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Rekstad, Lindsay C. *A Case Study on the Effects of Allergic Rhinitis on the Academic Performance and Behavior of a School-Aged Child*

Abstract

This study focused on the impact of allergic rhinitis symptoms on academic performance in an eighth-grade female student diagnosed with environmental allergies. The student was asked to complete a survey two times per week regarding the severity of her allergic rhinitis symptoms. The researcher then compared her weekly severity of symptoms to her average academic performance for that same week in order to determine a possible trend.

Results indicate that there appears to be a small relationship between the severity of allergic rhinitis symptoms and academic performance. Additionally, the student indicated that when she experienced allergic rhinitis symptoms (i.e. lethargy/moodiness, eye and/or sinus symptoms) she reported that her daily functioning was impacted the majority of the time. Educators and parents are in optimal positions to provide support to students suffering from allergic rhinitis symptoms. An increase in the awareness of this impact on academic performance can offer multitudes of support for students who are affected.

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Chapter I: Introduction

Benjamin is a fourth grade boy who has recently been struggling in class. His teacher has noticed that he appears drowsy and has a difficult time concentrating on class activities.

Benjamin has frequently been asking to go to the nurse because his head hurts and he feels very tired. With no improvement over two weeks, Benjamin's mother brings him to the doctor. They diagnose him with allergic rhinitis caused by dust mites and mold. The doctor strongly suggests to Benjamin's mother that action be taken to diminish Benjamin's contact with the allergens.

When Benjamin's mother brings the issue to his teacher, she is unsure how to handle the situation while he is in school.

Benjamin's symptoms were classified as allergic rhinitis (AR) and are extremely common throughout the United States and the world. Allergic rhinitis is more commonly known as hay fever. Symptoms are very similar to that of a cold, but are actually caused by the body's reaction to a foreign substance (Gershwin & Klingelhofer, 1998). These symptoms can include itchy, watery eyes, nasal congestion, sneezing, and postnasal drip. Such symptoms can lead to a variety of consequences in children that include decreased learning ability, lower school performance, sleep impairment, daytime fatigue, and missed school days. The National Medical Expenditure estimated that approximately 824,000 days of school are missed each year due to allergic rhinitis symptoms in the 1987 survey (Blaiss, 2004b). Since then, the number has risen to an estimated 2 million days of missed school annually by those under age 18 (Borres, 2009).

Allergic rhinitis was considered the fifth most prevalent chronic health condition in the United States in the 1990's (Stewart, 2008). Approximately 40 million people are affected each year and one-third are younger than 18 years of age (Zipp et al., 2008). The prevalence is so

great that a large number of cases go undiagnosed. Although the disease is not life-threatening, the consequences are still very alarming. The quality of life for a child can decrease dramatically, performance in school can suffer, and the likelihood of developing other diseases such as asthma, chronic sinusitis, and other respiratory complications increases as well (Blaiss, 2004a).

Common causes of allergic rhinitis include mold, pollen, animal dander, dust mites, pollutants, and other airborne particles. These substances can be found almost anywhere on earth and do not always depend on the time of year. Some of these allergens are considered seasonal, while others are common year-round (Blaiss, 2004b).

Whether a student is allergic to a substance seasonally or year-round, attention should be given during the time the allergen is present. Certain supports should be put into place to provide the best learning and home environment possible for students. The supports and adjustments will depend on the allergy, and are very imperative to the success of the student.

The onset of allergic rhinitis can occur at any age and the severity does not always lessen over time (Monroe, 2001). Oftentimes allergies can show up unexpectedly and can be quite severe (Cutler, 1998). Data has shown that symptoms resolve in only 10 to 20% of children within 10 years of the onset. That leaves a large majority of allergic rhinitis sufferers to deal with the symptoms over a long period of time (Blaiss, 2004a). As symptoms arise, the likelihood of a child presenting a learning disability is more likely. Borres et al. (2002) reported that children with allergies are more likely to have difficulty concentrating, staying alert, and attending school. Blaiss (2004a) also stated that children with allergic rhinitis can be so short-tempered and fatigued that they disrupt classroom activity and adversely influence their relationships with peers.

Allergic rhinitis can cause many health issues that make it very difficult for a child to cope with day-to-day activities. In addition to the illness, students are also responsible for keeping up with school and performing to the best of their ability. Oftentimes children with allergies appear as though they are performing inferior to their classmates who do not suffer from allergies (McLoughlin et al., 1983). If that is the case, then efforts need to be made to ensure that students with allergies do not fall so far behind their same age peers that they are unable to catch up.

Along with trying to promote an ideal environment for children with allergies, there are many medications that can help control the symptoms of allergies and prevent allergic rhinitis. Popular methods include pills and nose sprays. Antihistamines are pills that work to counteract the histamines that are released from the nose and eyes when an allergen comes in contact with an individual. It is these histamines that essentially cause the allergic rhinitis symptoms and can make it unbearable for the individual (Gershwin & Klingelhofer, 1998). Nose sprays also work well to prevent the symptoms of allergic rhinitis. Nose sprays stop the reaction before it even occurs. Nose sprays are considered to be safer than pills because they do not cause drowsiness and are not completely absorbed by the body (Gershwin & Klingelhofer, 1998). In recent years, Van Bever and Potter (2006) have illustrated how studies completed by Potter (2005) and de Blic, Wahn, Billard, Alt, and Pujazon (2005) concluded that treatment with an antihistamine improves the quality of life in children suffering from allergic rhinitis. Van Bever and Potter (2006) have argued that overall improvements of quality of life should be considered just as, if not more, important as symptom improvement.

Statement of the Problem

Prior research has been conducted on the affects of allergic rhinitis on academic performance in students under the age of 18. It is widely known that allergic rhinitis symptoms can be problematic for any individual; however, long-term research looking directly at the impact on classroom performance is sparse.

This study, conducted between December 2010 and May 2011, explored the possible impact allergic rhinitis symptoms can have on a school-aged child's academic performance.

Purpose of the Study

This study chose to focus on one individual student in order to gain detailed data over a period of several months. The purpose of this study was to investigate the potential link between allergic rhinitis symptoms and its impact on academic performance. Additional focus was put on determining if the severity of symptoms also related to an increase in school absences. This study also sought to focus on what implications the subject personally felt specific symptoms had on daily functioning. Based on the above purposes, the following research questions were formed to gain insight into the impact of allergic rhinitis on a school-aged child:

1. Does the severity of allergic rhinitis symptoms correlate with lowered academic performance?
2. Does the severity of allergic rhinitis symptoms correlate with an increase in school absences?
3. How often does the student feel that the presence of eye and nose/sinus symptoms impacts her daily functioning?
4. How often does the student feel that the presence of lethargy and moodiness related to allergy symptoms impacts her daily functioning?

5. What teacher support does the student feel helps her to do her best academically while experiencing allergic rhinitis symptoms?

Assumptions of the Study

This research was based around a case study approach in order to gain a significant amount of information about one specific individual. It was felt that this approach would allow for more accurate and in-depth data.

Structured interviews and surveys were completed to gain information on the prevalence of allergic rhinitis symptoms and background information on the student involved in the case study. Additionally, teacher reports were used to gather information on the weekly academic performance of the student.

It was assumed that the student and her parents reported honestly throughout, and that teachers reported weekly grades accurately. It was also assumed that the interviews and surveys that were used gathered appropriate and thorough information on the targeted topic. The surveys and interviews were created assuming they were developmentally appropriate for the student as well.

Definition of Terms

Allergic Rhinitis – Allergic rhinitis is commonly referred to as hay fever. The disease is quite widespread. The disease typically presents itself during early school age. Typical symptoms include repeated sneezing, nose itching, runny nose and nasal congestion. Eye symptoms also are often present (Borres, 2009, p. 1088).

Eustachian tube – a dynamic organ connecting the middle ear to the uppermost part of the throat that allows for pressure equalization of the middle ear space, drainage of fluid from the

middle ear space, and protection of the middle ear space from materials and sounds emanating from the uppermost part of the throat (McGrath & Michaelides, 2011, 202).

Limitations of the Study

In terms of the literature reviewed for this research, limitations exist in the amount of research information compiled. It is unlikely that every study that has been conducted on the subject was reviewed for this study.

As a case study, the results are not meant to be generalized beyond the interview sample. However, it is hoped that this research will bring attention to this issue and the importance of further research in the area of education and allergic rhinitis.

Methodology

The methodology of this paper included gathering information on one individual student's allergic rhinitis symptoms and academic performance on a weekly basis. The allergic rhinitis symptoms were gathered through survey, while data on academic performance was gathered through online reports provided by the student's classroom teachers. The weekly data was analyzed to determine if a correlation existed between the reported symptoms and academic performance. Further detailed explanation of Methodology can be found in Chapter 3.

Chapter II: Literature Review

This chapter will include information on the prevalence of child and adolescent allergic rhinitis, symptoms, possible causes, and prevention inside and outside of school. In addition, information on what constitutes academic achievement will also be addressed. This chapter will conclude with information on research that has been conducted regarding allergic rhinitis and the effect on academic achievement.

Prevalence

Allergic rhinitis affects up to 40% of the United States population under the age of 18. However, a large number of adolescent cases go undiagnosed and untreated each year (Blaiss, 2004a). Many children start off with seasonal allergy symptoms that develop into year-round allergies that can be an even larger burden (Brody, 1997). Allergy symptoms are so common that Seargeant (1997) stated that “one out of every five pediatric visits is allergy related” (p. 15). So many physician visits can add up when expenses are considered. It is estimated that 2.3 billion dollars are spent each year on allergic rhinitis related doctor visits concerning children under the age of 12 (Blaiss, 2004b). Additionally, the direct and indirect costs associated with allergic rhinitis have been estimated at 4.6 billion dollars (Zipp et al., 2008).

The prevalence of allergic rhinitis has risen dramatically over the past 20 years. The number of children affected compared to 20 years ago has doubled (Blaiss, 2004b). It is now estimated that one-third of individuals diagnosed with allergic rhinitis are under that age of 18 (McCabe, 2008). The increase is so overwhelming that many are wondering why the frequency has risen so dramatically. The incidence of allergic rhinitis in early childhood is less than two percent, however, the prevalence increases dramatically after age two once a child is repeatedly exposed to consecutive seasons of allergens in the air (McCabe, 2008). Allergies can influence

people of all ages and races, but heredity has a lot to do with whether an individual will become an allergic rhinitis sufferer or not. If one or both parents of a child have allergies, the chances of the child inheriting those allergies go up considerably. If one parent has an allergy, the likelihood of a child inheriting the allergy is about 30%. However, if both parents have an allergy the likelihood climbs to 60%. Those numbers are much greater than the probability of a 10% chance of developing an allergy if neither parent has an allergy (Brody, 1997).

