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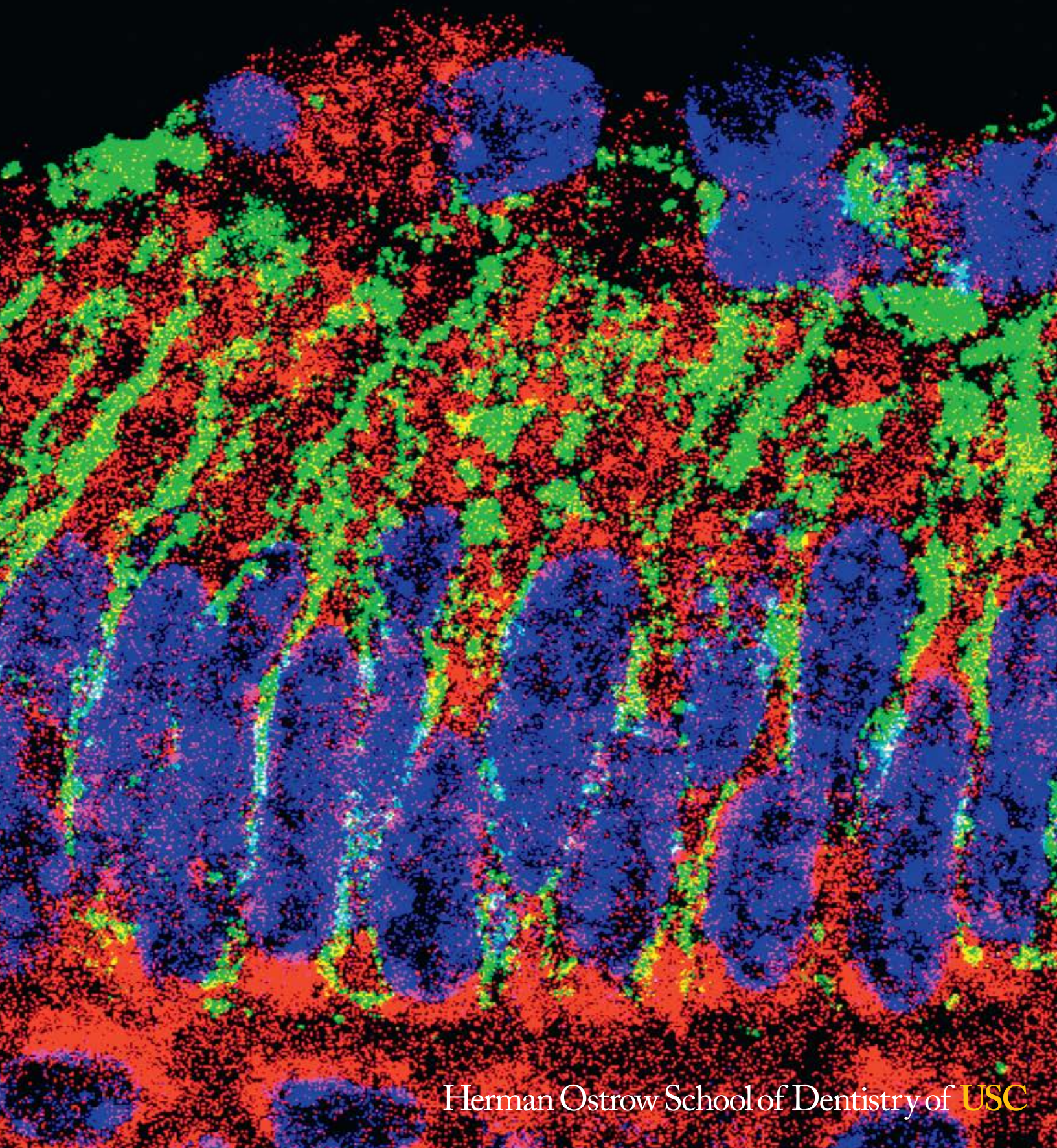
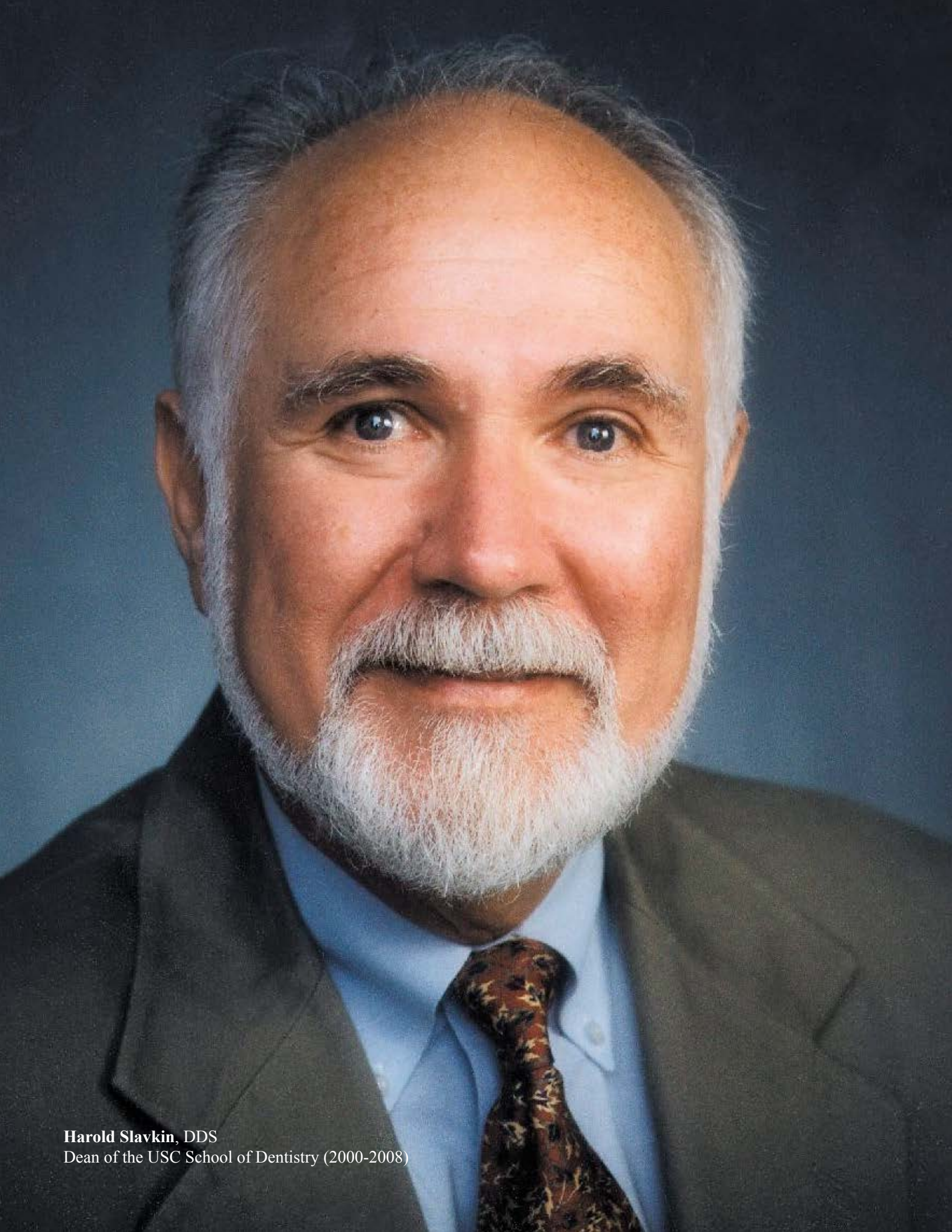


Herman Ostrow School of Dentistry of USC



Harold Slavkin, DDS
Dean of the USC School of Dentistry (2000-2008)

In memoriam: Dr. Harold C. Slavkin (1938-2023)

Few individuals make as profound an impact in their careers—and on their students and colleagues—as Dr. Harold C. (Hal) Slavkin made on the field of craniofacial biology. In Dr. Slavkin's memory, we pay tribute to a remarkable career characterized by visionary leadership and outstanding accomplishments. A true Trojan, Dr. Slavkin's career at USC began as an undergraduate and concluded with his retirement from the faculty in 2014. He was a stalwart figure whose profound influence on dentistry and craniofacial science remains indelible.

A highly formative period in Dr. Slavkin's life began with his military service as a dental technician in the U.S. Army, which instilled in him an appreciation for how receiving compassionate dental care can improve people's lives. He was an avid student of the liberal arts, too, and completed an undergraduate degree in English at USC before entering the DDS program. His ascent to leadership in the field was swift, and in 1968, he assumed the role of Chair of the Department of Biochemistry after completing postdoctoral training at both UCLA and USC. During this period, he founded the Laboratory for Developmental Biology in 1972, later transforming it into the Center for Craniofacial Molecular Biology in 1989, which today stands as a testament to his enduring impact.

Throughout his five-decade career, Dr. Slavkin was at the forefront of many profound advancements in science and technology that changed the very nature of what it means to be a clinician or a biologist. His 2012 monograph *The Birth of a Discipline: Craniofacial Biology* is essential reading for understanding the paradigm shifts in the mid-twentieth century that created the conditions for this field to come into existence. Upon his appointment as the Director of the National Institute for Dental Research (NIDR) in 1995, Dr. Slavkin played a crucial role in securing increased funding for dental and craniofacial research. Under his leadership, NIDR was more fittingly re-named the National Institute for Dental and Craniofacial Research (NIDCR). Alongside these triumphs, there were challenges, too, including two government shutdowns followed immediately by a blizzard, all of which ground NIH activity to a halt. Dr. Slavkin returned from his five-year leave from USC to serve as the Dean of the School of Dentistry in 2000, during an exciting scientific period that coincided with the publication of the first draft of the complete human genome. In all his leadership roles, Dr. Slavkin worked tirelessly to improve oral and craniofacial health care, to integrate medical and dental education, to implement advanced technologies, and to foster interdisciplinary collaborations. Dr. Slavkin retired from the USC faculty in 2014, an occasion we marked at CCMB with a lively symposium in his honor. In retirement, Dr. Slavkin enjoyed traveling, spending time with his grandchildren, pursuing artistic endeavors, sailing, and cherishing moments with his beloved wife, Lois.

The USC dental and craniofacial communities are profoundly grateful for Dr. Slavkin's dedication, integrity, enthusiasm, and vision. We hope that his family and friends will find his enduring legacy a source of pride and comfort, and all of us who knew Hal will miss him as a scholar, leader, colleague, and friend.

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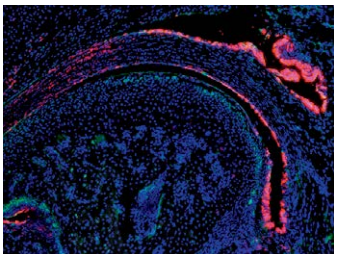

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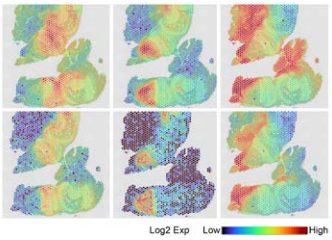

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FROM THE **DEAN**

Dear Ostrow Students and Colleagues:

Every year, I look forward to Ostrow's annual Research Day. Nothing can compare to seeing the unbridled excitement and enthusiasm on our students' faces as they share the fruit of their research labors. Even better, I always enjoy reading more about their studies in our award-winning *The Explorer* — put together by Ostrow's Student Research Group.

It gives me such pride to see our students committing themselves to our professions' scientific foundation. To be successful in their careers, our students — whether they study dentistry, biokinesiology/physical therapy or occupational science/occupational therapy — will need an insatiable thirst for new knowledge. They will need to consume cutting-edge research, learn new technologies, and adapt their practices to stay apace an ever-evolving profession. I will know that we have been successful with our students if we impart within them this lifelong love of learning.

As part of a research-intensive university, we have always taken scientific investigation incredibly seriously. Ostrow is No. 3 on the list of top-funded U.S. dental institutions by the National Institute of Dental and Craniofacial Research (NIDCR). This is the highest place we've ever occupied on this list, demonstrating the trust that the NIDCR has for our research faculty and staff. Likewise, the USC Chan Division of Occupational Science and Occupational Therapy and the USC Division of Biokinesiology and Physical Therapy retain their high U.S. News & World Report rankings — a true testament to our colleagues' ongoing research and clinical prowess.

I want to congratulate all of our faculty and student researchers for their hard work, long hours, and dedication as you completed these research endeavors this year.

Fight On!

(PHOTO/KEN LUND)

INTRODUCTION TO **RESEARCH DAY**

Dear Ostrow Students and Colleagues:

Welcome to the Herman Ostrow School of Dentistry of USC Research Day 2024! We gather together annually with great enthusiasm to applaud the remarkable accomplishments of our students, staff, and faculty in Dentistry, Occupational Science, Occupational Therapy, Biokinesiology, and Physical Therapy. As we embark on this event, which has become a highlight of the academic calendar, we are eager to showcase the groundbreaking discoveries and inspiring work that provide a glimpse into USC's ongoing contributions to societal healthcare needs.

As educators, we take pride in fostering an environment conducive to pioneering research. Witnessing students in our labs and clinics working together on innovative research to improve patient care remains a source of immense pride. On such occasions, I am struck by how deeply the Herman Ostrow School of Dentistry embodies USC's steadfast commitment to our core values: integrity; excellence; diversity, equity, and inclusion; well-being; open communication; and accountability. Our supportive culture fosters a vibrant space for interdisciplinary collaboration, underlining our dedication to providing superb opportunities for our students. Their experiences and clinical training are instrumental for honing the critical thinking skills that are crucial for advancing scientific knowledge and for being trusted healthcare providers. Introducing students to the joys and challenges of research equips them with indispensable skills for their future roles as clinicians, educators, and scientists.

Our students stand as the torchbearers of our professions, and the exceptional discoveries presented today signal a promising future. Being part of a community that nurtures the next generation of scientific leaders, shaping the landscape of healthcare, should be inspiring to all of us.

We invite you to enjoy this year's edition of *The Explorer*. Within its pages, you will discover the latest research endeavors undertaken by your colleagues, alongside articles showcasing the achievements of exceptional researchers at the Herman Ostrow School of Dentistry. Covering a diverse array of topics, this publication underscores how research innovation continues to enhance our lives. Please join me in extending congratulations to all our students and researchers on their successes as we gather to commemorate their efforts on Research Day.

Fight on!

Yang Chai, DDS, PhD
University Professor
George and MaryLou Boone Chair in Craniofacial Molecular Biology
Associate Dean of Research
Director, Center for Craniofacial Molecular Biology
Herman Ostrow School of Dentistry of the University of Southern California

INTERVIEW WITH CCMB FACULTY:
DR. JIANFU (JEFF) CHEN

By George Parisis and Deep Thakker

Dr. Jianfu (Jeff) Chen is an Associate Professor and Researcher for the Center for Craniofacial Molecular Biology (CCMB) at the Herman Ostrow School of Dentistry of USC who focuses on identifying novel disease mechanisms and therapeutic strategies to treat developmental brain and craniofacial disorders. His laboratory uses mouse genetics and human induced pluripotent stem cells (iPSCs)/organoids to study brain development and craniofacial neuroscience. Dr. Chen and his team are interested in stem cell biology, tissue regeneration, neurovascular interaction, and the neuroscience of craniofacial biology and disease.

Dr. Chen received his Bachelor of Science in Microbiology from the China Agricultural University in Beijing in 1999, and ever since being a college student, he recalls being fascinated in the sciences, particularly the biological sciences. This launched his pursuit of becoming a researcher which led him to obtain his Masters of Science in Plant Pathology at the Kansas State University in 2004.

In 2008, Dr. Chen received his PhD in the Department of Cell & Developmental Biology, under the supervision of Dr. Da-Zhi Wang, at the University of North Carolina at Chapel Hill (UNC-CH) and was granted the Linda Dysktra Distinguished Dissertation Award upon graduation. While beginning his PhD studies, his focus was on microbiology and microbial interactions; however, he found himself being drawn to biomedical research. At this point in his graduate studies, he switched his field of study to cardiovascular development. After completing his PhD, Dr. Chen went on to pursue his postdoctoral research at the University of Colorado, Denver (CU Denver), where he worked under the supervision of Dr. Lee Niswander. As a postdoctoral researcher, he was recognized as a Damon Runyon Postdoctoral Fellow, and at CU Denver, he became

Dr. Chen

interested in studying the brain and its complexity, particularly how the brain is formed. During this endeavor, he received the K99/R00 Pathway to Independence Award from National Institutes of Health (NIH) in 2012.

In 2014, Dr. Chen started an independent investigator position at the University of Georgia Athens (UGA) in the Department of Genetics and Department of Biochemistry & Molecular Biology. At this point in his career, he wanted to pursue more interdisciplinary research, in particular health related projects that translate to helping patients. Since the University of Georgia was not a medical campus, he sought out a school where he could make this pursuit possible. This led him to the Center for Craniofacial Molecular Biology (CCMB) here at the University of Southern California in 2017. He became fascinated with craniofacial biology in general, but the formation and regeneration of the skull were what he became fascinated with the most. He realized that our brain and skull sit in very close proximity to each other, and that researchers have not identified whether they communicate and how they potentially communicate with each other and he wanted to learn more.

Craniofacial malformations account for close to one-third of all birth anomalies and significantly compromise the quality of life for these patients. Dr. Chen's lab currently investigates neurological abnormalities in craniofacial disorders such as neurocognitive dysfunctions in craniosynostosis, a congenital craniofacial disorder. Dr. Chen is not only interested in how the skull and brain communicate but also what happens if their coordination goes wrong. To help drive his research, he likes to ask questions like: "What kind of congenital disorders do they cause?" and "How do we mitigate these disorders?" His lab's research guides our therapeutic efforts in mesenchymal stem cell-mediated tissue regeneration in treating craniosynostosis.

Microcephaly and macrocephaly are characterized by undergrowth and overgrowth of the brain, respectively. These abnormal brain growths are often associated with cognitive dysfunctions in individuals with autism, intellectual disability, and vascular brain injury. Dr. Chen's team

uses microcephaly/macrocephaly disease genes as an entry point to investigate neural progenitor cell (NPC) proliferation & differentiation, neuronal morphogenesis, and neurovascular interaction in health and diseases. One such project involves investigating the neurovascular functions of a small RNA Snord118-mediated ribosome biogenesis. The goal of this project is to establish new genetically modified mice to model small vessel diseases (SVD) and to investigate the function of ribosome biogenesis in neurovascular unit (NVU) cells. His lab's aim is to identify novel disease mechanisms and therapeutic targets for developmental brain disorder and injury.

Dr. Chen's other research interests are related to the temporomandibular joint (TMJ) and temporomandibular disorders (TMD). During this academic year, his goal is to work with Dr. Yang Chai to assemble a comprehensive multi-institutional Center for TMD Improving Patient Centered Translational Research (C-TMD IMPACT). This multi-institutional center will include clinicians, research scientists, regulatory experts, and clinical trial specialists who will advance basic and clinical research, research training, and evidence-based treatment for TMDs. Because of his neuroscience background, Dr. Chen is well equipped with the skillset to take on these research projects; he is interested to see how the fields of neuroscience and craniofacial research can influence each other and ultimately understand how the craniofacial aspect can influence the whole body.

Dr. Jeff Chen's past research activities include trying to model brain development disorders such as macrocephaly and autism spectrum disorder, and intellectual disabilities and trying to identify potential targets to treat these disorders. In general, he has used mouse models and human induced pluripotent stem cells (iPSCs)/ organoids to help model these developmental disorders, study their cause of disease and identify their potential targets for intervention. He has also looked at neurocranial dysfunction, in particular diseases such as craniosynostosis and temporomandibular disorders (TMD), in mouse models that recapitulate the patients' phenotype.

Dr. Chen's team uses CRISPR/Cas9 approaches to introduce disease mutations into human iPSCs followed by the differentiation into brain organoids and different cell types, such as neural progenitor cells (NPCs), neurons, pericytes, neural crest cells (NCCs), and suture stem cells (SuSCs). They aim to use these in vitro and ex vivo human models to identify new disease mechanisms and therapeutic strategies for brain and craniofacial disorders. Meanwhile, they are interested in generating large amounts of relevant cells from pluripotent stem cells (PSCs) to treat craniofacial and neurological diseases. For example, they aim to generate highly uniform PSC-derived suture stem cells (SuSCs) as the off-the-shelf stem cell-based product to effectively treat craniosynostosis.

Dr. Chen's lab is interested in stem cell biology, tissue regeneration, neurovascular interaction, and neuroscience of craniofacial biology and disease. They aim to identify novel disease mechanisms and therapeutic strategies to treat developmental brain and craniofacial disorders. He is currently working on collaborative research projects to treat craniosynostosis and temporomandibular disorders (TMD).

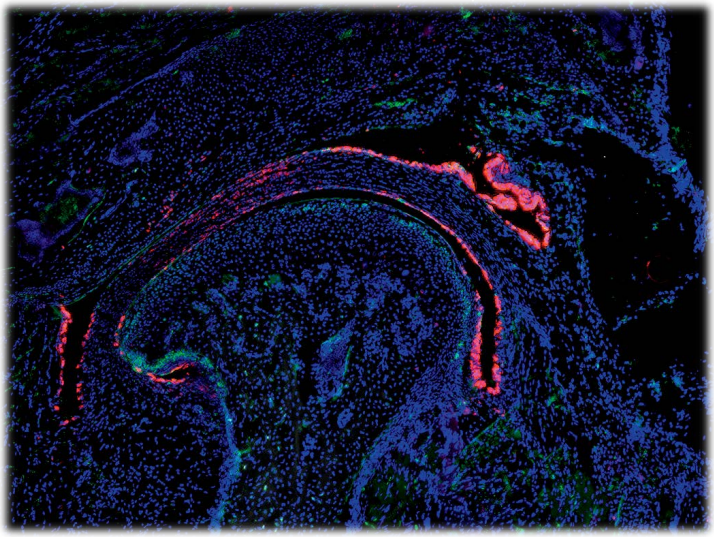


Figure 1. Temporomandibular joint (TMJ) section stained with Prg4 (red) and Thy1 (green).

The Future of Endodontics:
Laser-Assisted Irrigation

By Sam Geranpayeh & Austin Nahouray

Dr. Zweig

New York-born, Dr. Stefan Zweig spent the early years of his life growing up in the San Fernando Valley suburb of Los Angeles. He completed his undergraduate studies at UCLA receiving a bachelor's degree in biochemistry. Following graduation, he briefly worked in industrial research for a pharmaceutical company, isolating human interferon and developing artificial blood platelets. However, he soon realized that the lonely life working in a pharmaceutical laboratory was not for him and opted for a career which would not only allow him to use his science background, but also work with and help people.

Coming from a very hands-on family, Dr. Zweig always felt inclined to work with his hands. And having spent an extensive amount of time in the dental office for his own treatment as an adolescent, he naturally became interested in dentistry as a career option. It was a compelling path as it incorporated both science, which he was passionate about, and the opportunity to work with his hands.

He was fortunate enough to be accepted to the University of Southern California School of Dentistry (now the Herman Ostrow School of Dentistry of USC), which was considered one of the top dental schools in the country. He began dental school immediately after receiving his undergraduate degree. Dr. Zweig thought about specializing during his pre-doctoral education, but opted to become a general dentist first to gain experience as a practicing dentist. A unique fact about Dr. Zweig is that he was the first student at the Herman Ostrow School of Dentistry of USC to deliver a set of facial veneers. Upon graduating from dental school, Dr. Zweig was offered a position as part-time faculty and taught removable prosthodontics for both preclinical and clinical students before returning for his endodontic residency.

When he had started to teach in the late 1980s, the field of dentistry had started to undergo drastic changes. He realized that in order to keep up with these changes he would have to retrain himself, even though he had just completed his dental training. Instead, he decided that he would return to school to specialize and continue his dental education. Dr. Zweig joined the Advanced Endodontics Program at USC in 1990 and was subsequently offered a teaching position immediately after graduation in 1992. He attributes his consistent involvement in academia to a piece of advice his mentor gave him: to always have a foot in the door of education because it will keep you at the forefront of clinical advancements and research, as well as provide a mode of continued learning, which would ultimately make one a better practitioner down the road.

In addition to teaching, Dr. Zweig has been actively involved in the leadership aspect of dentistry over the past 20 years. His main organizational involvement has been with the American Association of Endodontists (AAE), where he served as President. He has since moved on to more philanthropic work with membership on the Board of Trustees for the Foundation of Endodontics, which raises money to fund outreach programs, research, educators, and residents. He is also in the process of completing the Master of Health Administration Program at the Price School of Public Policy at USC.

When asked what has kept Dr. Zweig interested in the field of endodontics, he explained that even though it is a very hard and technical skill, it is very important and he enjoys providing the community with a service using his talents. He understands how some might get tired of the field as it is very episodic and can be difficult to build ongoing relationships with patients, yet the technical aspect has been very gratifying for him, especially when he reaches his goals. He also notes that for many years there was a "battle" between the fields of endodontics and implant dentistry, but he personally believes that the pendulum has swung and that there is a place for both disciplines in dentistry. He is happy that patients and dentists are realizing the importance of saving natural teeth. He also enjoys the evolving nature of endodontics as he claims he does not perform a root canal anywhere near how he used to when he had just started practicing as a dentist. Dr. Zweig elaborated, "Back in the day all they had were hand files and simple irrigation techniques, but now the technology has made endodontics more technological and more predictable."

The constantly evolving technology in endodontics is one of the main reasons Dr. Zweig has persisted with the field. He states that the constant change and advancements that have improved and defined the specialty of endodontics, along with his desire to be an educator, have given him the impetus to stay current and keep up with change. Of course, keeping up with the latest advances in endodontics is time consuming, but very worthwhile for him. Teaching was the logical next step after 30 years of private practice for Dr. Zweig, as it allowed him to give back to the community and keep learning to stay relevant. However, he still has not given up on his passion for clinical endodontics as he maintains a role in the USC Dental Faculty Practice at least once a week.

Dr. Zweig understands that he is not a prominent researcher, rather a more focused clinician. However, he acknowledges the importance of research in the field of endodontics and has been involved in mentoring his advanced endodontic resident students in their research projects and has been involved in a few publications as well. Dr. Zweig emphasized that he is a major proponent of clinical research in endodontics. He states, however, that clinical research in dentistry is extremely difficult to complete due to regulations and ethical concerns. Still, it is necessary to support new clinical methods and technology, and to monitor outcomes.

Dr. Zweig believes that there are many up-and-coming technologies in endodontics that are yet to be proven to be clinically effective, but have potential to have real validity after the proper research is analyzed. Dr. Zweig shared that one of the major research topics in endodontics is new irrigation methods. One example is multi-sonic irrigation which allows for endodontic irrigation using multi-frequencies to create pressure and pump solutions into canals. An additional type of irrigation that he believes is gaining momentum is laser technology. These laser-assisted irrigation methods activate the solution using a laser. The next big topic of question in the field he believes is minimally invasive endodontics, where conservation of tooth structure is emphasized. Additional research is needed when it comes to finding a balance between the necessary size of the access and the effectiveness of cleaning the canals.

He believes that research of topics in endodontics is very necessary. Endodontic therapy is extremely successful on a biologic level with Apical disease cured over 90% of the time using standard endodontic procedures. But attention must also be given to the functionality and longevity of endodontically treated teeth, and how endodontic therapy affects these.

In his personal life, Dr. Zweig enjoys playing golf and being active. He has also enjoyed traveling and has been to many places around the world, with a few of his notable trips including Egypt, Japan, South America, and Europe. He also used to be an avid watch collector, collecting over 100 watches, many being antique and manufactured prior to World War 2. He enjoys spending time with his family at his home by the beach and supporting his two daughters through their education.

Dr. Zweig emphasizes how leadership has been his passion and therapy in his personal life. His final messages are to get involved as much as possible as dental students and to look for all types of opportunities to increase one's exposure to the many avenues of dentistry. He is a real proponent of being an active member of organized dentistry, educating future dentists, and collaborating with one's peers.

Dr. Xuan Yue:
A Dedication to Dentistry, Teaching, and Research

By Mailynh Nguyen & Bryan Fedchun

Dr. Xuan Yue's journey through dentistry is a testament to dedication and unwavering commitment. Her extensive experience and remarkable achievements are not just inspiring but also reflective of her passion for the field. A former editor for the Explorer magazine during her dental training at UCLA, she has now come full circle by being featured in the same publication.

Introduced to the world of dentistry through family members in her youth, Dr. Yue made the decision to commit to dentistry in her college years. Starting her undergraduate journey in Bioengineering at UCLA, a pivotal moment came when she encountered an academic mentor specializing in prosthodontics. Under their guidance, Dr. Yue gained her first exposure to dentistry research, confirming her inclination toward the field. Dr. Yue was able to study and experiment with different dental materials, which opened up her newfound interest in the field. For her, dentistry became a realm where she could express creativity, embrace artistry, work hands-on, and provide essential care to those in need. From there, Dr. Yue attended UCLA's dental school where she continued her research on materials and began her dental training.

After completing dental school, Dr. Yue embarked on a General Practice Residency (GPR) at Montefiore Medical Center in New York with a goal to deepen her understanding of dental procedures and enhance her preparedness for the intricacies of dentistry. Throughout her program, Dr. Yue acquired expertise in treating complex cases involving medically compromised patients, spanning from basic restorations to the management of comprehensive situations such as full-mouth restorations, cancer treatments, comorbidities, and long-term trauma. Skillfully navigating non-ideal scenarios, she developed creative solutions for each patient, attributing her training to the rapid acquisition of advanced clinical experience. The one-year program helped with a diverse range of dental discipline skills, encompassing oral surgery, emergency medicine, pediatric dentistry, and special needs dentistry. It also allowed for gaining valuable experience in managing diverse patient populations, complex cases, and dental emergencies.

Dr. Yue

While learning how to deal with more complicated cases, Dr. Yue's drive for knowledge led her to further continue her education and skills with an Advanced Prosthodontics residency at her alma mater, UCLA. Prosthodontics is a specialized branch of dentistry that focuses on the restoration and replacement of damaged, missing, or aesthetically compromised teeth and oral structures. She learned how to restore complex cases, how to critically think and plan treatment, and gained a large set of newfound technical skills. Dr. Yue credits a large amount of her overall learning and knowledge to this program, gaining a decade of information and skill in only three

years. Dr. Yue also participated in research during her education regarding tissue bars, looking into the effects of the distance of the bars as well as the durability of the clips in contact with different bar materials. She tested the durability of newer materials such as using zirconia over the traditional titanium or cast gold metal. Dr. Yue then served her fellowship at the MD Anderson Cancer Center in Texas to hone her skills and passion for working with cancer patients. As a highly skilled prosthodontist, she meticulously designs and fabricates various prosthetic devices to enhance both the function and appearance of her patients' oral cavities. Utilizing advanced materials and technologies, Dr. Yue creates custom-made dental prostheses, including dentures, crowns, bridges, and dental implants. Beyond addressing the functional aspects of oral health, her practice places a significant emphasis on achieving optimal aesthetic results, ensuring that patients not only regain their ability to bite and chew, but also enjoy a natural and aesthetically pleasing smile. Through her expertise in prosthodontics, Dr. Yue plays a crucial role in improving the overall quality of life for individuals.

Presently, Dr. Yue divides her time between working at the hospital as a prosthodontist and as an attending at the USC GPR Program, which is a county-based hospital program, and working in private practices.

In the hospital, Dr. Yue works as a maxillofacial prosthodontist, treating a large volume of cancer patients. Her specialty aids them in recovering vital functions after head and neck cancer treatments, and defines a significant portion of her work. Crafting removable maxillofacial prostheses such as obturators enables these patients to regain essential activities like eating, speaking, and restores their appearance after losing critical portions of either their jaw or maxilla. Her expertise extends to creating extraoral facial prostheses, such as ears, eyes, or noses, as well as silicone facial parts. As an interdisciplinary field, Dr. Yue works with oral surgeons, otolaryngologists, plastic surgeons, as well as other medical professionals in order to deal with the complicated medical interactions and procedures necessary for cancer patients. Her true passion lies in aiding cancer patients in their recovery, which also allows her to give back to the community by restoring confidence and providing tools for a return to normalcy in those who need it.

