SECOND ANNUAL STUDENT RESEARCH DAY

Friday, September 23, 2022

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

GUEST SPEAKER
Anil T. Mangla, State Epidemiologist, DC

Dr. Mangla has previously served in numerous public health leadership roles at the state, city, and county levels, including Assistant Director at the San Antonio Metro Health Department, Director of Infectious Diseases and Immunization, and Acting State Epidemiologist at the Georgia Department of Health, lead epidemiologist at the Indiana State Department of Health, a supervisory epidemiologist at the Texas Department of State Health Services and laboratory manager and MedTox laboratories.

Dr. Mangla completed his undergraduate degree at the University of KwaZulu-Natal, a master's at the University of El Paso, and his Ph. D at Texas Tech University. He then completed an infectious disease fellowship and an MPH at the University of Minnesota. After his fellowship, Dr. Mangla served as the chair of infectious diseases for the United Nations Association and traveled to South Africa, Swaziland, and Lesotho, as part of the response to HIV, TB, and Malaria. He interned with congresswoman Betty McCollum and served as a public health advisor for Colette Von Hanna.

He was Board Chair for the Texas Kidney Foundation and one of the 17 gubernatorial appointees by Texas Governor Abbott to the Chronic Kidney Disease Task Force for his expertise in diabetes-related amputations and kidney failure. He served as an Associate Professor and Director of Public Health at UIW School of Medicine and as an adjunct professor at the Mercer School of Medicine and the University of Georgia. He serves as the chief scientific officer for TOXYScreen laboratories.

Dr. Mangla has received numerous accolades for his leadership in public health, policy development, Social Determinants of Health, and social justice. A strong patriot of human rights, he is one of the victims that survived the apartheid era and the free Nelson Mandela campaign. His African roots ignite his passion for identifying pathways for immigrants and minorities to overcome health and higher education barriers.

Table of Contents

POSTER

CLINICAL MEDICINE/COMMUNITY HEALTH RESEARCH (CC)

CC9

Evaluation of Copy Number Losses in the MBD5 5'-Untranslated Region: Expression Matters
K. Kashyap, S. Milosavljevic, M. Zschappel, R. Mendoza-Londono, W. Han Tan, J. Innis, T. Ezashi, S. Elsea
Advisor: S. Mullegama

CC10

Further Elucidation of Mullegama-Klein-Martinez Syndrome
K. Liang
Advisor: S. Mullegama

CC11

Impact of COVID-19 on the Self-Report Assessment of Obsessive-Compulsive Disorder
E. Meza, G. Hapenciuc, S. Bistricky
Advisor: R. Marek

CC12

Pre-Surgical Psychological Functioning Predicts One-Year Postoperative Spine Surgery Outcomes
J. Le, G. Hapenciuc, M. Philip, A. Block, Y. Ben-Porath
Advisor: R. Marek

CC13

Sacral Asymmetry: Relationships Between Morphological and Metric Analyses
R. Mota
Advisor: K. Lesciotto

CC14

The Effects of Osteopathic Manipulative Treatment (OMT) in Post-Concussive Collegiate-Aged Athletes
L. Milunovich
Advisor: L. Tucker

MEDICAL EDUCATION RESEARCH (ME)

ME1

Accessibility to Sexual Health Education
A. Nair, H. Jeong, C. Schumann
Advisor: P. Taylor

ME2

Addressing Vaccine Hesitancy in the Homeless Population
R. Patel, K. Morris-Ibarra, V. Mousa, E. Ladine, M. Wojciechowski, K. Liang, K. Hu, L. Knittig
Advisor: M. Manis

ME3

An Evaluation Approach of Current Medical Students in the Context of an Implicit Bias Framework – A Mixed Methods Study
D. Dozier
Advisor: C. Collins

ME4

Developing a Peer Mentorship Program Integrated with Osteopathic Principles for Medical Students at SHSU-COM
W. Zhuo, L. Banuelos, L. Zhan, R. Nagaraj, L. Knittig
Advisor: Y. Zhao

ME5

Developing a Student-Led Scholarship of Teaching and Learning Research Interest Group at an Osteopathic Medical School
R. Bhattacharjee, A. Reynolds, L. Knittig, R. Nagaraj, L. Zhan
Advisor: Y. Zhao

ME6

Evaluating Medical Student Perceptions of Team-based Learning (TBL) at SHSU-COM
R. Nagaraj, L. Zhan, L. Knittig
Advisors: R. Andrews-Dickert, Y. Zhao

ME7

Facilitating the Integration of Embryology, Histology, and Radiology within Clinical Anatomy Education
M. Tran, R. Buch
Advisor: M. Loomis

ME8

Facilitating the Integration of Embryology, Histology, and Radiology within Clinical Anatomy Education
R. Buch, M. Tran, M. Loomis, J. Hinojosa, D. Moeller
Advisor: D. Wooten

ME9

Patient-Perceived Implicit Bias in East Texas Clinics
T. Moore, B. Birks
Advisor: M. Manis

ME10

Skin of Color in Medical School Dermatology Curricula
L. Knittig, B. Birks, L. Zhan, R. Nagaraj
Advisor: J. Hinojosa

ME11

What's in a từ? Scheduling Disparities Among Non-English Speakers
K. Chi Dang, K. Ibarra, E. Deya Edelen
Advisor: P. Taylor

ME12

You Can D.O. Medicine Mini-medical School Camp and Self-Efficacy in High School Students
P. Jesudasen, D. Dozier
Advisor: R. Marek

PRE-CLINICAL/LABORATORY

PL1

Airyscan Technology Fills the Gap Between Traditional Confocal Methods and New Super-Resolution Microscopy for Sensitive Immunohistochemistry Protein Studies
M. Kakakhel, L. Tebbe, M. Makia, M. Al-Ubaidi
Advisor: M. Naash

PL2

Assessing if Tumor Secreted IL-6 Type Ligands Regulate Peripheral Tissue in a Drosophila Tumor Model
B. Birks, C. Everson, I. Perez
Advisor: M. Atkins

PL3

Does Tumor-Produced TEP3 and PGRP-SA Activate a Host Innate Immune Response in Drosophila *M*elanogaster Tumor-Bearing Larvae?

I. Perez

Advisor: M. Atkins

PL4

Ebf1 GST Fusion Proteins Protocol & Pull Down's

K. Ibarra, A. Gutierrez, Z. Bailey, H. Jenkins, Y. Martinez

Advisor: M. Griffin

PL5

Effect of Neuropsychiatric Medications on Gut Microbiome

Imaan Ali

Advisor: O. Kelly

PL6

In-vitro Characterization of the Release Profile Models of Novel Cannabidiol Formulations Using Cryopreserved Cadaveric Skin Mounted in Franz Diffusion Cells

L. Zhan

Advisor: H. Abdelhady

PL7

Quantifying Ultrasound and Micro-CT Imaging of Cranial Suture Anatomy and Related Trauma

P. Martin, S. Baker, Z. Rasheed

Advisor: P. Lewis

ORAL

O1

Application of Osteomyelitis Classification Systems in Skeletal Samples

J. Ross, I. Esparza

Advisor: K. Lesciotto

O2

Comparing Two Methods of Calculating Acute: Chronic Workload Ratio on Girls, Youth Volleyball

C. Schumann, M. Wojciechowski

Advisor: J. Bunn

O3

Novel Partial MBD5 Duplication in a Patient Expands and Refines the Phenotypic Spectrum of 2q23.1 Duplication Syndrome

J. Chang, R. Webster, G.B. Peters, J. A. Martinez-Agosto, S. Ghedia, S. Elsea

Advisor: S. Mullegama

O4

Re-Evaluating the Binge Eating Scale Cut-Off Using DSM-5 Criteria: Analysis and Replication in Presurgical Bariatric Surgery Samples

H. Jeong, G. Hapenciuc, E. Meza, J. Le, L. Heinberg

Advisor: R. Marek

Clinical Medicine/Community Health Research

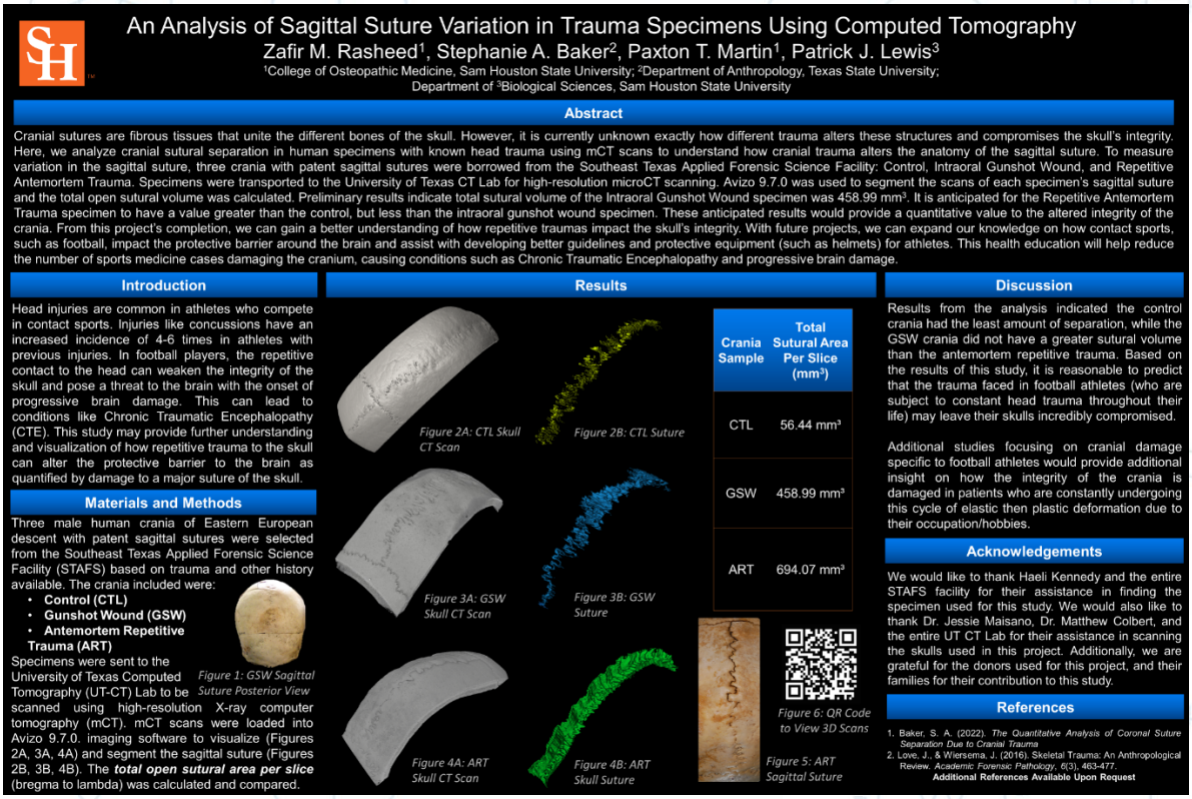
These projects aim to produce knowledge valuable for understanding human disease, preventing, and treating illness, and promoting health. These projects embrace a continuum of studies involving interactions with patients, diagnostic clinical materials or data, or populations.

CC1

An Analysis of Sagittal Suture Variation in Trauma Specimens Using Computed Tomography

Z. Rasheed, S. Baker, P. Martin
Advisor: P. Lewis

Introduction: Cranial sutures are fibrous tissues that unite the different bones of the skull. However, it is currently unknown exactly how different trauma alters these structures and compromises the skull's integrity. Here, we analyze cranial sutural separation in human specimens with known head trauma using mCT scans to understand how cranial trauma alters the anatomy of the sagittal suture.
Methods: To measure variation in the sagittal suture, three crania with patent sagittal sutures were borrowed from the Southeast Texas Applied Forensic Science Facility: Control, Intraoral Gunshot Wound, and Repetitive Antemortem Trauma. Specimens were transported to the University of Texas CT Lab for high-resolution microCT scanning. Avizo 9.7.0 was used to segment the scans of each specimen's sagittal suture and the total open sutural volume was calculated.
Results/Anticipated Results: Preliminary results indicate total sutural volume of the Intraoral Gunshot Wound specimen was 458.99 mm^3. It is anticipated for the Repetitive Antemortem Trauma specimen to have a value greater than the control, but less than the intraoral gunshot wound specimen. These anticipated results would provide a quantitative value to the altered integrity of the crania.
Conclusion: From this project's completion, we can gain a better understanding of how repetitive traumas impact the skull's integrity. With future projects, we can expand our knowledge on how contact sports, such as football, impact the protective barrier around the brain and assist with developing better guidelines and protective equipment (such as helmets) for athletes. This health education will help reduce the number of sports medicine cases damaging the cranium, causing conditions such as Chronic Traumatic Encephalopathy and progressive brain damage.

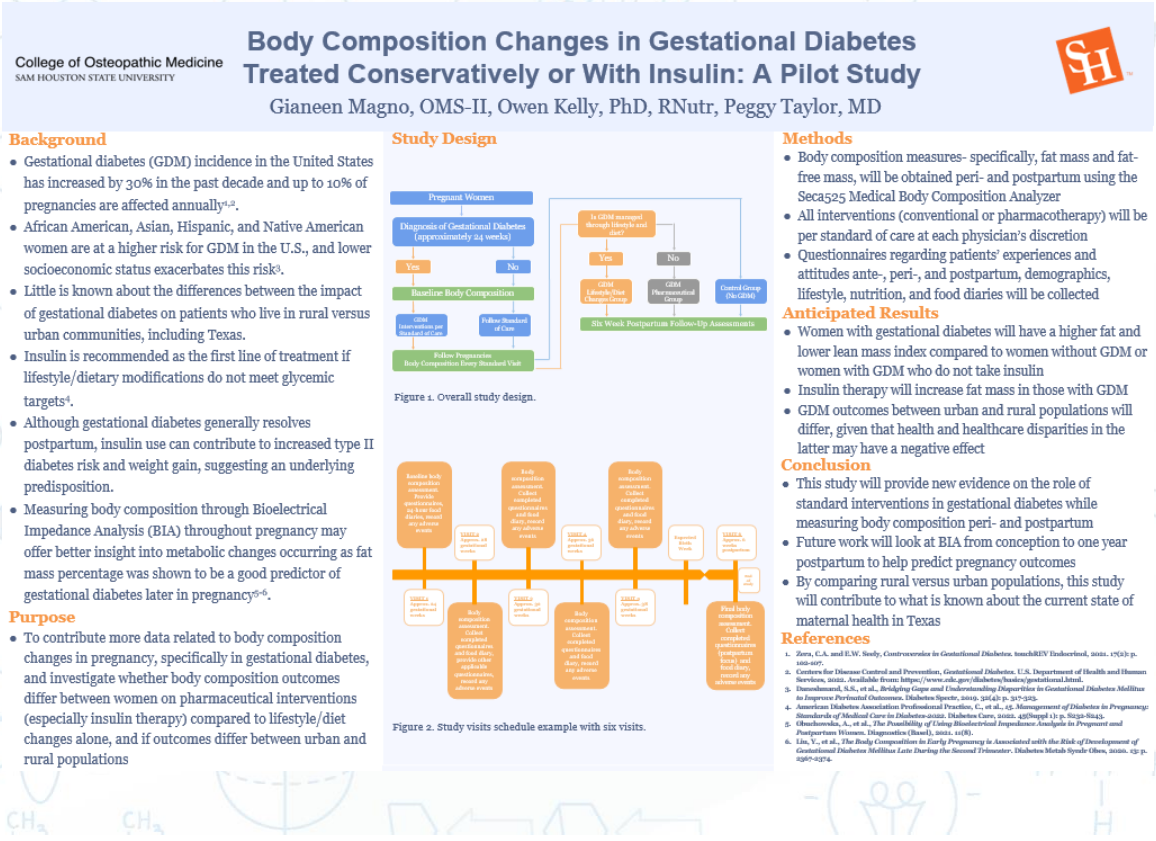


CC2

Body Composition Changes in Gestational Diabetes Treated Conservatively or With Insulin: A Pilot Study

G. Magno
Advisors: O. Kelly, P. Taylor

Introduction: Gestational diabetes (GDM) incidence has increased in the past decade. Women who are a minority and/or of lower economic status are at higher risk. Treatment includes insulin and lifestyle/dietary modifications. However, insulin can contribute to increased type II diabetes risk and weight gain. Measuring body composition through bioelectrical impedance (BIA)throughout pregnancy may offer better insight into metabolic changes occurring as fat mass percentage was shown to be a good predictor of GDM later in pregnancy. Comparing the impact of GDM diagnosis and treatment between rural and urban populations is understudied. Only a few BIA studies have been performed on pregnant women. The purpose of this study is to evaluate body composition changes with gestational diabetes between urban and rural populations while comparing treatment with insulin or conservatively.
Methods: Body composition measures (fat versus fat-free mass) will be obtained peri- and postpartum. All interventions (conventional or pharmacotherapy) will be per standard of care at each physician's discretion. Control group will be pregnant women without GDM. Questionnaires (experiences and attitudes before, during, and after pregnancy, demographics, lifestyle, nutrition) and food diaries will be collected.
Anticipated Results: Women with GDM will have higher fat and lower lean mass compared to those without, and insulin therapy will increase fat mass in those with GDM.
Conclusion: This study will provide new evidence on the role of standard interventions in GDM on BIA. Future work will look at BIA from conception to one year postpartum to help predict pregnancy outcomes in hopes of diminishing health disparities.



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Body Composition Changes in Gestational Diabetes Treated Conservatively or With Insulin: A Pilot Study

Gianeen Magno, OMS-II, Owen Kelly, PhD, RNutr, Peggy Taylor, MD

Background

- Gestational diabetes (GDM) incidence in the United States has increased by 30% in the past decade and up to 10% of pregnancies are affected annually[1,2].
- African American, Asian, Hispanic, and Native American women are at a higher risk for GDM in the U.S., and lower socioeconomic status exacerbates this risk[3].
- Little is known about the differences between the impact of gestational diabetes on patients who live in rural versus urban communities, including Texas.
- Insulin is recommended as the first line of treatment if lifestyle/dietary modifications do not meet glycemic targets[4].
- Although gestational diabetes generally resolves postpartum, insulin use can contribute to increased type II diabetes risk and weight gain, suggesting an underlying predisposition.
- Measuring body composition through Bioelectrical Impedance Analysis (BIA) throughout pregnancy may offer better insight into metabolic changes occurring as fat mass percentage was shown to be a good predictor of gestational diabetes later in pregnancy[5-6].

Purpose

- To contribute more data related to body composition changes in pregnancy, specifically in gestational diabetes, and investigate whether body composition outcomes differ between women on pharmaceutical interventions (especially insulin therapy) compared to lifestyle/diet changes alone, and if outcomes differ between urban and rural populations

Study Design

Figure 1. Overall study design.

Figure 2. Study visits schedule example with six visits.

Methods

- Body composition measures- specifically, fat mass and fat-free mass, will be obtained peri- and postpartum using the Seca525 Medical Body Composition Analyzer
- All interventions (conventional or pharmacotherapy) will be per standard of care at each physician's discretion
- Questionnaires regarding patients' experiences and attitudes ante-, peri-, and postpartum, demographics, lifestyle, nutrition, and food diaries will be collected

Anticipated Results

- Women with gestational diabetes will have a higher fat and lower lean mass index compared to women without GDM or women with GDM who do not take insulin
- Insulin therapy will increase fat mass in those with GDM
- GDM outcomes between urban and rural populations will differ, given that health and healthcare disparities in the latter may have a negative effect

Conclusion

- This study will provide new evidence on the role of standard interventions in gestational diabetes while measuring body composition peri- and postpartum
- Future work will look at BIA from conception to one year postpartum to help predict pregnancy outcomes
- By comparing rural versus urban populations, this study will contribute to what is known about the current state of maternal health in Texas

References

1. Zera, C.A. and E.W. Seely, *Controversies in Gestational Diabetes.* touchREV Endocrinol, 2021. 17(2): p. 102-107.
2. Centers for Disease Control and Prevention, *Gestational Diabetes.* U.S. Department of Health and Human Services, 2022. Available from: https://www.cdc.gov/diabetes/basics/gestational.html.
3. Dunsmuir, S.S., et al., *Bridging Gaps and Understanding Disparities in Gestational Diabetes Mellitus to Improve Perinatal Outcomes.* Diabetes Spectr, 2019. 32(4): p. 327-332.
4. American Diabetes Association Professional Practice, C., et al., 15. *Management of Diabetes in Pregnancy: Standards of Medical Care in Diabetes-2022.* Diabetes Care, 2022. 45(Suppl 1): p. S232-S243.
5. Obuchowska, A., et al., *The Possibility of Using Bioelectrical Impedance Analysis in Pregnant and Postpartum Women.* Diagnostics (Basel), 2021. 11(8).
6. Liu, Y., et al., *The Body Composition in Early Pregnancy is Associated with the Risk of Development of Gestational Diabetes Mellitus Late During the Second Trimester.* Diabetes Metab Syndr Obes, 2020. 13: p. 2367-2374.

CC3

Characterization of Motor and Speech Phenotypes in Children Under 18 Years of Age Diagnosed with *MBD5*-Associated Neurodevelopmental Disorder (MAND) Associated with 2q23.1 Deletions Inclusive of *MBD5*

L. Zhan, *S.* Elsea
Advisor: S. Mullegama

Introduction: MBD5-associated neurodevelopmental disorder (MAND) is characterized by developmental delay, speech impairment, seizures, and intellectual disability. One cause is haploinsufficiency in *MBD5*, a dosage-sensitive gene involved in gene activity regulation. This study characterizes motor and speech phenotypes in children with 2q23.1 deletions inclusive of *MBD5.*
Methods: A survey was administered to caregivers (n=38) of children under 18 years of age with a heterozygous *MBD5* deletion confirmed through clinical genetic testing. Questions covered demographics, milestone achievement, therapies received, gross and fine motor skills, speech, and other behaviors.
Results: The mean age of diagnosis was 3.17±2.88 years. The mean age at the time of survey was 7.03±4.20 years. The majority did not meet major milestones for gross motor skills on time, with crawling and standing not achieved by 63.6% (20/32) and walking not achieved by 55.5% (19/35). The motor phenotype observed with *MBD5* haploinsufficiency includes gait abnormalities, poor coordination, difficulty with fine motor control, and difficulty swallowing. Speech is markedly impaired, with severely delayed development and inappropriate control of tempo, volume, and pitch when verbal.
Conclusions: Missed milestones are apparent in the first year of life, but most children remained undiagnosed after 3 years of age. These data highlight the need to define the underlying cause of MAND and target critical milestones earlier in the child's life. Earlier genetic evaluation for children who miss key milestones would lead to earlier diagnosis and would offer education and specific interventions to families navigating these complex syndromes, improving outcomes in these populations.

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Characterization of Motor and Speech Phenotypes in Children Diagnosed with 2q23.1 deletions in *MBD5*

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[2]Baylor College of Medicine, Department of Molecular and Human Genetics, Houston TX 77030 U.S.A

INTRODUCTION

MBD5-associated neurodevelopmental disorder (MAND) is a group of conditions characterized by:

- Developmental delay
- Speech impairment
- Seizures
- Dysmorphic features
- Hypotonia
- Sleep disturbances
- Intellectual disability
- Abnormal behaviors

MAND can be caused by haploinsufficiency due to single-nucleotide variants, microdeletions, or microduplications in *MBD5*, a dosage-sensitive gene which encodes a protein involved in gene activity regulation [1]. Recent studies have shown that genes such as *FOXP1* involved in speech and motor development are dysregulated in individuals with *MBD5* variants. Thus, this study focuses on characterizing motor and speech phenotypes in children with 2q23.1 deletions inclusive of *MBD5.*

FIGURE 1. Examples of Typical Craniofacial, Hand, and Foot Features of Children with MAND. [2]

METHODS

A survey was administered to caregivers (n=38) of children under 18 years of age with a heterozygous *MBD5* deletion confirmed through clinical genetic testing. Questions covered demographic information, milestone achievement, therapies received, gross and fine motor movement assessment, speech assessment, and other behaviors.

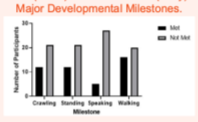
TABLE 1. Demographics of Study Cohort

	n	% of n
Sex		
Female	18/39	53.8
Male	21/39	46.2
Age at Diagnosis, years		
0-2.9	20/39	51.3
3-5.9	14/39	35.9
6-11.9	3/39	7.7
12-17.9	1/39	2.6
18-25	1/39	2.6
Current Age, years		
0-2.9	5/39	12.8
3-5.9	13/39	33.3
6-11.9	15/39	38.5
12-17.9	5/39	12.8
18-25	1/39	2.6

RESULTS

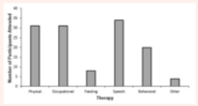
The mean age of diagnosis was 3.17 ± 2.88 years. The mean age at the time of survey was 7.03 ± 4.20 years.

FIGURE 3. Number Of Participants That Met (Black) Or Did Not Meet (Gray) Major Developmental Milestones.



Crawling and standing were not achieved on time by 63.6% (20/32) and walking was not achieved by 55.5% (19/35). Further, 84.3% (26/31) missed the speaking milestone. Normal milestone achievements were coded according to WHO standards.

FIGURE 4. Types Of Therapeutic Interventions Used.



Participants engaged in different therapeutic interventions aimed at improving gross motor control, with 84.6% (32/38) receiving at least three types.

TABLE 2. Current Reported Capabilities.

	n	%
Feeding Self	30/38	78.9
Swallowing	20/39	51.3
Walking	31/39	79.5
Running	23/39	59.0
Full Limb Movement	34/39	87.2

Caregivers of participants reported on their current capabilities. Most participants were able to meet major development milestones despite developmental delay.

TABLE 3. Current Reported Challenges.

	n	%
Poor coordination	30/39	76.9
Poor extremity coordination	16/39	41.0
Stumbles while walking	27/39	69.2
Difficulty walking	11/39	28.2
Loss of balance	22/39	56.4
Poor fine motor movements	35/39	89.7
Nystagmus	7/39	17.9
Slurred speech	7/39	17.9
Change in speech	17/39	43.6

Caregivers of participants also reported on their current challenges. Despite multiple therapeutic approaches, a majority of the cohort still reported difficulties with coordination, fine motor movements, and speech development.

CONCLUSIONS

The motor phenotype observed with *MBD5* haploinsufficiency includes:

- Gait abnormalities
- Difficulty with fine motor control
- Poor coordination
- Difficulty swallowing

The speech phenotype observed with *MBD5* haploinsufficiency includes:

- Marked impairment in communication
- Severely delayed development
- Inappropriate control of tempo, volume, and pitch

Missed milestones were also apparent by 1 year of age, but most children were still not diagnosed after 3 years of age. These data highlight the need to define the underlying cause of MAND and target critical milestones earlier in the child's life.

FUTUREDIRECTION

Future direction includes comparison of phenotypes of the cohort from this study to the Human Gene Mutation Database (HGMD) cohort of *MBD5* deletions to determine whether there is a significantly different motor and speech phenotype in individuals with 2q23.1 deletions.

REFERENCES

[1] Mullegama, SV, Elsea SH. Clinical and Molecular Aspects of *MBD5*-associated Neurodevelopmental Disorder (MAND). *Eur J Hum Genet.* 2016; 24(9): 1235-1243.
[2] Talkowski ME, Mullegama SV, et. al. Assessment of 2q23.1 Microdeletion Syndrome Implicates MBD5 as a Single Causal Locus of Intellectual Disability, Epilepsy, and Autism Spectrum Disorder.

