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18. Statistics

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Abstracts from the 2015 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

18. Statistics

05.18.01 Simulated Learning, Does It Work?

Cynthia, Murray *University of Central Oklahoma*

Danielle, Perlingiere *University of Central Oklahoma*

Jessica, Sanders *University of Central Oklahoma*

Seth, Hiddink *University of Central Oklahoma*

This study compares two groups of UCO nursing students enrolled in the 2013 Medical Surgical Nursing II class. One group (control) was assigned to a traditional clinical rotation at a hospital; the other group (experimental) was assigned to a simulation lab rotation at UCO. All students took the same pre- and post-tests. Differences in scores between pre- and post-tests and between control and experimental groups were determined. In addition, student demographics and a satisfaction survey given to the experimental group were analyzed. Statistical methods included t-test, Fisher's Exact test, analysis of variance, and chi-square test. In the control group, there was a significant difference between pre- and post-test means ($p=0.0013$). A test score of 60 or greater was used to indicate passing. In the experimental group, there was a significant difference between the percent of those passing the post-test with regard to whether they had passed the pre-test ($p=0.0144$). 84% of the survey responses indicated that the simulated lab was effective at providing a safe environment to practice.

05.18.02 All About the 3-Point Kick

Cynthia,Murray *University of Central Oklahoma*

Danielle,Perlingiere *University of Central Oklahoma*

Jessica,Sanders *University of Central Oklahoma*

Seth,Hiddink *University of Central Oklahoma*

This study investigates whether there is variability in successful field goal DISTANCES in professional football with regard to the team, quarter (1-4, OT), stadium (indoor/outdoor/both), regular/post season game, home/away game, time (month and year) and the kicker's age and size. In addition, because a team can reduce its reliance on a bad FG kicker, the NUMBER of successful field goals was analyzed. To determine reliability, 5 years (2009-2013) of data was collected (NFL.com) which included 4207 successful field goals by 56 kickers. Statistical methods included t-tests, analysis of variance, goodness-of-fit chi-square tests, Pearson correlation coefficients, and multiple regression. Based on univariate analyses, the longest average distance occurred in stadiums with a retractable roof, regular season games, and in 2012 or 2013. The number of field goals was greatest in the 2nd quarter, outdoor stadiums, and the month of December. The greatest number of field goals (61.6%) was between 20-30 and 30-40 yards. The largest percent of kicks greater than 40 yards (43.4%) occurred in October 2013.

05.18.03 Examining the relationship between reporting quality and journal prestige in PTSD Neuroimaging research

Anh,Tran-Pham *Tulsa Community College*

Branden,Carr *Oklahoma State University*

Matt,Vassar *Oklahoma State University*

Reporting quality has received increased attention in recent years due to concerns related to the validity of scientific evidence as well as the proliferation of meta-analysis studies in medicine. To address this issue, standardized reporting frameworks have been adopted for the reporting of randomized controlled trials (e.g.,CONSORT), meta-analyses (e.g., PRISMA, MOOSE), and other research designs. Due to the unique features of neuroimaging studies, current frameworks are not applicable. We recently developed a quality scale to evaluate neuroimaging studies. For the present study, we located 66 neuroimaging studies of post-traumatic stress disorder. These studies were evaluated using the quality scale and assigned a numeric rating. Next, the impact factor - a proxy measure for journal prestige - was retrieved for each journal in which these articles were published. A Pearson correlation coefficient will be used to evaluate the relationship between journal prestige and reporting quality.

05.18.04 The Future of Ghana: A Time Series Analysis and Forecast of Inflation

Josephine, Akosa *Oklahoma State University*

For a very long time, inflation has been one of the intractable problems the Ghanaian economy has faced. Many Ghanaians are generally worried about how future inflation rates would affect the economic growth of the country. This study, based on inflation rates from 1965 to 2013, utilized an ARMA(1,1) model with outlier intervention to forecast inflation rates of Ghana. The results indicated that the highest plausible prediction limit is about 57%, well above the threshold beyond which inflation has adverse effect on the economic growth of the country. As such it is recommended policy makers put in place measures to deal with the rise of inflation in the country.