While performing her work, Dr. Yue also serves as a mentor to guide budding student doctors in the GPR Program. Her days kickstart with morning meetings to organize and prepare the student doctors for their hospital work. Throughout the day, she equips them with tools for critical thinking in treatment planning. Emphasizing troubleshooting with removable prosthetics, she highlights its critical role in treatment planning, offering invaluable advice derived from her extensive experience through both clinical advice and lectures to the students. Dr. Yue's decision to teach stems from a desire for diversity in her professional life and a heartfelt wish to share her wealth of knowledge with the community, as she feels grateful to the excellent mentors she had in the past. She appreciates the opportunity to teach at a higher level of education, passing on complex knowledge of prosthodontics to the residents.

In private practices, Dr. Yue works with both everyday patients performing mostly indirect restorations and also in a prosthodontic office working on complex procedures such as full mouth restorations and dentures. Her work requires her to collaborate with other surgeons such as periodontists and oral surgeons to achieve the best result for the patient.

Balancing teaching, hospital duties, and private practice seems exciting to her, as each day brings unique and exhilarating challenges. Her positions emphasize her commitment to education and patient care, dedicating her time to practicing rather than ownership.

In regards to the current state of dental prosthodontics, Dr. Yue believes that there is currently a large number of advancements driven by the integration of digital dentistry and looks forward to future advancements. Within the last five years, 3D printing has greatly decreased the number of appointments needed for patients in need of dentures. Going from five appointments to around two appointments before a patient can walk out with a fully developed denture, digital dentistry has not only decreased the time needed to fabricate a prosthesis but also has reduced the amount of human error such as removing the need for wax-ups. These innovations promise more efficient, tailored, and comfortable treatments, benefiting both patients and practitioners.

Dr. Yue encourages a GPR or prosthodontics residency to those who wish to greatly increase one's skill and knowledge at a rapid pace. She emphasizes the importance of learning how to think critically and treatment planning as the key to advancing one's learning and skills.

Dr. Xuan Yue stands as a beacon in the field of dentistry, seamlessly blending her roles as a dedicated practitioner, passionate educator, and relentless researcher. Her tireless commitment to enhancing patient care, empowering future dentists, and advancing the boundaries of dental science through innovative research defines her remarkable journey. Dr. Yue's unwavering dedication to restoring smiles, confidence, and normalcy to those in need exemplifies the true spirit of a healer and educator, making her a revered figure within both the academic and clinical fields of dentistry.

A Journey Through Dentistry: Professor Oshiro's Story

By Cloris Yidan Zhang & Subramony Bhagavatheeswaran

Stepping into the second floor clinic here at Ostrow, if you've ever encountered a professor who effortlessly combines kindness with clarity, patience with precision, and whose smile feels like the warmest ray of sunshine, chances are that you have met Professor Lisa Oshiro. Professor Lisa Oshiro is a Clinical Associate Professor in the section of Periodontology department at the Herman Ostrow School of Dentistry of USC. Currently Professor Oshiro teaches on the second floor periodontal clinic sections and instructs for the D2 Periodontal Module.

Journey to Dentistry

Professor Oshiro's dental journey began in 1988 at Citrus College in Glendora California, where she started her degree in Dental Assisting and Liberal Arts.

Professor Oshiro

In 1996, Professor Oshiro earned her Bachelor of Science degree in Dental Hygiene at the Herman Ostrow School of Dentistry of USC. In the same year she became a registered dental hygienist (RDH), holding licences and certifications in CPR, X-rays, and expanded functions including local anaesthesia, curettage, and nitrous oxide sedation. Her solid education foundation laid the groundwork for a seamless transition from a student to an educator.

Since 1996, Professor Oshiro has been teaching at the Herman Ostrow School of Dentistry of USC. She began teaching as a Clinical Instructor and eventually evolved into Clinical Associate Professor in the Section of Periodontology.

Over the years she has actively contributed to the development of faculty orientation, student evaluation, and clinic guidelines. From co-authoring evaluation booklets to co-directing courses, Professor Oshiro has played a pivotal role in improving the periodontal education for the dental school.

Teaching at the USC Dental School

With a personality that radiates friendliness and an unwavering commitment to making complex subjects feel approachable, Professor Oshiro is an ideal mentor. She is the kind of educator who not only imparts knowledge but does so with a smile that speaks volumes. Barely out of school herself but already recognized for her remarkable talent, she was invited by her mentor to step into the teaching role at USC. In her own words, "The university's emphasis on open interaction and fostering a supportive learning environment resonates with me. This shared commitment continues to drive my decision to work here and contribute to shaping the future dental students."

In her interaction with students during the D2 sophomore periodontal module, Professor Oshiro embodies patience and a commitment to clear and detailed explanations. She witnesses the progression of students from tentative learners to independent practitioners by the time they graduate in their D4 years.

In her approach to patient management, Professor Oshiro emphasizes on effective communication. She advises students to explain the procedures thoroughly, manage expectations, and most importantly, to listen attentively to patients. This dedication to patient care goes beyond the clinical chair, creating an atmosphere of trust and understanding. "You have to communicate with the patient. Don't just assume that they've been here for so long that they are going to know exactly what you are gonna be doing." Perhaps the most

important thing about her is that the classroom becomes a two-way street with her. Every lesson is a shared journey, where her students enrich her understanding while she ignites their curiosity.

On being asked what the best thing she liked about USC, Professor Osihro comments that "The second floor school clinic offers an unparalleled learning environment, which thrives on the constant exchange of knowledge. The opportunity to learn alongside experienced colleagues and esteemed faculty is invaluable. Whether it's a quick question during a procedure, or a deeper discussion in a dedicated session, the clinic fosters a collaborative atmosphere where no query goes unanswered. This network of expertise feels like a hidden treasure, empowering students and faculty to tackle any challenge and expand the understanding of dentistry with each interaction."

Beyond Teaching at the Dental Chair

Professor Oshiro's commitment to the dental community extends beyond the academic domain. Since 1996, she has served as an RDH at several dental groups and private practices. She keeps a busy schedule, usually working five to six days a week. In her free time, she relaxes by solving jigsaw puzzles and reading. These hobbies give her a break from the demands of her work and help her recharge. Sometimes finding simplicity in life provides moments of joy and balance between professional commitment and personal interests.

Aspirations and Gratitude: The Supportive Educator

Teaching, for Professor Oshiro, is a nuanced journey of propelling students to exceed expectations and frosting an environment where questions are not just welcomed but also encouraged. Grateful for the supportive community at Ostrow, she humbly acknowledges the values of learning from collaborating with colleagues. Not one to bask in the limelight, Professor Oshiro finds fulfillment in supporting her students, peers, and colleagues.

For her, clinic is not just about the diagnoses or the procedures; it's the stories, the smiles, the wrinkles that deepen over the years. She's been in this field for over two decades, a witness to lives unfolding, joys shared, and battles fought. The most rewarding part? The connection, the bond forged in those moments besides the dental chair. Watching her patients grow older, helping those in pain, Professor Oshiro sees her own life reflected. It's the heart of her job, what keeps her going.

Future and Beyond

So, private practice or teaching? Both paths offer exciting opportunities! Switching from the clinic to the classroom could feel like a refreshing change of scenery. You'd trade the daily patient flow for the focused development of future dental professionals. Imagine sharing the expertise in a perio-focused office, learning new techniques firsthand, and then translating those insights into engaging lessons for your students. Think of it as a loop: what you learn in private practice, you teach back at the dental school, shaping the next generation of dentists. This continuous growth would be incredibly rewarding, a chance to both refine personal skills and influence the future of the field.

Professor Lisa Oshiro's story unfolds a journey through dentistry, highlighted with genuine exploration of dental hygiene education and painted with warm smiles and her down-to-earth personality. As she continues to make her mark, one class at a time, her relatable story is an inspiration for both students and educators alike.

Delving into Expertise:
Welcoming Our Orofacial Pain and Oral Medicine Specialist

By Melodie Saremi and Feroza Hayatt

Dr. Anette Vistoso Monreal is an Assistant Professor of Clinical Dentistry at the Herman Ostrow School of Dentistry of USC. She specializes in Orofacial Pain and Oral Medicine and holds a Diplomate status from the American Board of Orofacial Pain. Moreover, she is affiliated with the Department of Distance Learning and Telehealth at the Orofacial Pain and Oral Medicine Center and serves as the director.

Always engaged and adept at multitasking, Dr. Monreal embarked on her journey in dentistry with a unique background. Unlike many others in her field, she has no family connections in dentistry and was personally dedicated to the field. Throughout her academic journey, she consistently excelled, ultimately earning the title of Valedictorian. Her early involvement in speech and debate gave her confidence and showcased her communication skills. In high school, Dr. Monreal was interested in medicine and science and wanted to focus on biotechnology. After completing a challenging series of exams which determined her admission to schools, she found herself uncertain on her career path. She decided to pursue a bachelor's degree and the next two years involved intense coursework in mathematics, chemistry, and biology. The admissions process was difficult as only the top 20 from a pool of 300 individuals were granted the privilege to select their preferred field of study. Despite dentistry being Dr. Monreal's first choice, she ended up in biotechnology due to the competitive selection process. However, a spot in dentistry opened up within the first two weeks, and she embraced the opportunity to start her dental major the very next day.

In 2013, Dr. Monreal graduated from the University of Chile, marking the beginning of her professional journey. Her path included a residency in Advanced Prosthodontics at the University of Desarrollo, where she earned her diploma in 2016. Intrigued by orofacial pain, she pursued a master's degree at the University of Southern California in 2020, completing a certificate in orofacial pain in 2021. Delving even further, she dedicated an additional year and a half to oral medicine at the University of California, San Francisco. Dr. Monreal returned to USC as faculty in February 2023, bringing a wealth of experience to her role. During her time in Chile, Dr. Monreal's passion for dentistry was showcased. She founded a scientific society for dental students, expanding it nationally and organizing conferences that drew significant attention. The first dental student conference achieved an impressive attendance of over 500 individuals and garnered media coverage. Her commitment to research was apparent in dental school where her thesis on utilizing probiotics in underserved schools secured government funding, evolving into a federal initiative to supply milk to underserved children. Dr. Monreal also played a crucial role as a teaching assistant in her anatomy class. She worked hard to organize dissection labs and her experience here gave her confidence in her ability to differentiate oral anatomy.

At the age of 15, Dr. Monreal met her future husband, who obtained a job as a software engineer in the United States, ultimately leading to her relocation to the US and shaping her career path. Upon her arrival to the US, Dr. Monreal enriched her expertise with an additional year and a half in oral medicine at UCSF. Transitioning from Chile to the US, she seamlessly integrated into university and hospital settings, collaborating on initiatives and working with cancer patients and medically compromised individuals. In the United States, she faced challenges of orofacial pain, a field that required her to learn English and better understand her patient's experiences to provide optimal treatment. Dr. Monreal's dedication to professionalism and scientific rigor is transparent in her efforts to make dentistry more than just the practice of teeth. Her commitment to advancing the field of dentistry led her to propose improvements to note-taking systems. Recognizing the inherent challenges in this subjective specialty of orofacial pain, relying heavily on patient-reported experiences making it difficult to document, she decided to embark on a mission to improve diagnostic processes. Collaborating with Dr. Glenn Clark, she proposed a groundbreaking thesis project in 2017, evolving into a sophisticated note-taking system integrated with artificial intelligence. Dr. Monreal's vision to elevate dentistry's professionalism and scientific reliability, allowed her to collaborate with Dr. Nicolas Veas and Dr. Gerald Loeb, to develop a system called "SmartNote" that is currently undergoing trials in clinics.

This innovative approach guides clinicians through

structured data collection, leading to real-time diagnoses and facilitating collaboration with residents. The system that is applicable to all specialties, incorporates a smart questionnaire, patient medical history integration, and a list of tentative diagnoses. Driven by the goal to minimize the prevalence of misdiagnoses, this system adapts to demographic factors, ensuring a personalized approach. Having accumulated data from more than 600 patients, Dr. Monreal's AI-integrated system is positioned to revolutionize diagnostic precision, providing crucial support to clinicians in their decision-making process.

In a field with a predominant focus on aesthetics, Dr. Monreal differentiates herself with her unwavering commitment to a deeper purpose. While dentists are frequently questioned, especially with aesthetic concerns, she distinguishes herself by prioritizing a more profound objective. Rather than solely concentrating on surface appearances, her main focus lies in the genuine well-being of her patients. Driven by a sincere desire to make individuals feel good, comfortable, and alleviate pain, she focuses on the holistic experience within dental care to improve overall comfort, health, and quality of life.

Dr. Monreal is also actively engaged in research focused on the medication Imiquimod, originally designed to treat warts in the mouth. The FDA initially approved Imiquimod for malignant lesions on the skin; it explores its potential application for precancerous lesions inside the oral cavity, particularly in cases of dysplasia. This research extends to the prevention of cancer development, with a specific focus on red and white lesions such as leukoplakia. Dr. Monreal's approach encompasses various studies aimed at prevention, assistance, and improvement in the utilization of Imiquimod. Rather than targeting to create new medications, her emphasis lies in optimizing the utilization of existing resources.

Dr. Monreal has consistently championed the cause of women's independence, underscoring the significance of self-reliance, unwavering perseverance, and dedicated efforts. Dentistry in particular, emerged as the cornerstone of her independence, playing a pivotal role in shaping her professional identity and laying the foundation for her successful career. Her advocacy extends to her personal journey, as she accentuates the importance for women to be taken seriously in the healthcare industry, a domain where gender biases persist. In a field predominantly dominated by men, Dr. Monreal actively empowers women, striving to break barriers and challenge preconceived notions. Through her actions and achievements, she becomes a beacon of inspiration, encouraging women to pursue their aspirations with confidence and resilience in the face of adversity, thereby contributing to the ongoing evolution of gender dynamics within the healthcare profession.

Recognizing the collaborative nature of success, she emphasizes the importance of teamwork. Dr. Monreal places great emphasis on finding team members who share her dedication and passion for the field. Moreover, she acknowledges the pivotal role of good mentors in providing guidance and support, serving as key contributors to sustained motivation and progress in her research endeavors. Dr. Monreal's enduring commitment to create opportunities has and continues to be a guiding principle throughout her groundbreaking career. Amidst her myriad of accomplishments, she successfully completed boards, obtained licenses, and earned notable references. The culmination of her expertise and leadership was evident last year when she was appointed as a member of the Board of Directors of the American Board for Orofacial Pain. In this capacity, she actively contributes to shaping the future of the field by aiding in the formulation of exams for aspiring diplomats, where her role is pivotal in the development and assessment of future leaders. Her influence extends even further as the first Hispanic member to join this significant Board, underscoring her innovative contributions to the field of oral medicine.

Dr. Monreal

USC's Anesthesiologist Making
Big Shots

By Jessica Kim & Naghmeh Aminzadeh

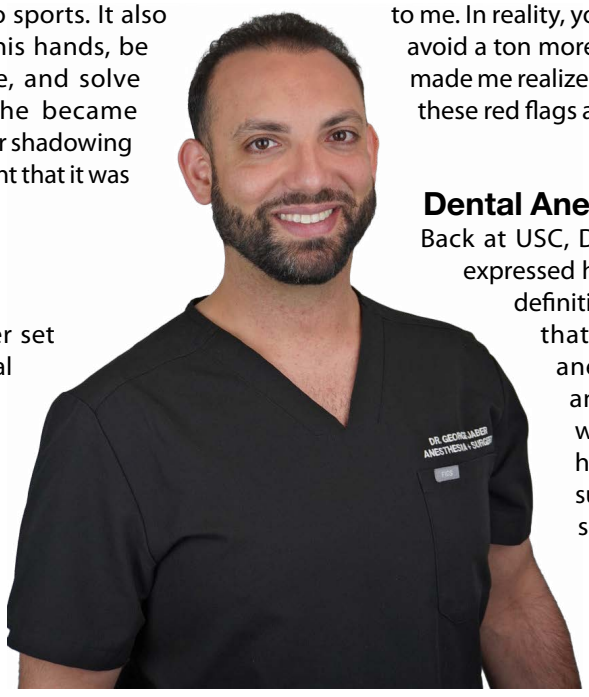
Dr. George Jaber, DDS '13 (USC '08), is a dentist, dentist anesthesiologist, and dental surgeon. He has a reputation that precedes him for his extensive clinical training and expertise in the field of dentistry. He is a board-certified diplomate of the American Dental Board of Anesthesiology and holds a position as an adjunct assistant professor of clinical dentistry and dentist anesthesiologist attending at Herman Ostrow School of Dentistry, University of Southern California. His journey showcases that doing what you love is what matters the most.

The Spark of a Journey

Dr. Jaber grew up in San Francisco, CA. During his childhood, sports were always a fundamental part of Dr. Jaber's life. Whether it was rowing crew, soccer, weight training, or golf, he enjoyed getting out to the playing field and pushing himself. Despite the physical and mental challenges, he always found participating in sports rewarding because it helped him build character and the person he is today. During a race, he enjoyed thinking strategically, building teamwork, setting goals, and taking risks. In fact, it encouraged him to pursue dentistry. He liked how dentistry was similar to sports. It also allowed him to work with his hands, be in health care, help people, and solve challenges. In particular, he became interested in oral surgery, after shadowing his local oral surgeon. "I thought that it was the coolest thing ever."

Dental School

From an early age, Dr. Jaber set his life plan to become an oral and maxillofacial surgeon. He pursued a Doctor of Dental Surgery degree from USC in Los Angeles, CA. As a dental student, he excelled in school and would always be in the oral surgery department actively shadowing, assisting, and volunteering his time. He was also part of Dr. STAT, an in-house emergency response team, where he gained mentorship from Drs. Stanley Malamed and James Tom, dentist anesthesiologists and professors at USC. This is where his initial interest in dental anesthesiology began, especially since anesthesia is integral for oral surgery. After graduation, Dr. Jaber continued to follow his goal and completed an oral and maxillofacial surgery internship at a Level 1 trauma center at the Ohio State University Wexner Medical Center in Columbus, Ohio.



Dr. Jaber

Turning Point

Dr. Jaber recalls one particular occasion during his internship becoming a turning point in his life. He vividly remembers a patient with cancer and chronic pulmonary disease who came into the emergency room with a life-threatening odontogenic infection that compromised the airway. The patient received an emergency surgery but unfortunately did not make it during recovery. "For me, that was a big defining moment because you have to understand other disciplines really well. Although people can say that it was out of the surgeon's hands, it doesn't matter because it is still your patient. In my practice, I don't want this to happen to me. In reality, you can't protect everything, but you can avoid a ton more than what people think. This moment made me realize that I wanted to know how to recognize these red flags and prevent situations like this."

Dental Anesthesiology

Back at USC, Dr. Jaber reached out to Dr. Tom and expressed his interest in dental anesthesiology. By definition, dental anesthesiology is a specialty that aims to deliver safe and effective anesthesia and pain control for dental and oral surgery procedures. Dr. Jaber wanted to pursue this field to better help patients undergo dental and oral surgery treatment by providing advanced sedation and anesthesia care that they may not otherwise be able to receive. The primary role of an anesthesiologist is to ensure optimal patient safety and comfort during surgery by continual medical assessment of the patient. This includes monitoring

and controlling the patient's vital life, functions, breathing, blood pressure, body temperature, and body fluid balance. "In order to do surgery, you need to make the patient feel comfortable. In fact, this translates to all dentistry."

A New Journey

From this moment, he pursued a competitive dental anesthesiology residency at a Level 1 trauma center at NYU Langone Hospital in Brooklyn, NY. Throughout his residency, he saw and took on many complex cases for lifesaving procedures such as gunshot wounds, heat procedures, cancer treatment, diagnostic evaluations, trauma, and reconstruction. Many of these challenging cases helped him become more familiar with understanding how to prioritize a patient's safety in critical situations. "In anesthesiology, the airway is one of the most challenging aspects when it comes to administering anesthesia. Although we did a broad range of cases, we would get many dental and oral surgery cases because we are the ones being most acquainted with the head and neck because we are dentists. This was our subspecialty."

"Especially in dentistry, there is a great need for advanced sedation opportunities for patients that require it." Although hospitals take on dental cases, not all operating rooms are equipped for dental cases. "You can't just take out your high speed, connect it to the equipment, and get to work." Many times, it is challenging to book operating rooms because someone needing a life-saving heart surgery often takes priority over a dental case. In general, there is a tremendous need for anesthesiology for dentistry outside of the hospital. Dental office sedation can be appropriate for many cases too, but not enough offices offer it. Dentists will also try to do it in a surgery center, but often lack the support from other services such as cardiology or pulmonology like a hospital setting would have readily available. "There is a bottleneck in terms of delivery of care, finding facilities, having qualified providers, and handling the level of care." Today, there are only about 350 dental anesthesiologists in the country.

Live Your Best Life Now

After his anesthesiology residency, he moved back to California where he started a mobile anesthesia practice and joined USC to teach students about dental anesthesiology. With his experience and expertise, he started to give lectures around the world about dental anesthesiology. Reflecting on his path, becoming an oral and maxillofacial surgeon was his ultimate career goal for more than 15 years. He worked hard thinking that one day he would achieve this goal. He went wherever he could to achieve his goal. With his continuous love for oral surgery and desire to always learn, he pursued a surgical residency at UCLA Health in Los Angeles, CA to strengthen his skills in surgical implant dentistry. Fortunately, formal training in dentistry, anesthesia, and surgery allows him to effectively communicate with dentists and surgeons alike, providing elevated care to patients. After a few years in practice, Dr. Jaber received a phone call for an acceptance to an oral and maxillofacial surgery program in New York. Of course at the time, Dr. Jaber felt like he finally reached his destination in starting his oral and maxillofacial surgeon journey. In the end, he rejected the offer. That became a bittersweet moment for him because he had to let go of his original dream for the life he has now masterfully built for himself. Today, Dr. Jaber is a prominent figure in the field of dentistry and practices what he loves to do: oral surgery and dental anesthesiology. He believes that a title doesn't define everything about a person. Being happy and competent is what matters in life.

What Is Dr. Jaber Doing Now?

A typical day for Dr. Jaber changes every day. When practicing, he jokes about how it is either a quiet day or an active day. For Dr. Jaber, working as a dentist anesthesiologist is completely different from performing oral surgery. "When I do the sedation, I prefer a quiet day because that means things go safely. Surgery days are much more active and activate a totally different part of my brain." When Dr. Jaber is not practicing, he is somewhere around the world traveling for work and for fun. You can find him traveling the world to give lectures on dental anesthesiology. Most recently, he was invited to a national conference in Chicago in December 2023 to talk about the pharmacology of sedation and patient management for pediatrics, anxious adults, special needs, and geriatric patients. Other times, you can often find him traveling to visit his family or doing sedation cases with his brother, a general dentist, in San Francisco, CA. He enjoys traveling because it teaches him about humanity and gives him appreciation, understanding, and respect for different points of view and ways of life.

Seize the Opportunities!

"To be successful, I encourage people to work diligently with perseverance." He also emphasizes taking opportunities. During his training, he grasped every opportunity and worked hard to enhance his knowledge and practical skills. He believes that there is always something out there for you to grow. "All the training I did also helped me personally because I got a chance to meet people from all different walks of life and experiences.""I am super lucky that the places I trained gave me opportunities to interact with people. When interacting with people and seeing what they bring to the table, you appreciate the colors and flavors that add to life." As he loves interacting with people, you can find Dr. Jaber on Instagram showcasing fun educational videos about his practice philosophy and life as a dentist anesthesiologist and dental surgeon living life and practicing in Beverly Hills and San Francisco @drgeorgejaber.

Dr. Reem Kabbarahn:
Pediatric Dentistry Across Borders

By Merna Ghallab and Nathaniel LaSalle

Dr. Reem Kabbarahn (Dr. R) born and raised in the multi-national melting pot of Damascus, Syria – dually educated in pediatric dentistry in Syria and in the United States (US) – has practiced pediatric dentistry in Syria, the United Arab Emirates (UAE), and the US. She can be found working with the pediatric residents at USC or at her private practice in Los Angeles. No matter where she is or what she is doing, Dr. R brings with her wisdom past her years, experiences enough for a lifetime, and a bright, bubbly personality. Dr. R is driven by her passionate heart and strives to create a safe space for all her patients, making her the perfect role model for all and any aspiring pediatric dentists.

Born in the culturally diverse Damascus, Syria to an American mother and Syrian-Lebanese father, Dr. R was raised in a vast multinational experience. After starting dental school at Damascus University, Dr. R found a mentor in an University of Pennsylvania alumnus oral surgeon who taught her English as it pertains to dentistry. After finishing first in her class at Damascus, Dr. R faced the decision of either pursuing pediatrics or oral surgery. Despite the impact that her mentor had on her, she decided to pursue a career focused on the care of children. When questioned on this decision, Dr. R revealed that watching her mother as a school teacher planted the seed of love and care for children in her heart. During her pediatric residency in Syria, Dr. R started applying for pediatric residencies in the United States as she knew that America could provide her with cutting-edge dental education. With an acceptance letter from USC in hand, she completed her Syrian residency and headed off to start the next.

Dr. Kabbarahn

Looking back on this time, Dr. R remembers being shocked as to how collaborative education was in the US. In her experience, education in Syria was much more individualistic and recalled, "You were left to learn on your own, siloed from your peers." When her studies started at USC she was pleasantly surprised to find ideas and projects alike being shared between students. After graduating from USC, she was back to Syria to open up a private office, but that alone could not fill her plate; on the side she worked as a satellite pediatric dentist in the UAE. While in the UAE, she played a key role in impressing the importance of dental care for children in the communities she was in. However, she felt the magnetic pull back to Southern California, and in 2008, she opened her current practice, Smiles Pediatric Dentistry, in Los Angeles.

Through the practice of pediatric dentistry in three different countries and two residency programs, she has learned many different lessons and identified several goals that shape the way she practices today. A major goal for Dr. R is not only to remove disease and restore health, but also assure that it is done in a gentle and compassionate way that plants a seed of joy in children for dentistry in the future. She wants to create an experience for her patients so that they want to come to the dentist, brush their teeth, and enjoy a lifetime of oral health. With this goal at hand she has enthusiastically incorporated several new advancements into her daily practice. An invaluable tool that Dr. R loves to use is the Single Tooth Anesthesia (STA) system. The STA uses a pressure sensor at the tip of a needle-like delivery device called the wand to detect the amount of pressure at the tip of the needle and deliver local anesthetic at a flow rate below the level that causes pain. In practice, this allows for painless

injections and profound anesthesia. Dr. R also prefers the STA system because the wand eliminates that scary "I'm going to poke you" look. With the use of advancements such as STA and hard and soft tissue lasers, Dr. R is able to make the dentist a place where kids can have fun and not be in pain.

The inspirational, new faculty dentist continued to share insight into her continuous pursuit of knowledge and the transformative impact of returning to USC. Dr. R expresses a profound belief in learning in every moment and interaction, emphasizing the perpetual potential for growth in any field which she coined to be an "eternal student." While independent study dominated her previous academic setting in Syria, she has now learned to appreciate and embrace the camaraderie and team approach prevalent at USC. Teaching, she asserts, is an interactive process, fostering a mutual exchange of knowledge. Dr. R notes that the dynamics of teaching residents also bring unexpected insights as the evolving times contribute to diverse perspectives. She expresses fascination with the unique paths and perspectives of her colleagues and students, anticipating the stories that will emerge from their journeys.

Dr. R will be stepping in for Dr. David Good, who is retiring from his literature review class, a role he has held since 1975. Collaborating with Dr. Good in co-piloting the class, she attends sessions with residents. She expresses deep admiration for Dr. Good, considering him a beacon of education. She notes that the literature review class goes beyond exams, focusing on valuable information with clinical implications. Dr. Good updates the material annually, blending classical foundation with the ever-evolving field of pediatric dentistry.

Considering Dr. R's busy schedule, when questioned about work-life balance and managing responsibilities both at home with her children and at work, she candidly acknowledges that she wasn't initially a good example in this regard. She detailed a past where her life was consumed by work, encompassing long hours at the office, coupled with the demands of studying and working at home. The dynamics of office work and raising children created a hectic schedule, with social engagements being infrequent but significant events. She attributed her approach to life to her upbringing, emphasizing the importance of family, hospitality, and warm, homemade meals for her children. Dr. R appreciates all of her decisions and recognizes that they were all right choices at the time. However, as life evolved, she discovered the value of balance and a more joyful way of living. Contrary to the "no pain, no gain" concept, she advocated for a more holistic approach to life. Through her experiences, she found that taking care of oneself is crucial for personal growth, leading to a better balance between professional and personal aspects.

Stressing the importance of applicability and clinical relevance, she described her own research project, which focused on the comparison of a modern syringe alternative called "the wand" or single tooth anesthesia with traditional methods. Dr. R aimed to gather pediatric patient perspectives by asking for feedback on procedures, a practice she continues today in her current role. The project significantly influenced her career as she recognizes the benefits of the innovative method, particularly its efficiency and patient comfort. She affirmed the significance of her findings, particularly for palatal injections of her pediatric population. Acknowledging the initial investment and the need for disposable handpieces, she praised the system for its built-in safety features and credited Dr. Stanley Malamud for sparking her interest in the technology during her training at USC.

As a final thought, Dr. R shed light on the impactful concept of salutogenesis, emphasizing the active promotion of health in pediatric dentistry. With a wealth of experience and a passion for collaborative care, she highlights the crucial role of education and investing time in building connections with families. Despite the challenges of a demanding clinical schedule, she underscored the values of engaging in meaningful discussions about maintaining and celebrating children's oral health. Dr. R's unwavering commitment to promoting the importance of pediatric dentistry stands as a beacon, highlighting the enduring significance of education, familial connections, and meaningful discussions in cherishing the oral health of children.

Dr. Zhaoyang Liu:
A Tale of Two Joints

By Talar Kevorkian & Richard Lengkong

Dr. Liu

Plants. They were what sparked Dr. Zhaoyang Liu's passion for research as an undergraduate researcher at Nanjing Agricultural University in China. Dr. Liu was particularly interested in how plants react to environmental stress and how this would affect their lateral root formation. After immigrating to the United States to obtain her Master's Degree at Miami University in 2008, she continued using a plant model to better understand the alternative mRNA processing mechanisms of plants including Arabidopsis thaliana. This allowed her to gain the understanding of the effects that various genes and stimuli may have on RNA splicing and polyadenylation. Dr. Liu continued her study at the University of Rochester Medical Center in New York in 2010, where she obtained her Doctor of Philosophy degree. Ultimately, she wanted to incorporate her knowledge of molecular and cellular biology and apply it to studies and innovations pertaining directly to human health. This is when she began using mouse models at the Center of Musculoskeletal Research (CMSR) to learn about the roles of Notch signaling to maintain the articular cartilage. After some time working and studying this highly conserved signaling pathway, Dr. Liu was eager to learn more about tissue cartilage, due to its unique properties and importance in long bone formation.

Dr. Liu's lab focuses particularly on molecular mechanisms that regulate cartilage/joint homeostasis and osteoarthritis. The two signaling pathways that are being focused on are GPCR and STAT3. The knee joint and temporomandibular joint (TMJ) are two structures that are very similar, yet different. In the TMJ, the cartilage looks different from the knee joint. The surface of the cartilage of the TMJ contains cells that have more fibrotic tissue and are more elastic in comparison with the cartilage beneath it, which indicates that it is adapted to the biofunction of the TMJ due to the amount that we use it (See ***Figure 1***). In other words, the mechanical forces faced by the TMJ are different from the loading forces faced by the knee joint. "The biological differences lead to structural differences, which lead to different biological outcomes," mentioned Dr. Liu.

One of Dr. Liu's research interests is to understand the similarities and differences between these two important joints. Aside from the cartilage population in these two joints, Dr. Liu is interested in the articular disc in the TMJ, which is similar to the meniscus in the knee joint. However, the collagen and proteoglycan composition of the meniscus and the structure and function of the two knee joints are different.