ACKNOWLEDGEMENTS

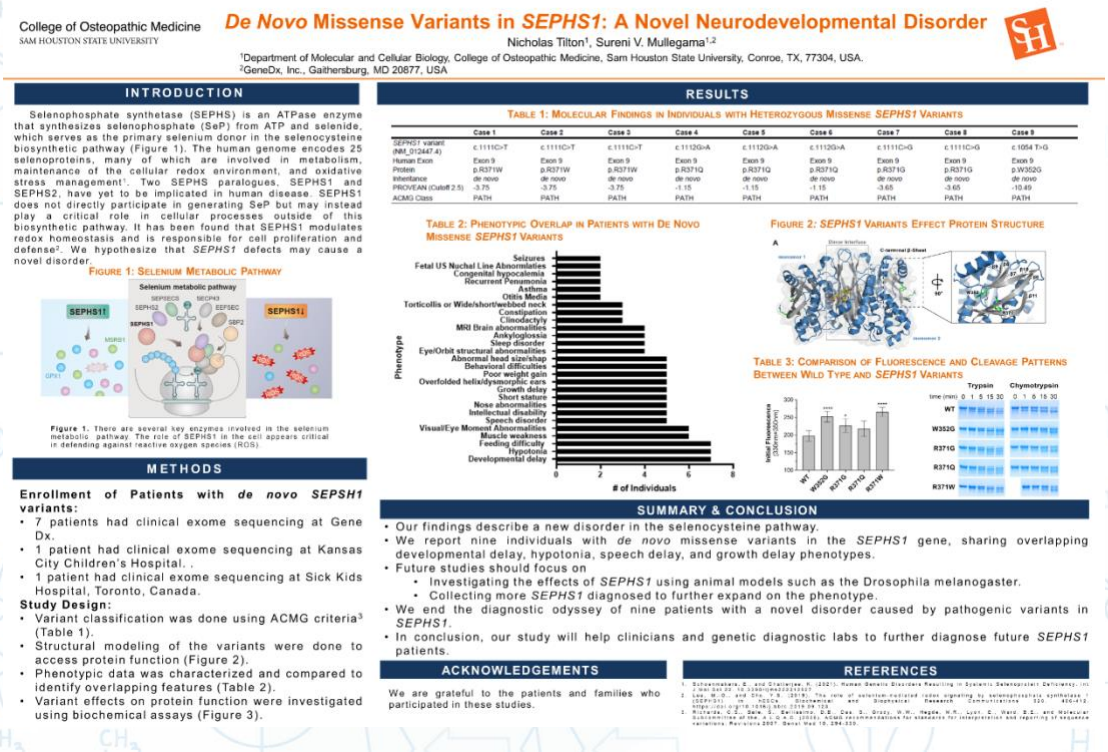
This project is funded by an intramural grant from SHSU COM. We are grateful to the MAND Family Support Group and our study participants and their families for their interest and support of MAND research.

CC4

De novo missense Variants in *SEPHS1* Cause a Neurodevelopmental Disorder with Developmental Delay, Hypotonia, Muscle Weakness, Speech Delay, and Growth Delay

N. Tilton, K. Kiernan, E. Torti, E. Pavlovsky, A. Sekula, H. Gao, J. Alaimo, K. Blocker, K. Dipple, V. Fettig, R. Hickey, H. Hare, I. Glass, D. Grange, M. Griffin, C. Phornphutkul, L. Massingham, L. Mehta, D. Miller, E. Muller, M. Osmond, S. Sawyer, R. Slaugh, B. Wolf, M. Simonović, T. Palculict, A. Telegrafi, D. Carere, I. Wentzensen, M. Morrow, K. Monaghan, J. Juusola
Advisor: S. Mullegama

Selenophosphate synthetase (SEPHS) is an ATPase enzyme that synthesizes selenophosphate from ATP and selenide, which serves as the primary selenium donor in the selenocysteine biosynthetic pathway. Two SEPHS paralogues, SEPHS1and SEPHS2, have yet to be implicated in human disease. Here, we report nine individuals with heterozygous missense variants in the SEPHS1gene, sharing overlapping developmental delay, hypotonia, speech delay, and growth delay phenotypes. Seven missense variants were found to be classified as pathogenic based on the American College of Medical Genomics variant guidelines. The remaining two were classified as likely pathogenic. The effects of these variants were investigated using biochemical assays, structural modeling, and knockdown of SEPHS1mRNA in fly, mouse, and human cell models. Structural modeling revealed these variants occur in p.W352 or p.R371 residues, both of which are situated within a six-stranded β-sheet in the C-terminal domain. p.W352 variants significantly decreased the inflection temperature and markedly altered the Chymotrypsin-catalyzed cleavage pattern compared to WT Sephs1, while p.R371 variants did not. Thus, p.R371 does not contribute to protein stability or proteolytic cleavage but may instead participate in protein-protein interactions involving Sephs1 in the cell. Knockout and knockdown studies of SEPHS1mRNA showed that SEPHS1is critical in the survival of embryonic stem cells. In conclusion, we end the diagnostic odyssey of nine patients with a novel disorder caused by pathogenic variants in SEPHS1. We were able to provide preliminary insight into a novel neurodevelopmental disorder, which may aid physicians in diagnosing and caring for patients with SEPHS1variants.



CC5

Developing a Counseling Psychology Course Elective at an Osteopathic Medical School

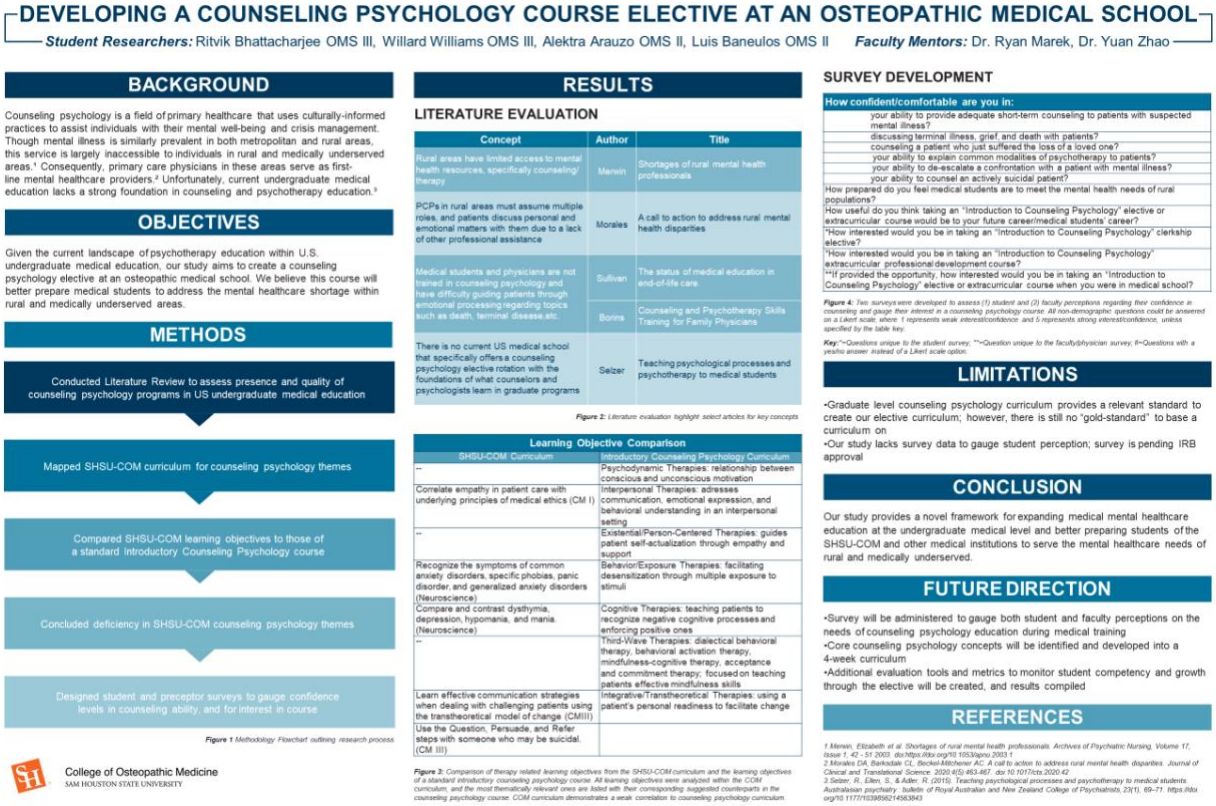
A. Arauzo, L. Banuelos, R. Bhattacharjee, W. Williams
Advisors: R. Marek, *Y. Zhao*

Introduction: Counseling psychology is a field of primary healthcare that uses culturally informed practices to assist individuals with their mental well-being and crisis management. Though mental illness is similarly prevalent in both metropolitan and rural areas, this service is largely inaccessible to individuals in rural and medically underserved areas. Consequently, primary care physicians in these areas serve as first-line mental healthcare providers. Unfortunately, current undergraduate medical education lacks a strong foundation in counseling and psychotherapy education. Our study aims to create a counseling psychology elective and determine whether this course will better prepare students to address the mental healthcare shortage in rural and medically underserved areas.

Methods: Four osteopathic medical students conducted a literature evaluation on the state of counseling psychology education in American medical schools. Next, SHSU-COM curriculum was mapped and evaluated for the existence of counseling psychology themes and concepts. A student and preceptor survey was then created to assess student perceptions on counseling skills and gauge interest in the proposed program. Expected

Results: Literature evaluation demonstrated a lack of structured counseling psychology education within American medical institutions. SHSU COM-specific curriculum mapping reflected this trend, with a lack of curriculum on mental health treatment modalities. Survey results are expected to demonstrate a student demand for this course offering.

Conclusion: Our study provides a novel framework for expanding medical mental healthcare education at the undergraduate medical level and better preparing students of the SHSU-COM and other medical institutions to serve the mental healthcare needs of rural and medically underserved areas.



CC6

Effect of Nutritional Choices on Mental Well-Being

E. Deya Edelen, X. Valencia, R. Buch, J. Thomas
Advisor: O. Kelly

Introduction: New medical students must navigate a different set of expectations, contributing to student anxiety, which results in worse performance and grades. A healthy diet may assist in the prevention and treatment of anxiety, especially foods high in magnesium and zinc. However, there is no information, to our knowledge, on medical student diets and how diet changes in the first two years of medical school. This study will determine if diet is associated with an increased perception of anxiety in medical students during their first semester.
Methods: Participants record their food intake over three days (3-day food diary) and complete the Generalized Anxiety Disorder Questionnaire (GAD-7) twice over the course of a semester. Food diaries will be analyzed using Food Processor® (ESHA Research). The GAD-7 score will be calculated and assigned scores of minimal anxiety, mild anxiety, moderate anxiety, and severe anxiety. Both study tools (3-day food diary and GAD-7) have been extensively validated. Dietary components and GAD-7 scores will be analyzed for correlations.
Anticipated Results: It is expected that students with poorer dietary components (e.g., low zinc and magnesium intake) will have greater anxiety. However, the main limitation in this pilot study is sample size may be too small to find correlations.
Conclusion: This study will help inform medical students on the importance of good dietary habits throughout medical school to mitigate anxiety and maintain performance. Future work will involve a cohort study of dietary habits and anxiety over the first two years of medical school.

Nutritional Choices and their Effect on Mental Well-Being

College of Osteopathic Medicine
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Elizabeth Deya Edelen | Rahee Buch | Jasmine Thomas | Ximena Valencia
Faculty Advisor: Owen Kelly, PhD

INTRODUCTION

New medical students must navigate a different environment resulting in varying degrees of psychosocial distress. Many students struggle to maintain balance. Suboptimal nutrition may be contributing to feelings of anxiety and depression.[1] Consequently, a healthy diet may help prevent and treat anxiety, especially foods high in magnesium and zinc. However, the relationship between a healthy diet and perceptions of mental distress in medical students is not studied. There is also no information, regarding changes in diet throughout the first two years of medical school. This represents a large knowledge gap. Therefore, to begin to investigate this hypothesis, this study will examine if poorer nutritional choices are associated with a greater perception of anxiety in pre-clerkship medical students.

METHODS

First-year and second-year SHSU-COM medical students were invited to participate in this study. Approx. 65 students were recruited and randomly assigned a participant ID number. Participants are instructed to record their food intake using a 3-day food diary and to complete the Generalized Anxiety Disorder Questionnaire (GAD-7) administered in an encrypted qualtrics survey. Students will be prompted to fill out the 3-day food diary and the GAD-7 4 times throughout the academic year. The first response was recorded prior to course examinations, subsequent surveys will be provided to participants three more times in fixed intervals.

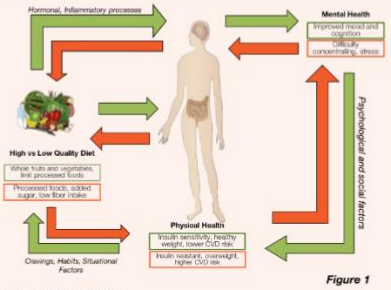

Figure 1

DATA ANALYSIS

The total GAD-7 score will categorized as follows: 0-4 minimal anxiety, 5-9 mild anxiety, 10-14: moderate anxiety, and 15-21: severe anxiety. The three-day food diaries will be analyzed using Food Processor® (ESHA Research). Correlations between nutrient intakes and the GAD-7 score will be assessed by Pearson's correlation coefficient after adjustment for class year.

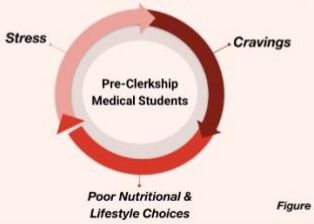

Figure 2

INTENDED OUTCOMES

We expect to see a positive correlation between a worse quality diet (overall and specific nutrients) and GAD-7 scores.

SUMMARY & CONCLUSION

It is of the utmost importance students are aware of the influence of their dietary choices on their mental health. This study will add new data to the body of evidence regarding food choices and medical student stress and anxiety. This study can provide information to empower and educate medical students about the significance of a healthier diet for alleviating feelings of anxiety and thereby improving performance.

REFERENCES

[1]Kris-Etherton PM, Petersen KS, Hibbeln JR, et al. Nutrition and behavioral health disorders: depression and anxiety. Nutr Rev. 2021;79(3):247-260. doi:10.1093/nutrit/nua025

Figure 1 Adapted from: Firth, J., Gangwisch, J. E., Borisini, A., Wootton, R. E., & Mayer, E. A. (2020). Food and mood: how do diet and nutrition affect mental wellbeing?. BMJ (Clinical research ed.), 369, m2382. https://doi.org/10.1136/bmj.m2382

Figure 2 Adapted from: Stress, cortisol, and other appetite-related hormones: Prospective prediction of 6-month changes in food cravings and weight. Ariana M. Chao,Ania M. Jastreboff,Marney A. White,Carlos M. Grilo,Rajita Sinha. First published: 28 March 2017. https://doi.org/10.1002/oby.21790

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Sam Houston State University College of Osteopathic Medicine Department of Molecular & Cellular Biology

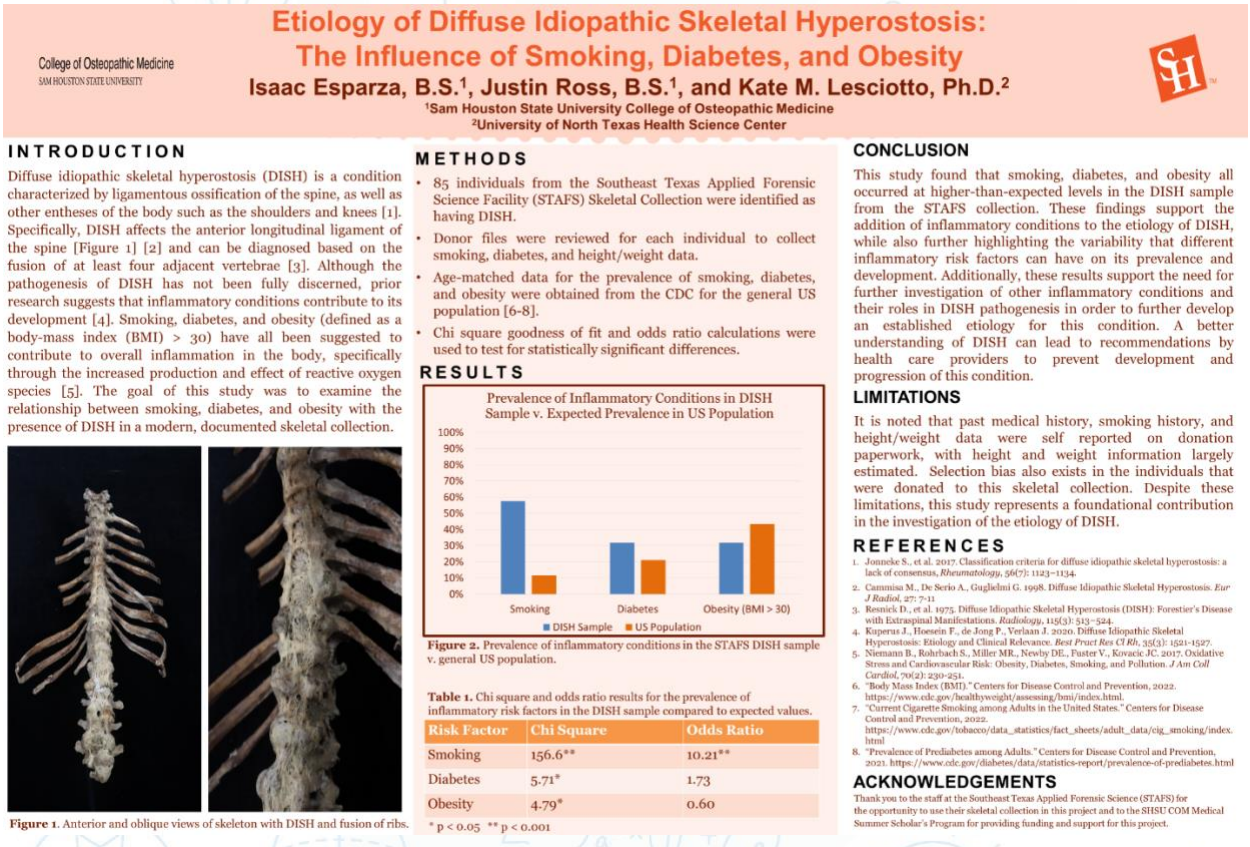
We thank all students who have agreed to participate in this study.

CC7

Etiology of Diffuse Idiopathic Skeletal Hyperostosis: The Influence of Smoking, Diabetes, and Obesity

I. Esparza, J. Ross
Advisor: K. Lesciotto

Diffuse idiopathic skeletal hyperostosis (DISH) is a condition that results in ligamentous ossification, primarily affecting the spine. Although the pathogenesis of DISH is not fully understood, studies suggest that inflammatory conditions contribute to its development. This study aimed to examine the relationships between tobacco smoking, diabetes mellitus (DM), and obesity (BMI > 30), as inflammatory factors, and the presence of DISH, using data collected from the Southeast Texas Applied Forensic Science Facility Skeletal Collection. Eighty-five individuals in this collection were identified as having skeletal indications of DISH, following the diagnostic criteria set forth by Resnick et al. (1978). Height/weight data, history of smoking, and DM were gathered from associated donor files. Data were analyzed to examine whether the observed frequency of smoking, DM, and obesity within this study's DISH sample significantly differed from expected values, based on age-matched data on the general population of the United States, taken from the Centers for Disease Control. While the observed frequencies of smoking ($\chi 2 = 156.6$, $p < 0.00001$), DM ($\chi\ 2 = 5.71$, $p = 0.017$), and obesity ($\chi 2 = 4.79$, $p = 0.029$) were all significantly higher than expected for this study's sample, only smoking significantly affected the effect size of comorbidity with DISH (odds ratio = 10.21, $p < 0.0001$). These findings support the hypothesis that inflammatory conditions contribute to the etiology of DISH, while also highlighting the variability in effect sizes.



Etiology of Diffuse Idiopathic Skeletal Hyperostosis: The Influence of Smoking, Diabetes, and Obesity

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INTRODUCTION

Diffuse idiopathic skeletal hyperostosis (DISH) is a condition characterized by ligamentous ossification of the spine, as well as other entheses of the body such as the shoulders and knees [1]. Specifically, DISH affects the anterior longitudinal ligament of the spine [Figure 1] [2] and can be diagnosed based on the fusion of at least four adjacent vertebrae [3]. Although the pathogenesis of DISH has not been fully discerned, prior research suggests that inflammatory conditions contribute to its development [4]. Smoking, diabetes, and obesity (defined as a body-mass index (BMI) > 30) have all been suggested to contribute to overall inflammation in the body, specifically through the increased production and effect of reactive oxygen species [5]. The goal of this study was to examine the relationship between smoking, diabetes, and obesity with the presence of DISH in a modern, documented skeletal collection.

Figure 1. Anterior and oblique views of skeleton with DISH and fusion of ribs.

METHODS

- 85 individuals from the Southeast Texas Applied Forensic Science Facility (STAFS) Skeletal Collection were identified as having DISH.
- Donor files were reviewed for each individual to collect smoking, diabetes, and height/weight data.
- Age-matched data for the prevalence of smoking, diabetes, and obesity were obtained from the CDC for the general US population [6-8].
- Chi square goodness of fit and odds ratio calculations were used to test for statistically significant differences.

RESULTS

Figure 2. Prevalence of inflammatory conditions in the STAFS DISH sample v. general US population.

Table 1. Chi square and odds ratio results for the prevalence of inflammatory risk factors in the DISH sample compared to expected values.

Risk Factor	Chi Square	Odds Ratio
Smoking	156.6**	10.21**
Diabetes	5.71*	1.73
Obesity	4.79*	0.60

* $p < 0.05$ ** $p < 0.001$

CONCLUSION

This study found that smoking, diabetes, and obesity all occurred at higher-than-expected levels in the DISH sample from the STAFS collection. These findings support the addition of inflammatory conditions to the etiology of DISH, while also further highlighting the variability that different inflammatory risk factors can have on its prevalence and development. Additionally, these results support the need for further investigation of other inflammatory conditions and their roles in DISH pathogenesis in order to further develop an established etiology for this condition. A better understanding of DISH can lead to recommendations by health care providers to prevent development and progression of this condition.

LIMITATIONS

It is noted that past medical history, smoking history, and height/weight data were self reported on donation paperwork, with height and weight information largely estimated. Selection bias also exists in the individuals that were donated to this skeletal collection. Despite these limitations, this study represents a foundational contribution in the investigation of the etiology of DISH.

REFERENCES

1. Jonneke S., et al. 2017. Classification criteria for diffuse idiopathic skeletal hyperostosis: a lack of consensus, *Rheumatology*, 56(7): 1123–1134.
2. Cammisa M., De Serio A., Guglielmi G. 1998. Diffuse Idiopathic Skeletal Hyperostosis. *Eur J Radiol*, 27: 7-11
3. Resnick D., et al. 1975. Diffuse Idiopathic Skeletal Hyperostosis (DISH): Forestier's Disease with Extraspinal Manifestations. *Radiology*, 115(3): 513–524.
4. Kuperus J., Hoesein F., de Jong P., Verlaan J. 2020. Diffuse Idiopathic Skeletal Hyperostosis: Etiology and Clinical Relevance. *Best Pract Res Cl Rh*, 35(3): 1521-1527.
5. Niemann B., Rohrbach S., Miller MR., Newby DE., Fuster V., Kovacic JC. 2017. Oxidative Stress and Cardiovascular Risk: Obesity, Diabetes, Smoking, and Pollution. *J Am Coll Cardiol*, 70(2): 230-251.
6. "Body Mass Index (BMI)." Centers for Disease Control and Prevention, 2022. https://www.cdc.gov/healthyweight/assessing/bmi/index.html.
7. "Current Cigarette Smoking among Adults in the United States." Centers for Disease Control and Prevention, 2022. https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.html
8. "Prevalence of Prediabetes among Adults." Centers for Disease Control and Prevention, 2021. https://www.cdc.gov/diabetes/data/statistics-report/prevalence-of-prediabetes.html

ACKNOWLEDGEMENTS

Thank you to the staff at the Southeast Texas Applied Forensic Science (STAFS) for the opportunity to use their skeletal collection in this project and to the SHSU COM Medical Summer Scholar's Program for providing funding and support for this project.

CC8

Evaluating the Acute: Chronic Workload Ratio Across a Season in Collegiate Female Lacrosse Athletes

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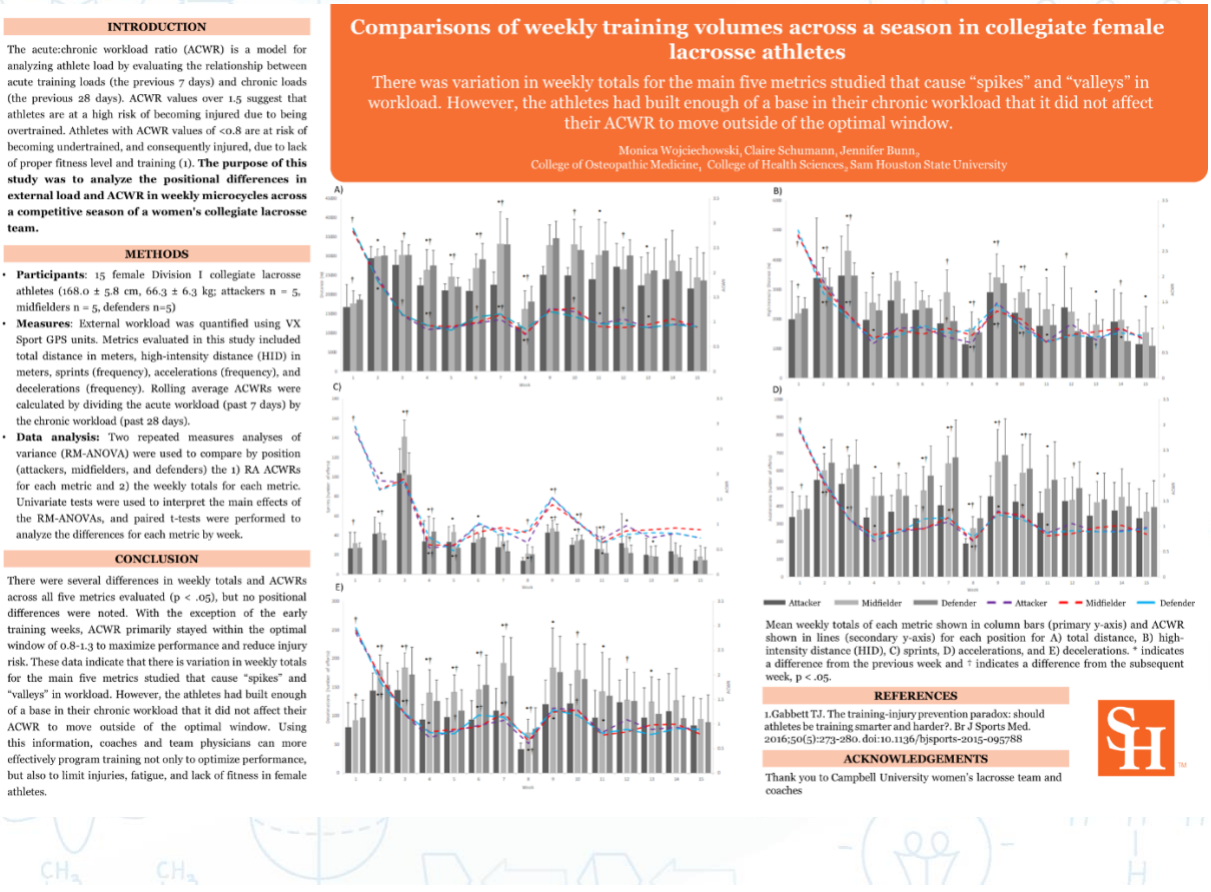
Advisor: J. Bunn

The purpose of this study was to analyze the in-season variations of external workload variables and the acute: chronic workload ratio (ACWR) by player positions on a Division I collegiate women's lacrosse team. Data were collected via wearable microtechnology across 17 games and 64 training sessions on 15 participants (attackers n=5, midfielders n=5, defenders n=5). Weekly totals for distance, high-intensity distance (HID), sprints, accelerations, and decelerations were tabulated, and ACWRs were calculated by dividing the workload from the past seven days by the workload from the past 28 days for each metric. Two repeated measures analyses of variance (RM-ANOVA) were used to compare positional differences and weekly changes in all five metrics for 1) ACWR and 2) weekly totals. There were several differences in weekly totals and ACWRs across all five metrics evaluated ($p < .05$), but no positional differences were noted. With the exception of the early training weeks, ACWR primarily stayed within the optimal window of 0.8-1.3 to maximize performance and reduce injury risk. These data indicate that there was significant variation in weekly totals for the main five metrics studied that cause "spikes" and "valleys" in workload, but the athletes had built enough of a base in their chronic workload that it did not affect their ACWR to move outside of the optimal window. Using this information, coaches and team physicians can more effectively program training not only to optimize performance, but also to limit injuries, fatigue, and lack of fitness.