The prevalence of allergic rhinitis can also be affected by location within the United States. Those who live in rural areas have a higher probability of coming into contact with allergic rhinitis triggers and sparking allergic rhinitis symptoms compared to those who live in the cities with a lower chance of coming into contact with allergen causing symptoms (Gershwin & Klingelhofer, 1998). It should be noted that no matter what the circumstance, allergic rhinitis is not contagious and cannot be passed from one person to another. The illness is caused by the predisposition of one individual and is unique to each individual (Monroe, 2001).

Symptoms

Allergic rhinitis is characterized by a number of symptoms caused by substances that are generally breathed in through the air. The majority of the substances in the air are considered harmless. However, the body's immune system attacks substances that could be harmful such as viruses and other illness-causing agents. Sometimes the immune system mistakenly attacks a non-threatening substance such as pollen or mold. The immune system releases antibodies to fight off the substances. One antibody emits chemicals called histamines in the lining of the nose and eyes. Histamines can cause the eyes to water, turn red and itch, and the nose to run. Aside from the nose and eyes, many other symptoms may occur (Monroe, 2001). Allergies can cause sore throats, nasal congestion, fatigue, stomachache, headache, and tenderness in the cheeks and

forehead (Brody, 1997). It is important to note that not all of the symptoms listed are going to be present in every individual with allergic rhinitis. Symptoms can vary from person to person (Blaiss, 2004b).

In actuality, symptoms of allergic rhinitis are very similar to the symptoms of a common cold. The major difference is the duration of symptoms. A common cold generally lasts for about a week and then the symptoms diminish. Allergic rhinitis on the other hand, can last for weeks or even months. Some people have year-round symptoms because the allergens they are allergic to are in the air year-round (Brody, 1997).

It has been reported that approximately 30-40% of allergic rhinitis sufferers show symptoms for up to five hours after the original exposure to the allergen that caused the reaction. This occurs mainly because the body continues to emit chemicals to continually fight the allergen that has entered the body (McCabe, 2008).

It is important to note that once an individual becomes sensitized to certain allergens, more frequent exposure can cause immune responses in anticipation of the exposure. Repeated exposure causes the threshold of an allergic reaction to lower substantially. This is commonly referred to as priming. Priming affects the response to certain allergens, but can also cause reactions to other encountered allergens as well (McCabe, 2008). This effect can lead many seasonal allergy sufferers to not only react to their usual seasonal allergens, but exacerbate reactions to year-round allergens as well (McCabe, 2008).

One of the larger concerns with allergic rhinitis in children is the inability for many children to express their symptoms accurately. The result generally is an inappropriate diagnosis and treatment. Many children often present with recurrent sore throats or upper respiratory tract infections (Stewart, 2008).

Aside from physical symptoms, allergic rhinitis can have a debilitating effect on the lifestyle of an allergic rhinitis sufferer. As stated earlier, allergic rhinitis symptoms can impair a child enough that he or she may have difficulties learning, sustaining attention, and sleeping. Children are also more likely to become fatigued and perform poorly in school (Blaiss, 2004b). Studies have looked at overall health-related quality of life of children and adolescents affected by allergic rhinitis. The studies indicate that “allergic rhinitis is associated with fatigue, poorer health perception, and disturbed social function in adults, and learning impairment, difficulty integrating with peers, anxiety, and family dysfunction in children” (McCabe, 2008). These symptoms can be severe enough to prevent a child from attending school on some days. Children who live in environments that continually expose them to mold, dust, pollutants and vermin are much more likely to continually miss school days. Increased school absences contribute largely to the probability of a child falling behind in school and struggling with grades (McCabe, 2008).

If a child with allergic rhinitis symptoms does come to school, the chances are great that the symptoms will contribute to greater difficulty concentrating, physical discomfort and general unhappiness. Symptoms have been shown to effect short-term memory and recall, fatigue and intermittent hearing loss that can affect attention at times. Sleep patterns also can be affected by allergic rhinitis symptoms and lead to diminished attention and academic performance (McCabe, 2008).

Complications associated with allergic rhinitis in children can lead to behavioral and functional problems. A study completed by Brawley et al. (2004) reported that 75 percent of children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) also reported two or more symptoms of allergic rhinitis, 100 percent were considered genetically predisposed for the

allergy and 69 percent tested positive to at least one allergen. Implications of the study indicated that nasal obstruction, sleeping disorders and other allergic rhinitis symptoms may be suggestive of ADHD (Borres, 2009). It is crucial that assessments be completed in order to determine whether or not allergic rhinitis is having an impact on a child's behavior before such diagnoses are made.

It has also been reported that children with allergic rhinitis are two times more likely to have a depressive episode due to their lack of overall life satisfaction (Blaiss, 2004b). It is important to note the effect symptoms of allergic rhinitis can have on an individual's mental health. Many students with allergic rhinitis symptoms carry tissues, blow their nose frequently, rub their eyes and nose and take medications. These behaviors can be distracting to peers and possibly lead to teasing. Certain difficulties students with allergic rhinitis experience while in school have been connected to low self-esteem and embarrassment in childhood (McCabe, 2008). Other studies have found a definite link between allergic rhinitis and anxiety and depression (Borres, 2009).

At the current time, there is no evidence to support the claim that allergic rhinitis causes learning disabilities or any long lasting delay in achievement. On the other hand, the repetitive absenteeism, lack of sleep, and reduced ability to concentrate are shown to influence a child's ability to learn effectively in the classroom (McCabe, 2008). Some medical professionals suggest that allergic rhinitis symptoms can even have an effect on an individual's physical growth. Recent research has found that children with disorders such as asthma, dermatitis, and allergic rhinitis are two to five times more likely to display a shorter stature and a slowing of bone maturation. The main cause of the retardation in bone maturation is due to a chemical released during the presence of an allergen. The chemical released effects the growth factor

prostaglandin E2 from being synthesized in osteoblasts and negatively effects bone growth (McCabe, 2008).

Possible Causes

Depending on what region a child resides, the allergens may vary. The largest concern in one region may be pollen and dust mite exposure, while alternative inhalant allergens (chemicals) may be problematic in others (Muraro et al., 2010). There are numerous different airborne allergens that are found in the air. A few of the most common are plant pollens, dust, dust mites, molds, animal dander, pollutants, and other airborne particles (household cleaners, perfumes, soaps, and detergents). One or more of these allergens can cause allergic rhinitis symptoms in an individual (Gershwin & Klingelhofer, 1998). The main issue that individuals with allergic rhinitis struggle with is eliminating contact with the many allergy triggers they may come into contact with.

Pollen is given off many plants as part of their reproduction. A pollen particle is so small that thousands of them could fit on the head of a pin. Pollen allergies are most common in the spring and come mainly from trees (Gershwin & Klingelhofer, 1998).

Dust and dust mites can be found inside and outside. Dust is made up of many different components, but the most influential in causing allergic rhinitis symptoms is the dust mite. They are mainly responsible for the allergic reactions to dust. Dust mites are most comfortable in humid and warm conditions. When their bodies or feces are inhaled, an allergic reaction is caused. Dust mites live in fabrics such as carpet, drapes, mattresses, blankets, pillows, stuffed animals, etc. (Gershwin & Klingelhofer, 1998).

A mold allergic reaction is caused by inhaling spores from mold. Mold is found both indoors and outdoors. Mold also grows in moist and warm conditions (Gershwin &

Klingelhofer, 1998). In a home, mold is often found in basements, bathrooms, and kitchens where there tends to be a more moist environment.

Animal dander is essentially the flakes of skin off of an animal. An individual can be allergic to one or more types of animals. Most common are cats and dogs; however, rabbits, hamsters, mice, birds, and horses are also included. Between 5 to 10% of the population has an animal allergy and the number continues to rise as the number of in-home pets rise as well (Monroe, 2001).

Pollutants are found in the air due to industrial and vehicular emissions. Pollutants are more likely to be a factor in urban settings where the emissions are much more common and tend to have permanent and temporary severe air pollution (Gershwin & Klingelhofer, 1998).

Other airborne allergens tend to come from household chemicals, detergents, perfumes and soaps. Most airborne allergens emit an overpowering odor and usually are irritating to individuals with the allergy. Not too much is known about other airborne allergens and dealing with symptoms is dealt with through trial and error (Gershwin & Klingelhofer, 1998).

Prevention

When planning on implementing preventative measures for school-aged children, it is wise to consider where a child will be spending his or her time each and every day and what allergens may be hidden within that environment. During the school year, a student spends the majority of his or her time in school and at home. Those are the primary places of concern. When a child begins to fall behind in school, it is necessary to provide supports at home and in school in order to limit the contact with allergens that may be causing the illness. There are many different types of supports to consider when trying to provide a healthy environment for a child with allergies and prevent allergic rhinitis from occurring.

If a child is allergic to dust and/or dust mites, there are several preventative measures that can be taken. At home, mattresses, pillows, and box springs should be covered in an allergen-proof encasement. Bedding should also be washed in hot water once a week to rid them of dust mite remnants. Carpet and stuffed animals should be kept to a minimum in the house and should not be in the child's bedroom. Indoor humidity should also be kept to a minimum of less than 50% in the home. At school, the environment should be quite similar in order to accommodate individuals with dust and/or dust mite allergies. Humidity should be kept to a minimum and can be done so with an air conditioner. Schools should replace carpeting with tile floors in order to reduce dust mite occurrences (Blaiss, 2004a).

Pollen is another common allergen that causes allergic rhinitis in children. Schools should keep windows and doors closed to prevent pollen-filled air from entering the learning environment. Children with strong pollen allergies should refrain from going outside when there is a high pollen count (Blaiss, 2004a). Indoor recess and gym class should be encouraged during that time of the year for those students. At home, the windows closed and students should refrain from being outside during times when pollen counts are high. Children should refrain from camping, hiking, and raking leaves when the pollen count is high as well. If possible, a HEPA filter could be installed to clean the air that is circulated throughout the house. It is also encouraged that children take showers or baths before going to bed to ensure that their body and hair is free of pollen particles (Blaiss, 2004a).

Mold and fungi can be a large allergic rhinitis contributor. In order to accommodate those students with mold and fungi allergies, additional steps can be taken. Meticulous cleaning is very important at both home and school. Like dust mite prevention, carpet should be avoided to prevent mold growing underneath. Humidity should be kept to a minimum and air conditioning

can help with that. Special filters can be added to air conditioners to trap mold spores and clear them from the air. A dehumidifier can be helpful as well, but should be properly maintained (Cutler, 1998).

