The Effects of Barometric Pressure on First Graders' Behavior

by

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A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Guidance and Counseling

Approved: 2 Semester Credits

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December, 2007

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Title: ***The Effects of Barometric Pressure on First Graders' Behavior***

Graduate Degree/Major: Master of Science in Guidance and Counseling

Research Adviser: **Amy Gillett, Ph.D.**

Month/Year: **December, 2007**

Number of Pages: **40**

Style Manual Used: **American Psychological Association, 5th edition**

ABSTRACT

In our modern day lifestyles as humans we may not always have the time to be in tune with our bodies and the surrounding effects of the weather. Some people can feel a weather pattern change from the moment they wake up, and others do not feel the effects of weather changes at all. Biometeorology is defined by Merriam-Webster Online as "A science that deals with the relationship between living things and atmospheric phenomena" (2007, n.p.).

Teachers being as busy as they are do not have time to spend during the day trying to get students to cooperate behaviorally or to maintain their attention. If a correlation exists between the barometric pressure and behavioral changes, teachers could check the barometric pressure before school starts to get an idea of how they will need to alter their lesson plans.

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Acknowledgements

I would like to thank my family for their continuous love and support throughout my life and education, my husband Brian for his love and dedication with me throughout the time we have been together, and the friends that I have met throughout my life that have encouraged me along the way. I would also like to thank Dr. Amy Gillett for being a great thesis advisor, the teachers that I have had throughout my life, and the teachers that participated in this research. Last but not least, I would like to thank Aaron J. Staut for his thesis topic *The Effects of Barometric Pressure on Elementary School Students' Behavior*; his thesis inspired me to perform further research on the topic.

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Chapter I: Introduction

In our modern day lifestyles as humans we may not always have the time to be in tune with our bodies and the surrounding effects of the weather. Some people can feel a weather pattern change from the moment they wake up from sleep, and others do not feel the effects of weather changes at all. Do you sometimes feel your brain is a little foggy? Do you have pain in your joints during some types of weather patterns? How about the dog, can you notice when he or she is acting a little strange? These things may all be related to the weather around us. Biometeorology is defined by Merriam-Webster Online as "A science that deals with the relationship between living things and atmospheric phenomena" (2007, n.p.).

PBS.org's *Health Week* made available an article written by Dan (nd) pertaining to the study of how atmospheric pressure (barometric pressure) may influence how you take a test or write an essay. This particular study was performed on twelve individuals including tasks such as mental exercises, proofreading, and memorization. Bruce Dan reported when the experimenters varied the barometric pressure in the room where the twelve participants were performing those tasks, they experienced changes in their performance. When the barometric pressure varied unsteadily like the conditions seen during a storm, all of the participants experienced attention drifts. When small controlled changes were made in the pressure, the attentive volunteers performed better, and the sluggish participants did not perform as well. Bruce Dan stated in his article, "No one is sure why, but it is thought that such changes in air pressure may cause changes in blood pressure, affecting brain activity" (n.d., p.1 ¶ 3).

Animals are also affected by the change in barometric pressure. After hunting whitetail deer in Midwestern Wisconsin for about 35 years, Larry Putman can predict rain or storms by the whitetail deer's behavior (L. Putman, personal communication, July 7, 2007). Mr. Putman explained that the whitetail deer will move and eat more when the barometric pressure is falling because they can sense that rain or a storm is approaching. The keen instincts of the whitetail deer are to eat and find shelter before the rain or storm arrive.

It is not fully understood how the barometric pressure affects fish. An article written by Adams (2006) titled *Effects of Barometric Pressure on Fishing*, described that fish activity can be related to the barometric pressure. Adams reported how the types of pressure affected fish behaviors. A clear day with high barometric pressure cause the fish to move toward deeper water, and the fish tend to move slower. As the barometric pressure rises and the skies are clearing, the fish move around a more. During average barometric pressure, ordinary fishing patterns were seen and the weather was reasonable. As the barometric pressure dropped, the weather became questionable, and the fish were at their most active peak. As the barometric pressure became lower, the fish slowed down and were less active as rain or a storm approached. The lowest barometric pressure was during a storm or rainfall and this inhibited fish activity. Adams stated, "It is important, however, to note that the effects of barometric pressure is greater in fresh and shallow waters, than it is in deeper waters" (2006, p. 1).

Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996) included a chapter in their book *Weather* pertaining to the weather and our health. They stated,

"Respiratory infections and muscular pains appear to be triggered by sudden changes in temperature and humidity that accompany both cold and warm fronts, especially when temperatures are low" (1996, p. 131). "Heart attacks, bleeding ulcers, and migraines have also been linked to abrupt weather changes" (1996, p. 131). Looking back to history and even today, people can sometimes predict weather patterns by pain in they feel in their joints.