Dr. Liu is currently trying to develop new biological methods to understand the gene expression difference at different structural tissues. In order to map gene expression difference onto a structure, updated technology such as spatial transcriptomics is needed (***Figure 2***).

How Spatial Transcriptomics Works

In order to understand what is happening to the cell population on the structure, two knee joints are sectioned and placed together on a paraffin block. One section now covers the two knee joints on the paraffin block, with one being the control and one being the mutant. This section is put onto a spatial expression slide, which releases the RNA from the tissue, allowing RNA to be captured by the expression slide, and now the RNA that is released from the cells can be sequenced with spatial information on it. After sequencing and after obtaining gene expression, this can be mapped back to the tissue to figure out exactly which part of the tissue the gene is expressed. The workflow, shown in ***Figure 2***, shows several K expression markers of different tissues. As shown, there are higher and lower expressions of biomarkers in different tissues. This is how spatial transcriptomics workflow can be worked in mineralized joint tissues, which is very challenging for tissues of the TMJ or knee joint which are mineralized tissues, and not soft tissues. This means that to get a nice section, the tissue needs to be fixed and decalcified to make it soft prior to sectioning and gene analysis. This technique has been applied to soft tissue in the brain and spinal cord, which are easy to manipulate. However, in order to study craniofacial biology or

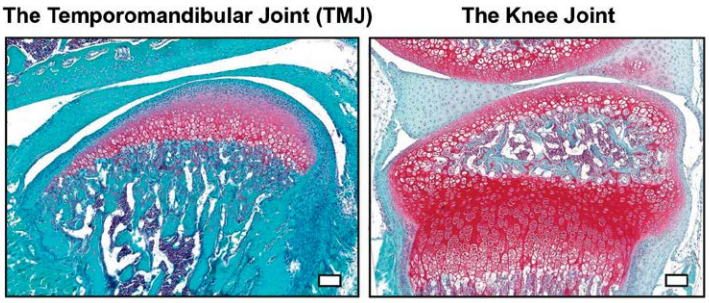


Figure 1. Histological analysis of TMJ and knee joint showing varied amounts of fibrotic tissues.

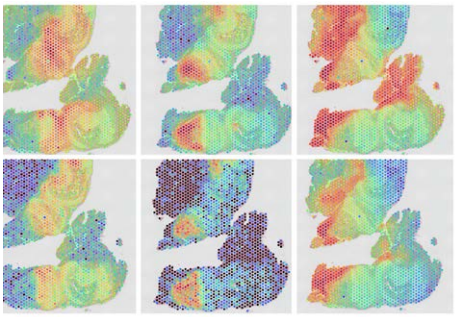


Figure 2. Spatial Transcriptomics showing varying levels of gene expression onto the structure under investigation.

orthopedics, this technique needs to work on hard or mineralized tissue. "Our contribution to the field is to adopt the most sophisticated technique in the field and get it to work in craniofacial and orthopedic research," Dr. Liu said.

Incorporating Spatial Transcriptomics

In order to understand gene expression, the regular and widely used method is quantitative PCR (qPCR), which is why we extract RNA from the entire tissue, and the gene expression of the genes of interest is performed. This is an example of a smaller scale biased technique and a cheap method. It is biased because only a certain amount of the gene of interest can be picked to detect its expression. Not only that, when the RNA is getting extracted, the whole tissue can be destroyed. Since the whole tissue is destroyed, the cell type information of the specific tissue will be lost. Single cell RNA sequencing is then used to solve these shortcomings of qPCR where gene sequence expression can be performed in each single cell. There is still a limitation of this technique, however. During the dissociation of the tissue into single cells, the spatial information will also be lost. For example, the knee joint has articular and gross plate cartilages. Following the dissociation of these cartilage tissues into single cells, backtracking and differentiating between the two different cartilages becomes impossible. Spatial transcriptomics comes into play to serve as a better solution for the issues mentioned, which is to obtain gene expression as well as the spatial information. Therefore, it is an unbiased technique for the purpose of Dr. Liu's research. A limitation for the spatial transcriptomics method is that the results obtained are not at single-cell resolution. It can only capture a very small group of cells to assign spatial particles. The next step to improve this technique is to combine the single cell RNA sequencing with the spatial transcriptomics method to obtain gene expression and pinpoint the exact location of the cells.

Therapeutic Approaches of Dr. Liu's Research

GPCR is the largest group of receptors that many researchers try to focus on and is also the largest group of FDA-approved drugs. This is due to the ease of targeting GPCR as they are cell surface markers and the largest group of receptors in mammalian cells. During her research analyzing the role of GPCRs, particularly ADGRG6, in joint cartilaginous tissues, Dr. Liu was able to understand how cyclic AMP and STAT3 contribute to maintaining articular cartilage. These are effectors of ADGRG6 that play an important role in signaling pathways. Dr. Liu's groundwork efforts in research and experimentation earned her the K99/R00 award, a highly competitive award given to postdoctoral scientists and researchers. She began working at the University of Southern California's Center for Craniofacial and Molecular Biology (CCMB) in 2022.

Dr. Liu hopes to discover several GPCRs that are highly expressed in cartilage that might have a chondroprotective effect to protect the cartilage by reducing mechanical loading and enzyme degeneration stress. Dr. Liu found that ADGRG6 is highly expressed on the superficial and intermediate zones of the articular cartilage. By challenging the cartilage with cytokines such as IL-1 and IL-6 and overexpressing the GPCRs, Dr. Liu found out that the cells appeared to result in counter-protective effects compared to the cells without the ADGRG6. The role of ADGRG6 in TMJ is also a research interest for Dr. Liu's research in the future.

Conducting research can be stressful and very difficult at times. Dr. Liu enjoys doing calligraphy during these times to clear her mind. In her free time, she also loves spending time with her family. She has two very active young boys who like doing sports on the weekends, such as swimming and soccer. Dr. Liu's journey as a researcher started with studying plants as well as using mouse models. It has now advanced to using techniques such as spatial transcriptomics to better understand the mechanisms that regulate cartilage and joint homeostasis. Her knowledge, discoveries, achievements, as well as the resources at USC's Center for Craniofacial Molecular Biology will enable her to contribute her scientific knowledge to the field in order to devise therapeutic means to prevent osteoarthritis.

Surfing the Waves of Chronic Pain:

Dr. Jason Kutch's Innovative Approach

By Greg Park and Deep Thakker

Dr. Kutch

In the vast realm of medical research, the convergence of mechanical engineering, neuroscience, and interdisciplinary collaboration has given birth to groundbreaking studies. Dr. Jason Kutch, currently an associate professor in the USC Division of Biokinesiology and Physical Therapy, embarked on a unique journey that led him to explore the profound impact of surfing on chronic pain.

Dr. Kutch's academic journey started with a bachelor's degree in Mechanical Engineering from Princeton University in 2001. His early passion lay in unraveling the mysteries of how the brain controls movement, propelling him to construct robots mimicking the brain's ability to control muscles. This interdisciplinary pursuit guided him to a Ph.D. in Applied Mathematics from the University of Michigan in 2008, where he delved into the mathematical theory of neuroscience.

In 2011, Dr. Kutch transitioned into a faculty position, steering his research focus towards chronic pain. His curiosity was piqued by the overlap between the brain systems that control movement and those involved in chronic pain. Mapping out the brain's surface and targeting circuits via non-invasive stimuli became central to his research endeavors.

Personal Revelation and Multidisciplinary Collaboration

Dr. Kutch's personal encounter with chronic pelvic pain, developed during his Ph.D. studies, took an intriguing turn. While it was not resolved during his time at the University of Michigan, he started to surf for fun when he moved to California, and his pain remarkably diminished every time he engaged in surfing. This revelation, coupled with a Netflix documentary featuring veterans with PTSD finding relief in water, prompted Dr. Kutch to initiate a multidisciplinary study. The study involved collaboration with engineering experts and the Division of Biokinesiology and Physical Therapy, and it received funding to explore how surfing could rewire the brain to alleviate pain.

Realizing the profound impact of surfing on chronic pain, Dr. Kutch sought to understand the underlying mechanisms. He once had a dream to use a mini-MRI machine in the back of his van to scan the surfer's brain before and after the activity, but he faced limitations. Instead, he employed a portable EEG device, in the form of a headband, to capture objective evidence of brain activity patterns during surfing sessions.

"Chronic pain," Dr. Kutch said, "is not only a physical discomfort but also an unpleasant emotional and sensory experience that exists for a long period of time to the point that the body interprets pertinent sensory signals as alarming and painful." The underlying theory postulates changes in the salience network, a system responsible for scanning sensory stimuli and assessing their threat level. Dr. Kutch hypothesized that pain could be diverted in dynamic environments, such as in water, which forces individuals to redirect their attention to the outward world and on external stimuli.

His pilot study proved that surfing, in fact, produced significant changes in the brain activity in patients suffering complex chronic pain, coupled with pain reduction. After understanding the potential benefits of surfing on pain reduction through his experience and study, Dr. Kutch started to delve into the neuroscience of surfing and the mechanism by which brain activity is changed.

Engineering Virtual Reality Surfing

To systematically study the benefits of surfing, Dr. Kutch initiated a project to engineer a virtual reality environment. The team aimed to

Figure 1. A virtual reality surfing simulation model in Dr. Kutch's lab

replicate the experience of surfing without the need for ocean access. Dr. Kutch recalled that this model of study was unprecedented, so he needed to consider a lot of principles of mechanical engineering and neuroscience to get this project funded to systematically study which aspects of the environment during surfing creates the benefit of pain reduction.

The first critical element involved a six-degree freedom motion, allowing users to experience rotation in three directions without a VR headset. Subtle motions, such as mimicking the real board's movement and incorporating elements like airflow from the fan that creates the sense of wind, aimed to create an immersive surfing experience. It has been their focus to understand whether pain relief effects come from the action of picking up the waves or being able to turn the wave on by creating an immersive environment and incorporating vision, motion, and tactile sensations.

Complexities in Chronic Pain Research

Dr. Kutch faced several challenges in his research, including the complexity of chronic pain and the subjective nature of pain reporting. He emphasized the need for both objective and subjective measures to comprehensively evaluate pain outcomes. The studies conducted on chronic overlapping pain conditions revealed greater connectivity between specific regions of the sensory cortex and the salience network, shedding light on the neural mechanisms underlying pain perception. In addition, chronic pain has been a big burden to the medical system. With this study, he anticipates mapping out the brain circuits related to muscle control.

Another study Dr. Kutch is involved in includes trying to understand why people are likely to develop chronic overlapping pain conditions, such as in pelvic, jaw, and low back pain. He aims to look at a larger number of neuroimaging studies and gain an understanding of their relationship between brain structures and functions. With solid foundations of primary findings via his studies, Dr. Kutch is looking forward to extracting greater connectivity between specific regions of the sensory cortex and the salience network, exploring the relationship between actual or potential threat and pain. This will eventually unlock our understanding of how the brain interprets and processes signals.

Navigating Personal Experience and Scientific Objectivity

Balancing personal experience with scientific objectivity is a challenge Dr. Kutch grapples with in his research. While his own positive experience with surfing guides his direction, he strives to maintain objectivity in designing well-controlled trials. In addition, due to problems that arise from multiple different scales, it is a very slow process and an overwhelming task to pick apart where the brain is stimulated to produce therapeutic effects. The holistic nature of surfing therapy adds a layer of complexity to the study of pain, requiring innovative approaches to measure outcomes.

Surfing the Waves of Transformative Impact

The success of Dr. Kutch's research is evident in patient testimonials. Participants in the virtual reality surfing therapy study reported significant pain reduction and expressed excitement after sessions. During the post-talk interview with one of the study participants who had been suffering from debilitating, chronic pain, Dr. Kutch found them coming out of the water with a giant smile, giving a sense of satisfaction and fulfillment that his team has made a huge impact on their lives.

Though he's excited about his colleagues saying nice things about his work, he can't be happier when he hears the patients in the study describe the experience, saying it is the first time they felt freed from their chronic pain. He uses personal experience as a guide and inspiration to fuel his passion for this potential transformative impact of this innovative approach to understand neuroscience and to alleviate pain for many.

Dr. Kutch recalls one of the best compliments he has ever received when he took his 12-year-old daughter to the lab and she said about his VR surfing project, "Dad, you created a work of art."

Dr. Jason Kutch's journey from mechanical engineering to chronic pain research and virtual reality surfing therapy exemplifies the power of interdisciplinary collaboration and innovative thinking in scientific exploration. His groundbreaking studies offer hope for individuals suffering from chronic pain, showcasing the potential of non-traditional approaches to reshape our understanding and management of pain. As Dr. Kutch continues to ride the waves of scientific discovery, the future holds promise for a new era in pain therapy.

Pioneering Advances in Prosthodontics at USC and Beyond

By Eman Rafalian and Justin Matian

In the constantly evolving landscape of dental research and education, Dr. Alberto Lazaro shines as a beacon of expertise and innovation in the field of Advanced Prosthodontics. Recently welcomed into the Trojan family at the University of Southern California (USC), Dr. Lazaro brings with him a wealth of experience and a fervent commitment to advancing the realm of dental prosthetics. A native of Barcelona, Spain, Dr. Lazaro earned his Doctor of Dental Surgery (DDS) in 2019 and subsequently decided to elevate his professional trajectory by pursuing advanced studies in Prosthodontics at USC as part of the graduating Class of 2024.

As a current third-year Prosthodontics resident, Dr. Lazaro has thrived as a member of the Trojan family. He has excelled in his coursework and is driven by a fervent dedication to research. Furthermore, he has been actively engaged in various projects, leaving a mark on both the Advanced Prosthodontics and the Master of Science in Biomaterials and Digital Dentistry programs.

In the domain of Advanced Prosthodontics, Dr. Lazaro spearheads a study in the field of implants and digital dentistry. His main interests include exploring the influence of different types and configurations of implant digital analogs. This investigation probes into the nuanced impact of differences in shape and retention mechanisms between different implant brands and systems and their influence on the final position of these analogs on digitally printed implant casts. Meanwhile, within the Master of Science in Biomaterials and Digital Dentistry program, Dr. Lazaro conducts research regarding the influence of different materials (milled and printed materials) and their thickness in regards to the transmittance of light. The findings of this research allows for a greater understanding in comprehending the relatively new intricacies of digital dental procedures, with the potential for refining precision standards and material choices in prosthodontic applications based on patient needs.

Dr. Lazaro harbors a profound conviction regarding the significance of prosthodontics as a pivotal field in modern dentistry. He underscores prosthodontics' crucial role in restoring not only the physical aspects of a patient's oral health but also their overall well-being. Prosthodontics, encompassing the reconstruction and rehabilitation of oral structures through crowns, bridges, or implants, directly impacts an individual's quality of life. Dr. Lazaro perceives prosthodontics as a dynamic field that perpetually evolves to meet the diverse needs of patients, positioning it as an indispensable cornerstone in contemporary dentistry.

Dr. Lazaro's decision to choose USC for his advanced studies is underpinned by the university's renowned strength in Advanced Prosthodontics. His dedication to advancing the field aligns seamlessly with USC's commitment to excellence in dental education and research. He has felt completely welcomed by his colleagues at USC and has enjoyed everything the institution as well as the city of Los Angeles has had to offer throughout his journey here.

Beyond academia, Dr. Lazaro indulges in a diverse array of activities during his free time. His penchant for travel, exploration, and cross-cultural connections aligns harmoniously with a passion for exercise—whether it is running, biking, playing tennis, or engaging in regular workouts. He loves to go to the beach and play volleyball with friends during the weekends. Additionally, he savors the experience of sampling new cuisines and exploring various gastronomic establishments, reflecting his appreciation for life's multifaceted experiences. He does love the food here, but there are times where he truly misses the food from Spain!

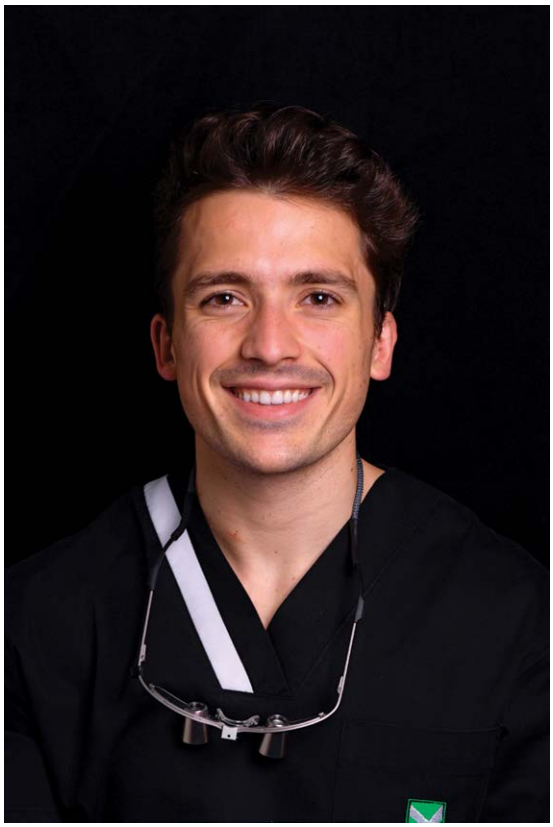
Beyond the academic realm, Dr. Lazaro's diverse interests and activities paint a vivid picture of a well-rounded individual. The integration of regular exercise and social experiences in conjunction with a deep passion for Prosthodontics reflects a holistic approach to well-being. Additionally, his appreciation for exploring various cuisines and gastronomic establishments adds a flavorful dimension to his life outside the research lab!

Looking ahead, Dr. Lazaro envisions his research contributing significantly to the advancement of prosthodontics. Through the ongoing exploration of digital dentistry, both in the field of implant dentistry as well as on dental materials, he anticipates a future where prosthodontic procedures become more precise, efficient, and tailored to individual patient needs. The outcomes of his research have the potential to reshape clinical conventions and practices that have been around for some time, offering clinicians valuable insights into selecting the most effective digital technologies and new materials for optimal patient outcomes. Dr. Lazaro aims to deepen the field's understanding and contribute to the ongoing

evolution of prosthodontics, ensuring it continues to meet the highest standards of care in contemporary dental practice. Through his steadfast dedication to advancing knowledge in prosthodontics, Dr. Lazaro stands as a beacon of progress in the pursuit of improved oral health and patient well-being.

Furthermore, the complexity of Dr. Lazaro's research reflects his commitment to pushing the boundaries of knowledge in Prosthodontics. By examining the interplay between implant characteristics and digital processes, he aims to provide a comprehensive understanding of the factors influencing the outcome of prosthodontic treatments. This research has far-reaching implications, potentially leading to advancements in precision standards and material choices in the field. He recognizes the pivotal role Prosthodontics plays in restoring not only the physical aspects of a patient's oral health but also their overall well-being. The reconstruction and rehabilitation of oral structures through crowns, bridges, or implants directly impact an individual's quality of life. Dr. Lazaro perceives Prosthodontics as a dynamic field that continually evolves to meet the diverse needs of patients, positioning it as an indispensable cornerstone in contemporary dentistry.

As Dr. Lazaro looks ahead, his vision extends beyond individual research projects. He envisions a future where his cumulative contributions significantly advance Prosthodontics as a whole. The potential outcomes of his research have far-reaching implications, extending beyond the confines of academic inquiry to reshape clinical practices and offer valuable insights to clinicians. Dr. Lazaro's commitment to deepening the understanding of Prosthodontics and contributing to its ongoing evolution is a testament to his dedication to the highest standards of care in contemporary dental practice. His steadfast pursuit of advancing knowledge in Prosthodontics positions him as a beacon of progress, contributing to the ever-expanding landscape of dental research and education. In his role as a catalyst for improved oral health and patient well-being, Dr. Lazaro's impact is both profound and far-reaching.



Dr. Lazaro

Revolutionizing Learning: A New Horizon in Orofacial Pain

By Haeseong Lee and Pahul Warya

Dr. Ahmadieh

Dr. Ahmadieh's odyssey in dentistry intricately intertwines familial influence, academic pursuit, and a steadfast commitment to pushing professional boundaries. Raised in an environment where her parents actively engaged in medical discussions, she developed not only a natural affinity for the subject but also a profound connection to the healthcare realm from an early age. The combined impact of her parents and her aunt, a dentist, played a pivotal role in shaping the initial chapters of her life.

This familial exposure not only laid the groundwork for her aspirations but also kindled a curiosity that continued to illuminate her dental path. In 2003, driven by innate curiosity and familial influence, Dr. Ahmadieh earned her Doctor of Dental Surgery (DDS) from Tehran Azad School of Dentistry. Expanding her horizons, she obtained a Master of Science in Oral Medicine and Diagnosis from Shahid Beheshti School of Dentistry in 2009, solidifying her commitment to a specialized path within dentistry.

In 2012, a pivotal move to the United States, prompted by her husband's fellowship at the University of Southern California, proved transformative for her career. Over the next two years, she underwent rigorous post-graduate training in Orofacial Pain and Oral Medicine, completing the dual certification program at the Herman Ostrow School of Dentistry of USC. This experience not only broadened her horizons but also propelled her into the specialized realm of Orofacial Pain, where she would later leave an indelible mark.

Transitioning into a volunteer faculty member at USC, Dr. Ahmadieh later assumed the significant role of Clinical Assistant Professor of Dentistry in the Department of Biomedical Sciences in 2015. Here, she embraced the role of a mentor, imparting knowledge and shaping the next generation of dental professionals. In 2022, she reached a significant milestone, being appointed Associate Professor of Dentistry, a testament to her sustained dedication and contributions to the field.

Beyond her titles and academic positions, Dr. Ahmadieh is board-certified in Orofacial Pain and recognized as "Diplomate" by the American Board of Orofacial Pain, and as "Fellow", by the American Academy of Orofacial Pain, underscoring her unwavering commitment to excellence and expertise within the specialized realm of Orofacial Pain.

Dr. Ahmadieh has played a pivotal role in introducing a unique approach to teaching Orofacial Pain. Recognizing the need for clinicians to identify and address non-odontogenic sources of tooth pain, she has worked with Dr. Navazesh to develop the groundbreaking "Maria's Lingering Pain"; Dr. Ahmadieh serves as a director for this module and has proudly presented this valuable course to the DDS and ASPID students since 2020. The innovative learning approach for the new Orofacial Pain module is based on a flipped classroom pedagogy, where case material is delivered ahead of time, with a rich array of resources, including textbooks, journals, podcasts, and videos. Students engage with the material through questions, surveys, and constant feedback, fostering a dynamic learning environment. This module has proven to be successful in exposing predoctoral students to different aspects of orofacial pain, specifically, neuropathic pain and trigeminal neuralgia disorders. As a result of her efforts, students have been better able to understand pain mechanisms and developed greater diagnostic proficiency; furthermore, they have been more prepared for the "Orofacial Pain" rotation. In addition to her involvement in pioneering and shaping the predoctoral curriculum at USC, Dr. Ahmadieh has amended multiple PBL cases with Orofacial pain-related contents, such as "The King's High Crown" and "Dr. DeOlio."

Her commitment to Orofacial Pain education extends beyond the PBL classroom, as she frequently joins the Orofacial Pain Clinic to actively engage with students on rotation. In addition to being involved in teaching the DDS and ASPID students regarding major concepts of Orofacial Pain, Dr. Ahmadieh collaborates with Dr. Padilla in teaching the Orofacial Pain topics to the post-graduate residents, including restorative, endodontics, periodontics, and prosthodontic residents.

Dr. Ahmadieh's dedication to creating a comfortable and productive learning environment is widely known by the students. Her exceptional teaching abilities and enthusiasm for teaching were recognized with the "Faculty Appreciation Award" in 2016 and the "Faculty Award for Excellence in Teaching" in 2023, having been selected by the DDS Class of 2023. It is beyond question that her innovative curriculum development and compassionate teaching abilities have enriched dental education at USC.

While her main role at Ostrow is teaching, Dr. Ahmadieh has been passionate about research throughout her education and career. During her dental studies in Iran, she conducted a cohort study on the eruption of primary teeth in low-birth-weight infants. Her thesis during residency investigated oral microflora in patients on hemodialysis and kidney transplant recipients, which was cited in the 13th edition of Burket's Oral Medicine textbook. Her research interests have allowed for collaboration with other USC research luminaries. This cooperation resulted in publishing multiple systematic reviews and meta-analyses including "Osseointegration of Dental Implants and Osteonecrosis of the Jaw in Patients Treated with Bisphosphonate Therapy" as well as "The Utility of Serum C-telopeptide cross-link of type 1 collagen as a predictor of Bisphosphonate-Related Osteonecrosis of the Jaw" (in collaboration with Dr. Sedghizadeh), and "Is saliva collected passively without forceful coughing sensitive to detect SARS-CoV-2 in ambulatory cases? A systematic review" (in collaboration with Drs. Dincer and Navazesh). The latest review on the role of saliva in diagnosing COVID-19, of which Dr. Ahmadieh serves as the first author, was proudly published in the Journal of "Oral Surgery, Oral Medicine, Oral Pathology, and Oral Radiology".

In addition to peer-reviewed publications, Dr. Ahmadieh co-authored with Dr. Navazesh on a book chapter titled "Saliva and Drugs of Abuse" (published in Salivary Bioscience). She has also presented multiple abstracts in different scientific meetings. Dr. Ahmadieh's commitment to research is further highlighted by her role as an invited reviewer for multiple journals, such as the Journal of American Dental Association (JADA) and the Journal of Public Health Dentistry.

In addition to her remarkable contributions to teaching, research, and curriculum development, Dr. Ahmadieh has also been actively engaged in presenting Continuing Education (CE) courses. These courses have allowed her to extend her influence beyond the classroom, reaching a broader audience of dental professionals seeking to enhance their knowledge and skills in Orofacial Pain and Oral Medicine. Her collaboration with colleagues on developing educational materials, such as the "Cranial Nerve Examination" video and "Characteristics of Pain in Trigeminal Neuralgia vs. Trigeminal Neuropathy" podcasts, demonstrates her commitment to advancing the understanding of Orofacial Pain in the broader dental community. Dr. Ahmadieh has worked closely with Dr. Padilla, to educate and empower fellow dental professionals in the ever-evolving landscape of Orofacial Pain and Oral Medicine.

Dr. Ahmadieh's involvement extends beyond the walls of USC, as she is an active member of the American Board of Orofacial Pain (ABOP), American Academy of Orofacial Pain (AAOP), American Dental Education Association, and the American Academy of Oral Medicine. As a trailblazer in the Orofacial Pain community, she sits on the exams board committee for the American Board of Orofacial Pain, as well as the research committee for the American Academy of Orofacial Pain, creating, administrating, and evaluating examinations and reviewing grants, respectively. She recently joined the Commission on Dental Accreditation (CODA) as a site visitor for "Advanced Orofacial Pain" programs nationwide.

Dr. Ahmadieh is not only a dedicated professional but also a devoted mother of two, balancing her role as a working mom with her family responsibilities. Her commitment to her family is matched by her commitment to her profession, and the support of her husband and children has been instrumental in maintaining this balance. Dr. Ahmadieh's journey exemplifies the profound impact one can have in one's field. Her dedication to teaching, research, and her community and family along with her unwavering commitment to educating the next generation of dentists is a source of inspiration for aspiring dental professionals.

Forging a Path in the Field of Orthodontics

By Steffi Chen & Bahar Khalilian

Professor Ellen Grady's academic and professional journey serves as a testament to her resilience, adaptability, curiosity, passion, and unwavering commitment to the field of orthodontics. Born in Chicago, Illinois, and having lived all over the United States, Professor Grady aspired to join the medical field from a very early age. Professor Grady's journey started at college, where she studied speech to fulfill her ambition of working as a speech therapist in hospitals. During this time, Professor Grady was particularly intrigued by the phenomenon that the position of one's teeth could affect one's speech. When she realized that the connection between teeth position and speech had been underestimated by her colleagues, Professor Grady dedicated her Master's thesis to exploring this topic, alongside dentofacial growth and development.

At the same time, Professor Grady began working as a secretary for Dr. Robert M. Ricketts (1920-2003). Dr. Ricketts was a renowned orthodontist known for his many contributions to the profession of orthodontics, including cephalometric analysis and the 0.018-inch slot in an orthodontic bracket; he was also widely recognized for his expertise in temporomandibular joint disorders and orthodontics for jaw surgery. Dr. Ricketts served on the UCLA/St. John's Cleft Palate and Craniofacial Team and conducted groundbreaking research on the growth and structural variation of the face and jaws—a subject that bolstered Professor Grady's curiosity and motivation. Through her new position, Professor Grady delved deeper into the world of orthodontics. "I had fallen in love with [the work] I was doing." Professor Grady had found passion for a field that resonated with her deeply.

This period invariably laid the groundwork for Professor Grady's subsequent roles in orthodontics. She regularly attended orthodontic seminars; and during one such seminar, Professor Grady met and was recruited by a group of orthodontists who were forming a consulting company for private orthodontics practices. Their strategy focused on implementing fundamental business principles in the private practice setting. In this role, Professor Grady held a multitude of responsibilities—she conducted research, organized educational seminars, trained consultants, and counseled countless orthodontists. After many years with the company, Professor Grady took the bold step of starting her own dental consulting company in 1982. Professor Grady continued to forge her own path in the field of orthodontics, providing consulting services to dentists, hospitals, and veterinarians.

Another pivotal development in Professor Grady's orthodontic journey occurred in the early 1990s, when Dr. Peter Sinclair recruited Professor Grady to join the University of Southern California (USC) as a faculty member. As the Chairman of the Advanced Orthodontic Program at USC, Dr. Sinclair resolved to provide educational opportunities for the orthodontic residents to learn more about practice management. Having heard Professor Grady's lectures at various orthodontic meetings, Dr. Sinclair had found the ideal expert to implement this endeavor. Thus, in 1994, Professor Grady began teaching a practice management course to the orthodontic residents at USC, all the while running her dental consulting company. This collaboration would forever impact contemporary orthodontic education at USC.

Professor Grady designed the year-long course to teach the orthodontic residents the essentials of business management, marketing, and effective communication. A structured and highly specific curriculum was created to provide opportunities for orthodontic residents to thoroughly grasp the latest developments and techniques in orthodontic practice management. "My goal was to teach them all of the things that they needed to be aware of [when running a practice]—what trends don't work, what should be excellent, and when to get help." A sampling of the topics taught in the course include orthodontic office design, marketing strategies, patient scheduling, overhead expenses, patient demographics, and financial management. The course proved an incredible success. In fact, many of Professor Grady's students kept their notes from the course and utilized them as a guide when starting their own orthodontic practices. In 1997, the course officially became part of the Advanced Orthodontic Program's curriculum. Later in 2001, the model for the course was articulated in an article titled "Preparing to practice and manage: A program for educating orthodontic residents in practice management." Authored by Dr. Sinclair and Professor Grady, the article was published in the American Journal of Orthodontics and Dentofacial Orthopedics. It detailed how the integration of practice management principles into orthodontic graduate programs can help

young practitioners avoid many of the mistakes typically made in developing an orthodontic practice, as well as provided resources and guidelines for a new orthodontic practice owner.

As the times change, so does Professor Grady's course. The factors that affect the success of an orthodontic practice are ever evolving, and as a result, Professor Grady prioritizes the continual development of her course. The contents of the course are updated every year to incorporate the shifting intricacies of practice management. For instance, an integral component of Professor Grady's course in its current form is the utilization of social media as a marketing tool. "The world changes continuously. Students don't have twenty years to figure out how to turn their practices on their own. The time just isn't available anymore and it costs too much." However, the core mission of the course remains the same—to provide orthodontic residents with the skills and knowledge required to own, manage, and grow a successful orthodontic practice.

