Smith et al., 2008).

Brief Resilience Scale (BRS) and Leisure Physical Activity (LPA) Comparisons

Across all three areas of interest of LPA (physical activities, amount of physical activity, activity tracker usage) there was a positive association with engaging in LPA and the BRS score. There were higher BRS scores in conventionally group physical activities like Dance (3.96), Fitness Class (3.88), and Sports (3.89). Those three group activities had higher mean BRS scores than the three out of the four most frequently chosen activities; Biking (3.81), Gardening (3.46), and Walking (3.7). Weightlifting was the only frequently chosen activity that had an equivalent BRS score (3.93). The typically social aspect of Dance, Fitness Classes, and Sports may be adding to the respondent's perception of resilience under the social capital umbrella of Community Resilience, therefore being reflected in the BRS.

BRS scores were positively associated with amount of physical activity. BRS scores increased in the highest weekly amounts of physical activity (181-240, 241+ minutes), though

the sample sizes of those groups were smaller than the lower LPA groups. Levelling the sample size of the 181 and 241+ groups to the others was of interest. When combining the 181-240 and 241+ groups, the positive association remained (181+ $n=12$, BRS 3.93). The positive association continues in the use of an activity tracker receiving a higher mean BRS score than not using (Yes 3.8, No 3.62).

Limitations

There are three limitations in this study. The first and main limitation, is the use of “ranges” for demographic information and physical activity. A more precise measurement for age and average amount of weekly physical activity is needed to create a more robust data set. The second is the higher proportions of women and high-income earners. This will limit the generalizability of the study to other more diverse areas. Specific attention to recruiting respondents from other gender identities and incomes is warranted. Third, this is not a study on causation or even correlation, but rather association at one point in time. Further research is needed to find a cause as to how and why leisure physical activity increases specific aspects of resiliency.

Conclusion

These findings are expected. Research has shown that physical activity decreases levels of Allostatic Load (AL) in individuals (Bernstein & McNally, 2018; Upchurch et al., 2015; Gay et al., 2013; Petrovic et al., 2016; Tsatsoulis & Fountoulakis, 2006) The Brief Resilience Scale was designed to measure the ability for an individual to “bounce back” from stress (Smith et al., 2008). One can surmise that if physical activity can reduce AL, and AL is how much stress the body has, then increasing LPA would increase one’s ability to bounce back from stress.

As this study shows positive associations with the amount of LPA and BRS scores, it could be combined with the evidence of LPA decreasing AL. I speculate that physical activity can have a positive association with individual disaster resilience. Following that line of thought, the increase of individual disaster resilience through physical activity could have positive association with increased community resilience to disasters, as well.

This study adds to the evidence of physical activity and its positive health outcomes. One of the overall goals of public health is to increase the wellness of the general population through physical activity. This study attempts to look at adding the new dimension of emergency and disaster resilience in relation to LPA in the general population. Climate Change is beginning to show more negative effects with increases in severity and frequency of emergencies and disasters. Finding more ways to build community resilience is essential. I suggest that public health can get multiple benefits from more LPA promotion, which in turn will only strengthen the overall health of us as a whole. Not only does activity increase the overall health indicators, but it also could increase communities’ resilience to disasters and public health emergencies.

Box Butte County, Nebraska has the tools in place to increase community resilience. Further study and effort should be put into finding out how leisure physical activity can increase individual and community resilience. These findings can guide future research in other areas and counties of Nebraska on how best to integrate physical activity with emergency preparedness and public health resiliency efforts.

Acknowledgements

I want to acknowledge my Capstone committee, Dr. Sharon Medcalf, Keith Hansen, Dr. Sarah Meade, and Dr. Michelle Strong. Their knowledge and expertise have guided me in becoming a better public health advocate, more confident in my abilities in emergency preparedness, and helped me to hone my interests in community resiliency.

I want to thank and acknowledge the leaders and people of Alliance, Hemingford, and Box Butte County. A special thank you to those out there who helped me with the survey. They include Chelsie Herian, Mara Andersen, Larry Bolinger, Jessica Davies, Revé Fries, Nina Millwood, Susan Unzicker, and Janelle Visser. You all made it possible for me to get the data I needed.

