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# McNair Summer Research Journal 2013

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# RONALD E. McNAIR 2013



Summer Research Journal

**Volume 18**



The College at  
**BROCKPORT**  
STATE UNIVERSITY OF NEW YORK

**TRiO**

RONALD E. McNAIR  
POST-BACCALAUREATE  
ACHIEVEMENT PROGRAM





## 2013 Ronald E. McNair Summer Research Journal—Volume 18



The College at  
**BROCKPORT**  
STATE UNIVERSITY OF NEW YORK

### About TRiO Programs

TRiO refers to six programs funded by the Title IV of the Higher Education Act of 1965. The original TRiO Programs are Upward Bound, Talent Search, and Student Support Services. The name TRiO was retained even though more programs were added. The additional programs are Educational Opportunity Centers, the Ronald E. McNair Post-Baccalaureate Achievement Program, and a training program for TRiO staff. In general, TRiO programs are focused on providing educational opportunities to first-generation college students who come from low-income families and students with disabilities.

### About Ronald E. McNair

**Ronald Erwin McNair** was born on October 21, 1950, in Lake City, South Carolina. He attended North Carolina Agricultural and Technical State University, where he graduated magna cum laude in 1971 with a Bachelor of Science in physics. He continued his education at the Massachusetts Institute of Technology, earning his PhD in 1976, and went on to become a recognized expert in the field of laser technology with the Hughes Laboratory. In 1978, McNair realized his dream of becoming an astronaut; selected from a pool of 10,000 applicants for the

space shuttle program, McNair became the second African American to fly in space. After his death aboard the space shuttle Challenger in 1986, Congress approved funding for the Ronald E. McNair Post Baccalaureate Achievement Program, which is dedicated to the support and promotion of the high standards of achievement exemplified by McNair. Those who knew McNair characterized him as fearless, determined, and accustomed to applying all available resources to any problem he faced.

### The Ronald E. McNair Post Baccalaureate Achievement Program at The College at Brockport, State University of New York

Designed for first-generation and low-income students as well as students from groups underrepresented at the doctoral level, the Ronald E. McNair Post Baccalaureate Achievement Program at The College at Brockport encourages talented students to pursue a doctoral degree. The program promotes graduate studies by providing participants with seminars and workshops germane to the pursuit of graduate education, a mentored summer research experience, and opportunities to present this research at professional conferences.

The *Ronald E. McNair Summer Research Journal* is a publication of the Ronald E. McNair Post Baccalaureate Achievement Program. The McNair Program is a grant funded by the United States Department of Education and is administered by the Research Foundation of the State University of New York, College at Brockport.

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## Introduction and Acknowledgements

**Barbara J. Thompson**

Project Director, Ronald E. McNair  
Post Baccalaureate Achievement Program

### Dear Readers:

I am pleased to introduce you to the 18th volume of the *Ronald E. McNair Summer Research Journal*. This journal is a compilation of the work our scholars complete each summer as they learn to conduct research in their chosen field. Under the guidance of dedicated faculty members, McNair scholars design and implement projects that teach them the fundamentals of creating and using knowledge and provide them with their first taste of the graduate and professional world they are preparing to enter. The Summer Research Program takes our students beyond the average undergraduate experience, setting them apart from their peers as it elevates their education to a level not usually available to students pursuing a bachelor's degree. I am sincerely grateful to the 40 faculty members who invest so much of themselves in moving our students forward. The expertise and encouragement they provide is critical to the success of our McNair scholars, not only during their undergraduate years, but most importantly when they enter the competitive world of graduate school. The fact that 263 of our 705 McNair alumni have successfully earned master's degrees, 25 professional degrees and 38 doctoral

degrees is a tribute to the quality of the work our mentors expect and elicit from their students. Those involved in nurturing our future professionals in this manner deserve to be highly recommended. I look forward to seeing our scholars enter the ranks of academia and continue the process of personally investing in future generations, passing on what they have received through the dedication of our mentors, program staff, and campus community.

### Acknowledgements

The McNair staff would like to take this opportunity to thank Dr. John Halstead, Dr. Douglas M. Scheidt, and Dr. Michael Fox who have assisted in strengthening our program this past year. While the Office of Academic Affairs administers the program, the support base represents a university-wide commitment to achieving our program goals. The US Department of Education, other TRiO Programs, the Research Foundation and the entire institution collectively lend their efforts to the program's success.