Watson (1993) described how the weather has an effect on humans. It has been documented that many people in the world are sensitive to the weather. Variations in the atmospheric pressure can alter our moods, reactions, and attention. Watson explained, "For example, a sudden drop in barometric pressure (the first sign of an approaching storm) may cause the cells in your body to exert an increased outward pressure – at least until they adjust – which causes a bloated feeling, a headache, or grumpiness" (Watson, 1993, p. 17). Pressure change is what gives us the yucky feeling of swelling, irritability, and headaches. The barometric pressure can also cause us to be less active or more active throughout our day. The drastic weather changes have also been said to be linked to why suicide rates tend to be higher in early spring (Watson, 1993.)

Americans have developed myths about the animals and weather. If you have been outside before a storm, you may have noticed that insects tend to be more lively, birds fly lower, and the frogs start to croak more. Have you ever driven down a country road on an overcast day and started to smell rain in the air? Then further down the road you noticed a group of cows lying in the pasture gathered together? These are all examples of how the barometric pressure can be an indicator of a change in animal

behaviors. Although some of these patterns may not be statistically supported, it is evident to those who have repeatedly witnessed this phenomenon.

Teachers being as busy as they are do not have time to waste during the day trying to get students to cooperate behaviorally or to maintain their attention. If a correlation exists between the barometric pressure and behavioral changes, teachers could check the barometric pressure before school started to get an idea of how they will need to alter their lesson plans. For example, on a higher than average barometric pressure day teachers could adjust accordingly to students' sluggish behavior, and on a lower than average barometric pressure day, it may be more challenging to get work accomplished when children are more restless and lively.

Statement of the Problem

The purpose of this study was to explore the atmospheric pressure effects on first grade students' overall daily behavior reported by their teacher. The atmospheric pressure was recorded at 8:00am during the first part of the school day and also at 3:00pm at the end of the seven hour school day. The researcher recorded the atmospheric pressure with an instrument called a barometer from the website Weather Underground, which can be found at www.wunderground.com/ and is continuously updated throughout the day. The atmospheric pressure study was conducted from April 10, 2007 through May 18, 2007 at a rural school in northwestern Wisconsin. A Likert scale was used by the teachers to assess the students' overall behavior at 3:00pm for the seven hour school day. The atmospheric pressure change from 8:00am to 3:00pm was recorded and correlated with the Likert scale of the students' overall classroom behavior for the day.

Purpose of the Study

The purpose of this study was to analyze the possible connection between atmospheric pressure and first graders' classroom behavior.

Null Hypotheses

There will be no relationship between the daily variations in atmospheric pressure and the overall daily first grade students' behavior rating by their teachers.

Assumptions of the Study

There are some assumptions that go along with this study. It is assumed that the first grade children are developed behaviorally in adapting to the routine and schedule of school, and can demonstrate socially appropriate daily school behaviors that we commonly practice in the United States school systems. It will also be assumed that the teachers of the first graders will be openly willing to participate and will generate truthful answers on the Likert scale measuring the students' overall classroom behavior on a daily basis. Lastly, it will be assumed that the barometric pressure will be accurately recorded, whether by personal or mechanical functioning of the barometer.

Limitations of the Study

The researcher has identified various limitations to the study.

1. The first day of spring begins March 20th, and the students may be excited for the upcoming warm weather.

2. April/ May are close to the end of the school year and students may be "worn out from the school year," or "eager" that it is almost finished.

3. There may be a field trip or a school activity during the month of the study that could cause a change in the data, or any type of gathering at school that may cause energetic behaviors.

4. Aspects outside of school such as poor nutrition, family issues, friendships, an illness, academic struggles, poverty, did not sleep well the night before, and any other variable the child may have could adversely impact this study.

5. The teachers may not remain objective during the study, or may also adversely be impacted by the barometric pressure, which may cause them to alter their judgment of the overall classroom behavior for the day.

6. The lack of sunshine from cloud cover may cause the students and/or the teachers to demonstrate a lethargic demeanor.

Definition of Terms

For clarification, these definitions are the interpretations of the researcher.

Atmospheric pressure is the pressure at any point of the Earth's atmosphere and is commonly referred to as the "barometric pressure."

Barometer is an instrument used to measure the atmospheric pressure.

High Pressure Area is when the atmospheric pressure is higher than the surrounding area. This occurs with the presence of light winds and clear skies.

Low Pressure Area is when the atmospheric pressure is lowest compared to the surrounding area. This occurs with the presence of tropical storms, stronger winds, and overcast skies.