Furthermore, Professor Grady's vigor and passion extend far beyond the classroom. An avid traveler, Professor Grady has consulted in 49 different states, as well as in Italy, France, Germany, and Switzerland. At each new destination, Professor Grady completely immerses herself in the culture by experiencing every aspect of the art, history, and nature. "I always try to get to know the country from the perspective of the people who live there." This enthusiasm for exploration has led Professor Grady to partake in fishing and kayaking in Alaska, to traverse the pristine landscapes of Romania, to behold historical monuments all over the world, and to even witness the humane and painless dehorning of rhinoceroses in South Africa to protect them from poachers. In fact, Professor Grady will soon be traveling to Africa again later this year. Also a highly talented photographer, Professor Grady documents these world travels through her camera lens. Many of her stunning wildlife photographs decorate her office desk—the wrinkled, inquisitive eye of an elephant, vast landscapes, and many more vivid images serve as an exquisite reminder of all the places she has traveled.

Dr. Grady

With such an immense wealth of experience and knowledge, Professor Grady's future knows no bounds. Recognized throughout the halls of the dental school as a "fixer of everything," Professor Grady's presence in the Advanced Orthodontic Program at USC is ubiquitous, vital, and revered. As Professor Grady looks toward the future, she remains entirely dedicated to her work and her teaching, striving to contribute for as long as she perceives the value of her efforts.

When asked what advice she would like to give to dental students and aspiring orthodontists, Professor Grady provides three main takeaways. First, from a clinical aspect, Professor Grady recommends that dental students adhere to the USC standard of excellence. "The goal here at school is to train you to be a dentist. The mantra here for each of you should be excellence—quality over quantity." In addition, Professor Grady emphasizes that, within the dental profession, the happiness and satisfaction of doctor and patient are wholly intertwined. "Do what you love because otherwise, you and your patients are going to be unhappy." Lastly, Professor Grady advises dental students to maintain foresight and continually look toward the future. "Get to know your future options, where you want to practice, and which community you want to serve. And if you aren't sure where to start, you can always ask for help and advice from your dental friends."

A Competitor's Journey: *From College Football to Craniofacial Surgery and Cleft Lip Repair*

By Arya Sahabi & Kaveh Mahdavi

Dental school, medical school, oral maxillofacial residency, plastic and reconstructive surgery residency, and pediatric plastic and craniofacial surgery fellowship were plan B. Plan A? Playing middle linebacker for the Chicago Bears and following that up with a career in broadcasting for ESPN or as a sports agent. Dr. Jeffrey Hammoudeh's journey is just as unique as his subspecialty within medicine.

When he was a child, Dr. Hammoudeh immigrated to the US from the Middle East. As is typical for a zero-generation immigrant family, his parents encouraged him to become either a doctor or a lawyer. But Dr. Hammoudeh had a different plan. He wanted to play for the Chicago Bears. He played his senior year of football at Notre Dame High School when he was 16 years old, with an eye on big name football programs. However, he was only recruited by local colleges including Northwestern and Northern Illinois University. That is when he knew he had to be the "underdawg" moving forward and prove himself on and off the field. His parents encouraged him to go to Northwestern because of its great reputation in the Midwest but he decided to attend Northern Illinois for a better athletic option. Hiding his true intentions, he told his parents about his strategic plan where he would go to Northern Illinois for undergraduate and then go to Northwestern for graduate school. Despite these claims, Dr. Hammoudeh really went to Northern Illinois because he was "16 and a rebel" who did not want to live at home and play for a terrible Northwestern team.

Dr. Hammoudeh's primary focus at Northern Illinois University was football. Having looked up to greats like Dick Butkis, Mike Ditka, and John Madden, he knew he did not want to be average. He understood that that excellence only came with significant sacrifices on and off the field. A football injury in his third year made him realize that his path to greatness was not straightforward; his dream to play for the Chicago Bears was not going to happen. It made him realize he needed a plan B.

Dr. Hammoudeh's plan B was dental school. He had done well in his undergraduate coursework and was accepted to the Northwestern University Dental School; but, his passion for success on the football field carried over to academia and he demanded more out of himself. He quickly realized that he would not be happy in general dentistry without specializing. Dr. Hammoudeh took interest in oral and maxillofacial surgery due to its overlap with the medical world, and started spending time with the oral surgeons and residents at Northwestern. He set himself on excelling in dental school, with the goal of being admitted into Northwestern's dual degree Oral and MaxillofacialSurgery (OMFS) residency program. After receiving his DDS, he was admitted to the Northwestern University Medical School and OMFS residency program, despite those around him telling him that it would be "impossible." Dr. Hammoudeh earned his MD from Northwestern in 2000 and started his internship in OMFS. On the recommendation of his program chief, Dr. Pecaro, Dr. Hammoudeh transferred to the Harvard OMFS program to complete his general and oral surgery training at the Massachusetts General Hospital.

Dr. Hammoudeh's initial exposure to plastic surgery occurred during his general surgery training. It was here that he first developed his fascination with craniomaxillofacial surgery and its overlap between plastic and oral maxillofacial surgery. He felt it was imperative to train formally in plastic surgery–a medical specialty–in order to fully appreciate this overlap. Dr. Hammoudeh continued his training at the University of Miami, where he completed his residency in Plastic and Reconstructive Surgery. There, he discovered his passion for pediatric plastic and craniofacial surgery, merging his years of education and expertise in dentistry, medicine, and surgery. To fully explore this, he completed a fellowship at USC/Children's Hospital Los Angeles (CHLA) with Dr. Urata and Dr. Reinisch in pediatric plastic and craniofacial surgery. Eighteen years later, he is still at USC where he serves as Associate Chief of Plastic and Maxillofacial Surgery and Director of the Jaw Deformities Center at CHLA; Associate Professor of Surgery at the Herman Ostrow School of Dentistry; and Professor of Clinical Surgery at the Keck School of Medicine. Reflecting back on his journey, he jokes that maybe plan B was not so bad.

Plan A and plan B were unified by the drive to be great. Dr. Hammoudeh describes this drive as a psychosis of sorts. Whether in football or surgery, Dr. Hammoudeh has always been driven to be a little better every day. For him, this drive is not in pursuit of success; rather, the drive itself is success. Knowing that you gave 110% everyday, that you gave it your all, is a value that has been embedded in Dr. Hammoudeh as long as he can remember. This drive is embodied by the poster of Vince Lombardi's "What it Takes to be Number One" speech Dr. Hammoudeh has

had since the fifth grade. The poster has gone with him from grade school, to high school, to college, and even to his office today. His favorite excerpt reads, "Winning is not a sometimes thing; it's an all the time thing. You don't win once in a while. You don't do things right once in a while. You do them right all the time. Winning is a habit." He emphasizes that this is not about sports; it is about life. Whether in sports, medicine, politics, or family life, success is expecting the best from yourself to optimize your potential and do the right thing.

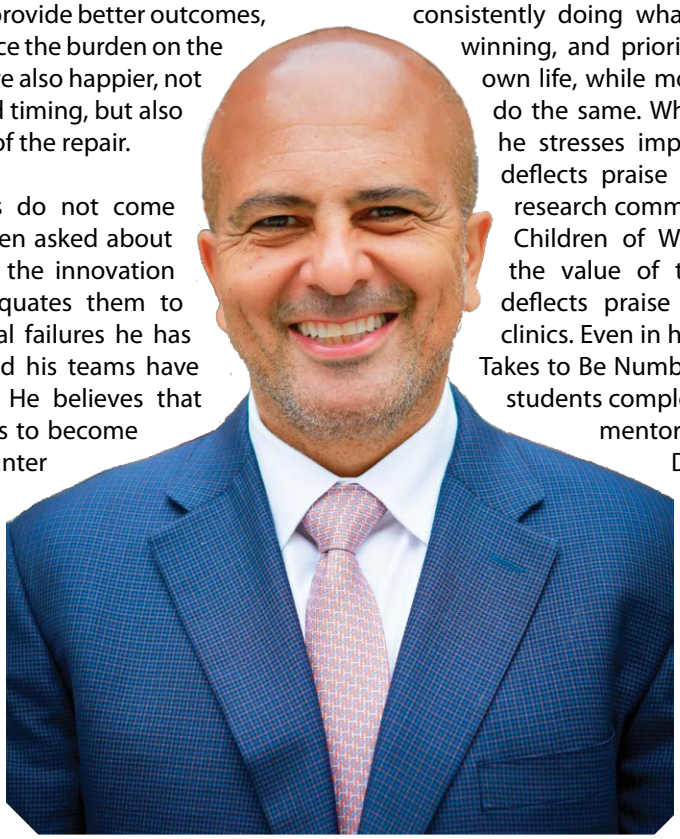
This same philosophy transcends every aspect of Dr. Hammoudeh's life and directly translates into his research career. Driven by the mantra "if you're not growing you're dying," his pursuit of growth led him to pioneer advancements in early cleft lip repair. Cleft lips and palates rank among the most common congenital anomalies in the United States. Traditionally, patients undergo cleft lip and palate repairs in the first 3-6 months of life. Depending on the severity of the cleft, some patients may also require nasal alveolar molding devices to help shape the defective structures before surgical repair. Dr. Hammoudeh and his team aimed to challenge this convention. Rather than waiting three-to-six months to repair a patient's cleft, he posed the idea that clefts could be repaired as early as in the first two weeks of life. He found that aided by the increased levels of maternal estrogens and TGF-beta, molding of the nasal cartilage was improved and scarring was minimized. Having now treated over two hundred patients, it is becoming clear that early cleft lip and palate repairs have the potential to provide better outcomes, lower revision rates, and reduce the burden on the healthcare system. Families are also happier, not only because of the improved timing, but also because of the reduced cost of the repair.

Groundbreaking innovations do not come without their challenges. When asked about the hurdles he has faced in the innovation process, Dr. Hammoudeh equates them to the personal and professional failures he has experienced and how he and his teams have worked to overcome them. He believes that when one pushes themselves to become better, they will encounter challenges and failures along the way. How one reacts to and grows from these challenges comes to define them, and the measure of success becomes the growth they experience as a result. The unacceptable outcomes encountered when attempting bilateral early cleft lip repairs led to the restriction of early cleft lip repairs to those that are unilateral. Understanding their limitations was key to progressing toward the successful outcomes seen today.

Dr. Hammoudeh also serves as the Chief Medical Officer of the Children of War Foundation. Crediting his wife, Amel Najjar, for the organization's growth, the Children of War Foundation was initially founded to provide lifesaving care for one child. Hashim was nine years old when he experienced severe shrapnel injuries as a casualty of the war in Iraq. Through the foundation's efforts, Hashim received the quality medical care he needed and is now thriving in young adulthood. In the years following its inception, the foundation has evolved to provide aid to children impacted by abuse, poverty, educational interruptions, and more. Reflecting on the organization's impact, Dr. Hammoudeh jokes that the medical aspect is the easy part. The real recognition should go to those acting behind the scenes paving the way for the clinicians to do their work, contributing to actions that will change the trajectory of hundreds of lives.

Although oral maxillofacial surgery and plastic surgery were his plan B, these have brought Dr. Hammoudeh closer to plan A than it might seem. He didn't become an NFL player, a broadcaster, or an agent, but he has become a mentor, a leader, and a coach. Drawing inspiration from legendary football coaches Vince Lombardi, John Madden, Mike Ditka, and Lou Holtz; and emphasizing compassion, altruism, empathy, and love, he applies the tenets of consistently doing what is right, making a habit of winning, and prioritizing personal growth to his own life, while motivating those around him to do the same. When reflecting on his research, he stresses improving upon his failures and deflects praise to his team and the greater research community. When talking about the Children of War Foundation, he highlights the value of the administrative team and deflects praise to those who organize the clinics. Even in his office, seated by his "What it Takes to Be Number 1" poster, sat three medical students completing a research year under his mentorship. In striving to be the best, Dr. Hammoudeh inspires those around him to find the best within themselves. In his own words, "Just be the best at anything you do and you're going to be fine in life."

Maybe this is plan A after all.



Dr. Hammoudeh

Using Machine Learning Prediction Models to Advocate for Neurodiversity:

Amber Angell leads USC Chan's Disparity Reduction and Equity in Autism Services Lab

By Abby Khou (MA 2023, OTD 2024) & Ellie Taylor (PhD 2025)

Today, Assistant Professor Amber Angell is the principal investigator of the Disparity Reduction and Equity in Autism Services (DREAmS) Lab at the USC Chan Division of Occupational Science and Occupational Therapy. Alongside a multidisciplinary team of researchers, clinicians, students and autistic collaborators, Angell works towards a future in which autism will be more equitably identified across ethnicities and gender identities, especially underserved populations such as racial minority groups and girls.

But the native Texan's journey to academia began with a family sports connection. After shadowing an occupational therapist, who was also the wife of Angell's little brother's football coach, Angell knew that occupational therapy was where she one day wanted to be.

After earning her Master of Occupational Therapy (MOT) degree from Texas Woman's University in 2005, Angell headed west to the Pediatric Therapy Network (now known as Momentum PTN) in Torrance, California. PTN is a renowned private clinic whose co-founders helped pioneer Ayres Sensory Integration through the 1970s and 1980s. ASI is an evidence-based occupational therapy framework and intervention that takes place within specially designed therapeutic environments in which the therapist playfully presents specific sensory experiences to the child. The child then flexibly responds to novel challenges that increasingly develop their confidence and competence. At PTN, Angell was trained in and used Ayres Sensory Integration therapy for pediatric clients with various developmental and learning difficulties including autism, behavior and attention disorders, learning disabilities and developmental coordination disorder.

It was during this clinical work, Angell says, that she first witnessed disparities in access to autism services for Latino/x/e and African American children, who are less likely than Caucasian autistic children to have access to high quality, family-centered care that meets their needs. Angell began to question why Caucasian children were more frequently referred for occupational therapy evaluations than their Latino/x/e and African American peers. While she treated individual patients and consulted with their families and caregivers, her eyes couldn't help but be opened to the structural and systemic health disparities that her clients experienced.

As a Doctor of Philosophy (PhD) in Occupational Science student at USC Chan, Angell says she "learned a whole new language" to think and talk about systemic disparities. In collaboration with her mentor Olga Solomon, now an assistant professor of clinical pediatrics at the Keck School of Medicine of USC, Angell examined families' experiences of autism services and began to unravel them. Her PhD dissertation explored health disparities that disproportionately impact Latino/x/e caregivers of autistic children — trailblazing research that was among the first to identify racial inequalities in health service access for non-white families with autism.

From this work, Dr. Angell established a research trajectory focused on promoting equity for underserved autistic populations. After earning her PhD degree at USC Chan in 2016, she completed a postdoctoral fellowship at the University of Illinois at Chicago, where she gained experience with critical disability studies and participatory research approaches. She then received a career development award at the University of Florida, where she was trained in health services research using large healthcare datasets. In 2020, she returned to USC Chan Division as an assistant professor and principal investigator of the DREAmS Lab.

The mission of the DREAmS Lab is to "identify, measure, understand, and reduce disparities in autism diagnosis and services," and "to eliminate health disparities and achieve health equity for all neurodiverse individuals." It's composed of a multidisciplinary team of occupational science PhD students, occupational therapy doctoral and master's students and what is known as the Autistic Lived Experience Collaborators (ALEC) group. The ALEC

group includes autistic research assistants, volunteers and advisors who have a primary role in steering the conceptual direction of the DREAmS Lab. Angell is a fierce advocate for uplifting the voices of those populations whom the DREAmS Lab actually studies.

Some of those studies are aimed at eliminating health disparities by finding new ways for children with "possible autism," or are showing early signs that they may be autistic, to access diagnostic services. Early identification opens the door for occupational therapy evaluations, and ultimately, access to early intervention services.

One current DREAmS Lab project is using clinical informatics approaches, such as machine learning and natural language processing, to develop algorithms that can identify these children with "potential autism" using only data found in their electronic health records. The algorithms weight autism diagnosis criteria (as indicated in the DSM-5-TR) as well as features associated with, but not unique to, autism spectrum disorder (e.g., sleep and gastrointestinal problems).

Angell and the DREAmS Lab team hope their work can be translated to a clinical decision support tool for clinicians to identify children who should be further evaluated for autism. This kind of decision support tool, which can flag particular patient charts and recommend referral, will especially benefit girls and Latino/x/e children who are statistically more likely to be overlooked by healthcare providers, bypassing the implicit and explicit biases of healthcare providers who function as gatekeepers for autism evaluations. The team has already begun to explore similar methods to address other autism-related challenges, including gastrointestinal symptoms and treatment, mental health crises and issues experienced in broader pediatric populations, such as suicidality.

The unique value of occupational science lies in the "big picture" perspective it offers in the creation of algorithms for examining large data sets that can help detect possible autism in children. Occupational science and occupational therapy consider the roles of parents and caregivers whenever engaging in the notoriously difficult occupation of navigating health services systems. The heart of this work, according to Angell, is advocacy for neurodiverse individuals.

"We're in an interesting moment for autism research," Angell says. "Because of social media, so many people are learning about neurodiversity, and so many people are self-identifying or seeking an adult diagnosis. People are really embracing it as an identity, not just as a kind of pathologizing label. People are really taking it on and saying, 'Here's what's cool about how my brain works.' But autistic communities are also saying, 'Hey, we still need support with certain things.' And that's exactly the type of person-centered, advocacy-driven and inclusive future that the DREAmS Lab is working towards."

Professor Angell

Dr. John Morzov:

A Dentist Dedicated to Community Health

By Daniel Kohanghadosh & Jasmine Shafa

In the realm of dentistry, Dr. John Morzov emerges as a paragon of unwavering dedication to community health, with a particular emphasis on the intricate realm of pediatric dentistry. He currently holds the esteemed position of Associate Professor of Clinical Dentistry at the Herman Ostrow School of Dentistry along with the Assistant Director of the QueensCare USC Mobile Dental Clinic (QueensCare mobile clinic), where he has meticulously crafted a nuanced and multifaceted career replete with diverse experiences, comprehensive education, and a profound commitment to community service. Dr. Morzov's influence is far-reaching, and his impact on dentistry is undeniable, leaving an enduring and indelible mark that extends beyond the conventional boundaries of a traditional dental practice. His commitment to the QueensCare mobile clinic, extensive academic contributions, and compassionate care at the renowned Children's Hospital of Los Angeles (CHLA) showcase a dentist whose fervor for community health transcends confines, weaving a rich tapestry throughout his career.

Educational Journey and Early Career:

Dr. Morzov's journey into dentistry began in high school, sparked by an interest in orthodontics while receiving his own braces treatment. He took the initiative to shadow his orthodontist, where his interaction with patients and direct involvement in the field allowed him to solidify his passion for dentistry and pursue his career in dentistry from a young age. Dr. Morzov successfully gained admission to an accelerated undergraduate-to-DDS program, a distinctive offering at USC, entailing two years of rigorous undergraduate education preceding the commencement of dental school. Despite not initially considering a career in pediatric dentistry outside of orthodontics, his involvement in the mobile clinic at USC introduced him to the joy of working with young children. By senior year, he joined the mobile clinic staff, which he describes as the most memorable part of dental school, forming friendships with his colleagues that have lasted to the present day. He felt as though Queenscare mobile clinic provided him with extensive experience in pediatrics and found he was the happiest and felt the most himself when working with children. During his time at USC, Dr. Morzov was also involved in geriatric dental research, allowing him to expand his own knowledge and contributions to dentistry.

After graduating from Ostrow with a holistic view and experience in dentistry, Dr. Morzov began his career at CHLA. Furthermore, Dr. Morzov became involved in the QueensCare mobile clinic through his mentor, the late and cherished pioneer in mobile dentistry and service-committed dentist Dr. Charlie Goldstein. The Queenscare Mobile Dental Program partners with the Herman Ostrow School of Dentistry to provide high-demand services to children in the Los Angeles Unified School District using the largest mobile dental clinic trailer world-wide, "Whitening McQueen." As a clinical instructor at QueensCare Mobile Dental Program, Dr. Morzov found profound satisfaction in contributing to the community and discovering a deep-seated passion for teaching. Imbued with a sense of fulfillment, he relishes the opportunity to impart his invaluable insights and techniques to the burgeoning generation of dentists, a process that he perceives as immensely rewarding. Interacting with new students weekly, Dr. Morzov keenly observes the remarkable progression these individuals undergo, witnessing their growth and development from the inception of each week to its culmination.

Dr. Morzov

Over time, his views on dentistry have expanded, embracing various aspects, including pediatrics, geriatrics, and research, and continue to grow more as dentistry expands and technology advances.

Academic and Professional Achievements:

Graduating in 2000 from the Herman Ostrow School of Dentistry, Dr. Morzov's formative experiences include his time with the senior mobile clinic staff. The mobile clinic at USC, with its emphasis on preventative dentistry, provided Dr. Morzov with valuable insights into the importance of oral hygiene instructions, a lesson he passionately imparts to both children and their parents. This exposure shaped his approach to dentistry, steering him towards a focus on pediatric care. Dr. Morzov proudly embraces his role as a general dentist, focusing primarily on pediatric care. His extensive education and wealth of experience in the field have equipped him with the knowledge and practice necessary to deliver comprehensive and specialized care in pediatric dentistry.

Teaching and Mentoring:

Dr. Morzov's journey at the Ostrow School of Dentistry has seen him evolve from a Clinical Instructor in 2003 to an Associate Professor of Clinical Dentistry. His teaching philosophy is rooted in allowing students to take ownership of their work, making mistakes, and learning from them, while at the same time ensuring that the patient receives excellent treatment. He believes that the value of learning from mistakes is immeasurable and encourages students to embrace some struggle as a part of the learning process. His mentor, Dr. Charlie Goldstein, played a pivotal role in shaping his teaching approach and inspiring his involvement in the QueensCare Mobile Dental Program. Dr. Morzov finds great satisfaction in witnessing students' progression and appreciating the impact of his guidance on their education and future careers.

Hospital Work at CHLA:

Since 2000, Dr. Morzov has been an attending dentist at CHLA, facing unique challenges working with medically compromised children. From treating patients under general anesthesia to addressing complex cases, such as those with epidermolysis bullosa, he navigates the intricacies of pediatric dentistry with skill and compassion. Dr. Morzov emphasizes the constant evolution of dentistry and the need for adaptability in the face of new challenges, showcasing his commitment to staying at the forefront of the field.

Community Engagement and Health Fairs:

Dr. Morzov's unwavering commitment to community service is vividly demonstrated through his active engagement in various health fairs and clinics, exemplifying a compassionate dedication to promoting dental awareness and hygiene. Notable among these are the 2006 Special Olympics Special Smiles Dental Screenings at Cal State Long Beach, the 2012 Community Health Involvement Project (CHIP) Health Fair at USC, and the recurrent LA Festival of Books Dental Screenings from 2012 to 2023.

These health fairs, in alignment with Dr. Morzov's commitment, serve as invaluable platforms to educate individuals who may have never sought dental care. Through his participation, he not only imparts crucial information on oral health but also provides essential resources for ongoing care. Dr. Morzov plays a vital role in fostering dental awareness within communities, underscoring the significance of finding individuals a dental home. Importantly, his dedication extends beyond the events themselves, as he actively emphasizes the need for continued access to oral healthcare even after the conclusion of these community-driven initiatives.

In addition to these specific clinics, Dr. Morzov has generously volunteereed his expertise at numerous other health fairs and events over the years, reflecting his commitment to community well-being. His holistic approach to oral health underlines the importance of education, accessibility, and continuous care within the community, showcasing his dedication and values.

Advice for Aspiring Dentists:

Dr. Morzov's advice for aspiring dentists is straightforward – volunteer. He emphasizes the positive impact on both the community and personal growth. Encouraging the setup of programs offering free visual screenings and care, he stresses the importance of community oral health. Dr. Morzov believes that volunteering not only benefits the community but also enriches the soul of the dentist, providing invaluable learning experiences.

Dr. Morzov's journey epitomizes a commitment to community health, education, and compassionate care for pediatric patients. His multifaceted approach to dentistry serves as an inspiration for aspiring dentists seeking to make a positive impact. Through his work at the QueensCare mobile clinic, academic contributions, hospital care at CHLA, and active involvement in community health fairs, Dr. Morzov leaves an enduring legacy of service and excellence in the field of dentistry. As he continues to impart his knowledge and passion to the next generation of dentists, Dr. Morzov stands as a shining example of the profound impact one individual can have on the oral health and well-being of a community.

To Print a Tooth: An Insight into CAD/CAM Resin Materials

By Brandon Pham & Bhumika Gumber

What was once considered as a novelty method of producing dental restorations and as a tool limited only to dental laboratories, CAD/CAM dentistry is a field that has taken off in recent years due to its ability to design and produce aesthetic yet sturdy prostheses, such as crowns, inlays, onlays, dentures, and orthodontic appliances. CAD/CAM systems function by combining a computer-aided design (CAD) and computer-aided manufacture (CAM) stages, first by capturing an image of the patient's oral cavity, then by using computer software to design and create instructions for producing the final dental restoration. As the field is rapidly evolving, new materials and methods are being developed to create CAD/CAM restorations, yet there is a common concern with using these new materials. Generally speaking, the stronger a material is, the less aesthetic it appears visually, and the more aesthetic a material seems, the weaker it functions for the user. One may then ask, "What is the best material for CAD/CAM dentistry? How can one create a material that is highly aesthetic and durable? And how can that material withstand the ongoing changes that occur in the oral cavity?" As more and more materials are developed, it is imperative that questions like these be answered to understand their strengths, weaknesses, and potential to be utilized by practitioners and the general public.

During the fabrication of arestoration that appears aesthetically similar to the surrounding teeth, there are a multitude of factors that may influence its appearance. The way in which a restoration appears to the naked eye depends on the wavelength of light that is reflected off of it, and this can vary depending on the light source, the type of material used, and the amount of material in the restoration. Due to the structure of enamel rods in natural teeth, some teeth may exhibit a degree of translucency where light is able to pass through, and this is the reason why many opaque restorations appear to be rather "unnatural." To further understand this phenomenon, Dr. Alberto Lazaro Pascual engineered a study that focused on evaluating light transmittance from various CAD/CAM resin materials. Dr. Pascual embarked on his educational journey with a bachelor degree in Dentistry from the University of Barcelona in 2019 and furthered his expertise with a Master in High Complexity Esthetic Adhesive Oral Rehabilitation at the University of Murcia (UCAM) in Barcelona, Spain. In Dr. Pascual's study, light transmittance was studied as a function of material, thickness, and wavelength and was compared across restorations that were manufactured additively (printed) or subtractively (milled). Lava Ultimate exhibited the highest light transmittance, followed by Varseo Smile Crown Plus and Ceramic Crown. Notably, significant differences were observed based on thickness, with 1mm thickness allowing the highest light transmission and 4mm thickness showing the lowest. The study also found that longer wavelengths, particularly at 468 nm, resulted in higher transmittance, while shorter wavelengths, such as 400 nm, showed lower transmittance. Overall, it should be noted that CAD/CAM printed materials exhibited lower light transmittance compared to milled materials, meaning that more light was absorbed and caused the restorations to appear more opaque. The conclusions highlight the impact of material, thickness, and light wavelength on light transmittance in permanent CAD/CAM resin materials, emphasizing the factors influencing this property.

As the technology has progressed, dental restorative materials come in a vast array of different shades, enabling one to achieve nearly identical shade matching to allow restorations to look no different than natural teeth. However, the original shade of the restorative material can vary drastically over time depending on various factors, such as a patient's diet, smoking habits, and other changes to the oral cavity. To understand more about color stability, Dr. Xin En Andrew Lim, a highly accomplished dentist with a comprehensive background in both clinical practice and academia, who graduated from the National University of Singapore in 2015, conducted a study that aimed to evaluate the impact of common beverages (e.g., coffee, red wine, Coca-Cola, and distilled water) on color and translucency changes in resin-based definitive CAD/CAM materials. The findings revealed that coffee caused the most significant staining, while Ceramic Crown (SprintRay) exhibited the highest color instability, followed by VarseoSmile and Lava Ultimate. Polishing improved the color change in coffee and wine-stained materials. Notably, printable resin-based CAD/CAM materials exhibited more pronounced color and translucency changes compared to milled counterparts. The study suggests careful consideration of these differences before clinical use, especially for printable materials, due to observed non-acceptable color changes. This insight is crucial for ensuring optimal optical properties in definitive restorations meant for extended intraoral service.

To assess the ability of a CAD/CAM material to reliably bond and be retained to tooth structure, not to mention having sufficient longevity within the oral cavity, it is important to consider the method in which a CAD/CAM restoration is bonded. One such variable that may be modified is the surface treatment of the restoration, which, carried through chemical treatment, surface abrasion, or a combination of the two, can allow for stronger micro-mechanical retention between the restoration and the tooth structure. This focus on micro tensile bond strength has been analyzed by Dr. Waad Mzain, who has a comprehensive educational background, including a bachelor's degree in Dental Medicine and Surgery from King Abdul-Aziz University. Dr. Mzain pursued advanced education, completing the International Dental Comprehensive Program at New York University and is currently pursuing a dual program at the University of Southern California, specializing in Advanced Operative and Adhesive Dentistry, along with a master's in Biomaterial and Digital Dentistry. Her study investigated the influence of surface treatments and artificial aging on the micro tensile bond strength of three milled and printed CAD/CAM materials; the samples that were compared included popular CAD/CAM materials Lava Ultimate, VarseoSmile Crown Plus, and Ceramic Crown. Milled and printed versions of each material were used, where different surface treatment modalities were applied including airborne particle abrasion, silane, adhesive and combinations of the above. As for the results, airborne particle abrasion resulted in the highest micro tensile bond strength for both milled and printed materials. The milled material showed a lower probability of adhesive interface failure compared to the printed materials. Her conclusions were that surface treatments significantly affect the micro tensile bond strength of both milled and printed CAD/CAM materials, with airborne particle abrasion showing the best results. Additionally, the milled materials also exhibited a more robust adhesive interface compared to the printed materials, resulting in a lower probability of failure over time. This study provides valuable insights into optimizing surface treatments for CAD/CAM materials to improve their long-term durability and bonding strength.

As many new materials are currently being introduced to the dental market, it is important to evaluate how these new materials respond to physical and mechanical stresses for restorations to allow for basic function. Dr. Jordi Llena Prats, who holds a Doctor of Dental Surgeon (D.D.S) degree from the University of Barcelona in 2019, has created an extensive study which involves assessing the two-body wear of three CAD/CAM resin-based permanent dental materials (Lava Ultimate, Varseo Smile Crown Plus, Ceramic Crown) compared to a ceramic material (Empress CAD) using a two-axis chewing simulator. Results indicated that wear was material-dependent, with Ceramic Crown exhibiting less wear (in terms of volumetric loss and vertical loss) than Lava Ultimate and Varseo Smile Crown Plus. Wear increased with the number of cycles, emphasizing the influence of material composition and wear cycles on CAD/CAM materials' durability.

With every passing year, more CAD/CAM resin materials have continued to be introduced to the market, with each material boasting its own unique properties. As the field continues to grow, so too must the evidence-based research behind the use of these materials continue to expand in order to determine not only the efficacy of each material, but also how they can be utilized to produce stronger, more aesthetic, and longer-lasting restorations.

Dr. Lim

Dr. Mzain

Dr. Pascual

Dr. Prats

Forge-ing a Strong Special Patients Clinic

By Caroline Mardouryan & Courtney Fortier

Dr. Joni Forge, DDS has been a faculty member of Herman Ostrow School of Dentistry's Special Patients Clinic (SPC) for over a year. With her she brings several years of expertise from her storied history of clinical experience. It is easy to be impressed by the constellation of opportunities she includes on her resume. Among many other achievements, she owned a private practice for 30 years, and has served on several committees and boards for Los Angeles-based organizations such as the health advisory committee of Los Angeles Southwest College, LA Urban League Head Start and State Preschool, and the LA Dental Society. She has even written a children's book titled Andie's Amazing Discovery about a young girl who discovers an extra set of teeth in her mouth and sets out to find out why this happened, learning about the role and responsibilities that dentists undertake in the process. This impressive collection of experiences was garnered through no shortage of hard work. A native LA resident that grew up in Compton, Dr. Forge credits her mother as a role model for her incredible perseverance and strength, as she watched her mother juggle the responsibilities of being a housewife and earning her master's degree.

