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Relationship Between Physical Activity and Depressive Symptoms in Adolescents

By

Joshua Ganz

A Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Masters of Science

In

School Health

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Relationship Between Physical Activity and Depressive Symptoms in
Adolescents

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Chapter 1: Introduction

Understanding the relationship between physical activity and depressive characteristics among the adolescent population is important in addressing two major public health concerns, depression and lack of physical activity. Additionally, it is important to be able to identify group differences (e.g., gender) with respect to the relationship between physical activity and depressive symptoms among adolescents. For example, do females differ significantly from males when it comes to the correlation between physical activity and depressive symptoms? Both depressive symptoms and lack of physical activity may cause or lead to future health problems (Centers for Disease Control and Prevention [CDC], 2011b, 2011c; Lenz, Coderre, & Watanabe, 2009). Understanding the relationship between physical activity and depressive symptoms may help in using physical activity to help prevent depressive symptoms. There also could be consideration of using physical activity into care plans for those experiencing depressive symptoms. Studying adolescents behaviors of physical activity in relation to depressive characteristics may help focus on prevention techniques early in life that may be used throughout life, which in turn could affect public health.

Lack of physical activity and depression are two health concern areas that affect many youths. During the 12 months before the 2009 Youth Risk Behavior Surveillance (YRBS) survey, 26.1% of students in grades 9-12 nationwide had felt so sad or hopeless almost every day for two or more weeks in a row that they stopped doing some usual activities (CDC, 2010). According to the CDC (2011c), 30 to 60 minutes of physical activity three to five times a week can improve mood (CDC, 2011c). Fewer than 60% of

American adolescents meet the daily requirements of physical activity (Birkeland, Torsheim, & Wold, 2009)

Low physical activity levels or depressive traits may cause or lead to health problems. Depressive traits are key risks for suicide, coronary artery disease, heart attack, and stroke (CDC, 2011b; CDC, 2011c). Regular physical activity is one of the most important things people can do for their health. According to CDC (2011c), regular physical activity can help:

- control weight,
- reduce risk of cardiovascular disease,
- reduce risk for type 2 diabetes and metabolic syndrome,
- reduce risk of some cancers,
- strengthen bones and muscles,
- improve mental health and mood,
- improve ability to do daily activities and prevent falls in older adults, and
- increase the chances of living longer.

Statement of the Problem

Low levels of physical activity levels may have a relationship with depressive characteristics. Understanding that there is a relationship between physical activity and depressive traits in the adolescent population may contribute to effective ways to reduce depressive traits and increase physical activity. Most adolescents are not receiving the recommended amount of physical activity daily. The 2009 national Youth Risk Behavior Surveillance System (YRBS) indicated that only 18% of high school students had been physically active for 60 minutes every day in the previous week (CDC, 2011d). Only 33% of high school students nationwide attended physical education classes five

days per week (CDC, 2011d). Further, at any given time, 10–15% of children and adolescents can have symptoms of depression (Birkeland et al., 2009).

Researchers suggest that there is a correlation between physical activity and depressive characteristics (Birkeland et al., 2009; CDC, 2011c; Johnson & Taliaferro, 2011; Wiles, Haase, Lawlor, Ness, & Lewis, 2011). Understanding if this is accurate irrespective of demographic characteristics is important. Understanding what demographics are more susceptible for low levels of physical activity or depressive traits may help in advocating physical activity or depression treatment options. Possible differences between gender, ethnicity, and sport affiliation may affect how to influence adolescents to improve their physical activity levels or treatment options for depression.

Understanding the exact science of physical activity related to depressive traits is a problem. The physiological effects from physical activity on the brain and body are not entirely known. An article in Harvard University (2009) explains that experts are unsure of the exact brain chemicals that may improve mood in some people. They also question if depressive characteristics are related to body image, social interactions during physical activity, or distraction from work and everyday worries that may limit stress. The article also suggests that physical activity increases brain levels of the chemicals known to reverse symptoms of depression. Serotonin (an antidepressant), norepinephrine (an adrenalin-like protein) and endorphins (natural pain killers) rise with sustained physical activity (Harvard University, 2009).

Past studies have indicated a relationship between physical activity and depressive characteristics (Johnson & Taliaferro, 2011). Do low levels of physical activity increase depressive characteristics? Or do exhibiting depressive characteristics determine levels of

physical activity? Two hypotheses describe possible connections between physical activity and depressive traits.

protection hypothesis. The protection hypothesis holds that physical activity protects against depressed mood. Biological and psychological mechanisms have been proposed to suggest how this protection effect occurs. For example, one biological hypothesis proposes that the relationship between physical activity and depressed mood is mediated by acute physiological responses. Specific physiological mechanisms might be involved, such as an increase in monoamine circulation, endorphin production, elevated body temperature, or lower hormonal responses from stress (Birkeland et al., 2009).

inhibition hypothesis. The inhibition hypothesis assumes that depressed mood, at least to some degrees disables an individual's capability of being physically active. Thus, an inverse relationship between physical activity and depressed mood can be explained by the depressed person lacking the energy to be physically active. Along the same lines, a positive mood can give the surplus energy and motivation necessary to participate in physical activity (Birkeland et al., 2009).

Significance of the Problem

Major depression frequently goes unrecognized and untreated and may foster tragic consequences, such as impaired interpersonal relationships at work and at home or even suicide (CDC, 2011c). Learning techniques that may help prevent depression early in life is important. Treating depression can be a time-consuming project. Two treatments are most often used: talking with a clinician about problems, taking an

antidepressant for symptoms, or a combination of both. Improvement takes time: antidepressants often require 4–8 weeks to take effect (Harvard University, 2011).