## Cloning the Kita Gene from Zebrafish Gastrointestinal Tissues

**Hakeem Daquan Banks, Biological Studies**

Mentor: Adam Rich, PhD

Gastrointestinal (GI) motility is the muscular contractions that mix and propel intestinal content. Although the process is complex, most people take motility for granted until it does not work. Approximately 40% of all visits to the doctor are motivated by discomfort resulting from motility disorders, and treatment options are limited. This research contributes to understanding GI motility. The Kit gene is expressed on interstitial cells of Cajal (ICC) in the mammalian GI tract and is functionally important for ICC development and growth. ICC act as pacemaker cells and initiate rhythmic GI contractions. A reduced ICC density is associated with GI motility disorders, and therefore understanding ICC growth and development is important. The zebrafish has two Kit orthologues, *kita* and *kitb*. The function of *kita* in zebrafish supports development of pigment cells, and the development of gastrointestinal motility.

However, the function of *kita* in ICC development in zebrafish is unknown. This research focuses on cloning a fragment of the *kita* that will be used to construct a probe for in situ hybridization experiments. Developing zebrafish are transparent and the gastrointestinal tract can be viewed in intact animals, providing an opportunity to visualize gene expression and ultimately ICC development in intact tissues. Methods include isolating total RNA, making cDNA, testing quality using PCR and using PCR to amplify *kita*, purifying PCR products, cloning reaction, transfect E-Coli, grow cells on agar plate/choose single colonies, and isolated plasmids using a miniprep. Sequencing the isolated *kita* clone showed a 99% match to the known sequence for the *kita* gene. Future experiments use this PCR product as a probe for in situ hybridization.



## Metabolic Flexibility: Fat Loss Solved?

**Theotis Daniels**, Biological Sciences/  
Mathematics

Mentor: Barbara J. Thompson, MA

The human body is highly adaptive, enabling humans to live in a broad spectrum of environmental conditions. Our bodies are capable of utilizing two types of energy sources obtained from food: glucose and triglycerides, or, in other words, sugars and fats in their simplest form. As the first law of thermodynamics states: all energy can neither be created nor destroyed. Therefore, too many calories will result in weight gain. There are some truths and fallacies with this concept, however. Obesity is a problem with fat tissue accumulation. There are many examples of people who eat the same amount of calories but with very different body composition. It is not how many calories people eat; it is really what the body does with those calories that counts. Genetics and metabolism play a role, but fundamentally the act of the body storing energy rather than expending it is ultimately the responsibility of insulin. Insulin is the hormone responsible for nutrient absorption and fat storage and it is secreted in response to carbohydrates and in some cases protein. Therefore, limiting the secretion of insulin can impair fat storage since it is a secondary characteristic of insulin. Ever since the low fat, high carbohydrate diet was believed to prevent heart disease in the late 1970s, the world has only seen an increase in the very problems the diet was supposed to prevent. Certainly it has produced positive effects on some people, but as a whole it has done more damage. Experts today still fail to acknowledge the detrimental effects of carbohydrates on the body, especially for diabetics, and demonize fats because of the common dogmatic

belief that fats cause heart disease.

It is true that all diets work, but not all diets work in the same manner. In order to burn fat, the body has to deplete its glycogen stores first, and once it reaches a low amount then the body taps into fats as an energy source in a state called ketosis. However, it does not make sense to eat a high carb diet to lose fat because this restores glycogen stores and takes the subject out of a fat burning state. Why not stay in a fat burning state all the time when people are trying to lose fat? Current research has confirmed low carbohydrates work much more efficiently in all aspects of a diet including improved cardiovascular risk factors, lipid profiles, blood pressure, amount of weight loss, and even compliance. However, as with all diets, even those on low carbohydrate diets do not seem to lose weight after a period of time which can be attributed to the decrease in metabolic rate.

This research takes a look at utilizing both sources of energy in a seasonal way to optimize the energy sources in our favor. There are many beneficial effects of carbohydrates including improving metabolism; however, it seems tapping into both extremes of dieting seems to produce many physiological problems. In order to avoid these problems I have devised a theoretical diet scheme which can reverse type 2 diabetes, improve cardiovascular risk factors, increase fat loss, and more importantly provide the ability to eat a broad spectrum of food without consequences. At the conclusion of this diet, each dieter assumes a perfectly balanced diet according to their bodies.