Mold-growing inhibitors can also be added to many areas of home and school. Shower curtains, tile walls, tubs, and toilet tanks can all be treated with mold-inhibiting solutions to prevent mold growth on the damp surfaces. Mold can also grow in basements, so it is imperative that those who are allergic to mold do not have a room in a basement or near a damp area in the house (Cutler, 1998). The classroom the student spends the day while in school should also be in an area away from damp places where there could be possible mold growth.

Schools should also impose a rule that no working animals be allowed on school premises (Borres et al., 2002). The remnants of the animals could spark an allergic reaction to any child who comes in contact with it. Homes should also be free of animals that could trigger an allergic reaction. Rules should also be imposed to control the airborne particles that are being deposited into the air within the school. Perfumes and strong smelling skin or hair-care products should not be worn excessively by teachers and/or students, and cleaning products should lack a strong scent as well (Borres et al., 2002).

It is very important to be a keen observer of a child's allergy symptoms so identification of triggers can be determined. It is possible that allergy symptoms may be worse in the morning because a pillow may be full of dust mites, or the bedroom may have mold. Avoiding the allergens is considered the best therapy for allergies, but it takes some effort (Schultz et al., 1994).

One important aspect of allergies to consider is the lack of training and knowledge professionals within schools will have with allergies. Oftentimes the environment within the

school will be lacking in qualities that will minimize the risk for allergens in the air. Parents and nurses need to be advocates for change within the schools because they possess the knowledge of the supports that would be most beneficial for students (Sander, 2003). Despite the large amount of literature on allergy management, schools are often poorly prepared and informed. It is imperative that parents communicate information on student allergies to the school in order to prevent complications in the school setting (Muraro et al., 2010).

Academic Achievement

Academic achievement can have many meanings to people. Some would define achievement as the proficiency in the core subjects of math and reading. Others would say that academic achievement is characterized by the ability to learn information that makes an individual able to contribute to society (Center for American Progress, 2006). When people are concerned with allergies affecting the academic performance of a child with allergic rhinitis, they are usually concerned with how well he or she is performing in school. The easiest way to determine how a student is doing in school is to look at their grades and determine if the overall performance is different when allergies are affecting his or her health. For instance, a child with pollen allergies may develop allergic rhinitis in the spring when the pollen count is the highest in the air. If that is the case, it is possible that a drop in grades from winter to spring could be a consequence of the symptoms of allergic rhinitis.

Previous Research

Research regarding allergic rhinitis and academic performance has increased in recent years. However, only a handful of researchers have dedicated the time to empirically study the effects that allergic rhinitis can have on a student's academic performance. Many researchers have conducted reviews of literature regarding the effects of allergic rhinitis. Recent research

suggests that allergic rhinitis can have a much larger effect on a student's learning than many originally presumed (McCabe, 2008).

Research Based on Literature

Michael S. Blaiss wrote an article on behalf of The Allergic Rhinitis in Schoolchildren Consensus Group in 2004. The article was published in the *Current Medical Research and Opinion* journal. The consensus group consisted of academic, school and healthcare providers who possessed a great deal of experience and knowledge concerning allergic rhinitis. The goal of the article was to gather a variety of information in order to accurately assess how severely allergic rhinitis can affect school-aged children. Based on the compiled information, the group aimed to determine how to improve screening, prevention, diagnosis and treatment to ensure the highest quality of life and school performance for this school-aged population. The group was able to make conclusions about the effects of allergic rhinitis symptoms on school-aged children, as well as the effects of allergic rhinitis medications on school-aged children (Blaiss, 2004a).

Based on the group's collected information, it was determined that allergic rhinitis symptoms can have considerably harmful effects on absenteeism, cognitive impairment, poor school performance and behavioral and psychosocial problems in schoolchildren. The researchers suggested that the effects the allergic rhinitis symptoms can have on academic performance is significantly unrecognized (Blaiss, 2004a). Uncontrolled symptoms of allergic rhinitis were concluded by the group to impair cognitive functioning and risk optimum learning ability within the classroom. For example, a student may be present in the classroom, but they are not able to cognitively concentrate on what is being presented in class. The group conducted a survey of adolescents in order to determine what effects allergic rhinitis has on their school performance. The majority of adolescents reported that they experience difficulty doing

homework, difficulty focusing on problems, and was less able to get school activities accomplished when their allergic rhinitis symptoms were present (Blaiss, 2004a).

In addition, researchers found that children with allergic rhinitis can become more irritable and tired that result in inattention and difficulty concentrating on class material. More alarming behavioral patterns were acknowledged as well within the youth population as well. The symptoms of allergic rhinitis can become so severe that they begin to distract students and noticeably influence their in-class behaviors. Students will often not only be distracted, but become unresponsive and disinterested in tasks as well. It is also possible that the symptoms may drive the student to elicit disruptive behaviors. Such behaviors can negatively affect the relationships between the student and their peers/teachers (Blaiss, 2004a).

Unfortunately, allergic rhinitis symptoms can occur all year long. Those with seasonal allergies are afflicted in fall and spring with allergies, which both occur during the traditional school year. Allergic rhinitis can lead to the development of other serious comorbidities such as sinusitis and asthma as well. Early diagnosis of allergic sinusitis is crucial in reducing the impairment caused by allergic rhinitis, but can only be established through increased education and awareness in schools and in the home (Blaiss, 2004a).

In order to obtain a reliable representation of the effects of allergic rhinitis on school performance, the researchers also collected information regarding medications for allergic rhinitis symptoms. Treatment for allergic rhinitis in children is very similar to allergic rhinitis in adults, but more close attention needs to be paid to side effects and how susceptible children may be. Some of the current forms of treatment identified by the research group were antihistamines, decongestants, corticosteroids, mast cell stabilizers, anticholinergics, and allergen-specific immunotherapy (Blaiss, 2004).

Antihistamines remain the most common form of treatment for allergic rhinitis symptoms and are mainly available for oral use. Antihistamines work by blocking the histamine effects on cell surfaces and nerve endings. First and second-generation antihistamines are available. First-generation antihistamines are usually found over the counter and are traditionally found to be “sedating” (Blaiss, 2004a). Second-generation usually require a prescription and are found to be less or non-sedating. Sedation can have a negative effect on a child’s school performance; therefore, it is recommended by the researchers that non-sedating antihistamines are tested before sedating antihistamines on younger children (Blaiss, 2004a).

Decongestants are commonly used to treat nasal congestion caused by allergic rhinitis; however, decongestants really have no influence on other symptoms such as itching, sneezing or runny nose. Pseudoephedrine is commonly one of the main drugs found in decongestants and can cause nervousness, irritability, and insomnia because the drug has a tendency to effect the Central Nervous System (Blaiss, 2004a).

Intranasal corticosteroids act against allergic rhinitis symptoms by being administered nasally. Most symptoms of allergic rhinitis are found to be treated with intranasal corticosteroids. Not many side effects have been reported, but the researchers were able to identify one large effect intranasal corticosteroids causes within children. It has been reported by several studies that intranasal corticosteroids may have an effect on the growth of young children. It was recommended by the researchers that use of intranasal corticosteroids be used in severe cases of allergies in order to control the severe symptoms that may occur (Blaiss, 2004a).

Mast cell stabilizers relieve allergic rhinitis symptoms such as itching, sneezing, and runny nose, but have little effect on nasal congestion. Possible side effects include sneezing and

burning. A positive of this type of drug is that it is approved for the use in children under the age of 6 years (Blaiss, 2004a).

Anticholinergics prevent nasal secretion and ultimately runny nose. Unfortunately, anticholinergics have no effect on other allergic rhinitis symptoms. Side effects of this drug include nosebleeds, blood-colored mucus and nasal dryness. Not much data has been collected regarding this drug, and is not recommended for use in children under the age of 12 (Blaiss, 2004a).

Immunotherapy is recommended when antihistamines and other treatments do not diminish side effects of allergic rhinitis. Immunotherapy also aids in preventing the development of asthma in school-aged children. Because of the risk of anaphylaxis, immunotherapy should only be used in severe cases of allergic rhinitis and should be discontinued if benefits are not noticeable (Blaiss, 2004a).

Based on the research The Allergic Rhinitis in Schoolchildren Consensus Group conducted, they made several conclusions to guide further research and strategies that can be used to ensure children with allergic rhinitis are being properly taken care of. The group stated that allergic rhinitis can be a debilitating disease if not treated properly and create large negative effects on a child's school performance. One recommendation that was made by the group was to increase education and awareness encompassing allergic rhinitis in order to properly diagnose and treat it. The group maintained that early detection and prevention are very important in minimizing the impact on the education of children (Blaiss, 2004a).

Prevention strategies such as removing carpet in school classrooms to eliminate risk of mold growth may not always be possible; however, schools should take special efforts to make the learning environment as allergen free to the students who suffer from allergic rhinitis as

possible. Oftentimes, preventative strategies may not be enough for some individuals. If that is the case, the group recommends involving a medical doctor to determine the need for medications in order to control symptoms (Blaiss, 2004a).

As stated earlier, the group was able to evaluate what drugs are most beneficial to children based on side effects and the effectiveness of relieving allergic rhinitis symptoms. The group concluded that antihistamines are the medication of choice for school-aged children, but should be evaluated for side effects before having a child take it. Antihistamines such as fexofenadine have been shown to increase school attendance and classroom performance due to the non-sedating side effects (Blaiss, 2004a).

Moreover, the group also stresses the need for communication between parents, educators and medical professionals in the management of allergic rhinitis and school performance (Blaiss, 2004a). The research conducted by The Allergic Rhinitis in Schoolchildren Consensus Group, serves as a framework for any professional or parent dealing with allergic rhinitis in a child they know and serve.

Bruce G. Bender published an article in the *School Psychology Review* in 1999 concerning asthma and allergies and the likelihood that they are causal for learning disorders. Bender (1999) collected a variety of data pertaining to asthma and allergy effects on development. He also reported information on how medications and side effects of allergic rhinitis and asthma can contribute to poor school performance (Bender, 1999). This research focuses on allergic rhinitis, so the Bender's findings regarding asthma will not be reported.