In 2021, during the COVID-19 pandemic, she decided that after working her entire life to establish and maintain her private practice, she wanted something different for herself. Not only did she wish to spend time with her mother, who had fallen ill, she wanted to shed the responsibilities of private practice ownership to turn her focus to community service and public health. Both were facets of dentistry in which she has always participated and been passionate. Volunteering has been a constant throughout the many phases of her career, and sparked her interest in a career as a dentist to begin with. After working in a more traditional private practice setting with dental specialists, she began to consider the profession, but it was not until after volunteering in a clinic that primarily served unhoused populations and those with financial difficulties that she felt she found a job she truly loved. She explains, "I really liked working with people. I liked the community setting so I've always wanted to work in public health dentistry and serve the community."

Dr. Forge feels passionately about serving her community through several channels. On a systemic level, through her service as chairman of community health relations with the LA Dental Society, and as a delegate for the CDA, she feels that she is able to represent her communities in environments where they do not have voices and are not seen. On a personal level, she volunteers her time to Care Harbor, an organization that provides free dental care to underserved populations. She finds value in being seen at work by other community members stating, "You'd be surprised at how many times I go and volunteer in situations where [young people and students] will say to me 'You know I've never seen a black female dentist before,' and that often amazes me here in 2021 but that is the reality of the fact." Through a mutual connection at Herman Ostrow School of Dentistry via her late brother, she was informed about an opening as a faculty member and decided to step out of her comfort zone to pursue a new form of community service that she had always been interested in: teaching.

Having years of exposure as a dentist comes with unforgettable experiences. When asked about her experience at SPC, Dr. Forge stated, "The patients think we are giving to them, but they are really giving to us. They give us our humanity." Each patient that walks in helps build a practitioner's perspective andcreates a connection with the dentist. Their gratitude along with the practitioner's empathy create meaningful experiences for practitioners. Dr. Forge explains that working at the SPC is rewarding and really emphasizes how blessed we are to have a roof over our heads and the ability to see. She states that despite the hardships that the patients in SPC have, they are extremely grateful and kind, which makes the hard work worth it. She recalls a specific example where a patient who had lost all their teeth came into the clinic. Despite the long months it took for treatment to be completed, the four hour appointments, and loads of paperwork, the patient never complained and was extremely grateful when she received her dentures and restored her smile. The patient stated that other clinics would not accept her as a patient due to her HIV diagnosis. It was the patient's heartwarming remarks that were left with Dr. Forge and served as a powerful reminder of her diligent efforts.

No reward comes without a challenge. Treating medically compromised patients can be difficult. Medical consultations can make the process lengthy and tricky.

Additionally, some patients with phobias can be difficult to treat. Thankfully, Dr. Forge feels she has been blessed with the gift to help people feel comfortable in the dental chair. With the experiences she gained from working at a children's clinic, she has the tools to convince children to cooperate. Her degree in social sciences played a role in the psychological strategies she has developed to persuade patients to cooperate. For example, she always had stickers and gifts for children after they displayed good behavior. She applies the strategies and patience she has learned from working with children to treating special patients with phobias. Dr. Forge recalls a specific incident where a patient exhibited very aggressive and disrespectful behavior. After establishing appropriate boundaries with the patient and communicating what behavior is and is not acceptable in the dental chair, Dr. Forge asked what help the patient felt she needed and took the time to understand where the patient's behavior stemmed from. The patient articulated that she had several stressors in her life that, along with a fear of the dentist, contributed to her abrasive comments. When the patient saw that Dr. Forge took the time to listen to her story, saw she really cared, and offered her iatrosedative tools to help her calm her anxiety, the patient started to cry. She was really touched by Dr. Forge's patience and ability to listen to her needs. Dr. Forge stated that some people just needed a little more time to come around, but more importantly they needed a dentist who was willing to give them that time and comfort that they needed.

Dr. Forge explains that there are three key characteristics that a practitioner needs to embody in order to be successful when treating patients in a community clinic setting. The first is that the practitioner must have a deep love for the community. A practitioner who loves their community will want to take the steps to see it thrive and flourish. This practitioner can recognize the cultural, social, and economic differences in its community members. Additionally, this practitioner will have the competence, sensitivity, and commitment to foster a relationship with its community members. Second, the practitioner must have a love for people. Ultimately, this would mean that the practitioner is invested in the well-being of individuals. This means more than having the clinical expertise, but the respect and desire to positively impact lives. Lastly, the practitioner must love public health dentistry. This means that the practitioner must be devoted and dedicated to working hard, long hours with little attention to pay, and a great deal of attention to impact.

Dr. Forge feels as though she has a responsibility to give back to her community. As one of few black females in the field, she has the power, clinical skills, and physical ability to represent and inspire a generation of dentists. As a young dentist, she was surprised at how few black female dentists were in the field. Her commitment to addressing health disparities and dedication to bridge the gap in dentistry is inspiring. By excelling in the field of dentistry, Dr. Forge has broken barriers and created opportunities for women of color. Her commitment to community dentistry, impressive resume, and persistent passion to help underserved populations is long-standing.

Dr. Forge

Schedule of Events

08:00 AM
Registration (Presenters & Judges)

09:00 AM – 12:00 PM
Poster Presentation Judging

11:30 AM – 12:30 PM
General Registration & Lunch

12:30 PM – 12:45 PM
Opening Remarks

Ishwar Puri, PhD
Senior Vice President
USC Office of Research & Innovation

Avishai Sadan, DMD, MBA
Dean
Herman Ostrow School of Dentistry of USC

Yang Chai, DDS, PhD
University Professor
Associate Dean of Research
Herman Ostrow School of Dentistry of USC

12:45 PM – 01:25 PM
Keynote Speaker

Mark S. Humayun, MD, PhD
Cornelius J. Pings Chair in Biomedical Sciences
Director of the USC Ginsburg Institute for Biomedical Therapeutics

01:30 PM – 02:10 PM
Keynote Speaker

Mark Handelsman, DDS
Diplomate
American Board of Periodontology

02:15 PM – 02:55 PM
Keynote Speaker

Leah Stein Duker, PhD, OTR/L
Assistant Professor
USC Chan Division of Occupational Science & Occupational Therapy

03:00 PM – 03:50 PM
Student Presentations

03:50 PM – 04:50 PM
Poster Viewing

04:50 PM – 05:20 PM
Award Presentations

05:20 PM – 05:50 PM
Reception

Keynote Speakers

Mark S.
HUMAYUN
MD, PhD

Director
USC Ginsburg Institute
for Biomedical
Therapeutics

12:45 PM – 01:25 PM

Mark S. Humayun, MD, PHD, is the Cornelius J. Pings Chair in Biomedical Sciences, Professor of Ophthalmology, Biomedical Engineering, and Integrative Anatomical Sciences, Director of the USC Ginsburg Institute for Biomedical Therapeutics, and Co-Director of the USC Roski Eye Institute. Dr. Humayun is an internationally recognized pioneer in vision restoration. He assembled a team of multidisciplinary experts to develop the first FDA approved artificial retina, Argus II, for sight restoration. He has more than 140 issued patents and over 300 peer reviewed publications. He has a Google Scholar h-index of 106. Dr. Humayun is a member of the U.S. National Academies of Medicine, Engineering, and Inventors. He is a Fellow of the American Association for the Advancement of Science (AAAS), Institute of Electrical and Electronics Engineers (IEEE), American Society of Retinal Specialists (ASRS), and Association for Research in Vision and Ophthalmology (ARVO). For his extraordinary contributions he was awarded the United States' highest technological achievement, the 2015 National Medal of Technology and Innovation by President Obama. He is the recipient of the 2018 IEEE Biomedical Engineering Award, the 2020 IEEE Medal for Innovations in Healthcare Technology, and the Charles Schepens award by the American Academy of Ophthalmology in 2021. Dr. Humayun was named top 1% of ophthalmologists by the U.S. News & World Report.

Mark
HANDELSMAN
DDS

Diplomate
American Board of
Periodontology

01:30 PM – 02:10 PM

Mark Handelsman received his D.D.S. in 1987 from the University of Southern California Dental School. He continued his studies at USC and obtained his Certificate in Advanced Periodontics in 1989. He is a Diplomate of the American Board of Periodontology since 1994. He was a Clinical Assistant Professor at USC for 15 years, teaching Periodontics and Dental Implants, as well as practicing in the faculty practice. He has been in full time private practice in Santa Monica, California for over 19 years. He has been involved in clinical research and published many articles. The topics include the Perio-Restorative interface, Guided Tissue Regeneration, Guided Bone Regeneration, Surgical Crown Lengthening, Esthetic Soft Tissue Grafting and Surgical Guidelines for site development and implant placement, & Management of Implant Complications. He has lectured nationally and internationally.

Leah
STEIN DUKER
PhD, OTR/L

Assistant Professor
USC Chan Division
of Occupational Science
& Occupational Therapy

02:15 PM – 02:55 PM

Dr. Leah Stein Duker is an Assistant Professor in the Chan Division of Occupational Science and Occupational Therapy at the University of Southern California. Her research focuses on the broad-ranging effects of environmental factors on stress, well-being, and engagement during challenging healthcare encounters and the efficacy of tailored environmentally-based interventions to alleviate these challenges. For the last 15 years, her work has explored the oral health challenges experienced by children with special health care needs and their caregivers, as well as the benefits of adapting the environment to improve dental care for these populations (e.g., autistic children). Dr. Stein Duker is currently funded by a NIH/NIDCR UG3/UH3 grant to explore the efficacy of adapting the sensory environment of the dental office to decrease behavioral and physiological distress in children with and without dental fear and anxiety. Her research interests include autism, sensory processing, Multisensory Environments, and both traditional wired and innovative wireless techniques for measuring psychophysiological stress and anxiety. Her work has examined care in a variety of settings, including dentistry, primary care, oncology, emergency medicine, and mHealth. In 2021, she was a recipient of the American Occupational Therapy Foundation's A. Jean Ayres Award for commitment to research-related development or testing of occupational therapy, especially in sensory processing.

RESEARCH DAY
POSTER ABSTRACTS

ADVANCED SPECIALTY PROGRAM RESIDENTS

Poster #1

Title: Orofacial Pain: A Google Trends analysis

Authors: Jack Botros and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Conducting a web search for health-related information is a frequent behavior and analyzing the trends on such searches is a valuable strategy to understand this behavior. **Purpose**: To assess the Google Trends (GT) search scores regarding the interest in orofacial pain (OFP) specialists. **Methods**: GT scores for OFP specialists from February 2013 to December 2022 were analyzed. Poisson regression analyses, mean differences (m), and Cohen's D (d) were employed to assess the score change over time. **Results**: The top three search words indicating the interest in nearby OFP specialists were "TMJ specialist near me", "TMJ doctor near me", and "TMJ dentist near me". The time frame related to the spike in SARS-CoV-2 pandemic (COVID-19) searches was between March and May 2020. For eight out of the nine years assessed, there was an increase in the GT scores for OFP specialists by rates ranging from 25% to 186% compared to the year before. This increase was significant ($P < 0.05$) for all years except 2017. OFP scores increased most substantially in 2020 after the first wave of COVID-19 compared with 2019 (m=30.05, d=3.978) followed by the growth between 2017 and 2018 (m=17.04, d=2.259). **Conclusion**: The interest in OFP specialists expressed by Google searches increased over the years, particularly following the pandemic onset. More awareness is needed about the OFP scope of practice, and the use of GT might serve as an indicator. Further studies are suggested to determine the implications of using GT as a research strategy.

Poster #2

Title: Wear resistance analysis of additively manufactured materials for permanent restorations

Authors: Jordi Llena Prats, Jin-Ho Phark, and Sillas Duarte

Faculty Advisor: Jin-Ho Phark and Sillas Duarte

Background: Materials for permanent restorations using 3D printing technology have been introduced to the market recently. Physical and mechanical properties, such as wear, need to be addressed to evaluate their limitations. **Purpose**: To evaluate the two-body wear of three CAD/CAM resin based permanent dental materials (Lava Ultimate (LU), VarseoSmile Crown Plus (VS), Ceramic Crown (CC)) against a ceramic material (Empress CAD) using a two-axis chewing simulator. **Methods**: 24 samples were fabricated with 8 samples per group for 3 different materials. The samples were standardized by polishing. An interchangeable mounting system was used for positioning of the samples during surface analysis. Dual-axis chewing simulator (CS-8, SD Mechatronic, Feldkirchen-Westerham, Germany) was used for 120,000 cycles, 5kg load with a 0.7mm sliding movement at a frequency of 1.6Hz in distilled water. The samples and antagonists were analyzed with a surface optical scanner to evaluate volumetric loss and maximum depth at different stages of the process. Profilometry was performed after 120,000 cycles. Data was analyzed using nonparametric tests: Kruskal-Wallis Test ($\alpha=0.05$) with Bonferroni post-hoc test. **Results**: Volumetric loss and vertical loss differed between materials (CC < LU < VS). A statistically significant difference between CC and the other two materials was shown. Number of cycles showed an increase of wear as the number of cycles increased. **Conclusion**: The wear of definitive milled and printed CAD/CAM materials is material and wear cycle dependent. Larger filler particles materials showed less wear than the other two materials. Wear increases with increasing numbers of cycles.

Poster #3

Title: Self-inflicted oral lesions in patients with intellectual disability: Two case reports

Authors: Sang H. Chung, Kanvara Virojsakulchai, Mariella Padilla, and Douglas Wall

Faculty Advisor: Douglas Wall

Background: Patients with intellectual disabilities often show self-injurious behaviors, including oral soft tissue biting. Management of these patients with self-inflicted injuries continues to be a challenge for the dental profession, and the use of oral appliances has been suggested. **Purpose**: To present the management challenges of two cases of self-inflicted oral lesions in patients with intellectual disability. **Methods**: The patients' guardians signed the authorization form that permits the use of protected health information for education and instruction purposes. Medical history and clinical examination were performed by a trained practitioner in Orofacial Pain from the Herman Ostrow School of Dentistry. The oral lesions were diagnosed as being caused by self-inflicted behavior. **Results**: First case is a 30-year-old male with severe autism and cardiovascular disease. He has habitual biting of the lip, creating a non-healing ulcer. Management with an occlusal guard and different oral devices was not successful and a section of the lower lip turned necrotic and fell off. The second case is an 18-year-old female patient diagnosed with Rett's syndrome. This patient also bites her lips habitually; however having a towel or cloth in between her teeth stops the behavior. **Conclusion**: The management of self-inflicted oral lesions is challenged by a persistence in the behavior which inhibits proper healing.

Poster #4

Title: Precision TMD diagnosis utilizing AI technology

Authors: Sang H. Chung, Salma Awaad, Parish Sedghizadeh, and Anette Vistoso Monreal

Faculty Advisor: Parish Sedghizadeh

Background: This research aims to assess the accuracy of diagnosing temporomandibular joint dysfunction using the myTMJ mobile application, which incorporates AI technology. The study addresses the need for a reliable and efficient diagnostic tool for temporomandibular joint dysfunction, leveraging advanced AI technology within the myTMJ application. **Purpose**: The primary objective is to evaluate

the precision and effectiveness of the myTMJ application in diagnosing temporomandibular joint dysfunction through AI technology. **Methods**: Participants will utilize the myTMJ mobile application for diagnoses, with the intervention being the AI-driven assessment of temporomandibular joint dysfunction. The study will involve individuals in our Orofacial Pain Clinic at USC with suspected temporomandibular joint dysfunction, and their characteristics may include diverse demographics, ages, and severity levels of the condition. The methodology will encompass the use of the myTMJ mobile application for diagnostic assessments, with data collection and analysis guided by established research protocols. In this single-arm study, participants will only use the myTMJ application with AI technology for temporomandibular joint dysfunction diagnosis. **Conclusion**: The study aims to measure the accuracy of temporomandibular joint dysfunction diagnosis by the myTMJ application, with endpoints focused on sensitivity, specificity, and overall diagnostic precision. Participants will be followed up over a specified period to track the ongoing accuracy and effectiveness of the myTMJ application in diagnosing temporomandibular joint dysfunction. Statistical analyses will include sensitivity, specificity, and predictive values, with plans to employ appropriate statistical tests to assess the significance of the results and validate the diagnostic accuracy of the myTMJ.

Poster #5

Title: Tumor progression-related interferon signature confers ADAR dependency in OSCC

Authors: Stephanie Wong, Hua Zhao, Boyan Hu, Casey Collet, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Oral premalignant lesions (OPL) are dysplastic plaques found in the oral cavity that can lead to oral squamous cell carcinoma (OSCC). While 70-95% of OPL do not progress, 5-30% will develop into OSCC. Public gene expression datasets for normal tongue, OPL, and OSCC indicate that the interferon pathway is among the top differentially enriched pathways between the groups. **Purpose**: Our goal is to understand how the interferon pathway leads to progression to OSCC. **Methods**: A set of 31 shared interferon signature genes were created from publicly available datasets and termed interferon-stimulated gene signature-1 (ISS-1). Genetically engineered mouse tongue organoids were developed as a model for OPL. Normal mouse tongue control (MTC) organoids were generated from mouse tongue tissue and cultured in organoid medium. To generate an OPL model (MTK), TP53 and CDKN2A were knocked out of MTC organoids using CRISPR. Bulk RNAseq was performed on these organoids for gene expression analyses. **Results**: OSCC was found to have among the highest expression of ISS-1 genes. Bulk RNAseq of MTC and MTK revealed the interferon response pathway as the top differentially expressed pathway. The DepMap portal revealed OSCC cell lines as highly dependent on ADAR, an RNA editing protein. After knockdown of ADAR in OSCC cell lines and organoids, ISS-1 expression significantly increased, and proliferation and viability significantly decreased. **Conclusion**: ISS-1 genes increase from normal to OPL to OSCC, and OSCC growth and survival rely on ADAR activity. Dependency on ADAR could signify a therapeutic target for treatment of OSCC.

Poster #6

Title: Incidence and Timing of Extraction of Anterior Maxillary Supernumerary Teeth

Authors: Padideh Nazarian, Brian Zahab, and Catherine Pham

Faculty Advisor: Catherine Pham

Background: The prevalence of anterior maxillary supernumerary teeth poses a common dental anomaly, impacting tooth eruption and adjacent structures. Understanding its occurrence, complications, and ideal management is crucial for optimizing patient care. **Purpose**: This study aims to investigate the frequency, complications, and optimal timing of extractions for anterior maxillary supernumerary teeth. The goal is to provide insights into patient demographics, supernumerary tooth characteristics, their impact on adjacent dentition, and the extraction timeline. **Methods**: Retrospective analysis of electronic patient records from the Herman Ostrow School of Dentistry of USC Graduate Pediatric Dental Clinic was conducted. Two pediatric dentists rated pre-extraction and post-extraction radiographs to determine characteristics and complications post extractions. Descriptive statistics and inter-rater reliability were performed. **Results**: Results pending data analysis. **Conclusion**: The conclusive findings of this study are pending the completion of data analysis.

Poster #7

Title: Space Analysis of Children with Cleft Lip and Palate

Authors: Vania Chan, Vesna Ferrer, Fatemah Husain, David Kang, and Stephen Yen

Faculty Advisor: Stephen Yen

Background/Purpose: During the mixed dentition in cleft lip and palate patients, the collapsed maxillary segment often presents with a crowded dentition. This study measured the available and required in cleft segments prior to grafting and estimated the space gained by expansion and bone grafting. **Methods**: Pre-graft analysis measures the available bone in each cleft segment and estimates the width of the unerupted teeth using the mixed dentition dental cast, panoramic radiograph, and cone beam computed tomography (CBCT) scans. The unerupted premolar width is measured either on the panoramic radiographic or on the CBCT and then measured virtually using Dolphin 3D software. A catenary curve formed from the mesiobuccal cusp of the permanent first molar to the anterior incisors is used to estimate the arch perimeter after expansion and bone grafting. The arch perimeter is compared to the combined widths of the unerupted premolars and canines in order to assess whether there is space for dental eruption of the permanent teeth. We plan to measure the records of 30 patients with unilateral cleft lip and palate. **Results**: Dental crowding was evident in both the lesser and greater segments prior to expansion. 2/28 cases showed crowding after maxillary expansion and bone grafting on the panoramic radiograph, and additional cases with CBCTs are being analyzed. **Conclusion**: Within-segment dental crowding prior to grafting is resolved by dental expansion and bone grafting.

Poster #8

Title: Oral and maxillofacial manifestations of Sagliker syndrome

Authors: Kanvara Virojsakulchai, Omeed Soltanalipouryekesamak, Parish Sedghizadeh, and Anette Vistoso Monreal

Faculty Advisor: Parish Sedghizadeh

Background: A 33-year-old Latino male presented to the Oral Medicine Clinic of USC Ostrow School of Dentistry with the chief complaint of enlarged maxillary and mandibular bone and a medical history of chronic kidney disease (undergoing hemodialysis) and also parathyroid/thyroid removal. **Purpose**: To describe the features and manifestations of a rare syndrome with high morbidity and mortality that may present initially as oral and maxillofacial pathology. **Methods**: Clinical case presentation of Sagliker syndrome with medical history, radiographic, clinical, and systemic findings. **Results**: Clinical appearance of the

patient included short stature and abnormal posture due to a previous chest bone fracture with aberrant healing, impaired gait, convex facial profile and deformity, mouth breathing and dry lips. Intra-oral examination showed malocclusion due to maxillary and mandibular bone expansion, anterior open bite, enlarged maxillary tori covering the hard palate, enlarged maxillary and mandibular exostoses, and generalized tooth spacing or diastemas. Radiographic findings showed characteristic salt and pepper pattern of trabeculae and diffuse jaw sclerosis consistent with osteitis fibrosa/renal osteodystrophy. The patient was referred for medical workup including serology and advanced imaging, and a diagnosis of Sagliker syndrome was rendered/confirmed. **Conclusion**: Sagliker syndrome is a rare yet significant syndrome that can present with oral and maxillofacial findings which may provide clues to the clinician regarding the potential diagnosis. The condition also presents challenges for dental management given the commonality of renal failure and jawbone pathology including brown tumors of hyperparathyroidism and renal osteodystrophy.

Poster #9

Title: Laser vs. Conventional Treatment of Pediatric Cavities Effect on Anxiety

Authors: Katelyn Ordway, N. Chen, and Alexander Alcaraz

Faculty Advisor: Alexander Alcaraz

Background/Purpose: Dental fear is a significant factor contributing to the avoidance of regular dental care. Adverse childhood dental experiences can reduce the frequency of visits to the dentist, leading to poor oral hygiene and potential emergency visits. **Methods**: Patients seen at Healthy Smiles for Kids of Orange County will be randomized into either the Waterlase (Er,Cr:YSGG laser) or control groups. The control treatment group assesses conventional cavity preparation beginning with local anesthetic injections followed by cavity preparation using a high-speed handpiece. The Waterlase treatment group does not routinely receive local anesthetic injections at the beginning of their visit, unless requested or if the doctor deems it necessary to complete treatment. Patients' blood pressure, pulse rate, and behavioral signs of stress are monitored throughout the appointment. Additionally, anxiety will be assessed using a modified Child Dental Anxiety Scale and Frankl behavior rating score. Questionnaires are numerically weighted for statistical analysis. **Results**: Final data pending. **Conclusion**: We hypothesize that treatment of dental caries with hard tissues lasers will reduce the need for local anesthesia and dental anxiety.

Poster #10

Title: Light transmittance of printed CAD/CAM materials

Authors: Alberto Lázaro Pascual, Jin-Ho Phark, and Sillas Duarte

Faculty Advisor: Jin-Ho Phark and Sillas Duarte

Background: Recently, printed CAD/CAM materials for definitive restorations have become available. However, little information is available about the transmittance of light through these materials. **Purpose**: To evaluate the transmittance of light through CAD/CAM resin materials for definitive restorations manufactured additively (printed) or subtractively (milled) as a function of material, thickness, and wavelength. **Methods**: A total of 120 flat, squared samples were fabricated from three different CAD/CAM resin materials for definitive restorations (milled: Lava Ultimate; printed: Varseo Smile Crown Plus and Ceramic Crown). Specimens of different thicknesses (1.00 mm, 2.00 mm, 3.00 mm and 4.00 mm, n=10 per thickness) were fabricated and polished. Transmittance of light at different wavelengths (400 nm, 410 nm, 418 nm, 420 nm, 468 nm) was measured using a transmittance spectrophotometer (PerkinElmer Lambda 950 UV-Vis-Nir). Data was analyzed using Kruskal-Wallis and Mann-Whitney tests with Bonferroni correction (α=.05). **Results**: Transmittance of light was higher for Lava Ultimate, followed by Varseo Smile Crown Plus and Ceramic Crown. Significant differences were observed between thicknesses: 1 mm thickness transmitted the most while 4 mm transmitted the least. Higher transmittance values were achieved when longer wavelengths were used: irradiant light at 468 nm transmitted the most, while irradiant light at 400 nm transmitted the least. **Conclusion**: Light transmittance can be affected by the material used, the thickness, and the wavelength of the light. Light transmittance through permanent CAD/CAM resin materials was reduced for printed materials, increasing thickness, and lower wavelengths.

Poster #11

Title: Artificial Intelligence-Based Diagnostic Support System for Residents

Authors: Rekha Jayaprakash, Nicolas Veas, Gerald Loeb, Glenn Clark, and Anette Vistoso Monreal

Faculty Advisor: Anette Vistoso Monreal

Background: The American Dental Association (ADA) has recently approved two new specialties in dentistry; these are the disciplines of Orofacial Pain (OFP) and Oral Medicine (OM). These two disciplines are more commonly established in healthcare centers for education as hospitals and Universities therefore, the majority of the patients with OFP and OM conditions are seen by trainee providers (clinical residents) under the supervision of senior clinicians. The significant subjective component and multiple symptom presentations of the diseases in OFP and OM present a big diagnostic challenge for dental residents. Providers and clinical residents must often rely on a combination of subjective and objective observations to diagnose a patient who might have multiple complaints, which represents a challenge for novice clinicians, specifically first-year residents. The clinical observations in these two disciplines are typically recorded as free text, making the information difficult to process for the novice clinician and mine computationally. **Purpose**: Create a customized note-taking system called Smart Note (SN) for the Orofacial Pain (OFP) and Oral Medicine (OM) Center at the University of Southern California (USC). **Methods**: We calculated the probabilities with the Naïve Bayesian inference algorithm trained on 1020 de-identified encounters recorded in our dataset. **Results**: The accuracy reached 96.41%, the specificity 96.95%, and sensitivity 70.37%. **Conclusion**: While some rarer diagnoses still present low accuracy, we have created a structured and accurate note-taking system that shows a promising ability to predict the expert's true positive working diagnosis, supporting the clinical decision-making process of novice clinicians.

Poster #12

Title: Color and translucency change of 3D-printed resins after staining

Authors: Xin En Andrew Lim and Jin-Ho Phark

Faculty Advisor: Jin-Ho Phark

Background/Purpose: To assess the effect of different beverages (coffee, red wine, Coca-Cola, and distilled water) on the color and translucency change in resin-based definitive CAD/CAM materials. **Methods**: 180 specimens of 3 different resin-based definitive CAD/CAM materials, Lava Ultimate (LU; 3M, St. Paul, MN, USA), VarseoSmile Crown plus (VS; Bego, Bremen, Germany) and Ceramic Crown (CC; SprintRay, Los Angeles, CA, USA) were immersed in 3 staining solutions (coffee, wine and Coca-Cola) twice a

day, for 2 weeks. Specimens were immersed in distilled water as a control. Color and translucency changes were calculated using CIE L*a*b* values. Statistical analysis was done with the Kolmogorov-Smirnov and Shapiro-Wilk tests, and the Kruskall-Wallis test with Bonferroni correction. **Results**: For color change, after staining, there were significant differences between materials, except for LU-VS (p=0.155). There were significant differences between solutions, except for distilled water-Coca-Cola (p=1.000). After polishing, there were significant differences between all materials (p<0.05). There were significant differences between coffee-wine (p=0.038) and coffee-water (p=0.040). For translucency change, after staining, there was a significant difference in materials only between LU-VS (p=0.004). There were significant differences between solutions except for coffee-wine (p=0.080) and Coca-Cola-water (p=1.000). After polishing, there were significant differences between materials, except for CC-LU (p=1.000). There were significant differences between all solutions, except for water-Coca-Cola (p=1.000). **Conclusion**: Different staining solutions influenced the color and translucency of resin-based CAD/CAM materials. Coffee produced the most significant color and translucency changes. The printable materials had more significant color and translucency changes compared to the milled material.

Poster #13

Title: Digital Atlas of Facial Growth in *Macacca fascicularis* Rhesus Monkeys as defined by lead acetate vital stains

Authors: Sareen Pateel Ayvazian and Stephen Yen

Faculty Advisor: Stephen Yen

Background: The rhesus monkey, *Macacca fascicularis*, is an animal model for studying post-natal facial and cranial growth due to anatomic similarities to the human skull. Vital stains are used to define regions of active mineralization. **Purpose**: To digitize photomicrographs of osseous samples stained with lead acetate stains and group the digital data into an atlas organized by anatomic parts of the monkey skull. **Methods**: Three rhesus monkeys (mixed dentition, age 8-10 in human years) were injected weekly with lead acetate for a total of four to five injections. The bone samples were fixed in 10% formalin and demineralized in 0.4% HCl with H_2S gas. Coronal blocks of bone were embedded in gelatin and immersed in a gold chloride solution to reveal sharp lead sulfite lines. Bone blocks were frozen with liquid nitrogen and sectioned with a Zeiss table cryostat. Bone blocks were separated and sectioned according to the cranium, femur, mid-ramus, supraorbital ridges, nasal septum, and skull base. These slices were then photographed under a Zeiss light photomicroscope. To digitize the images, each Ektachrome 100 slide was scanned using the Nikon COOLSCAN 5000 ED and organized into corresponding digital folders. **Results**: Digitized scans were organized into digital folders corresponding to each bone block origin. Each region was described according to the location and gap distance between incremental lead sulfide lines. **Conclusion**: The goal is to make this atlas accessible to researchers and clinicians interested in postnatal skull growth.

Poster #14

Title: Digital Atlas of Human Fetal Development

Authors: Ashley Mach and Stephen Yen

Faculty Advisor: Stephen Yen

Background: An atlas of human fetal development can help clinicians appreciate the changes that occur during prenatal growth. **Purpose**: To collate a collection of photographs, radiographs, and cephalometric tracings of human fetal specimens into an atlas of human development, and to evaluate the growth and development of cranial and facial bones during the prenatal period. **Methods**: This collection consists of 450 human fetal specimens collected by Dr. Peter Yen, the orthodontic department chairman at Sun Yat-Sen University of Medical Sciences between 1986-1990. Of the 445 fetal specimens (13 weeks to 40 weeks), 215 were male and 230 were female. All specimens were from the Sun Yat-Sen University Medical Center (Guangzhou, China). The specimens were photographed, radiographed in a lateral orientation, and traced. This data was digitized from Ektachrome slides with a Nikon COOLSCAN LS 5000 ED Film scanner. Photographs were digitized with the Plustek Z3000 Photo and Document scanner. Cephalometric radiographs were hand-traced to evaluate cranial and facial proportions and Bjork's facial polygon. **Results**: Specimens showed a downward growth pattern in the anterior cranial base and an upward growth pattern in the posterior cranial base. The soft tissue grew forward in nearly parallel increments from the frontal region to the chin while the facial height lengthened. **Conclusion**: The photographic data was collated into a digital atlas and organized according to chapters describing different anatomic regions of the face.