Current treatments have been found to work for only about 50%–60% of cases under controlled research conditions (Gladstone & Beardslee, 2009). Thus, consideration of depression treatment options that may be widely used and easily taught, such as physical activity, may help the specialized approaches being currently used. Physical activity's importance is an area that could easily be incorporated into K–12 school settings.

Based on the Substance Abuse and Mental Health Services Administration (SAMHSA, 2008) National Survey on Drug Use and Health from 2004–2006, 8.5% of youth (about 2.1 million) had experienced at least one major depressive episode during the past year. Over 91% of the youth who experienced at least one major depressive episode in the past year reported more than one period in their lifetime during which for two weeks or longer they felt sadness, discouragement, or boredom and also had other problems of impairment in the home, school/work, family relationships, or social life domains (SAMHSA, 2008). Nearly half (48.3%) of the youth with a major depressive episode in the past year reported severe impairment in at least one of four major role domains (home, school/work, family relationships, or social life), and 21% reported very severe impairment in at least one of the domains (SAMHSA, 2008). Untreated major depressive disorder carries a high risk of substance abuse, legal problems, physical illness, poor academic and social functioning, early pregnancy, and exposure to negative life events (Lenz et al., 2009).

Physical inactivity is a major public health concern. Adequate physical activity is defined by the guidelines of 3–5 days a week for 30–60 minutes, which may promote mental health (CDC, 2011c). Among adults, even moderate and light physical activity has been shown to have positive effects on immediate mood (Birkeland et al., 2009). The urgency to lower the rate of depression is likely compounded by the recognition that if not effectively treated, depression is likely to become a chronic condition. Just experiencing one episode of depression places the individual at a 50% risk for experiencing another, with subsequent episodes raising the likelihood of experiencing even more episodes in the future (CDC, 2011c). Given the high prevalence and costs of adolescent depression, the connection between early onset depression and recurrence of disorder in adulthood, the impairment associated with youth depression, and the difficulty in treating depression once it has developed, efforts to prevent depression are warranted (Gladstone & Beardslee, 2009). Prevention may be the key to decreasing the burden of adolescent and adult depression on society. Increasing physical activity may be more cost-effective and less distressing than waiting for the condition to appear and then trying to treat a full depressive episode.

Questions to Be Answered

The questions involved will deal with relationships and significant differences in demographics relationship of physical activity and depressive traits.

1. What is the relationship between physical *activity* and depressive symptoms in adolescents?
2. What is the relationship between physical *intensity* and depressive symptoms in adolescents?

3. Do adolescent groups, as defined by physical activity level and depressive symptoms, vary by gender, sport involvement, and physical education participation?

Question one and three differ in that the first one involves finding a relationship between physical activity and depressive characteristics in a sample size. If there is a relationship, then it's important to analyze demographics to determine any differences that may occur between certain groups. For example, are there major differences in physical activity/depressive traits relationships between genders? What about in individuals who have a current sport affiliation and in those who have no sport affiliation? What about those who participate in physical education class and those who do not?

Limitations

A few limitations may affect the research.

- The participants may not accurately mark questions on survey.
- There may be low number in the sample size.
- School districts, parents, or teachers may not consent to the survey.
- A major life event or other external factors, such as sleep, stress, time of day or year, may skew the accuracy of the survey.

Delimitations

Some delimitations are necessary for practical reasons.

- The study is delimited to anyone in the age group of 15–18. (This will help in understanding the adolescent and student population better with associations of physical activity and depressive characteristics.)

- The use of a school district in Minnesota and an entire grade level to participate in the survey will also be a delimitation. This will help in attempting to include a heterogeneous sample.

Assumptions

There are assumptions about the relationship between physical activity and depression symptoms. For instance, one can assume that all adolescents will show an inverse relationship in their physical activity levels and depressive characteristics. Is it that physical activity increases mood, or is it other factors, such as body issue or social connectedness with others in the activity? Could it be that physical activity is the cause of happiness for those who have high levels of physical activity and express a positive mood? Is it that positive mood and happiness is the cause of high levels of physical activity for those who have high levels of physical activity and express a positive mood?

A few assumptions can be made also about the research methods. The expectation is that subjects will respond accurately to the survey questions. The generalization that students will understand all the questions may also affect research collection.

Definition of Terms

clinical depression. A mood disorder in which feelings of sadness, loss, anger, or frustration interfere with everyday life for weeks or longer (National Institutes of Health, 2011).

depressive characteristics or symptoms. Any signs or symptoms relating to depression. Feelings of guilt, worthlessness, sadness, anxiety, hopelessness, irritability, loss of interest in hobbies, fatigue, decreased energy, difficulty concentrating, changes in

sleep patterns, changes in eating patterns, suicidal ideation or attempt, and persistent aches, pains, or digestive problems (Johnson & Taliaferro, 2011).

metabolic equivalent (MET). A metabolic equivalent, or MET, is a unit useful for describing the energy expenditure of a specific activity. A MET is the ratio of the rate of energy expended during an activity to the rate of energy expended at rest (United States Department of Health and Human Services, 2008)

physical activity. Any activity that increases breathing and heart rate and may produce some sweat (CDC, 2011d).

prevention. Interventions that occur before the onset of the disorder (Gladstone & Beardslee, 2009).

Reynolds Adolescent Depression Scale (RADS)-A self-report measure (no appendix due to copyright) that provides clinicians and researchers with a brief and easy-to-administer evaluation of depressive symptomatology in adolescents (Reynolds, 2002).