Station Pressure is when the atmospheric pressure ranges from altitudes different than sea level, theses include geographic specific readings.

Chapter II: Literature Review

Introduction

In this chapter the researcher will be providing background information in four main areas: weather basics, the history of weather inventors, how weather can affect species, and student behaviors in the classroom. This background information is to provide the reader with a foundation to explore the topic of how the barometric pressure may affect first grade students' behavior.

Weather Basics

To understand the effects of weather, it is important to understand the basic elements of weather. The troposphere is the lowest part of the atmosphere in which weather occurs. Species on Earth live in the troposphere layer of the atmosphere. According to Allaby (1995), the atmosphere is over 370 miles in thickness, and the weight from all that air pressure is on our Earth's surface. The force that is exerted downward is known as the pressure, hence the term atmospheric pressure.

Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996) explained the weather and some of the effects weather has on animals and humans. In their book *Weather,* the atmosphere was described in great detail. The Earth's atmosphere gives species the oxygen to breath, the water vapor that is needed in order to have weather, and the circulation of the wind that creates storms and varies our climate. Air is composed of trillions of molecules moving in all different directions, causing collisions between the molecules themselves and other particles in the atmosphere. When the molecules bounce off these other particles, it creates pressure in the air, also known as barometric or

atmospheric pressure (Burroughs et al., 1996). As the barometric pressure goes up, the molecules collide more frequently causing the barometric pressure to rise.

High atmospheric pressure is generally associated with clear skies, whereas low pressure is associated with cloudy skies and possibly precipitation or a storm moving into the area (Burroughs et al., 1996). A change in barometric pressure occurs as a warm air mass rises. It cools and spreads due to the lower temperatures higher in the atmosphere. When the air has cooled, it starts to sink back to Earth through gravity. In the locations where the air is rising, an area of low pressure occurs, where there is air sinking, high pressure occurs. Since the atmosphere works constantly to reach stability, air moves into the low pressure area from surrounding areas of high pressure. The movement from high to low pressure areas is always in one direction, and is what we call, the wind (Burroughs et al., 1996).

Air pressure was also described by Sloane (2005). "Air pressure is just another way of referring to air weight" (Sloane, 2005, p. 11). Barometric pressure is another term people often use when referring to air pressure. The barometer is the instrument that measures the amount of pressure in the air by weighing it. Since mercury is a liquid, has a high density, and will not evaporate, it is a commonly used substance for measuring barometric pressure.

Sloane (2005) described air movement. The movement of the air is wind, and it moves from high pressure areas to low pressure areas. "It first flows around the high-pressure area, all the while leaning outward; then it flows around the low-pressure area, all the while leaning inward" (Sloane, 2005, p. 12). "The steeper the slope of the

atmospheric hill or valley, the faster the air flowed downward (the higher is the wind)" (Sloane, 2005, p. 13). In the northern hemisphere the wind moves clockwise around the high pressure area, and then flows counterclockwise around the low pressure area. This is reversed in the southern hemisphere where the wind would flow counterclockwise around the high and clockwise around the low (Sloane, 2005).

History of Weather Inventors

Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996), included several chapters on how past generations reported and recorded weather. Aristotle and Theophrastus were from the golden age of Greek scholarship. "His treatise, *Meteorologica*, was an attempt to describe everything of a physical nature in the sky, air, sea, and earth, including all weather phenomena" (Burroughs et al., 1996, p. 64). In *Meteorologica,* Aristotle documented interesting things regarding the weather, but also had some misconceptions as well (Burroughs et al., 1996). When Aristotle retired, his student, Theophrastus, continued his work (cited in Burroughs, Crowder, Robertson, Vallier-Talbot, & Whitaker, 1996). Theophrastus wrote a book titled *On Weather Signs* which included 80 various signs of rain, 24 different documentations of fair weather, 50 of storms, and 45 of the wind. Some we would consider to be more like folklore today.

"Whenever there is fog, there is little or no rain (Burroughs et al., 1996, p. 65.). Today, we see this as truthful because fog generally occurs with settled weather near the center of a high pressure area. After Aristotle and Theophrastus, the Greeks continued to show a great interest in meteorology (Burroughs et al., 1996). When the Roman Empire

dissolved, civilization shifted to the Islamic world. During the Middle Ages, European scholars rediscovered the work of Aristotle.

Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996) further talked about how the Middle Ages and Renaissance was a time period when meteorology began to prosper. "Leonardo's journals contain numerous studies of weather phenomena and designs for meteorological instruments, including a hygrometer- a device for measuring humidity" (Burroughs et al., 1996, p. 67). The thermoscope was developed by Galileo, which was the first creation of what we know as the thermometer. Sadly, Galileo did not leave a trace of what he accomplished with his thermoscope.