CBY/PIBBS GRADUATE STUDENTS

Poster #15

Title: Decoding Citrullination in Oral Inflammation: Impact, Mechanisms, and Therapeutic Strategies

Authors: Mehrnaz Zarinfar, Xi Chen, and Jian Xu

Faculty Advisor: Jian Xu

Background: Periodontal disease (PD) is a chronic inflammatory disease caused by pathogens and the host's immune response, leading to alveolar bone loss, damage to periodontal ligaments, and tooth loss. Induction of inflammation critically depends on TLR signaling and NFκB pathway, known to be regulated by TGF-b and BMP signaling. Protein methylation, particularly arginine methylation by PRMT1, regulates TGFβ's role in inhibiting TLR-NFκB signaling, impacting inflammation and bone loss in periodontitis models. Citrullination, another arginine modification catalyzed by PADs, links to autoimmune responses such as rheumatoid arthritis and Alzheimer's disease. Elevated PADs and citrullinated proteins are found in periodontitis, yet the precise link between citrullination and the condition remains unclear. **Purpose**: To assess the extent and intensity of citrullination in oral inflammation and the impact of its interplay with arginine methylation on exacerbating periodontitis. **Methods**: Biochemical and signaling analysis using oral gingival epithelial cells will be performed. Furthermore, we will implement translational and transcriptional analysis using an experimental mouse periodontitis model. **Results**: My results have demonstrated increased citrullination in inflamed gingival epithelium during Ligature-induced mouse periodontitis. Inhibiting citrullination notably reduced tissue damage and bone loss, while inhibition of arginine methylation aggravated inflammation and bone loss. **Conclusion**: Our findings indicate a protective role for protein arginine methylation, whereas citrullination demonstrates detrimental effects in periodontal tissue during inflammation and contributes to bone loss. Subsequent experiments will aim to elucidate the intricate molecular mechanisms governing the interplay between methylation and citrullination in oral inflammatory pathologies.

Poster #16

Title: The skull injury repair and suture regeneration at single-cell resolution

Authors: Ziying Lin, Li Ma, Jing Wang, Qing Chang, Supawadee Jariyasakulroj, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Calvarial sutures joint flat bones of the skull and serve as the growth center of the skull. The development and homeostasis of calvaria are under tight regulations, which are crucial for understanding the etiologies and developing treatments of craniofacial disorders. However, a comprehensive mechanistic understanding of skull injury repair and suture regeneration is lacking. **Purpose**: To uncover the cell dynamics and potential signaling interactions within the injured skull and regenerating suture. **Methods**: Here we performed single cell RNA-sequencing of regenerating tissues of mouse coronal sutures after suturectomy followed by RNAscope imaging analysis. **Results**: Mesenchymal stem cells (MSCs) have limited presences in regenerating tissues, whereas injury induced a drastic increase in three sub-populations of macrophages with distinct localization. We identified injury-induced four sub-clusters of fibrotic or regenerative fibroblasts at the wound site as potential progenitor cells for the potential replenishment of loss sutures. Transcriptomic analysis suggested that these induced fibroblasts may originate from local ectocranial layers above the coronal suture as well as the meninges below the suture, through a cell state transition process resembling suture development. CellChat analysis suggests a potential macrophage-fibroblast interaction via Igf1 signaling after injury. **Conclusion**: Thus, our study provides a systematic view of cell dynamics during skull injury repair and suture regeneration.

Poster #17

Title: PRMT1-SFPQ Regulated Intron Retention Controls ECM Expression During Mandibular Development

Authors: Julia Raulino Lima, Nicha Ungvijanpunya, Qing Chen, Greg Park, Zhipeng Lu, Mohammadreza Vatankhah, Tal Rosen, Weiqun Peng, and Jian Xu

Faculty Advisor: Jian Xu

Background: Cranial Neural Crest Cells (CNCCs) are vital for craniofacial structure formation. Alterations in CNCCs' spliceosome elements influence the processing of pre-mRNA, resulting in facial abnormalities characterized in human patients as spliceosomopathies. Intron retention (IR), for instance, is one type of alternative splicing (AS) involved in various biological processes and diseases. By investigating the regulation of IR in CNCCs, we uncovered a novel mechanism that involves post-translational modification of splicing factor SFPQ through methylation by PRMT1. **Purpose**: Investigate the unappreciated roles of PRMT1 and SFPQ in regulating gene transcription and mRNA splicing in CNCCs. **Methods**: *Wnt1-Cre;Prmt1fl/fl* embryos at E13.5 underwent CNCC-specific PRMT1 deletion. A set of imaging and FACS analyses was performed to observe PRMT1's impact on SFPQ function and intron splicing. Primary CNCC cultures transfected with SFPQ-targeting siRNAs and RNA-sequencing further elucidated the regulatory role of PRMT1-mediated SFPQ methylation in gene expression. **Results**: *Prmt1 CKO* embryos exhibited increased IR events of mRNA splicing, particularly in mRNAs with decreased expression. Among the genes with the highest IR levels, ECM transcripts were observed as the most affected genes, demonstrating that PRMT1 controls ECM expression through IR. *Prmt1 CKO* embryos also exhibited a reduction in the methylation and protein expression of SFPQ. Further, SFPQ-depleted CNCCs showed ECM transcripts as the top downregulated genes with the highest IR levels, demonstrating that the PRMT1-SFPQ pathway regulates mRNA splicing to control ECM transcripts through IR. **Conclusion**: PRMT1's methylation of SFPQ influences intron splicing and affects ECM gene expression in CNCCs.

Poster #18

Title: Identifying injury-responsive temporomandibular joint cells

Authors: Maria Pacheco Vergara, Aaron Huang, and Amy E. Merrill

Faculty Advisor: Amy E. Merrill

Background: Over 10-15% of the adult population are affected by temporomandibular joint disorders (TMD), particularly women 20-45 years old. TMD is a group of clinical conditions characterized by chronic jaw dysfunction with persistent orofacial pain. Articular disc displacement (ADD) is thought to develop arthrogenous TMD, where there is derangement of joint connective tissue. Yet, little is known about the transcriptional and cellular changes that occur in the temporomandibular joint (TMJ) following ADD. **Purpose**: The aims of this study are to characterize the molecular and cellular response that occur in the TMJ following ADD, combining genomics and genetics in a mouse surgical model. **Methods**: For ADD surgery, the masseter muscle is cut between the zygomatic and buccal branches of the facial nerve, exposing the condyle neck. Next, the joint capsule is opened and the AD's retrodiscal laminae severed. The ADD response will be characterized by histology (days 5, 10 and 15 post-surgery), bulk RNA-seq to identify gene expression changes, and scRNA-seq to detect cell composition differences. I will use genetic lineage tracing to identify Sox9- and Scx-lineage cells (key sources of condylar and disc cells) following ADD. **Results**: Utilizing lineage tracing, we identified Scx+ and Sox9+ cells in the AD and articular surfaces (condyle, temporal bone) of adult mice. Preliminary results following ADD surgery show histological changes in the condylar superficial zones and AD. **Conclusion**: New insights into the molecular and cellular mechanism that underlie arthrogenous TMD can further our understanding of TMD and improve patient outcomes.

Poster #19

Title: Immune activation inhibits CAD-mediated metabolic reprogramming through TBK1 and IKKβ

Authors: Taolin Xie, Chi Liang, Hansong Xia, Anjie Lu, Chao Qin, Ali Can Savas, Yongzhen Liu, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: CAD (Carbamoyl-phosphate synthetase, Aspartate transcarbamoylase and Dihydroorotase) catalyzes the first three steps of *de novo* pyrimidine synthesis. Our lab previously reported that CAD deamidates NF-κB transcriptional factor RelA, which shunts RelA from mediating inflammation to aerobic glycolysis. We hypothesize that CAD-mediated RelA deamidation serves as a switch between immune activation and cell proliferation. Thus, we are keen on the question how CAD activity is modulated in response to infection. **Purpose**: This study aims to determine whether CAD activity is regulated by immune activation and, if so, how it is regulated. **Methods**: CAD enzymatic activity is comprised of dihydroorotate synthesis and protein deamidation. The synthesis rate of dihydroorotate is measured by tracing and pool size using mass spectrometer coupled to liquid chromatograph, indicative of CAD metabolic activity, while RelA deamidation is analyzed by two-dimensional gel electrophoresis. Additionally, canonical or deamidated RelA-mediated gene expression is quantified by real-time PCR. **Results**: We found that CAD enzymatic activity is inhibited upon immune activation in multiple cell lines. Mechanistically, CAD is phosphorylated by TANK-binding kinase-1 (TBK1) and inhibitor of nuclear factor κB kinase-β (IKKβ) at multiple sites, which block its activities in pyrimidine synthesis and RelA deamidation. Intriguingly, a portion of cancer cells can switch TBK1 from inhibiting CAD to activate mTOR signaling, thereby promote

CAD activation and subsequent tumor cell growth. **Conclusion**: Our study highlights a novel crosstalk between innate immunity and cellular metabolism, placing cellular metabolism as a ramification of immune response against infection and tumorigenesis.

Poster #20

Title: Role of arginine methylation of Runx2 in osteogenic differentiation

Authors: Prerna Sehgal, Nicha Ungvijanpunya, Yongchao Gou, Abhijit Shinde, Stephen Yen, Baruch Frenkel, and Jian Xu

Faculty Advisor: Jian Xu

Background: Runx2 is the master transcription factor for bone formation. Mutations in Runx2 results in cleidocranial dysplasia with patients displaying craniofacial defects including an open metopic suture. Because of its importance, Runx2 is tightly regulated by various post-translational modifications. Our preliminary data showed that PRMT3 and PRMT4 are highly expressed in the osteoblast lineages and catalyze Runx2 methylation at four arginine (R) residues within the transactivation domain. **Purpose**: To investigate the role of Runx2 arginine methylation in osteogenesis and craniofacial development. **Methods**: qRT-PCR, Alp staining and RNA-seq analysis were performed using dox-inducible C2C12 stable cell lines expressing Runx2 WT or methylation-deficient mutants. Profiled genome-wide enhancer binding sites differentially regulated by Runx2 WT vs mutants by conducting H3K4me1 and H3K27Ac ChIP-seq analysis. **Results**: Runx2 arginine methylation is required for osteogenic differentiation and essential in promoting osteoblast migration in cultured osteoblasts. Our data indicates Runx2 recruitment to distal enhancers contribute towards skeletal development. PRMT4 deficiency inhibits osteoprogenitor migration at the osteogenic fronts in mice with neural crest-specific PRMT4 deletion. These mice exhibit open posterior frontal suture. Genomic and transcriptomic analysis revealed a significant downregulation of ECM-related and cell motility genes, as well as decreased Runx2 enrichment in these gene promoters. **Conclusion**: Arginine methylation of Runx2 is required for osteogenesis and PRMT4-methylated Runx2 at the osteogenic fronts is essential for posterior frontal suture closure via regulating osteoprogenitor migration and matrix maturation.

Poster #21

Title: Perturbation in Ameloblastin Amphipathic Helix Motif Leads to Enamel Malformation

Authors: Gayathri Visakan, Edwin Sarkisians, Jing Cai, and Janet Moradian-Oldak

Faculty Advisor: Janet Moradian-Oldak

Purpose: To investigate the consequences of perturbation in the cell binding amphipathic helix (AH) motif of ameloblastin (Ambn) on enamel prismatic structure using cell culture and genetically engineered mouse models. **Methods**: Mutant mouse lines Ambn$^{\Delta K74\text{-}L79}$ and Ambn$^{\Delta L76\text{-}P86}$ that delete either the polar (Ambn$^{\Delta K74\text{-}L79}$) or the hydrophobic amino acids (Ambn$^{\Delta L76\text{-}P86}$) within the AH motif were generated. P21 and 7-week-old mouse incisors were analyzed by optical microscopy, Micro-CT analysis and SEM. Analysis of enamel mineral density, thickness and volume was carried out using CTAn and Avizo software. **Results**: In the Ambn$^{\Delta K74\text{-}L79\ -/-}$ mice the incisal 1/3rd of the enamel surface appeared rough and chalky white with blunted tips. In the Ambn$^{\Delta L76\text{-}P86\ -/-}$ mice, a more severe phenotype was observed with the entire enamel appearing chalky white with a coarse 'sandpaper' like texture and significant blunting of incisal tips. A decreased mineral density and enamel volume compared to age matched controls was observed in both Ambn$^{\Delta K74\text{-}L79\ -/-}$ and Ambn$^{\Delta L76\text{-}P86\ -/-}$ mice. SEM revealed hypomineralized enamel with normal thickness in homozygotes and heterozygotes of both mutant mice lines. Loss of mineral density and prismatic structure was more severe in Ambn$^{\Delta L76\text{-}P86\ -/-}$ mice. Some patches of hypo-mineralized regions, enriched in organic matrix, with a loss of prismatic structure were observed in Ambn$^{\Delta K74\text{-}L79\ -/-}$. xAB2 peptide interacted with ALC causing cell spreading whereas xAB2ΔK74-L79 and xAB2ΔL76-P86 peptides failed to do so. **Conclusion**: Our data suggests that the presence of an intact and functional AH motif on Ambn is necessary for the development of prismatic enamel.

Poster #22

Title: Investigating Mechanisms of Craniosynostosis in Bent Bone Dysplasia Syndrome

Authors: Audrey Nickle and Amy E. Merrill

Faculty Advisor: Amy E. Merrill

Background: Craniosynostosis, or the premature fusion of suture joints in the skull, is the second most common craniofacial difference. The most commonly affected gene in inherited cases is Fibroblast Growth Factor Receptor 2, or *FGFR2*. Bent Bone Dysplasia Syndrome (BBDS) is one such condition, with two identified mutations (M391R and Y381D) within the transmembrane domain of *FGFR2*. The Merrill Lab has previously characterized the cellular changes these mutations illicit, including a non-canonical function of FGFR2 within the nucleolus where it affects rDNA transcription and ribosome biogenesis. **Purpose**: In order to relate this function to the development of craniosynostosis, we developed a Cre-inducible mouse model for the M391R allele. **Methods**: Activation of this mutation within the neural crest leads to progressive fusion of all calvarial sutures, including those which are not made of NC-derived bone. We hypothesize that the signaling changes driving this phenotype are directed by the NC-derived non-osteogenic connective tissue within sutures. **Results**: Lineage tracing of NC cells shows that these cells are altered when the Fgfr2^{M391R} allele is expressed. At the coronal suture, mutant cells contribute to ectopic bone. Differential RNA sequencing shows an increased Wnt signaling and decreased p53 signaling. Utilizing snATAC sequencing, we will assess differential accessibility of affected genes between WT and *Wnt1-Cre;Fgfr2$^{M-391Rfl/+}$* mutants to assess how nuclear Fgfr2 is responsible for these signaling changes. **Conclusion**: This will not only expand our understanding of the pathology of craniosynostosis in BBDS, but also provide *in vivo* evidence of the role of nuclear Fgfr2 during craniofacial development.

Poster #23

Title: Functional studies of the lymphatic system in TMJOA and pain

Authors: Yang Shu, Paofen Ko, Supawadee Jariyasakulroj, Qing Chang, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: TMJOA is a degenerative disease that has chronic pain as well as bone and cartilage changes. The pathogenesis and treatment strategies of TMJOA remain to be established. The lymphatic system regulates fluid balance and immune surveillance. Murine studies demonstrate the critical role of the lymphatic system in the pathogenesis and therapy of infammatory-erosive knee arthritis by removing catabolic factors, cytokines and inflammatoy cells. However, the roles of lymphatic system in TMJOA have not been investigated. **Purpose**: This research is to investigate the lymphatic functions in TMJOA and pain. **Methods**: We established an inflammatory painful TMJ OA mouse model via intra-articular injection of CFA (Complete Freund's Adjuvant). Prox1 is a master regulator for lymphatic vessel development. We use Prox1$^{+/-}$ mouse to perturb the lymphatic function on the CFA mouse models. We perform von Frey and bite force assays to quantify the pain and immunostain-

ing and lymphatic drainage assay to characterize pathologies. **Results**: 1. Increased lymphangiogenesis in painful TMJOA after CFA-induced joint inflammation; 2. Lymphatic dysfunctions by Prox1$^{+/-}$ lead to more severe pain; 3. Delayed resolution of CFA-induced TMJ inflammation in Prox1$^{+/-}$ lymphatic dysfunction mouse models; 4. Prox1$^{+/-}$ lymphatic dysfunctions results in more severe TMJOA and synovitis. **Conclusion**: These results suggest the lymphatic system might facilitate the resolution of inflammation to prevent severe TMJOA and pain.

Poster #24

Title: Characterize Temporomandibular Joint Osteoarthritis with Pain at Single-Cell Resolution

Authors: Supawadee Jariyasakulroj, Ziying Lin, Qing Chang, Yang Shu, Jiying Chen, Paofen Ko, Li Ma, Wei Zhang, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Temporomandibular joint (TMJ) osteoarthritis (OA) is characterized by joint degeneration with synovitis, cartilage remodeling, and subchondral bone destruction along with the potential orofacial pain. However, treating pain conditions are a challenging task due to the inability to target underlying mechanisms precisely. Therefore, further studies in mechanisms contributing to painful TMJ OA are required. **Purpose**: To model and characterize at the single cell level of TMJ osteoarthritis with pain. **Methods**: We established an inflammatory painful TMJ OA mouse model via intra-articular injection of CFA (Complete Freund's Adjuvant). Single-cell RNA sequencing (scRNA-seq), multiplex immunodetection, and genetic reporter mice were used to investigate the cell type diversity in the TMJ and identify their dynamic changes during the progression of TMJ OA and pain. **Results**: TMJ OA mice exhibited cartilage remodeling, bone loss, synovitis, and orofacial pain behavior, recapitulating hallmark symptoms in patients. Single-cell transcriptomics of TMJ identified the anatomically discrete and functionally different fibroblast subsets that are expanded in TMJ OA along with pain development. A distinct population of tissue-resident macrophages, form an internal immunological barrier at the synovial edge adjacent to the lining fibroblast subsets. In addition, sensory innervation was robustly induced in the synovial regions coupled with an expansion of fibroblasts and macrophages, contributing to painful TMJ OA. **Conclusion**: Single-cell atlas provides a comprehensive view of cell type diversity and function in the development of TMJ OA and pain, pointing toward potential targets for therapeutic strategies.

Poster #25

Title: The role of histone demythlase *Kdm6b* in regulating tooth root development

Authors: Heliya Ziaei, Tingwei Guo, Jifan Feng, Lin Meng, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: During development, histone modifications, including histone H3 lysine 27 methylation (H3K27me), play a pivotal role in regulating gene expression and maintaining cellular identity. The *Kdm6b* gene encodes a histone H3K27 demethylase, counteracting the methyltransferase Ezh2's repressive effects on gene transcription. Dysregulation in this balance can lead to developmental defects, such as tooth root abnormalities. **Purpose**: This study investigates Kdm6b's role in mouse tooth root development. **Methods**: Immunofluorescence, RNA *in situ* hybridization, microCT, histology, RNA sequencing. **Results**: The RNAscope of the *Kdm6b* gene confirmed widespread expression of Kdm6b in first molar root mesenchymal cells across various developmental stages. Conditional knockout of *Kdm6b* in CNC-derived mesenchymal cells (*Osr2Cre;Kdm6b$^{fl/fl}$*) resulted in significant morphological alterations and bone and dentin differentiation defects in the adult mouse tooth root. Bulk RNA sequencing at PN3.5 revealed several upregulated and downregulated genes in mutants. *Ezh2* was one of the top upregulated genes; therefore, one of the alleles of *Ezh2* was deleted from the mutant mice to rescue the phenotype. The length of the tooth root and cell differentiation defects were rescued in *Osr2Cre;Kdm6b$^{fl/f}$;Ezh2$^{f/+}$* mice compared to the control. **Conclusion**: *Kdm6b*-specific knockout in CNC-derived mesenchymal cells led to shortened tooth roots and disrupted cell differentiation, which were rescued by deleting one of the alleles of its antagonist enzyme, Ezh2. These findings underscore the imperative and interactive role of Kdm6b and Ezh2 in regulating tooth root development. Future research will explore downstream factors identified through bulk RNA sequencing, elucidating their precise regulatory mechanisms in mouse tooth root morphogenesis.

Poster #26

Title: HSV-1 UL37 facilitates virus assembly by deamidating UL19 capsid protein

Authors: Rui Wang and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Herpes Simplex Virus 1 (HSV-1) primarily infects mucosa epithelial cells and establishes latent infection in the peripheral and central nervous system. During the HSV-1 life cycle, the capsids are assembled in the infected cell nucleus. The virus capsid assembly determines the following DNA packaging and nuclear egress, while the molecular mechanisms that regulate capsid assembly are not well established. Our lab has previously characterized the HSV-1 UL37 tegument protein as a bona fide protein deamidase that inactivates cellular RIG-I and cGAS to avoid antiviral immune response. Utilizing the UL37 deamidase-deficient recombinant HSV-1, we have uncovered the essential role of the UL37 deamidase in HSV-1 capsid assembly during lytic replication. **Purpose**: Delineate the molecular mechanism underlying how UL37 deamidase facilitates HSV-1 capsid assembly. **Methods**: The virus capsid assembly defect is characterized through plaque assay, real-time qPCR, and western blot. The UL19 deamidation is determined by 2D-gel electrophoresis and LC-MS. **Results**: The deamidase-deficient HSV-1 displays significant impairment in lytic replication in Vero cells deficient in interferon (IFN) induction. Analysis of virus capsid protein indicates a specific requirement for the UL37 deamidase activity for HSV-1 capsid assembly. Meanwhile, we characterized the interaction between UL37 and major capsid protein UL19. In the UL37 deamidase-deficient HSV-1, a decreased level of UL19 deamidation is identified by 2D-gel electrophoresis and LC-MS. **Conclusion**: Targeting capsid assembly in HSV-1 pathogenesis may provide new insights into the fundamental mechanisms underlying HSV-1 infection and inform novel strategies for the treatment and prevention of oral inflammatory diseases.

Poster #27

Title: The Crucial Role of ADGRG6 in Maintaining Growth Plate Homeostasis

Authors: Fangzhou Jo Bian, Hong Colleen Feng, and Zhaoyang Liu

Faculty Advisor: Zhaoyang Liu

Background: The cartilage growth plate is essential for maintaining skeletal growth; however, the mechanisms governing postnatal growth plate homeostasis remain poorly understood. We recently identified a cartilage-enriched G protein-coupled receptor (GPCR) named ADGRG6, which does not vitally affect embryonic limb development but inhibits postnatal skeletal growth. We

hypothesize that ADGRG6 plays a crucial role in maintaining postnatal growth plate homeostasis in mice. **Purpose**: To understand the functional role of ADGRG6 in maintaining postnatal growth plate homeostasis in mice, we performed spatial transcriptomics on mineralized tissues. We then used IHC to validate and dissect the downstream signaling pathway of *Adgrg6*. **Methods**: We generated two genetic mouse models to delete *Adgrg6* expression in osteochondral progenitor cells and postnatal chondrocytes. Utilizing spatial transcriptomics with the 10x Genomics Visium platform in combination with immunohistochemistry analyses, we identified a group of crucial molecules and signaling pathways that are downstream of ADGRG6 signaling. **Results**: *Adgrg6* ablation in osteochondral progenitor cells or postnatal chondrocytes leads to severe growth plate defects, including disorganized columnar alignment of the chondrocytes, impaired formation and maintenance of the resting zone, and increased cell death. These phenotypes may be driven by reduced SOX9 expression and ectopic Indian hedgehog (IHH) signaling. We further demonstrated that ADGRG6 regulates the proper formation of the resting zone growth plate by maintaining the PTHrP and SOX9-positive cell populations. **Conclusion**: Altogether, our findings elucidate the essential role of a cartilage-enriched GPCR in maintaining chondrocyte fate, survival, and homeostasis in mouse growth plates via positive regulation of SOX9 expression and negative regulation of IHH signaling.

Poster #28

Title: Ahr pathway activation disrupts osteogenic differentiation in mesenchymal cells

Authors: Mohammadreza Vatankhah, Prerna Sehgal, Tal Rosen, Julia Raulino Lima, Mehrnaz Zarinfar, Jiang Qian, and Jian Xu

Faculty Advisor: Jian Xu

Background: TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin) is the most toxic dioxin produced through various industrial sources which can induce cancer, skin diseases, and birth defects. When pregnant mice were injected with 40μg/kg TCDD, 100% of the offspring showed cleft palate (CP). Ahr is the receptor for TCDD and regulates important gene expressions including Cyp1a1. Ahr deletion completely rescues TCDD-induced CP. Furthermore, Nrf2 is the main pathway against oxidative stress, regulating genes such as Nqo1. Crosstalk between Ahr and Nrf2 pathways was proposed to respond to TCDD in mammalian cells. **Purpose**: To characterize the transcriptional responses to TCDD mediated through the crosstalk of Ahr and Nrf2 pathways in ST2 cells. **Methods**: siRNA transfection, RNA-sequencing, qPCR, Immunostaining, Chromatin Immunoprecipitation (ChIP)-qPCR. **Results**: RNA-seq and qPCR tests demonstrated that TCDD activated Ahr and Nrf2 pathways. Double knockdown (KD) by different siRNAs confirmed an expression regulatory role for each Ahr and Nrf2 on their downstream factors. TCDD treatment downregulated osteogenic genes at the expression level, more pronounced during osteogenic differentiation. Osteogenic differentiation itself significantly downregulated the Ahr pathway, and to a lesser effect, the Nrf2 pathway components. ChIP-qPCR revealed that Ahr protein binding upon TCDD exposure was significantly increased to the promoter regions of both Cyp1a1 (~40 folds) and Nqo1 (~20 folds). Nrf2 binding to the promoter region of Nqo1 almost doubled, but its binding to the Cyp1a1 promoter region did not change after TCDD exposure. **Conclusion**: TCDD disrupted osteogenic differentiation through Ahr pathway activation. Nrf2 effect was minimal. We are investigating each pathway's independent roles and downstream factors using KD systems.

Poster #29

Title: Amelogenin *Peptide-Based Hydrogel: An Effective Treatment for White Spot Lesions*

Authors: Erika Bauza Nowotny and Janet Moradian-Oldak

Faculty Advisor: Janet Moradian-Oldak

Background: White spot lesions (WSLs) have high prevalence (68%) and incidence (45%) in fixed orthodontic patients. **Purpose**: The aim of this study was to assess the effectiveness of an amelogenin peptide-based chitosan hydrogel (P26-CS) in the remineralization of WSLs in vitro. **Methods**: WSLs in sectioned human blocks were treated with water (control), P26-CS, or fluoride varnish (positive control) followed by remineralization in artificial saliva (pH 7.1) for 21 days. Remineralization was assessed using quantitative light-induced fluorescence (QLF) and micro-computed tomography (μCT). A fluorescently tagged version of the hydrogel was used to quantify the penetration into WSLs. To test if salivary enzymes interfere in the remineralization of WSLs, tooth sections were treated with water (control) or P26-CS and remineralized for 5 days in artificial saliva with or without salivary enzymes (i.e., amylase, lysozyme, MMP1, and MMP8). **Results**: P26-CS promoted significant remineralization of WSLs when compared to control ($p = 0.002$) and fluoride varnish groups as shown by QLF. Additionally, the P26-CS group showed the highest % recovery of bone mineral density. P26-CS successfully penetrated within WSLs and was detectable to a depth of 700 μm. No difference was observed between the change in mineral density in the presence or absence of salivary enzymes, with P26-CS exhibiting higher remineralization than control in both cases. These results suggest that salivary enzymes do not impair remineralizing action of P26-CS. **Conclusion**: These results showed that P26-CS effectively penetrated and remineralized WSLs in vitro even in the presence of salivary enzymes.

Poster #30

Title: MAVS Links Mitochondrial Dynamics with Nucleotide Synthesis via PFAS-DRP1 axes

Authors: Yongzhen Liu, Xinchi Xie, Chao Qin, Yulu Duan, Ali Can Savas, Jessica Crriere, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Mitochondrial Antiviral Signaling protein (MAVS) is an integral adaptor protein in the mitochondrial outer membrane, essential for activating innate immune responses against viral infections via the RIG-I-like receptor pathway. Beyond its immune function, MAVS is implicated in mitochondrial metabolism. **Purpose**: We describe an essential role of MAVS in coordinating mitochondrial metabolism and nucleotide synthesis to fuel cell proliferation. **Results**: Loss of MAVS reduces cell proliferation and depletes metabolites of the tricarboxylic acid (TCA) cycle. There's a marked decrease in purine and pyrimidine in MAVS-deficient cells, correlating with reduced formation of purinosome. MAVS deficiency leads to highly punctate mitochondria compared to elongated mitochondria in wildtype cells. Functional screening and biochemical analysis support that MAVS recruits PFAS to deamidate DRP1, inhibiting mitochondrial fission. Cells with elongated mitochondria exhibit higher levels of oxidative phosphorylation compared to those with punctate mitochondria. **Conclusion**: Our observation of metabolic changes in cells lacking MAVS also aligns with this hypothesis. Essentially, MAVS and protein deamidation in coupling oxidative phosphorylation to *de novo* purine synthesis.

Poster #31

Title: Bacteria fuel gamma herpesvirus lytic replication via inducing ISGylation

Authors: Shutong Li, Yongzhen Liu, Chao Qin, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Periodontitis pathogenesis involves polymicrobial infection and host immune responses. Herpesviruses are implicated in peridontitis. However, how herpesvirus and oral bacteria interact and their association with periodontitis remain poorly understood. Interferon-induced gene 15 (ISG15) can be added to a target protein via concerted action of E1, E2 and E3, a process known as ISGylation. ISG15 restricts microbial infection via its action on either microbial proteins or cellular antimicrobial defense molecules. The effect of ISGylation may be target-specific and the biological functions are not well-defined in viral infection. **Purpose**: We are investigating the roles of ISGylation in MHV68 lytic replication that underpins the bacteria-stimulated effect. **Methods**: We found that *Aggregatibacter actinomycetemcomitans* (A.a, a bacterial species related to periodontitis) promoted the replication of MHV68 in mouse embryonic fibroblasts (MEFs). Moreover, MHV68 and A.a synergized to induce the expression of ISG15. Loss of ISG15 impaired MHV68 replication in MEFs. Employing affinity purification and LC-MS technology, key ISGylation sites in major capsid protein of MHV68 were identified. The recombinant MHV68 that contains ISGylation-resistant mutations replicated with much slower kinetic and yielded lower titer. The effect of ISGylation on A.a-MHV68 interaction will be futher examined by virological and immunological analyses. **Results**: Our preliminary results suggest that murine gamma herpesvirus 68 (MHV68), a model herpesvirus of human Kaposi's sarcoma-associated herpesvirus and Epstein-Barr virus, hijacks ISGylation to promote its lytic replication, and oral bacteria stimulate MHV68 lytic replication via ISGylation. **Conclusion**: In conclusion, we found that MHV68 hijacks ISGylation to promote its lytic replication, which may underpin the bacteria-virus interaction.

Poster #32

Title: Investigating the role of LGRs in jaw connective-tissue stem cells

Authors: Arshia Bhojwani, Audrey Nickle, Ryan R. Roberts, Gage Crump, and Amy E. Merrill

Faculty Advisor: Gage Crump and Amy E. Merrill

Background: Disruptions in connective tissue development cause impaired jaw movement, temporomandibular joint disorders, and other craniofacial anomalies. While stem cells that generate the skeleton are beginning to be understood, we know little about stem cells generating the non-skeletal connective tissue components of the skull. **Purpose**: This study aims to reveal the identity of connective tissue stem cells (CTSCs) that generate diverse connective tissues in the jaw and face. Leucine-rich repeat-containing G protein-coupled receptors (LGRs) have been established as an epithelial stem/progenitor cell marker in various tissues such as the intestinal epithelium and hair follicle, where they are thought to promote high WNT signaling. Whether LGRs mark stem cells of mesenchymal origin remain unclear. **Methods/Results**: Our preliminary single-cell RNAseq analyses of the developing zebrafish and mouse jaw suggest potential roles for the LGR4/5/6 family in regulating CTSCs. *In situ* hybridization analysis of *Lgr5* in mouse, and *lgr4/lgr6* in zebrafish, reveal expression in mesenchyme of Meckel's cartilage perichondrium and jaw joint, but not in cartilage, tendons, and ligaments. Preliminary lineage tracing with *Lgr5:GFP-CreER* reveals that Lgr5+ mesenchyme gives rise to jaw tendons and ligaments. Further, I find that loss of *Lgr5* results in a defective angular process. Reciprocally, constitutive WNT signaling in jaw mesenchyme also results in defective angular and condylar processes. **Conclusion**: I will discuss our model that LGR4/5/6 maintain CTSCs for alternative non-skeletal fates in mice and zebrafish by promoting a niche of high WNT signaling, with decreased WNT signaling required for tendon and ligament differentiation.