Summary

Physical inactivity and depression are two health concerns that currently affect adolescents. Understanding the relationship between physical activity and depressive symptoms may help in promoting physical activity. Researching if adolescent groups differ in regards to physical activity and depressive symptoms would be beneficial in targeting physical activity to specific groups.

Chapter Two: Literature Review

Introduction

This study investigates the relationship between physical activity and depressive characteristics along with group differences among the adolescent population. This chapter covers literature review containing physical activity, depressive traits and depression, and relationship of physical activity to depressive characteristics. Physical activity topics will involve definition/recommendations and benefits of physical activity. Depression/depressive traits will focus on symptoms, problem, and treatment. Physical activity's relationship to depression will focus on physiology of physical activity related to depression on the brain and body, hypotheses about the relationship of physical activity and depression, and significant study research.

Physical Activity

Physical activity is defined as “any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level” (CDC, 2011d). The United States Department of Health and Human Services recommends that children and adolescents engage in a minimum of 60 minutes of physical activity daily, which should include moderate-intensity or vigorous-intensity aerobic physical activity. Intensity is the level of effort required to do an activity. A subject doing moderate-intensity activity can talk, but not sing during the activity (CDC, 2009). A person doing vigorous activity cannot say more than a few words without pausing for a breath (CDC, 2009).

Regular participation in physical activity among children and adolescents is related to demographic, personal, social, and environmental factors. (CDC, 2011d).

The 2009 national Youth Risk Behavior Surveillance System indicated that only 18% of high school students had been physically active for 60 minutes every day in the previous week (CDC, 2011d). And only 33% of high school students nationwide attended physical education classes five days per week (CDC, 2011d).

Regular physical activity is one of the most important things people can do for their health. Physical activity plays a role in controlling weight, lowering risk for heart disease or stroke, reducing risk of developing type II diabetes, lowering risk of developing some cancers (colon and breast cancer), strengthening bones and muscles, and improving mental health and mood (CDC, 2011c). Physical activity benefits increase the chances of living a longer life by reducing some major contributors of death and disease.

Depression

Depression can be defined as a mood disorder in which feelings of sadness, loss, anger, or frustration interfere with everyday life for weeks or longer (National Institute of Mental Health ([NIMH], 2011). Researchers often assess depressive symptoms in adolescents by using valid and reliable instruments like surveys and questionnaires to identify characteristics such as:

1. Sadness
2. Anxiety
3. Hopelessness
4. Feelings of guilt
5. Worthlessness
6. Helplessness
7. Irritability
8. Loss of interest in hobbies
9. Fatigue
10. Decreased energy
11. Difficulty in concentrating
12. Changes in sleep patterns

13. Changes in eating patterns
 14. Suicidal ideation or attempt
 15. Persistent aches, pains, or digestive problems
- (Johnson & Taliaferro, 2011)

Depression is ranked among the top five contributors to the global burden of disease, and its prevalence is increasing among young people (Birkeland et al., 2009). At any given time, 10–15% of children and adolescents worldwide can have symptoms of depression (Birkeland et al., 2009). Many youths experiencing depression show impairment in the home, school/work, family relationships, or social life domains (SAMHSA, 2008). Adolescence is a critical period, and depression during this time is associated with an increased likelihood of recurrence of symptoms later in life. Untreated major depressive disorder carries a high risk of substance abuse, legal problems, physical illness, poor academic and social functioning, early pregnancy, and exposure to negative life events (Lenz et al., 2009).

Two treatments are most often used. The treatments are talking with a clinician about problems, taking an antidepressant for symptoms, or a combination of both. Improvement takes time and more often 4–8 weeks for antidepressants to take effect (Harvard University, 2011). Current treatments do not always work for depression. Such treatments have been found to work for only about 50%–60% of cases under controlled research conditions (Gladstone & Beardslee, 2009).

Physical Activity's Relationship to Depression

The effects of exercise related to depressive characteristics on the brain and body are not entirely known. Animal studies have shown that physical activity increases levels of brain derived neurotrophic factor and promotes cell proliferation and 5-

hydroxytryptamine release (Wiles et al., 2011). Physiological mechanisms affecting the body from exercise may involve an increase in monoamine circulation, elevated body temperature, or lower hormonal responses from stress (Birkeland et al., 2009). Physical activity may also increase brain levels of the chemicals known to reverse symptoms of depression. Serotonin (an antidepressant), norepinephrine (an adrenalin-like protein), and endorphins (natural pain-killers) rise with sustained physical activity (Harvard University, 2009).

A meta-analysis study indicated a relationship between physical activity and depressive characteristics (Johnson & Taliaferro, 2011). It is unknown which is the cause and which is the effect in this relationship. There are two hypotheses about the potential relationship between physical activity and depressive characteristics (Birkeland et al., 2009).

The protection hypothesis. This states that physical activity protects against depressive characteristics. Biological and psychological mechanisms have been proposed to suggest how this protection effect occurs. For example, one biological hypothesis proposes that the relationship between physical activity and depressed mood is determined by acute physiological responses (Birkeland et al., 2009).

The inhibition hypothesis. Inhibition hypothesis speculates that depressive characteristics somewhat disables an individual's capability of being physically active. Thus, an inverse relationship between physical activity and depressed mood can be explained by the depressed person lacking the energy to be physically active. This inverse relationship also determines that a positive mood can give the surplus energy and motivation that is necessary to participate in physical activity (Birkeland et al., 2009).

Researchers have found a relationship between physical activity and depressive characteristics. Johnson and Taliaferro (2011) studied relationships of physical activity and depressive symptoms in adolescents by analyzing 19 various studies. All of the studies relied on self-report measures of physical activity or sports team participation to collect data.