## The Economic Measurements of Youth Self-Determination through Psychological Capital

**Lesondra Dawkins, Accounting/Economics**

Mentors: Karen M. Podsiadly, MS  
Kari A. Smoker, JD

This research looks at the determinants of underrepresented youth resulting from the highest unemployment rate in the US Psychological Capital's (PsyCap) correlation of self-efficacy and economic stability, and the lasting effect in conjunction with educational opportunity programs. Employers measure their assets through tangible and intangible assets of the following factors: human capital through combinations of intellectual property, products of research and innovation, and future expenditures. Low motivation, reliability, and negative attitudes elude the developmental experiences or accomplishments of educational preparation through higher education and readiness programs.

This research project examines the reports of the Bureau of Economic Analysis, US Department of Commerce's measurement of innovations role in GDP, and Productivity Growth in 2008. Research and Development (R&D) accounted for 1/6 of Total-Factor Productivity (TFP), of "Advance in Knowledge," the cost directly related to Human Capital, that employers spend on employee training and development. Psychological Capital trends are widespread throughout business, institutions and private associations. Several reviews on the topics are being formed; one such review, "Labor-Market Consequences of Poor Attitude and Low Self-Esteem in Youths," is located in the Economic Inquiry (Waddell 2006) literature review. I used the national survey provided by Bowles et al. (2000) on the importance of employers' ranking of particular applicants' traits for nonsupervisory and production positions and "applicants attitude" (Waddell 2006). Why is behavior so profound? Simply, our attitudes inhibit talents and abilities or transform them into paths of perception into identities. Development and relationships are formed around those principles.

Their discoveries showed the importance of the traits of individual/youth relevance on maintaining employment readiness from high school to early adulthood. I examined the High School Longitudinal Study of 2009 (HSL: 09) and the steps of the Executive Order: White House Initiative on Educational Excellence for African Americans (President Obama, 2012). These measures are focused on increasing education, public, private, philanthropic and nonprofit stakeholders' relationships with African American students and their contributions towards our economy. When underutilization occurs within a sector of its citizens (youth), it inhibits all the members of its society. Harms & Luthans Implicit Psychological Capital Questionnaire (I-PCQ) shows the determinants that organizations apply as a measurement on the employability, supervisory and work-outcomes. The United Nations Development Program, using the International Human Development Indicators for the United States from 1980 through 2012, shows results on the overall stability criteria of economic contributors to the continuation of growth.

PysCap bridges human capital and traditional economic capital through social capitalism. Although further studies are ongoing in PsyCap, there is an overly reflective aspect where employment opportunities, career connections and networking play a heavy role towards the success in a country's competitive advantages. It is done through the urge of outsourcing, recruitment globally for ingenuity, to gather employees who possess the skill sets to allow corporations the advancement towards the future. As a final thought, competitive edge divides the weaker organizations from the strongest and gives those corporations added niches and vast intellectual property products in a market economy.



## The College at Brockport Admissions: Financial Leveraging Model

**Jourdan Giambona, Mathematics, Finance**  
Mentor: Pierangela Veneziani, PhD

Colleges and universities worldwide face the same problem each year: how to select the most proficient applicant pool for their freshman class. In other words, the growth and success of institutions rely almost directly upon the types of students which they enroll. First and foremost, institutions prefer students with the highest retention rates, thus ensuring four solid years of tuition income as well as sustaining the institutions' brand with perceived student success. However, drawing in the best of the best students does not come cheap.

In order to entice the highest caliber of students, colleges award scholarships in addition to need-based aid. More sophisticated methods of doing so include the development of financial leveraging models to efficiently distribute these funds in a way that maximizes gains and minimizes losses. In particular, this project will look at the parameters that will affect The College at Brockport directly, thus creating a custom financial leveraging model for Admissions personnel to apply in the future.

There are several steps that go along with this research project. First, a survey was sent to all of the students who received this scholarship last year, regardless of whether they chose to enroll in The College at Brockport or not. This additional information will help refine the model by helping us understand which factors are most important to incoming freshmen in their college decision-making process as well as the types of students who are drawn to our school. Next, we will track

the students who received this scholarship and enrolled with The College at Brockport during the fall 2013 semester to get insight on how well they are performing and engaging in The College at Brockport's community. Using this information, combined with historical information from The College at Brockport's Admissions team, we will run a regression analysis to determine which students are best estimated to succeed. We will cluster these predetermined "types" of students based on similar characteristics and distribute the funds accordingly. The College at Brockport's main intention is to enhance its student academic profile, thus creating a more attractive image for the school.