It has been reported that allergic rhinitis is one of the most frequent causes of school absences in the United States. Prevalence has risen dramatically in recent years in every region of the country. It has been suggested that children with allergic rhinitis may have trouble

adapting to school, attending school and experience obstacles within learning. New reports suggest that allergic rhinitis may be a cause, or associated, with changes within a child's brain. If this were true, it would explain the academic difficulties children with allergic rhinitis face and the frequent diagnosis of specific learning disabilities (Bender, 1999). Bender (1999) reported on several studies that addressed this issue and was able to come up with what he considered to be an accurate conclusion.

Several researchers have conducted studies on the assumption that allergic rhinitis causes brain changes severe enough to indicate learning disabilities. A few studies have concluded that it is a large possibility that learning disabilities can be mediated by autoimmune diseases such as allergic rhinitis (Bender, 1999). Bender (1999) found one study by Pennington, Smith, Kimberling, Green and Haith (1987) that concluded allergic rhinitis is found to be increased in populations with dyslexia. This research supports the assumptions that allergic rhinitis could have an effect on normal brain development and manifest in a learning disability or behavioral problems (Bender, 1999).

Havard (1975) also conducted a study that concluded that individuals with allergic rhinitis may experience difficulties with auditory and visual processing as a result of allergic rhinitis symptoms. Within this study, Havard (1975) reported that many children who are considered to be hyperactive, language disabled, lazy, minimally brain damaged, or emotionally disturbed may have allergic rhinitis problems underlying their disability. Bender (1999) also reported on several other studies that indicated attention deficit disorders as an underlying effect of allergic rhinitis.

Succeeding research has not supported the results reported in the previous studies. Samples of hyperactive children were assessed in studies done by McGee, Stanton, & Sears

(1993) and Mitchell, Aman, Turbott, & Manku (1987). The results of the studies concluded that there was no connection between allergic rhinitis and an increased incidence of hyperactive children. McLoughlin et al. (1983) also conducted a study and concluded that achievement levels of children with allergic rhinitis were no different than children not diagnosed (Bender, 1999).

Based on the inconsistent information Bender (1999) collected from a variety of resources, he concluded that there was no clear evidence to support that allergic rhinitis interferes with normal brain development and has the potential to cause learning disabilities and behavioral problems. It is possible that some children may experience allergic rhinitis as well as learning disabilities, but it does not mean one causes the other (Bender, 1999).

Despite the conclusions of the previous studies, Bender (1999) did state that many children with allergic rhinitis may have difficulty in school due to school absence, illness symptoms interfering with concentration, hearing loss, sleep loss and medication side effects. School absence is common in children with allergic rhinitis, and interrupts the learning process as well as social interactions and extracurricular activities. Special education intervention is not often needed in children with allergic rhinitis who frequently miss school, but can interrupt acquisition of new skills (Bender, 1999).

Fatigue was identified by Bender (1999) as another common side effect of allergic rhinitis. Children who experience this fatigue generally feel ill and may interfere with their concentration and learning within the classroom. The fatigue could be described as low energy, unable to function or just feeling poor. Vuurman, van Veggel, Ulterwijk, Leutner, & O'Hanlon (1993) found that children with allergic rhinitis symptoms displayed larger impairment of short-

term memory than their nonallergic peers even when they did not have symptoms of allergic rhinitis (Bender, 1999).

Allergic rhinitis can often be a cause of hearing loss, which can impede speech development and aspects of learning in young children. It has been shown that children with chronic ear infections during the first year of life demonstrate long-term delays in auditory processing (Bender, 1999). Bender (1999) noted that hearing deficits early on in life can be corrected and academic deficits are usually regained after correction. It should be noted that there is not enough substantial research at the current time to determine whether hearing loss due to allergic rhinitis symptoms is a cause of language impairment and more research is necessary to make an accurate assumption (Bender, 1999).

As also stated by Blaiss (2004a), sleep loss is a common symptom of allergic rhinitis sufferers. Sleep loss can occur due to the nuisance of other symptoms such as runny nose, drippy throat, headache and general ill feelings. Lack of sleep can cause fatigue, irritability, poor attention and inability to learn while a child is in school. It has been shown that children require a certain amount of REM sleep per night, and if that amount is not met then significant changes in daily behavior can be noted (Bender, 1999).

Contrary to the reports from Blaiss (2004a), Bender (1999) reports that medications have not been shown to be significant in affecting a child's learning. The side effects of medications used for children with allergic rhinitis are so small that no changes in children are noticeable. For example, it is reported that intranasal corticosteroids cause no difficulties for children and no cognitive or negative effects have been found (Bender, 1999). Antihistamine side effects in children have been reported to be minimal in affecting school performance. Bender (1999) reported that very little research has been done in this area, and currently it is reported that first

generation antihistamines cause more sedating side effects than second generation antihistamines. One study conducted by Guill et al. (1986) looked at the effects of a non-sedating antihistamine and a placebo on school-aged children. It was concluded that there were no differences within attention, visual memory, motor speed and coordination between subgroups (Bender, 1999).

Based on the information Bender (1999) collected, he concluded that conditions such as allergic rhinitis can severely impair a child's ability to learn and adapt within the school setting. Contrary to some research, Bender (1999) did not find any reason to assume that allergic rhinitis would interfere with appropriate brain development and functioning. Certain medications on the other hand, were found to have side effects that have the potential to interfere with the learning process in children. Bender (1999) recommended that parents notify teachers of the medications a student is taking in order for the teacher to make appropriate accommodations for the student in the classroom. Sleep loss, fatigue, ill feelings, and ear infections can result in diminishing a child's ability to concentrate in school and perform to their ability. In order to provide for such students, catch-up support should be offered to students who may miss school because of their symptoms and in most cases should be sufficient enough to maintain pace within the classroom (Bender, 1999).

Magnus P. Borres (2009) highlighted some of the most up to date information on the impact allergic rhinitis can have on cognitive functioning and the consequences this can have on school performance, work and quality of life. His article highlighted research by Marshall, O'Hara and Steinberg (2000) that indicated that patients allergic to ragweed demonstrated impaired cognitive learning during the pollen season. Some individuals also demonstrated memory impairment. Within this same study, researchers concluded that patients with allergic

rhinitis symptoms may take more time to make decisions and may have a slower psychomotor rate than healthy control subjects.

Research completed by Mannerfeldt and Pettersson (as cited in Borres, 2009) suggested that students without allergies showed an increase in average grades from the autumn to spring terms. On the other hand, those students with pollen allergies demonstrated a lower grade average or only a marginal increase. Additionally, Mannerfeldt and Pettersson (as cited in Borres, 2009) found that the ratio of students with pollen allergies who enjoyed school ‘very much’ was lower than the group not afflicted with allergies. The ratio of students who felt stress ‘during virtually every lesson’ was higher within those students with pollen allergy as well.

In terms of allergy management in schools, Borres (2009) indicated that importance of understanding within the school setting for students with allergies. He stated that students “must not develop symptoms or need to increase their medication because of school conditions” (p. 1091). On the school grounds, allergy triggers and irritants should be kept to a minimum level. The Ministry of Health in France was the first European country to issue rules regarding how students with chronic illness should be served by schools and staff members. In the case of children with allergic rhinitis, doctors should establish a written action plan available for schools to follow (Borres, 2009).

Empirically Based Research

As stated earlier, only a handful of researchers have dedicated the time to empirically researching the effects of allergic rhinitis on children and adolescents and more specifically on academic performance. McLoughlin, Nall, Isaacs, Petrosko, Karibo and Lindsey (1983) studied the relationship between allergies and allergy treatments to student’s school performance and behavior. The researchers focused on school attendance, academic performance and social

behavior. Additionally, comparisons were made between the relationships between allergy medications and allergies to the behavior and learning within the student's school and home (McLoughlin et al, 1983).

Between January and August of 1982, data was collected concerning children and adolescents attending nursery school through grade twelve in the Louisville, Kentucky area. Parents of children diagnosed with an allergy and visiting an allergist's office completed surveys and returned them to the researchers. Other surveys were sent out to random allergy patients who were receiving treatment at the time but did not make visits to the allergist's office. Furthermore, parents of nonallergic children were also surveyed within pediatrician's offices in the same area. An individual was available at each site to verify and answer any questions parents may have had about the survey. Additionally, physicians verified the information provided by low socioeconomic respondents. Independent, blind ratings conducted by a physician in 30 of the remaining cases indicated that the judgments made by the parents were reliable and above what would have been expected out of chance (McLoughlin et al., 1983).

The first portion of the survey addressed school performance and behavior issues. Topics included absenteeism, academic and language performance, school retention, handicapped diagnosis and behavior issues. The second portion of the survey focused on symptoms, current allergy treatments and diagnosis, possible side effects of medication on behavior and perceived effectiveness of the treatment. Overall, 400 parents were surveyed. 79% had children who were allergic and 21% had children who were nonallergic. 85% of the children were in grades nursery to 7 and 15% were in grades 8 to 12. Problems with allergic rhinitis (86%), Eustachian tube dysfunction or chronic ear infections (57%), asthma (58%), gastrointestinal symptoms (36%) and hives (29%) were reported (McLoughlin et al., 1983).

The results of the study indicated that parents with allergic children reported a greater amount of school absences than nonallergic children. The absences mainly occurred in the winter (49%). However, there was no significant difference between school performance in children diagnosed with allergies and those nonallergic. Reports of diagnosed handicaps were reported within both allergic and nonallergic populations. Speech/language difficulties as well as learning disabilities were reported in both cases (4%) and matched the national average (McLoughlin et al., 1983).

In regards to school and home behavior issues, there was little to no difference between groups overall. However, it should be noted that parents with allergic children reported more problems regarding sleep and drowsiness in the behavior of their children. The majority of the parents who reported that their children had allergies also reported the presence of upper respiratory problems (chronic rhinitis and eustachian tube dysfunction) and asthma. Those with eustachian tube dysfunctions were rated lower on reading, spelling, math, writing, listening, and speaking than their peers. Eustachian tube dysfunction was also linked to inattentiveness and overtalkativeness in the behavior of the child. Additionally, gastrointestinal-related allergy problems were linked to inattentiveness, hyperactivity, impulsivity and withdrawn behaviors with children and adolescents (McLoughlin et al., 1983).

Researchers analyzed the effects of allergy medications on student behavior in the home and in school based on parent reports as well. About 25% of parents reported a change in behavior at home due to medication. The use of antihistamines seemed linked to complaints of side effects in the home. On the other hand, over 65% of parents indicated that they considered the allergy treatments to be very effective and could see a difference in their child's behavior (McLoughlin et al., 1983).