Johnson and Taliaferro (2011) concluded that regardless of study design, sample size, sample demographic characteristics, or cutoff points for depressive symptoms and physical activity, studies consistently identified inverse relationships between physical activity, including sports participation, and depressive symptoms among adolescents. Only one study reviewed found no association between physical activity and depressive symptoms. Limitations of the research included different survey instruments used to measure physical activity in the various studies.

Wiles and associates (2011) conducted a cross-sectional study on physical activity related to depressive symptoms in adolescents for the Avon Longitudinal Study of Parents and Children. The aim of this study was to determine whether there is an association between objective measures of physical activity (total physical activity and time spent in moderate and vigorous physical activity) and adolescent depressive symptoms. The study involved 5,423 children aged 14 years, and physical activity data were collected for 62% of the participants who wore an accelerometer to measure physical activity and intensity. The participants also completed a mood and feelings questionnaire (MFQ) to assess depression symptoms. Only 62% of data was collected because some subjects did not meet the time requirements for wearing the accelerometer per day or failed to take the depressive characteristics survey (Wiles et al., 2011).

Wiles and colleagues (2011) went one step further than the Johnson and Taliaferro (2011) study by analyzing physical activity intensity related to depressive traits. They concluded there was no evidence for a differential effect of physical activity according to gender. The intensity of the physical activity (that is, percentage of time spent in moderate to vigorous physical activity) was not associated with depression in this cohort once total physical activity was taken into account. Thus, the results suggested that it is the *amount* of physical activity undertaken that is inversely associated with depressive symptoms in adolescents, rather than the *intensity* of that physical activity.

Birkeland and associates (2009) studied physical activity and depressive characteristics using a 10-year longitudinal study with a sample of 924 adolescents; data from subjects were collected 8 times from the age of 13 years to the age of 23 years. The data were analyzed using multivariate latent curve modeling. The researchers found that physical activity and depressed mood were inversely related throughout adolescence (Birkeland et al., 2009). They also concluded that changes in leisure-time physical activity and depressed mood are related, but the results do not provide support for the common assumption that a high early level of physical activity protects against later depressed mood; nor does a high early level of depressed mood act as a barrier for later physical activity (Birkeland et al., 2009).

Summary

Physical activity and depression are public health concerns. Studies have found that there may be a relationship between physical activity and depressive characteristics (Birkeland et al., 2009; Johnson & Taliaferro, 2011; Wiles et al., 2011). Given the high prevalence and costs of adolescent depression, the connection between early onset

depression and recurrence of disorder in adulthood, the impairment associated with youth depression, and the difficulty in treating depression once it has developed, efforts to prevent depression are warranted (Gladstone & Beardslee, 2009). The review of literature helped in determining the questions involved in this study. These questions involve determining the relationship of physical activity and depressive traits along with gender differences among the relationship.

Chapter 3: Research Procedures

Introduction

Research procedures in this study involved a non-experimental techniques to analyze physical activity levels in relationship to depressive characteristics in the adolescent population. This includes using cross-sectional survey research to examine the relationship between the variables of physical activity levels and depressive characteristics.

Research Design

Using a non-experimental research design allowed a practical approach to research the variables of the adolescent sample of physical activity levels in relationship to depressive traits in adolescents. Survey research will be used to collect data about adolescents' demographics, physical activity levels, and depressive characteristics. This self-report measure is used because it is simple to administer and a noninvasive procedure.

The research procedures involving adolescent participants was submitted to, and approved by the Minnesota State University, Mankato Institutional Review Board for the Protection of Human Subjects in Research (IRB).

The use of adolescent participants required permission from the school, and the parents (see appendix A, parental consent form), as well as assent from each participant (see appendix B, student assent form). There was a meeting with the school superintendent, principal, counselor, and cooperating English teacher to ensure student welfare, procedure methods, and role of counselor and cooperating teacher. For a student to be able to participate in the survey, his or her parent had to sign a consent form that

was handed out one week before the study. Students also received assent forms a week before the study. There were also copies handed out for parents and students to reference. Students were to bring a signed copy of each form back before the survey date.

Participant Selection

Participants were selected from the adolescent school population. The sample was taken from a Minnesota public high school by using an entire tenth-grade population from a local school. There were 90 tenth-grade students at this school, with 75 students divided among the 4 English classes. The anticipated number of participants was 100 students between the ages of 15–16 years old, but due to English enrollment limitations, the sample of 75 students was used with the hope for 50 participants. The participant selection was determined through communication with the high school principal. Tenth graders were chosen for practical reasons of being able to gather them all at one specific time along. Of the 75 students being used for sample size, nine were absent on the survey date and 22 didn't have signed consent forms, which left 44 to complete the survey.

Instrumentation

Instrumentation for this study was considered of valid and reliable surveys of physical activity levels and depressive characteristics among adolescent population. The physical activity questionnaire being used is the International Physical Activity Questionnaire (IPAQ) and using the short, seven day, self-administered format (IPAQ, 2002). The physical activity survey will measure how much physical activity students are currently getting and the approximate intensity of their physical activity (see appendix C,

physical activity and demographic characteristics survey). This survey was developed in 1998 and was subjected to extensive reliability and validity testing in 12 countries during 2000. The IPAQ is used for ages 15–69, has seven questions, and takes around five minutes for students to complete.

The Reynolds Adolescent Depression Scale is designed for health professionals to screen children for depressive symptoms in adolescents (Carnevale, 2011). It is a 30-item self-reported scale measuring the severity of depression in adolescents age 13–18. It is designed for the clinical and school setting and takes around 5–10 minutes to complete. Scoring is based on a four-point Likert scale Test where scores range from 30–120. The cutoff score of 77 is a positive screen for depression. Reliability for internal consistency was $\alpha = 0.90$ and $\alpha = 0.88$ (Carnevale, 2011). Test–retest was found to be 0.87 and criterion-related validity was noted to be $r(87) = 0.72, p < 0.001$ (Carnevale, 2011).