Finally, I want to thank my mother, Jeanne Pulver, for editing all my papers while I was pursuing my master's degree at UNMC.


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Biography & CV

Eric Pulver is a Master of Public Health Emergency Preparedness student at the University of Nebraska Medical Center. In his time at UNMC he has been interested in Climate Change preparedness, community resilience, emergency preparedness exercise design, and infectious disease epidemiology. He was chosen as a Rural Fellow with the University of Nebraska-Lincoln, where he was sent to Alliance, Nebraska to do work in the community in the summer of 2022. There he completed projects on Continuity Planning, Risk Assessments, professional presentations for Panhandle Public Health Department, and collected 245 pairs of new socks in a sock drive for the Sandhills Center for Hope.

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Education

Dec 2022

UNIVERSITY OF NEBRASKA MEDICAL CENTER

Master Of Public Health Emergency Preparedness,

GPA: 3.8

Doctorate level coursework in Exercise Design, Managing Complex Disasters, and Infectious Disease Epidemiology.

Apr 2015

BELLEVUE UNIVERSITY

Bachelor of Science Health and Human Performance,

Minor Sport Management

Experience

04/2022 – Present

Emergency Preparedness Consultant

Created Business Continuity Plan for nonprofit fitness facility, including Risk Assessment, Business Impact Analysis, and Active Shooter Risk education.

Generated, ran, and analyzed multiple discussion based preparedness exercises including a workshop and tabletop.

Conducted Risk Assessment for Behavior Health facility.

Cultivated cross-sector relationships including architecture, business development, financial services, public health, and mental health.

Conducted Cross-Sectional research into physical activity and resilience.

09/2015 – 06/2022

Owner, AYMBBooks

Built business from the ground up including marketing, sourcing, inventory, storage, and customer service.

16,000+ books sold, sales of \$230,000+, with a 99% lifetime feedback rating.
 Engaged and nurtured outside relationships with business managers including Salvation Army and Lincoln's Catholic Social Services.
 Created and evolved multiple processes and techniques for every facet of the business.

06/2012 – 06/2022

Facility and Property Manager, DENNIS GAULE

Maintain and secure 130-year-old building.
 Coordinate and contract repair and maintenance individuals and companies.
 Make sure building is secure by maintaining the grounds, employing commercial security system, and checking over the property.

07/2013 – 07/2015

ACT and Subject Tutor, Huntington Learning Center

Tutor high school students on ACT and SAT test taking skills, subjects, and methods.
 Tutor high school students in science fields including Biology, Chemistry, Physics, Anatomy and Physiology.

09/2011 – 10/2012

Microbiology assistant, CHI HEALTH

Receive, process, plate, and store biological samples using proper hazardous material guidelines.
 Knowledgeable use of plate material, fumigation hoods, biological storage, and hazardous material disposal.

Accomplishments

University of Nebraska Lincoln/University of Nebraska Medical Center

Rural Prosperity Fellowship

Rural Prosperity Nebraska

Rural Fellows Training in Inclusive Community Leadership

University of Nebraska Medical Center

Certification in Emergency Preparedness

FEMA Emergency Management Institute Certifications

IS 100 Introduction to Incident Command System,

IS 120 An Introduction to Exercises

IS 139 Exercise Design and Development

IS 200 Basic Incident Command System for Initial Response

IS 700 An Introduction to the National Incident Management System

IS 800 National Response Framework, An Introduction

IS 907 Active Shooter: What You Can Do

Johns Hopkins

Contact Tracing Certification

American College of Sports Medicine

Personal Training Certification

Projects

Evaluating How Physical Activity Affects the Perception of Resilience in Box Butte County, Nebraska

Designed a research survey for physical activity and resilience using evidence based research and tools.

Produced and distributed survey to Box Butte County, Nebraska utilizing connections with local leaders and key stakeholders.

Analyzed and presented on the findings of the survey to peers, faculty, key stakeholders, and the public.

Alliance Recreation Center Continuity Plan

Business Continuity Planning for a nonprofit. This involved Risk Assessments, Business Impact Analysis, Workshops, Tabletops, and research.

Alliance Recreation Center Workshop “Risky Endeavors”

Workshop exercise to facilitate Incident Command Structure education and Risk Assessment.