INTRODUCTION

The acute:chronic workload ratio (ACWR) is a model for analyzing athlete load by evaluating the relationship between acute training loads (the previous 7 days) and chronic loads (the previous 28 days). ACWR values over 1.5 suggest that athletes are at a high risk of becoming injured due to being overtrained. Athletes with ACWR values of <0.8 are at risk of becoming undertrained, and consequently injured, due to lack of proper fitness level and training (1). **The purpose of this study was to analyze the positional differences in external load and ACWR in weekly microcycles across a competitive season of a women's collegiate lacrosse team.**

METHODS

- **Participants**: 15 female Division I collegiate lacrosse athletes (168.0 ± 5.8 cm, 66.3 ± 6.3 kg; attackers n = 5, midfielders n = 5, defenders n=5)
- **Measures**: External workload was quantified using VX Sport GPS units. Metrics evaluated in this study included total distance in meters, high-intensity distance (HID) in meters, sprints (frequency), accelerations (frequency), and decelerations (frequency). Rolling average ACWRs were calculated by dividing the acute workload (past 7 days) by the chronic workload (past 28 days).
- **Data analysis:** Two repeated measures analyses of variance (RM-ANOVA) were used to compare by position (attackers, midfielders, and defenders) the 1) RA ACWRs for each metric and 2) the weekly totals for each metric. Univariate tests were used to interpret the main effects of the RM-ANOVAs, and paired t-tests were performed to analyze the differences for each metric by week.

CONCLUSION

There were several differences in weekly totals and ACWRs across all five metrics evaluated ($p < .05$), but no positional differences were noted. With the exception of the early training weeks, ACWR primarily stayed within the optimal window of 0.8-1.3 to maximize performance and reduce injury risk. These data indicate that there is variation in weekly totals for the main five metrics studied that cause "spikes" and "valleys" in workload. However, the athletes had built enough of a base in their chronic workload that it did not affect their ACWR to move outside of the optimal window. Using this information, coaches and team physicians can more effectively program training not only to optimize performance, but also to limit injuries, fatigue, and lack of fitness in female athletes.

Comparisons of weekly training volumes across a season in collegiate female lacrosse athletes

There was variation in weekly totals for the main five metrics studied that cause "spikes" and "valleys" in workload. However, the athletes had built enough of a base in their chronic workload that it did not affect their ACWR to move outside of the optimal window.

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Mean weekly totals of each metric shown in column bars (primary y-axis) and ACWR shown in lines (secondary y-axis) for each position for A) total distance, B) high-intensity distance (HID), C) sprints, D) accelerations, and E) decelerations. * indicates a difference from the previous week and † indicates a difference from the subsequent week, $p < .05$.

REFERENCES

1.Gabbett TJ. The training-injury prevention paradox: should athletes be training smarter and harder?. Br J Sports Med. 2016;50(5):273-280. doi:10.1136/bjsports-2015-095788

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Thank you to Campbell University women's lacrosse team and coaches

Evaluation of Copy Number Losses in the MBD5 5'-Untranslated Region: Expression Matters

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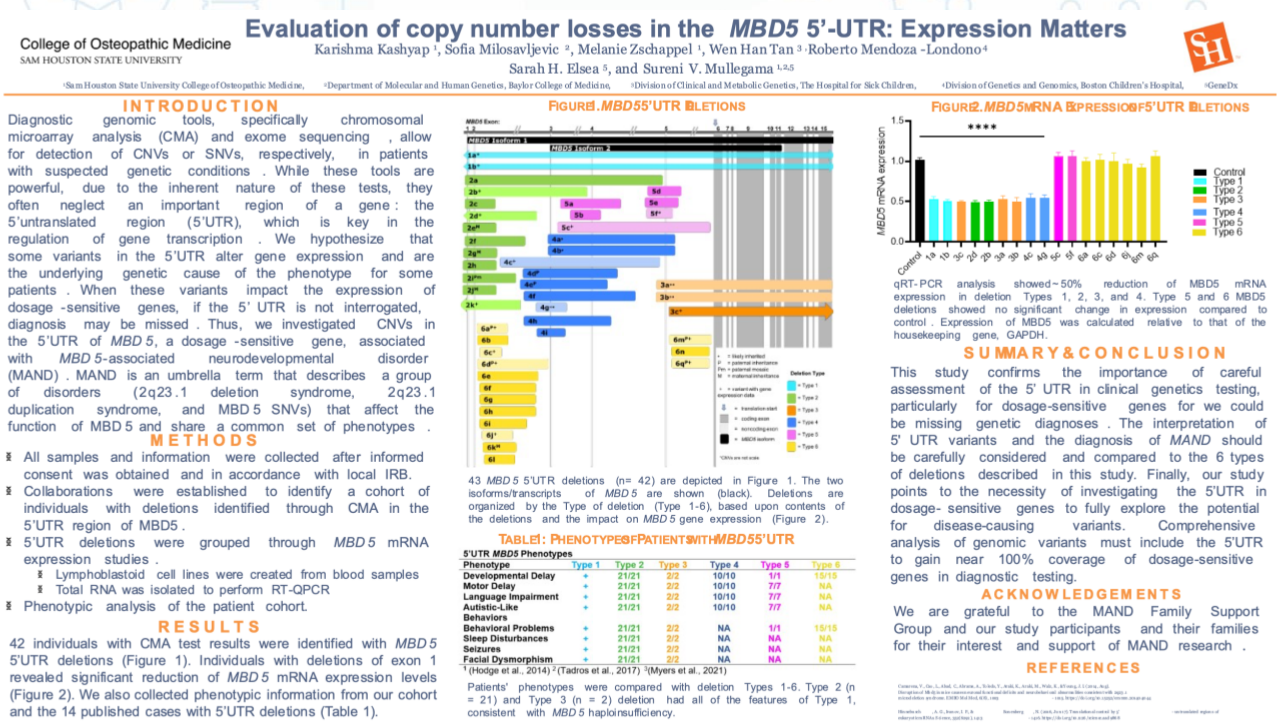
Advisor: S. Mullegama

Genomic tools, such as chromosomal microarray analysis and exome sequencing, allow for detection of copy number variants (CNVs) or single nucleotide variants (SNVs) in patients with suspected genetic conditions. However, these tools do not detect an important component of gene transcription which is the 5' untranslated region (5'UTR). We hypothesize that when there is alteration of mRNA gene expression in the 5'UTR of a dosage-sensitive gene, this defect could lead to a clinical phenotype. Therefore, to confirm the importance of the 5' UTR, we investigated CNV losses in *MBD5* which is associated with 2q23.1 deletion syndrome. 2q23.1 deletion syndrome is one of the many disorders that are grouped under *MBD5*-associated neurodevelopmental disorder (MAND). These disorders affect the function of *MBD5* and share developmental disabilities, neurological disturbances, language impairments, and hyperactive behavior. Patients were recruited with deletions in the 5' UTR region of *MBD5* to evaluate whether these deletions may be responsible for haploinsufficiency of *MBD5* which is present in all 2q23.1 deletion patients. The patients were grouped based on their 5'UTR *MBD5* deletions into six categories of deletions. Genotype-phenotype studies of these deletions revealed that Category 1 5'UTR deletion phenotypes resembled a traditional MAND phenotype. We conducted qPCR studies to evaluate the mRNA expression of the various 5'UTR deletions. We saw decreased *MBD5* mRNA expression in Category 1 and Category 3. This study confirms the importance of careful assessment of the 5' UTR in clinical genetics testing, particularly for dosage-sensitive genes for we could be missing genetic diagnoses.



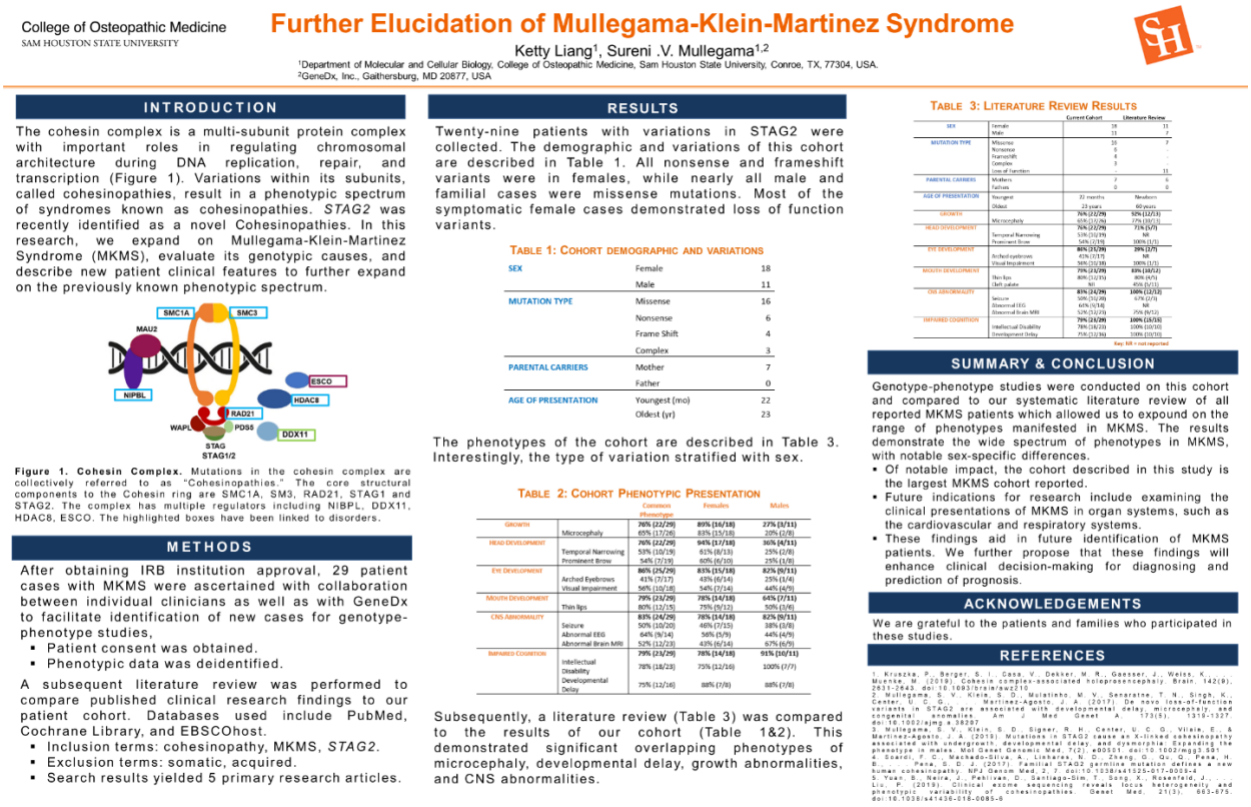
CC10

Further Elucidation of Mullegama-Klein-Martinez Syndrome

K. Liang

Advisor: S. Mullegama

Deriving its name from its central role in sister chromatids cohesion, the cohesin multi-protein complex is involved in many cellular mechanisms. The cohesin complex includes four subunits and interacts with several regulatory proteins to carry out roles in DNA replication, repair, and transcription. Consequently, variants in any part of the cohesin complex, or of its regulators, result in a spectrum of syndromes called cohesinopathies. Recently, a novel X-linked cohesinopathy was identified, Mullegama-Klein-Martinez syndrome (MKMS), which shares overlapping phenotype to other cohesinopathies such as developmental delay, speech delay, microcephaly, skeletal abnormality, and brain anomalies. MKMS results from pathogenic single nucleotide variants in the *STAG2* gene which encodes for stromal antigen 2 protein, a core subunit of the cohesin complex. In this study, we further characterize the genotype and phenotype of MKMS. Eighteen female and nine male cases were collected that were genetically diagnosed with MKMS. Genotype-phenotype studies were conducted on this cohort and compared this cohort to our systematic literature review of all reported MKMS patients which allowed us to further expound on the range of phenotypes manifested in MKMS. We found that most of the symptomatic female cases demonstrated loss of function variants. Meanwhile, male, and familial cases were mainly missense mutations, notably occurring around residues related to *RAD21* docking. We propose that these findings can enhance the understanding of *STAG2* variants and improve accuracy in clinical diagnosis and prognosis. This study supports the need for further research on *STAG2*'s role in development.



College of Osteopathic Medicine
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Further Elucidation of Mullegama-Klein-Martinez Syndrome

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INTRODUCTION

The cohesin complex is a multi-subunit protein complex with important roles in regulating chromosomal architecture during DNA replication, repair, and transcription (Figure 1). Variations within its subunits, called cohesinopathies, result in a phenotypic spectrum of syndromes known as cohesinopathies. *STAG2* was recently identified as a novel Cohesinopathies. In this research, we expand on Mullegama-Klein-Martinez Syndrome (MKMS), evaluate its genotypic causes, and describe new patient clinical features to further expand on the previously known phenotypic spectrum.

SMC1A SMC3 MAU2 NIPBL ESCO HDAC8 RAD21 WAPL PDS5 DDX11 STAG STAG1/2

Figure 1. Cohesin Complex. Mutations in the cohesin complex are collectively referred to as "Cohesinopathies." The core structural components to the Cohesin ring are SMC1A, SM3, RAD21, STAG1 and STAG2. The complex has multiple regulators including NIBPL, DDX11, HDAC8, ESCO. The highlighted boxes have been linked to disorders.

METHODS

After obtaining IRB institution approval, 29 patient cases with MKMS were ascertained with collaboration between individual clinicians as well as with GeneDx to facilitate identification of new cases for genotype-phenotype studies,

- Patient consent was obtained.
- Phenotypic data was deidentified.

A subsequent literature review was performed to compare published clinical research findings to our patient cohort. Databases used include PubMed, Cochrane Library, and EBSCOhost.

- Inclusion terms: cohesinopathy, MKMS, *STAG2*.
- Exclusion terms: somatic, acquired.
- Search results yielded 5 primary research articles.

RESULTS

Twenty-nine patients with variations in STAG2 were collected. The demographic and variations of this cohort are described in Table 1. All nonsense and frameshift variants were in females, while nearly all male and familial cases were missense mutations. Most of the symptomatic female cases demonstrated loss of function variants.

TABLE 1: COHORT DEMOGRAPHIC AND VARIATIONS

SEX	Female	18
	Male	11
MUTATION TYPE	Missense	16
	Nonsense	6
	Frame Shift	4
	Complex	3
PARENTAL CARRIERS	Mother	7
	Father	0
AGE OF PRESENTATION	Youngest (mo)	22
	Oldest (yr)	23

The phenotypes of the cohort are described in Table 3. Interestingly, the type of variation stratified with sex.

TABLE 2: COHORT PHENOTYPIC PRESENTATION

		Cohesion Phenotype	Females	Males
GROWTH	Microcephaly	76% (22/29)	89% (16/18)	27% (3/11)
		65% (17/26)	83% (15/18)	20% (2/9)
HEAD DEVELOPMENT	Temporal Narrowing	76% (22/29)	94% (17/18)	36% (4/11)
	Prominent Brow	53% (10/19)	61% (8/13)	25% (2/8)
		54% (7/13)	60% (6/10)	25% (1/4)
EYE DEVELOPMENT	Arched Eyebrows	86% (25/29)	83% (15/18)	82% (9/11)
	Visual Impairment	41% (7/17)	43% (6/14)	25% (1/4)
		56% (10/18)	54% (7/14)	44% (4/9)
MOUTH DEVELOPMENT	Thin lips	79% (23/29)	78% (14/18)	64% (7/11)
		80% (12/15)	75% (9/12)	50% (3/6)
CNS ABNORMALITY	Seizure	83% (24/29)	78% (14/18)	82% (9/11)
	Abnormal EEG	50% (10/20)	46% (7/15)	38% (3/8)
	Abnormal Brain MRI	64% (9/14)	58% (5/9)	44% (4/9)
		52% (12/23)	43% (6/14)	67% (6/9)
IMPAIRED COGNITION	Intellectual Disability	79% (23/29)	78% (14/18)	91% (10/11)
	Developmental Delay	78% (18/23)	75% (12/16)	100% (7/7)
		75% (12/16)	88% (7/8)	88% (7/8)

Subsequently, a literature review (Table 3) was compared to the results of our cohort (Table 1&2). This demonstrated significant overlapping phenotypes of microcephaly, developmental delay, growth abnormalities, and CNS abnormalities.

TABLE 3: LITERATURE REVIEW RESULTS

		Current Cohort	Literature Review
SEX	Female	18	11
	Male	11	7
MUTATION TYPE	Missense	16	7
	Nonsense	6	
	Frameshift	4	
	Complex	3	
	Loss of function		11
PARENTAL CARRIERS	Mothers	7	6
	Fathers	0	0
AGE OF PRESENTATION	Youngest	22 months	Newborn
	Oldest	23 years	60 years
GROWTH		76% (22/29)	50% (12/13)
	Microcephaly	65% (17/26)	77% (10/13)
HEAD DEVELOPMENT		76% (22/29)	71% (5/7)
	Temporal Narrowing	53% (10/19)	NR
	Prominent Brow	54% (7/13)	100% (3/3)
EYE DEVELOPMENT		86% (25/29)	29% (2/7)
	Arched eyebrows	41% (7/17)	NR
	Visual Impairment	56% (10/18)	100% (1/1)
MOUTH DEVELOPMENT		79% (23/29)	83% (10/12)
	Thin lips	80% (12/15)	80% (4/5)
	Cleft palate	NR	40% (2/5)
CNS ABNORMALITY		83% (24/29)	100% (12/12)
	Seizure	50% (10/20)	67% (2/3)
	Abnormal EEG	64% (9/14)	NR
	Abnormal Brain MRI	52% (12/23)	75% (9/12)
IMPAIRED COGNITION		79% (23/29)	100% (10/10)
	Intellectual Disability	78% (18/23)	100% (10/10)
	Developmental Delay	75% (12/16)	100% (10/10)

Key: NR = not reported

SUMMARY & CONCLUSION

Genotype-phenotype studies were conducted on this cohort and compared to our systematic literature review of all reported MKMS patients which allowed us to expound on the range of phenotypes manifested in MKMS. The results demonstrate the wide spectrum of phenotypes in MKMS, with notable sex-specific differences.

- Of notable impact, the cohort described in this study is the largest MKMS cohort reported.
- Future indications for research include examining the clinical presentations of MKMS in organ systems, such as the cardiovascular and respiratory systems.
- These findings aid in future identification of MKMS patients. We further propose that these findings will enhance clinical decision-making for diagnosing and prediction of prognosis.

ACKNOWLEDGEMENTS

We are grateful to the patients and families who participated in these studies.

REFERENCES

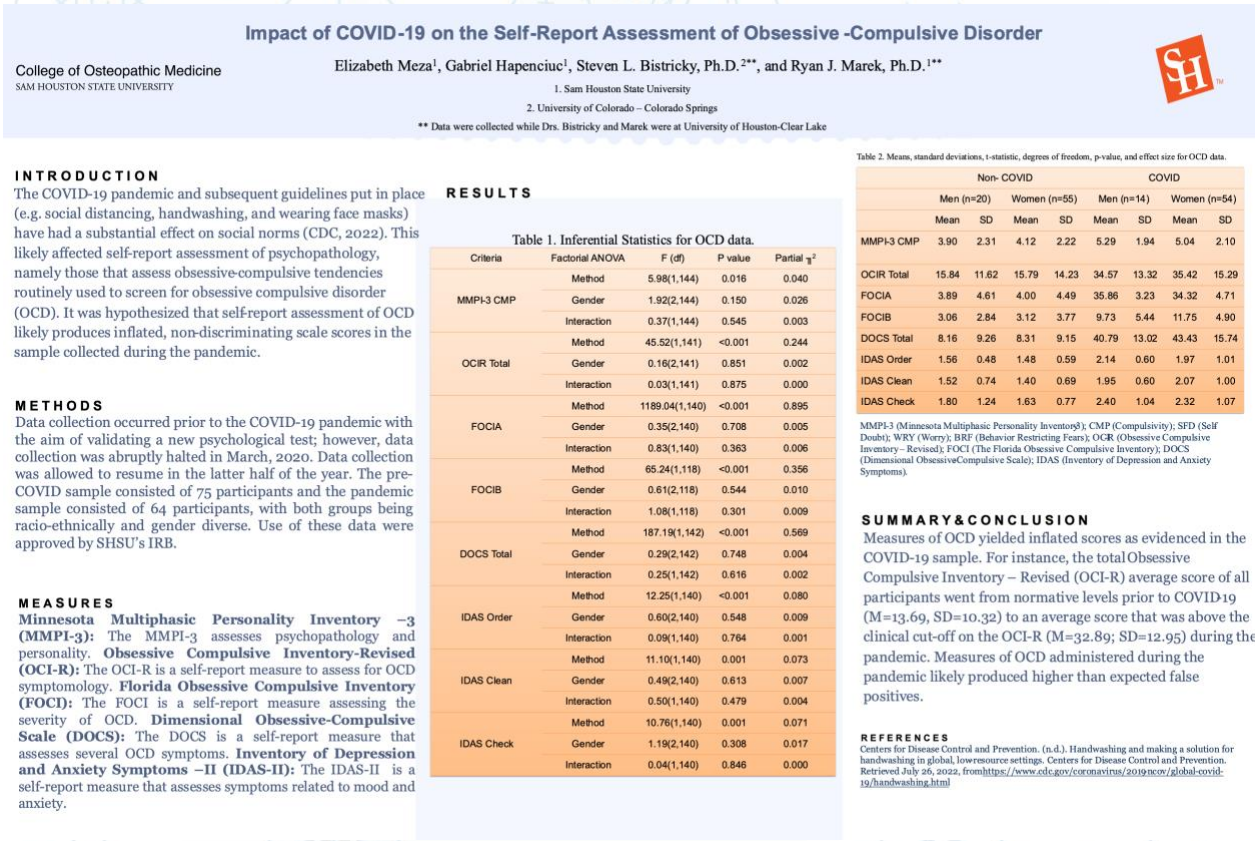
1. Krusza, P., Berger, S. I., Casa, V., Dekker, N. R., Gaesser, J., Weiss, K., Muenke, M. (2019). Cohesin complex-associated holoprosencephaly. Brain, 142(9), 2831–2843. doi:10.1093/brain/awz210
2. Mullegama, S. V., Klein, S. D., Mulatinho, M. V., Senaratne, T. N., Singh, K. Center, U. C., Martinez-Agosto, J. A. (2017). De novo loss-of-function variants in STAG2 are associated with developmental delay, microcephaly, and congenital anomalies. Am J Med Genet A, 173(6), 1318–1327. doi:10.1002/ajmg.a.38297
3. Mullegama, S. V., Klein, S. D., Signer, R. H., Center, U. C. G., Vilain, E., & Martinez-Agosto, J. A. (2019). Mutations in STAG2 cause an X-linked cohesinopathy associated with undergrowth, developmental delay, and dysmorphia. Expanding the phenotype in males. Mol Genet Genomic Med, 7(2), e00501. doi:10.1002/mgg3.591
4. Soardi, F. C., Machado-Silva, A., Linhares, N. D., Zheng, G., Qu, Q., Pena, H. B., Pena, S. D. J. (2017). Familial STAG2 germline mutation defines a new human cohesinopathy. NPJ Genom Med, 2, 7. doi:10.1038/s41525-017-0005-4
5. Yuan, B., Neira, J., Pehlivan, D., Santiago-Sim, T., Song, X., Rosenfeld, J., Lupski, J. R. (2019). Clinical exome sequencing reveals locus-heterogeneity and phenotypic variability of cohesinopathies. Genet Med, 21(3), 663–675. doi:10.1038/s41436-018-0085-8

CC11

Impact of COVID-19 on the Self-Report Assessment of Obsessive-Compulsive Disorder

E. Meza, G. Hapenciuc, S. Bistricky
Advisor: R. Marek

Introduction: The COVID-19 pandemic and subsequent guidelines put in place (e.g., social distancing, handwashing, and wearing face masks) have had a substantial effect on social norms. This likely affected self-report assessment of psychopathology, namely those that assess obsessive-compulsive tendencies routinely used to screen for obsessive compulsive disorder (OCD). It was hypothesized that self-report assessment of OCD likely produces inflated, nondiscriminating scale scores.
Method: Data collection occurred prior to the COVID-19 pandemic with the aim of validating a new psychological test; however, data collection was abruptly halted in March 2020. Data collection was allowed to resume in the latter half of the year. The pre-COVID sample consisted of 75 participants and the pandemic sample consisted of 64 participants, with both groups being racio-ethnically and gender diverse.
Results: Measures of OCD yielded inflated scores. For instance, the total Obsessive Compulsive Inventory – Revised (OCI-R) average score of all participants went from normative levels prior to COVID-19 (M=13.69, SD=10.32) to an average score that was above the clinical cut-off on the OCI-R (M=32.89; SD=12.95) during the pandemic ($t(135)=9.66$, $p< .001$, Cohen's $d=1.66$). Two by two factorial ANOVAs were also conducted to examine if there were any method by gender interaction effects. Interaction effects were non-significant across all criteria.
Conclusions: The larger OCD-related scale scores assessed are likely false positives due to COVID-19 health guidelines put in place to protect against infection that may otherwise be considered contamination fears on OCD measures.



Impact of COVID-19 on the Self-Report Assessment of Obsessive -Compulsive Disorder

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

Elizabeth Meza[1], Gabriel Hapenciuc[1], Steven L. Bistricky, Ph.D.[2**], and Ryan J. Marek, Ph.D.[1**]

1. Sam Houston State University
2. University of Colorado – Colorado Springs
** Data were collected while Drs. Bistricky and Marek were at University of Houston-Clear Lake

INTRODUCTION

The COVID-19 pandemic and subsequent guidelines put in place (e.g. social distancing, handwashing, and wearing face masks) have had a substantial effect on social norms (CDC, 2022). This likely affected self-report assessment of psychopathology, namely those that assess obsessive-compulsive tendencies routinely used to screen for obsessive compulsive disorder (OCD). It was hypothesized that self-report assessment of OCD likely produces inflated, non-discriminating scale scores in the sample collected during the pandemic.

METHODS

Data collection occurred prior to the COVID-19 pandemic with the aim of validating a new psychological test; however, data collection was abruptly halted in March, 2020. Data collection was allowed to resume in the latter half of the year. The pre-COVID sample consisted of 75 participants and the pandemic sample consisted of 64 participants, with both groups being racio-ethnically and gender diverse. Use of these data were approved by SHSU's IRB.

MEASURES

Minnesota Multiphasic Personality Inventory –3 (MMPI-3): The MMPI-3 assesses psychopathology and personality. **Obsessive Compulsive Inventory-Revised (OCI-R):** The OCI-R is a self-report measure to assess for OCD symptomology. **Florida Obsessive Compulsive Inventory (FOCI):** The FOCI is a self-report measure assessing the severity of OCD. **Dimensional Obsessive-Compulsive Scale (DOCS):** The DOCS is a self-report measure that assesses several OCD symptoms. **Inventory of Depression and Anxiety Symptoms –II (IDAS-II):** The IDAS-II is a self-report measure that assesses symptoms related to mood and anxiety.

RESULTS

Table 1. Inferential Statistics for OCD data.