The expected findings are that students who have applied to local colleges, applied to colleges with similar or lower academic reputations, live closer to The College at Brockport's campus, visited the campus, and have low to average family incomes will be more likely to enroll in The College at Brockport. However, these results are not yet proven and there are several other factors that we will consider such as SAT score, high school grade average, etc. Also, it is extremely probable that the model will separate the clusters of students into different tiers and assign different amounts to each tier. This method is expected to be less risky and therefore more efficient than awarding a flat amount (\$1,000) to all clusters of students as seen in the fall 2012 financial leveraging model.



## A Review of Outreach and Preventive Programs for At-risk Inner City Youth

**Lisa D. Jones, Criminal Justice**

Mentor: James Ross, JD, PhD

Research shows that conduct disorders among youth can be a viable predictor of future delinquent activity and low academic performance. Of the many reasons for preventing juvenile delinquency, the most noticeable is that “delinquency puts a youth at risk for drug use and dependency, school dropout, incarceration, injury, early pregnancy, and adult criminality” (Greenwood, 2008, p.186).

The purpose of outreach and preventive programs is to deter youth away from at-risk behavior. This topic is important because if youth are impacted before any risk factors lead them in the wrong direction, they can become productive members of society. Only in the past 15 years has research been available that clearly identifies risk factors that produce delinquency and interventions that reduce the likelihood of them occurring (Greenwood, 2008).

This research project involves a review of outreach and preventive programs for at-risk inner city youth. “This treatment paradigm for youths has been a consistent fixture of the juvenile justice system for more than 100 years, since the birth of the juvenile court in Cook County, Illinois, in 1899” (Mann & Reynolds, 2006, p.153). This research will focus on the various kinds of outreach and preventive programs, public and/or private, available for inner city at-risk youth ages 10-17. For purposes of this research, outreach programs will be conceptualized as programs that offer services for at-risk youth to help educate and instill social and moral value within the home and community. For purposes of this research, youth will be conceptualized as persons 10-17 years of age. Many programs, especially those

geared towards preschool such as ABC Head Start and Universal Pre-K, are also known programs that offer preventive measures for inner city youth born into disadvantaged homes; they too will be examined. Preventive programs will be conceptualized as those designed to help educate and teach social skills to pre-delinquents, non-violent juvenile delinquents and first time offenders. This research offers a literature review of outreach and preventive programs that have proven efficacy. Some programs are nationwide and can be replicated in various communities; some programs have been proven on a smaller demographic scale and also have potential for replication via strong implementation (Blueprints for Violence Prevention). In contrast, there are nationwide programs that have been evaluated and proven ineffective but yet continue to receive government funding (Petrosino, Turpin-Petrosino & Buehler, 2003); these programs will also be examined.

Information on outreach and preventive programs for youth is not lacking; however, evaluation and efficacy of some programs is limited because of the length of time it takes to prove if a program is effective or not; in cases of juvenile prevention programs it takes years to recognize if a program is doing what it is meant to do. In order for a program to be successful it must have a strong foundation that can be proven and replicated across a number of communities (Blueprints for Violence Prevention). The proven programs in this research have a strong foundation of proven efficacy, can be replicated, and all have a positive cost benefit analysis.