Procedures

Data was collected in the classroom setting using a tenth-grade English class. The approximately 75 participant used were divided among four English classes. The cooperating teacher received the parental consent and student assent forms a week before the survey date. The teacher handed out parental consent forms, student assent forms, and copies of each to the students. The teacher directed the students to return the parental consent forms before the survey date the following week. The cooperating English teacher collected the parental consent and student assent forms and placed them in the corresponding folder marked with the appropriate class period. The teacher then wrote the name of the students returning the forms on the folder of their English period. Writing down the names of the students who returned the parental consent forms helped indicate

who would be receiving the coded envelope with the survey on the research date. The survey was administered by the researcher. Before the start of the survey, the school counselor made a brief statement that directed the students to contact her for a meeting if they were concerned with any questions or answers from the RADS. The researcher reviewed how the survey was set up and discussed the six physical activity questions regarding vigorous, moderate, and walking activity for the past week. While the researcher was discussing the survey, the cooperating teacher was passing out an envelope to each student. Students with parental consent forms received an unmarked envelope, whereas students without parental consent were given an envelope with a letter on it. The students that had a letter were given a crossword puzzle in the envelope with the directions to do as much as possible, and that it wasn't homework. The students with a crossword puzzle were told they could hand in their envelopes when others started turning in envelopes. The students with a survey were directed to answer all 40 questions to the best of their knowledge. When finished, they were to put the survey back in their envelope and place their envelope in a backpack that was in the front of the room.

Data Collection and Analysis

Each student's envelope was given a coding number 1–44. Data from each of the 40 question's was entered into a spreadsheet. The spreadsheet was transferred into SPSS. Analysis of data involved descriptive statistics, Cronbach's alpha reliability analysis Pearson product-moment correlation, and independent sample t-tests.

Summary

The research study analyzing relationship between physical activity and depressive symptoms in adolescents was conducted in a school within a rural community.

The study involved a 10–15 valid and reliable survey which was administered in four tenth grade English classes. Of the possible 75 participants in the population, 44 turned in signed parental consent forms along with student assent and were able to take the survey. The survey gathered information on current physical activity levels and depressive symptomology.

Chapter 4: Results and Discussion

Data was collected by using a one-day cross-sectional survey which included questions related to the students demographic characteristics, physical activity, and depressive symptoms. The findings were generated on the 44 participants through the use of descriptive statistics, Pearson correlation analysis, Cronbach's alpha reliability analysis, and independent sample t-tests. Six tables were created to report findings from the survey. The low number of participants (only 44) participants limited the researchers capacity to analyze the data for research purposes.

Participants

There were 44 participants from a possible sample size of 75. The 75 possible sample participants were given parental consent forms a week before the survey date. There were 46 parental consent forms returned, and two participants were absent on the data collection date. There were 22 students who didn't have signed parental consent forms on the data collection date, and nine students were absent on the day of data collection. The response rate was 58.60%. Given that only 44 students participated in the study, the results cannot according to Krejcie and Morgan (1970) be considered representative of tenth grade students from the participating school.

The demographic characteristics questions involved gender, age, physical education participation, and sport participation. Of the 44 participants 65.9% were female and 34.1% were male (see table 1). The age range was between 15 and 17 with 40.9% of participants 15 years of age, 56.8% of participants 16 years of age, and 2.3% were 17 years old. There were 52.3% of participants currently enrolled in a daily physical education class and 45.5% who were not taking any physical education classes.

The proportion of students participating in sports once a month or less was 27.2%, whereas 72.8% participated in weekly to daily sport.

Certain characteristics of the population and sample size may have affected results. Of the sample size, only two participants had a RADS score that would be characterized as possible depression (see table 2). This fact, along with the insufficient population size and response rate may have had an affect on the results.

Results

Three research questions were being considered with respect to data collection and analysis:

1. What is the relationship between physical activity and depressive symptoms?
2. What is the relationship between physical activity intensity and depressive symptoms?
3. What are the differences between physical activity, intensity, and depressive symptoms between genders, between those in physical education and those who were not, and between those whose sport participation is three to seven days per week compared to those whose participation is one day monthly or less?

No significant relationship was found between physical activity and depressive symptoms among the 44 participants who took part in the study. Physical activity was calculated with an IPAQ survey and participants recalling how many minutes per day they performed vigorous, moderate, and walking activities. A MET total formula was used to multiply their minutes total by 8.0 for vigorous activities, 4.0 for moderate activities, and 3.3 for walking minutes.

Table 1

Frequency Counts (n), Percentages (%), mean (M), and Standard Deviation (SD) for Demographic Characteristics of Physical Activity Levels and Depressive Symptoms in Adolescents

Characteristics	N	%	M(SD)
Gender	44		
Male	15	34.1	
Female	29	65.9	
Age	44		15.61(.54)
15	18	40.9	
16	25	56.8	
17	1	2.3	
Sport Participation	44		
Never	4	9.1	
>Monthly	2	4.5	
Monthly	6	13.6	
Weekly	5	11.4	
3-4/Week	19	43.2	
Everyday	8	18.2	
Physical Education Participation	44		
Yes	23	52.3	
No	20	45.5	
Missing	1	2.3	

Depressive symptoms were calculated by 30 questions using the Reynolds Adolescent Depression Scale (RADS). The RADS is a self-report measure that provides clinicians and researchers with an easy-to-administer evaluation of depressive symptomatology in adolescents (Reynolds, 2002). There are four subscales for the depression scale involving dysphoric mood (DM), anhedonia/negative affect (AN), negative self-evaluation (NS), and somatic complaints (SC). Scoring is based a 4-point Likert scale, with total scores possibly ranging from 30–120. A score raw score of 76 or above would indicate a clinical severity of depression symptomology.