Galileo's student, Evangelista Torricelli, made the first barometer. He took a glass tube that was about four feet long, and filled it with mercury, then inverted the open end into a dish of more mercury. "Torricelli noted that much of the mercury remained in the tube instead of going into the dish, and that the space above the mercury in the tube was a vacuum" (Burroughs et al., 1996, p. 67). Torricelli decided that the air pressure changes is what caused the variations in the height of the mercury in the tube (Burroughs et al., 1996).

During the Age of Reason, meteorological observations continued improving and advancing. Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996) documented that Gabriel Fahrenheit created the Fahrenheit measurement for temperature, which is still commonly used in the United States. Because of Torricelli's previous invention, the atmospheric pressure was fairly simple to calculate. During the Age of Reason variations of the barometers were created using different fluids. Robert Boyle

invented two different types of barometers, one made from water, and the other a siphon device which was more transportable.

The Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996) book contains valuable pieces on the history of weather. Many Severe storms have struck the Great Lakes, sinking numerous ships, and killing countless people between the years 1868 and 1869. As a result of the tragic loss of life, President Ulysses S. Grant signed a law in 1870 that established the first national weather service in the United States. This weather service has predicted weather and protected many lives over the past century.

Moving into the Modern Era, Burroughs, Crowder, Robertson, Vallier-Talbot, and Whitaker (1996), documented the use of satellites and computers to monitor our weather systems. The late 1900's was a time of technological changes for the advancement of predicting weather. Today, we use extensive equipment and experts to predict weather. Even with modern technology, weather cannot always be predicted quick enough to save lives. For example, when hurricane Katrina ripped through New Orleans the residents who stayed behind did not anticipate the flood gates breaking from the waves crashing upon it. This left thousands of people stranded without food or drinking water. Weather has devastating affects on living species and non-living things on Earth. Although not all weather can be predicted in time to save lives, the current technology has done a wonderful job of saving numerous lives.

How the Weather Can Affect Species

The barometric pressure has been studied by several researchers. In a research study by El-Mallakh, Nair, Piecznski, and Schory (2003), it was proposed that violent

acts, along with why psychiatry patients needed immediate assistance were linked to low barometric pressure. This study obtained information about patients that were checked into the impatient emergency psychiatric at the University of Louisville Hospital in 1999. The researchers also obtained information from the Police Department in Jefferson County regarding violent offenses. The researchers examined the amount of emergency psychiatric patients along with violent offenses for 337 days. Although, the research did not find a strong link between low barometric pressure and emergency psychiatric visits, and low barometric pressure and violent offenses, a correlation still existed (El-Mallakh et al., 2003).

When humans feel sinus pressure it may be caused by the change in barometric pressure (Williams, 2005). During a cold or when your sinuses are stopped up, the change in barometric pressure becomes more noticeable. More air may enter your sinuses during high pressure, and if the air pressure suddenly falls before a storm, the pressure in your sinuses needs time to adjust. During this period of adjustment it may be uncomfortable as the pressure moves out of the sinuses. The uncomfortable feeling in your sinuses also may occur when you are flying on an airplane and have a sudden altitude change, or if you are taking an elevator that quickly goes up many floors (Williams, 2005).

Student Behaviors in the Classroom

Research by Barry (2006) investigated how children from birth to the age of eight behave based on memory skills learned. Memory has not been fully developed at this point in a child's life, but this time period serves as the building blocks for future

memory skills. With younger children it is effective for adults to give small easy commands when initiating a behavior. For example, when asking the students in your classroom to clean up an area it may be more effective to ask them to, "put the lids tightly on the paint," "wash the brushes with soap in the sink," "put the paint and the brushes in the drawer," and "remain seated quietly when you are finished". These specific verbal commands said slowly, and repeated will help young children understand exactly what is expected of them versus just saying "clean up the classroom". After repeating the steps of the process many times, the children will have the background knowledge to understand what "cleaning up the classroom" means (Barry, 2006).

In a classroom where young children are talking it is better to say "talk quietly" than "do not yell" because in their speed of processing it takes more time to process negative information than it does to process positive information (Barry, 2006). Teachers may notice when they ask a question to the class they may call on an eager student to answer a question and the student says "ahh, I forgot," this is usually because the younger child has used up all of their limited amount of processing memory to get your attention to call on them. Overtime the amount of basic knowledge increases along with how the information is organized and processed (Barry, 2006).

