CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Mizna Akbar; Dayna Thai

Project Number

S0401

Project Title

The Effects of Aerobic Exercise on Semantic Memory

Abstract

Objectives/Goals

The purpose of this study was to investigate whether performing a short amount of aerobic exercise would decrease the amount of false memories produced as result of increased blood flow and oxygen towards the brain. We hypothesized that if healthy adolescents perform short term aerobic exercise, then their rates of false memory production will decrease.

Methods/Materials

A total of 93 participants (41 males and 52 females) aged 14-18 signed an ethics committee approved consent with the assent of their guardians to participate in the study, and were divided into exercise and control groups. The study required exercise group participants to perform aerobic exercise on a fitness bike until reaching their target heart rate and then maintaining their pace for a short period of time. Participants then performed a false memory test containing 12 semantically associated words in which they had to write as many words as they could remember.

Results

Analysis was conducted through the comparison percentages of critical words, incorrectly recalled words, correctly recalled words, and the total amount of words recalled between exercise and control groups. Since males and females demonstrated significant variance in their results, they were analyzed independently of each other. The results did not demonstrate any statistically significant correlations between short term exercise and false memory production or the number of words recalled (all p-values for females and males > 0.05). But, males who exercised proved to recall a statistically significant ($p\text{-value} < 0.05$) higher percentage of correct words than the control group (the same did not hold true for females).

Conclusions/Discussion

Due to the false memory recall percentages between exercise and non-exercise groups denoting no significant discrepancy, the hypothesis was not supported by the results. However, though there was no decreased false memory production, males showed improved memory in general after exercising because they recalled a significantly higher percentage of correct words than the control group.

Summary Statement

Our project demonstrated that short term aerobic exercise did not decrease false memory production, but improved memory in general in males.

Help Received

All experimentation and data analysis was performed on our own. Background research was reviewed by psychologists Michael Danovsky and Yvette Segura.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Nicholas M. Brdar

Project Number

S0402

Project Title

Effects of Online vs. Printed Textbooks

Abstract

Objectives/Goals

The goal of this project was to determine if online or printed textbooks lead to significantly different levels of concentration and comprehension.

Methods/Materials

To test students' comprehension scores, I randomly divided twenty students into two groups, one for online textbooks and one for printed. Each participant read a section of my school's Biology textbook (Miller & Levine, 574-579), either online or printed, and took a comprehension test that I created. To analyze the results, I conducted a two sample t-test. To test concentration levels, I used an EEG Machine (MUSE: The Brain Sensing Headband) and its iPhone application to interpret the results. I used two student participants. Each of their concentration levels was tested for both the online and printed textbooks and then compared.

Results

I found that students using the printed textbook scored higher on the comprehension test (average score 74%) than those who used the online textbook (average score 50%). On just the questions involving pictures and charts, the online textbook users scored slightly higher (57.5% as compared to 52.5%). Lastly, I found that the students maintained higher concentration levels when using a printed textbook, and their concentration levels constantly changed when using an online textbook.

Conclusions/Discussion

I discover that printed textbooks lead to higher overall levels of comprehension and concentration, while online textbooks were more beneficial when studying pictures and charts. With the increase in the popularity of ebooks and online educational materials, many schools are currently looking into switching from printed to online textbooks. It is essential that they look into the advantages and disadvantages of each type of textbook before making a final decision.

Summary Statement

I found that printed textbooks lead to higher levels of concentration and comprehension, while online textbooks lead to higher comprehension of pictures and charts.

Help Received

My science teacher mentored me through the entire process. My school counselor, who has two Master's Degrees in the field of psychology, guided my research of psychology. Julian Homburger, who has a Bachelor of Science Degree in Biometry and Statistics from Cornell, helped me with the statistics.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Shreyas Chandrashekaran

Project Number
S0403

Project Title
The Effect of Age on Human Thinking Processes

Abstract

Objectives/Goals
This project studies the distribution and differences in exhibition of inherence heuristic amongst different age groups: children, adolescents, and adults. Inherence heuristic is a human behavior where individuals rely on inherent features of objects and patterns to try to explain them. The objective of this project is to see whether there is a difference between the three groups and age is a factor in the display of this behavior.

Methods/Materials
Recording Device, images of babies taken from internet. Ask for age and ask seven open-ended questions with recording device turned on. Baby images part of question 1.

Results
Inherence heuristic is not evenly split between the three groups with 99.998% probability, calculated using a chi-squared test. Teachers exhibited the least instances of inherence heuristic, followed by students and then preschoolers. The high school students were closer in relative instances of heuristic to the teachers than to the preschoolers. Distribution and differences were found, and the objective was met.

Conclusions/Discussion
Inherence heuristic was unevenly distributed between the three groups, leading me to conclude that age is a factor in the display of heuristic and that as people grow older, they adjust their paradigm to include generally accepted explanations for complex patterns and ideas. I found that inherence heuristic can serve as another metric by which to measure cognitive development and current thinking level of individuals due to its age dependence.

Summary Statement
I found that inherence heuristic, a thinking process that defines objects by their inherent features, was non-homogeneously distributed between three age groups and therefore could be used as a tool to measure cognitive development.

Help Received
I made the questionnaire myself. I used help from Mr. Troy Thiele of the Harker School's Math Department for statistical analysis. I used the help of my mentor, Mrs. Kelly Horan from The Harker School's Science Department, to discuss some results.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Andrew C. Condon

Project Number
S0404

Project Title
The Influence of General Anxiety on the Perception of Personal Safety

Abstract

Objectives/Goals
The purpose of this project was to obtain a general idea of how people felt about their personal safety based on being attacked and terrorist attacks/shootings, and collected GAD-7 scores to compare data.