Table 2

Means (M), Standard Deviations (SD), and Cronbach's Index of Internal Consistency (α) for RADS Scales

Scale	N of Items	M(SD)	Cronbach's Alpha
(DM) Dysphoric Mood	8	17(4.94)	.852
(AN) Anhedonia/Negative Affect	7	10(2.69)	.724
(NS) Negative Self-Evaluation	8	12.61(4.22)	.82
(SC) Somatic Complaints	7	15.34(4.23)	.793
(CI) Critical Items	6	10.07(3.32)	.76
(RADS) Reynolds Adolescent Depression Scale	30	54.93(13.56)	.923

The reliability of RADS testing is shown in table 2. Only two participants out of the 44 scored reached the clinical severity cutoff point. The Pearson correlation analysis found no significant relationship between physical activity and depression symptoms (see table 3). The Pearson correlation analysis also found no significant relationships between physical activity intensity and depression symptoms.

Table 3

Pearson Product Moment Correlation Coefficients (r) for the Relationship between Physical Activity, Intensity, and Depressive Symptoms in adolescents

	MET	RADS
Vigorous Physical Activity	.807	-0.25
MET		.008

*=p < .05; **= p < .01

An independent t-test analysis was used to compare vigorous activity, total MET, and depression symptoms based on gender, involvement in sport, and participation in physical education or not to answer question 3. Males and females showed no significant differences in vigorous physical activity, MET total, and depression symptoms (see table 4). Participants in physical education class every day showed no significant differences than participants not in physical education in terms of vigorous activity, total MET, and RADS depression symptoms (see table 5). Participants involved in a sport three to seven days a week showed a significant difference from participants in sports one day a month or less in terms of vigorous physical activity with p < .01. Total MET and RADS

depression symptoms showed no significant difference between sport participation (see table 6).

Table 4

Means (M), Standard Deviations (SD), and Independent Sample t-tests Comparing VPA, Total MET, and RADS by Gender

Scale	Male M(SD)	Female M (SD)	t-value
VPA	1578.67(1196.46)	1718.00 (1938.32)	-.253
Total MET	3451.67(1628.28)	4070.14(4115.73)	-.557
RADS	52.13(10.68)	56.43(14.84)	-.990

Table 5

Means (M), Standard Deviations (SD), and Independent Sample t-tests Comparing VPA, Total MET, and RADS by Participation in Physical Education

Scale	Daily Physical Education M(SD)	No Physical Education M(SD)	t-value
VPA	1937.45(1953.31)	1432.00(1405.24)	-.954
Total MET	4546.02(3854.78)	3227.33(2907.59)	-1.242
RADS	56.22(15.18)	52.53(11.17)	-.880

Table 6

Means (M), Standard Deviations (SD), and Independent Sample t-tests Comparing VPA, Total MET, and RADS by Those in a Sport One Day a Month or Less to Those in a Sport 3–7 Days a Week

	Monthly	3-7 Days per Week	t-value
VPA	473.33 (627.80)	2348.62 (1806.26)	-3.479*
Total MET	2427.46 (1857.26)	4790.56 (3967.67)	-1.956
RADS	51.18 (14.05)	56.22 (14.51)	-.980

*P < .01.

Discussion

Results from correlation data analysis weren't similar to previous research findings (Birkeland et al., 2009; Johnson & Taliaferro, 2011; Wiles et al., 2011). Other research results, as stated above in chapter two, found that there was an inverse relationship among physical activity and depression symptoms. The hypothesis was that there should be an inverse relationship between physical activity and depressive symptoms. The small sample size may have affected the results. Having a larger sample may have more accurately depicted the 10–15% depression rate in adolescents (Birkeland et al., 2009) instead of the 4.5% rate in my participants. There was no relationship in physical activity and depression symptoms among the 44 participants. The use of a subjective survey may have also played a role in the difference of findings. An objective data collection method may have more accurately depicted physical activity minutes and intensity.

Physical activity intensity had no relationship to depressive symptoms. Previous research has shown that it is total time of physical activity and not intensity of activity that is related to depressive symptoms (Wiles et al., 2011). Once again, sample size may have limited results.

There was some difference between sport participation associated with time spent in vigorous activity. Participants who played sports 3–7 days per week were significantly higher in vigorous activity minutes. There were no significant differences in gender for vigorous physical activity, total MET, and RADS depressive symptoms. Total minutes in physical activity were higher for physical education and sport participants.

Chapter 5: Conclusions and Recommendations

Introduction

Low levels of physical activity have a relationship with depressive characteristics (Birkeland et al., 2009; Johnson & Taliaferro, 2011; Wiles et al., 2011). Understanding that there is a relationship between physical activity and depressive traits in the adolescent population will help contribute to effective ways to reduce depressive traits and increase physical activity. Physical inactivity and depression are public health concerns that affect everyone (Birkeland et al., 2009; CDC, 2011b; CDC, 2011c; Lenz et al., 2009). Being able to understand the relationship between physical activity and depression symptoms is important in setting recommendations and guidelines of physical activity to youths and adolescents.