Criteria	Factorial ANOVA	F (df)	P value	Partial η^2
MMPI-3 CMP	Method	5.98(1,144)	0.016	0.040
	Gender	1.92(2,144)	0.150	0.026
	Interaction	0.37(1,144)	0.545	0.003
OCIR Total	Method	45.52(1,141)	<0.001	0.244
	Gender	0.16(2,141)	0.851	0.002
	Interaction	0.03(1,141)	0.875	0.000
FOCIA	Method	1189.04(1,140)	<0.001	0.895
	Gender	0.35(2,140)	0.708	0.005
	Interaction	0.83(1,140)	0.363	0.006
FOCIB	Method	65.24(1,118)	<0.001	0.356
	Gender	0.61(2,118)	0.544	0.010
	Interaction	1.08(1,118)	0.301	0.009
DOCS Total	Method	187.19(1,142)	<0.001	0.569
	Gender	0.29(2,142)	0.748	0.004
	Interaction	0.25(1,142)	0.616	0.002
IDAS Order	Method	12.25(1,140)	<0.001	0.080
	Gender	0.60(2,140)	0.548	0.009
	Interaction	0.09(1,140)	0.764	0.001
IDAS Clean	Method	11.10(1,140)	0.001	0.073
	Gender	0.49(2,140)	0.613	0.007
	Interaction	0.50(1,140)	0.479	0.004
IDAS Check	Method	10.76(1,140)	0.001	0.071
	Gender	1.19(2,140)	0.308	0.017
	Interaction	0.04(1,140)	0.846	0.000

Table 2. Means, standard deviations, t-statistic, degrees of freedom, p-value, and effect size for OCD data.

	Non- COVID				COVID			
	Men (n=20)		Women (n=55)		Men (n=14)		Women (n=54)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
MMPI-3 CMP	3.90	2.31	4.12	2.22	5.29	1.94	5.04	2.10
OCIR Total	15.84	11.62	15.79	14.23	34.57	13.32	35.42	15.29
FOCIA	3.89	4.61	4.00	4.49	35.86	3.23	34.32	4.71
FOCIB	3.06	2.84	3.12	3.77	9.73	5.44	11.75	4.90
DOCS Total	8.16	9.26	8.31	9.15	40.79	13.02	43.43	15.74
IDAS Order	1.56	0.48	1.48	0.59	2.14	0.60	1.97	1.01
IDAS Clean	1.52	0.74	1.40	0.69	1.95	0.60	2.07	1.00
IDAS Check	1.80	1.24	1.63	0.77	2.40	1.04	2.32	1.07

MMPI-3 (Minnesota Multiphasic Personality Inventory3); CMP (Compulsivity); SFD (Self Doubt); WRY (Worry); BRF (Behavior Restricting Fears); OCR (Obsessive Compulsive Inventory – Revised); FOCI (The Florida Obsessive Compulsive Inventory); DOCS (Dimensional ObsessiveCompulsive Scale); IDAS (Inventory of Depression and Anxiety Symptoms).

SUMMARY&CONCLUSION

Measures of OCD yielded inflated scores as evidenced in the COVID-19 sample. For instance, the total Obsessive Compulsive Inventory – Revised (OCI-R) average score of all participants went from normative levels prior to COVID-19 (M=13.69, SD=10.32) to an average score that was above the clinical cut-off on the OCI-R (M=32.89; SD=12.95) during the pandemic. Measures of OCD administered during the pandemic likely produced higher than expected false positives.

REFERENCES

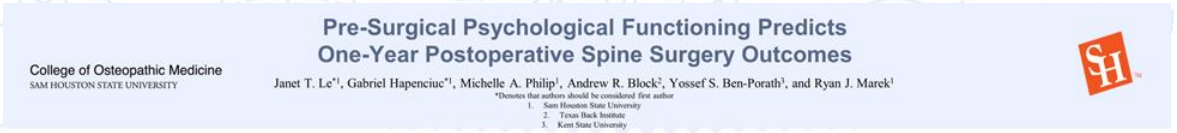
Centers for Disease Control and Prevention. (n.d.). Handwashing and making a solution for handwashing in global, lowresource settings. Centers for Disease Control and Prevention. Retrieved July 26, 2022, fromhttps://www.cdc.gov/coronavirus/2019-ncov/global-covid-19/handwashing.html

CC12

Pre-Surgical Psychological Functioning Predicts One-Year Postoperative Spine Surgery Outcomes

J. Le, G. Hapenciuc, M. Philip, A. Block, Y. Ben-Porath
Advisor: R. Marek

Introduction: Over 80% of the population in the United States have reported experiencing chronic low back pain at least once in their lives. Although a variety of treatment options exist, reparative spine surgery is being increasingly sought after. To minimize postoperative detriments, pre-surgical psychological evaluations are becoming more routine to assess for psychosocial risks. This investigation hypothesized that objective psychological markers assessed prior to spine procedures predict pain, functional disability, and negative emotions up to one-year post-operation.
Method: The sample included 910 participants – 50.4% men and 49.5% women. The sample was 89% White, 4.1% Black, and 3.9% Hispanic. Prior to surgery, participants took the Minnesota Multiphasic Personality Inventory – 3 – the most widely used objective measure of psychopathology. They were also administered self-report measures of pain, functional disability, and negative affect prior to surgery and one-year postoperative.
Results: Patients largely reported decreases in pain and negative affect, though standard deviations were quite large. Hierarchical linear regression analyses suggested that the presurgical MMPI-3 scale scores that assessed somatization and emotional dysfunction accounted for up to 5.4% additional variability in these outcomes after controlling for baseline measures.
Conclusions: Pre-surgical scale scores on the MMPI-3 were notably associated with pre-surgical and post-surgical negative affect and functional disability scores. Emotional dysfunction scales, such as Demoralization, Dysfunctional Negative Emotions, and Negative Emotionality/Neuroticism tended to be the strongest predictors of post-surgical negative affect. Use of reliable, validated tests of psychopathology during a pre-surgical evaluation can predict diminished outcomes in spine surgery and spinal cord stimulator settings.



INTRODUCTION

Over 80% of the population in the United States have reported experiencing chronic low back pain at least once in their lives.[1] Although a variety of treatment options exist, reparative spine surgery is being increasingly sought after.[2] To minimize postoperative detriments, pre-surgical psychological evaluations are becoming more routine to assess for psychosocial risks.[3] This investigation hypothesized that objective psychological markers assessed prior to spine procedures predict pain, functional disability, and negative emotions up to one-year post-operation.

METHODS

The sample included 910 participants – 50.4% men and 49.5% women. The sample was 89% White, 4.1% Black, and 3.9% Hispanic. Prior to surgery, participants took the Minnesota Multiphasic Personality Inventory – 3 – the most widely used objective measure of psychopathology. They were also administered self-report measures of pain, functional disability, and negative affect prior to surgery and one-year postoperative. Use of these data were approved by SHSU's IRB.

RESULTS

Patients largely reported decreases in pain and negative affect, though standard deviations were quite large. Hierarchical linear regression analyses suggested that the presurgical MMPI-3 scale scores that assessed somatization and emotional dysfunction accounted for up to 5.4% additional variability in these outcomes after controlling for baseline measures.

Table 1. Zero-Order Correlations between the MMPI-3 and External Criteria

MMPI-3 RF Substantive Scales	Pre-surgical pain	Post-surgical Pain	Pre-surgical ODI	Post-surgical ODI	Pre-surgical negative affect	Post-surgical negative affect
Demoralization	.75	.03	.21	.10	.60	.35
Somatic Complaints	.18	.20	.34	.26	.39	.22
Low Positive Emotions	.03	-.03	.13	.06	.32	.08
Dysfunctional Negative Emotions	.08	.03	.16	.15	.55	.27
Malaise	.24	.15	.42	.28	.44	.24
Disconstraint	.01	.01	.01	.05	.23	.25
Negative Emotionality/Neuroticism	.08	.01	.17	.10	.60	.35
Introversion/Low Positive Emotionality	.01	-.03	.11	.01	.23	-.01

Note: Bolded coefficients are statsitcially significant ($p < .05$) and practically significant

RESULTS CONTINUED

Table 2. Descriptive Statistics of Presurgical and Postoperative Outcomes

Measure	Presurgical Score		Postoperative Score		Dependent Samples t test	
	M	SD	M	SD	t (df)	Cohen's D
Current pain level	7.22	1.91	3.44	2.38	19.24 (213)*	1.32
Oswestry Disability Index	48.60	11.83	31.29	14.23	15.99 (182)*	1.18
Negative Affect	1.83	0.62	1.65	0.67	3.58 (213)*	0.25

Note: M (Mean); SD (Standard Deviation); df (Degrees of Freedom); * indicates statistically significant at $p < .001$

SUMMARY&CONCLUSION

Pre-surgical scale scores on the MMPI-3 were notably associated with pre-surgical and post-surgical negative affect and functional disability scores. Emotional dysfunction scales, such as Demoralization, Dysfunctional Negative Emotions, and Negative Emotionality/Neuroticism tended to be the strongest predictors of post-surgical negative affect. Use of reliable, validated tests of psychopathology during a pre-surgical evaluation can predict diminished outcomes in spine surgery and spinal cord stimulator settings.

REFERENCES

1. Freburger, J. K., Holmes, G. M., Agans, R. P., Jackman, A. M., Darter, J. D., Wallace, A. S., Castel, L. D., Kalsbeek, W. D., & Carey, T. S. (2009). The rising prevalence of chronic low back pain. *Archives of internal medicine*, *169*(3), 251–258. https://doi.org/10.1001/archinternmed.2008.543
2. Friedly, J., Standaert, C., & Chan, L. (2010). Epidemiology of spine care: the back pain dilemma. Physical medicine and rehabilitation clinics of North America, 21(4), 659-677.
3. Block, A. R., & Marek, R. J. (2019). Presurgical Psychological Evaluation: Risk Factor Identification and Mitigation. Journal of Clinical Psychology in Medical Settings. https://doi.org/10.1007/s10880-019-09660-0

CC13

Sacral Asymmetry: Relationships Between Morphological and Metric Analyses

R. Mota

Advisor: K. Lesciotto,

Variability in the gross morphology of the sacrum can be attributed to directional asymmetries associated with mechanical loading forces. Directional asymmetry can contribute to unbalanced bone hypertrophy of the sacrum and affect somatic function. Previous studies have used osteological landmarks on the superior aspect of the sacrum to attempt to quantify sacral asymmetry. However, asymmetry between sacral promontory height and bilateral alar height has not previously been defined or correlated with linear sacral measurements, leaving a gap between current knowledge of sacral asymmetry and potential clinical implications. The goals of this projects were to (1) develop an ordinal scoring system for sacral height asymmetry and (2) investigate potential correlations between 3D morphological asymmetry and 2D linear measurements. Data were collected on 92 non-pathological sacra from the Southeast Texas Applied Forensic Science Facility Skeletal Collection. Sacral asymmetry was recorded through nine 2D linear measurements using standard osteological landmarks, as well as a novel scoring method that graded sacral height asymmetry on an ordinal scale of 1-3. Non-parametric testing revealed no significant correlations between ordinal scoring of alar height asymmetry and any linear measurement (all $p > 0.05$). These results demonstrate that the commonly used osteological linear measurements fail to fully capture the range of sacral asymmetry. Further study of the ordinal asymmetry scoring method developed through this research will help provide a foundational frame of reference for sacral asymmetry, pathologies, musculoskeletal biomechanics, and somatic dysfunction.

Sacral Asymmetry: Relationships Between Morphological and Metric Analyses

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

Roxanna Mota, BS and Kate M. Lesciotto, PhD

INTRODUCTION

Sacral asymmetry develops due to repeated, uneven unilateral mechanical forces.[1,2] This results in morphological asymmetries that persist into adulthood with no significant association with age or sex. Marked sacral asymmetry could contribute to other skeletal pathologies,[2] as well as somatic dysfunction. Previous studies examined symmetry through commonly used 2D linear measurements based upon osteological landmarks on the superior aspect of the sacrum[1,2]; however, no studies have attempted to quantify the relationship between sacral promontory height and bilateral alar height ("sacral height asymmetry"). The goals of this study were to:

1. Develop a novel ordinal scoring system for sacral height asymmetry; and
2. Investigate potential correlations between 3D morphological asymmetry and 2D linear measurements.

MATERIALS & METHODS

SAMPLE

- Non-pathological specimens with five sacral segments were identified using the Southeast Texas Applied Forensic Science Facility Skeletal Collection (N = 92; Age Range 18-87):

	Age								
Sex	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	Unknown	Total
Male	0	1	0	5	17	13	6	1	2	45
Female	1	0	1	6	9	17	5	8	0	47

MEASUREMENTS

- Seven 2D linear measurements were defined and measured (Table 1 and Figure 1).
- Sacral height asymmetry was defined as: no gross asymmetry between promontory and alae heights (Score: 1), mild asymmetry (Score: 2), or extreme asymmetry (Score: 3) (Figure 2).

ANALYSES

- Intra-observer error study: Two trials were conducted on a subsample and compared using technical error of measurement (TEM= $\sqrt{\sum D^2/2N}$) and relative technical error of measurement (rTEM= TEM/mean * 100) for linear measurements and percent agreement for morphological scoring.
- Comparison of morphological and metric analyses: Spearman's correlation was used to test for significant correlations between 2D linear measurements and sacral height asymmetry.

Table 1 – 2D linear measurements of the sacrum.[7]

Abbreviation	Name	Bilateral/Unilateral	Landmark
S1APB	S1 Body Anterior-Posterior Breadth	Unilateral	(1,2)
S1TL	S1 Body Transversal Length	Unilateral	(3,3)
TSB	Transverse Sacral Breadth	Unilateral	(8,8)
AAL	Anterior Alar Length	Bilateral	(4,6)
PAL	Posterior Alar Length	Bilateral	(5,7)
LAL	Lateral Alar Length	Bilateral	(3,8)
LAB	Lateral Alar Breadth	Bilateral	(6,7)

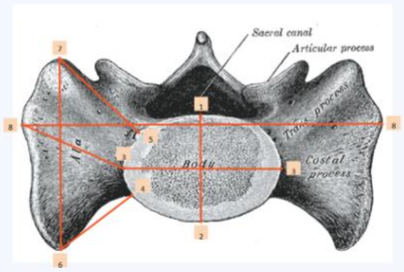


Figure 1 – Osteological landmarks and measurements (image adapted from [3]).

Figure 2 – Ordinal scoring system for sacral height asymmetry.

RESULTS

Table 3 – Intra-observer error study for 2D linear measurements (N = 18).

	S1APB	S1TL	TSB	Right AAL	Left AAL	Right PAL	Left PAL	Right LAL	Left LAL	Right LAB	Left LAB
TEM	0.362	0.465	0.256	0.330	0.411	0.389	0.473	0.444	0.380	0.317	0.348
rTEM	1.122	0.948	0.216	0.781	0.991	1.279	1.394	1.186	1.020	0.553	0.604

Table 4 – Intra-observer error study for ordinal scoring system (N = 20).

Perfect Agreement	(+/-) 1	(+/-) 2
85%	10%	5%

Table 5- Correlation between morphological asymmetry and linear measurements.

Measurement	Correlation Coefficient	P-Value
S1APB	0.002	0.985
S1TL	0.082	0.438
TSB	0.083	0.434
Right AAL	0.095	0.367
Left AAL	-0.002	0.981
Right PAL	-0.065	0.537
Left PAL	-0.100	0.344
Right LAL	0.061	0.562
Left LAL	0.017	0.873
Right LAB	0.113	0.285
Left LAB	-0.001	0.991

CONCLUSIONS

These results demonstrate that current studies do not fully capture sacral asymmetry using common osteological landmarks on the superior aspect of the sacrum.

- 2D linear measurements were found to be reliable (all rTEM < 2%)
- Ordinal scoring of alar height was reliable with 85% perfect agreement.
- No significant correlation between the scaral height morphological asymmetry and any 2D linear measurement exists (all $p > 0.05$).

REFERENCES

1. Plochocki JH. Directional bilateral asymmetry in human sacral morphology. *Int. J. Osteoarchaeol.* 2002;12(5):349-355.
2. Rmoutilová R, Gómez- Olivencia A, Brůžek J, et al. A case of marked bilateral asymmetry in the sacral alae of the Neandertal specimen Regourdou 1 (Périgord, France). *Am J Phys Anthropol.* 2020;171(2):242-259.
3. Gray H. *Anatomy of the human body*. Philadelphia and New York, Lea & Febiger; 1918 (Figure 98).

ACKNOWLEDGEMENTS

Special thanks to the Southeast Texas Applied Forensic Science Facility for allowing us access to the skeletal collection.

CC14

The Effects of Osteopathic Manipulative Treatment (OMT) in Post-Concussive Collegiate-Aged Athletes

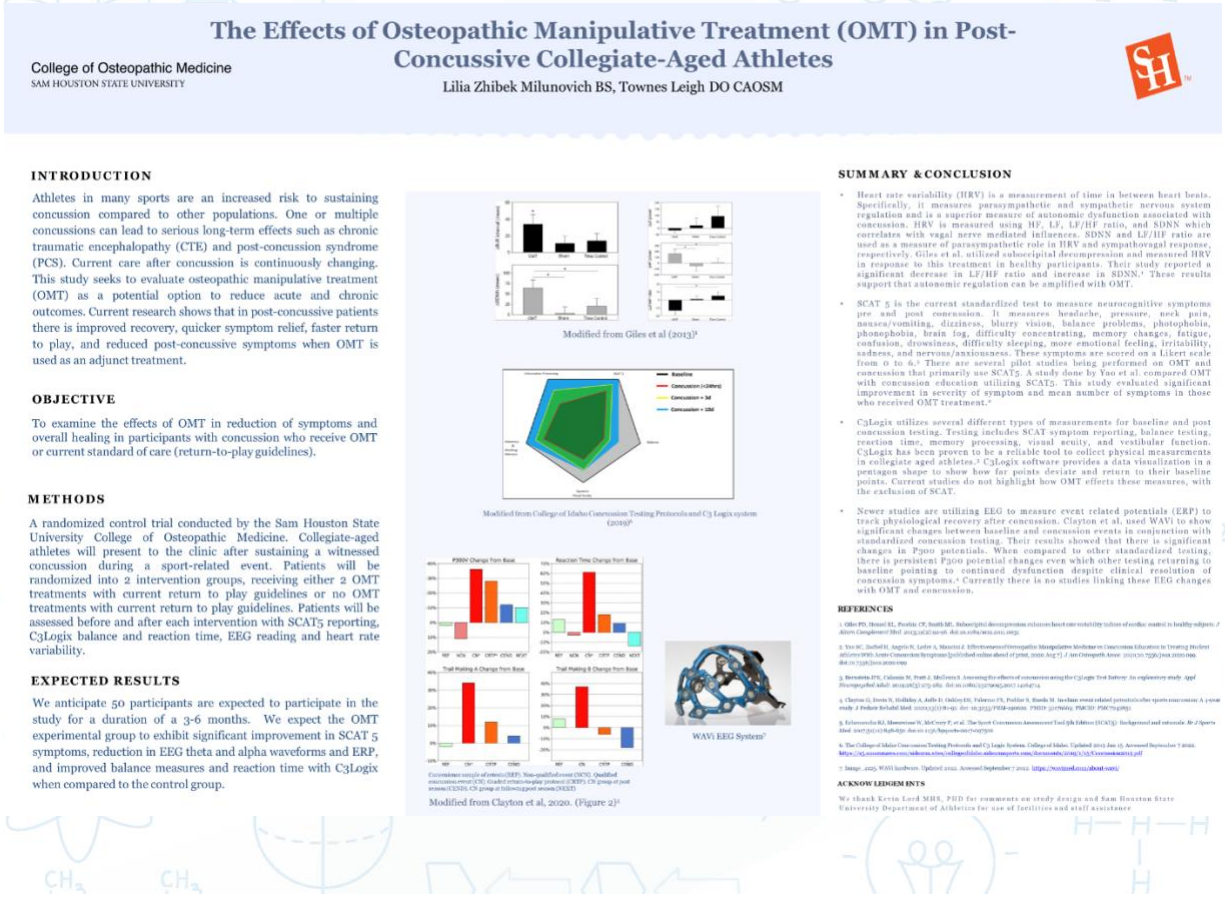
L. Milunovich
Advisor: L. Tucker

Introduction: Athletes in many sports are an increased risk to sustaining concussion compared to other populations. One or multiple concussions can lead to serious long-term effects such as chronic traumatic encephalopathy (CTE) and post-concussion syndrome (PCS). Current care after concussion is continuously changing. This study seeks to evaluate osteopathic manipulative treatment (OMT) as a potential option to reduce acute and chronic outcomes. Current research shows that in post-concussive patients there is improved recovery, quicker symptom relief, faster return to play, and reduced post-concussive symptoms when OMT is used as an adjunct treatment.

Objective: To examine the effects of OMT in reduction of symptoms and overall healing in participants with concussion who receive OMT or current standard of care.

Methods: A randomized control trial conducted by the Sam Houston State University College of Osteopathic Medicine. Collegiate-aged athletes will present to the clinic after sustaining a witnessed concussion during a sport-related event. Patients will be randomized into 2 intervention groups, receiving either 2 OMT treatments with current return to play guidelines or no OMT treatments with current return to play guidelines. Patients will be assessed before and after each intervention with SCAT5 reporting, C3Logix balance and reaction time, EEG reading and heart rate variability.

Anticipated Results: 50 participants are expected to participate in the study with the expectation of the OMT experimental group having improvement in symptomology when compared to the control group.



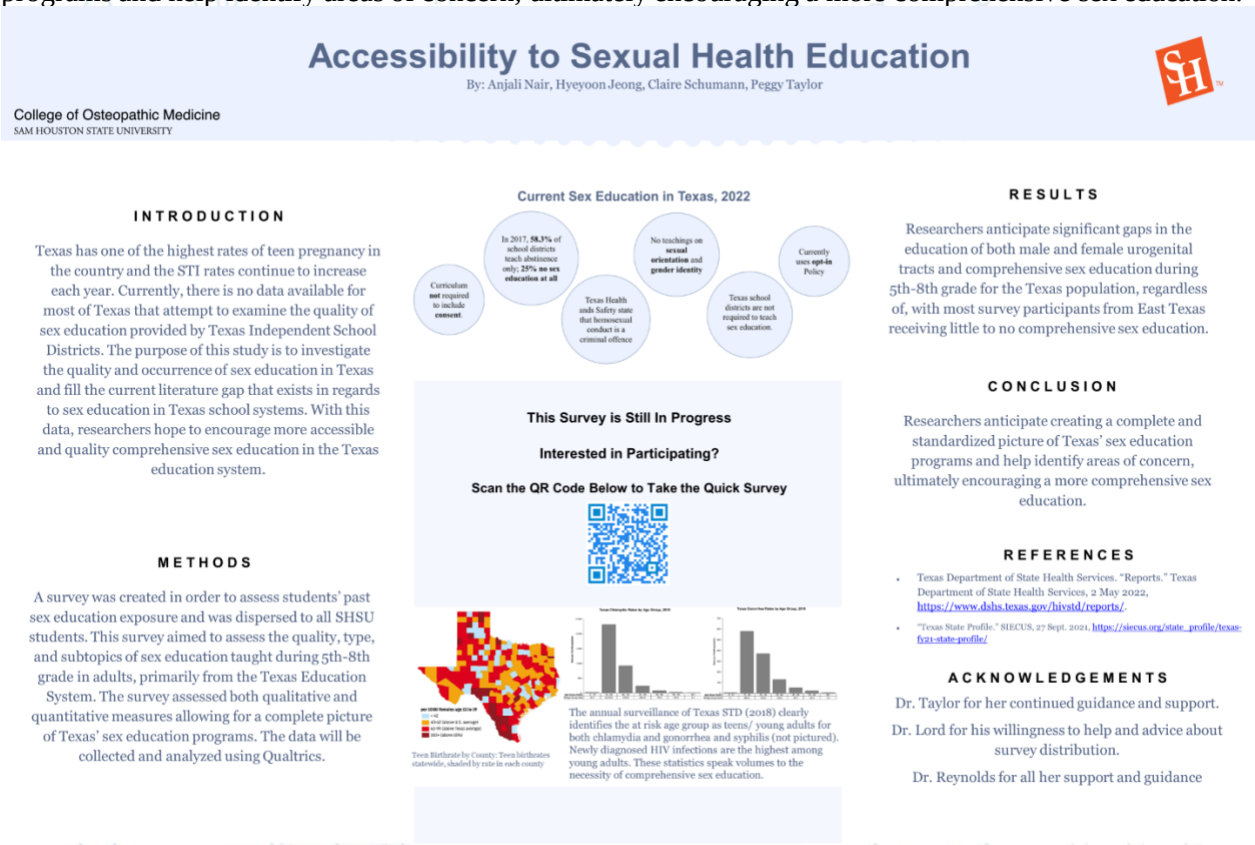
Medical Education Research:

These projects aim to advance the knowledge, skills, and professionalism of medical students by understanding and evaluating educational ecosystems. These ecosystems include policies related to admissions and curriculum, people who serve as teachers and mentors, instructional technology and other resources, the attitudes that pervade a given institution or educational experience, and even the medical students themselves.

Accessibility to Sexual Health Education

A. Nair, H. Jeong, C. Schumann
Advisor: P. Taylor

Background: Texas has one of the highest rates of teen pregnancy in the country and the STI rates continue to increase each year. Currently, there is no data available for most of Texas that attempt to examine the quality of sex education provided by Texas Independent School Districts. The purpose of this study is to investigate the quality and occurrence of sex education in Texas and fill the current literature gap that exists in regards to sex education in Texas school systems. With this data, researchers hope to encourage more accessible and quality comprehensive sex education in the Texas education system.
Methods: A survey was created in order to assess students' past sex education exposure and was dispersed to all SHSU students. This survey aimed to assess the quality, type, and subtopics of sex education taught during 5th-8th grade in adults, primarily from the Texas Education System. The survey assessed both qualitative and quantitative measures allowing for a complete picture of Texas' sex education programs. The data will be collected and analyzed using Qualtrics.
Results: Researchers anticipate significant gaps in the education of both male and female urogenital tracts and comprehensive sex education during 5th-8th grade for the Texas population, regardless of, with most survey participants from East Texas receiving little to no comprehensive sex education.
Conclusion: Researchers anticipate creating a complete and standardized picture of Texas' sex education programs and help identify areas of concern, ultimately encouraging a more comprehensive sex education.