Methods/Materials
Created a survey that consisted of questions regarding peoples' personal safety (surveymonkey.com), included GAD-7 questions, demographics,

Results
493 randomly recruited people off of social media completed the survey and their data was thoroughly analyzed. As age increases anxiety decreases (vice versa), females were more anxious than males, the higher level of education completed the less anxiety there was, the lower the annual income the more anxiety.

Conclusions/Discussion
Terrorist attacks and shootings are unpredictable, and clearly make people more anxious as there have been many recent occurrences like these in recent years/months. My data has concluded that people who are fearful of an attack are more anxious than those who aren't. Anxiety is a powerful emotion and can result in overreactions like incidences in the Santa Ana Mall and the LA County Schools.

Summary Statement
The levels of anxiety of people were measured, in regards to how they felt about their overall personal safety, given terrorist attacks and shootings.

Help Received
I developed the idea to measure peoples' anxiety based off of personal safety (using the GAD-7) and my father, Dr. Curtis J. Condon (PhD in Neurology) allowed me to use his work computer to organize the data collected from the survey I created.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Emily P. Condon

Project Number

S0405

Project Title

Motor Vehicle Driver Injury and Death in Orange County: Who Is Most at Risk?

Abstract

Objectives/Goals

Describe motor vehicle traffic accident (MVTA) driver injury and death using emergency department (ED), hospitalization, and death data from 2014 in Orange County, California. Determine who is most likely to be injured or killed, analyze the data in terms of the drivers' age, gender, race/ethnicity, and where they live.

Methods/Materials

Data for this report were obtained from the Office of Statewide Planning and Development (OSHPD), which collects patient-level data from all health care facilities in California. The 2014 Emergency Department (ED) and Patient Discharge (PD) hospitalization datasets for Orange County residents were used for this report, which was accessed at the Orange County Health Care Agency internship program. Data were analyzed using SPSS statistical software and other variables included victim#s age, gender, race/ethnicity and their city of residence. Significant differences were determined by calculating 95% confidence intervals for rates. The first section of the report covers ED cases, followed by hospitalizations, and concluding with motor vehicle-related deaths.

Results

The results of this study confirm the stated hypotheses. Younger drivers 20-24 years of age in Orange County are more likely to be injured and killed in motor vehicle traffic accidents compared to older, more experienced drivers. While female drivers more likely to be injured while driving a motor vehicle (car/truck) compared to males, they were eight times less likely to be killed. Despite only accounting for 12% of ED visits, motorcycle drivers (all male) made up over half (51.8%) of all driver deaths.

Conclusions/Discussion

With nearly 10,000 OC drivers injured in 2014 alone, the results clearly show that motor vehicle collisions have a significant personal and economic cost. Based on these findings, it is estimated that over $120 million in medical costs were spent to treat these drivers# injuries in the ED and/or hospital in Orange County. While most injuries were relatively minor, a substantial number were more serious such as spinal fractures and head injuries that could result in a lifetime of disability. While these data do not say who was at fault, those who are young, male, and/or drive motorcycles are most at risk. These findings can help inform public health education efforts to reduce such unnecessary injury and death, and help improve motor vehicle safety.

Summary Statement

Data analysis of the demographics of drivers being injured or killed on the roads of Orange County.

Help Received

I received access to hospital data by working as an intern at the Orange County Health Care Agency.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Leanna Duong; Peizu Qian

Project Number

S0406

Project Title

Analysis of the Impacts of Cultural Changes through Interpretation of Hofstede's Cultural Dimension Theory

Abstract

Objectives/Goals

The objective of this experiment is to gain better insight on how the changes in cultural settings directly influence changes in social values.

Methods/Materials

In this project, we have made a 20-dimensional coordinate plane in which each question in our survey correlates to one dimension. Based on the score of the participants, they are assigned to a point on the 20-dimensional coordinate plane. On this plane there are two points for every person, one indicating their values and beliefs before transitioning a different cultural setting and the other point signifying their current views.

Results

For participants of an Eastern upbringing, 64.29% showed a leaning towards individualism after the transitioning to a Western cultural setting. The rest of 35.71% showed an opposite change: from individualism to collectivism.

For participants of a Western upbringing, 100% of them showed a leaning towards collectivism from their original individualism after transferring to our Buddhist school.

Regardless of the directions of their change, all participants indicated a change in their values after a change in their cultural settings. 35.71% of international students indicated a big change in their morals and 50% of local students showed a medium change in their values.

Conclusions/Discussion

We expected the international students to show a change from collectivism to individualism after coming to study in the US for a several years. In our survey, the higher the number answered the more collective the attitude indicates. Similarly, the smaller a number is, the more individualism an attitude indicates. Therefore, a negative net change shows a change from collectivism to individualism and a positive net change shows a change from individualism to collectivism.

In our survey, the majority of the international group showed the expected change but a few showed the opposite. They most likely received a Western education and lived in a westernized environment in their original countries. As for the local group, everyone showed an expected change from Western individualism to Eastern collectivism because the local students came from public schools which teach very different values from this Buddhist school.

Summary Statement

The mathematical model built in this project serves the purpose of analyzing how the shift in cultural settings has a significant impact on their social values.

Help Received

None. We designed the surveys and created the mathematical model ourselves.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Ruwanthi N. Ekanayake

Project Number

S0407

Project Title

Effects of Sleep Quality on Virtual Reality Language Learning

Abstract

Objectives/Goals

The study is studied the effects of sleep quality on recalling words in an entirely novel language. The impact of demographic details such as gender, race, and age and recall were analyzed to rule out covariates. This research is important scientifically because it contributes to knowledge about virtual reality language learning and how sleep quality can hinder, benefit, or have no effect on recall.