McLoughlin et al. (1983) concluded several findings based on their research. Contrary to belief, this study found that allergic children do not really have any more problems in school or behavioral areas compared to their nonallergic peers. This supports the assumption that expectations should not be lowered for allergic children due to their allergic side effects. If side effects do occur from the allergies or medications, teachers, parents and physicians should all be contacted in order to serve the student as effectively as possible. The teacher should be notified on how the allergies may affect a student's performance and what they can do to accommodate. For example, the data showed that upper respiratory problems can be associated with inattentiveness and inability to express thoughts and feelings (McLoughlin et al., 1983).

McLoughlin et al. (1983) wanted to use this research to answer a variety of questions related to allergies in children and adolescents. Although they collected a large amount of data, they did suggest that only a portion of their questions were answered due to the objectivity of parental knowledge and perceptions. They suggested the imperativeness of information being collected from teachers in order to gain a full view of child and adolescent behavior that a parent may lack knowledge about. Lastly, the researchers wanted to note that the current research is reliable enough to pay a closer look at what implications are being made about the school performance and behaviors of allergic children in order to decide if the right inferences are being made (McLoughlin et al., 1983).

Marshall, O'Hara and Steinberg (2002) explored the effects of seasonal allergic rhinitis on mood and levels of fatigue in adults. Although the population sample was between the ages of 23 and 50, the focus and results of the study could still be applied to any individual suffering from allergic rhinitis including children and adolescents. Marshall et al. (2002) recognized that many individuals complain of moodiness and fatigue during their allergy seasons. The focus of

the research was to gather information on the effects allergies can have on negative and positive mood and fatigue levels. The researchers hypothesized that patients with allergic rhinitis do indeed experience changes in fatigue and mood during the seasons their allergies are present (Marshall et al., 2002).

To gain information on the fatigue and mood changes within allergic rhinitis sufferers, Marshall et al. (2002) tested both allergic and nonallergic patients. The nonallergic patients acted as control subjects within this study. Subjects were tested in the fall of 1996, winter 1997 and fall 1997. Ragweed, a common allergen, is found to be most high in the fall, and should elicit allergic rhinitis symptoms. It was noted that in fall 1997 the ragweed level was unusually low, so the fall of 1998 was used in place of fall 1997 in the study after an extension in the research. Each subject was questioned and interviewed to ensure that they had no history of drug abuse or major physical or mental illness that could interfere with the reported mood or fatigue levels. Additionally, no subject was taking a medication that could have affected the central nervous system and consequently affected mood and/or fatigue (Marshall et al., 2002).

Each allergic subject was asked to complete the Positive Affect Negative Affect Scales (PANAS) each morning and before dinner in the fall of 1996 and 1997 when their allergy symptoms were most severe. Both allergic and nonallergic subjects were asked to complete the PANAS each evening for 7 consecutive days in the winter of 1997 when allergens would likely not be in the air. In addition to the PANAS, the subjects were given the Multidimensional Fatigue Inventory (MFI-20) in order to assess levels of fatigue. The subjects were all given the MFI-20 at the same time of the day across all three seasons in order to account for daily variables that may have an influence on fatigue (Marshall et al., 2002).

Results indicated that allergic rhinitis sufferers reported more motivational fatigue, activity-related fatigue, general fatigue and mental fatigue in ragweed season 1996 than in winter 1997. Physical fatigue was not noted to increase between ragweed season 1996 and winter 1997. Allergic subjects also reported more motivational fatigue, general fatigue and mental fatigue in the fall of 1998 than in winter 1997. Physical and activity-related fatigue was not shown to increase during this time. Control subjects did not report any change in motivational fatigue, activity-related fatigue, general fatigue, mental fatigue or physical fatigue in ragweed seasons 1996 and 1998 and winter 1997 (Marshall et al., 2002). Marshall et al. (2002) concluded that allergic rhinitis symptoms can cause fatigue within the central nervous system and the data collected supports that original assumption.

In regards to mood, results indicated that positive affect (PA) increased within allergic subjects between ragweed season 1996 and winter 1997. PA scores also decreased within allergic subjects between winter 1997 to ragweed season 1997. These results indicate that allergic subjects experienced a more positive mood during the winter rather than ragweed seasons. On the other hand, control groups (nonallergic) were found to have no significant change in affect between winter and ragweed seasons. Results suggested that allergic reaction symptoms are related to positive affect in allergic rhinitis sufferers. Data concerning negative affect indicated that no change was significant between winter and ragweed seasons in the allergic group or control group. The researchers concluded that allergic reactions are unrelated to negative affect changes (Marshall et al., 2002).

In conclusion, the researchers stated that allergic rhinitis symptoms can create fatigue and depressive feelings. Marshall et al. (2002) suggest that allergic reactions may induce biochemical changes that create symptoms that are similar to depression. The changes in mood

and fatigue documented in this study support the researcher's claims. The authors suggest that more research be conducted in order to determine the relationship between depression and allergic rhinitis for future medical use (Marshall et al., 2002).

Sundberg, Torén, Höglund, Åberg and Brisman (2007) conducted a study in Sweden involving the association between nasal symptoms and school performance in adolescents. The researchers hypothesized that the side effects (specifically nasal symptoms) of allergic rhinitis symptoms could negatively impact learning, cognitive functioning, classroom performance and the quality of life in children and adolescents. In fall 2000, 10,837 responses were assessed in order to determine the relationship between allergic rhinitis symptoms and overall school performance. Questionnaires were used to determine what symptoms the adolescent's experienced related to nasal congestion and allergic rhinitis. Grades were also compiled and compared to the symptoms of individuals (Sundberg et al., 2007).

Results of the research suggested a significant relationship between allergic rhinitis symptoms (severe nasal symptoms) and low grades. The researchers stated that their research supported their original hypothesis that severe nasal symptoms associated with under controlled allergic rhinitis can negatively impact children and adolescent's school performance. Moreover, the researchers suggested that allergic rhinitis can also impact children and adolescent's physical, social and psychological well-being (Sundberg et al., 2007).

Summary

It is apparent that allergic rhinitis is a prevalent health concern for many and influences the lives of those who suffer from it. It is reported that 35 million people are affected by allergies each year in the United States. 40% of those who suffer are children. A large number of cases are still undiagnosed and indicates that a large number of allergy sufferers are experiencing

debilitating symptoms without any medical help (Blaiss, 2004a). Prevalence, symptoms, possible causes, prevention and previous research regarding allergic rhinitis have been examined.

Over the past 20 years, the prevalence of allergic rhinitis has risen greatly. In fact, the number of children diagnosed with allergic rhinitis has doubled in the past twenty years. Many are wondering why the increase has been so great in the past twenty years (Blaiss, 2004b). Many factors have been contributing to the rise in allergic rhinitis diagnoses. Heredity has been shown to influence whether an individual will suffer from allergic rhinitis. If one parent has an allergy, then a child has a 30% chance of inheriting that allergy. If both parents have an allergy, then a child has a 60% chance of inheriting that allergy. Even if both parents do not have an allergy, the chance of a child having an allergy is 10% (Brody, 1997). With percentages such as these, it is understandable why the number of people suffering from allergic rhinitis is increasing all the time.

Symptoms can be obvious or concealed by the sufferer. Allergic rhinitis is caused by the body's release of antibodies called histamines. The histamines are meant to fight off harmful substances such as viruses and illness-causing agents, but are not needed for non-threatening substances. Unfortunately, many non-threatening substances such as dust, mold, pollen, animal dander, and dust mites are often mistaken for harmful substances and the body releases histamines. Histamines cause eyes to water, turn red and itch and the nose to run. Allergic reactions can also cause sore throats, nasal congestion, fatigue, stomachache, headache, and tenderness of the cheeks and forehead (Brody, 1997). Depending on what an individual is allergic to, symptoms can last year-round or occur depending on the season. Symptoms can become severe enough to affect the daily lives of those who suffer. Children who suffer from allergic rhinitis are more likely to miss school days. If a student with allergic rhinitis symptoms

does go to school, they will likely experience intermittent hearing loss and the inability to concentrate (McCabe, 2008).

Allergic rhinitis is caused by allergens that are found in the air. The most common allergens that elicit allergic responses are plant pollens, dust, dust mites, molds, animal dander, pollutants, and other airborne particles (household cleaners, perfumes, soaps, and detergents) (Gershwin & Klingelhofer, 1998). An individual can be allergic to one or more allergens found in the air. The main trouble for allergic rhinitis sufferers is eliminating contact with allergens that cause reactions. Many allergens are found both indoors and outdoors. Other allergens are mainly found outside, but are found during most of the seasons of the year (Gershwin & Klingelhofer, 1998).

Prevention strategies are highly recommended and can be very successful in avoiding the symptoms of allergies and allergic rhinitis. In order to prevent children and adolescents from having a large amount of contact with allergens consideration should be given to where they spend most of their day. Home and school are generally the two places a child spends the most time, so it is imperative to ensure that both environments are preventing allergic rhinitis symptoms. Many accommodations such as eliminating carpet, keeping windows closed and utilizing air conditioning can be used in the schools. At home, mattresses can be covered with an allergy-proof encasement, bedding should be washed in hot water, humidity should be kept to a minimum and carpet and stuffed animals should be kept to a minimum (Blaiss, 2004a).

At this time a limited amount of research has been completed concerning allergic rhinitis and the effect on school performance in children and adolescents. The findings are rather inconsistent as well. Several research and empirically based studies have been analyzed and it is unclear whether or not allergic rhinitis does affect school performance. Michael S. Blaiss wrote

an article in 2004 that concluded allergic rhinitis to have substantial effect on absenteeism, cognitive impairment, poor school performance and behavioral and psychosocial problems in school-aged children. Alternatively, Bender (1999) concluded that there is not any clear evidence that suggests that allergic rhinitis causes behavioral problems and learning disabilities. Bender (1999) did state in his article that despite his findings, many children may have difficulty in school due to absenteeism, inability to concentrate, hearing loss, and medication side effects all resulting from allergic rhinitis symptoms.

McLoughlin et al. (1983) conducted empirically based research in 1982 and concluded that allergic rhinitis does not affect school performance contrary to the beliefs of many. Although, McLoughlin et al. (1983) did note that their research could be expanded to account for more information they did not cover. Marshall et al. (2002) also gathered empirically based information on the effects of allergic rhinitis on mood and fatigue in adults. The research indicated that allergic rhinitis symptoms decrease positive affect and also increases certain types of fatigue in allergic rhinitis sufferers (Marshall, et al., (2002). Sundberg et al. (2007) determined, based on their research, that allergic rhinitis is related to low grades in children and adolescents. It was also suggested that the physical, social and psychological well-being of children and adolescents can also be affected by allergic rhinitis symptoms (Sundberg et al., 2007).