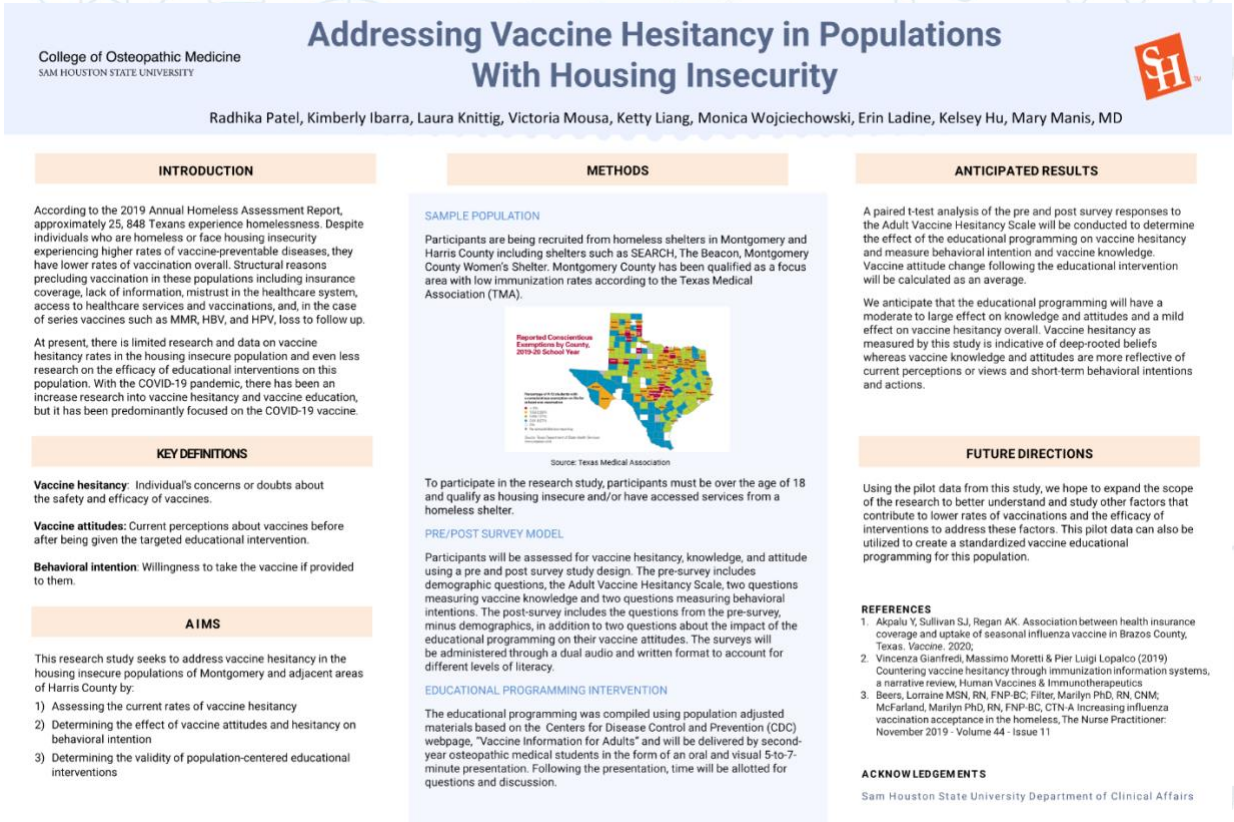


ME2

Addressing Vaccine Hesitancy in the Homeless Population

R. Patel, K. Morris-Ibarra, V. Mousa, E. Ladine, M. Wojciechowski, K. Liang, K. Hu, L. Knittig
Advisor: M. Manis

Background: In persons currently experiencing homelessness, chronic lower vaccination rates contribute to an increase in disease vulnerability and burden. In addition to the accessibility concerns evident in this population, vaccine hesitancy plays a role in lower levels of vaccination rates. This study aims to address both the gap in literature around vaccine hesitancy in the homelessness population in non-urban areas and to further develop insight into the behavioral intentions of this population by measuring levels of vaccine hesitancy before and after targeted educational programming.
Methods: Participants receiving services at homeless shelters in Montgomery and Harris Counties will be assessed for vaccine hesitancy through the use of a dual audio and written administered Adult Vaccine Hesitancy Scale survey prior to and following targeted educational programming. The intervention was compiled using population adjusted materials based on the Centers for Disease Control and Prevention (CDC) webpage and will be delivered by second-year osteopathic medical students. Following collection, paired data will be analyzed via t-test to determine if the educational programming affects vaccine hesitancy.
Anticipated Results: The expected outcome is decreased vaccine hesitancy and a desire to stay up-to-date on vaccinations following our educational programing. Due to the inaccessibility and vulnerability of the study population, data collection has been delayed, although materials have been favorably reviewed by a focus group and feedback is being incorporated into the programming.
Projected Impact: Once collected, the data will be some of the first of its kind and can serve to tailor future interventions for people experiencing homelessness in East and Southeast Texas.



College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

Addressing Vaccine Hesitancy in Populations With Housing Insecurity

Radhika Patel, Kimberly Ibarra, Laura Knittig, Victoria Mousa, Ketty Liang, Monica Wojciechowski, Erin Ladine, Kelsey Hu, Mary Manis, MD

INTRODUCTION

According to the 2019 Annual Homeless Assessment Report, approximately 25, 848 Texans experience homelessness. Despite individuals who are homeless or face housing insecurity experiencing higher rates of vaccine-preventable diseases, they have lower rates of vaccination overall. Structural reasons precluding vaccination in these populations including insurance coverage, lack of information, mistrust in the healthcare system, access to healthcare services and vaccinations, and, in the case of series vaccines such as MMR, HBV, and HPV, loss to follow up.

At present, there is limited research and data on vaccine hesitancy rates in the housing insecure population and even less research on the efficacy of educational interventions on this population. With the COVID-19 pandemic, there has been an increase research into vaccine hesitancy and vaccine education, but it has been predominantly focused on the COVID-19 vaccine.

KEY DEFINITIONS

Vaccine hesitancy: Individual's concerns or doubts about the safety and efficacy of vaccines.

Vaccine attitudes: Current perceptions about vaccines before after being given the targeted educational intervention.

Behavioral intention: Willingness to take the vaccine if provided to them.

AIMS

This research study seeks to address vaccine hesitancy in the housing insecure populations of Montgomery and adjacent areas of Harris County by:

1) Assessing the current rates of vaccine hesitancy
2) Determining the effect of vaccine attitudes and hesitancy on behavioral intention
3) Determining the validity of population-centered educational interventions

METHODS

SAMPLE POPULATION

Participants are being recruited from homeless shelters in Montgomery and Harris County including shelters such as SEARCH, The Beacon, Montgomery County Women's Shelter. Montgomery County has been qualified as a focus area with low immunization rates according to the Texas Medical Association (TMA).

Source: Texas Medical Association

To participate in the research study, participants must be over the age of 18 and qualify as housing insecure and/or have accessed services from a homeless shelter.

PRE/POST SURVEY MODEL

Participants will be assessed for vaccine hesitancy, knowledge, and attitude using a pre and post survey study design. The pre-survey includes demographic questions, the Adult Vaccine Hesitancy Scale, two questions measuring vaccine knowledge and two questions measuring behavioral intentions. The post-survey includes the questions from the pre-survey, minus demographics, in addition to two questions about the impact of the educational programming on their vaccine attitudes. The surveys will be administered through a dual audio and written format to account for different levels of literacy.

EDUCATIONAL PROGRAMMING INTERVENTION

The educational programming was compiled using population adjusted materials based on the Centers for Disease Control and Prevention (CDC) webpage, "Vaccine Information for Adults" and will be delivered by second-year osteopathic medical students in the form of an oral and visual 5-to-7-minute presentation. Following the presentation, time will be allotted for questions and discussion.

ANTICIPATED RESULTS

A paired t-test analysis of the pre and post survey responses to the Adult Vaccine Hesitancy Scale will be conducted to determine the effect of the educational programming on vaccine hesitancy and measure behavioral intention and vaccine knowledge. Vaccine attitude change following the educational intervention will be calculated as an average.

We anticipate that the educational programming will have a moderate to large effect on knowledge and attitudes and a mild effect on vaccine hesitancy overall. Vaccine hesitancy as measured by this study is indicative of deep-rooted beliefs whereas vaccine knowledge and attitudes are more reflective of current perceptions or views and short-term behavioral intentions and actions.

FUTURE DIRECTIONS

Using the pilot data from this study, we hope to expand the scope of the research to better understand and study other factors that contribute to lower rates of vaccinations and the efficacy of interventions to address these factors. This pilot data can also be utilized to create a standardized vaccine educational programming for this population.

REFERENCES

1. Akpalu Y, Sullivan SJ, Regan AK. Association between health insurance coverage and uptake of seasonal influenza vaccine in Brazos County, Texas. *Vaccine*. 2020;
2. Vincenza Gianfredi, Massimo Moretti & Pier Luigi Lopalco (2019) Countering vaccine hesitancy through immunization information systems, a narrative review, Human Vaccines & Immunotherapeutics
3. Beers, Lorraine MSN, RN, FNP-BC; Filter, Marilyn PhD, RN, CNM; McFarland, Marilyn PhD, RN, FNP-BC, CTN-A Increasing influenza vaccination acceptance in the homeless, The Nurse Practitioner: November 2019 - Volume 44 - Issue 11

ACKNOWLEDGEMENTS

Sam Houston State University Department of Clinical Affairs

An Evaluation Approach of Current Medical Students in the Context of an Implicit Bias Framework – A Mixed Methods Study

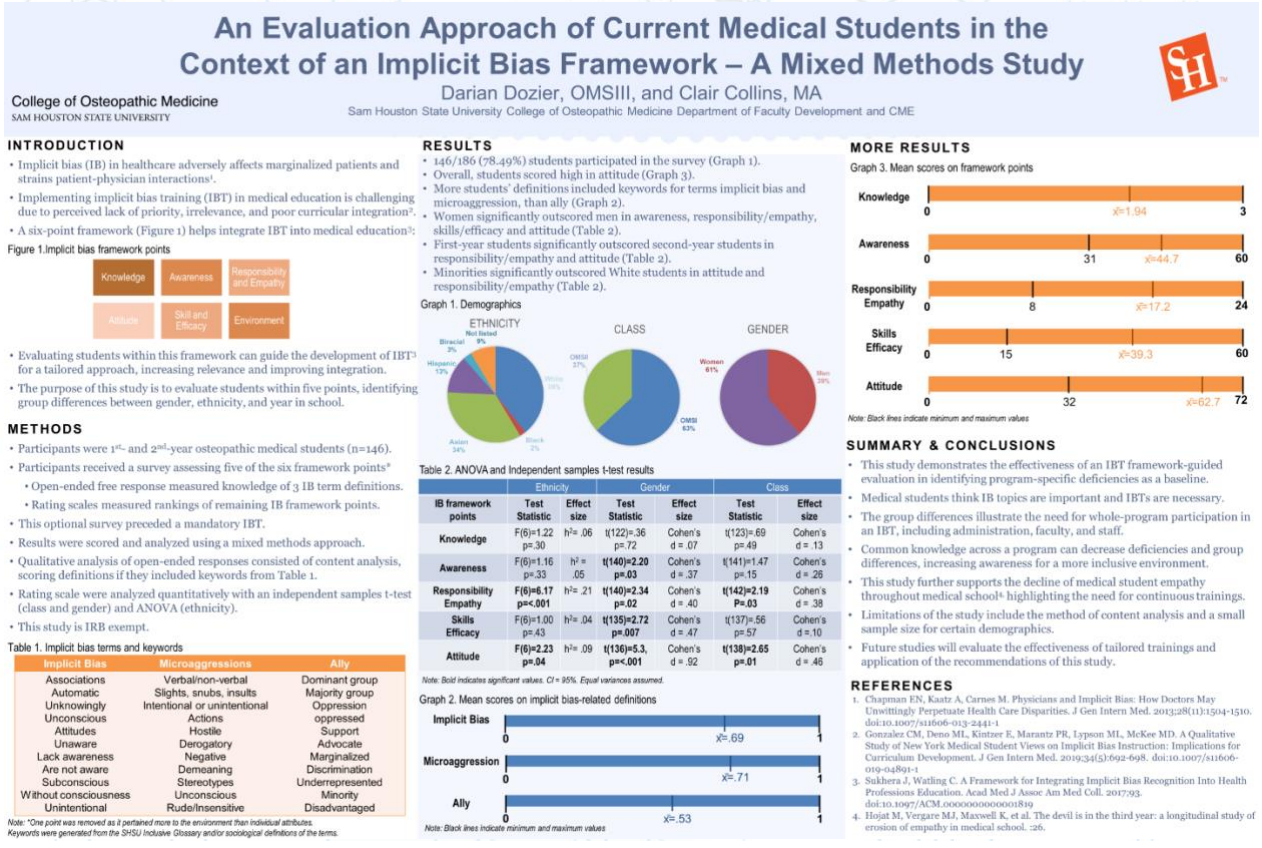
D. Dozier
Advisor: C. Collins

Introduction: The purpose of this study is to evaluate medical students within an implicit bias training (IBT) framework, and determine if group differences exist between gender, class, and race. Implicit bias (IB) in healthcare adversely affects marginalized patients, and strains patient-physician interactions. Implementing implicit bias trainings (IBT) in medical education is challenging due to a lack of priority, perceived relevance, and effective curricular integration. Evaluating medical students' adequacies and deficiencies in IB-related topics can guide programs in tailoring IBTs, increasing relevance, and improving integration.

Method: Students completed a survey measuring IBT Framework-guided topics: knowledge, awareness, responsibility/empathy, skills/efficacy, and attitude. A mixed methods approach was used to qualitatively analyze students' open-ended responses through content analysis and quantify scored data through independent samples t-tests and ANOVA models.

Results: Of 186 surveys, 146 (78.49%) participated. Students scored high in responsibility/empathy ($\bar{x}$=17.19/24) and attitude ($\bar{x}$=62.69/72). More students entered keywords related to "implicit bias" (96/139, 69%) and "microaggression" (95/135, 71%) definitions, than "ally" (72/136, 53%). Women outscored men in awareness (p=.032), responsibility/empathy (p=.02), skills/efficacy (p=.007) and attitude (p=<.001). First-years outscored second years in responsibility/empathy (p=0.03) and attitude (p=.009). And minorities outscored White students in attitude (p=.044) and responsibility/empathy (p=<.001).

Conclusion: The results of this study show that an IBT framework-guided evaluation can be effectively utilized to identify program-specific deficiencies and establish a baseline for curriculum development. Study results also guided the development of proposed recommendations for IBTs. Limitations of this study include restricted content analysis and small group sizes. Future studies will assess effectiveness of tailored trainings and proposed recommendations.



ME4

Developing a Peer Mentorship Program Integrated with Osteopathic Principles for Medical Students at SHSU-COM

W. Zhuo, L. Banuelos, L. Zhan, R. Nagaraj, L. Knittig
Advisor: Y. Zhao

Introduction: While peer mentorship has been implemented in many U.S. medical schools, few programs incorporate osteopathic principles to achieve the goal of providing mental health support for first year students. The osteopathic approach to health promotion and consideration of the entire person can guide incoming osteopathic medical students to avoid burnout and manage anticipated stress. This study aims to design and evaluate the effectiveness of a new peer mentorship program that incorporates the osteopathic principles of mind, body, and spirit on student adaptation to medical school and associated mental health challenges.
*Methods:*137 incoming first years were matched with 93 incoming second year students. A curriculum outlining the osteopathic principles of mind, body, and spirit is being developed for discussion at monthly events. The curriculum includes a one-page leaflet for the mentors detailing a theme, including social connectedness, time and stress management, which will be paired with an activity, such as guided meditation, for mentors and mentees. Pre-surveys evaluating mental health and burnout rates of first-year students will be administered just before the first event and post-surveys will be administered at the end of the school year.
Expected Results: Expected outcomes include improved mental health and decreased burnout rates in those who participated compared to those who did not.
Conclusion: Our study provides a novel framework for a mentorship program that improves the mental health of incoming medical students. Future research can target the efficacy of osteopathic principles in establishing effective mentorship programs.

Developing a Peer Mentorship Program Integrated with Osteopathic Principles for Medical Students at SHSU-COM

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INTRODUCTION

While peer mentorship has been implemented in many U.S. medical schools, no established study has evaluated the feasibility and impact of incorporating osteopathic principles in a peer mentoring program that focuses on student wellbeing. The osteopathic approach to health promotion and holistic consideration of the entire person can guide osteopathic medical students during the transition to medical school and increase their appreciation of their future profession. This study aims to design and evaluate the effectiveness of a new peer mentorship program at SHSU-COM that incorporates the osteopathic principles of mind, body and spirit.

METHODS

One hundred and thirty-seven incoming first year students were matched with 93 incoming second year students. Google forms were sent out to mentors and mentees; responses on preferences, career interests, and leisure activities helped guide the matching process.

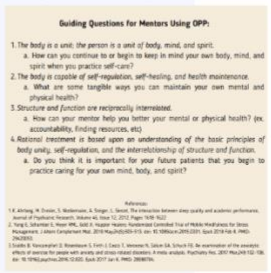
A yearlong mentoring program integrating the osteopathic principles of mind, body, and spirit is being developed. Themes of monthly event for the fall semester include stress management, time management, and social integration, and will be paired with an activity, such as guided meditation, for mentors and mentees (Table 1). Mentors will be provided with a one-page leaflet about the event theme and suggestions for how to incorporate osteopathic principles into the mentoring relationship (Figure 1).

Anonymous surveys will be administered at the end of each event and at the end of year to both mentors and mentees to evaluate perceptions of specific events, the whole program, and alignment with osteopathic principles. Two focus groups, one for mentees and one for mentors, and thematic analyses of the resulting qualitative data will be conducted by an unbiased facilitator at the end of the year to gain deeper understanding of the impact.

Table 1. Design of Mentorship Program Curriculum Activities for the Fall Semester

Theme	Activity	OPP	Description
Introductions	Pizza Social	**The body is a unit; the person is a unit of body, mind, and spirit.**	Introduction to a new mentoring relationship provides students with an opportunity to learn more about each other's background, beliefs, and hobbies to gain a more holistic understanding of each other.
Managing Stress	Ice Cream Social/ guided meditation	**Structure and function are reciprocally interrelated.**	Discuss ways to improve stress; lower stress levels can improve overall health (i.e., finding resources for meditation, exercise, etc.).
Managing Time	Cookie Decorating Contest	**The body is capable of self-regulation, self-healing, and health maintenance.**	Explore ways that effective time management techniques can contribute to self-regulation, self-healing, and health maintenance (i.e., having time for exercise, self-care, sleep, etc.).
Social Integration/ Connection	Trivia/Board Games	**The body is a unit; the person is a unit of body, mind, and spirit.**	Discuss ways to begin or continue to incorporate the body, mind, and spirit when making time for relationships and social connections (ex: what are some tangible ways will this improve overall wellbeing?).

Figure 1. An Example of Leaflet for Stress Management Theme (Front and back)



ANTICIPATED RESULTS

We expect that the survey results on perceptions of the peer mentoring program and events are positive. Focus group analyses will inform the similar finding with more details. Students will also gain greater understanding of the connectedness of mind, body, and spirit and their importance in wellbeing.

SUMMARY & FUTURE DIRECTION

Our study provides a novel framework for a mentorship program that may improve the mental health of incoming medical students and raise their awareness of professional identity. Future research can expand the program to all cohorts and observe whether such mentoring program design could be transferred to other osteopathic institutions.

REFERENCES

1. Farkas AH, Allenbaugh J, Bonifacino E, Turner R, Corbelli JA. Mentorship of US Medical Students: a Systematic Review. J GEN INTERN MED. 2019;34(11):2602-2609. doi:10.1007/s11606-019-05256-4

2. Bhatnagar V, Diaz S, Bucur PA. The Need for More Mentorship in Medical School. Cureus. 2020;12(5). doi:10.7759/cureus.7984

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

ME5

Developing a Student-Led Scholarship of Teaching and Learning Research Interest Group at an Osteopathic Medical School

R. Bhattacharjee, A. Reynolds, L. Knittig, R. Nagaraj, L. Zhan
Advisor: Y. Zhao

Introduction: Counseling psychology is a field of primary healthcare that uses culturally informed practices to assist individuals with their mental well-being and crisis management. Though mental illness is similarly prevalent in both metropolitan and rural areas, this service is largely inaccessible to individuals in rural and medically underserved areas. Consequently, primary care physicians in these areas serve as first-line mental healthcare providers. Unfortunately, current undergraduate medical education lacks a strong foundation in counseling and psychotherapy education. Our study aims to create a counseling psychology elective and determine whether this course will better prepare students to address the mental healthcare shortage in rural and medically underserved areas.

Methods: Four osteopathic medical students conducted a literature evaluation on the state of counseling psychology education in American medical schools. Next, SHSU-COM curriculum was mapped and evaluated for the existence of counseling psychology themes and concepts. A student and preceptor survey was then created to assess student perceptions on counseling skills and gauge interest in the proposed program.

Expected Results: Literature evaluation demonstrated a lack of structured counseling psychology education within American medical institutions. SHSU COM-specific curriculum mapping reflected this trend, with a lack of curriculum on mental health treatment modalities. Survey results are expected to demonstrate a student demand for this course offering.

Conclusion: Our study provides a novel framework for expanding medical mental healthcare education at the undergraduate medical level and better preparing students of the SHSU-COM and other medical institutions to serve the mental healthcare needs of rural and medically underserved areas.

Promoting Scholarship of Teaching and Learning for Medical Students at SHSU COM - An Outcome Report

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Background

Scholarship of teaching and learning (SoTL) is an expanding field of academic research, focusing on the effects of pedagogy and student outcomes in various fields of education. While the health science community has embraced the value of SoTL, the medical educational community lags behind other health science educational fields in terms of the volume of published SoTL research.[1,2] Additionally, there is a lack of student researcher participation compared to faculty participation in SoTL research.[3]

SoTL research boasts several benefits for students:

- Provides different research experience and increases research productivity
- Bolsters student leadership capability by improving "student confidence and sense of intellectual agency."[2]
- Healthier student-faculty relationships via improved communication
- Prepares students for future academic careers

Objective

In order to address (1) the lack of SoTL publications in the field of medical education and (2) the reduced student researcher participation in SoTL work, **a Student-Led SoTL Research Interest Group and a year-round program was created at Sam Houston State University College of Osteopathic Medicine (SHSU COM).**

Our study aimed to measure the outcome of the SoTL Research Interest Group program and we hypothesized that students engaging with a SoTL curriculum within this interest group would:

- Increase knowledge and confidence as a researcher
- Gain competency on the process of SoTL research, from developing a research question to creating a tangible SoTL research project
- Increase research productivity at SHSU-COM, both in SoTL research, and overall research

Methodology & Design

- A year-round program with six events was developed by two osteopathic medical students and a faculty mentor, featuring a variety of sequenced events designed to introduce osteopathic medical students to SoTL and gradually improve their proficiency in SoTL research.
- Participation within the research interest group was voluntary, and attendance was logged for each event.
- Student participants were surveyed using Qualtrics at the end of each semester to evaluate their perspective on the efficacy of the program, their confidence in conducting SoTL research, and research productivity.
- IRB Exemption was determined by SHSU IRB for this study.

Results

- The description and attendance of each SoTL event are listed in Table 1, with highest attendance for SoTL Faculty-Student Luncheon, and lowest for Journal Club.
- Participant perception data was collected using a 5-point Likert Scale (1-strongly disagree, 5-strongly agree) at the end of each semester. (Table 2) Students found the events were helpful in providing them opportunities to connect with faculty and peers dedicated to SoTL work and to receive feedback about research investigations.

Table 1. The Design of SoTL Research Curriculum

Event	Description	Attendance (N)
Introduction to SoTL *August 31st, 2021*	Introductory lecture where students learned about the definition and processes of SoTL research.	21
The Art of the Research Question *September 30th, 2021*	Students learned how to formulate and refine a SoTL research question to base their projects on.	22
Research Methodology *November 4th, 2021*	Student learned how to create a research methodology to investigate their SoTL questions.	10
Journal Club *November 16th, 2021*	Students learned how to analyze and investigate research literature in SoTL.	5
SoTL Faculty-Student Luncheon *March 9th, 2022*	Opportunity for students to interact with faculty interested in SoTL research to facilitate faculty-mentee relationships.	56
Grant Proposal Workshop *April 29th, 2022*	Students learned how to create a grant proposal from their research methodologies.	20

Table 2. Event Attendee Perception Data

	Mean ± Std	
	Fall 2021	Spring 2022
How well has participation in the SoTL Research Interest Group:		
Improved your ability to develop research questions?	3.68 ± 0.88	3.83 ± 1.14
Helped you network with other peer members with similar research interest?	3.76 ± 0.99	4.17 ± 0.94
Provided opportunities to receive on-going feedback about research investigations?	4.12 ± 0.86	3.75 ± 1.19
Provided opportunities to connect with faculty and/or administrators dedicated to SoTL work?	4.28 ± 0.83	4.67 ± 0.65
Expanded your knowledge and skill as a researcher?	3.72 ± 1.11	3.75 ± 1.22
Increased your ability to critically evaluate SoTL literature?	3.80 ± 1.06	3.17 ± 1.53
Increased your overall confidence in your abilities as a researcher?	3.48 ± 1.24	3.58 ± 1.19
Helped you progress on your project?	--	3.67 ± 1.23

- Research progress was surveyed at the end of each semester. While research productivity cannot be solely attributable to participation in the SoTL research interest group, and respondents were decreased from N=25 to N=13 for the reiteration of the survey in the spring semester, an increase in research productivity was found in each category of scholarly activity.

Table 3. Event Attendee Research Progression Data

	N (%)	
	Fall 2021	Spring 2022
In this semester, you have made the following research progression as either first or co-author:		
Drafted an abstract	5 (20)	6 (50)
Drafted a manuscript	0	4 (33)
Submitted an abstract or manuscript	1 (4)	3 (25)
Drafted an IRB	--	4(33)
Others (please explain)	1 (4)	0
None	20 (80)	5 (42)

Conclusion & Limitation

A year-round program for the SHSU-COM Student-Led SoTL Research Interest Group was created in summer 2021, with the first iteration of its curriculum administered in the 2021-2022 academic year. Survey data of participants indicates an overall positive perception of the efficacy and value of the SoTL Research Interest Group, particularly in helping them network and receiving feedback regarding SoTL research investigations.

Limitations of this study include: 1. limited sample size for spring semester, and less than a 50% response rate. 2. Student research productivity is not directly attributable to participation in this SoTL interest group.

Future Direction

New student leaders of the group will modify the curriculum and survey based on student attendee feedback to improve attendee experience as well as data fidelity.

References

1. Hoover MJ, Jung R, Jacobs DM, Peeters MJ. Educational Testing Validity and Reliability in Pharmacy and Medical Education Literature. *Am J Pharm Educ.* 2013;77(10):213.
2. Fincher R, Simpson D, Mennin S et al. Scholarship in Teaching. *Academic Medicine.* 2000;75(9):887-894. 3. Felten P, Bagg J, Bumbry M, et al. A Call for Expanding Inclusive Student Engagement in SoTL. *Teach Learn Inq ISSOTL J.* 2013;1(2):63-74.

Acknowledgements

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ME6

Evaluating Medical Student Perceptions of Team-based Learning (TBL) at SHSU-COM

R. Nagaraj, L. Zhan, L. Knittig
Advisors: R. Andrews-Dickert, Y. Zhao

Introduction: TBL has been associated with positive learning outcomes in medical education, including improved knowledge acquisition and teamwork appreciation. However, challenges exist with successfully implementing TBL, such as student engagement and session planning. As TBL is one teaching method used at SHSU-COM, we aimed to evaluate student perceptions of TBL experience at COM to improve the quality of TBL and learning outcomes.
Methods: OMS2 students were invited to participate in a voluntary survey assessing perceptions of current practice of TBL at SHSU-COM. The survey contained three parts: demographic information, perception questions which were measured on a 5-point Likert scale, and open-ended questions which targeted the perceived advantages and disadvantages of TBL. Descriptive and thematic analyses were performed to analyze data.
Results: Fifty-three out of 108 students (49.1%) participated in the survey. Among all perception questions, peer collaboration in TBL being critical to ensuring future success as a physician received the highest rating (4.68±0.51), which aligned with qualitative analyses. Interestingly, student preference for TBL over traditional lecture was rated lowest (2.51±1.13). The perceived reasons for this included limited time for adequate session preparation and lack of facilitation and feedback from faculty.
Conclusion: Students understand that TBL is advantageous in professional development and concept application; however, students prefer traditional lectures over team-based sessions. A study limitation includes variation in TBL delivery between and within courses, so students may have had difficulties generalizing their views to report in the survey. Future direction includes developing pedagogical strategies to improve TBL delivery at SHSU-COM.

Evaluating Medical Student Perceptions of Team-based Learning (TBL) at SHSU-COM

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

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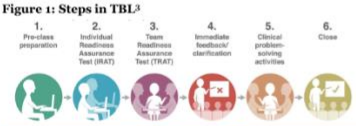
INTRODUCTION

TBL has been associated with positive learning outcomes in medical education, including improved knowledge acquisition and teamwork appreciation. However, challenges exist with successfully implementing TBL, such as student engagement and session planning. As TBL is one teaching method used at SHSU-COM, we aimed to evaluate student perceptions of TBL experience at our institute to improve the quality of TBL sessions and student learning outcomes.

METHODS

- OMS2 students were invited to participate in the voluntary survey assessing perceptions on current practices of TBL at SHSU-COM. The survey contained three parts: demographics, perception questions on a 5-point Likert scale (1-Strongly Disagree, 5-Strongly Agree), and open-ended questions targeting the advantages and disadvantages of TBL.
- Survey questions were based on the six steps of TBL as outlined in Figure 1.[3] Descriptive and thematic analyses were performed to analyze data.