Methods/Materials

Subjects received a short video tutorial on how to use the virtual reality controls, and spent some time familiarizing themselves with moving throughout the virtual reality space. Subjects then went through a learning session, during which they moved through the world and learned names of objects as they #met# them in the world, in Swahili and Chinyanja, in random matched-pairs design. Subjects then underwent two testing sessions, during which they retraced their path through the virtual reality world and attempted to recall the foreign language words as they met the objects that represented them. The next day, the subjects underwent one more testing session and took a sleep quality survey, the Pittsburg Sleep Quality Index.

Results

The dependent variable, participants# recall score, is defined as the proportion of syllables correctly recalled during the first recall on Day 2 (after the overnight delay, before Day 2 learning session). The independent variable, is sleep quality (two levels: good and poor sleepers, as defined by the Pittsburg Sleep Quality Index).

Based on a two-sample mean t-test, the p-value was not smaller than the given value of ᾰ at 0.05, therefore failed to reject the null hypothesis.

Conclusions/Discussion

There was not convincing evidence that sleep quality has an effect on recall of language learned in a virtual reality setting. This may be due to the fact that implicit motor learning may not be impacted by sleep quality/quantity.

Summary Statement

I studied the impact of sleep quality on the learning of a novel language in a virtual reality setting.

Help Received

The Rissman Memory Lab helped with the design and procedure of my experiment.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Lauren R. Fishman

Project Number

S0408

Project Title

Expressing Emotion: Physiological, Verbal, and Facial Differences

Abstract

Objectives/Goals

This experiment aims to discover the differences in the way boys and girls (ages 6-13) and senior citizens (persons 65+) express emotions, including physiological, verbal and facial differences. Through comparing the results to previous studies on middle-aged adults, the experiment will help review how emotional expression differs not only with gender, but also with age.

Methods/Materials

80 subjects (44 children and 36 senior citizens) were individually exposed to 3 multi-media videos, each meant to elicit a different emotional reaction (happiness, sadness). Recorded measurements included each subject's physiological reactions (pulse), verbal responses and facial expressions (mouth, cheek, eyebrow and eye movements).

Results

Analysis for the 6 measurements displayed many differences in how males and females express emotion. Data for the happy video in children ages 6-13 shows that boys and girls outwardly express happiness over 70% from both genders smiled/laughed). Inwardly, however, girls' pulse increased nearly double that for boys. Regarding the sad video, 70% of girls grimaced, while 40% of boys did. Inwardly, girls' pulse increased by 0.1 beats per minute; boys' increased 3.3 BPM. Results for seniors proved that women are externally and internally more expressive than men. 100% of women smiled/laughed during the happy video; 66% of men did. However, women's pulse jumped 8 BPM while men#s only jumped 2.94 BPM. During the sad video, 89% of women grimaced, but only 22% of men reacted similarly. Internally, women's pulse increased by 6.94 beats per minute, while men's increased by 1.22 BPM.

Conclusions/Discussion

When the results of this experiment are compared to past research on middle-aged men and women, many conclusions can be made regarding the impact of age and gender on emotional expression. Prior studies discovered that men outwardly express neither happiness nor sadness, while women clearly convey both. The results from this particular experiment suggest that while girls continue to express emotions throughout their lives, boys fall under societal pressures as teenagers to hide their emotions. However, when boys reach a certain age (around 65), they stop worrying about conforming to social norms and thus express their emotions.

Summary Statement

There are many differences in the way males and females (ages 6-87) express emotion (including physiological, verbal and facial differences), and these differences by gender vary with age.

Help Received

None

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Musaiel Gebremariam; Ryan Le

Project Number

S0409

Project Title

Influence of Math Level and Grade on Number Sequence Recall Accuracy

Abstract

Objectives/Goals

Our goal is to find out if math level and grade make a correlation with number sequence recall accuracy. If someone were to have a high math level, that means there recall accuracy will also be high.

Methods/Materials

Materials that we used our 3x5 index cards for the number sequences. The starting card would have 2 digits, and every card after that would increase by one. For example, the first card would be 13, then the next card would be 578. We would read these numbers slowly and clearly, so the person we are testing understands. The number sequence keeps increasing as the person is repeating all of the digits correctly. Once they make an error repeating, they stop and we record the amount of digits they go up to.

Results

From our results, our hypothesis was not supported by our results. Geometry had the highest average for recall accuracy even though it is considered a low math level. For course grade, B students had the highest average.

Conclusions/Discussion

The math level and grade are not important components of the recall accuracy.

Summary Statement

Even though high math levels and grades have high exposure with numbers, it was not a major factor that affected a student's performance

Help Received

My biology teacher assisted me greatly with my work, and how to improve.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Zoey R. Grant

Project Number

S0410

Project Title

Gender Influence in the United States Military Correlating to the Imbalance of Gender Diversity in Active Duty Recrui

Abstract

Objectives/Goals

The military is in need of more women recruits; however, they are not projecting enough female interest. As the movement for women in STEM fields grow, so does the need for women in our military. If a correlation can be made, and supported, between women recruiters and women recruits then this project can be used as evidence to convince the authoritative military to hire more women recruiters and liaisons and aid the current gender imbalance.

Methods/Materials

One must contact local military liaisons or recruiters and collecting information pertaining to the ratios between men and women.The data must be put into the appropriate graph to see correlations between the two data sets. If one would like to see the gender bias in one subject group, one could juxtapose the statistics to a survey. One should ask the subject group varying questions related to their experience or involvement with the military. To further support one#s claims, interviews with military personnel could be sought after. One will need to keep a scientific logbook to record all data and legally retain all intellectual property.