With the amount of time first grade teachers spend in the classroom with their students, they can observe changes in the overall feel of the classroom. I have heard teachers say when a rain or snow storm is approaching the children are more "lively". While doing my practicum for school counseling in the elementary school, I noticed these changes while giving guidance lessons to the first grade classrooms. It could be linked to

the barometric pressure, or it could be linked to other factors such as: the children are excited or nervous for approaching weather, the reaction the teachers and faculty have about approaching weather may affect the students' reactions, or their behavior may be linked to other weather elements or external factors.

Chapter III: Methodology

Introduction

This chapter includes information regarding how the sample was selected, a description of the sample, and the instruments used. In addition, data collection, along with data analysis procedures is given. The chapter concludes with the methodological limitations.

Subject Selection and Description

Participants were chosen from a rural school near by the local weather recording station for the most accurate barometric recording. Selection of participants was based on students in the first grade for the purposes of developmental reasoning. Upon receiving approval from the principal of the school, the researcher left the consent form, along with the Likert scale for the principal to distribute to the first grade teachers. The teachers were instructed to mail the consent form to the researcher prior to data collection. At the end of the data collection, the teachers were instructed to mail the data back to the researcher. A copy of the consent form sent to the teachers is located in Appendix A.

Only the first grade teachers were invited to participate in this study and were chosen due to the amount of time they spend in the classroom with the students on a regular basis. The students were unaware that their teachers were observing and recording their behavior therefore limiting biases. The first grade has four-full time teachers with about 20 students in each classroom.

Instrumentation

The researcher used two instruments to record data for this study. One was a barometer to measure the atmospheric (barometric) pressure, and the other was a Likert scale created by the researcher to measure the teachers' perception of first graders' behavior. The Likert scale was created by the researcher; no pilot study was performed, nor was the instrument tested for validity or reliability. The Likert scale was made up of five variables to rate the students' behavior including: 1=sluggish, 2=between sluggish and usual, 3=usual, 4=between usual and lively, 5=lively. A copy of the instrument used can be found in Appendix B.

The barometric reading was taken from the Weather Underground. The website www.wunderground.com/ provides a station located in Eau Claire, Wisconsin, which was the closest weather station to the elementary school in this study. The researcher recorded the atmospheric pressure with an instrument called a barometer used by the website Weather Underground, which can be found at www.wunderground.com/ and is continuously updated throughout the day.

The atmospheric pressure study was conducted from April 10, 2007 through May 18, 2007 at a rural school in northwestern Wisconsin. The Likert scale was used by the teachers to assess the students' overall behavior at 3:00pm for the seven hour school day. The atmospheric pressure change from 8:00am and 3:00pm was recorded and correlated with the Likert scale of the students' overall classroom behavior for the day.

The purpose of this study was to examine the effects that atmospheric pressure had on first graders overall daily classroom behavior. The reason for choosing first grade

would be they have the developmental skills of the appropriate behaviors our United States public school system deems acceptable. Also, first graders are generally in the Piaget's pre-operational phase, which may inhibit the students' ability to think abstractly about the effects the barometric pressure is having on their behaviors and overall feelings of being lively or sluggish.

Data Collection Procedures

The barometric pressure was recorded at 8:00am and 3:00pm for the duration of the 29 day study through the Weather Underground webpage, which was on average updated hourly at the time the researcher recorded data. At 3:00pm the teachers were instructed to circle on the Likert scale what the overall rating of their classroom was for the day, this included: 1=sluggish, 2=between sluggish and usual, 3=usual, 4=between usual and lively, 5=lively.

Data Analysis

The difference in barometric reading from 8:00am and 3:00pm was recorded. The researcher compiled the four overall behavior ratings from each of the teachers' Likert scale for an average behavior rating score. The difference in barometric reading and overall behavior score were analyzed through a computer program titled Statistical Program for Social Sciences, version 15.0 (SPSS, 2006). A Correlation was used to determine if there was a statistically significant relationship between barometric pressure change and overall classroom behavior, using Pearson r correlation coefficient. Significance was set at the .05 level.

Limitations

The following are limitations of the methodology from this study:

1. The Likert scale was not tested for validity for reliability prior to being used for this research.

2. No baseline data was taken prior to the study for comparison of results.

3. Other schools were not included in this sample, limiting data to this particular school.

Chapter IV: Results

Introduction

This chapter will present demographic information of the participants in the research study. It will also include statistics regarding the outcome of the study and conclude with the research hypothesis.

Demographic Information

For purposes of confidentiality, the name of the school was not identified. The demographics the researcher can provide is that of the four first grade teachers, 100% participated. Each teacher had on average 20 students in a classroom. The school is located in a small town, in the Midwestern region of Wisconsin.