Chapter III: Methodology

The purpose of this study was to further investigate the impact of allergic rhinitis symptoms on academic achievement in a school-aged child. As previously stated, many researchers have documented the implications allergic rhinitis symptoms can have on academic performance; however, a select few have actually completed in-depth research to document that impact. This chapter will explain the methodology behind the case study design, a discussion on the student who was selected for this study, the instrumentation and data collection process, and the data analysis.

Research Design

The approach to this research was mainly quantitative, using survey and academic data. However, qualitative information was also gathered from the subject on the extent to which specific symptoms impacted her day. The purpose of the survey was to assess the severity of one individual student's allergic rhinitis symptoms two times per week. The researcher then compared the severity of the symptoms each week to the student's average academic performance for the week as reported by the student's teachers.

Subject Selection and Description

The selected subject attended the eighth grade at a junior high school in central Minnesota. The researcher selected the subject based on her history with allergic rhinitis symptoms. The researcher was an employee of the district in which the student attended. Written consent was attained from the student's mother, the school district, and the University of Wisconsin-Stout's Institutional Review Board prior to starting the study. The agreement to participate in the study informed the subject and her mother of the purpose of the study, an explanation of the procedures, the amount of time required to complete the surveys, the right to

refuse/withdraw from the study, potential risks/discomforts, benefits of the study and the level of confidentiality involved in the research. A copy of this agreement can be found in Appendix A.

An initial interview was completed with the subject and her mother. This interview was created by the researcher and customized to gather background information on the student's allergic rhinitis symptoms and perceived impact while in school (refer to Appendix B). Her mother indicated that the subject was originally diagnosed with allergies at two years of age; however, her mother indicated that symptoms started prior to the diagnosis. In the past, the subject and her mother indicated that she has experienced cough, wheezing, shortness of breath, chest tightness, runny or stuffy nose, headache, face pain, sneezing, itchy nose, headaches, loss of sense of smell, sore throat, post nasal drip, throat clearing, itchy throat, hoarseness, red eyes, itchy eyes, puffy eyes, blurry eyes, watery eyes, rash, hives, itchy skin, hearing loss and ear pain. Triggers of symptoms were identified as grass, hay, ragweed, leaf mold, weeds, tree pollen, cosmetics, aerosol sprays, smoke, exercise, cold air, humidity, weather changes, house dust, pollution, odors, cleaning products, fertilizers and laundry soap. Symptoms were reported to be most severe year-round. Her mother reported that the student previously had her skin tested for allergies; however, the test was not comprehensive and only identified allergies to dogwood trees, pollen, weeds, leaf mold and chemical products.

The student indicated that the symptoms seemed more severe in the school environment. Teachers had been informed of her allergies and a 504 plan was in place to allow her to receive special modifications and accommodations within the classroom related to her symptoms.

In terms of academic performance, the subject and her mother reported that the allergic rhinitis symptoms at times interfered with school. The subject explained that due to severe symptoms she had missed schools days, felt lethargic, had difficulty concentrating while in

school, and felt tired due to lack of sleep caused by the symptoms. Her mother reported that she missed 15 days of school while attending the seventh grade. The subject commented that she found it difficult to stay caught up when she missed school and also had difficulty working well in class when the symptoms were present. The subject and her mother reported that the subject could be described as “moody” when symptoms were present. In terms of alleviation of symptoms, the subject reported that she used several allergy medications; however, she reported that relief had not been consistent.

A record review indicated that the subject was enrolled in some honors courses and had earned mainly A’s and B’s during her seventh grade year. However, her individual assignments on tests, homework, participation, etc. indicated inconsistent grades ranging from F’s to A’s.

Instrumentation

The survey used to gather information from the subject on the severity and impact of allergic rhinitis symptoms asked the participant to rate the severity of specific symptoms using a Likert scale. Additional open-ended questions were asked to gain insight into the impact the participant felt certain symptoms impacted her daily functioning. A copy of this survey can be found in Appendix C and has been labeled as the “Environmental Allergy Student Questionnaire”. The survey was created by the researcher specifically to address the following research questions:

1. Does the severity of allergic rhinitis symptoms correlate with lowered academic performance?
2. Does the severity of allergic rhinitis symptoms correlate with an increase in school absences?

3. How often does the student feel that the presence of eye and nose/sinus symptoms impacts her daily functioning?
4. How often does the student feel that the presence of lethargy and moodiness related to allergy symptoms impacts her daily functioning?
5. What teacher support does the student feel helps her to do her best academically while experiencing allergic rhinitis symptoms?

Data Collection Procedures

Following the initial family interview and file review on the student, as explained in Subject Selection and Description, the student was asked to meet with the facilitator approximately two times per week to complete the survey. Each week the student completed the survey, the facilitator documented the student's average academic performance for that week as well. Academic performance was defined as any reported grades by her eighth grade teachers. Data collection began the week of November 29, 2010 and concluded the week of May 23, 2011.

Data Analysis

The weekly data gathered from the Likert scales on the survey provided to the participant was averaged to gain an overall rating of symptoms severity for each week. Since the Likert scale created ranged from 1 to 5, the overall average for each week was also between 1 and 5. This information was plotted on a graph using Microsoft Excel. The information gathered on the students weekly academic performance was also plotted on this same graph. Classroom grades were converted to numbers ranging from 1 to 5 to correspond to the Likert scale. Since a Likert score of 1 signified 'never' experiencing allergic rhinitis symptoms and a score of 5 signified 'very frequent' allergic rhinitis symptoms, grades were assigned based on the assumption that a student who 'never' experiences symptoms would be able to perform to the best of their ability

and that a student who 'very frequently' experienced symptoms would suffer in the classroom. Therefore, A's were assigned a Likert score of 1, B's a score of 2, C's a score of 3, D's a score of 4 and F's a score of 5. Once this information was graphed, the method of visual analysis was completed in order to determine if a correlation existed each week between academic performance and the severity of allergic rhinitis symptoms.

Based on a visual analysis of this information, the researcher was able to determine whether a correlation existed each week between the two variables. For example, if the severity of allergic rhinitis symptoms increased one week from 1.5 to 3.1 on the Likert scale and the student's grades went from 1.0 to 2.8, a lowering of overall grades, this would be considered a correlation.

A second visual analysis was completed using data gathered on the severity of symptoms and the number of school days missed due to those symptoms. The information was plotted to determine if the severity of symptoms corresponded with an increase in missed school days.

A third analysis was completed by gathering data on the presence of allergic rhinitis symptoms and the reported impact those symptoms had on the student's daily functioning. The presence of eye and nose/sinus symptoms, as well as lethargy and moodiness were reported each week by the student. An overall percentage was calculated for the presence of these symptoms over the course of the study and compared directly with the percentage the student reported these symptoms had an impact on daily functioning. The purpose for this analysis was to determine how frequently the student experienced these specific symptoms and what percentage of that time the student felt was influential.

Chapter IV: Results

The purpose of this study was to determine whether an individual student's academic performance is impacted by the presence of allergic rhinitis symptoms through a case study. In addition, this study also examined the impact specific symptoms (i.e. nasal/sinus, mood/energy level) was reported to have on the student's daily functioning. This chapter will outline results of the visual analysis for the two variables: academic performance and severity of allergic rhinitis symptoms. A visual analysis also will be presented to look at the severity of allergic rhinitis symptoms and missed school days as well. Additionally, data on the presence of allergic rhinitis symptoms and the reported impact those symptoms had on the student's daily functioning will be examined. Lastly, data on what supports the student felt were helpful from her teachers in performing her best academically while experiencing allergic rhinitis symptoms will be looked at.

Item Analysis

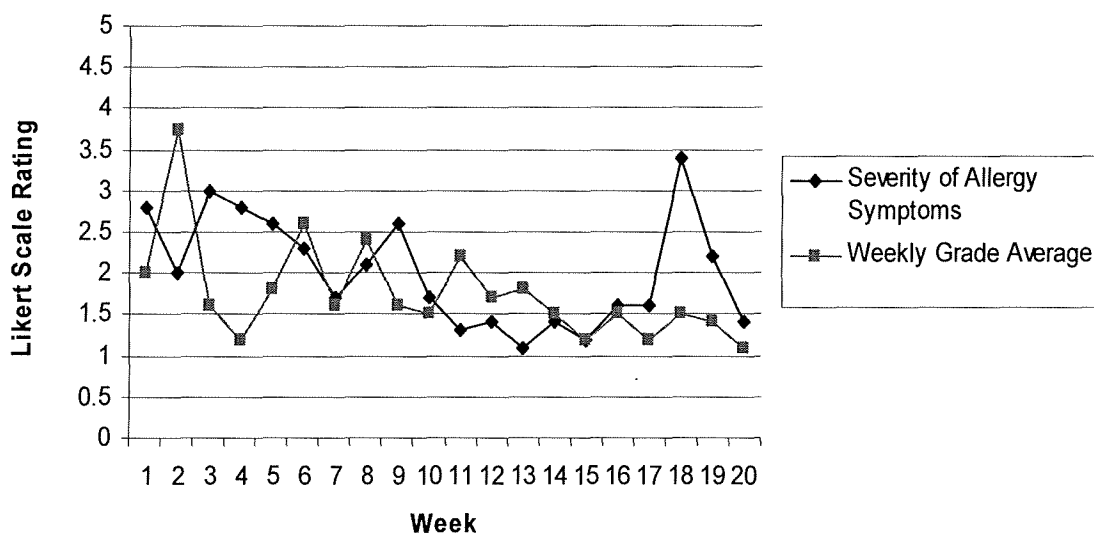
The participant was asked to complete the "Environmental Allergy Student Questionnaire" two days per week. The student elected to designate every Tuesday and Thursday to completing the form. The week the data started being collected to the last week of the project comprised 26 weeks. Due to student and school schedules, a total of 20 weeks of data was able to be collected.

Research Question 1: Does the severity of allergic rhinitis symptoms correlate with lowered academic performance?

Using the technique of visual analysis, the data collected on the severity of allergic rhinitis symptoms and average academic performance was analyzed (see Figure 1). The analysis focused on the weekly changes in both the severity of symptoms and academic performance.

Due to there being no data prior to the first week, correlation analysis was only able to be completed with weeks 2 through 20. As shown in Figure 1, 10 of the weeks resulted in no correlation being shown between the two variables. However, nine of the weeks resulted in a positive correlation between the participant's severity of allergic rhinitis symptoms and her average weekly academic performance. To put the data into a percentage, 47 percent of the time the participant's severity of allergic rhinitis symptoms was correlated with her average weekly academic performance and 53 percent of the time no correlation was noted. Based on the data, there did not appear to be a solid relationship between academic performance and the severity of the student's allergic rhinitis symptoms.