## TbLpn, *Trypanosoma brucei* protein and phospholipid synthesis

**Mackenzie Meyer, Biological Sciences**

Mentors: Michel Pelletier, PhD

African sleeping sickness is an insect-borne devastating disease caused by the parasitic protozoan, *Trypanosoma brucei*. African sleeping sickness threatens over 60 million people and 70 million livestock in 36 countries of sub-Saharan Africa. Over 70,000 humans and 3 million cattle die every year; the disease is always fatal unless it is treated. Unfortunately, the current treatment is very toxic and can also be fatal. Trypanosomes have a protein coat armor consisting of variant surface glycoproteins (VSG). Although there are over 1,500 genes encoding VSG proteins, only one is expressed at a time, allowing *Trypanosoma* to keep hiding in the body and build tolerance to current drugs. Since there are so many potential VSG sequences, no vaccine can be developed to prevent this disease from spreading. In trypanosomes, a large number of surface proteins with critical role in virulence such as VSGs are anchored to the plasma membrane via a molecule known as glycosylphosphatidylinositol (GPI). In addition, phosphatidylethanolamine (PE) and phosphatidylinositol (PI) are key phospholipids involved in the biosynthesis of GPI. Of great importance is the fact that, as opposed to other parasitic organisms, trypanosomes synthesize phospholipids *de novo*. This makes the trypanosome phospholipids biosynthesis machinery very attractive for new drug design. When investigating protein function, a lipin TbLpn was discovered. In trypanosome lipin catalyzes the dephosphorylation of phosphatidic acid (PA) to diacylglycerol (DAG), with a potential role in phospholipid biosynthesis.

When testing TbLpn protein interactions, a protein arginine methyltransferase (PRMT) known as TbPRMT1

was found to interact with TbLpn. As predicted from this *in vivo* interaction, it was also found that TbLpn contains methylated arginine residues. As there are five different PRMTs expressed in *T. brucei*, we wanted to determine whether TbPRMT1 was the enzyme responsible for TbLpn methylation. To address this question, both TbLpn and TbPRMT1 were expressed in the bacterium *Escherichia coli* and purified. The two proteins were then incubated with S-adenosyl-L-methionine (SAM), the methyl source PRMTs use. Following incubation at 30°C for 30 min to 18 h, the samples were run on a polyacrylamide gel, then transferred onto a membrane. The presence of methylation on TbLpn was determined by using antibodies that specifically recognize methylated arginines. Once exposed to film, increasing signals were shown to correlate with the incubation time. In the absence of TbPRMT1, no methyl groups were detected. These results clearly show that TbPRMT1 is able to methylate TbLpn *in vitro*.

The next step will be to assess whether any of the other four PRMTs are also able to methylate TbLpn. Understanding how proteins function within *Trypanosoma* is just one step in understanding how the parasite evolves so we can stop this disease from spreading. The United States has tripled business with the Sub-Sahara in the past 10 years. Exposure to this disease is putting Americans and their cattle at risk, and there have already been reported cases. A homologous disease, *Trypanosoma cruzi*, already exists here. Knowing how *Trypanosoma brucei* disease functions allows knowledge to be applied to *Trypanosoma cruzi* and other similar diseases.



## Do Philanthropic Foundations Make a Difference?

**Roslyn M. Phillips, Sociology**

Mentor: Eric Kaldor, PhD

This research project was conducted with the purpose of finding an answer to the research topic "Do Foundations Make a Difference?" The project included a literature review of the current scholarship on philanthropic foundations with special attention to the historical development of philanthropy by foundations in the United States. To explore the changing nature of foundations, I assembled case studies of two foundations: the Rosenwald Foundation and the Bill and Melinda Gates Foundation. These two cases reflect the shift described in the literature to a more modern business model for philanthropic work. In the past, many philanthropic organizations intended their endowments to ultimately be exhausted while working towards some cause. Their primary goals focused on assisting members of society that were less fortunate. Most foundations of today are seeking to remain relevant by becoming more in tune in evaluating the causes they are committed to supporting. This involves establishing mechanisms for accountability and transparency for community organizations. Modern philanthropy addresses not only social problems related to poverty but also an array of problems that affect all citizens, such as cures for major illnesses or new educational policies to improve student outcomes. They are true

agents of change, seeking to make society a better place for all members.

The literature review reveals, however, a growing concern with the actual effects of foundation money and the kind of community organizations and social movements that foundations support. This concern serves as a basis to consider implementation of more governmental supervision. Government oversight can insure that true social or public good is being delivered with foundation funds. This would mean that foundations are going to be held to standards of accountability and transparency they now require of the organizations they support. A system of auditing should be implemented as an obligated task to show proof of monies being applied directly for community actions that seek to support targeted issues and concerns that foundations are supporting through their connections with community action organizations and movements. The information achieved through this research will hopefully serve to help to democratically improve the standings of those foundations already in existence, while it could also serve as a catalyst to establish new philanthropic foundations which could undoubtedly serve to combat the many ails and social injustices that occur in this nation's many communities.