Results

Males, as expected, had received a greater amount of recruiting opportunities than female counter parts. Female test subjects had felt a greater need to speak with a recruiter or liaison of their same gender than males. The young females interviewed experienced similar results stating they had been over looked by male recruiters and have little to no encounters with a female recruiter. On the converse, males stated they have had a fair opportunity and have been frequently approached by recruiters.

Conclusions/Discussion

Throughout the research of gender bias in the military, I noticed many trends and correlations between survey questions leading me to conclude that my hypothesis was indeed correct. The use of two subject pools aided in the overall comparison of gender relations in the military. By juxtaposing the male and female surveys, one can see that the females have had less opportunity for military awareness then the males. From the survey results and the statistics from different recruiters, it can be concluded that the hypothesis was supported. The gender of the recruiter directly affects the gender of the new-coming recruits. To respond to the request for more female involvement in the military, one can simply argue to bring in a larger some of women recruiters and liaisons.

Summary Statement

This project emphasizes the apparent gender imbalance in the military and proposes a viable solution to the imbalance of recruiters and liaisons as well as overall recruits.

Help Received

Roger Chevalier PhD., Captain Charles E. Fosse, Eric King, Molly Keyser, Mr. Scott Mckeon, Dr. Joe Immel.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Camryn J. Herold

Project Number

S0411

Project Title

Factors Contributing to the Academic and Social Success of the Emotionally Disturbed Programs within the CVUSD

Abstract

Objectives/Goals

The emotionally disturbed programs in the Conejo Valley Unified School District have more than doubled in the past four years, so finding the best method in helping students harness skills for their post-secondary endeavors is beneficial in helping the special education programs grow as quickly as their population does.

Methods/Materials

*Teacher interviews and contact
*Student surveys (anonymous)

Results

The favored form of counseling in order to ensure social success was going to school provided counseling sessions and listening to music. The favored form of counseling in order to ensure academic success was the use of the IEP to set goals and integrating emotionally disturbed students with general education students.

Conclusions/Discussion

The most beneficial method recommended by teachers to help ED students cope socially, was going to the school provided counselors. More than half of the student population participates with this form of counseling. This form of counseling was helpful in getting students to verbally express their feelings one-on-one with the counselor, which helped them gain the social skills they need for their post-secondary endeavors. Based on students coping choices, the most helpful method was going to a different classroom or table and listening to music. This gave students a chance to feel relaxed and focused on the music to get their mind off of what was causing the emotional reaction. Teachers should encourage this method because students learn how to channel their emotions into something positive and artistic rather than trying to ignore their feelings.

Academically, the IEP form of counseling which helps students set goals, apply for college and fill out practice tests was favored by the students. Although the data shows it was being more helpful than DIS counseling, student#s perceived preparation for college varies. In addition to the IEP, the majority of students feel having elective classes is helpful in gaining skills that pertain to their future as they learn to interact with non ED students and gain a freedom from the less restricted setting. Thus, this research agrees with the previous work within Wagner#s study, proving that ED students should integrate with GE students to better their lives post-secondary schooling.

Summary Statement

This research shows the most beneficial methods in ensuring social and academic success for emotionally disturbed students in the CVUSD.

Help Received

Dr. Kristsr Swanson, Dr. Nikki Malhotra, Ms. Cara Shea

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Rufina Joung; Simran Sandhu

Project Number

S0412

Project Title

A Study of the Impact of Race on Facial Recognition of Asian Ethnicities

Abstract

Objectives/Goals

The objective of this study is to determine if being socially and culturally exposed to a certain race will allow a student to more easily identify an ethnicity within that race.

Methods/Materials

A total of 10 classes (246 students) were surveyed. In each class, a slideshow of 15 people of five different mongoloid ethnicities (Korean, Chinese, Vietnamese, Japanese, and Filipino), was shown to the students; there were three photos representing each ethnicity. Students selected for the experiment viewed each photo for 10 seconds and identified which ethnicity they thought the person belonged to. The race of each student subject was also recorded (Mongoloid, Negroid, Caucasian).

Results

Results of the survey were organized so that the percent accuracy (correctness) of identification of each ethnicity by each race was shown.

Using proportions from the organizations of the results mentioned above, statistical analysis was conducted on the data. Two distinct tests were conducted: Two Proportion Z-Interval Test, and Two Proportion Z-Test.

The analysis revealed that from this sample, students belonging to the Mongoloid race may be predicted to more accurately identify people of certain ethnicities within the Mongoloid race. However, there is not enough evidence to show that this will always occur for each of the five ethnicities discussed, and there was insufficient evidence to determine a difference between Caucasians and Negroids in the identification of any of the five Asian ethnicities.

Conclusions/Discussion

Statistical analysis revealed that students of the Mongoloid race had higher ethnic identification rates than the Caucasian and Negroid students in the identification of select Mongoloid ethnicities. This leads us to believe that to some degree, social and cultural exposure to a certain race may allow students to more accurately identify various ethnicities within the race.

Summary Statement

We conducted a study which highlighted social and cultural importance in the identification of various Asian ethnicities.

Help Received

We conducted and designed our survey ourselves; however, Mr. Shaun Harris aided us in deciding on the most appropriate statistical tests for our data.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Miranda Li

Project Number

S0413

Project Title

Impact of Patient-Centered Approach Intervention on Women's Knowledge of National Cervical Cancer Screening Guidelines

Abstract

Objectives/Goals

The objective of this project is to determine the impact of the Patient-Centered Approach (PCA) intervention tool on women¡#s knowledge of updated national cervical cancer screening guidelines. The aim is to find an effective method of implementing knowledge of cervical cancer screening guidelines that will target young women, specifically those in the lower income community, with the end goal of increasing adherence to the updated guidelines.