Regular physical activity benefits increase the chances of living a longer life by reducing some major contributors of death and disease. Most adolescents are not receiving the recommended amount of physical activity daily. Only 18% of high school students had been physically active for 60 minutes every day in the previous week (CDC, 2011d). In addition, only 33% of high school students nationwide attended physical education classes five days per week (CDC, 2011d). Improving the current statistics of physical activity in adolescents would benefit not only our physical health but also mental health.

At any given time, 10–15% of children and adolescents worldwide can have symptoms of depression (Birkeland et al., 2009). Many youth experiencing depression show impairment in the home, school/work, family relationships, or social life domains (SAMHSA, 2008). The effort to prevent depression, especially depression that occurs

early in life, will benefit economic and public health domains. A very simple and practical preventive treatment such as physical activity could be a key to lowering adolescent depression and preventing depression from recurring later in adulthood.

The study conducted used a population of tenth graders from a rural Midwestern community. The population size was smaller than desired. Of the 75 student population, 66 were present that day, with only 44 having returned their signed consent forms to be eligible to participate in the study. The questions answered involved:

1. What the relationship is between physical activity and depressive symptoms?
2. What is the relationship between physical intensity and depressive symptoms?
3. Do groups, as defined by physical activity level and depressive symptoms, vary by gender, sport involvement, and physical education participation?

Conclusions

The conclusions of the study involved the limitation of an insufficient sample size represent and response rate. Therefore, the findings yielded only the students who participated in the study. The Pearson correlation analysis found no significant relationship between physical activity and depression symptoms. The Pearson correlation found no significant relationships between physical activity intensity and depression symptoms.

There was some difference among groups involved as described in question three. Sport participation three to seven days a week was associated with a significantly higher time spent in vigorous activity than those not participating three to seven days per week

in a sport. There were no significant differences in gender for vigorous physical activity, total MET, and RADS depressive symptoms. Total minutes in physical activity were higher for physical education and sport participants.

Recommendations

Recommendations regarding the findings from physical activity and the relationship with depressive symptoms will be divided into two subsections. The first will deal with recommendations for the practice in school and health settings. The second will deal with recommendations for future research along with improving research regarding relationship between physical activity and depressive symptoms in adolescents.

Recommendations for practice or implementation in school and health settings. Previous research has indicated an inverse relationship between physical activity and depressive symptoms (Birkeland et al., 2009; Johnson & Taliaferro, 2011; Wiles et al., 2011). Findings from the study may have been compromised by an insufficient sample size and response rate. Current researchers have made it clear that the majority of youth are not meeting the recommended amount of time spent in physical activity (CDC, 2011d). Current researchers have also shown that depression continues to burden adolescents (Birkeland et al., 2009). Thus, finding activities in school and school after-hours that promote physical activity will improve the problem of inactivity along with the possibility of prevention or limiting depression symptoms.

There needs to be focus on the promotion of physical activity for both the physical health benefits and the mental health benefits of exercise. The option for schools to use physical activity for enjoyment, physical health, and a positive mood may

affect the home, school/work, family relationships, or social life domains. In 2009, only 33% of high school students nationwide attended physical education classes five days per week (CDC, 2011d). Improving this proportion of students engaged in physical activity could be beneficial to increasing physical activity and overall health of adolescents.

How could schools improve this percentage of students engaged in physical activity? They could begin with increasing the requirements to take physical education or increasing the options of physical education elective courses. Schools should incorporate a proper health curriculum that emphasizes the importance of physical activity in overall health, which needs to include the mental health domain. In Minnesota, there is currently no state requirement to take a physical education or health course (Minnesota Department of Education, 2012). An effective health education program would involve teaching functional health information (essential knowledge), shaping personal values and beliefs that support healthy behaviors, shaping group norms that value a healthy lifestyle, and developing the essential health skills necessary to adopt, practice, and maintain health-enhancing behaviors (CDC, 2011a). An effective health curriculum should incorporate mental health knowledge and skills that could help adolescents to better understand depression and its symptoms.

There could also be opportunities for after-school sporting programs, such as intramurals or club sports that differ from the school-sanctioned teams. These club or intramural sports give students who aren't on a school-sanctioned team (because of the commitment needed, a lack of ability, or lack of competitive nature) an opportunity to stay active. Smaller schools lacking adequate participants, facilities, or equipment could combine to alleviate these issues. It was shown in the research study that students

playing on a sport team three to seven times per week had more vigorous physical activity along with an average of more physical activity time than those only participating monthly or less.

Recommendations for future research along with improving research. There is a lack of data in regard to physical activity's relationship to depressive symptoms among adolescents. The factors contributing to difficulties in researching physical activity and depression in adolescents involve working with consent of minors, finding an adequate sample population, the use of different survey instruments in previous studies, and being able to conduct subjective measurements regarding physical activity intensity and time. Determining if there is a cause-and-effect relationship from higher amounts of physical activity and the lowering or prevention of depression would also benefit in physical activity recommendations.

The sample population and return rates were lower than expected. Due to time constraints and limited access to students there was an insufficient sample population and associated with that was an inadequate response rate. Future studies will need a larger and more diverse sample population. Being able to conduct research among different schools would help gain a better understanding of a variety of students. If a larger sample size had been used, then demographic questions could have included ethnicity and possibly socioeconomic status. Analyzing groups based on these demographic characteristics would identify any differences among specified students.

This was a cross-sectional study, and future longitudinal research may present more accurate findings. Being able to collect objective physical activity data along with incorporating different levels of physical activity among specified groups may eliminate

subjective inaccuracies. This may more accurately help determine if physical activity may prevent or lower depressive symptoms among adolescents and any demographics who may be at a higher risk for low activity levels and high depressive symptomology.