Item Analysis

The results from the study are reported in Table 1. There was more variation in classroom behavior noted in classroom one, however, when the classroom data was combined, there were not appreciable variations verified. See Table 1 for the complete data. In addition, a copy of the raw data is provided in Appendix C.

Table 1: Barometric Pressure Change and Behavior Rating Scale

Date	Barometric Pressure Change From 8:00am to 3:00pm	Average Overall Behavior Rating for the Four Classrooms	Behavior Rating for the First Classroom	Behavior Rating for the Second Classroom	Behavior Rating for the Third Classroom	Behavior Rating for the Fourth Classroom
4/10	-.11	3.25	3	3	3	4
4/11	-.12	4	4	4	4	4
4/12	.07	3	3	3	3	3
4/13	-.07	3	3	3	3	3
4/16	-.13	2.25	3	3	3	2
4/17	.01	3.25	2	4	4	3
4/18	-.10	3	3	3	3	3
4/19	-.05	4	3	4	4	5
4/20	-.08	4.25	4	5	4	4
4/23	.08	3.75	5	3	3	4
4/24	-.05	3.75	4	3	3	5
4/25	0	3.25	3	3	3	4
4/26	-.12	4	3	4	4	5
4/27	-.04	4	3	5	4	4
4/30	-.12	2.5	2	2	3	3
5/1	.02	3	3	3	3	3
5/2	-.04	3.5	3	4	3	4
5/3	-.10	3.75	3	5	4	3
5/4	-.08	4.5	4	5	5	4
5/7	-.08	3.75	3	5	5	2
5/8	-.05	3.75	3	5	4	3
5/9	-.06	3.5	3	4	4	3
5/10	-.04	3	3	3	3	3
5/11	-.20	3	2	3	3	4
5/14	-.15	3	2	4	3	3
5/15	.07	3.5	3	4	4	3
5/16	.02	3	3	4	3	2
5/17	-.06	4	4	5	4	3
5/18	-.13	4	3	5	4	4

Null Hypothesis

There will be no relationship between the daily variations in atmospheric pressure and the overall daily first grade students' behavior rating by their teachers. Pearson r correlation coefficient was used to analyze the data. Results from the analysis specified there was no relationship found between barometric pressure change and overall classroom behavior at the .05 level, therefore the null hypotheses was not rejected ($r=.023$; $p=.906$).

Chapter V: Conclusions and Recommendations

Introduction

This chapter includes conclusions of the research and recommendations for further research.

Conclusions

Although classroom one noted more variation in behavior in relationship to barometric pressure change, the overall study suggested that there was no relationship between the pressure change and all the classroom students' overall behavior during the school day. The barometric pressure has been studied by several researchers including research performed by El-Mallakh, Nair, Piecznski, and Schory (2003), a correlation existed between violent acts and barometric pressure change, and emergency psychiatry visits were also correlated to low barometric pressure.

In the research performed by Staut (2001), he also documented no relationship between barometric pressure change and overall students' classroom behavior. The research performed was not to say that the only cause in the change of students' behavior was due to the barometric pressure change, but rather suggest that the change in barometric pressure could be one of the many factors of a change in student behavior.

Recommendations for Further Research

Future changes that could be done to enhance data on this topic are:

1. Determine the months with the most frequent weather variations and plan the study to occur during that time period.

2. Invite more teachers and schools to participate in the study.

3. Incorporate other elements of weather into the study.

4. Ask teachers to document important events or activities that occurred each day.

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Appendix A:

Consent to Participate In UW-Stout Approved Research

Title: The Effects of Barometric Pressure on First Graders' Behavior

Investigator: Nicole J. Blaskowski **Research Sponsor:** Amy L. Gillett

Description:
For twenty nine continuous school days during the time period of April 10th and May 18th, the researcher will record the barometric pressure from a local weather station www.weau.com/weather which is continuously updated throughout the day. The barometric recordings will occur at 8:00am and 3:00pm. At 3:00pm the first grade teachers will complete one question on the Likert scale asking what the overall energy level of the classroom was for the day. After the study, the researcher will take an average of the two barometric recordings and correlate it with the Likert scale recordings from the teachers.

Risks and Benefits:
The risks are minimal. The first grade teachers will use a Likert scale to assess the overall daily classroom energy level of the first grade students. The students will be unaware that their teacher is rating their overall behavior for the day.

The benefits of this study are valuable. If a correlation is found, then first grade teachers can check the barometric pressure before school and make modifications to their lesson plans according to the anticipated energy level of the students. This can improve the effectiveness of teachers' lesson plans and decrease the amount of wasted time in the classroom.