Alliance Recreation Center Tabletop “No One Steps on an ARC in My Town!”

Tabletop exercise to facilitate Crisis Communication planning and Business Impact Analysis.

Panhandle Public Health District Presentation “Travel Preparedness Around the Panhandle”

Presentation for PPHD staff on how to prepare for traveling Western Nebraska during time of inclement weather.

Community Service

Sandhills Center For Hope, Alliance, Ne

Developed and ran a Sock Drive in Alliance and Hemingford Nebraska. The socks were going into Emergency Kits for clients in need.

Sock Drive led to the collection of 245 pairs of new socks in all sizes and types.

Appendix A

Survey

Eric Pulver's Capstone: Physical Activity and Resilience in Box Butte County.

University of Nebraska Medical Center IRB #0496-22-EX

Hello, my name is Eric Pulver. I was in Box Butte County for the Rural Fellows program this summer. I am near the end of my graduate program at the University of Nebraska Medical Center. I appreciate your help in getting me one step closer by completing this short research survey. Please complete if you live and/or work within Box Butte County.

The questions will ask you about your demographics, your physical activity, and your resilience.

When you are ready, hit the OK button.

The following questions will ask your demographic information.

What is your age?

- ☐ 19-29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60+
- ☐ Decline to Answer

Choose your gender?

- ☐ Female
- ☐ Male
- ☐ Non-Binary
- ☐ Transgender Female
- ☐ Transgender Male
- ☐ Decline to Answer

Do you identify as Hispanic or Latino?

- ☐ Yes
- ☐ No
- ☐ Not Applicable
- ☐ Decline to Answer

What is your ethnicity?

- ☐ American Indian or Alaska Native
- ☐ Asian or Pacific Islander
- ☒ Black
- ☐ White
- ☐ Multiple
- ☐ Do not know
- ☐ Decline to Answer

What was your household income for 2021 from all sources, before taxes were taken out?

- ☐ Less than \$10,000
- ☐ \$10,000 to less than \$20,000
- ☐ \$20,000 to less than \$30,000
- ☐ \$30,000 to less than \$40,000
- ☐ \$40,000 to less than \$50,000
- ☐ \$50,000 to less than \$75,000
- ☐ \$75,000 to less than \$100,000
- ☐ \$100,000 or more
- ☐ Decline to Answer

What is your current employment status?

- ☐ Full Time: Employed 32 to 40+ hours
- ☐ Part Time: Employed less than 32 hours
- ☐ Self Employed
- ☐ Not Employed
- ☐ Student
- ☐ Retired
- ☐ Decline to Answer

The following questions will ask about physical activity.

What types of leisure physical activity do you engage in? Check all that apply:

- | | |
|---|---|
| <input type="checkbox"/> Biking | <input type="checkbox"/> Rowing |
| <input type="checkbox"/> Crossfit/Xfit | <input type="checkbox"/> Running |
| <input type="checkbox"/> Dance | <input type="checkbox"/> Sports like basketball, racquetball, pickle ball |
| <input type="checkbox"/> Fitness Classes like Zumba, Pound, Silver Sneakers | <input type="checkbox"/> Swimming |
| <input type="checkbox"/> Gardening | <input type="checkbox"/> Walking |
| <input type="checkbox"/> Golf/Disc Golf | <input type="checkbox"/> Weight lifting |
| <input type="checkbox"/> Martial Arts | <input type="checkbox"/> Yoga |
| <input type="checkbox"/> Rodeo | |
| <input type="checkbox"/> Other (please specify) | |

On average, how many minutes per week did you engage in leisure physical activity over the last 3 months?

- ☐ 0-60
- ☐ 61-120
- ☐ 121-180
- ☐ 181-240
- ☐ 241+

Do you use an activity tracker like an Apple Watch, Fitbit, or similar device to monitor your physical activity?