Summary

Previous researchers have indicated an inverse relationship between physical activity and depressive symptoms in adolescents. Findings of this study were limited to the 44 students who participated in the survey due to the small population size and response rate (Krejcie and Morgan, 1970). The participants had no correlation between physical activity or intensity and depressive symptoms. Physical activity may improve physical and mental health (CDC, 2011b; CDC, 2011c). Understanding ways to promote physical activity in adolescents would be beneficial in reducing depressive symptoms and increasing physical activity. Understanding ways to prevent or treat depression symptoms early in life with practical methods, such as exercise, could help in decreasing depression.

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Appendix A

Parental Consent Form

Please print CLEARLY

Name of parent or guardian: _____

Address: _____

Telephone: _____

I am the legal guardian of _____. I consent for her or him to participate in a research project about the relationship of physical activity related to depressive characteristics. I understand that Marge Murray-Davis from the Department of Health Sciences at Minnesota State University Mankato (MSU) is director of the project. I understand that participation in this study includes the following commitment for my child and me:

- 1) Read and sign this consent form.
- 2) My child will complete a voluntary and anonymous survey that has 40 questions, and will measure physical activity and mood. (takes about 10-15 minutes).

Procedures

I understand that my child will be asked to complete an anonymous physical activity and depressive rating survey administered during English class. Participation in this survey should take approximately 10-15 minutes of the 50 minute English period. If parental consent is given along with assent of student, then at the time of research, a folder with the three part survey will be given while any student missing consent of parent or their own assent will receive a folder with an English worksheet inside. Researcher will have folders marked to know who will be receiving alternative worksheet and who will receive survey to help in not making it obvious who is not taking part in the survey.

Confidentiality

All information obtained in this project will be kept private by the staff of this research project. All information will be stored in a locked file cabinet. It can be viewed only by authorized research staff members. I understand that no information about my child will be released and no names will be recorded other than the consent forms. By law, the only times

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when information will not be kept confidential is if my child or I state that we are in imminent danger of harming ourselves or others, or in suspected cases of child abuse.

Risks and Benefits

I understand that the risks of participating in this study are less than minimal which may include embarrassment for students not taking survey. I understand that participating in this study will help the researchers better understand the relationship between physical activity and depressive characteristics. I understand that I can request a copy of the study's results (but not my child's results), which would be mailed to me after the end of the study. It is hoped up to 75 students will participate in the study.

Right to Refuse Participation

I understand that participation in this project is voluntary and my child and I have the right to stop at any time. If the parent does not give consent it will not affect the relationship with Pine Island High School in addition to MSU, Mankato.

Contact

I understand that I can contact Dr. Murray-Davis at 389-1527 or mmd@mnsu.edu about any concerns I have about this project. I understand that I also may contact the MSU Institutional Review Board Administrator, Dr. Barry Ries, at 389-2321 with any questions about research with human participants at MSU.

Voluntary Nature of Research

Participation in this research is voluntary. My child or I can stop at any time. My decision whether or not to participate will not affect my relationship with Minnesota State University, Mankato.

Date: _____ Signed: _____

With my signature, I affirm that I am at least 18 years of age and I have received a copy of the consent form to keep.

____ Parent/guardian received a copy

MSU IRB LOG # 300375-2

Date of MSU IRB approval: February 24, 2012

Appendix B

Student Assent Form

Student Participation Agreement

I would like to ask you some questions ABOUT your recent physical activity and mood.

Your name or other information that lets people know that the information is about you will not be used. Your answers will not be shared with your parents or anyone else, unless you are in danger of being hurt or hurting someone. If you have any questions about this project, you can ask them at any time.

You can refuse to be in the study and neither your parents nor the research staff will be upset. You can stop answering questions at any time and no longer be in the study just by letting me know you want to quit.

If you are unhappy about how you or other students have been treated in this research, tell your teacher or parent(s).

Date: _____ Signed by student: _____

___ copy provided to student

MSU IRB LOG # 300375-2

Date of MSU IRB approval: February 24, 2012

Appendix C

Physical Activity and Demographic Characteristics Survey

This is a voluntary and anonymous survey. It can be stopped at any time without affecting academic standing or grades. The intent of the study is to analyze the relationship between current physical activity and mood. There will be three sections of the survey. Section I is demographics, section II deals with physical activity, and section III is associated with mood. After completing all three sections, place your survey into your envelope and place the envelope in the assigned box.

Section I: Demographics

Please circle answer

1.)What is your age?

- 1) 14
- 2) 15
- 3) 16
- 4) 17

2.)What is your gender?

- 1. Male
- 2. Female

3.)In the previous 12 months, how often have you participated in school or community sports?

- 1) Never
- 2) Less than monthly
- 3) Monthly
- 4) 1-2 times per week
- 5) 3-4 times per weeks
- 6) Every day

4.) How many days per week do you attend physical education class?

- 1) 1
- 2) 2
- 3) 3
- 4) 4
- 5) 5
- 6) Not currently attending PE

Section II: PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that adolescents do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at school, work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the moderate to vigorous activities that you did in the last 7 days. Moderate to vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ days per week

No vigorous physical activities  Skip to question 3

2. How much time did you usually spend doing vigorous physical activities on one of those days?

_____ hours per day

_____ minutes per day

_____ Don't know/Not sure

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ days per week

No moderate physical activities  Skip to question 5

4. How much time did you usually spend doing moderate physical activities on one of those days?

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_____ hours per day
_____ minutes per day
_____ Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

_____ days per week

No walking  Skip to question 7

6. How much time did you usually spend walking on one of those days?

_____ hours per day
_____ minutes per day
_____ Don't know/Not sure

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