Methods/Materials

Informed consent was obtained from 18 women who were a part of the Family PACT program; ages ranged from 21 to 44. Subjects interacted with the PCA tool on a tablet as they waited for their scheduled appointment regarding cervical cancer screening. After, the subjects filled out a written survey anonymously. Answers were provided and assigned numbers on the Likert scale. Two question responses were analyzed with chi square analysis to determine respective correlation between 2 independent variables the women¡#s age (<26, ¡Y26) or experience (Pap smear before or not) and their understanding of the guidelines.

Results

100% of the subjects chose either the ¡°strongly agree¡± or the ¡°somewhat agree¡± answer choice in response to questions regarding comprehension, clarity, and preparedness of the information presented. 72%-94% of the subjects chose either the ¡°completely¡± or the ¡°very much¡± answer choice in response to questions regarding the women¡#s understanding of the reasoning behind the screening guidelines. Chi square analysis of 2 questions found no correlation between women¡#s experience and understanding the screening guidelines (x^2=0.9, 0.2), but found correlation between women¡#s age and their understanding of the guidelines (x^2=0.02, 0.054).

Conclusions/Discussion

National cervical cancer screening guidelines were updated in 2012 to correct issues of women¡#s over screening and overtreatment of cervical cancer. These problems still persist today in 2016. It was assumed that women were not adhering to the guidelines because they did not understand the reasoning behind them. The data suggests that the PCA intervention tool is an effective method of providing information about the guidelines, thus increasing adherence to them. The data also suggests that the age of women is an important factor in their adherence to the guidelines.

Summary Statement

I showed that an intervention tool gave a positive impact on women's knowledge of cervical cancer screening guidelines.

Help Received

This experiment was a sub-study under a larger study done at UCLA, the department of pedatrics. I came up with an original question and hypothesis, and analyzed the data myself. Ms. Charlene Chang advised my project, and Dr. Anna-Barbara Moscicki was the PI.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Gabriel Lipow

Project Number
S0414

Project Title
Does Giving Children the Opportunity to Recycle Increase Waste Output?

Abstract

Objectives/Goals
This experiment aims to determine whether giving children the opportunity to recycle will increase their waste output. This was tested by measuring paper towel usage at a middle school for one week by weighing paper towel rolls on a daily basis. The next week, I introduced recycling bins to the restrooms, and repeated the process. The results disproved my hypothesis, as they show that schoolchildren actually use 25% less paper (on average), and shows that children are actually more aware of their environmental impact than adults, based on a prior experiment (Caitlin and Wang, 2013)

Methods/Materials
Measured paper usage at a middle school for one week by weighing paper towel rolls in four restrooms daily then compiling them onto a graph. The following week, added recycling bins and repeated the process.

Results
The results show that middle school students will actually (on average) use 25% less paper when given the opportunity to recycle relative to when they are not allowed to recycle.

Conclusions/Discussion
When tested with middle school students, it was found that children actually decrease the amount of waste they produce when given the opportunity to recycle, although the result was not statistically significant. This is completely contrary to what was recorded in Catlin and Wang#s experiment with college students.

Summary Statement
This project is testing whether giving children the opportunity to recycle will increase their waste (paper towel) usage.

Help Received
While I conducted this study, my father explained how to run a regression with the associated statistics.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Anna J. Lou

Project Number

S0415

Project Title

Closing the Achievement Gap in STEM: Effect of Prior Knowledge on Guidance in Technology-Based Student-Centered Learning

Abstract

Objectives/Goals

As the United States is falling behind in STEM education and struggling with the achievement gap, there have been many practical obstacles concerning teachers and existing multimedia tools in implementing research-recommended guidance in student-centered learning (SCL) into classrooms. Based on the Cognitive Load Theory and meta-analytic findings, I developed an innovative web-based instructional tool that combined expertise from educational research and best teaching practices to overcome these obstacles and enhance Guided-SCL in chemistry. My objectives were to (a) compare Guided-SCL's short and long term effectiveness with other approaches such as traditional Direct Instruction (DI) and Khan Academy, (b) examine Guided-SCL's short and long term effects on the achievement gap between students with low prior knowledge (LK) and high prior knowledge (HK), and (c) investigate how prior-knowledge level would influence the guidance effects (prior-knowledge activation effect and feedback effect) of Guided-SCL on learning outcomes.

Results

College students (N = 185) were randomly assigned to Guided-SCL or either of two control groups and were given pre-posttests and one month follow-up tests, resulting in the following key findings: (a) Guided-SCL significantly outperformed traditional direct instruction (d = 1.60, 262% increase) and Khan Academy (d = 1.42, 185% increase) with long-term effects; (b) Guided-SCL fully closed the achievement gap between students with low prior knowledge (LK) and high prior knowledge (HK) for both conceptual and procedural knowledge; (c) Consistent with the Expertise Reversal Effect, prior-knowledge activation significantly benefited LK (d = 0.84), both in the short term and the long term, but harmed HK (d = -0.46); (d) Feedback timing (immediate vs. delayed) made no difference for LK and HK when explanatory feedback was also provided.

Conclusions/Discussion

This novel work in chemistry classrooms provides the greatly-needed empirical data supporting guidance in SCL and contributes new insight towards more effective and adaptive instructional designs, as well as towards existing research in learning theories. By translating research into practice, this study demonstrates the great potential of using innovative research-based technology to close the achievement gap and improve STEM education in the United States.

Summary Statement

My study is the first to systematically implement research-recommended guidance into classrooms and study the influence of prior knowledge on guidance effects, demonstrating the great potential of research-based technology.