05.18.05 Methods to Improve Accuracy of Predicting Traffic Fatalities in Oklahoma

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Tracy, Morris *University of Central Oklahoma*

The Oklahoma Highway Safety Office (OHSO) is a state agency that keeps records of vehicle accidents in Oklahoma. The OHSO uses this information to help other state agencies, like the Oklahoma Department of Transportation and the Oklahoma Highway Patrol, to develop programs to address highway safety issues. The OHSO must also make future projections for the number of traffic fatalities and report this information to the National Highway Traffic Safety Administration. Currently, students and faculty at the University of Central Oklahoma (UCO) analyze data provided by the OHSO to determine trends in the number of traffic fatalities over time and to make projections for the future. The goal of this project is to find the best method that could be used to improve the accuracy of projections of the number of traffic fatalities in Oklahoma. Data on the number of traffic fatalities from 1937 to 2007 were used to develop models for predicting the number of traffic fatalities in the future. Four modeling methods were used: Moving Averages, ARIMA, ARIMA with additional variable unemployment, and Exponential Smoothing. The models were then used to predict the number of traffic fatalities for 2008 to 2012. These predictions were then compared to the actual data values for these years. The mean square error of the predicted values to the actual values was used to select the best fitting model.

05.18.06 A Statistical Analysis of the Last 78 Years of the Heisman Trophy

Jessica,Sanders *University of Central Oklahoma*

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The Heisman Trophy is given annually to the best U.S. college football player regardless of position. Sports journalists from around the country and previous Heisman winners cast ballots with a list of the voter's top three choices in order. Each first place vote receives three points, second place votes receive two points, and third place votes receive one point. The player with the most points is named the winner and presented with the Heisman Trophy at a ceremony in December of each year. There is some controversy surrounding the selection of Heisman Trophy winners. Specifically, critics have speculated the presence of selection bias with respect to region, position, conference, and school, arguing that the best player is not necessarily selected each year. This research investigated the presence or absence of this bias through statistical analysis. Data concerning 755 players, including nominees and winners from 1935 to 2013, were collected from www.sports-reference.com. Variables related to player ability as well as variables concerning school, geographic location, and other demographics were examined to determine what variables are significantly related to winning the trophy. A logistic regression model was developed to predict the winner of the Heisman Trophy. This model was then used to predict the winner of the 2014 Trophy.

05.18.07 Statistical Ideas: Strength of Masseter and Temporalis Muscles in Deer Mice from Various Regions in Oklahoma

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Beitriz,Granda Vega *University of Central Oklahoma*

Breanna,Smith *University of Central Oklahoma*

Christina,Evans *University of Central Oklahoma*

Christopher,Chan *University of Central Oklahoma*

Erin,Healey *University of Central Oklahoma*

Erinn,Murphy *University of Central Oklahoma*

Joan,Brenneman *University of Central Oklahoma*

Jordan,Gooch *University of Central Oklahoma*

Julia,Garrett *University of Central Oklahoma*

Kristey,Meyer *University of Central Oklahoma*

Meghan,Carr *University of Central Oklahoma*

Mekale,Chapple *University of Central Oklahoma*

Tamatha,Perkins *University of Central Oklahoma*

William,Caire *University of Central Oklahoma*

Zhi,Lin *University of Central Oklahoma*

A data set was provided by Dr. Caire which contained measurements taken from deer mice (*Peromyscus maniculatus*) stored in a natural history museum. The mice that were measured were selected because they had complete skulls. All of the measurements in this experiment are from deer mice in Oklahoma. This report analyzed adult (3 years old) deer mice exclusively. We used the One-Way ANOVA test to determine if the regions where the mice are subjected to harder dietary fare (far Western and Eastern Oklahoma) produce mice with a significantly higher mechanical advantage than those regions where the food sources are softer. We also used a Two-Sample T-test to determine whether or not a difference exists in the mechanical advantage of the male and female deer mouse.