Poster #33

Title: Probing the role of HSV-1 in tauopathy and neurodegeneration

Authors: Zhenfeng Shu and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background/Purpose: Neurodegeneration is a growing issue in the aging world, with Alzheimer's Disease (AD) being the most common form of dementia. Treatments for AD face challenges due to a lack of understanding of this complex disease. Emerging evidence suggests a strong link between AD and herpes simplex virus type 1 (HSV-1) brain infection. HSV-1, an α-herpes virus causing oral and genital herpes, can also establish latent infections in the brain. AD is characterized by hyperphosphorylation of the Tau protein, leading to pathological aggregation and neural toxicity. HSV-1's encoded protein kinases, including UL13 and US3, have the potential to phosphorylate Tau. We propose that HSV-1 infection contributes to AD progression via US3-dependent Tau phosphorylation. US3 influences the location and expression of Tau, confirmed through viral protein screening. Mass spectrometry identifies phosphorylation sites within Tau upon HSV-1 infection. **Methods/Results**: To verify US3's role, an HSV-1 kinase dead mutant virus is generated. Tau phosphorylation results in oligomerization and neurofibrillary tangle formation. Soluble oligomerized Tau, a vector of neuronal toxicity, is observed in HSV-1 infected cells. In vivo experiments on tau transgenic mice involve HSV-1 brain infection. Acute pathological models are created by intracranial injection of exogenous tau followed by HSV-1 injection into the mouse hippocampus to assess HSV-1's impact on Tau modification. Fast Protein Liquid Chromatography confirms oligomer formation. **Conclusion**: This study provides insights into the intricate relationship between HSV-1 infection and Tau phosphorylation, shedding light on potential mechanisms contributing to AD progression.

Poster #34

Title: Unraveling the Splicing Complexity: Intron Retention in Osteogenic Differentiation

Authors: Tal Rosen and Jian Xu

Faculty Advisor: Jian Xu

Background: The spliceosome, a complex of RNA and proteins, governs splicing events, crucial for mRNA maturation. Mutations in spliceosome proteins lead to tissue-specific diseases called spliceosomopathies. Among various splicing events, intron retention (IR) has been predominantly studied in plants and fungi but was recently discovered in mammals. **Purpose**: IR plays a role in cell differentiation and is suspected to be involved in osteogenic differentiation, although its precise mechanism remains unclear. **Methods**: This study utilizes RNA-sequencing to identify IR events during osteogenic differentiation in ST2 cells. **Results**: The analysis revealed genome-wide enhancement of IR during BMP2-induced osteogenic differentiation, affecting numerous genes related to RNA processing. **Conclusion**: Based on identified premature termination codons (PTCs) within intron-retaining transcripts, we propose that IR regulates RNA processing transcripts through nonsense-mediated decay. Additionally, we hypothesize that splicing factors may control IR during differentiation. Osteogenic differentiation plays a

key role in directing progenitor populations to become cells that form intricate craniofacial structures. Understanding this mechanism will reveal potential therapeutics that could prevent the dysregulation of bone formation.

Poster #35

Title: Probing the Metabolic Roles of IKKepsilon in Cancer Cell Proliferation

Authors: Ali Can Savas, Chao Qin, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Glutamine amidotransferases (GATs) catalyze the synthesis of nucleotides, while glutaminolysis is generally catalyzed by glutaminase (GLS) utilizing glutamine as a nitrogen and carbon source respectively. GLS induced glutaminolysis was shown to be essential for tumor cell proliferation in vitro, however the evidence from in vivo studies is contradictory. Moreover, it was shown that tumor metabolism varies greatly in vivo and in vitro. **Purpose**: In this study we would like to better characterize the glutamine dependencies of tumors and regulatory mechanisms controlling glutamine utilization. We also decipher the role of an immune kinase, IKKepsilon, in controlling the glutamine utilization. **Methods**: We used human plasma like medium combined with high throughput metabolomics and proteomics approaches to delineate the glutamine pathway. **Results**: Our findings revealed glutamine utilization is shifted from GLS induced TCA cycle to GAT induced nucleotide synthesis in nutrient deprived in vivo like conditions. We discovered an immune kinase, IKKepsilon directs this shift via activating GATs, thus sparing glutaminase function. Phospho-proteomics analysis identified GATs (CAD, PFAS and GMPS) whose phosphorylation was significantly reduced upon IKKepsilon-depletion. Furthermore, metabolic profiling via stable isotope tracing with glucose and glutamine showed that IKKepsilon increases glutamine utilization in de novo nucleotide synthesis. **Conclusion**: Our studies showed IKKepsilon-mediated activation of glutamine amidotransferase, and likely glutamate-OAA transaminase, couples de novo nucleotide synthesis to GOT-dependent non-canonical glutaminolysis and aspartate regeneration independent of TCA cycle, thus fueling tumor cell proliferation. We further provide a novel combination strategy to target the glutamine metabolism while overcoming the GLS1 resistance.

Poster #36

Title: Viral Glutamine Amidotransferase Activates (vGAT) Purine Synthesis and Induce Tumorigenesis

Authors: Wayne Yeh, Chao Qin, Ali Can Savas, Ting-Yu Wang, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Tumor cells are generally highly proliferative. Cellular glutamine amidotransferases (GATs) catalyze the synthesis of nucleotides, amino acids, glycoproteins, and enzyme cofactors, which are building blocks for cells. PFAS belongs to the GAT family and is essential for de novo purine synthesis. We previously found that Kaposi's sarcoma-associated herpesvirus (KSHV) vGAT (encoded by ORF75) interacts with PFAS and induces tumor formation in nude mice. Though sharing homology with PFAS, vGAT lacks intrinsic enzyme activity in purine synthesis. We hypothesize that vGAT interacts with PFAS to activate *de novo* purine synthesis and fuel cell proliferation, thus contributing to KSHV-associated tumorigenesis. **Purpose**: We propose to investigate the molecular mechanism by which vGAT activates de novo purine synthesis through its interaction with PFAS. **Methods**: The purine synthesis induced by vGAT and PFAS deamidation will be analyzed using mass spectrometry to examine the metabolites of nucleotide synthesis. The role of vGAT in the formation of the purinosome, a cytosolic "organelle" for purine synthesis, will be quantified using fluorescence-tagged PFAS. **Results**: Metabolite analysis by mass spectrometry shows that vGAT expression increases purine and pyrimidine synthesis in diverse cell types, including endothelial cells and keratinocytes. The enhancement of de novo purine synthesis by vGAT was further confirmed by tracing analysis using stable-isotope-labeled precursors. Interestingly, vGAT expression in NIH3T3 cells promoted tumor formation in nude mice. **Conclusion**: vGAT induces activation of purine synthesis and alters PFAS deamidation, collectively increasing KSHV-associated tumorigenesis. Further investigation in this topic may reveal potential molecules to target for antiviral and antitumor therapy.

DENTISTRY & CCMB FACULTY

Poster #37

Title: Social Work Services Provided at the Special Needs Patient Clinic

Authors: Daniel Jacob, Anahita Far, Chris Soto, and Jasmine Flores

Background: The Associated Social Work Educational Internship Program began at the Dr. Roseann Mulligan Special Patients Clinic (SPC) in 2016, providing Master of Social Work students with clinical experience collaborating with dental faculty, students, and staff to improve service outcomes for patients. **Purpose**: Retrospectively analyze the number and type of social work support services provided at SPC. **Methods**: De-identified demographic data (age, gender, ethnicity/race, medical/dental insurance) and reported medical history form data was collected from patients' chart review 09/01/2021 to 08/31/2022 (IRB #UP-22-00501). Social work notes in axiUm were reviewed/entered into a tabular form indicating what type of service(s) were provided. **Results**: A total of 199 visits for 129 unduplicated patients were reviewed. 75% of the patients were supported by the Ryan White HIV/AIDS program. Of those 129 patients, 57% were male and 43% female. In terms of race, 60% were Hispanic, 19% African American or Black, 19% White, 1% Asian and 1% Other. 62% of our patients had Denti-Cal, 1% had Delta Dental and 36% had other insurance with 15 paying cash. Of those 199 visits, 70% were in person and 30% tele-medicine. Of those 199 visits, services provided were general needs assessment (163), supportive counseling (75), mental health services (32), transportation (20), food (19), housing (13), clothing (8), legal services (7), smoking cessation (2) and crisis intervention (1). **Conclusion**: Patients living with HIV/AIDS and other special needs benefited from a variety of social work supports that traditionally are limited in community dental homes.

Poster #38

Title: Analysis of gender gap in speaker's roles at dental organizations

Authors: Mariela Padilla, Joan Wang, and Jack Botros

Background: A comparable increase of the proportion of female representation in dentistry has not been seen in dental leadership roles. **Purpose**: To explore the speaker's gender distribution at the annual meetings for ADA-recognized specialties. **Methods**: The distribution was extracted from the schedules of the meetings (2019 to 2023). The biological gender was determined by gender specific names, facial morphology, and use of pronouns in the program. A limitation is that non-binary gender is not considered. **Results**: The analysis represents 10 specialties, with an average of female representation of 26.9% (not significantly impacted by pandemic). The lowest participation was in 2019 (26.4%), and the highest was in 2022 (27.8%). After Public Health, Pediatrics has the highest average of female participation (41.0%), followed by Oral Medicine (39.1%).

Dental Anesthesia had 50% in 2019, but the number declined to 23.3% in 2022, increasing to 42% in 2023. The lowest average corresponds to Oral Surgery (15.1%), followed by Prosthodontics (18.9%). The likelihood of females to be speakers in the surgical specialties was 23% less than in the non-surgical specialties. This might have been due to the possible fewer females in these fields (not adjusted). There is no significant increase in female participation from one year to the next from 2019 to 2023. **Conclusion**: There is a gender imbalance amongst the speakers at the annual sessions of ADA-recognized specialties. Further studies are required to analyze the reasons of such unbalanced participation, which offers lack of role models for female leadership in organized dentistry.

Poster #39

Title: An Observational Analysis of the Trends in Female Authorship

Authors: Joan Wang, Reyes Enciso, and Mariela Padilla

Background: Having balanced gender representation of role models serves to motivate those in pursuit of dentistry and to meet the needs in society. **Purpose**: To explore the representation of females in authorship over a 4-year span for the newest recognized dental specialties. **Methods**: The gender distribution was extracted from the journals of Orofacial Pain (OFP), Oral Medicine (OM), and Dental Anesthesia (DA). Biological gender was determined by gender-specific names or facial morphology in web-search. Non-binary gender was not considered in the analysis. Chi-square test was employed to compare the number of authors, likelihood ratio was calculated by journal. **Results**: For females-males as first and/or corresponding author, there were no significant changes per year. From 2020-2023, the female representation as first author was 47.27% and as corresponding author was 39.36%. Over the full period, there is a significant difference in first author females between the journal of DA and OM (p=0.015) and between DA and OFP (p=0.001). In 2022, the first author gap between OM and OFP compared with DA is larger (less females in the last). For corresponding authorship, there was no significant difference between DA and OM (p=0.282) or DA and OFP (p=0.443). OM has the highest overall percentage of female representation as first author, and OFP as corresponding author. **Conclusion**: Over the last 4 years there has not been a change in the percentage of female representation for the 3 newest recognized specialties. Further studies are suggested to determine the implications of gender authorship in each discipline.

Poster #40

Title: Amelogenin Isoform LRAP Induces Wnt3a to Regulate Human MSC Fate

Authors: Yan Zhou and Malcolm Snead

Background: Compelling evidence indicate a reciprocal relationship between osteoblasts and adipocytes, with these two cell lineages being derived from a common progenitor, the mesenchymal stem cells. The pathophysiological linkages between osteoporosis and marrow adiposity suggest that small therapeutic molecules may be able to affect both compartments by influencing the fate of mesenchymal stem cells. **Purpose**: Previously, we demonstrated in mouse models that LRAP promotes osteogenesis of mesenchymal stem cells at the expense of adipogenesis through upregulating Wnt10b expression to activate the canonical Wnt signaling. Due to the differences in gene expression and genomic responses between mice and humans, results obtained in mice might not carry over to humans. **Methods**: In this study, we employed human bone marrow mesenchymal stem cells (hBMMSCs) to characterize the therapeutic potential of LRAP to control mesenchymal stem cell fate. **Results**: LRAP stimulates osteogenesis and inhibits adipogenesis of hBMMSC cells. LRAP treatment elevates beta-catenin protein level in hBMMSC cells. Wnt antagonist sFRP1 abolishes the effect of LRAP on the stimulation of osteogenesis and the inhibition of adipogenesis of hBMMSC cells. LRAP treatment results in the upregulation of Wnt3a expression in hBMMSC cells, in comparison to Wnt10b in mice. **Conclusion**: We have identified a naturally occurring 59-amino-acid peptide molecule to control mesenchymal stem cell fate by activating the Wnt/beta-catenin signaling pathway in both humans and mice. This peptide has the potential to be developed as a therapeutic agent to increase bone mineral density while decrease marrow adiposity concurrently for more effective treatment of osteoporosis.

Poster #41

Title: Comparing "Recall" to "Case-based" Questions in Orofacial Pain Module Assessment

Authors: Azadeh Ahmadieh and Mahvash Navazesh

Background: A newly developed Orofacial Pain module has been presented to third-year DDS, and first-year ASPID students at Herman Ostrow School of Dentistry of USC for the past four years. **Purpose**: This study was done to assess the exam results taken at the end of the Orofacial Pain module. The purpose was to identify the type of questions (recall vs case-based) that were mainly missed by the students, and, to assess if the passing rate was comparable in DDS and ASPID groups. **Methods**: The Orofacial Pain module is presented through "Case-Base, Flipped Classroom" pedagogy. A review session is conducted at the end of the case. A written exam is given after the review session. The exam contains both recall and case scenario/ patient box questions. **Results**: The exam results belonging to 699 students (570 DDS and 129 ASPID), who took the exam during 2020-2023 were evaluated. The most common questions that were missed by the students were the questions that focused on recalling the information, compared to the questions with a case scenario/patient box which focused on the application of knowledge (126 times missing the correct answer happened for 21 recall questions, whereas only 67 times of missing the correct answer happened for 19 case-based questions). The passing rate was comparable in ASPID and DDS groups (95% to 99%). **Conclusion**: Case scenario/patient box-based questions may be more advantageous to assess retention and application of knowledge than recall questions. Both DDS and ASPID groups showed similar performances in passing this module.

DENTISTRY & CCMB AFFILIATES

Poster #42

Title: XPR1 in Enamel Formation

Authors: Mackayla Uy, Marziyeh Aghazadeh, Rucha Bapat, and Michael L. Paine

Faculty Advisor: Michael L. Paine

Background: Enamel is the hardest and most mineralized tissue in humans. Enamel disease results in many dental issues causing excessive tooth sensitivity and changes in tooth appearance. Enamel development and mineralization is an important process significantly influenced by ion transportations. **Purpose**: The *XPR1* gene is known as a main gene in phosphate transportation. This research studies how the loss of *XPR1* gene affects enamel formation as compared to normal enamel. **Methods**: For this purpose, we have analyzed phenotypes, enamel density, and cells of 10-month-old mice teeth in two groups: mice with no *XPR1* gene expression (mut) and mice with *XPR1* gene expres-

sion (WT). **Results**: Phenotypes of mice mandibles were examined illustrating discoloration, a blunter, shorter, chipped incisor, and worn-down molars in the mutated mice. MicroCT analysis was also conducted on the labial cortical bone edge, medial to 1st molar, and distal to 1st molar region of the incisor discovering that the mutant mice had a lower enamel density. Lastly, we performed H&E staining of mice tissues to observe the enamel-forming cells. **Conclusion**: According to our research, the *XPR1* gene plays a key role in enamel formation during tooth development, as when the gene is suppressed, the tooth experiences a lot of enamel abnormalities.

Poster #43

Title: Proteomic characterization of critical ion transporters in mouse mandibular ameloblasts

Authors: Yanbin Ji, Rucha Arun Bapat, Andres Stucky, Oliver Duverger, Yan Zhou, and Michael L. Paine

Faculty Advisor: Michael L. Paine

Background: Ion transporters, especially localized on the distal plasma membrane of ameloblasts, play a predominant role in the mineralization of enamel. Increasing evidence has demonstrated that the unique cyclic dynamic morphological transversion between SA and RA ameloblasts during the maturation-stage amelogenesis is associated with the regulation of various ion-transporting processes. **Purpose**: To investigate whether the protein half-lives and expression patterns of ion transporters in the maturation stage are associated with the cyclic modulation of RA-SA morphological status. **Methods**: We developed a novel method to assess the protein half-lives of critical ion transporters in ameloblasts, using HEK 293T cells. We also examined their protein expression signatures in post-natal day 9 (PN9) mandibular incisors maturation-stage ameloblasts. **Results**: CFTR was found to have a short half-life ($t_{1/2}$ ~ 3 hours). Slc4a4/NCKX4, Slc34a2/NaPi2b and Dlx3 have medium half-lives ($t_{1/2}$ 7-10 hours). Slc4a2/AE2, Slc26a1/SAT1, Slc26a6/PAT1, Slc26a7/SUT2, and XPR1 have a $t_{1/2}$ life greater than 10 hours. Immunofluorescent staining demonstrated that the expressions of proteins with long half-lives appear consistently during the maturation stage whereas those with either short or medium half-lives, including the control CLDN1 ($t_{1/2}$ ~ 2.6 hours), are expressed intermittently. **Conclusion**: DLX3 is a potential transcriptional factor of CFTR, Slc4a4, and Slc34a2, hence these 4 genes/proteins may play a role in the regulation of pH values in the microenvironment between RA or SA ameloblasts and enamel. Finally, it is worth noting that Slc4a2/AE2 protein is expressed throughout maturation-stage amelogenesis and may be a bona fide biomarker for maturation-stage ameloblasts.

Poster #44

Title: The Use of Art in Public Health

Authors: Anthony Santiago Soto and Mina Habibian

Faculty Advisor: Mina Habibian

Background: This study explores the application of art in health education and health promotion. One of the key responsibilities of public health is disease prevention and the promotion of overall well-being. Investing in prevention, especially "primary prevention," yields benefits for individuals, the healthcare system, and society at large. Health education is a fundamental aspect of public health, and the incorporation of "Art" can be a valuable tool especially when dealing with challenging health literacy issues. Art can hold people's attention, simplify complex ideas, evoke emotions, and create connections between abstract concepts and real-life experiences. **Purpose**: The main purpose of this study is to review the role of art in health education and health promotion. Can art be used to transfer health information between people? **Methods**: A database search (PubMed, JSTOR, Google Scholar) resulted in 1,407 records. 9 records were included in the final review after applying the inclusion and exclusion criteria. **Results**: The use of art in public health has an emphasis on social learning theory and creating positive models for people to follow. Notable effects on individuals who engage with art in public health are increases in disease knowledge, empathy, and openness to engaging in conversation about the disease with others. **Conclusion**: Art can overcome barriers to effective health education delivery, promoting positive health behaviors that can reduce the burden of diseases within communities.

Poster #45

Title: STAT3 Signaling is Required for the Mandibular Condylar Cartilage Homeostasis

Authors: Hong Colleen Feng, Jingyu He, Denis Evseenko, and Zhaoyang Liu

Faculty Advisor: Zhaoyang Liu

Background: The knee joint and temporomandibular joints (TMJ) are two frequently used joints susceptible to degenerative joint diseases like osteoarthritis (OA), leading to joint pain and stiffness secondary to articular cartilage loss. However, the molecular mechanisms that regulate postnatal homeostasis of the mandibular condylar cartilage (MCC) in TMJ remain poorly understood. **Purpose**: Our prior studies highlighted the essential role of STAT3 signaling in the proliferation and homeostasis of the postnatal growth plate and articular chondrocyte in knee joints. This study aims to assess the significance of STAT3 signaling in postnatal TMJ homeostasis in mice. **Methods**: Using a cartilage-specific *Stat3* deletion mouse model (*Acan-Cre^{ERT2}; Stat3$^{f/f}$*, TM injection at P2), we collected TMJ at 1 month and 3 months of age and performed histological and gene expression analyses. **Results**: By 3 months of age, *Stat3* deletion in mice resulted in reduced cartilage thickness and altered extracellular matrix (ECM) component expression in the MCC, resembling OA-like cartilage degeneration. The mutant MCC exhibited reduced cellularity in the superficial and intermediate zones, with decreased type II collagen expression. Conversely, the hypertrophic zone was expanded with increased expression of type X collagen. In addition, mutant MCC showed decreased expression of Indian hedgehog (Ihh) signaling pathway molecules (IHH, GLI1, and GLI2) in the intermediate and early hypertrophic zones, coupled with reduced SOX9 expression. **Conclusion**: Our study suggests that STAT3 signaling maintains postnatal MCC and TMJ integrity via regulating chondrocyte proliferation and ECM homeostasis.

Poster #46

Title: The Role of Msx1 in Mouse Palatal Development

Authors: Adiba Adrita, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: The *Msx1* gene, widely known as the Msh Homeobox 1, is a gene that encodes a transcription factor during the embryonic development of mice. *Msx1* is expressed in the palate and plays a crucial role in the regulation of embryonic development and cell differentiation. Mutations occurring in the *Msx1* gene have led to multiple disorders, including but not limited to cleft lip or cleft palate. **Methods**: To investigate the role of *Msx1* in the craniofacial regions, we generated *Msx1*$^{-/-}$ mutant and *Msx1*$^{+/+}$ control mice. MicroCT and histology analyses revealed that *Msx1*$^{-/-}$ mutant mice had cleft palates. **Results**: MicroCT morphometric analysis revealed that the palate and the mandible of *Msx1*$^{-/-}$ mutant mice were significantly smaller than the littermate controls. Immunofluorescent imaging showed clear defects in the palatal muscles. All these data

suggest that *Msx1* is important for palate and mandible development. **Conclusion**: Through this study, we were able to determine the role of *Msx1* in craniofacial development. We want to explore the mechanisms of *Msx1* in craniofacial development and hope to rescue the defect in the *Msx1* mutant mouse model.

Poster #47

Title: Investigating the Role of Tgfbr2 in Craniofacial Development in Mice

Authors: Brandon Degoma, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: The *Tgfbr2* gene is vital for cell proliferation and functions. Previous studies have shown that the alteration of TGF-β signaling in humans can lead to craniofacial malformations such as Loeys-Dietz syndrome. **Methods**: To further our knowledge on the role of *Tgfbr2* in regulating craniofacial development, we crossed *Tgfbr2*$^{fl/fl}$ and *Wnt1-Cre* mice to generate *Wnt1-Cre;Tgfbr2*$^{fl/fl}$ mice, which causes a deletion of *Tgfbr2*. To confirm these mice are missing *Tgfbr2*, we performed genotyping using PCR. Moreover, we analyzed various mutant *Wnt1-Cre;Tgfbr2*$^{fl/fl}$ mouse samples using microCT analysis and performed morphometric measurements comparing the differences between the mutant mice and the control mice. **Results**: Based on the results, we found that the mutant mice were significantly smaller compared to control littermates. Histological and immunofluorescent analyses showed significant defects in the craniofacial muscles and bones. **Conclusion**: We aim to further investigate the mechanisms of *Tgfbr2* in craniofacial development, with the aspiration of potentially finding ways to address human craniofacial defects resulting from mutations in the *Tgfbr2* gene.

Poster #48

Title: Mechanisms of Premature Fusion of the Synchondroses in Bent Bone Dysplasia Syndrome

Authors: Sebastian Ko and Amy E. Merrill

Faculty Advisor: Amy E. Merrill

Background: The synchondroses of the cranial base play a pivotal role as growth centers for the skull during early development. Premature fusion of the synchondroses contributes to midface hypoplasia in syndromic craniosynostosis. Bent Bone Dysplasia Syndrome (BBDS), which is caused by a missense mutation in *FGFR2*, is characterized by craniosynostosis, craniofacial dysmorphia, thickened periosteum, and bent long bones. **Purpose**: The goal of this study was to identify key molecular mechanisms contributing to premature fusion of the intersphenoidal synchondrosis in BBDS. **Methods**: The *Wnt1-Cre2* driver mouse was used to induce the *FGFR2*^{M391R} mutation in cranial neural crest cells. Samples were then processed for whole mount and in section histological staining. The intersphenoid synchondrosis was also dissected for RNA bulk sequencing. In situ hybridization was used to validate RNA sequencing results. **Results**: Histological sections showed that fusion of the synchondrosis begins around postnatal day 6 and is in part due to formation of ectopic bone and thickening of the perichondrium. As the phenotype progresses, expressional changes drive differentiation of chondrocytes within the growth plate-like cartilage of the synchondrosis. RNA-sequencing shows upregulation of JAK-STAT related genes as well as cholesterol biogenesis related genes. **Conclusion**: This work implicates a role for *FGFR2* in regulation of chondrocyte maturation within the synchondrosis of the cranial base. Further research will better resolve key molecular regulators affected by mutation of *FGFR2*.

Poster #49

Title: Tcf12 controls calvarial bone growth and motor learning in mice

Authors: Jesse Anderson-Ramirez, Takahiko Yamada, Lu Gao, Jianfu Chen, and Yang Chai

Faculty Advisor: Yang Chai

Background: Craniosynostosis is a craniofacial disorder characterized by the premature fusion of cranial sutures. Patients with severe craniosynostosis often have neurocognitive abnormalities. Heterozygous loss-of-function mutations in *TWIST1* or *TCF12*, which can form a heterodimer, cause coronal suture fusion in humans. Craniosynostosis is observed both in *Twist1* mutant mice and *Tcf12* mutant mice. Neurocognitive abnormalities have also been observed in *Twist1* mutant mice, but whether *Tcf12* mutation induces neurocognitive abnormalities in mice is unknown. **Purpose**: The present study was designed to reveal the role of *Tcf12* in regulating brain development and skull-bone formation. **Methods**: Morphology of the skull in adult mice were studied by μCT imaging of *Tcf12*$^{fl/fl}$ (Control), *Wnt1-Cre;Tcf12*$^{fl/fl}$, *Mesp1-Cre;Tcf12*$^{fl/fl}$, and *Wnt1-Cre;Mesp1-Cre;Tcf12*$^{fl/fl}$ mice. Behavioral tests and MRI imaging of brains were performed to evaluate neurocognitive abnormalities in each mouse. **Results**: We found that, despite mild coronal synostosis, their skull shape appears to be similar to that of controls. We also found evidence of impaired motor learning ability in *Tcf12* mutant mice. Furthermore, loss of Tcf12 in neural crest lineage leads to upregulated *Runx2* expression in the calvarial mesenchyme and posterior expansion of the frontal bone in *Wnt1-Cre;Tcf12*$^{fl/fl}$ mice. Mechanistically, we show that *Lmx1b* is a direct downstream target of Tcf12 for the regulation of osteogenic differentiation in the calvarial mesenchyme during embryonic development. **Conclusion**: *Tcf12* expression in the brain is crucial for motor learning. Moreover, this study establishes a new molecular mechanism underlying regulation of calvarial bone formation.

Poster #50

Title: Swine Calvarial Bone Regneration using 3D-Printed Scaffold and BMA

Authors: Janet Sanchez, Jesse Anderson-Ramirez, Zoe Johnson, and Yang Chai

Faculty Advisor: Yang Chai

Background: Head trauma, congenital defects, disease, and tumor resection can leave patients with large, full-thickness calvarial defects that are incapable of healing on their own. These critical-sized defects (CSDs) are currently repaired using inferior metal or plastic implants. Bone grafting causes additional trauma to the body which should be avoided if possible. There is a significant need for improved treatment of calvarial CSDs. **Purpose**: In this study we used bone marrow aspirate (BMA) combined with a hydroxyapatite and tricalcium phosphate (HA/TCP) 3D-printed scaffold to regenerate bone in an irregular-shaped calvarial CSD. **Methods**: BMA was collected from the swine tibial crest. A 4.3cm^2 irregular sized defect was made in the calvaria. The MSCs were combined with a 3D-printed osteoconductive scaffold of HA/TCP and placed into the defect site. **Results**: We have defined a critical size irregular defect model in the swine calvaria as 4.3cm^2 over a 12-week timepoint. MSCs combined with our 3D-printed scaffold successfully regenerated complex cortical bone that integrated with native bone in this model. Density, compression, and trabecular analyses indicated the regenerated bone was of good quality and sound structure compared to native bone. **Conclusion**: We have successfully regenerated cortical bone in the swine calvaria using BMA combined with an osteoconductive 3D-printed scaffold. This represents a unique opportunity to utilize MSC-mediated tissue regeneration in improving care

for human patients with calvarial CSDs.

Poster #51

Title: FaceBase 3: Craniofacial Development and Dysmorphology Data Management and Integration

Authors: Ishmael Howard, Thach-Vu Ho, Robert Schuler, Cristina Williams, Bridget Samuels, Yuan Yuan, Joseph Hacia, Yang Chai, and Carl Kesselman

Faculty Advisor: Yang Chai

Background: The major goal of the FaceBase Consortium is to advance research by creating a comprehensive repository of datasets on craniofacial development and dysmorphologies, and disseminating these datasets to the research community. **Purpose**: The FaceBase 3 Data Management and Integration Hub builds on the existing and successful scientific and technical team that has led the development, deployment, operation and community engagement of the FaceBase 2 data hub. Looking forward to the future impact of the FaceBase Consortium, we face major challenges that include (1) how to annotate large datasets to empower the biomedical research community; (2) how to improve data integration and facilitate data search and retrieval from the hub; (3) how to use the data from FaceBase to design studies and otherwise inform our future research; and (4) how to translate our knowledge from animal model studies to improve human craniofacial health. **Methods**: FaceBase provides innovative tools for the identification, retrieval, display, curation, and analysis of data on human and animal models of craniofacial development and disease. **Results**: FaceBase currently includes over 950 datasets from human, zebrafish, mouse, and chimpanzee. Alongside these models, chick and xenopus data represent priorities. We are also expanding our data repository to include morphological and functional data on tooth development. **Conclusion**: FaceBase seeks to provide a comprehensive, trustworthy data repository and educational resource on craniofacial development, through ensuring that contributed datasets are findable, accessible, interoperable, and reusable. FaceBase promotes multidisciplinary collaboration and research in craniofacial development, molecular genetics and genomics.

Poster #52

Title: Deletion of Runx2 in Gli1+ Osteoprogenitors Prevents Ovariectomy-induced Bone Loss

Authors: Connor Buchanan, Shuo Chen, Yuan Yuan, Grace Carey, Ishmael Howard, Janet Sanchez, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Osteoporosis is a metabolic bone disorder and the most prevalent bone disease. Bone tissue homeostasis is governed by the balance of osteoblast and osteoclast activity. Gli1+ cells have been identified as a mesenchymal stem cell population critical in the maintenance of bone tissue homeostasis. They give rise to osteoprogenitors and are expressed at the osteogenic front in long bones in adult mice. Runx2, a transcription factor expressed by a subpopulation of Gli1+ osteoprogenitors, is important in osteoblastic differentiation. However, the functional requirement of Runx2 in an osteoporosis disease model remains unclear. **Purpose**: To determine the effects of *Runx2* deletion in Gli1+ osteoprogenitors on bone tissue homeostasis in adult mice following ovariectomy. Methods: Sham-operated $Runx2^{fl/fl}$ mice, ovariectomized $Runx2^{fl/fl}$ mice, and ovariectomized $Gli1\text{-}Cre^{ERT2};Runx2^{fl/fl}$ were induced with tamoxifen 1 week after surgery. MicroCT and histological analysis of distal femurs was performed to assess bone tissue homeostasis at regular intervals following surgery. **Results**: Deletion of *Runx2* increased cortical and trabecular bone as early as 1 month after induction. **Conclusion**: Deletion of *Runx2* leads to increased cortical and trabecular bone in ovariectomized adult mice. Further investigation is needed to understand the functional requirement of Runx2 in adult bone tissue homeostasis.