Time Commitment and Payment:
The time commitment of this study will be minimal. It should take about thirty seconds at the end of each day to circle one number on the Likert scale provided. No payment will be given to the participants.

Confidentiality:
Your name will not be included on any documents. I do not believe that you can be identified from any of this information. This informed consent will not be kept with any of the other documents completed with this project.

Right to Withdraw:
Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation at this time without incurring adverse consequences.

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Statement of Consent:
By signing this consent form you agree to participate in the project entitled, *The Effects of Barometric Pressure on First Graders' Behavior.*

_____

Signature Date

Appendix B:

The Effects of Barometric Pressure on First Graders' Behavior

Likert Scale

Rate the overall classroom behavior on a scale from 1 to 5: sluggish being 1, 2 being between sluggish and usual, usual being 3, between usual and lively a 4, and lively a 5. This should be completed at about 3:00pm when the students have left for the day, each day for thirty continuous school days.

	1 sluggish	2	3 usual	4	5 lively
Day 1: 4/10	1	2	3	4	5
Day 2 : 4/11	1	2	3	4	5
Day 3: 4/12	1	2	3	4	5
Day 4: 4/13	1	2	3	4	5
Day 5: 4/16	1	2	3	4	5
Day 6: 4/17	1	2	3	4	5
Day 7: 4/18	1	2	3	4	5
Day 8: 4/19	1	2	3	4	5
Day 9: 4/20	1	2	3	4	5
Day 10: 4/23	1	2	3	4	5
Day 11: 4/24	1	2	3	4	5
Day 12: 4/25	1	2	3	4	5
Day 13: 4/26	1	2	3	4	5

	1 sluggish	2	3 usual	4	5 lively
Day 14: 4/27	1	2	3	4	5
Day 15: 4/30	1	2	3	4	5
Day 16: 5/1	1	2	3	4	5
Day 17: 5/2	1	2	3	4	5
Day 18: 5/3	1	2	3	4	5
Day 19: 5/4	1	2	3	4	5
Day 20: 5/7	1	2	3	4	5
Day 21: 5/8	1	2	3	4	5
Day 22: 5/9	1	2	3	4	5
Day 23: 5/10	1	2	3	4	5
Day 24: 5/11	1	2	3	4	5
Day 25: 5/14	1	2	3	4	5
Day 26: 5/15	1	2	3	4	5
Day 27: 5/16	1	2	3	4	5
Day 28: 5/17	1	2	3	4	5
Day 29: 5/18	1	2	3	4	5

Appendix C:

Barometric Pressure and Weather Data Collected

Day 1: Tuesday April 10, 2007
8:00am: Barometric pressure: 30.04
Clear and 27 degrees Fahrenheit

3:00pm: Barometric pressure: 29.93
Clear and 45 degrees Fahrenheit

Day 2: Wednesday April 11, 2007
8:00am: Barometric pressure: 29.79
Flurries and 30 degrees Fahrenheit

3:00pm: Barometric pressure: 29.67
Flurries and 36 degrees Fahrenheit

Day 3: Thursday April 12, 2007
8:00am: Barometric pressure: 29.83
Partly cloudy and 33 degrees Fahrenheit

3:00pm: Barometric pressure: 29.90
Cloudy and 43 degrees Fahrenheit

Day 4: Friday April 13, 2007
8:00am: Barometric pressure: 30.22
Clear and 33 degrees Fahrenheit

3:00pm: Barometric pressure: 30.15
Clear and 53 degrees Fahrenheit

Day 5: Monday April 16, 2007
8:00am: Barometric pressure: 30.13
Clear and 37 degrees Fahrenheit

3:00pm: Barometric pressure: 30.00
Clear and 67 degrees Fahrenheit

Day 6: Tuesday April 17, 2007
8:00am: Barometric pressure: 30.02
Clear and 46 degrees Fahrenheit

3:00pm: Barometric pressure: 30.03
Clear and 60 degrees Fahrenheit

Day 7: Wednesday April 18, 2007
8:00am: Barometric pressure: 30.12
Clear and 41 degrees Fahrenheit

3:00pm: Barometric pressure: 30.02
Clear and 64 degrees Fahrenheit

Day 8: Thursday April 19, 2007
8:00am: Barometric pressure: 30.13
Clear and 43 degrees Fahrenheit

3:00pm: Barometric pressure: 30.08
Partly cloudy and 66 degrees Fahrenheit

Day 9: Friday April 20, 2007
8:00am: Barometric pressure: 30.25
Clear and 48 degrees Fahrenheit

3:00pm: Barometric pressure: 30.17
Clear and 70 degrees Fahrenheit

Day 10: Monday April 23, 2007
8:00am: Barometric pressure: 29.89
Partly cloudy and 53 degrees Fahrenheit