## The Power of Emotional Images

**Amen Ptah, Psychology**

Mentor: James E. Witnauer, PhD

Think about early childhood and the sound of a school bell; what does this automatically mean to young students? What about drivers hearing a siren and pulling over to the side of the road to allow a patrol car, ambulance, or fire truck to pass? How do human beings reach this level of response—just by having a mental representation of a stimulus—and does this type of learning involve physiological reflexes?

Since the classical experimentation performed by Ivan Pavlov (1927), associative learning has come to be a known phenomenon widely used across biological species. In 1927, Pavlov was credited for discovering a process involving changes in the associations between mental representations, where an antecedent stimulus (i.e. conditioned stimulus) activates a mental representation of an absent stimulus (i.e. unconditioned stimulus). This procedure is recognized as classical conditioning.

In classical conditioning situations, animals learn an association between a cognitive representative of a conditioned stimulus and a biologically important unconditioned stimulus. This can result in avoidance or acceptance, depending on the fear or pleasure response the animal has regarding the unconditioned stimulus. Therefore, by association, phobias are capable of coming into fruition. Just by the site or sound of a conditioned stimulus, it can elicit a fearful conditioned response without the unconditioned stimulus being present.

With all this in mind, how is it possible to help others conquer their fears? And by studying the physiological

response to emotional stimuli, is there a way to create a paradigm in human learning that could assist in the challenges of overcoming phobias?

The purpose of this study is to replicate classical conditioning of a pupillary response using an emotional image unconditioned stimulus. Two stimuli (X and Y) were paired with images that varied in emotional content. X was paired with an emotional (fearful) image. Y was paired with a control image that was matched to the fearful image with respect to luminance. An Applied Science Laboratories eye tracking device measured the pupil diameters of 40 undergraduate participants. After X-US pairings, pupil diameter during exposure to X should be greater than pupil diameter after exposure to Y, reflecting a pupillary conditioned response.

In order to examine the results, a quantitative analysis was demanded on preexisting data already collected by the experimenter. Using the software “Matlab,” an algorithm had to be produced to process and analyze the data. Because this is aggregate information, the program should speed up the task. The results are still inconclusive.

Hopefully this research will lead to the discovery of a new manifestation of associative learning. There aren’t any preexisting theories that can support the experimenters’ hypothesis, therefore this work attempts to break ground. The use of innovative technology will assist in coming up with logical explanations, and probable determinations for future learning techniques and/or programming.



## Sleep Quality and Negative Associated Behaviors of College Students: A Cross-Sectional Study

**Jordan S Stenzel, Health Science**

Mentor: Michael J Ray, MPH, MS, CHES

### Abstract

**Objective:** The purpose of this study was to ascertain what negative behaviors college students are engaging in that could be causing them to have poor sleep.

**Participants:** A total of 134 students completed the online surveys.

**Methods:** An online sleep survey was emailed to health science students at The College at Brockport. Survey questions included demographics, sleep patterns, and living situation, and asked them to self-report their negative sleep behaviors.

**Results:** Most students reported to live near campus in off-campus housing. Students claimed to average 8-9 hours of sleep each weekday and weekend night. Of the top negative self-reported behaviors students submitted, 23 students claimed their sleep loss was due to school work and studying. 18 students claimed poor sleep due to mental issues like stress and depression and 16 students claimed drugs, alcohol, and caffeine related stimulants led to their poor sleep. Lastly 14 students reported going out with friends or partying led to their poor sleep quality. The 64 other collected student surveys had a mix of answers that did not lend themselves to a particular larger theme or category.

**Conclusions:** There are many college students that suffer from poor sleep quality overall. This study attempted to shed light on what may be causing these students' poor sleep in general. College administrators

and school related faculty could use these results in forming prevention strategies to help college students improve their sleep. This better quality of sleep could help improve overall academic performance.

In the United States, sleep has been shown to be a problem within the realm of public health. Sleep is an essential part of life for several reasons. When we sleep the brain regains energy and is able to boost the human immune system to deal with illness and fatigue. Proper sleep also allows individuals to think more clearly and objectively. Sleep is also important for memory, and performance growth (University Health Center, 2013). Individuals who get quality, uninterrupted sleep are typically more positive during the day. That is why the issue of poor sleep quality is very important to study.