Help Received

Dr. Susanne Jaeggi (School of Education at UCI) and Dr. James Li provided me with professional feedback and valuable advice. Five chemistry teachers and professors gave input to the design of my instructional tool. Seven additional chemistry professors provided subjects in their classrooms for testing.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Henry G. Low

Project Number

S0416

Project Title

Assessing the Effectiveness of Virtual Psychotherapies for OCD by Developing a Novel Software Application

Abstract

Objectives/Goals

The goal of this research project was to develop an intuitive self-help software application for treating obsessive-compulsive disorder (OCD) that features novel virtual treatments. Available for Windows and Android, the application is intended to help patients overcome their symptoms and to assist mental health physicians with treating the disorder. After development of the application, this study investigated the effectiveness of the overall app and the individual virtual treatments at reducing OCD symptoms and anxiety levels.

Methods/Materials

I developed a software application called "Tranquility: An OCD Treatment App" using the Unity 3D Engine, C# programming, 3D models/animations, and custom-designed textures. The application is unlike other existing tools because it gives OCD and anxiety patients regular access to personalized treatments and can potentially serve as a useful complement to clinical sessions. The application features three novel virtual treatments - each based on an existing psychotherapy - titled The Gentle Tree of Thoughts, the Relaxation Journey, and the Personal Journal. A group of 10 research participants with OCD used the 3 treatments of the app for a 15-day testing period and took the Y-BOCS and FOCI symptom severity tests. The testers also completed daily log documents and used a unique scaling/scoring system to provide data regarding the app's effectiveness.

Results

The collected data indicated that the Gentle Tree of Thoughts and the Relaxation Journey were the most effective treatments, although the Personal Journal also demonstrated efficacy. It was found that effectiveness increased over time with all three therapies. In regards to anxiety levels, each therapy resulted in a decrease of anxiety levels over time, with the Gentle Tree and the Personal Journal inducing the lowest average anxiety scores.

Conclusions/Discussion

According to the Y-BOCS and FOCI scores, the overall application caused an approximate 8% reduction in OCD symptoms. Each individual therapy demonstrated effectiveness and was able to cause reductions in anxiety over time. This application has the potential to greatly benefit the mental health community, especially those who suffer from OCD and anxiety disorders.

Summary Statement

In this research project, I developed a novel and intuitive software application, featuring virtual psychotherapies for treating obsessive-compulsive disorder, which demonstrated effectiveness in reducing OCD symptoms and anxiety levels.

Help Received

After consulting with a mental health physician, I planned, designed, and developed the software on my own. I would like to acknowledge the assistance of the participant testers who used my app and anonymously provided data regarding its effectiveness.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Cassiel T. McEvoy

Project Number

S0417

Project Title

Music and the Induction of Emotions

Abstract

Objectives/Goals

This study focuses on how listening to film music without viewing the concurrent film may induce similar emotions in the listener. This involved the use of a survey in which the listener would begin by introducing their initial emotional state as chosen from 8 of the emotions listed on Plutchik#s Wheel. The subject then tracked their own heart rate throughout the test, starting with their initial heart rate before the very first piece, and continuing to report their emotional levels and heart rates after 60 seconds of listening to each piece. The purpose of this survey was to get a general idea of how students of various ages and musical backgrounds relate to film music both physiologically and psychologically.

Methods/Materials

Survey:listener began by introducing their initial emotional state (chosen from 8 emotional states from Plutchik#s Wheel of psychological emotions). Listener tracked their own heart rate and emotional level after 60 seconds of listening to each piece. Used 7 different film scores, each from different movies with different composers.

Results

There were significant differences between the physiological responses of musicians and non musicians. There were less significant but still promising differences between the emotional responses of musicians and non musicians.

Conclusions/Discussion

"Non musicians" (who had played for less than 4 years) did not have a significant physiological reactions to the music, though they were able to correctly identify the emotions present in each piece, except for that of tense/nervousness. "Serious musicians" (who had played for more than 4 years) had much higher physiological responses to the music (up to 12 bpm variations), and were able to identify similar emotions to those reported by the non musicians, except that they were able to correctly identify the tense/nervous emotion in three pieces.

Summary Statement

Musicians and non musicians have significantly different emotional and pysiological responses to film music.

Help Received

My psychology teacher helped me to design my experiment, and my music theory teacher assissted with my understanding of the theory behind my results.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Sheyenne E. Mitchell

Project Number
S0418

Project Title
Can You Taste the Rainbow?

Abstract

Objectives/Goals
The objective of this project is to identify whether synesthesia is rare or more prevalent than we think? I believe synesthesia is rare. My research states that one out of every twenty people has synesthesia. Therefore, 2 out of the 40 people I test should have synesthesia. I believe it will be difficult to find synesthetes

Methods/Materials
First, I presented my project at synesthete.org to attain permission for myself and human test subjects to use the synesthete battery.
After acceptance, my test subjects will "Register to Start the Battery" at synesthete.org, they logged in with their email and password, test subjects fill out researchers information and questionnaire. I then printed, studied, and logged results.

Results
Overall Testing:
62.5% of the people I tested have some form of synesthesia.
76% of synesthetes that I tested are women.
24% of synesthetes that I tested are men.
56.6% of right handed people I tested are synesthetes.
100% of left handed people I tested are synesthetes.
57.1% of ambidextrous people I tested are synesthetes.
THE RESULTS ARE PRELIMINARY AND TESTING IS STILL OCCURING.