Figure 1: Steps in TBL[3]



RESULTS

Fifty-three out of 105 OMS2 students (50.5%) participated in the survey. Results are shown in Figure 2, Table 1, and Table 2.

Figure 2: Demographic Data of Survey Participants

Table 1: Student Perceptions of TBL at COM from Likert Scale Questions

#	Question	Mean	STD
1	The content of the pre-class preparation provided was in line with the proposed learning objectives.	3.72	0.68
2	The amount of content available for the individual pre-class preparation was reasonable.	3.19	0.89
3	I consistently reviewed the pre-class preparation materials prior to TBL sessions.	3.36	1.23
4	Individual Readiness Assurance Tests were useful learning activities.	3.49	0.96
5	The team discussions during the Group Readiness Assurance Test allowed me to correct my mistakes and improved my understanding of the concepts that are used in TBL case discussion.	4.08	0.89
6	The TBL clinical problem-solving activities were useful learning activities.	3.42	0.98
7	I consistently received immediate feedback during TBL discussions.	3.06	1.02
8	In the discussion of the clinical case, teachers consistently acted as learning facilitators.	3.6	0.96
9	I have a positive attitude about working with my peers.	4.06	0.71
10	**The ability to collaborate with my peers is necessary if I am to be successful as a physician.**	**4.68**	**0.51**
11	Solving problems in a group is an effective way to practice what I have learned.	4.21	0.81
12	My team worked well together.	4.04	0.7
13	There was mutual respect for other teammates' viewpoints during TBL.	4.04	0.82
14	Team members were appropriately selected to maintain equality between groups.	3.49	0.92
15	I contributed meaningfully to the TBL discussions.	4.09	0.68
16	The learning objectives of TBL helped me focus on core information.	3.32	1.13
17	The TBL format helped increase my understanding and application of the course material.	3.47	1
18	I learned useful additional information during the TBL sessions.	3.6	0.94
19	TBL helped me prepare for course examinations.	3.53	1
20	TBL sessions encouraged me to progress beyond acquiring factual knowledge by helping me achieve a greater depth of understanding.	3.4	0.92
21	Most students were attentive during TBL sessions.	2.87	1.2
22	**I prefer TBL sessions more than traditional lectures.**	**2.51**	**1.13**

Table 2: Themes from Open-Ended Questions on Advantages, Disadvantages, and Barriers in TBL

Advantages	Disadvantages	Barriers
The TBL provided practice questions and helped for exam preparation	There were too many lectures/too little time to adequately prepare for the TBL content	There is inconsistency among faculty who deliver TBL's.
Working in a group and learning from one another was beneficial	There was a lack of feedback and facilitation from faculty	

CONCLUSION

Students perceived TBL as an effective way to apply knowledge and prepare for exams, and they regarded working in teams as advantageous to their professional development. Interestingly, students perceived their own contribution to TBL sessions as different than that of other students. Overall, students prefer traditional lectures over team-based sessions.

LIMITATION

Our study limitation includes variation in TBL delivery between and within courses, so students may have had difficulties generalizing their views to report in the survey.

FUTURE DIRECTION

Future direction includes developing training strategies for both students and faculty to improve TBL outcomes at the COM.

ACKNOWLEDGEMENT

We would like to thank all of the OMS2 students who participated in our survey.

REFERENCE

1. Levine RE, Hudes PD (2014). How-to Guide for Team-Based Learning.2.
2. Michaelsen LK., et al., editors. Team-Based Learning for Health Professions Education: A Guide to Using Small Groups for Improving Learning. Stylus Publishing, 2008
3. Burgess, A., van Diggele, C., Roberts, C. et al. Team-based learning: design, facilitation and participation. BMC Med Educ 20 (Suppl 2), 461 (2020)

ME7

Facilitating the Integration Embryology, Histology, and Radiology with Clinical Anatomy Education

M. Tran, R. Buch
Advisor: M. Loomis

Introduction: Near-peer teaching has been shown to help students master the type of complex material taught in clinical anatomy. The purpose of this study is to determine if directing teaching assistants to reinforce the generally difficult subjects of histology, embryology, and medical imaging during their time with first-year students in the gross anatomy lab can improve exam performance in those subjects.
Methods: Each week, anatomy TAs are briefed with prepared review sheets highlighting key histology, embryology, and imaging points that were taught in the previous week's lectures. The TAs then reinforce this material by integrating it into the assistance they provide to students in the lab.
Anticipated Results: By comparing student performance between prior SHSU COM Osteopathic medical students in anatomy with the current first years, we will see if the focused guidance of the TAs leads to improved exam performance in the areas of histology, embryology, and imaging.
Conclusions: It is hoped that the integration of histology, embryology, and imaging highlights into the teaching assistants' guidance of students in the gross anatomy lab will lead to improved performance in these subject areas on first-year students' anatomy examinations.

Facilitating the Integration of Embryology, Histology, and Radiology with Clinical Anatomy Education

Matthew Tran, Rahee Buch, Mario Loomis

Intro

Clinical anatomy is one of the most important classes taught in the first year of medical school, as it lays the groundwork on which many students will build the foundations of their medical career. However, it has been noted that many struggle with solidifying key anatomy concepts. Near-peer teaching has been shown to help students master the type of complex material taught in clinical anatomy. The purpose of this study is to determine if near-peer developed summary handouts of histology, embryology, and medical imaging during their time with first-year students in the gross anatomy lab can improve exam performance in those subjects.

Methods

A collection of near-peer developed summary handouts covering the histology, embryology, and radiology taught the previous week were to be shared with teaching assistants and first-year students. a literature search was undertaken see if there was support for the hypothesis that if exam item performance improves this year, a significant contribution would be from the handouts and not the change from 18wk to 9wk.

TABLE 1. Comparisons Between the Student Data for the Matriculating Classes of 1999–2000 (172-hr Course) and 2001–2002 (135-hr Course)[a]

Student data	172-hr course	135-hr course
Number of students	179	182
Gender (female = 0, male = 1; mean)	0.48	0.45
Undergraduate major (science/mathematics = 0, humanities/art = 1; mean)	0.13	0.13
Age (mean years ± SD)	25.68 ± 4.34	25.55 ± 3.20
Undergraduate science GPA (mean ± SD)	3.52 ± 0.31	3.45 ± 0.37
Undergraduate overall GPA (mean ± SD)	3.55 ± 0.27	3.52 ± 0.29
MCAT verbal reasoning (mean ± SD)	9.91 ± 1.58	9.69 ± 1.66
MCAT physical sciences (mean ± SD)	10.70 ± 1.72	10.68 ± 1.62
MCAT writing sample (mean ± SD)	9.66 ± 1.83[b]	9.31 ± 1.78
MCAT biological sciences (mean ± SD)	10.90 ± 1.44	10.98 ± 1.39
USMLE Step 1 Score (mean ± SD)	220.17 ± 23.34	221.81 ± 20.87[c]

[a]Independent *t*-tests did not yield significant differences between the two groups of students for any of the parameters shown.
[b]The letter scores were converted to numbers for statistical analysis (J = 4, K = 5, etc.). The ranges shown correspond to the letter scores O–P for both courses.
[c]Only data from the matriculating class of 2001 (n = 89) were available at the time of the study.

Figure 1. Data taken from Peterson et. al. demonstrating a lack of change in academic performance between a 172-lecture hour and 135-lecture hour anatomy course.

Survey Items	Strongly disagree /Disagree		Neutral		Agree/Strongly agree		Mean ± SD
	No.	(%)	No.	(%)	No.	(%)	(N=58)
No. of questions/session was reasonable	3	5.17	3	5.17	52	89.66	4.28±0.85
Difficulty level of questions is appropriate	0	0	4	6.90	54	93.10	4.26±0.58
Length of the sessions was optimal	12	20.69	8	13.79	38	65.52	3.76±1.16
Sessions are effective in improving my understanding of difficult concepts	3	5.26	10	17.54	44	77.19	4.05±0.85
Sessions helped me monitor the progress of my learning	1	1.72	5	8.62	52	89.66	4.31±0.71
Sessions helped me with my preparation for M1 module exams	4	6.90	5	8.62	49	84.48	4.16±0.85
Sessions helped me with my academic progress in M1 year	2	3.45	10	17.24	46	79.31	4.07±0.79
Sessions helped me with my preparation for Step 1 exam	1	1.72	23	39.66	34	58.62	3.84±0.85
Sessions helped me be familiar with Step 1 question style and format	2	3.45	4	6.90	52	89.66	4.43±0.77
Sessions helped in reducing stress and anxiety about Step 1 exam	10	17.24	21	36.21	27	46.55	3.45±1.06
Sessions increased my confidence in taking Step 1 exam	6	10.34	18	31.03	34	58.62	3.67±0.91
I'll recommend these sessions to the next year M1 students	1	1.72	4	6.90	53	91.38	4.47±0.78
Overall, the M4 sessions were valuable	0	0	1	1.72	57	98.28	4.69±0.50

Figure 2. Data taken from Morgan et .al. showing the positive outcome that near peer tutors can have on anatomy students' education in first year medical school anatomy courses.

Scan code with your camera's phone for full paper

Results

After providing handouts to students in first year anatomy courses detailing key points in embryology, histology, and radiology, and analyzing changes between first year students to previous students' performances on similar questions, it was determined that improvements to student performance in anatomy examinations could be attributed towards the handouts rather than the changes to course scheduling.

Discussion

While it is difficult to isolate the precise cause of changes in exam item performance from year to year given the different student population, modest changes in session delivery, etc. the literature supports the conclusion that the course restructuring from 18 to 9 weeks would most likely not be the cause of any improved performance, and it also identifies the benefit of near-peer teaching. To date, mid-course results have shown a 6.6% improvement in histology, embryology, radiology exam item performance this year compared to previous years. Data will be evaluated further at the conclusion of the course.

Citations:

Brakora, K.A., Chico, D.E., Allen, G.C., Hubbard, J.K. and Chen, W.-J. (2019), The Long and Short of It: Unopposed Basic Science Instruction over Fewer Weeks Improves Student Written Exam Performance in Medical Gross Anatomy. The FASEB Journal, 33: 607.14-607.14. https://doi.org/10.1096/fasebj.2019.33.1_supplement.607.14

Estai M, Bunt S. Best teaching practices in anatomy education: A critical review. Ann Anat. 2016 Nov;208:151-157. doi: 10.1016/j.aanat.2016.02.010. Epub 2016 Mar 17. PMID: 26996541.

Morgan, K.M., Northey, E.E. and Khalil, M.K. (2017), The effect of near-peer tutoring on medical students' performance in anatomical and physiological sciences. Clin. Anat., 30: 922-928. https://doi.org/10.1002/ca.22954

Peterson, C. A., & Tucker, R. P. (2005). *Undergraduate a... predictor of performance: Comparison between student... anatomy course of average length and a course shorter... Clinical Anatomy, 18(7), 540–547.* doi:10.1002/ca.20154

ME8

Facilitating the Integration of Embryology, Histology, and Radiology within Clinical Anatomy Education

R. Buch, M. Tran, M. Loomis, J. Hinojosa, D. Moeller
Advisor: D. Wooten

There is no doubt that the diverse disciplines within a medical school clinical anatomy class can be difficult to tackle. The goal of this project is to identify the extent to which intentional integrative teaching, via formatted deliverables and focused coordination of teaching assistants, can impact the understanding of anatomical sciences in first year medical students. We built a focused and consistent deliverable that can be distributed to teaching assistants as a guide to integrate histology and embryology into the gross anatomy laboratory. The teaching assistants will use that deliverable to correlate embryology and histology with the structures being dissected. These deliverables have started being distributed on a weekly basis to the laboratory teaching assistants for the Fall 2022 anatomy course. For outcome assessment, we will compare the average performance on certain exam items by the current first year medical students to those same results from students in the previous two classes. With the integration of histology and embryology within the gross anatomy lab, we seek to cultivate critical thinking skills needed for examinations, and thus, we anticipate an increase in performance on the histology and embryology items in the lecture and lab examinations. We hope that this study will quantify the anticipated benefits of coordinated near peer teaching as a means of reinforcing histology and embryology throughout the clinical anatomy course.

College of Osteopathic Medicine
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Facilitating the Integration of Embryology, Histology, and Radiology within Clinical Anatomy Education

Rahee Buch, Matthew Tran, Mario Loomis, Jaime Hinojosa, David Moeller, Dennis Wooten

INTRODUCTION

There is no one best way to teach clinical anatomy to first year medical students, however it is suggested that a multimodal approach with integrative teaching could benefit learning (Johnson et. al, 2012). With the integration of other disciplines, medical students often struggle with histology, embryology, and radiology within their clinical anatomy course . Studies have shown the benefit of near -peer teaching and how it can be a valuable aid to student learning (Morgan et. al, 2017), and specifically how students more advanced in the curriculum can become valuable tools to the first -year student and teaching faculty (Dickman et. al, 2017) . This study was specifically designed to quantify the benefit, if any, of a near -peer -developed weekly handout summarizing that week's histology, embryology, and radiology lectures.

METHODS

The near-peer handout was constructed independently by a second-year osteopathic medical student, then checked for errors and cleared by the clinical anatomy faculty. This focused and condensed material presented from a second- year student's perspective was integrated into the gross anatomy lab and shared with the teaching assistances and the first -year students. These handouts have been delivered on a weekly basis through the 2022 clinical anatomy course.

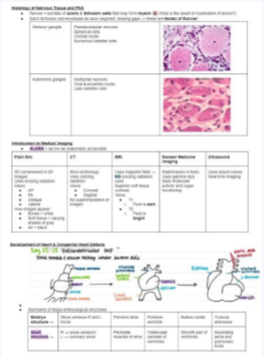


Figure: Sample Handout

EARLY RESULTS

In order to analyze the results of this intervention, there will be a comparison of the average performance on relevant exam items between the current first year class with the average performance on those items by the Class of 2025 .

Early analysis of data from the Fall 2022 midcourse examination shows an overall increase of about 6.6% on histology, embryology, and radiology items compared to the previous year .

CONCLUSION & FUTURE DIRECTION

We hope that this study will quantify the anticipated benefits of coordinated near -peer teaching as a means of reinforcing histology, embryology, and radiology throughout the clinical anatomy course .

We will gather data from the final examination, as well as the early results from the midcourse examination, and determine if the data demonstrates a statistically significant increase in student performance .

REFERENCES

Dickman, N., Barash, A., Reis, S. et al. Students as anatomy near-peer teachers: a double-edged sword for an ancient skill. BMC Med Educ 17, 156 (2017). https://doi.org/10.1186/s12909017-0996-y

Johnson EO, Charchanti AV, Troupis TG. Modernization of an anatomy class: From conceptualization to implementation. A case for integrated multimodal-multidisciplinary teaching. Anat Sci Educ. 2012 Nov-Dec;5(6):354-66. doi: 10.1002/ase.1296. Epub 2012 Jun 21. PMID: 22730175.

Morgan, K.M., Northey, E.E. and Khalil, M.K. (2017), The effect of near-peer tutoring on medical students performance in anatomical and physiological sciences. Clin. Anat., 30: 922-928. https://doi.org/10.1002/ca.22954

ACKNOWLEDGEMENTS

Department of Clinical Anatomy, Sam Houston State University College of Osteopathic Medicine

Patient-Perceived Implicit Bias in East Texas Clinics

T. Moore, B. Birks
Advisor: M. Manis

Introduction: Various research suggests that implicit bias in clinical settings is adversely affecting the health of minority patients. While there is research on physician bias and how that contributes to poorer health outcomes for patients of mainly minority demographics, there is not as much research on doctor-patient interactions from the patient's perspective. Thus, research from the patient's perspective may also reveal inequities in health outcomes.
Methods: Data collection will be done through incentivized student-administered surveys, where we will assess patients' perceived racial/ethnic implicit bias after physician and/or student doctor interactions in SHSU-COM East Texas clinics.1-2SHSU-COM medical students at each of the 3-4 clinics will offer surveys, via tablets, to all patients encountered at the clinics. Patients will create a unique password to avoid analysis of any duplicate response.
Anticipated Results: We expect that patients that have perceived implicit bias will have poorer health outcomes, indicated by medical records of increased disease prevalence or severity, less medical visits, and/or less medication adherence from previous research.
Conclusion: Research would allow us to evaluate how the patients of SHSU physicians, clinical sites, and medical students perceive their interaction to be and why. The main takeaway is that if we have a better understanding of patient accounts, then we can have a better understanding of how we can provide equitable care that could be established through targeting the curriculum and discussing the issue during the training of medical students. This allows conversations and actions towards the progression of increased healthy doctor-patient relationships.

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

Patient-Perceived Implicit Bias in East Texas Clinics

Tareah Moore OMS-2, Brooke Birks OMS-2, Mary Manis, MD

Introduction

Patients who perceive implicit racial bias during clinical encounters have been shown to have lower medication adherence for antihypertensive medications, higher A1c values, fewer annual physical exams, and lower pneumococcal vaccination rates.[1-3]
This is a novel study to investigate and characterize patient-perceived implicit racial bias in East Texas following health care interactions in medical student outpatient clerkship sites.

Methods

Data Collection:

- Medical students at SHSU-affiliated clinical education sites in East Texas will administer surveys to patients following physician and/or student doctor interactions.
- Number of surveys collected will be over the ideal sample size of 385 people(95% CI +/- 5%) using Cochran's formula.
- Responses will be stratified based on race, ethnicity, age, and sex which will allow survey data to be generalized to the East Texas population.

Utilization of Data

Implicit bias in health care contributes to unconscious discriminatory behavior which can lead to poorer health outcomes. This research data will be used to highlight any correlation between perceived implicit bias and health outcomes of patients in East Texas. It could be used enhance or create a curriculum that helps target biases and bring awareness that can lead to healthier physician-patient relationships.

https://www.twdb.texas.gov/waterplanning/rwp/regions/index.asp

Expected Outcomes

We expect our findings to show that patients who perceive implicit bias will have poorer health outcomes as indicated by lower medication adherence, higher disease prevalence or severity, and fewer medical visits.

Summary and Conclusion

Research would allow us to evaluate how the patients at SHSU-affiliated clinical sites perceive their interactions with physicians and medical students. A better understanding of patient perceptions of implicit bias can lead to more equitable care through targeted curriculum for medical students and clinical preceptors.

References

1. Greer TM. Perceived racial discrimination in clinical encounters among African American hypertensive patients. J Health Care Poor Underserved. 2010;21(1):251-263. doi:10.1353/hpu.0.0265
2. Cuffee YL, Hargraves JL, Rosal M, et al. Reported racial discrimination, trust in physicians, and medication adherence among innercity African Americans with hypertension. Am J Public Health. 2013;103(11):e58-62. doi:10.2105/AJPH.2013.301554
3. Gonzales KL, Lambert WE, Fu R, Jacob M, Harding AK. Perceived racial discrimination in health care, completion of standard diabetes services, and diabetes control among a sample of American Indian women. Diabetes Educ. 2014;40(6):747-755. doi:10.1177/0145721714551422

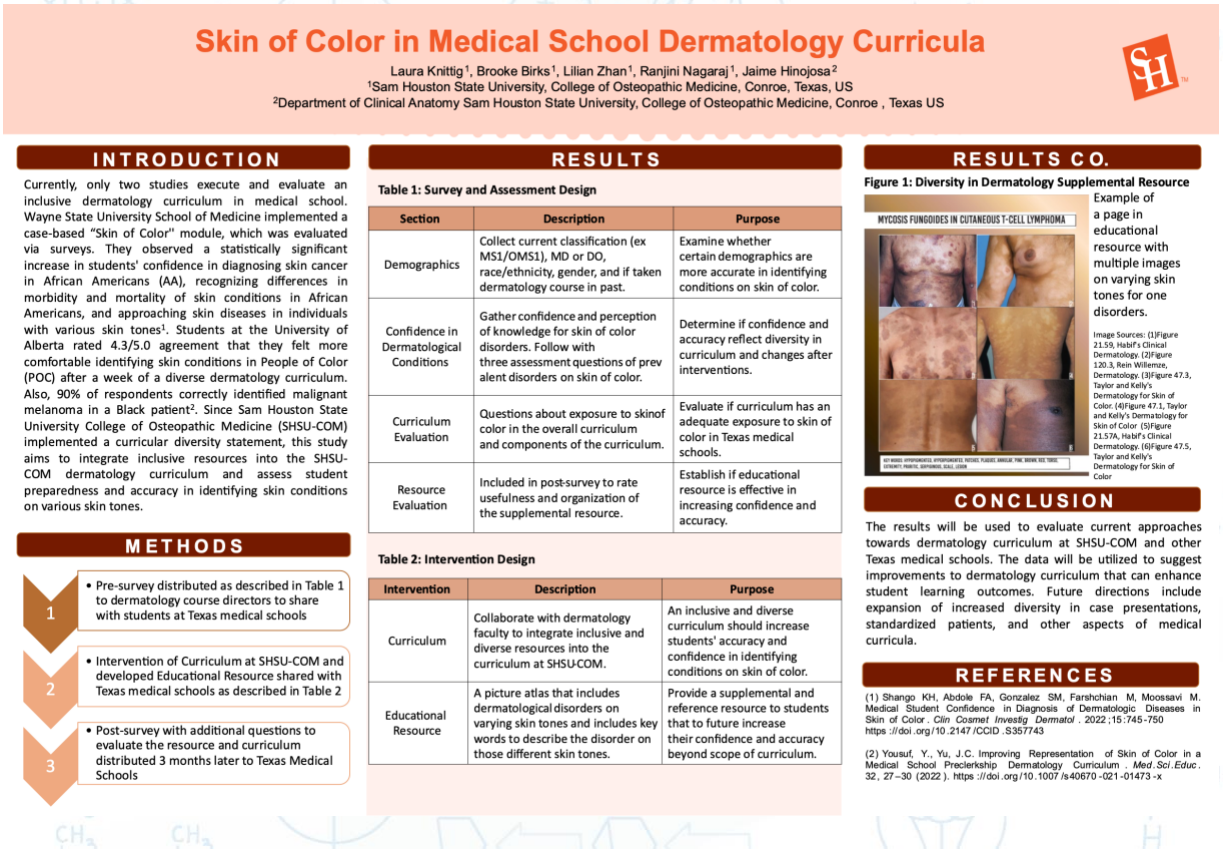
Acknowledgements: Dr. Kevin Kalinowski

ME10

Skin of Color in Medical School Dermatology Curricula

L. Knittig, B. Birks, L. Zhan, R. Nagaraj
Advisor: J. Hinojosa

Introduction: Previous studies suggest that dermatology curriculum in U.S. medical schools inadequately represents the diversity of skin tones in patients. Since medical schools are tasked with training competent physicians, students should be familiar with how skin manifestations present on various skin tones. Thus, this project aims to increase representation in dermatology curriculum at Texas medical schools and student preparedness in treating a diverse population.
Methods: We will distribute surveys to all Texas medical schools and gather quantitative and qualitative data to assess student confidence and accuracy in identifying dermatological conditions on various skin pigmentations. Students will then be invited to use a dermatologist-reviewed supplemental resource highlighting common skin disorders in an inclusive range of skin pigmentations. A post-survey will be administered which includes a 5-point Likert scale with a competency assessment with open-ended questions used to assess the perspectives on skin diversity in the curriculum.
Results: The expected outcome is that students introduced to diversity in skin manifestations through educational resources will have increased confidence and accuracy in identifying conditions on darker pigmented skin. A mixed approach will be utilized to analyze student perception and competency as well as identify patterns between different demographics.
Conclusion: The results will be used to evaluate current approaches towards dermatology curriculum at SHSU-COM and other Texas medical schools. The data will be utilized to suggest improvements to dermatology curriculum that can enhance student learning outcomes. Future directions include expansion of increased diversity in case presentations, standardized patients, and other aspects of medical curricula.



Skin of Color in Medical School Dermatology Curricula

Laura Knittig[1], Brooke Birks[1], Lilian Zhan[1], Ranjini Nagaraj[1], Jaime Hinojosa[2]
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INTRODUCTION

Currently, only two studies execute and evaluate an inclusive dermatology curriculum in medical school. Wayne State University School of Medicine implemented a case-based "Skin of Color" module, which was evaluated via surveys. They observed a statistically significant increase in students' confidence in diagnosing skin cancer in African Americans (AA), recognizing differences in morbidity and mortality of skin conditions in African Americans, and approaching skin diseases in individuals with various skin tones[1]. Students at the University of Alberta rated 4.3/5.0 agreement that they felt more comfortable identifying skin conditions in People of Color (POC) after a week of a diverse dermatology curriculum. Also, 90% of respondents correctly identified malignant melanoma in a Black patient[2]. Since Sam Houston State University College of Osteopathic Medicine (SHSU-COM) implemented a curricular diversity statement, this study aims to integrate inclusive resources into the SHSU-COM dermatology curriculum and assess student preparedness and accuracy in identifying skin conditions on various skin tones.

METHODS

1. Pre-survey distributed as described in Table 1 to dermatology course directors to share with students at Texas medical schools
2. Intervention of Curriculum at SHSU-COM and developed Educational Resource shared with Texas medical schools as described in Table 2
3. Post-survey with additional questions to evaluate the resource and curriculum distributed 3 months later to Texas Medical Schools

RESULTS

Table 1: Survey and Assessment Design

Section	Description	Purpose
Demographics	Collect current classification (ex MS1/OMS1), MD or DO, race/ethnicity, gender, and if taken dermatology course in past.	Examine whether certain demographics are more accurate in identifying conditions on skin of color.
Confidence in Dermatological Conditions	Gather confidence and perception of knowledge for skin of color disorders. Follow with three assessment questions of prev alent disorders on skin of color.	Determine if confidence and accuracy reflect diversity in curriculum and changes after interventions.
Curriculum Evaluation	Questions about exposure to skinof color in the overall curriculum and components of the curriculum.	Evaluate if curriculum has an adequate exposure to skin of color in Texas medical schools.
Resource Evaluation	Included in post-survey to rate usefulness and organization of the supplemental resource.	Establish if educational resource is effective in increasing confidence and accuracy.

Table 2: Intervention Design

Intervention	Description	Purpose
Curriculum	Collaborate with dermatology faculty to integrate inclusive and diverse resources into the curriculum at SHSU-COM.	An inclusive and diverse curriculum should increase students' accuracy and confidence in identifying conditions on skin of color.
Educational Resource	A picture atlas that includes dermatological disorders on varying skin tones and includes key words to describe the disorder on those different skin tones.	Provide a supplemental and reference resource to students that to future increase their confidence and accuracy beyond scope of curriculum.

RESULTS CO.

Figure 1: Diversity in Dermatology Supplemental Resource

Example of a page in educational resource with multiple images on varying skin tones for one disorders.

Image Sources: (1)Figure 21.59, Habif's Clinical Dermatology. (2)Figure 1.20.3, Rein Willemze, Dermatology. (3)Figure 47.3, Taylor and Kelly's Dermatology for Skin of Color. (4)Figure 47.1, Taylor and Kelly's Dermatology for Skin of Color (5)Figure 21.57A, Habif's Clinical Dermatology. (6)Figure 47.5, Taylor and Kelly's Dermatology for Skin of Color

CONCLUSION

The results will be used to evaluate current approaches towards dermatology curriculum at SHSU-COM and other Texas medical schools. The data will be utilized to suggest improvements to dermatology curriculum that can enhance student learning outcomes. Future directions include expansion of increased diversity in case presentations, standardized patients, and other aspects of medical curricula.