Figure 1. Visual analysis of allergic rhinitis symptoms versus average weekly grades

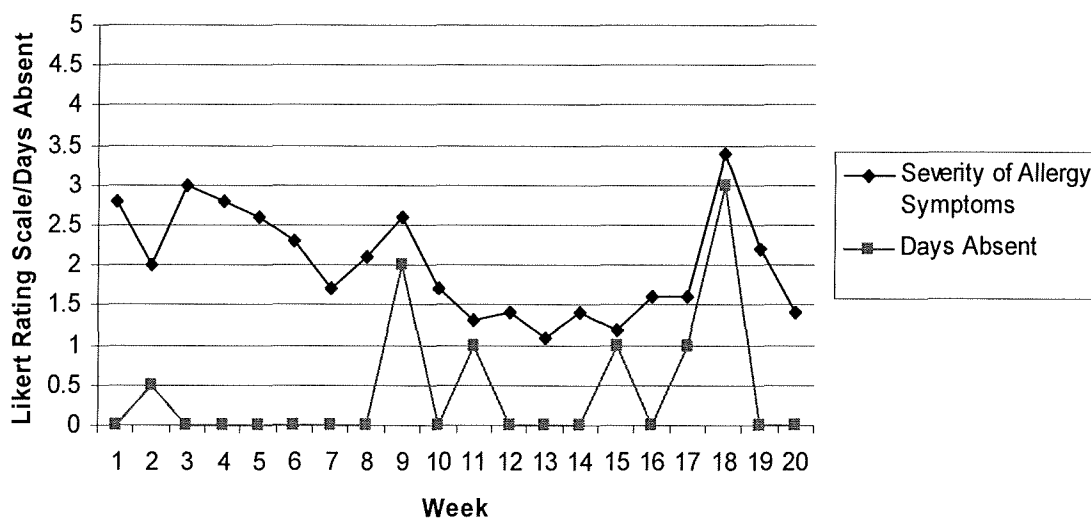


Research Question 2: Does the severity of allergic rhinitis symptoms correlate with an increase in school absences?

Using the technique of visual analysis, the data collected on the severity of allergic rhinitis symptoms and the number of school absences per week was analyzed (see Figure 2). Looking at weekly absences, the student missed at least half of a school day 6 out of the 20

weeks of data collection. Of those six weeks, four of the weeks did not correlate with an increase in the severity of allergic rhinitis symptoms. Therefore, the majority of the time the student did not report an increase in allergic rhinitis symptoms during a period of time she missed school. Additionally, during the weeks where schools days were missed, the student reported very mild allergic rhinitis symptoms the majority of the time.

Figure 2. Visual analysis of allergic rhinitis symptoms versus weekly absences



Research Question 3: How often does the student feel that the presence of eye and nose/sinus symptoms impacts her daily functioning?

In order to address this research question, the student was asked to complete open-ended questions that prompted her to further explain the eye and/or nose/sinus symptoms she was experiencing and if she felt her daily functioning was impacted by those symptoms. Based on the student responses, she reported that she experienced eye and/or nose/sinus symptoms 41 percent of the time during the 20 week data collection period. Of the time she indicated a presence of eye and/or nose/sinus symptoms, she reported that 80 percent of the time she reported that those

symptoms impacted her daily functioning. Common responses from the student indicated frequent need to get tissues due to a runny nose and/or recurrent sneezing.

Research Question 4: How often does the student feel that the presence of lethargy and moodiness related to allergy symptoms impacts her daily functioning?

In order to address this research question, the student was asked to complete open-ended questions that prompted her to further explain any lethargy and/or mood symptoms she was experiencing and if she felt her daily functioning was impacted by those symptoms. Based on the student responses, she reported that she experienced symptoms of lethargy and/or moodiness 32 percent of the time during the 20 week data collection period. Of the time she indicated a presence of the symptoms of lethargy and/or moodiness, she reported that 83 percent of the time she reported that those symptoms impacted her daily functioning. Common responses from the student indicated frequent drowsiness, irritability and desire to sleep.

Research Question 5: What teacher support does the student feel helps her to do her best academically while experiencing allergic rhinitis symptoms?

To address this research question, the student was asked to answer an open-ended question that prompted her to explain what teachers have done to aid her in doing her best academically despite her allergic rhinitis symptoms. The student reported that it was beneficial to her academic success when teachers allowed her to sit closer to the front of the room to help with engagement in the lesson, offered shortened assignments to complete in class and allowed her to take tests at a later time when symptoms were less severe.

Chapter V: Discussion

This chapter will summarize the analysis of the presented research questions that looked at the impact of allergic rhinitis symptoms on academic performance. A comparison will be made between the results of this study compared to those previously completed on similar topics. Additionally, limitations of the study, implications for educators and parents and recommendations for future research will also be discussed.

Conclusions

The main goal of the research was to establish if there is a relationship between the severity of allergic rhinitis symptoms and a student's academic performance. This study took place over a period of 26 weeks. Of those 26 weeks, 20 weeks of data was able to be collected from the student. Overall, the amount of data collected was felt to be substantial in determining this relationship and impact on student functioning.

The data collected through the student completion of the Environmental Allergy Student Questionnaire indicated that 47 percent of the time the student's academic performance correlated with her severity of allergic rhinitis symptoms. For example, during week 8 of data collection the student's severity of allergic rhinitis symptoms increased and the Likert scale rating for her academic performance also increased indicating lower overall academic performance. However, 53 percent of the time no relationship was noted between the student's weekly severity of allergic rhinitis symptoms and her academic performance for that week. Overall, the results of this collected data do not indicate a strong relationship between the two variables. On the other hand, there does appear to be some relation between the two when considering that approximately 50 percent of the time a correlation was present. This conclusion is consistent with those reported by Sundberg et al. (2007) and Blaiss (2004a). Their research

supported the claims that severe allergic rhinitis symptoms are in fact related to low grades/poor school performance. Although McLoughlin et al. (1983) reported that there does not appear to be a significant difference in academic performance between those who do and do not suffer from allergic rhinitis symptoms, this study did not take into account individual changes in performance and focused more on groups as a whole. This studies design attempted to look mainly at individual changes in academic performance in order to determine the possible relationship.

When looking at the relationship between the severity of the student's allergic rhinitis symptoms and the number of absences per week, there was very little data to utilize in determining the relationship. Throughout the 20 weeks of data collection, the student missed a total of 8.5 days. During several weeks in which the student's allergic rhinitis symptoms appeared to improve, the student's absences increased. It is not clear if the days missed were directly related to allergic rhinitis symptoms; however, it should be noted that during week 18 the student missed 3 days of school and noted a significant increase in allergic rhinitis symptoms as well. The data on the number of absences is not as supportive as those reported by Blaiss (2004a) and McLoughlin et al. (1983) that indicated that allergic rhinitis symptoms increase the level of school absences.

The student indicated that she was impacted by eye and/or nose/sinus symptoms about 41 percent of the time during the data collection period. Of that time, she indicated that the symptoms directly impacted her daily functioning 80 percent of the time. Commonly reported symptoms included frequent need to get tissues due to a runny nose and/or recurrent sneezing. Based on this data, there appears to be a strong connection between the presence of allergic rhinitis symptoms and this student's reported daily functioning.

Of the 20 weeks of data collection, the student reported that she experienced symptoms of lethargy and moodiness 32 percent of the time. Although the student did not experience these symptoms often, she did report that when she did experience such symptoms her daily functioning was impacted 83 percent of the time. This data also coincides with the data reported on eye and nose/sinus symptoms and indicates a strong connection between the presence of these symptoms and the reported impact on the student's daily functioning. Research completed by Blaiss (2004a), McLoughlin et al. (1983) and Marshall et al. (2002) also supported the conclusion that allergic rhinitis symptoms indeed can have a large impact on an individual's energy level, sleep habits and drowsiness. Marshall et al. (1983) found a direct relationship between the severity of allergic rhinitis symptoms and motivational fatigue, activity-related fatigue, general fatigue and mental fatigue. It was also reported that when individuals were not experiencing allergic rhinitis symptoms, a more positive mood was reported overall.

When the student was asked to report on the assistance her teachers have offered to help her in doing her best despite her allergic rhinitis symptoms, she consistently reported that sitting closer to the front of the room to help with engagement in the lesson, being offered shortened assignments to complete in class and being allowed her to take tests at a later time when symptoms were less severe helped her achieve academically. This information provided directly from the student serves as possible advice to educators in terms of what can be offered to students who may be impacted by allergic rhinitis symptoms as well.

Limitations of the Study

Several limitations existed within this study. As a case study, this research is not meant to and cannot be generalized beyond the interview sample. However, this research is intended to

bring attention to the relationship between allergic rhinitis and educational performance and the importance of further research in the field.

As the survey to gather data was created by the researcher, the reliability and validity of the instrument has not been determined at this time and is considered to be a limitation within this study. The tool was created based on those instruments that are already used within the allergy field and also focused on gathering data needed to answer this study's research questions.

The information used to determine the student's weekly academic performance was gathered from an online data system used by the student's general education teachers. Although many teachers record each assignment, test, etc. on this system, some teachers are not consistent with this grading process. Therefore, certain grades for the student may not have been included in the weekly calculated academic achievement score and is considered to be another limitation to this research.

Implications of the Study

The literature review and the findings from this study are meant to aid in the awareness of the impact of allergic rhinitis symptoms on academic performance. The information provided can be helpful for educators and parents in learning more on the prevalence, triggers, symptoms and treatment for allergic rhinitis. Many individuals do not realize that allergic rhinitis symptoms occur year around and should be a concern at all times. At times, the symptoms may not be noticeable and students do not always vocalize their discomfort, so it is up to educators and parents to be observant and proactive.

Implications for educators and teachers include setting up the school and home environment to limit the level of allergens in the air and the impact on students. Communication

between home and school is a vital piece in ensuring that a student's needs are being met both in school and out.

One of the larger suggestions offered by this research is the need for more of a focus to be put on the decline within academic performance that can be associated with allergic rhinitis symptoms. It is hoped that educators and parents begin to understand that allergic rhinitis symptoms can be very disruptive, uncomfortable and cause an overall interference in daily functioning. Therefore, the more support that can be offered to those students who suffer from allergic rhinitis will likely have a positive impact.