3:00pm: Barometric pressure: 29.97
Cloudy and 68 degrees Fahrenheit

Day 11: Tuesday April 24, 2007
8:00am: Barometric pressure: 30.16
Clear and 47 degrees Fahrenheit

3:00pm: Barometric pressure: 30.11
Clear and 61 degrees Fahrenheit

Day 12: Wednesday April 25, 2007
8:00am: Barometric pressure: 30.04
Clear and 47 degrees Fahrenheit

3:00pm: Barometric pressure: 30.04
Clear and 59 degrees Fahrenheit

Day 13: Thursday April 26, 2007
8:00am: Barometric pressure: 29.
Cloudy and 46 degrees Fahrenheit

3:00pm: Barometric pressure: 29.78
Cloudy and 56 degrees Fahrenheit

Day 14: Friday April 27, 2007
8:00am: Barometric pressure: 29.83
Clear and 46 degrees Fahrenheit

3:00pm: Barometric pressure: 29.79
Clear and 71 degrees Fahrenheit

Day 15: Monday April 30, 2007
8:00am: Barometric pressure: 29.99
Clear and 57 degrees Fahrenheit

3:00pm: Barometric pressure: 29.87
Clear and 68 degrees Fahrenheit

Day 16: Tuesday May 1, 2007
8:00am: Barometric pressure: 29.88
Cloudy, foggy, and 47 degrees Fahrenheit

3:00pm: Barometric pressure: 29.90
Clear and 66 degrees Fahrenheit

Day 17: Wednesday May 2, 2007
8:00am: Barometric pressure: 30.15
Clear and 50 degrees Fahrenheit

3:00pm: Barometric pressure: 30.11
Clear and 63 degrees Fahrenheit

Day 18: Thursday May 3, 2007
8:00am: Barometric pressure: 30.20
Clear and 47degrees Fahrenheit

3:00pm: Barometric pressure: 30.10
Clear and 70 degrees Fahrenheit

Day 19: Friday May 4, 2007
8:00am: Barometric pressure: 30.10
Cloudy and 55 degrees Fahrenheit

3:00pm: Barometric pressure: 30.02
Cloudy and 66 degrees Fahrenheit

Day 20: Monday May 7, 2007
8:00am: Barometric Pressure: 30.04
Drizzle and 59 degrees

3:00pm: Barometric Pressure: 29.96
Overcast and 64 degrees Fahrenheit

Day 21: Tuesday May 8, 2007
8:00am: Barometric Pressure: 30.05
Partly cloudy and 61 degrees Fahrenheit

3:00pm: Barometric Pressure: 30.00
Scattered clouds and 75 degrees Fahrenheit

Day 22: Wednesday May 9, 2007
8:00am: Barometric Pressure: 29.97
Clear and 61 degrees Fahrenheit

3:00pm: Barometric Pressure: 29.91
Clear and 79 degrees Fahrenheit

Day 23: Thursday May 10, 2007
8:00am: Barometric Pressure: 29.93
Clear and 54 degrees Fahrenheit

3:00pm: Barometric Pressure: 29.89
Mostly cloudy and 78 degrees Fahrenheit

Day 24: Friday May 11, 2007
8:00am: Barometric Pressure: 30.14
Clear and 57 degrees Fahrenheit

3:00pm: Barometric Pressure 29.94
Light rain and 54 degrees Fahrenheit

Day 25: Monday May 14, 2007
8:00am: Barometric Pressure: 29.77
Clear and 73 degrees Fahrenheit

3:00pm: Barometric Pressure: 29.62
Clear and 94 degrees Fahrenheit

Day 26: Tuesday May 15, 2007
8:00am: Barometric Pressure: 29.88
Cloudy and 61 degrees Fahrenheit

3:00pm: Barometric Pressure: 29.95
Overcast and 56 degrees Fahrenheit

Day 27: Wednesday May 16, 2007
8:00am: Barometric Pressure: 30.09
Cloudy and 45 degrees Fahrenheit

3:00pm: Barometric Pressure: 30.11
Drizzle and 46 degrees Fahrenheit

Day 28: Thursday May 17, 2007
8:00am: Barometric Pressure: 30.38
Clear and 41 degrees Fahrenheit/

3:00pm: Barometric Pressure: 30.32
Clear and 66 degrees Fahrenheit

Day 29: Friday May 18, 2007
8:00am: Barometric Pressure: 30.20
Partly cloudy, 54 degrees Fahrenheit

3:00pm: Barometric Pressure: 30.07
Clear and 75 degrees Fahrenheit