REFERENCES

(1) Shango KH, Abdole FA, Gonzalez SM, Farshchian M, Moossavi M. Medical Student Confidence in Diagnosis of Dermatologic Diseases in Skin of Color . *Clin Cosmet Investig Dermatol* . 2022 ;15:745-750 https ://doi .org /10 .2147 /CCID .S357743

(2) Yousuf, Y., Yu, J.C. Improving Representation of Skin of Color in a Medical School Preclerkship Dermatology Curriculum . *Med .Sci .Educ .* 32, 27–30 (2022). https ://doi .org /10 .1007 /s40670 -021 -01473 -x

ME11

What's in a từ? Scheduling Disparities Among Non-English Speakers

K. Dang, K. Ibarra. E. Deya Edelen
Advisor: P. Taylor

Introduction: Translation in healthcare systems is a multifaceted issue with value-based considerations often anecdotally leading to reinterpretation of existing standards or use of more convenient measures, such as the use of a family member, to deliver care. This study seeks to provide evidence relating to the perceived disparities of care-delivery in non-English speakers, through the use of "cold-calls" and clinic surveys.
Methods: This study focuses on how language can be a barrier in non-English speakers. Obgyn clinics within the SHSU-COM clinical rotation will be "cold-called" on a rotating order: English, Spanish, and Vietnamese by Osteopathic Medical Students seeking to set up an appointment for the "soonest availability". In addition, clinics will receive a survey regarding their use of in-house translation systems, perceived barriers to implementation, and current knowledge of translation best practices and standards.
Results: No data has been gathered at this present time; however, this study hopes to identify any significant difference in scheduling dates based on date- of-call to date-of-appointment. In addition, survey results will gauge how well guidelines are currently implemented and how that correlate to patient scheduling.
Conclusions: This study is to determine disparities in scheduling dates based on date-of-call to date-of-appointment for non-English speakers. Limitations include the inclusion of only two language groups besides English; this has been done to account for the other two dominant languages in the area but does not consider disparities found in other minority groups. Future studies could focus on identifying in person barriers and health outcomes.

College of Osteopathic Medicine
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What's in a từ ? Scheduling Disparities Among Non-English Speakers

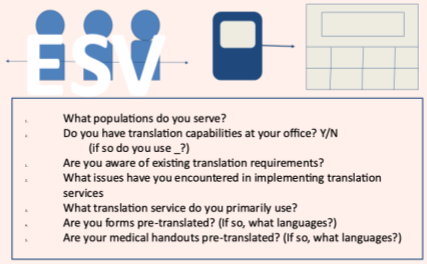
Kim Chi Dang BS, Kimberly Ibarra MPH CPhT, Elizabeth Deya Edelen BS, Peggy Taylor MD

INTRODUCTION

Translation in healthcare systems is a multifaceted issue with value-based considerations often anecdotally leading to reinterpretation of existing standards or use of more convenient measures, such as the use of a family member, to deliver care[3 5 8 9]. In this regard, studies have pointed out the ethics behind the relationship between informed consent and interculturalism[1]. A few studies have even attempted to address this issue by focusing on possible guidelines in such situations[2 4 6]. This study seeks to provide evidence relating to the perceived disparities of care-delivery in non-English speakers, through the use of clinic surveys and "cold-calls", and future studies may build upon knowledge regarding direct health outcomes in patients whose native language is not English[7]

METHODS

In the initial phase of this study, the focus will be OBGYN clinics within the SHSU- COM clinical rotation sites; clinics will receive a survey regarding their use of in-house translation systems, perceived barriers to implementation, and current knowledge of translation best practices and standards after being "cold-called" on a rotating order: (English, Spanish, and Vietnamese) by SHSU Osteopathic Medical Students using a standardized vingatte and script seeking to set up an appointment for the "soonest availability".



- What populations do you serve?
- Do you have translation capabilities at your office? Y/N (if so do you use _?)
- Are you aware of existing translation requirements?
- What issues have you encountered in implementing translation services
- What translation service do you primarily use?
- Are you forms pre-translated? (If so, what languages?)
- Are your medical handouts pre-translated? (If so, what languages?)

RESULTS

At this time, no data has been gathered. However, it is expected that participants who report language and translation services barriers will incur a greater burden in scheduling appointments and meeting follow-up guidelines. The primary emphasis of this study is to identify significant gaps in the care of non-English speaking patients. This research project closely aligns with rectifying the principles of equity and justice in healthcare. By the conclusion of the survey dissemination and analysis of the effectiveness of current non-English speaker scheduling guidelines, we hope to be able to make informed recommendations that promote the delivery and quality of care for these individuals.

SUMMARY&CONCLUSION

By further exploration of the disparities in scheduling dates based on date-of-call to date-of-appointment for non-English speakers, this study will identify the gaps in current best practices. In the future, we may be able to bridge the gap in care and advance the health of these patients that so commonly experience worse long-term health outcomes. The limitations of this study relate to language constraints. Only two language groups besides English are to be further studied for the purposes of this study. The two languages, Spanish and Vietnamese, were selected due to the high incidence in the area in which the study is conducted. These individuals made up a large part of the minority population and frequently experiences language translation difficulties in all healthcare settings. An opportunity for future studies includes more language inclusivity and a longer duration of intervention to better assess change. In doing so, there is a greater opportunity to understand the barriers to health and worsening outcomes among the non-English speaking patient population. text.

REFERENCES

1.Ekmekci, Perihan Elif, and Berna Arda. "Interculturalism and Informed Consent: Respecting Cultural Differences without Breaching Human Rights." Cultura (Iasi, Romania) vol. 14,2 (2017): 159-172.

2.Aguila, Emma, et al. "Culturally Competent Informed-Consent Process to Evaluate a Social Policy for Older Persons with Low Literacy." SAGE Open, vol. 6, no. 3, 2016, p. 215824401666588., https://doi.org/10.1177/2158244016665886.

3.Hlhnger Mesnias, DeAnne K et al. "Language interpreting as social justice work: perspectives of formal and informal healthcare interpreters." ANS. Advances in nursing science vol. 32,2 (2009): 128-43. doi:10.1097/ANS.0b013e3181a1af97

4.Martinez, Konane M., et al. "The Clas Challenge: Promoting Culturally and Linguistically Appropriate Services in Health Care." International Journal of Public Administration, vol. 27, no. 1-2, 2004, pp. 39-61., https://doi.org/10.1081/pad-120028652.

5.Ilderkin-Thompson, V et al. "When nurses double as interpreters: a study of Spanish-speaking patients in a US primary care setting." Social science & medicine (1982) vol. 52,9 (2001): 1343-58. doi:10.1016/s0277-9536(00)00234-3

ME12

You Can D.O. Medicine; Mini-Medical School Camp and Self-efficacy in High School Students

P. Jesudasen, D. Dozier
Advisor: R. Marek

Introduction: Mini-medical school programs introduce pre-medical students to medicine through hands-on learning, information sessions, and interactions with medical students. Previous mini-medical school studies reported increased student interest in, and knowledge of, medicine. However, effects on perceived self-efficacy to be a medical student have yet to be explored. We developed a 4-day mini-medical school camp and studied its effect on perceived self-efficacy.
Hypothesis: Participation in the program will increase perceived self-efficacy to be a medical student.
Methods: To measure self-efficacy, we collated validated surveys measuring self-efficacy in academics, grit/perseverance, learning clinical skills, self-care, and social support. We received IRB approval. Participants were (n=23) rising high school sophomores who completed the pre-test, then at the conclusion of the camp, completed the post-test. Responses were analyzed using a paired sample t-test.
Results: A total 18 of 23 surveys were analyzed. Six removed due to inability to match pre- and posttests. There were significant increases with large effect sizes in grit/perseverance (t=2.46; p=.026; Hedges' g= .583), clinical skills (t= 3.221; p=.005; Hedges' g= .742), and self-care (t=-2.365; p=.030; Hedges' g = .545) (CI=95%). Social support slightly increased (t=1.123; p=0.324), with a moderate effect size (Hedges = 0.454). There was no significant difference in Academic self-efficacy scores (t=0.426; p=0.678, Hedges' g = .118).
Conclusions: Our study improved several components of self-efficacy; an important factor in propelling students towards medicine to address the current physician shortage. Limitations include small sample size, survey misprint, and lack of diversity. Future direction will address these limitations.

College of Osteopathic Medicine
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'You Can D.O. Medicine' Mini-Medical School Camp and Self -Efficacy in High School Students

Parisa Jesudasen, OMSII, Darian Dozier, OMSIII, Ryan Marek, PhD, Shanon Ramsey-Jimenez, D.O.

INTRODUCTION

- "Mini-medical school" programs introduce pre-medical students to medicine, increasing their interest in and knowledge of medicine[1-3].
- However, effects on perceived self-efficacy to be a medical student have yet to be explored.
- A lack of perceived ability to be a physician can prevent students from pursing medicine, especially working class and minorities[4].
- The purpose of this study is to assess how a 4-day mini-medical school camp effects perceived self-efficacy to be a medical student.
- We hypothesize that after the camp, attendees' perceived self-efficacy will increase in five constructs.

METHODS

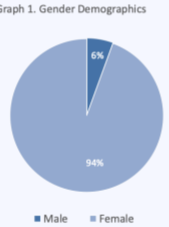
- To measure those five construct (Figure 1), we collated five previously-validated surveys[5-9] into a single survey.
- Participants were (n=23) rising high school sophomores recruited from the science academy at the local high school.
- Parental and student consent were obtained prior to the study.
- Participants completed both a pre-test, attended the camp, and then completed a post-test.
- The summer camp was completely designed and executed by medical students with informational and activity-based sessions.
- Topics included basic clinical skills, how to get into medical school, case-based scenarios, and patient interviewing to name a few.
- Responses were analyzed using a paired sample t-test.
- This study was IRB exempt and campers could opt out of the survey at any time without penalty.

Figure 1. Self-Efficacy Constructs of a Medical Student

RESULTS

- A total 18 of 23 (78%) surveys were analyzed. Five were removed due to inability to match pre- and posttests.
- Grit/perseverance, clinical skills, and self-care all significantly improved at the conclusion of the camp.
- Perceived social support and academic self-efficacy did not significantly change. Academic self-efficacy slightly decreased.

Graph 1. Gender Demographics



Graph 2. Racial Demographics

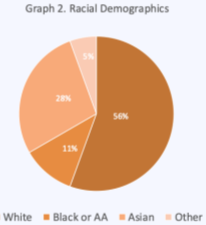


Table 1. Paired T-test Results

Self-Efficacy Constructs	Significance (CI=95%)	Effect sizes (Hedges' g)
Grit/Perseverance	**t(16)=2.46 p=.03**	Hedges' g=.58
Clinical Skills	**t(17)=3.22 p=.005**	Hedges' g=.74
Self-care	**t(17)=2.37 p=.03**	Hedges' g=.55
Social support	t(4)=1.12 p=.32	Hedges' g=.45
Academic	t(12)=.43 p=.68	Hedges' g=.12

Note: Bold indicates a significant result

DISCUSSION

- Attendees improved in three self-efficacy constructs related to being a medical student, partially supporting the hypothesis.
- The results support the positive impact that a summer camp can have on students' perceived ability to pursue medicine.
- Such interventions can address the physician shortage[1] by encouraging more students to purse medicine, especially those underrepresented in medicine.
- The lack of improvement in perceived academic self-efficacy may indicate academics as a barrier, and a focus for interventions.
- The limitations of this study include a small, non-diverse sample and survey misprint that led to some unanswered questions.
- Future studies will expand this program and improve academic preparedness for students interested in pursuing medicine.
- Future studies will also measure the created survey for statistical validation across various populations, including college students.

CONCLUSION

- Mini medical schools serve as an impactful community intervention to increase student interest in medical school.
- They have many benefits, one, increasing aspects of self-efficacy.
- Improving self-efficacy can provide students the self-assurance that they can be physicians, which has been an identified barrier.
- Academic efficacy may require extensive intervention, especially in communities without adequate educational resources.

REFERENCES

ACKNOWLEDGEMENTS

Special thanks to SHSU Faculty and Student counselors for their support and hard work before and during the camp.
Special thanks to Entergy Open Grants Program

Pre-Clinical/Laboratory (PL):

These projects involve the application of the natural sciences, are performed in the laboratory setting, and will often require additional training (provided by the program) for working with animal tissue, human tissues, cultures, or biosafety protocols.

PL1

Airyscan Technology Fills the Gap Between Traditional Confocal Methods and New Super-Resolution Microscopy for Sensitive Immunohistochemistry Protein Studies

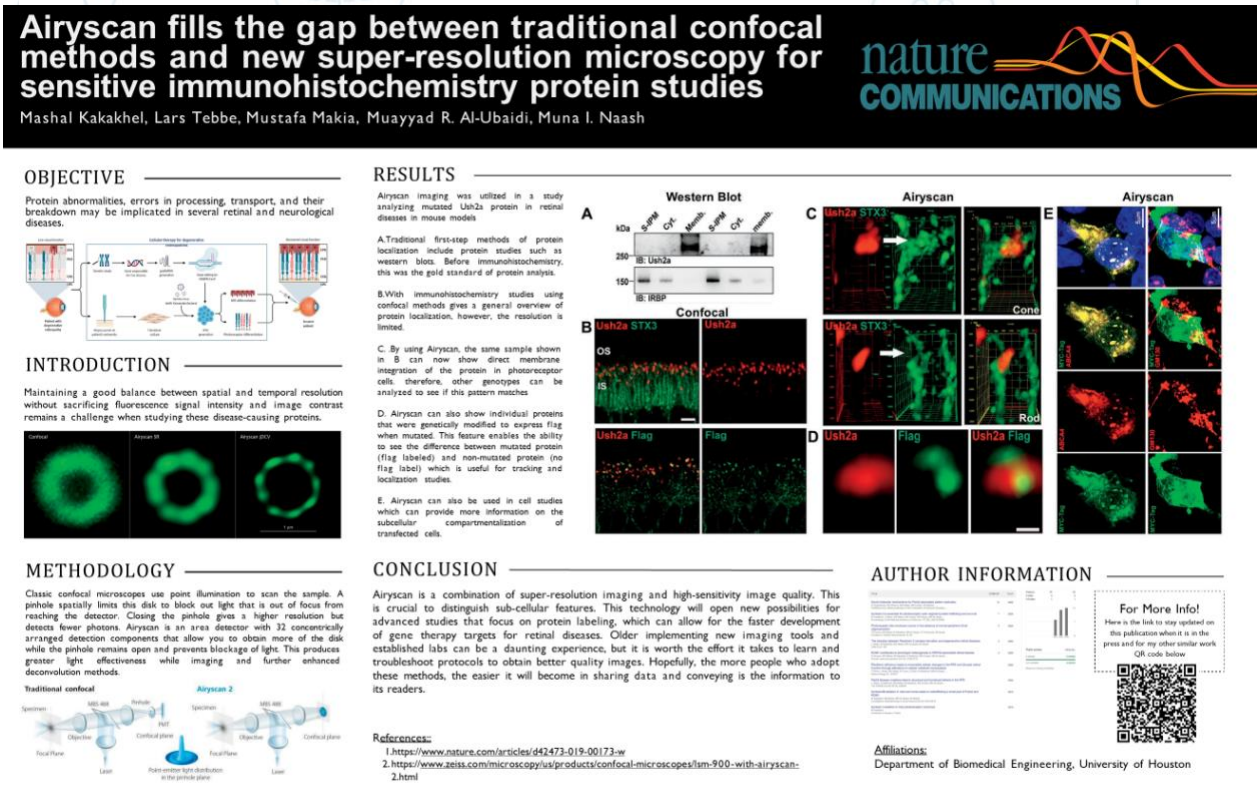
M. Kakakhe, L. Tebbe, M. Makia, M. Al-Ubaidi,
Advisor: M. Naash

Introduction: Protein abnormalities, errors in processing, transport, and breakdown may be implicated in several retinal and neurological diseases. Maintaining a good balance between spatial and temporal resolution without sacrificing fluorescence signal intensity and image contrast remains a challenge when studying these disease-causing proteins.

Methods: Classic confocal microscopes use point illumination to scan the sample (Figure 1A, Left [1]). A pinhole spatially limits this disk to block out light that is out of focus from reaching the detector. Closing the pinhole gives a higher resolution but detects fewer photons. Airyscan is an area detector with 32 concentrically arranged detection components (Figure 1A, right [1]) that allow you to obtain more of the disk while the pinhole remains open and prevents blockage of light. This produces greater light effectiveness while imaging and further enhanced deconvolution methods (Figure 1B [2]).

Results: Airyscan imaging was utilized in a study analyzing mutated Ush2aprotein in retinal diseases. Figure 1Cpresents confocal imaging which displays an overview of protein localization, while airyscan shows direct membrane integration of the protein. Figure 1Dpresentsanother useful component of airyscan, which is enhancing the mutated flag labeledUsh2a. This feature enables the ability to see the difference between mutated protein (flag labeled) and non-mutated protein (no flag label) which is useful for tracking and localization studies.

Conclusion: Airyscan is a combination of super-resolution imaging and high sensitivity image quality. This is crucial to distinguish sub-cellular features. This technology will open new possibilities for advanced studies that focus on protein labeling, which can allow for the faster development of gene therapy targets for retinal diseases.

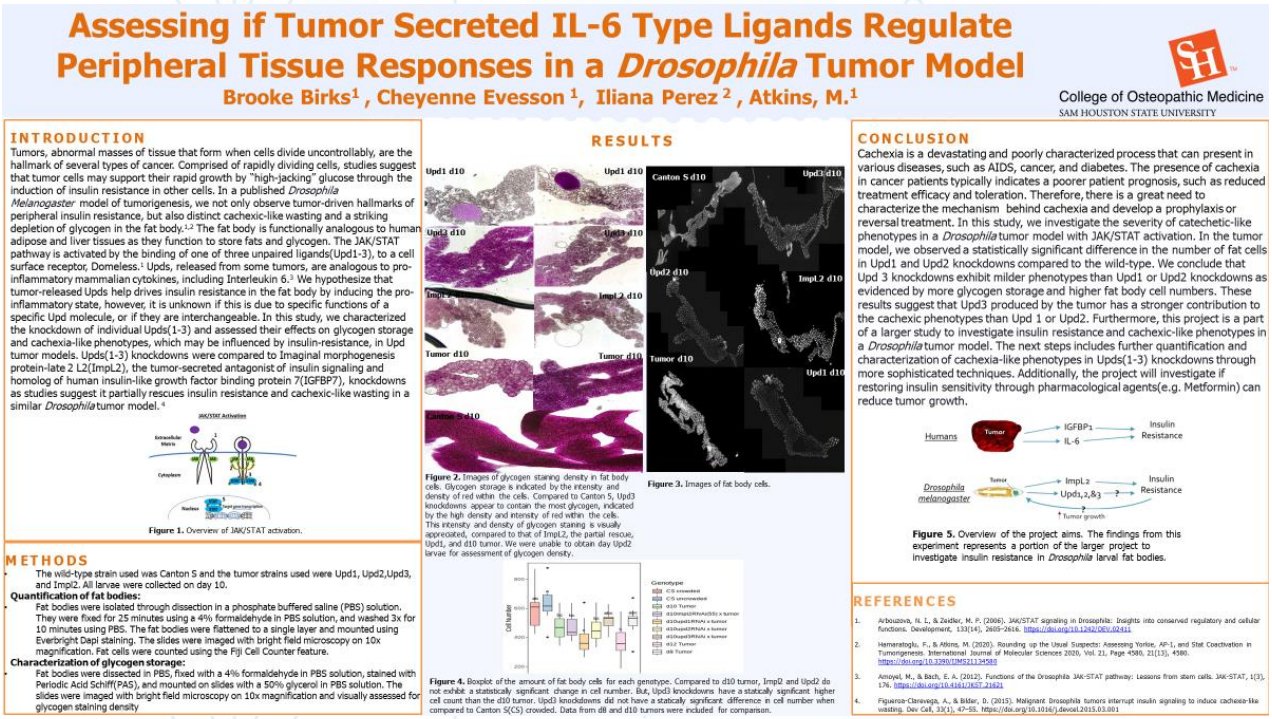


PL2

Assessing if Tumor Secreted IL-6 Type Ligands Regulate Peripheral Tissue in a Drosophila Tumor Model

B. Birks, C. Everson, I. Perez
Advisor: M. Atkins

In Drosophila melanogaster, the fat bodies have functional analogy to both human adipose and liver tissues as they function to store both fats and glycogen. Previous studies suggest that tumors may induce cachexia-like wasting in the fat body and activation of the STAT transcription factor. In Drosophila the JAK-STAT pathway is activated by the Unpaired ligands (Upd1-3). Unpaired ligand 2 (Upd 2), analogous to Interleukin 6, has been linked to tumorigenesis, but further characterization of Upds(1, 2, and 3) is needed. This study assesses the role of tumor derived Upds(1-3) on inducing fat-body wasting by assessing Upds(1-3) knockdowns in the tumor. In this experiment, wild-type larvae, and day 10 Upd (1-3) knockdowns were dissected and stained with periodic acid-Schiff to label glycogen, mounted, and imaged. Fat bodies were blind-scored for glycogen storage defects and rated according to severity. We observed an increase in score (severity) in Upd (1-2) knockdowns compared to Upd 3 knockdowns. Additionally, wild-type larvae and day 10 Upd (1-3) knockdowns were dissected, stained with Dapi, mounted, and imaged. Fat body nuclei were counted using Fiji Cell Counter. Based on preliminary data, we observe a statistically significant difference in the number of fat cells in Upd1 and Upd2 knockdowns compared to the wild-type. We conclude that Upd 3 knockdowns exhibit milder phenotypes than Upd1 or Upd2 knockdowns as evidenced by more glycogen storage and higher fat body cell numbers. These results suggest that Upd3 produced by the tumor has a stronger contribution to the cachexic phenotypes than Upd 1 or Upd2.



PL3

Does Tumor-Produced TEP3 and PGRP-SA activate a host innate immune response in *Drosophila melanogaster* tumor-bearing larvae?

I. Perez

Advisor: M. Atkins

This study uses a *Drosophila melanogaster* Ras^{V12}; $scrib^{RNAi}$ tumor model to investigate candidate genes responsible for remote Toll pathway activation, as part of continued research into tumor-host interactions.
It is known that Toll receptors recognize pathogen-associated molecular patterns. Two proteins established to be upstream regulators of the Toll pathway are PGRP-SA and TEP3- their role is previously established as direct recognition of non-self pathogens. A previous study demonstrated, in the absence of non-self-pathogens, the Toll Pathway is remotely activated in the fat body of *Drosophila* larvae with tumors (Parisi et al. 2014). Based on prior data gathered in the Atkins lab, it is established that the potential Toll activating molecules TEP3 and PGRP-SA are upregulated in the Ras^{V12}; $scrib^{RNAi}$ tumor. These findings are the basis for this study's hypothesis that tumor-produced TEP3 and PGRP-SA trigger Toll pathway activation in the fat body and that this activation influences tumor progression.
RNAi knockdowns of TEP3 and PGRP-SA investigated each gene's relative effects on Toll pathway activation in the fat body. GFP reporter of Toll activation was used, Drs-GFP. The effects of the RNAi knockdown on tumor survival, proliferation and invasiveness were assessed using DCP-1, PH3, and MMP-1, antibody staining, respectively.
We observed decreased cell death, increased proliferation, and increased invasiveness. These results suggest that TEP3 and PGRP-SA produced by the tumor may stimulate an anti-tumoral response from the host. Despite observed change in tumor morphology, no significant way to quantify the tumor size difference has been established. Future work will determine if that response relies on Toll activation in the fat body.

Does Tumor-Produced TEP3 and PGRP-SA activate a host innate immune response in *Drosophila melanogaster* tumor-bearing larvae?

College of Osteopathic Medicine
SAM HOUSTON STATE UNIVERSITY

Iliana Perez, Adheeta S. Dongre, Brooke Birks, and Dr. Mardelle Atkins Ph. D.

Introduction

This study uses a *Drosophila melanogaster* Ras^{V12}; $scrib^{RNAi}$ tumor model to investigate candidate genes responsible for remote Toll pathway activation, as part of continued research into tumor-host interactions.

It is known that Toll receptors recognize pathogen-associated molecular patterns. Two proteins established to be upstream regulators of the Toll pathway are PGRP-SA and TEP3. Their role is established as direct recognition of non-self pathogens. A previous study demonstrated, in the absence of non-self-pathogens, the Toll pathway is remotely activated in the fat body of *Drosophila* larvae with tumors (Parisi et al. 2014). Based on prior data gathered in the Atkins lab, it was observed that Toll activating molecules TEP3 and PGRP-SA are upregulated by the Ras^{V12}; $scrib^{RNAi}$ tumor.

Hypothesis:

These findings are the basis for this study's hypothesis that tumor-produced TEP3 and PGRP-SA trigger Toll pathway activation in the fat body and are influencers in tumor growth progression.

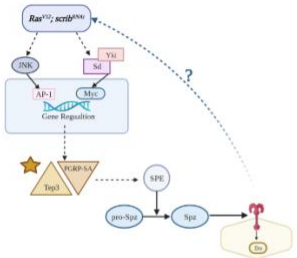


Figure 1: Overview of proposed mechanism of Toll activation by Tep3 and PGRP-SA (starred) and the upregulation of the proteins by the tumor signaling. The question mark is the investigated indirect affect of the pathway activation on tumor growth.

Results

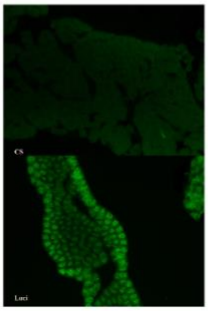


Figure 2: The reporter Drs-GFP in the fat body of wild-type and 'normal' type tumor *D. melanogaster* larvae.

Cross	Surface Area Average (px²)
Luci	1,167,870
PGRP-SA	1,268,147
Tep3 (1-3)	888,873
Tep3 (6-8)	966,970

Table 1: This table summarizes the surface area of the tumors for various crosses of larvae. N=5

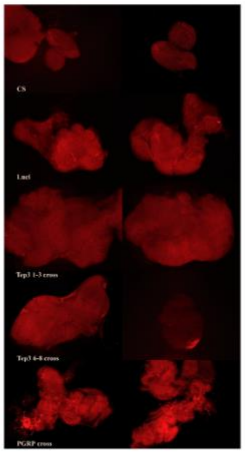


Figure 3: 10X DCP- 1 stain visualizing cell death in imaginal disc of wild type, unaltered tumor, Tep3 knockdown, and PGRP-SA knockdown *D. melanogaster* larvae.

Methods

A stock of scalloped RNAi and GFP-tagged flies were crossed to the GFP tumor-forming lines of flies to breed tumor larvae containing scalloped RNAi, and tagged TEP3 or PGRP-SA proteins, individually. Luci tumor larvae were dissected at day 10- isolating the fat body for Toll pathway activation confirmation. Imaginal disc were isolated from all crosses for tumor affect analysis. Non-tumor larvae were dissected at day 6. Ensuring they had not begun pupation.

Using established indirect immunochemistry DAPI staining protocol, a GFP reporter, Drs-GFP was used to visualize Toll activity. In order to determine the RNAi knockdowns' relative effects on tumor survival, the signal intensity was qualitatively assessed with Echo microscopy. The morphology change was noted, and the surface areas were measured using Fiji imaging.

Conclusion

The fat-body stains approve that the Toll pathway is upregulated in the tumor bearing larvae crosses studied. The increased expression of the Toll product Drs is reflected by the intensity of the GFP signal captured. The DCP1 Echo results suggest that PGRP-SA produced by the tumor may stimulate a pro-tumoral response from the host. The premise of this conclusion is the increased cell death reported by greater DCP1 intensity. It is observed that Tep3 cross's show an unchanged, if not decreased, cell death compared to the original tumor crosses.

The Tep3 knockdowns compared to the normal crossed tumor have some decreased average cell surface area, as reflected in Table 1. The decrease in size is evidence that a pro-tumoral cellular response is occurring when upstream this upstream toll pathway is unaltered. The morphology changes observed suggest loss of regulation of the tumor, as well.

Relevance

Cachexia is a chronic wasting disease that affects 80% of cancer patients causing a loss of muscle and fat. Cachexia is the cause of mortality in 20% of cancer patients and considered to be an irreversible process with no effective treatment. The mechanisms that cause cachexia are poorly understood. The investigation into the regulators proteins of tumors which promote wasting of muscle and fat cells in cancer patients is important to further supportive-care treatment options.