Conclusions/Discussion
Can you taste the rainbow? Does 1 plus 1 equal blue? Surprisingly, synesthetes can smell what they hear, hear music in color, taste shapes, see letters in color, Etc. Sometimes in reverse and sometimes having it all. Studies show 1 out of every 20 people have synesthesia. My studies show that 62.5% of the people I tested are synesthetes. These results prove my hypothesis incorrect. 25 out of the 40 people I tested have some form of synesthesia. It turned out to be that synesthesia is more prevalent than it is thought to be.

Summary Statement
This project explores the phenomenon of synesthesia and identifies whether synesthesia is rare or more prevelant than we think.

Help Received
My mother helped with my board and finding test subjects. Also, Granny helped provide supplies for my project.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Saumya Nimmagadda

Project Number

S0419

Project Title

The Effect of Support and Knowledge from Coaches and Family on an Athlete's Return to Sport from an ACL Injury

Abstract

Objectives/Goals

The first goal is to identify the more influential party in an athlete#s return to sport from an ACL injury.The second is to classify the specific knowledge a coach and family should have about the ACL injury.The third goal is to display the methods of support a family and coach should use.

Methods/Materials

Create a survey and address demographics,support and knowledge of the family and the coach.All of the questions and Likert statements were designed to find the most influential party in a recovery and areas of knowledge and support that will reduce the chance of re-injury.The respondents of this survey were athletes that suffered from an ACL injury and subsequently returned to their sport after an ACL reconstruction surgery and were reached through several ACL support groups on Facebook or through personal contacts.

Results

When comparing the coach#s importance for athletes who re-injured themselves and who had a safe recovery, the average difference of the weighted average of all the Likert statements was 0.48 points.This is a significant amount in relation to the weighted average of the family which was 0.016 points.

In terms of the coach#s knowledge,athletes who didn#t re-injure themselves reported a weighted average difference of 1.013 points higher than those of re-injured athletes.The familial knowledge only had a 0.137 point higher average when comparing athletes who didn#t re-injure themselves to re-injured athletes.

For the coach#s support, the average difference was 0.56 points.The familial support had an average difference of 0.25 points.

Conclusions/Discussion

The most influential party in the recovery process of a torn ACL and ACL reconstruction surgery was the coach.The areas of knowledge a coach should have include knowledge about the injury,the function of the ACL,the motions and activities that could cause an ACL tear,and which graft would be best for the athlete.The family should know which motions and activities cause an ACL tear,what happens in physical therapy,and about the recovery exercises.In terms of support, the coach should communicate with the athlete#s surgeon and physical therapist more often.The family should communicate with the surgeon more often and empathize about the injury.

Summary Statement

This project aimed at identifying factors expressed by coaches and families that contribute to a re-injury of the anterior cruciate ligament.

Help Received

I designed the experiment myself, but did receive feedback from a physical therapist, Valerie Jackson.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Meredith S. Sheppard

Project Number

S0420

Project Title

The Relationship of Depression between Nurses Working Night Shifts and Day Shifts

Abstract

Objectives/Goals

The purpose of this project is to compare the level of depression or symptoms of depression between nurses working nights and nurses working days, as measured by the PHQ-8 survey (see sample and setting in methods section).

Methods/Materials

Design: The type of study was selected for this project was a descriptive cross-sectional study.

Sample and Setting: With permission from a large academic hospital in Los Angeles, California nurses volunteered to fill out two surveys. The first survey asked them basic questions about their sleep schedule and work schedule. Next, they took the PHQ-8. The PHQ-8 (Patient Health Questionnaire) is an eight question survey that is typically given for patients to fill out while they are in the hospital. It is an accurate indicator of depression. The PHQ-8 shows whether a person may have low or no depression, mild or moderate depression, high likelihood of depression, major depression, or severe major depression.

Measures and Data Collection: After the surveys were completed the PHQ-8 was graded, the mean scores on the PHQ-8 were graded, and T tests were conducted.

Results

A total of 64 nurses completed the surveys, 26 nurses from the day shift, 37 from the night, and one survey was disregarded because the nurse work both day and night shifts. On the PHQ-8 the night shift nurses had a mean score of 6.05 and day shift nurses had a mean score of 4.62. A T test was conducted and it was found that the data was statistically insignificant.

Conclusions/Discussion

Although my data was considered statistically insignificant my hypothesis was still true. Therefore, nurses who are working the night shifts are more depressed and more prone to making mistakes. Because of this a nurse who is depressed could be compromising patient care, their reputation, and the hospitals reputation.

Summary Statement

My project investigated the relationship of depression between nurses working day shifts and night shifts.

Help Received

Dr. Maureen Metzger, Dr, Nikki Malhotra

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Edward A. Trimble

Project Number

S0421

Project Title

Using EEG as an Evaluative Tool for Sustained Concentration Studies: Phase III

Abstract

Objectives/Goals

I did this project to see if left-brain and right-brain hemispheric activity could be recorded on an EEG to indicate sustained concentration and good mental discipline or imagery, and transition to physical execution of a move during a game such as chess, as an indicator of the subject being able to sustain concentration over long period of time.

Methods/Materials

My hypothesis was that an EEG would be able to indicate this by displaying long period of beta wave concentration. Two subjects, one an experienced chess player and the other a novice, were #wired# to an EEG and instructed to be at their maximum concentration while trying to defeat a chess program. An EEG technician was instructed to start the EEG 8-9 moves into the game. The results were then to be compared.

Results

Changes between EEG waves were very abrupt in some circumstances. The experienced chess player went right into a sustained beta wave level of concentration, indicating that he/she was #in the zone#. Physical movement appeared on the EEG as spikes marking where the player had to make a move against the computer. The beta wave concentration returned immediately after the movement. The novice player, however, started with an alpha wave concentration which indicated he was very relaxed but not as focused. Beta wave concentration was much shorter and interrupted by movement and alpha waves. The player#s EKG also become elevated when making a move but became calmer when the subject started tapping a pencil.