05.18.08 A Study of the Most Vulnerable

Cynthia, Murray *University of Central Oklahoma*

Jennifer, Holmes *University of Central Oklahoma*

Seth, Hiddink *University of Central Oklahoma*

This study examines hospital discharges in Oklahoma for a disease prevalent in the elderly, stroke, and one common in children, asthma. The Oklahoma State Department of Health provided data for 2010 – 2012. Their research questions for stroke patients included discharge destination with regard to type of insurance, county of residence, and procedures during hospitalization. Research questions for childhood asthma included a trend analysis of hospitalization rates and costs with regard to air quality. In addition, yearly distributions for age, race, and sex were determined for both diagnoses. For stroke patients, survival distributions by race were compared as well as mortality rates for Oklahoma counties which were categorized into 5 regions. For the hospitalization and cost analysis involving asthma patients, Oklahoma counties in which ozone (15 sites, 9 counties) and fine particulate matter (8 sites, 5 counties) are measured were dichotomized into good and poor. SPSS was used for graphs and statistical tests. U.S. census data from 2010 was used to adjust rates for population in OK counties.

05.18.09 A Comparison of Statistical Methods for Phenotype Prediction From Genotype Data

Lan, Zhu *Oklahoma State University*

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Predicting phenotypes from genotype data is important for human health, medicine, animal and plant breeding, and evolutionary biology. Recently, it has also been applied to forensics science. To help researchers select an appropriate prediction model for their own data analysis, in this study, we offer a comparison of three popular statistical methodologies in the field of predicting phenotype from genotype data. Specifically, we compare Genomic Best Linear Unbiased Prediction (GBLUP) (Ober et al 2012), BayesB Model (Gianola et al 2011), and Neural Networks (Chang and McGeachie 2011). Each methodology performs well if all its assumptions are satisfied. However, some assumptions are often violated in reality. Therefore, no one statistical method outperforms others for all types of data. Besides assumptions, factors that affect the performance of prediction include but are not limited to sample size, available informative biomarkers, nature of phenotypes, etc. In this study, we compare above three methods and evaluate the performance of prediction by exploring different levels of sample size and various distributions of phenotypes, with the goal of providing a useful guideline for researchers to wisely select a suitable model that fits their research needs.

05.18.10 A Statistical Analysis of the Deterioration of Cartridge Cases

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Project SCHOLAR (Student Consulting Help for Organizational Leaders and Academic Researchers) is a statistical consulting service composed of undergraduate students at the University of Central Oklahoma (UCO). Faculty from the Department of Mathematics and Statistics oversee the work of the SCHOLAR students on projects submitted by other researchers. A graduate student from the Forensic Science Institute at UCO conducted an experiment concerning the matching of cartridge cases. In this study, 1,296 cartridge cases were collected. These cartridge cases were placed in six different locations and over the course of a year, 18 cartridge cases were collected from each location every 30 days for analysis. The cartridge cases were then matched to a set of control cases. Those greatly deteriorated cartridge cases that were unable to be matched then underwent one of three cleaning techniques to determine which technique had the best capability of restoring the cartridge cases' original features. The SCHOLAR students analyzed the data resulting from this experiment. Specifically, two questions were addressed: (1) what factors, including time, rainfall, temperature, humidity, composition, and gun, are significantly related to whether or not a cartridge case can be matched, and (2) which cleaning technique, if any, should be used depending on the composition of the cartridge case and in which location it was found.

05.18.11 The Use of Clinical Trial Registries for Meta-Analyses and Systematic Reviews of Select Neurological Journals

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Background: Systematic reviews (SRs) synthesize existing research findings in order to better inform medical decision making. Inherent to SR methodology is publication bias, or the notion that statistically-significant published studies are more commonly included in SRs than unpublished studies. Because of this, the resulting effect sizes from SRs may be misleading. Researchers have handled publication bias in numerous ways, and clinical trials registries have recently been discussed as a possibility for obtaining unpublished data. Very little is known about their use in SR searches, however. Objectives: To examine the use of clinical trials registries in published SRs from the neuroscience literature. Methods: A six-year review (2008-2014) of 6 neuroscience journals (American Neurological Association, Annals of Neurology, Brain, Lancet Neurology, Neurology, and The Neuroscientist) was performed to identify eligible SRs. Journals were selected based on their high impact factors. A previously published PubMed search strategy was used to initially identify eligible studies. All SRs comprising the final sample were independently reviewed to determine if clinical trials registries had been included as part of the search process. Results: Descriptive statistics will be used for analysis of study data. Conclusions: Researchers conducting SRs should search clinical trials registries to locate additional sources for unpublished data.