Human	Fruit Fly
CD109	TEP3
PGLYRP-3	PGRP-SA

References

1. Hamaratoglu, F., & Atkins, M. (2020). Rounding up the Usual Suspects: Assessing Yorkie, AP-1, and Stat Coactivation in Tumorigenesis. International Journal of Molecular Sciences 2020, Vol. 21, Page 4580, 21(13), 4580. https://doi.org/10.3390/IJMS21134580

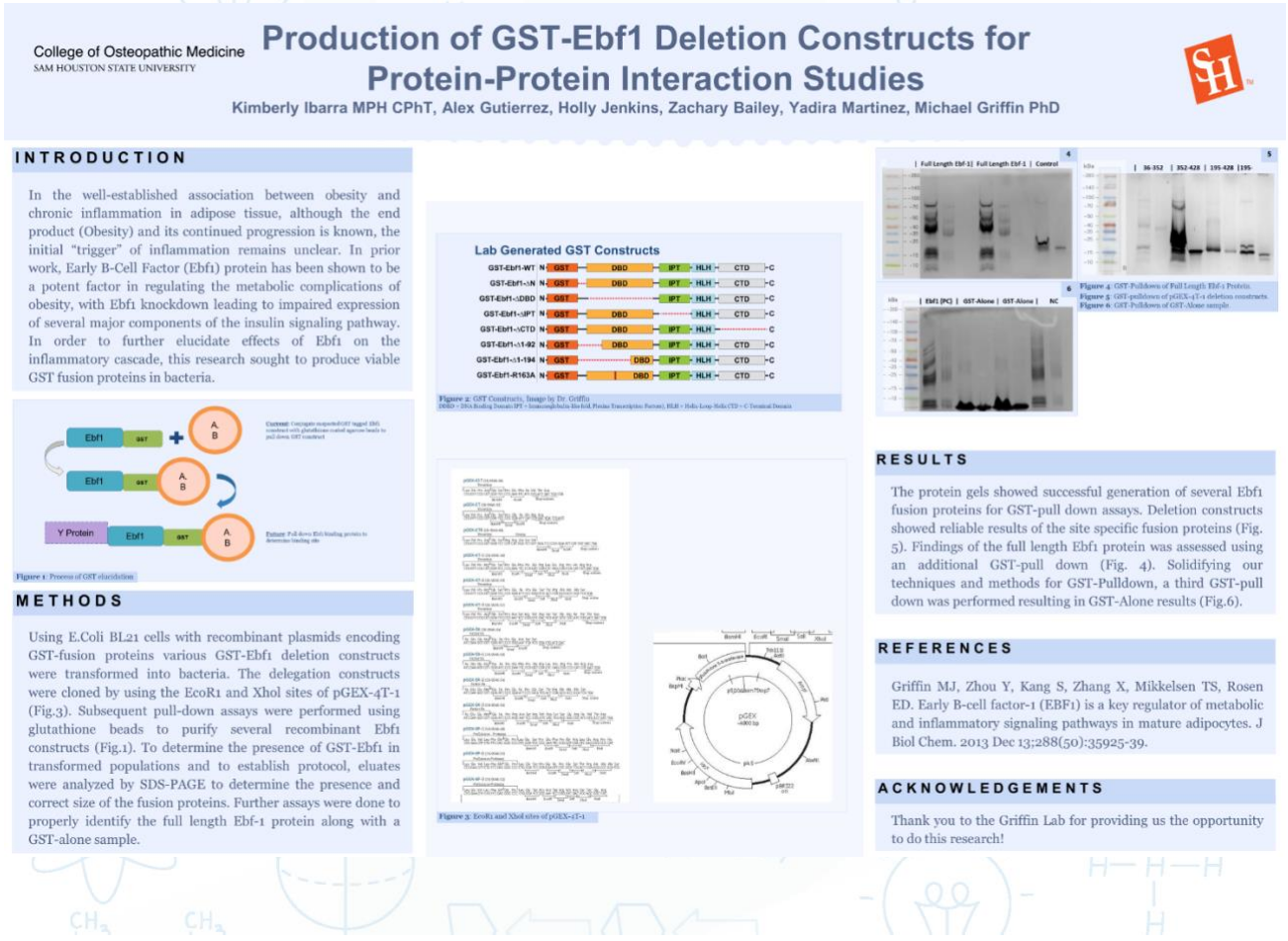
2. Parisi, Federica, Rhoda K. Stefanatos, Karen Strathdee, Yachuan Yu, and Marcos Vidal. 2014. "Transformed Epithelia Trigger Non-Tissue-Autonomous Tumor Suppressor Response by Adipocytes via Activation of Toll and Eiger/TNF Signaling." *Cell Reports* 6 (5): 855–67. https://doi.org/10.1016/J.CELREP.2014.01.039.

PL4

Ebf1 GST Fusion Proteins Protocol & Pull Down's

K. Ibarra, A. Gutierrez, Z. Bailey, H. Jenkins, Y. Martinez
Advisor: M. Griffin

Introduction: In the well-established association between obesity and chronic inflammation in adipose tissue, although the end product (Obesity) and its continued progression is known, the initial "trigger" of inflammation remains unclear. In prior work, Early B-Cell Factor (Ebf1) protein has been shown to be a potent factor in regulating the metabolic complications of obesity, with Ebf1knockdown leading to impaired expression of several major components of the insulin signaling pathway. In order to further elucidate effects of Ebf1 on the inflammatory cascade, this research sought to produce viable GST fusion proteins in bacteria.
Methods: Using E.Coli BL21 cells with recombinant plasmids encoding GST-fusion proteins various GST-Ebf1 deletion constructs were transformed into bacteria. Subsequent pull-down assays were performed using glutathione beads to purify several recombinant Ebf1 constructs. To determine the presence of GST-Ebf1 in transformed populations and to establish protocol, eluates were analyzed by SDS-PAGE to determine the presence and correct size of the fusion proteins.
Results: The protein gels showed successful generation of several Ebf1 fusion proteins for GST pull down assays.
Conclusions: The generation of viable Ebf1 GST fusion proteins in bacteria will allow further exploration into Ebf1 interaction domains which may be needed to develop novel anti-inflammatory agents. The next phase of the project will involve incubating our verified GST-Ebf1 deletion proteins with a recombinant Myc-Ebf1"prey" protein to validate the use of this technique for protein-protein interaction studies. Further studies with suspected Ebf1 protein partners will continue to elucidate the role of Ebf1 in adipose inflammation.



PL5

Effect of Neuropsychiatric Medications on Gut Microbiome

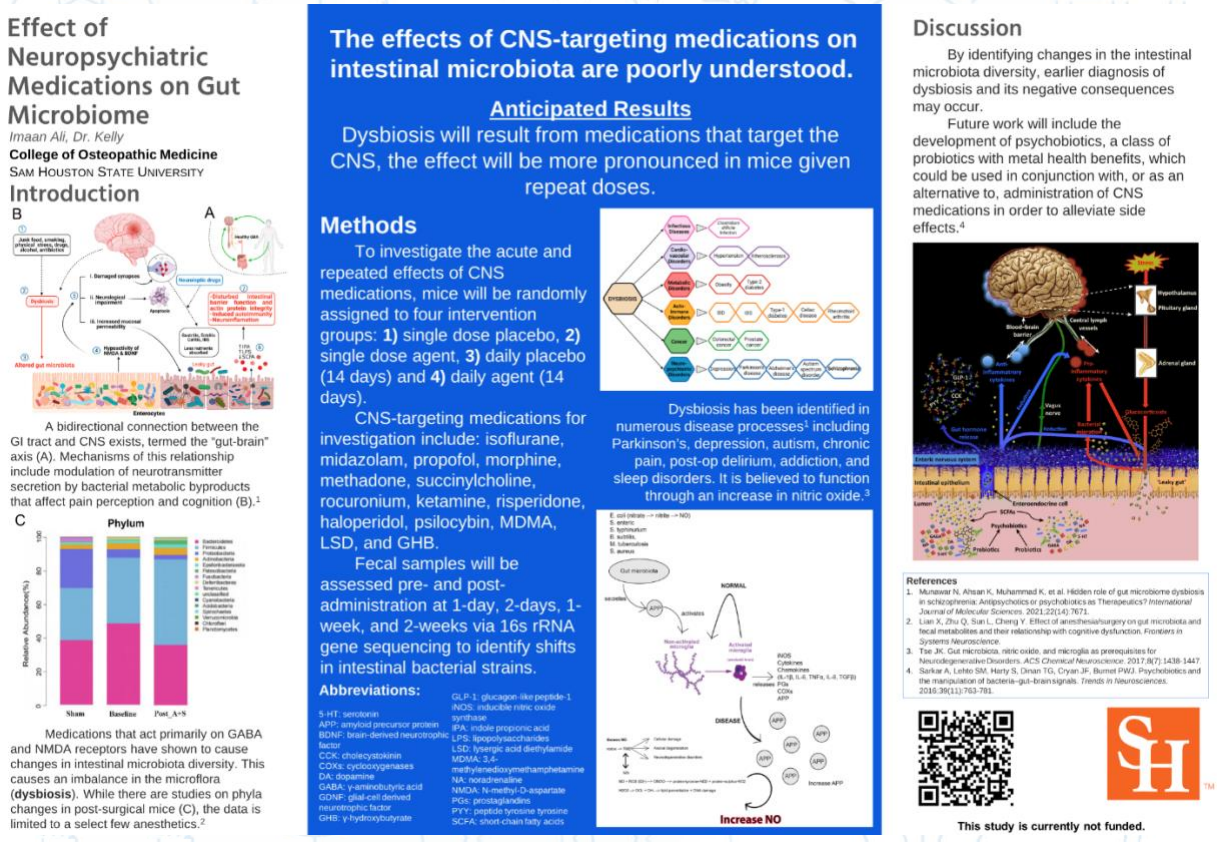
I.Ali
Advisor: O. Kelly

Introduction: A *bidirectional* connection between the GI tract and CNS exists, termed the "gut-brain axis." Mechanisms of this relationship include modulation of neurotransmitter secretion by bacterial metabolic byproducts that affect pain perception and cognition. Gut dysbiosis has been identified in Parkinson's, depression, autism, chronic pain, post-op delirium, addiction, and sleep disorders. According to previous studies, medications that act primarily on GABA and NMDA receptors have changed the intestinal microbiota diversity. However, there is limited data on the particular bacterial phyla most affected. The effects of CNS-targeting medications (isoflurane, midazolam, propofol, morphine, methadone, succinylcholine, rocuronium, ketamine, psilocybin, MDMA, LSD, and GHB) on intestinal microbiota is also poorly understood.

*Methods***:** To investigate the acute effect, and repeated effect, of CNS mediations, mice will be randomly assigned to four intervention groups: the first will receive one dose, the second group will receive a placebo, the third will receive daily doses and the fourth group will receive a daily placebo. Fecal samples will be assessed pre- and post-administration at 1-day, 2-days, 1-week, and 2-weeks via 16s rRNA gene sequencing.

Anticipated results: A shift in intestinal microbiota diversity will result from medications that target the CNS, the effect will be more pronounced in mice given repeated doses.

Conclusion: By identifying changes in the intestinal microbiota diversity, earlier diagnosis of dysbiosis and its negative consequences may occur. Future work will include the development of psychobiotics (a class of probiotics with mental health benefits) which could be used in conjunction with administration of CNS medications.



PL6

In-vitro Characterization of the Release Profile Models of Novel Cannabidiol Formulations Using Cryopreserved Cadaveric Skin Mounted in Franz Diffusion Cells

L. Zhan
Advisor: H. Abdelhady

Introduction: Transdermal cannabidiol (CBD) is gaining traction as an analgesic. Transdermal delivery has advantages over other systemic administration routes: rapid onset, reduced first-pass metabolism, reduced toxicity risks, and uniform pharmacokinetic drug profiles. This study aims to characterize diffusion profiles of novel transdermal CBD formulations using Franz diffusion cells to elucidate the effect of a long-chain fatty acid emulsion on CBD molecular kinetics.
Methods: 250µm-thick cryopreserved, cadaveric arm skin samples from a certified skin bank will be thawed at ambient temperature. Prior to use, skin integrity will be confirmed through impedance measurements and permeation studies. A 2x2cm^2 skin sample will be clamped between the donor and receptor portions of a Franz diffusion cell and maintained at human body temperature and pH. A one-time, 48-hour dose of one novel formulation will be applied to the stratum corneum. Samples will be collected from the receptor chamber at set time points under sink conditions; a stir bar in the receptor chamber ensures media homogeneity. Diffusion studies will be performed six times per novel formulation.
Anticipated Results: Samples of each formulation will be analyzed with HPLC-MS to detect the amount of CBD released over time. A permeation profile will be generated per diffusion study and compared to the control.
Conclusions: The anticipated results of this study have implications on the design and use of transdermal CBD to treat pain. Future directions include further comparisons between formulations at different temperatures, skin types, and skin locations to better characterize the release profiles of these novel formulations.

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In-vitro Characterization of the Release Profile Models of Novel Cannabidiol Formulations

Lilian Zhan[1], Dr. Hosam Abdelhady[1]
[1]Sam Houston State University College of Osteopathic Medicine, Department of Physiology and Pharmacology, Conroe TX 77304 U.S.A.

INTRODUCTION

Cannabidiol (CBD) has recently gained traction as an analgesic. As CBD is a small lipophilic molecule, it undergoes extensive first-pass metabolism after oral administration. Transdermal delivery of CBD has many advantages over other systemic routes of administration, including non-invasive delivery, rapid onset, reduced first-pass metabolism and toxicity risks, and uniform pharmacokinetics.

Long-chain fatty acids (LCFAs) are more efficient than their intermediate- or short-chain counterparts in drug transportation. Transdermal delivery of CBD with an LCFA emulsion bypasses the first-pass effect so that the drug enters the lymphatic system directly and is quickly delivered to the CNS. This study aims to characterize diffusion profiles of three novel transdermal CBD formulations to elucidate the effect of an LCFA on CBD drug kinetics.

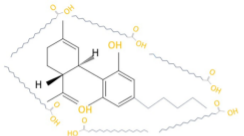


Figure 1. Color-coded structure of cannabidiol surrounded by LCFAs.

METHODS

250µm-thick cryopreserved, cadaveric, full-thickness arm skin samples from a certified skin bank will be thawed at ambient temperature. Prior to use of each skin sample, skin integrity will be confirmed through impedance measurements (Figure 2) , Z > 2 kΩ, and a water permeation study (Figure 3), ^3H_2O < 2.0 µL/eq [1].

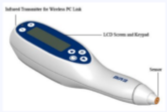


Figure 2. Handheld impedance measurement device, the Nova Penguin.

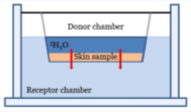


Figure 3. Simplified water permeation study diagram.

A 2x2 cm² intact skin sample will be clamped between the donor and receptor portions of a Franz diffusion cell and maintained at human body temperature and pH for the duration of the study. A one-time, 10mg dosing regimen of one novel CBD formulation will be added to the donor chamber and allowed to contact the stratum corneum for 48 hours. A magnetic stir bar in the receptor chamber ensures media homogeneity.

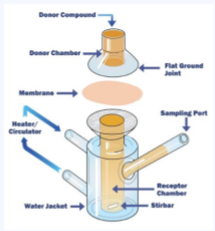


Figure 4. General Franz diffusion cell set-up.

Samples will be withdrawn from the receptor chamber at 15m, 30m, 45m, 60m, 2h, 4h, 8h, 12h, 24h, 36h, and 48h under sink conditions and tested using Liquid Chromatography Mass Spectrometry (LC-MS) to detect the quantity of CBD release per time for each diffusion study. 6 diffusion studies will be performed for each of the novel formulations, for a total of 18 experiments.

ANTICIPATEDANALYSIS

Data obtained from the diffusion study will be blinded by an unbiased facilitator before being shared with researchers for analysis. The release profile for each novel CBD formulation will be determined and compared to the control, a pure CBD formulation without the LCFA emulsion. The anticipated results are that each of the novel compounds will have a faster diffusion release profile compared to that of the pure CBD control.

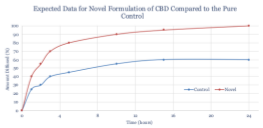


Figure 5. Sample diffusion curves illustrating expected results, based on a similar study conducted by Hernán Pérez de la Ossa, et al. [2]

CONCLUSION

The expected results of this diffusion study have implications on the design of CBD-containing compounds and the potential use of LCFA emulsions to improve transdermal absorption of CBD. Future research directions include additional comparisons between formulations at varied dosages, temperatures, skin types (dry, oily, etc.), and skin locations (thigh, upper back, etc.) to better characterize the release profile of these novel CBD formulations.

REFERENCES

[1] Supe, SM, Takudage, PJ. Methods for evaluating penetration of drug into the skin: A review. *Skin Res Technol.* 2021; 27: 259-308.
[2] Hernán Pérez de la Ossa, et al. Preparation and characterization of Δ 9 - tetrahydrocannabinol-loaded biodegradable polymeric microparticles and their antitumoral efficacy on cancer cell lines. *Journal of drug targeting.* 2013; 21(8).

ACKNOWLEDGEMENTS

Special thanks to the Department of Physiology and Pharmacology at SHSU COM for their guidance and support.

PL7

Quantifying Ultrasound and Micro-CT Imaging of Cranial Suture Anatomy and Related Trauma

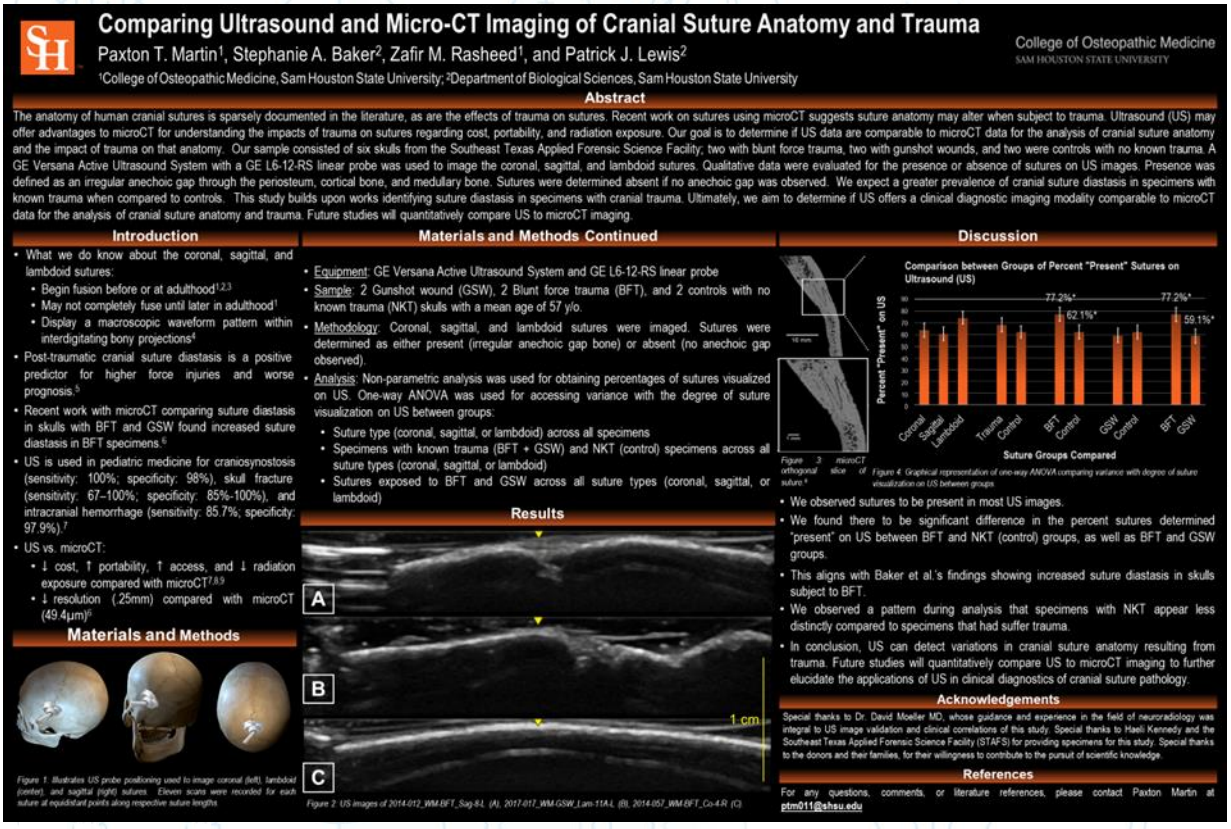
P. Martin, S. Baker, Z. Rasheed
Advisor: P. Lewis

Introduction: The anatomy of human cranial sutures is sparsely documented in the literature, as are the effects of trauma on sutures. Recent work on sutures using micro-CT suggests suture anatomy may alter when subject to trauma. Ultrasound (US) may offer advantages to micro CT for understanding the impacts of trauma on sutures regarding cost, portability, and radiation exposure. Our goal is to determine if US data are comparable to micro CT data for the analysis of cranial suture anatomy and the impact of trauma on that anatomy.

Methods: Our sample consisted of six skulls from the Southeast Texas Applied Forensic Science Facility; two with blunt force trauma, two with gunshot wounds, and two were controls with no known trauma. A GE Versana Active Ultrasound System with a GE L6-12-RS linear probe was used to image the coronal, sagittal, and lambdoid sutures. Qualitative data were evaluated for the presence or absence of sutures on US images. Presence was defined as an irregular anechoic gap through the periosteum, cortical bone, and medullary bone. Sutures were determined absent if no anechoic gap was observed.

Results/Anticipated Results: We expect a greater prevalence of cranial suture diastasis in specimens with known trauma when compared to controls.

Conclusion: This study builds upon works identifying suture diastasis in specimens with cranial trauma. Ultimately, we aim to determine if US offers a clinical diagnostic imaging modality comparable to micro CT data for the analysis of cranial suture anatomy and trauma. Future studies will quantitatively compare US to micro CT imaging.



Oral

O1

Application of Osteomyelitis Classification Systems in Skeletal Samples

J. Ross, I. Esparza
Advisor: K. Lesciotto

Adult cases of osteomyelitis, or an infection in bone, are most frequently observed in the tibia, although other long bones and vertebrae are also commonly affected. Expedient evaluation of the infection is critical to prevent bacteremia and possible amputation of an affected limb; however, a lack of universal agreement on diagnostic criteria has led to the creation of 13 classification systems. These systems are intended to aid in the description, management, and/or prognosis of osteomyelitis patients, primarily relying upon clinical symptoms and medical imaging. This research tested the application of the most common osteomyelitis classification systems to dry bone, using the Southeast Texas Applied Forensic Science Facility Skeletal Collection. Eleven individuals were identified as having at least one bone that exhibited characteristics of osteomyelitis (6 tibiae, 3 femora, 1 fibula, and 1 clavicle). Each was scored according to the Cierny-Mader, Weiland, Waldvogel, Kelly, and Romano systems, as these are widely known classification systems that provide a descriptive or etiologic explanation. Classification systems that focused on pediatric populations or soft tissue examination were excluded from this study. The Romano system uses the largest number of criteria to grade osteomyelitis, providing more criteria that could be applied to skeletal samples and therefore providing the highest level of description. Three case studies are included to highlight the benefits and limitations of each classification system, as well as demonstrate characteristics observable on dry bone that may affect the treatment and progression of osteomyelitis which may not be fully appreciated through traditional imaging.

O2

Comparing Two Methods of Calculating Acute: Chronic Workload Ratio on Girls, Youth Volleyball

C. Schumann, M. Wojciechowski
Advisor: J. Bunn

Monitoring training load using acute: chronic workload ratio (ACWR) enables coaches to maximize fitness potential while mitigating injury risks. There are two methods of determining ACWR: rolling average (RA) and exponentially weighted (EWMA). Female high school volleyball athletes play year-round, participating in a high school season (HSVB) and a club season (CVB) This study aimed to 1) compare changes in kinetic energy (KE) output in youth female athletes (n = 24) during the HSVB and CVB seasons, and 2) evaluate the agreement in RA and EWMA ACWR calculation methods during the high school and club seasons. Weekly load was measured using a wearable device and both the RA and EWMA ACWR were calculated using KE as the primary metric. A repeated-measures ANOVA assessed both the HSVB and CVB datasets for weekly differences and a repeated measures correlation was used to evaluate the agreement between the two ACWR methods. The HSVB data showed spikes in ACWR at the onset of the season and during one week at mid-season ($p = .001$-$.015$), whereas the CVB data had greater training load variations throughout the season ($p < .05$). Both datasets showed moderate correlations between the two ACWR methods (HSVB: $r = .756$, $p < .001$; CVB: $r = .646$, $p < .001$). This suggests that both methods can be used as a monitoring tool, but more research is needed to investigate which method is more appropriate for training and competition that does not follow a consistent schedule like that of CVB.

O3

Novel Partial MBD5 Duplication in a Patient Expands and Refines the Phenotypic Spectrum of 2q23.1 Duplication Syndrome

J. Chang, R. Webster, G.B. Peters, J. A. Martinez-Agosto, S. Ghedia, S. Elsea
Advisor: S. Mullegama

MBD5-associated neurodevelopmental disorder (MAND) includes duplications, deletions, and single nucleotide variations involving the *MBD5* gene located at chromosome 2q23.1. This group of disorders are clinically characterized by intellectual disability, motor delay, developmental delay, seizures, speech impairment, and autistic-like features. In this study, we describe a 6-year-old patient with one of the smallest reported 2q23.1 duplications that presented with developmental delay, language delay, and mild cerebellar features. The patient's clinical features and duplication location were compared to other reported patients in PubMed, ClinVar, and Decipher with *MBD5* duplications. Additionally, the patient's *MBD5* mRNA levels were also compared to three controls through quantitative-PCR. The patient's expression of MBD5 mRNA was increased while the three controls had normal levels. Our findings support *MBD5*'s classification as a dosage dependent gene while expanding the clinical phenotype of 2q23.1 duplications to include motor delay, seizures, language impairment, infantile hypotonia, behavioral problems, craniofacial anomalies, and autistic-like features. Our contribution towards the characterization of 2q23.1 duplication will assist clinicians in identifying and diagnosing patients with this syndrome.

O4

Re-Evaluating the Binge Eating Scale Cut-Off Using DSM-5 Criteria: Analysis and Replication in Presurgical Bariatric Surgery Samples

H. Jeong, G. Hapenciuc, E. Meza, J. Le, L. Heinberg
Advisor: R. Marek

Background: Binge eating disorder (BED) is associated with poorer outcomes in bariatric surgery. A measure used to screen for BED is the Binge Eating Scale (BES). A BES cut-off score of >17 is suggested for screening patients who have a high likelihood of meeting BED. The DSM-5 lowered the threshold for meeting criteria for BED, and classification accuracies of the BES need to be re-evaluated.
Methods: 1,133 patients seeking bariatric surgery were randomly split into two samples for validation and replication. The validation sample yielded 561 patients (30.1% men, 35% non-White). The replication sample yielded 572 patients that were demographically similar to the first random split sample (e.g., 25.3% men, 34.4% non-white). Patients were evaluated by psychologists for BED using a semi-structured clinical interview. Afterwards, patients completed the BES. Classification accuracies were calculated in both samples to evaluate the optimal cut - off score for the BES.
Results: 13.5% of patients met DSM-5 criteria for BED in the validation sample and 13.8% met criteria for BED in the replication sample. Lowering the interpretative cut-off to >15 on the BES yielded sensitivity values of >.72, specificity values of >.67, and accurate classification of BED in >.70 of cases across both samples – which were better than classification statistics at the traditional cut-off.
Conclusions: When using DSM-5 criteria for BED, BES cut-off scores need to be lowered to 15 for interpretation. Modifying the BES cut-off score will allow for a more accurate and sensitive screening in patients seeking bariatric surgery who also present with BED.

“A Celebration of Student Scholarship”