Conclusions/Discussion

I concluded that an EEG could be used to record sustained concentration indicated by beta waves over longer periods of time, and conversely to indicate when a subject is not concentrating adequately, indicated by alpha waves. This would suggest that it may be a diagnostic tool to assist athletes, artists, surgeons, and musicians employing a mental imagery program and a high level of physical performance.

Summary Statement

This project examines the use of an EEG to identify whether a subject is displaying sustained concentration or not as an evaluative tool.

Help Received

My advisor Dr. Morse helped provide an EEG with technician and school facilities. All other work was mine.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Anika J. Wille

Project Number
S0422

Project Title
Is Seeing Perceiving? Do Visual Cues Enhance Auditory Attention and Comprehension in a Mixed Speech Background?

Abstract

Objectives/Goals
The objective of this study is to test if visual cues such as images will improve the comprehension of information when two sentences are spoken at once.

Methods/Materials
To test my hypotheses, I conducted 2 sets of hearing tests, each consisting of a video recording of 2 spoken sentences combined with an image. Test #1 contains 2 sentences (sentences 1 and 2) that are dissimilar in words and sentence structure. Test #2 contains 2 different sentences (sentences 3 and 4) that are similar in their properties. Among the 28 male and 32 female subjects I recruited, I randomly divided them into 3 test groups, namely groups A, B, and C. Group A was shown images that were relevant to sentences 1 and 3. The images preceded the recorded sentences in the video, made using iMovie; while group B was shown images that were relevant to sentences 2 and 4. Group C was shown blank images that preceded the same recordings as used for groups A and B. In other words, all 3 groups were subjected to the same voice recordings, but to different visual cues prior to the mixed conversations.

Results
1). In general, the performance between the multiple-choice test and written test is comparable.
2). In mixed sentences 1 and 2, the image of a dancer shown to group B significantly improved the understanding of sentence 2. The visual cue of a brown fox also improved the understanding of sentence 1 for subjects in group A, although to a lesser extent. The reason for this difference is unclear, possibly due to the dominant effect of dancer image and the content of sentence 2 on my subjects.
3). In hearing test #2, both visual cues (A: tiger; B: zebra) helped the understanding of sentences 3 and 4.
4). The hearing score of group C did not favor either sentence in both hearing tests. Group C scored lowest overall, due to the fact that they did not have any visual cues helping them.
My data suggest that visual cues help enhance the understanding and processing in a mixed speech background, particularly when sentences share similar sentence structure.
5). There is no overall gender difference in the auditory comprehension performance.

Conclusions/Discussion
Visual cues improve auditory attention and perception in a mixed speech background under most circumstances, particularly when the competing sentences are very similar. There is no overall gender difference in auditory perception of mixed sentences.

Summary Statement
When subjects are presented with a visual cue of an image relating to one of two sentences being played at the same time, the sentence corresponding with the visual was comprehended more clearly over the other.

Help Received
My mentor offered advice on presenting my experiment more clearly, as well as possible ideas for further studies. My parents gave me advice on conducting statistical analyses (t-test).

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Nicholas G. Wong

Project Number

S0423

Project Title

Currency Movement Projections and Possible Societal Applications Using Dollar Bill Tracking Data

Abstract

Objectives/Goals

Dollar bills stamped with the "wheresgeorge.com" website were spent in Yolo or Sacramento County. Bills were tracked over time from their starting points by monitoring locations and dates where members of the general public received and logged in a stamped bill (a "hit"). The main goals of this study were to see if information from these "hits" could be used for 1) Development of a mathematical expression for predicting the movement of bills over time and 2) A social science based study to observe if information regarding these "hits" could be correlated with a variety of economic, transportation, and health related demographic data.

Methods/Materials

1) Dollar bills were marked the "wheresgeorge.com" site using stamps, recorded online, and then separated into the two distribution groups (Sacramento/Yolo). 2. Bills were then spent in their respective counties or exchanged with residents in those counties 3) For several months, bill tracking reports of "hits" were downloaded and recorded.

Results

Over a long term, the distance that a bill moves over time was best fit with a polynomial (Yolo) or exponential (Sacramento) expression. Over a shorter term (< 4 months) a linear expression could be calculated. For both counties, the number of commuters to and from a neighboring county correlated best with the "hits". Yolo county bills had higher "hits" correlation with neighboring counties based on population levels while the "hits" from Sacramento bills correlated more with counties with higher personal income, personal spending and lower poverty levels.

Conclusions/Discussion

Mathematical expressions can be developed for distances of "hits" over time and for the first few months, bills moved approximately 10 miles/week. Correlation analysis shows that bills from a smaller populated county tend to gravitate toward counties with larger populations while bills from a larger populated county are distributed to neighboring counties based on economic factors such as higher personal incomes, personal spending, and lower poverty levels. The number of commuters between counties appears to be the major factor for movement of dollar bills. The methodology developed in this study could be expanded for a larger scale study by researchers by following bill movements through more robust methods such as tracking bills in financial institutions in different areas and correlating with additional demographic data.

Summary Statement

Movements of dollar bills were tracked online and this information was used to determine the flow of bills between counties and the possible correlations of these flows with various economic, transportation, and health demographic data.

Help Received

Statistical analysis advice was given by AP biology teacher, Ms, Cordelia Nguyen. Mathematical expression calculations advice was given by my Pre-Caculus teacher Mr. Dennis Plotts. Advice on sources for demographic data was given by my AP History teacher, Mr. Todd Whalen