- ☐ Yes
- ☐ No

Please indicate the extent to which you agree with each of the following statements by using the following scale:

1 = strongly disagree

2 = disagree

3 = neutral,

4 = agree

5 = strongly agree

I tend to bounce back quickly after hard times

☐ 1 = strongly disagree

☐ 2 = disagree

☐ 3 = neutral,

☐ 4 = agree

☐ 5 = strongly agree

I have a hard time making it through stressful events

☐ 1 = strongly disagree

☐ 2 = disagree

☐ 3 = neutral,

☐ 4 = agree

☐ 5 = strongly agree

It does not take me long to recover from a stressful event

☐ 1 = strongly disagree

☐ 2 = disagree

☐ 3 = neutral,

☐ 4 = agree

☐ 5 = strongly agree

It is hard for me to snap back when something bad happens

- ☐ 1 = strongly disagree
- ☐ 2 = disagree
- ☐ 3 = neutral,
- ☐ 4 = agree
- ☐ 5 = strongly agree

I usually come through difficult times with little trouble


- ☐ 1 = strongly disagree
- ☐ 2 = disagree
- ☐ 3 = neutral,
- ☐ 4 = agree
- ☐ 5 = strongly agree

I tend to take a long time to get over set-backs in my life

- ☐ 1 = strongly disagree
- ☐ 2 = disagree
- ☐ 3 = neutral,
- ☐ 4 = agree
- ☐ 5 = strongly agree

Appendix B

UNMC IRB Approval

<div style="display: flex; justify-content: space-between; align-items: center;">  <div> University of Nebraska Medical Center™ </div> </div> <div style="display: flex; justify-content: space-between; font-size: 0.8em; margin-top: 5px;"> NEBRASKA'S HEALTH SCIENCE CENTER Office of Regulatory Affairs (ORA) Institutional Review Board (IRB) </div> <p style="margin-top: 10px;">August 4, 2022</p> <p>Eric Pulver, MPH COPH Epidemiology UNMC - 4320</p> <p>IRB # 0496-22-EX</p> <p>TITLE OF PROPOSAL: Evaluating How Physical Activity Affects the Perception of Resilience to Disasters in Box Butte County, Nebraska</p> <p>The Office of Regulatory Affairs (ORA) has reviewed your application for Exempt Educational, Behavioral, and Social Science Research on the above-titled research project. According to the information provided, this project is exempt under 45 CFR 46.104(d), Category 2, research involving only survey procedures. You are authorized to begin the research.</p> <p>It is understood this project will be conducted in full accordance with all applicable HRPP Policies. The ORA must be immediately notified of any proposed changes for your research project that:</p> <ul style="list-style-type: none"> A. affect the risk-benefit relationship of the research B. pose new risks which are greater than minimal C. constitute a new risk to privacy or confidentiality D. involve sensitive topics (including but not limited to personal aspects of the subject's behavior, life experiences or attitudes) E. involve deception F. target a vulnerable population G. include prisoners or children H. otherwise suggest loss of the exempt status of the research. <p>You are encouraged to contact the ORA to discuss whether changes to exempt research requires review by ORA.</p> <p>You will be asked to update the status of your research yearly by responding to an email from the Office of Regulatory Affairs. If you do not respond, your project will be considered completed.</p> <p>Sincerely,</p> <p>Signed on: 2022-08-04 16:54:20.253</p> <p>Nancy A. Olson, JD</p> <div style="font-size: 0.7em; margin-top: 20px;"> Academic and Research Services Building 3000 / 867530 Nebraska Medical Center / Omaha, NE 68198-7530 402.559.4403 / FAX: 402.559.3300 / Email: olsonn@unmc.edu / http://www.unmc.edu </div>	<div style="display: flex; justify-content: space-between; align-items: center;">  <div> University of Nebraska Medical Center™ </div> </div> <div style="display: flex; justify-content: space-between; font-size: 0.8em; margin-top: 5px;"> NEBRASKA'S HEALTH SCIENCE CENTER Office of Regulatory Affairs (ORA) Institutional Review Board (IRB) </div> <p style="margin-top: 10px;">IRB Administrator II Office of Regulatory Affairs</p> <div style="font-size: 0.7em; margin-top: 20px;"> Academic and Research Services Building 3000 / 867530 Nebraska Medical Center / Omaha, NE 68198-7530 402.559.4403 / FAX: 402.559.3300 / Email: olsonn@unmc.edu / http://www.unmc.edu </div>
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