One group of individuals who has been identified with trouble sleeping is college students. Over the last few decades there has been increased research into the importance of a good night's sleep and its relation to academic performance. According to Clete A. Kushida, MD, PhD, director of the Stanford University Center for Human Sleep Research and a member of the American Academy of Sleep Medicine (AASM) board of directors, "There are data that sleep loss leads to learning and memory impairment, as well as decreased attention and vigilance" (College students, 2007, para. 4.). Another physician-scientist, Lawrence Epstein, MD, the medical director of Sleep Health Centers in Brighton, Mass., says "that sleep deprivation effects [sic] not only whether a student can stay awake in class but how they perform as

well” (College students, 2007, para. 2.).

Throughout the typical college experience, students deal with an array of complex academic, social, and personal daily situations which shape them into who they will become. It is these daily experiences that may also be having an impact on their individual sleeping patterns. Therefore research into the area of sleep quality is necessary because sleep is important to active learning in the college environment.

One example of research into poor sleep quality was conducted by Forquer, Camden, Gabriau, and Johnson at the Department of Psychology at Central Michigan University in Mount Pleasant. Their study examined college students’ sleep patterns at a public university to identify problems and possible influencing factors. The investigators found that of 313 students surveyed, more than 33% of the students took longer than 30 minutes to fall asleep, 43% woke more than once nightly, and more than 33% reported being tired during the day. The researchers found no differences between undergraduate students and graduate students (Forquer et al, 2008). The study concluded that many college students have problems that can negatively impact academic performance and driving abilities.

Another sleep study conducted by Buboltz, Brown, and Soper (2001) of the Counseling Psychology Department at Louisiana Tech University used a quantitative based approach to find indications of students’ sleep problems. The researchers did this to help address deficiencies in the literature. In the study, a sample of 191 undergraduates at a rural southern university found that most of the students exhibited some form of sleep disturbance. Women, in general, reported more sleep disturbances than men did. In the end, the researchers concluded that universities and college authorities should look into sleep habits of college students to reduce the effects of sleep issues on overall academic performance.

The study conducted by Gilbert and Weaver (2010) looked into sleep quality and its relation to academic performance in college undergraduates. The study examined the relationship between sleep deprivation, sleep quality, and academic performance. The results found a significant negative correlation between global sleep quality (GSQ) on the Pittsburgh Sleep

Quality Index and grade point average (GPA). This finding supported the researchers’ initial hypothesis that poor sleep quality is associated with lower academic performance for non-depressed students. However, one of the limitations of their study was that they could not determine the underlying cause of the poor sleep quality, and the resultant lower grade point average. Gilbert and Weaver (2010) suggested, “Because this was correlational research, we cannot infer directionality of effect (i.e., that poor sleep quality caused lower grade point average). It is possible that students with academic difficulties engage in other behaviors that in turn cause poor sleep (e.g., substance abuse)” (p.303).

It is the Gilbert and Weaver study limitations and the lack of behavioral information that gave cause for further investigation. This study seeks to address this gap in the literature by asking: *What specific behaviors do college undergraduates engage in that affect their sleep quality?* It is hoped that the current study will allow for characterization of the behaviors themselves along with evaluation of the impact of individual and synergistic combinations of behaviors. This valuable information may provide insight into key factors behind the poor sleep epidemic.

## Methods

**Participants:** Both undergraduate and graduate students who are majoring in a field from the Department of Health Science at The College at Brockport, State University of New York, were invited through email to participate in this institutional review board (IRB) approved survey. Invitations were sent to approximately 700 students.

**Measures:** To examine and determine the other specific behaviors causing poor sleep quality, we conducted an online survey generated through *surveymonkey.com*. The survey asked basic demographic questions about gender, age, year of schooling and the students’ current housing situation. The survey also asked about sleep duration (how many hours a day/night they sleep) and variability (if they sleep more or less on a weekday or a weekend). The final two survey questions asked the participant to list in rank order of importance their own negative and positive sleep behaviors that they believe affect their sleep quality.

**Procedure:** The link to the survey was included in an email below a recruitment script that explained the purpose of the study. The email was sent to all health science students at The College at Brockport who have current school addresses and student ANGEL online network email accounts. All of the information was confidential. The students clicked the survey link to acknowledge their agreement to participate, then clicked through the informed consent statement page to participate in the study and complete the survey. All completed surveys were submitted to our password-protected, limited-access SurveyMonkey account, where the data was collected.

Upon close of the data collection window, a dataset consisting of anonymous question responses was exported and stored in a password-protected account, and all data on the SurveyMonkey site was cleared.