Educators should be aware of the impact of accommodations on the academic performance of a student who suffers from allergic rhinitis symptoms. Exploring options within their own classrooms is a necessary tool in preventing a decline in many students' academic performance.

It also is crucial for educators and parents to include students in their own allergic rhinitis intervention plans. This may help increase the student's awareness of the symptoms and the impact on their daily functioning. Additionally, it is important for student's to feel involved in a process that is centered on their well-being.

Recommendations for Future Research

Although this research was designed to be a case study and the findings cannot be applied directly to the general population, it is hope that it will serve as a beneficial guide to further research on the impact of allergic rhinitis symptoms on academic performance in school-aged children. Further research could attempt to collect more concrete data that illustrates the link between the severity of symptoms and school performance. Within this study it was difficult to determine whether or not the symptoms were the cause of a decline in academic performance, or

if other variables were to blame. Therefore, it is suggested that future research have multiple longitudinal case studies with students who are and are not impacted by allergic rhinitis symptoms. Additionally, it may be beneficial for researchers to gather symptoms data before or after a specific academic performance to gain more specific information on symptoms and the possible impact they may be having.

It may be beneficial for future research to look at the impact certain medications used to treat allergic rhinitis symptoms have on academic performance as well. Bender (1999) indicated that very little research has been completed on the sedating effects of antihistamines. He indicated that first generation antihistamines are currently reported to cause the side effect more often than second generation antihistamines that are presently more widely used.

It may be interesting for future research to focus on schools that have recently adapted the school environment to accommodate for the population within the building who suffer from allergic rhinitis symptoms. Research could focus on student academic performance before and after environmental changes have been made to decrease the presence of allergic rhinitis triggers such as dust, mold, outside allergens, etc.

Lastly, future research on the allergic rhinitis and the impact on children in poverty could be very influential in targeting a population that may go unnoticed. It should be taken into consideration that students in poverty have limited access to medical treatment, often live in homes that are not well maintained or have air conditioning and may have families that are uneducated regarding allergic rhinitis. Therefore, the impact on academic performance may be even more severe than those students who have access to supports.

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Appendix A: Agreement to Participate in Study

AGREEMENT TO PARTICIPATE IN ALLERGIC RHINITIS RESEARCH CASE STUDY

Research Title: A Case Study on the Effects of Allergic Rhinitis on the Academic Performance and Behavior of a School-Aged Child

Project Facilitator: Lindsay C. Rekstad, M.S. Ed., School Psychologist, St. Cloud Area Schools

You and your child are being asked to participate in the research project described below. The facilitator will explain to you, in detail, the purpose of the project, procedures to be used and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic description of the project is found below. Please read and contact Lindsay Rekstad if you have any questions or concerns.

This is a parental permission form. If you decide that you and your child can take part in this study, you would sign this form to confirm your decision in the presence of a witness. If you sign this form, you will receive a signed copy for your records.

1. **Purpose of the Project:** The main purpose of the project is to gain additional information on how allergic rhinitis can affect the academic performance of school-aged children. Information gathered from this project will add to the information that has previously been collected on the subject. Additionally, the information can help educators understand the impact of allergic rhinitis and what can be done to provide adequate support for students who suffer with allergic rhinitis. Ultimately, the research data will be compiled and reported in an Educational Specialist Thesis by the facilitator. The thesis will be submitted as part of the degree requirements for the Educational Specialist Degree in School Psychology.
2. **Explanation of Procedures:** You and your student will be asked to take part in an initial interview to gain background information about the student that is applicable to the study. The facilitator will also complete a review of the student's cumulative file to gain background information on the student's academic history. Following the initial interview and file review, the student will meet with the facilitator approximately two times per week to fill out a questionnaire that will ask her to rate her allergic rhinitis symptoms. Additionally, the student will be asked to provide feedback on how he/she feels the symptoms have been impacting their school day and what strategies teachers have used to help them do their best. Each day the student completes the questionnaire, the facilitator will compare document the student's academic performance (homework completion/grades, test scores, etc.). The purpose of looking at academic performance is to see how the severity of the student's symptoms each day compares to the academic performance.
3. **Time Commitment:** The student will meet with the examiner two days per week for approximately 10 to 15 minutes. This meeting will take place during a designated time of

the school day that does not interfere with instruction time. This schedule will be consistent until the student's last day of school on June 2, 2011.

4. **Refusal/Withdrawal:** At any time during your or your student's participation in this case study, you will have the opportunity to refuse to participate in any procedure or withdraw from the study at any time without prejudice or effect on you or your child.
5. **Discomforts and Risks:** The questionnaire and interview documents used within this study are meant to be administered anonymously and to be minimally invasive. Therefore, the study is not meant to cause any sort of discomfort on the part of the student or parent. Additionally, the way the case study is formatted, unusual risks as a direct results of participation are not expected. However, if you or your student should become concerned for any reason, the case study may be stopped. With your permission it may start up again.
6. **Benefits:** Participation in this case study can benefit you and your student in a number of ways. First, it offers to the opportunity to gain more perspective on how allergic rhinitis impacts the individual student's academic performance and behaviors while in school. Second, the results of this case study will add to the sparse educational research that has been conducted on the subject. Lastly, the results of this study can be shared with educational professionals who work with students with allergic rhinitis and would like recommendations on how to best support their educational needs.
7. **Confidentiality:** All information gathered within this study will remain completely anonymous. Interviews and questionnaires will not require the student or parent to identify themselves, with the exception of the consent form. All forms will be handled by the facilitator only.

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, I acknowledge that I have read and fully understand the above explanation of the research project, all of my questions have been answered to my satisfaction, and I give permission for my child and myself to participate in this case study.

Signature of Parent or Guardian

Date

Appendix B: Initial Family Interview

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Initial Family Allergic Rhinitis Interview

1. When did the allergic rhinitis symptoms begin?

2. Please check any of the following symptoms you have experienced.

- | | | |
|---|---|---------------------------------------|
| <input type="checkbox"/> Cough | <input type="checkbox"/> Headaches | <input type="checkbox"/> Puffy Eyes |
| <input type="checkbox"/> Wheezing | <input type="checkbox"/> Loss of Sense of Smell | <input type="checkbox"/> Blurry Eyes |
| <input type="checkbox"/> Shortness of Breath | <input type="checkbox"/> Sore Throat | <input type="checkbox"/> Watery Eyes |
| <input type="checkbox"/> Chest Tightness | <input type="checkbox"/> Post Nasal Drip | <input type="checkbox"/> Rash |
| <input type="checkbox"/> Runny or Stuffy Nose | <input type="checkbox"/> Throat Clearing | <input type="checkbox"/> Hives |
| <input type="checkbox"/> Headache | <input type="checkbox"/> Itchy Throat | <input type="checkbox"/> Eczema |
| <input type="checkbox"/> Face Pain | <input type="checkbox"/> Hoarseness | <input type="checkbox"/> Itchy Skin |
| <input type="checkbox"/> Sneezing | <input type="checkbox"/> Red Eyes | <input type="checkbox"/> Hearing Loss |
| <input type="checkbox"/> Itchy Nose | <input type="checkbox"/> Itchy Eyes | <input type="checkbox"/> Ear Pain |

3. Check what seems to be a trigger for the above symptoms.

- | | | |
|---|---|--|
| <input type="checkbox"/> Grass (spring to fall) | <input type="checkbox"/> Tree Pollen (Spring) | <input type="checkbox"/> Cold Air |
| <input type="checkbox"/> Hay | <input type="checkbox"/> Leaves | <input type="checkbox"/> Humidity |
| <input type="checkbox"/> Mold and Mildew (indoor) | <input type="checkbox"/> Basements | <input type="checkbox"/> Weather Changes |
| <input type="checkbox"/> Ragweed (late summer) | <input type="checkbox"/> Cats/Dogs | <input type="checkbox"/> Latex |
| <input type="checkbox"/> Leaf Mold (early spring and late fall) | <input type="checkbox"/> Cosmetics | <input type="checkbox"/> House Dust |
| <input type="checkbox"/> Weeds (late summer) | <input type="checkbox"/> Aerosol Sprays | <input type="checkbox"/> Pollution |
| | <input type="checkbox"/> Smoke | <input type="checkbox"/> Odors |
| | <input type="checkbox"/> Exercise | |

Other: _____

4. When are your symptoms the worst?

- | | | |
|-------------------------------------|---------------------------------|------------------------------------|
| <input type="checkbox"/> Year Round | | |
| <input type="checkbox"/> January | <input type="checkbox"/> May | <input type="checkbox"/> September |
| <input type="checkbox"/> February | <input type="checkbox"/> June | <input type="checkbox"/> October |
| <input type="checkbox"/> March | <input type="checkbox"/> July | <input type="checkbox"/> November |
| <input type="checkbox"/> April | <input type="checkbox"/> August | <input type="checkbox"/> December |

5. Do symptoms seem to be worse in school? YES NO

6. Has the student been skin tested? Results?

7. Do you feel that your allergic rhinitis symptoms interfere with school?

8. Are teachers aware of the student's allergies? Have any accommodations been made in the past?

9. Has the student missed any school days in the past due to allergic rhinitis symptoms? How many?

10. Have the effects of allergic rhinitis impacted the student emotionally at all? Explain.

11. Are behavior changes noted when the symptoms arise?

12. What helps to alleviate symptoms?

13. Overall, are changes in academic performance noticed when symptoms are present? Explain.

Appendix C: Instrument

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Environmental Allergy Student Questionnaire

Please read the following five statements on the left and rate the statement on the scale of 1 to 5 given below by putting a check in the box.

	1 Never	2 Rarely	3 Occasionally	4 Frequently	5 Very Frequently
I experienced eye symptoms today (redness, stinging, itchy, watery, blurry, sensitive to light)					
I experienced sinus/nasal symptoms today (sneezing, stuffy/runny nose, itchy nose, face pain, headache, drippy throat)					
I experienced a lack of energy today					
I was moody today					

I was unable to concentrate in class today because of the things listed above					
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Please answer the following questions the best you can and with much detail as you feel is important.

1. Do you feel that your allergic rhinitis symptoms were the cause of the above symptoms?
2. Explain more about your eye symptoms from today? How did it impact your day?
3. Explain more about your sinus/nose symptoms from today? How did it impact your day?
4. Explain more about your energy level today? How did it impact your day?
5. Explain more about your mood today? How did it impact your day?
6. Can you think of anything that a teacher has done recently that has helped you to do your best despite your symptoms? If so, what was it?
7. Overall, how do you think today at school went? Explain.