**Results:** We sent out 700 requests for participation by the health science students, and 134 participants completed the survey. In the sample of participating students, 118 were female, 16 were male. Mean age of the participants was 21 years (approximately 90% could be considered “traditional” college age students). The demographics of participants were representative of students in the Brockport health science department: 40% were in their third year of college, the highest at 45% reported living off campus in a housing residence nearby campus, and 27% reported living on campus in a dorm or on-campus apartment. The rest lived off campus with parents or by themselves not near the college campus. When asked to estimate the total number of hours the student sleeps each weekday and weekend, participants averaged around the same at 8-9 hours total each night. When asked if they sleep around the same time each weekday, 67% said yes. The students were also asked if they go to sleep around

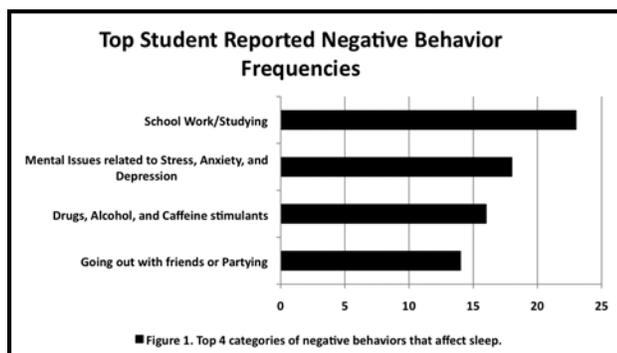
the same time on both weekdays and weekends; 77% reported that they went to sleep (and woke) later during the weekend.

**Comments:** The majority of college students that answered the survey reported that they go to sleep later during the weekends. Almost half also reported living in off-campus housing that was near the college. This suggests that there is a possible association between where the students reside and the lifestyle and behavioral choices that they make. That this population is near campus both during and after school offers the possibility for general health promotion programming by campus life offices that specifically targets improving sleep quality (such as time management skills when studying or the importance of maintaining sleep routines throughout weekdays and weekends).

The different negative behaviors that were reported also suggest possible targets for tailored health programming. For example, time management skills might benefit those who reported negative school-work/study behavior, and relaxation skills might benefit those who reported mental health stress-anxiety negative behavior. The drug and alcohol behavior group may be associated with the going out and partying behavior group. Both of these might benefit from increased alternatives within student life programming.

Another interesting find was that participants reported a close range in total hours of sleep for both weekdays and weekends (means of 8-9 hours). So, even when stressed over life, homework, school, or going out and drinking, participants are seemingly getting an adequate quantity of sleep hours, but the quality of these hours is in question. Given that there were few commonalities among the reported positive behaviors, there seems to be a need to teach students awareness and management skills to improve their quality of sleep.

There are some limitations in this study that should be noted. First, the 134 responses of the survey consisted only of students from the Department of Health Science at The College at Brockport. This issue could cause bias to the results of the study if students in the Department of Health Science have a greater level of information on the subject of poor sleep hygiene. If so, this would mean that



these results are probably conservative and the level of negative behaviors among the general college population may be worse. There may also be other negative behaviors that have yet to be identified among other groups on campus.

Secondly, the main question in the survey asked the student to self-report what they believe is the negative behavior impacting their quality of sleep. These responses may be affected by the participants' current social, personal, or cultural situations. In addition, the geographic location of this college in a Western New York suburban area may not allow for generalizing to other college students across the United States.

**Recommendations:** Based on the high frequencies of stress/school work, mental issues, drugs/alcohol, and partying found and the negative reported behaviors, it is not surprising that students at The College at Brockport also report suffering from some form of poor sleep quality. Poor sleep quality is an issue that has seen several studies yet relatively little preventive action. Action on this issue must be taken in order to achieve a positive impact on the college student population at large. At The College at Brockport, stress and anxiety along with time requirements for studying and assignments appear to play a role in a majority of the poor sleep quality cases that students are facing. Perhaps more large-scale studies looking at potential interventions toward the reported negative behaviors will prompt improvement in students' overall quality of sleep. Faculty and administrative leadership of colleges and universities across the country need greater awareness of how important sleep is. Students' outside lives are complicated, with pressures from peers and jobs competing with long assignments, presentations and test preparation. More emphasis on time management skills training seems like a novel target for health promotion programming to indirectly improve sleep quality among college students.

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