Poster #53

Title: The Role of KMT2C in Precursor Biology during Tumor Development

Authors: Yuhao Pan, Chehyun Nam, Hua Zhao, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Head and neck squamous cell carcinoma (HNSCC) is a highly invasive and metastatic cancer that arises from the epithelial cells of the head and neck region. HNSCC is the sixth most common cancer worldwide, with an estimated 890,000 new cases and 450,000 deaths per year. KMT2C, lysine-specific methyltransferase 2C, also known as MLL3, is a well-known tumor suppressor in cancers that encodes a histone lysine methyltransferase involved in the epigenetic regulation of gene expression. Loss of function mutation of *KMT2C* often occurs in cancer patients (12%). However, the mechanisms of how *KMT2C* mutations drive cancer and function in disease progression remain unknown. **Purpose**: To investigate the underlying mechanism of how *KMT2C* functioned as a tumor suppressor in HNSCC and the mechanism of how the loss of function mutation of *KMT2C* affects cancer development and disease progression. **Methods**: Using CRISPR/Cas9 system to perform knock out of *KMT2C* gene in both human-derived organoid and murine-derived organoid. Bulk RNA sequencing and metabolomics were performed in order to investigate the alterations in mechanisms. Xenograft was performed to identify the effects of KMT2C knockout in vivo. **Results**: Organoids featuring a *KMT2C* knock-out exhibited notable morphological alterations, increased proliferation rates, and displayed aberrant biomarker expression. In vivo, tumor development signifies that the knock-out transforms the organoid into a tumorous entity. **Conclusion**: The results suggest that loss of function of *KMT2C* promotes tumor progression.

Poster #54

Title: Training Students on Craniofacial Development Using FaceBase MicroCT Datasets

Authors: Thach-Vu Ho, Janet Sanchez

Faculty Advisor: Yang Chai

Background: Comprehensive datasets available through FaceBase can be used to teach undergraduates and high school students about craniofacial development. Student applicants from the USC Graduate Initiative for Diversity, Inclusion, and Access (DIA) JumpStart and USC's Science, Technology, and Research (STAR) program were selected to participate in hands-on research in Dr. Yang Chai's laboratory at USC. **Purpose**: The aims of these two programs are: (1) To train students in STEM research; (2) To create opportunities for underrepresented minorities to pursue careers in life sciences, biomedical engineering, and biotechnology; (3) To serve as a pathway to Ph.D. studies by providing financial support and professional development opportunities (DIA JumpStart). **Methods**: As part of their training, students used microCT datasets deposited into FaceBase to perform morphometric analyses of craniofacial bones. They used established anatomical landmarks to quantitatively analyze the size and shape of the craniofacial bones. **Results**: At the end of the program, students presented their research posters at a research symposium at USC. High school students who completed the STAR program have received academic scholarships and attended top-tier colleges and research institutions. DIA students who complete the JumpStart program are eligible to have their application fees waived, if they apply to a USC Ph.D. program. **Conclusion**: These two USC

programs serve as models for training underrepresented students research in craniofacial development using datasets available on FaceBase.

DENTISTRY & CCMB POST-DOCTORAL TRAINEES

Poster #55

Title: HSV-1 evades inflammatory response and activates nucleotide synthesis via CAD

Authors: Chao Qin, Zhenhao An, Taolin Xie, Ali Can Savas, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: HSV-1 infection causes a variety of diseases such as oral herpes. Cellular metabolism and innate immune response are two fundamental processes that shape the outcome of viral infection. How HSV-1 orchestrates these two processes remains largely unknown. **Purpose**: We hope to investigate how HSV-1 coordinates metabolic activation and immune evasion during viral infection. **Methods**: Two-dimensional gel electrophoresis, western blot, real-time PCR, mass spectrometry. **Results**: Through metabolite analysis, we found that HSV-1 significantly increases nucleotide synthesis during lytic replication. The multifunctional enzyme, carbamoyl-phosphate synthetase, aspartate transcarbamoylase and dihydroorotase (CAD), catalyzes the first three steps of the *de novo* pyrimidine synthesis. We found that HSV-1 activates CAD and CAD depletion significantly decreases HSV-1 replication. Activated CAD not only promotes *de novo* pyrimidine synthesis, but also deamidates ReA. While RelA deamidation shuts down NF-κB activation and subsequent antiviral inflammatory gene expression, deamidated RelA upregulates the expression of key glycolytic enzymes, thereby fueling aerobic glycolysis to provide intermediates for de novo nucleotide synthesis. Additionally, HSV-1 activates CAD to deamidate phosphoglycerate dehydrogenase (PHGDH), the rate-limiting enzyme of the serine synthesis pathway, and HSV-1 thymidine kinase (TK, UL23), to promote nucleotide synthesis. **Conclusion**: We conclude that HSV-1 activates CAD to promotes nucleotide synthesis and evade innate immune defense through deamidating cellular and viral proteins. Understanding these mechanisms will provide proof-of-concept to develop anti-HSV drugs via targeting cellular CAD.

Poster #56

Title: ARID1B maintains MSC quiescence via inhibiting BCL11B-mediated non-canonical Activin signaling

Authors: Mingyi Zhang, Tingwei Guo, Fei Pei, Jifan Feng, Junjun Jing, Jian Xu, Takahiko Yamada, Thach-Vu Ho, Jiahui Du, Prerna Sehgal, and Yang Chai

Faculty Advisor: Yang Chai

Background: ARID1B haploinsufficiency in humans causes Coffin-Siris syndrome, associated with developmental delay, facial dysmorphism, and intellectual disability. The role of ARID1B has been widely studied in neuronal development, but whether it also regulates stem cells remains unknown. **Methods**: scRNA-seq and scATAC-seq were employed to dissect the regulatory functions and mechanisms of ARID1B within mesenchymal stem cells (MSCs) using the mouse incisor model. **Results**: In this study, we reveal that loss of *Arid1b* in the GLI1+ MSC lineage disturbs MSCs' quiescence and leads to their proliferation due to the ectopic activation of non-canonical Activin signaling via p-ERK. Furthermore, loss of *Arid1b* upregulates *Bcl11b*, which encodes a BAF complex subunit that modulates non-canonical Activin signaling by directly regulating the expression of activin A subunit, Inhba. Reduction of *Bcl11b* or non-canonical Activin signaling restores the MSC population in *Arid1b* mutant mice. Notably, we have identified that ARID1B suppresses *Bcl11b* expression via specific binding to its third intron, unveiling the direct inter-regulatory interactions among BAF subunits in MSCs. **Conclusion**: Our results demonstrate the vital role of ARID1B as an epigenetic modifier in maintaining MSC homeostasis and reveal its intricate mechanistic regulatory network *in vivo*, providing novel insights into the linkage between chromatin remodeling and stem cell fate determination.

Poster #57

Title: Genetically-engineered organoid models reveal oral neoplastic evolution and therapeutic vulnerabilities

Authors: Hua Zhao, Yueyuan Zheng, Qiong Mao, Casey Collet, Boyan Hu, Luda Lin, Stephanie Wong, Uttam K. Sinha, Young Min Park, Alice Soragni, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Head and neck squamous cell carcinoma (HNSCC) is an aggressive and frequently lethal neoplasm. Despite advancements in deciphering HNSCC tumorigenesis, the initial neoplastic transformation steps remain elusive. **Purpose**: We aim to dissect crucial early events in neoplastic progression and identify therapeutic vulnerability of HNSCC. **Methods**: Using murine and human samples, we established 15 different genetically-engineered organoid models from oral-esophageal organs by CRISPR/Cas9-based gene knockout or retrovirus-mediated gene transfer, targeting key driver genes (*TP53, CKND2A, PIK3CA, NOTCH1*, and *MLL3*). Histology, IF, WST-1 assay, allograft transplantation, single-cell RNA sequencing (scRNA-seq), and drug screens at single-organoid resolution via bioprinting were employed to characterize organoids. **Results**: Double knockout of *Trp53/Cdkn2a* (MTK) significantly increased organoid proliferation and size, loss of squamous differentiation, and tumorigenicity, with further amplification in the presence of $PIK3CA^{E545K}$ (MTKE). ScRNA-seq analysis revealed an increase in quiescent basal cells and proliferative squamous cells in MTK, sustained in MTKE, while differentiated squamous cells decreased in both groups. A distinctive senescence-immune program substantially reduced in MTK and further decreased in MTKE. ANXA1, identified as a novel master regulator of the senescence-immune program, showed decrease in MTK and MTKE. Notably, overexpressing ANXA1 promoted the senescence-immune program and hindered neoplastic cellular features in both murine and human organoid models. Additionally, drug screens revealed the survival advantages of *PIK3CA* mutation against most drugs, with cisplatin, mitomycin, and alvocidib demonstrating higher efficacy in killing MTKE. **Conclusion**: Our study unveils that inactivation of *TP53* and *CDKN2A*, and amplification of $PIK3CA^{E545K}$ induce oral neoplastic evolution and therapeutic vulnerabilities.

Poster #58

Title: Trp53 supports mesenchymal stem cell homeostasis through regulating vascular architecture

Authors: Tingwei Guo, Fei Pei, Mingyi Zhang, Takahiko Yamada, Jifan Feng, Junjun Jing, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Microenvironmental cues provided by stem cell niches are important for regulating the fate of mesenchymal stem cells (MSCs), and the detailed mechanisms of the crosstalk between them are of significant interest. Blood and lymphatic vasculature have well-known roles in transporting oxygen and nutrients, as well as removing waste and CO_2. However, the vasculature's role as a niche component in regulating MSCs remains largely unclear. **Purpose**: To investigate the

role of vasculature in regulating stem cell homeostasis in adult tissue. **Methods**: The transgenic mouse model used in this study is *Gli1-Cre^{ERT2};Trp53$^{fl/fl}$*. Cellular and molecular experiments used in this study included immunohistochemistry, in situ hybridization, CoIP, RNA-seq, scRNA-seq and ChIP-qPCR. **Results**: Our study shows that the loss of *Trp53* in GLI1+ progeny reduces THBS2, which leads to alterations in the vascular architecture including an increase of arteries and a decrease of other vessel types. These changes further result in an increased deposition of artery-derived PDGFA and PDGFB at the proximal MSC region, where they interact with PDGFRA and PDGFRB. Significantly, PDGFRA+ and PDGFRB+ cells differentially contribute to defined cell lineages in the adult mouse incisor. **Conclusion**: This study shows how different vessels can provide unique microenvironmental cues to regulate subpopulations of MSCs and maintain their heterogeneity, and establishes mechanistic insight into the crosstalk between vasculature and mesenchymal stem cells.

Poster #59

Title: Investigating the Enamel Phenotype in Novel *Odam-IRESCre/Stim1$^{fl/fl}$* Mouse Model

Authors: Rucha Arun Bapat, Marziyeh Aghazadeh, Yanbin Ji, David C. Evans, Alexis E. Bauer, Yan Zhou, and Michael L. Paine

Faculty Advisor: Michael L. Paine

Background: Traditionally used *Keratin14-Cre* driver line suffers from widespread Cre expression in epithelial tissues when utilized for studying ameloblasts. We developed a maturation-stage ameloblast specific *Odam-IRESCre* driver line and investigated the enamel phenotype of *Odam-IRESCre/Stim1* conditional knockout mice. **Purpose**: To evaluate the specificity and efficacy of novel *Odam-IRESCre* line. **Methods**: *IRES-Cre* cassette was inserted immediately after the *Odam* stop codon to create *Odam-IRESCre* mice. Cre expression was observed by LacZ staining in *Odam-IRESCre/R26R* mice at post-natal-days (PN) 6&11. 8-weeks-old *Odam-IRESCre$^{+/-}$* and *Odam-IRESCre$^{+/+}$* mouse enamel was analyzed for phenotypic changes visually and by micro-CT. RNA expression of Cre and Odam was observed by in-situ hybridization at PN14. *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* mice were generated and ablation of *Stim1* was confirmed by in-situ hybridization. Mineral density changes in *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* mice were quantified using micro-CT. **Results**: Highly specific Cre (LacZ) expression was observed in *Odam-IRESCre/R26R* maturation-stage ameloblasts only at PN11. 8-week-old *Odam-IRESCre$^{+/-}$*, and *Odam-IRESCre$^{+/+}$* mouse enamel appearance and mineral densities were normal. Localization of *Cre* RNA at PN14 matched closely to that of Odam. At 8-weeks, *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* mice were viable and healthy except their incisors appeared chalky white and blunt. *In-situ* hybridization at PN14 confirmed *Stim1* deletion specifically in *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* maturation stage ameloblasts. *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* enamel mineral density was significantly lower than that of WT. **Conclusion**: *Odam-IRESCre* line was developed to drive Cre expression in maturation-stage ameloblasts and was successfully utilized to create *Odam-IRESCre$^{+/-}$/Stim1$^{fl/fl}$* mice which showed an enamel specific phenotype. *Odam-IRESCre* is a valuable tool for enamel research.

Poster #60

Title: Coronal Suture Regeneration in *Twist1$^{+/-}$* Mice

Authors: Peng Chen, Lu Gao, Takahiko Yamada, Oscar Peng, and Yang Chai

Faculty Advisor: Yang Chai

Background: Patients with craniosynostosis face challenges related to skull dysmorphology and neurocognitive impairments, often requiring surgical intervention. **Purpose**: This study explores an innovative method using *Twist1$^{+/-}$* mice, modeling Saethre-Chotzen Syndrome, to develop a new treatment approach. **Methods**: We created a biodegradable hydrogel (HAMA modified GelMA, H-GM) using methacrylate Hyaluronic acid (HAMA), methacrylate Gelatin (GelMA), and collagen I, combined with Gli1+ skull progenitor cells (SPCs) from WT coronal sutures. We conducted a suturectomy in *Twist1$^{+/-}$* mice, followed by the implantation of H-GM and SPCs into the fused coronal suture area in the same *Twist1$^{+/-}$* mouse model. **Results**: Using H-GM combined with SPCs, we successfully regenerated a functional suture that can support bone turnover, correct skull deformity, and partially rescue neurocognitive behavior deficiencies. **Conclusion**: This study suggests that the developed biodegradable hydrogel, in combination with SPCs, holds promise for coronal suture regeneration in *Twist1$^{+/-}$* mice, with potential applications in human craniosynostosis treatment.

Poster #61

Title: Kdm6b Maintains Mesenchymal Tissue Homeostasis in the Mouse Incisor

Authors: Lin Meng, Tingwei Guo, Jifan Feng, Mingyi Zhang, Heliya Ziaei, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Epigenetic modification affects gene transcription and influences the development of cells. Kdm6b, an H3K27me3 demethylase, plays an important role in fate determination. However, it is unclear how Kdm6b affects tissue homeostasis. **Purpose**: Using the mouse incisor as a model, we investigated the function of Kdm6b in tissue homeostasis. **Methods**: *Kdm6b* expression was detected using single-cell RNA-sequencing and in vivo. *Gli1-Cre^{ERT2};Kdm6b$^{fl/fl}$* mice were induced with tamoxifen at 1 month to delete *Kdm6b*. Samples were collected for micro-CT, HE, and DSPP staining. Next, we detected the number of label-retaining cells (LRCs) by EdU incorporation, and assessed proliferation, apoptosis, and differentiation of transit-amplifying cells (TACs) by Ki67, Tunel, and DSPP/EdU staining, respectively. We studied the migration of Gli1+ cells in tdTomato reporter mice. To investigate the molecular mechanism of Kdm6b, we performed bulk RNA-seq to study the mechanisms. **Results**: Kdm6b has broad expression in dental mesenchymal and epithelial tissues, colocalized with TACs and Gli1+ mesenchymal stem cells (MSCs). Lack of Kdm6b leads to thinner dentin and enamel, disordered odontoblasts and ameloblasts, reduced alveolar bone, and slower differentiation. At the cellular level, lack of Kdm6b causes a decrease in TACs due to increased apoptosis and compromised proliferation, defective differentiation of TACs, and decreased LRCs. IPA showed several affected signaling pathways related to cell cycle regulation and extracellular matrix (ECM), and the expression of CyclinD1 was decreased in TACs. **Conclusion**: Kdm6b is crucial for regulating the MSC niche and maintaining tissue homeostasis in the adult mouse incisor by causing TAC senescence.

Poster #62

Title: Investigation of Mesenchymal Lineage Diversification during Embryonic Palatal Development

Authors: Jifan Feng, Eva Janečková, Heliya Ziaei, Tingwei Guo, Sa Cha, Jessica Junyun Geng, Angelita Araujo-Villalba, Mengmeng Liu, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Cleft palate is a common birth defect that occurs due to palatal shelf formation defects during embryonic developmental stages. The development of the embryonic palate is a complex process which requires precise spatial and temporal regulation at the cellular level. The detailed regulatory mechanism of this pro-

cess remains to be elucidated. **Purpose**: Therefore, the aim of this project is to perform gene profiling at single cell resolution for the developing palatal mesenchymal cells to better understand the molecular regulatory mechanism required for proper palatal mesenchymal fate determination during embryonic stages. **Methods**: Palatal shelves of embryonic day (E) 12.5 to E18.5 mouse embryos were collected for analysis. Single-cell RNA sequencing analysis was performed to compare cell-type specific gene expression profiles in E12.5 to E18.5 cells from the palatal shelves. **Results**: We performed integration analysis of scRNA-seq data from E12.5-E18.5 palatal cells. Using molecular markers associated with individual cellular types, we mapped the *in vivo* identities of different cell clusters in the developing palatal shelves. We focused on the palatal mesenchymal cells and identified hard palate-associated osteogenic and odontogenic cell clusters as well as soft palate-associated perimysial clusters. We have also identified a previously unreported mesenchymal cell population that decreases as development proceeds, thus likely to be associated with the putative palatal mesenchyme progenitors. We are currently performing lineage trajectory analysis to identify lineage commitment for palatal mesenchymal cells as well as regulon analysis for putative lineage-specific makers and regulators. **Conclusion**: scRNA-seq analysis is a valuable tool to enable the understanding of how morphologically identical palatal mesenchymal cells undergo different fate decisions during embryonic development.

Poster #63

Title: Single-Cell RNA-Seq Analysis identifies ETS1 as a regulator of ETM

Authors: Benjamin Ziman, Qian Yang, Chehyun Nam, Laura Yang, Uttam Sinha, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Worldwide, over one million new cases of upper aerodigestive tract cancers (UATC) are diagnosed each year. UATC are highly aggressive malignancies affecting the upper aerodigestive tract (oral cavity, larynx and oropharynx, and esophagus) which are derived from stratified epithelium. **Purpose**: While the 5-year survival rate for patients with UATC ranges from ~20–50%, targeted therapies are mostly unavailable for UATCs. We aim to identify specific transcription factors which promote UATC and have the potential to be used as therapeutic targets in patients. **Methods**: This approach combined single-cell RNA-Seq data analysis from both UATC patients and malignant cells using non-negative matrix factorization (NMF) to identify groups of genes that were co-expressed in UATC. Using transgenic cells, findings will be validated in vitro and in vivo. **Results**: Data analysis identified the transcription factors ETS1 in regulating epithelial mesenchymal transition (EMT). We found that loss of ETS1 reduced the expression of our own EMT signature, while overexpression showed increased expression. Overexpressing ETS1 increased transwell migration and wound healing, while loss of ETS1 decreased these abilities. In vivo, injecting overexpressing ETS1 cells increased metastatic events and led to reduced overall survival. We found that heat shock protein 90 (HSP90) is upstream of ETS1, which can mediate ETS1 through direct binding of hypoxia inducible factor 1-A (HIF1A) to the ETS1 promoter. **Conclusion**: Our results suggest that using specific ETS1 targeted or HSP90 inhibitors may provide potential therapeutic approaches for UATC.

Poster #64

Title: Targeted *XPR1* Silencing in Ameloblasts: Impact on Enamel Development

Authors: Marziyeh Aghazadeh, Yanbin Ji, Rucha Arun Bapat, David C. Evans, Alexis E. Bauer, Yan Zhou, and Michael L. Paine

Faculty Advisor: Michael L. Paine

Background: The extracellular and intracellular levels of inorganic phosphate (Pi) are pivotal for normal enamel development and ameloblast function. Xenotropic and polytropic retroviral receptor 1 (XPR1) is known for its role in phosphate transport; however, its specific function in enamel formation remains understudied. **Purpose**: To employ ODontogenic AMeloblast-associated protein-IRESCre (*ODAM-IRES-Cre*) mice to selectively silence or suppress *XPR1* expression in ameloblasts during enamel formation. **Methods**: *Odam* is a gene expressed only in maturation-stage ameloblasts. Using an *Odam-IRESCre* mouse, we analyzed the effects of *XPR1* silencing (conditional knockout) during enamel maturation. We used quantitative PCR, western blotting, and RNA scope technology to study the enamel-specific phenotype of *XPR1*-knockout mice compared to wild-type (WT). Additionally, the phenotypic consequences of XPR1 absence were examined, and enamel density was quantitatively assessed through micro-CT. **Results**: Our preliminary findings suggest that the suppression of XPR1 in maturation-stage ameloblasts leads to notable alterations in the enamel formation process. Differences in gene and protein expression profiles between the WT and *XPR1*-suppressed groups were observed, indicating a potential regulatory role of *XPR1* in enamel development. Phenotypic analysis revealed distinct changes in enamel appearance in the absence of XPR1. Most notably, enamel density measurements showed significant reduction, suggesting that XPR1 may play a crucial role in the mineralization aspect of enamel development. **Conclusion**: Our findings suggest that *XPR1* is a key regulator in the maintenance of phosphate levels and overall enamel formation. This study opens avenues for further research into the molecular mechanisms governing dental enamel development and highlights potential targets for therapeutic interventions in enamel-related disorders.

Poster #65

Title: Methionine metabolism and epigenomic reprogramming in upper aerodigestive squamous cell carcinoma

Authors: Chehyun Nam, Li-Yan Li, Qian Yang, Benjamin Ziman, Hua Zhao, Boyan Hu, Casey Collet, Pei Jing, Qifang Lei, Li-Yan Xu, En-Min Li, H Phillip Koeffler, Uttam K. Sinha, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Upper aerodigestive squamous cell carcinoma (UASCC) presents as a prevalent and aggressive malignancy, posing challenges in terms of effective therapeutic interventions. **Purpose**: In this study, we aimed to reveal the alterations of amino acid metabolism and figure out the correlated epigenetic signaling pathways within UASCC, which distinguishes UASCC from all human cancers. **Methods**: We conducted multiple bioinformatic screenings to explore the correlation between significantly expressed amino acids and genes in UASCC. To validate our data analysis, we executed various *in vitro* experiments, including ChIP-PCR, Western blot, qPCR, and Luciferase reporter assay. Furthermore, we generated patient-derived organoids (PDO) to confirm specific drug effects. These findings were corroborated through *in vivo* experiments, wherein Xenograft models and specialized diet chow were employed. **Results**: Notably, LAT1 exhibits peak expression levels in UASCC, regulated at the transcriptional level by UASCC-specific promoters and enhancers, co-regulated by SCC master regulators TP63/KLF5/SREBF1. Surprisingly, our unbiased bioinformatic screen identifies EZH2 as a pivotal downstream target of the LAT1-methionine pathway, establishing a direct link between methionine metabolism and epigenomic reprogramming. This cascade emerges as crucial for the survival and proliferation of

UASCC patient-derived tumor organoids. Furthermore, we find that LAT1 expression closely correlates with cellular sensitivity to inhibition of the LAT1-methionine-EZH2 axis. **Conclusion**: This research unveils a novel mechanistic crosstalk connecting epigenomic reprogramming with methionine metabolism, revealing its biological significance in UASCC. Moreover, it identifies a unique tumor-specific vulnerability, providing avenues for exploitation through pharmacological and dietary strategies.

Poster #66

Title: Sensory innervation regulates the palatal development at single-cell resolution

Authors: Sa Cha, Jifan Feng, and Yang Chai

Faculty Advisor: Yang Chai

Background: The palate is the critical structure for normal functions of suckling, feeding and swallowing, which depends upon the coordination development of the hard palate, tongue, and pharyngeal muscles as well as the formation of the cranial nerve that controls these structures. Previous studies suggested that nerves may play great regulating roles in organgenesis and tissue homeostasis. However, the role of innervation during palate development is not fully understood. **Purpose**: This study was to examinate the potential regulating role and molecular mechanism of innervation during palate development at single-cell resolution. **Methods**: Here, we first developed a single-cell atlas of the mouse trigeminal ganglia at four critical palatal development embryonic stages, embryonic days 12.5 (E12.5), E13.5, E15.5 and E18.5, and explored the neuron-palate communication network at a single-cell level. Using *AdvillinCreER;Rosa-DTA* mice as the denervation model, we systematiclly analyzed how the somatosensory neurons communicate with the palatal mensenchyme to regulate mouse palatal development. **Results**: Our data suggests that the palatine innervation and vascularization pattern is from the lateral region to the midline following palatal fusion.We define Avil+ as the functional somatosensory neurons during palate development. Loss of Avil+ somatosensory nerve leads to a complete cleft palate and soft palatal muscle defect. Trigeminal nerve-derived GDF11 acts on cranial neural crest-derived mesenchyme to achieve functional specificity of neuron-to-mesnehcyme signals for palate development. **Conclusion**: Collectively, our study provides insights into the regulatory role of somatosensory innervation during palate development.

Poster #67

Title: The role of *Fgfr2IIIc* in coronal suture development and patency

Authors: Lu Gao, Md Shaifur Rahman, Takahiko Yamada, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: FGFR mutations cause the majority of syndromic craniosynostosis, among which the *Fgfr2* mutation plays an important role in Apert syndrome. A gain-of-function mutation of *Fgfr2* leads to coronal suture pre-mature osteogenesis and fusion. However, the function of *Fgfr2* in cranial progenitor cells is still largely unknown. **Purpose**: The purpose of this study is to unveil the role of *Fgfr2* in cranial progenitor cells for coronal suture development and patency. **Methods**: We generated *Gli1-Cre^{ERT2};Fgfr2IIIc$^{fl/+}$* mice and checked for potential calvarial developmental defects and cellular gene expression changes at different developmental stages. **Results**: In the *Gli1-Cre^{ERT2};Fgfr2IIIc$^{fl/+}$* mouse, *Fgfr2IIIc* expression is reduced and *Fgfr2* is overexpressed by this gain-of-function mutation. Coronal suture synostosis is induced in the PN1m *Gli1-Cre^{ERT2};Fgfr2IIIc$^{fl/+}$* mouse by injecting tamoxifen at PN3.5d, and the earliest time of coronal suture fusion is from PN9.5d to PN10.5d. Coronal suture fusion is first observed from the dura side of the osteogenic front. Maybe initial fusion starts from the dura side and extends to the periosteum side. *Gli1* expression starts to decrease in the *Gli1-Cre^{ERT2};Fgfr2IIIc$^{fl/+}$* mouse from PN7.5d to PN9.5d. Cell proliferation decreases at the suture mesenchyme near the bony front of the frontal bone, while no significant apoptosis is observed. *Runx2* increases in the PN8.5d mutant mouse, indicating stronger osteogenic activity at this timepoint. **Conclusion**: This study provides mechanistic insight on how *Fgfr2IIIc* regulates coronal suture formation and patency through its role in Gli1+ progenitor cells. A better understanding of *Fgfr2IIIc*'s regulatory role might lead to the development of novel treatment strategies for calvarial defects.

Poster #68

Title: Fgfr2 regulates connective tissue development in neural crest derived cells

Authors: Lauren Bobzin and Amy Merrill

Faculty Advisor: Amy Merrill

Background: Calvarial sutures and fontanelles are major sites of growth during development, and premature ossification of sutures and fontanelles (craniosynostosis) can lead to delayed neurodevelopment and malformation of the craniofacial complex. Gain of function mutations to Fibroblast growth factor receptor 2 (*Fgfr2*) cause several human disorders featuring craniosynostosis, often accompanied by widening or patency of the anterior fontanelle (AF). However, little work has been done to fully characterize the cellular composition of the AF or its contributions to the establishment and maturation of the suture joints. **Methods**: Therefore, we investigated the role of Fgfr2 in cell fate choice of the skeletogenic mesenchyme of the AF. **Results**: We find that loss of Fgfr2 expression within Wnt1 expressing skeletogenic tissue results in a persistence of the anterior fontanelle and a concomitant widening of the Scx expressing connective tissue domain. Additionally, loss of Fgfr2 precludes the establishment of Sox9 expressing cells at the suture midline, preventing fusion of the PFS. Evidence indicates that Fgfr2 functions to non-autonomously regulate cell fate through downregulation of Wnt signaling during normal PFS fusion. **Conclusion**: Together, these results suggest a key role for Fgfr2 in regulating cell fate decisions of sutural mesenchymal progenitors that contribute to the establishment of the AF and fusion of the PFS.

Poster #69

Title: Loss of Foxp4 leads to a mouse periodontal ligament defect

Authors: Jiarui Bi, Junjun Jing, and Yang Chai

Faculty Advisor: Yang Chai

Background: As transcription factors, forkhead box (Fox) proteins play essential roles in embryonic development by regulating gene expression in cell growth, proliferation, and differentiation. We have recently shown that Foxp4 has an exclusive role in periodontal ligament (PDL) development but not root morphogenesis. However, what the cellular mechanism of Foxp4 is in periodontium development remains unclear. The aim of this study is to establish a mouse model and confirm the PDL defect phenotype in neural crest cell-specific *Foxp4* knockout mice. **Methods**: *Foxp4$^{flox/flox}$* and *Wnt1-Cre* mouse strains were used in the experiments. The single-cell sequence was processed for the mandibular 1st molar and surrounding periodontium at various stages in wild-type mice, and data was analyzed using Seurat 5.0. Immunostaining and RNAScope in situ hybridization were performed. The mandibular jaws were analyzed for tooth morphology by micro-CT scanning. **Results**: *Foxp4* was expressed in the dental papilla and follicle of the 1st molar at PN3.5 in wild-type mice, consistent with the single-cell sequencing analysis. Furthermore, high expression of *Foxp4* was detected in the PDL region at PN14.5 and

21.5 in wild-type mice. At PN21.5 days, more extensive PDL morphology and reduced expression of the PDL marker periostin were observed in *Wnt1-Cre;Foxp4*$^{flox/flox}$ compared to control mice. Micro-CT showed that molar root morphology in *Wnt1-Cre;Foxp4*$^{flox/flox}$ mice was comparable to the control mice. **Conclusion**: The preliminary data confirmed that the loss of *Foxp4* resulted in a PDL defect of decreased periostin expression, which may suggest the critical role of *Foxp4* in PDL development in mice.

Poster #70

Title: Amphipathic Helix Deletions in Ameloblastin Affect Its Function

Authors: Natalie C. Kegulian, Edward Kim, and Janet Moradian-Oldak

Faculty Advisor: Janet Moradian-Oldak

Background: Ameloblastin has many critical functions in enamel formation. Cell-matrix adhesion, facilitated by an amphipathic helix (AH) motif, has been recently defined. This motif is part of a larger multitargeting domain (MTD) that spans residues 57-90 of mouse ameloblastin. **Purpose**: We investigated effects of deletions within the AH on the structure and membrane-binding ability of the MTD. We evaluated the ameloblastin and amelogenin content in nascent molars of mutant mice. **Methods**: We rationally designed peptides spanning residues 51-103 of mouse ameloblastin (xAB2) with and without deletions ΔK74-L79, ΔL81-P86, and ΔL76-P86 in the MTD. To assess membrane interaction, we combined xAB2 peptides with liposomes as a cell membrane model and performed biophysical assays. To evaluate effects of AH deletions on protein content in the extracellular matrix, we dissected molars at day P5 from model mice homozygous for deletions ΔK74-L79 and ΔL76-P86 in ameloblastin and performed Western blots and SDS-PAGE. **Results**: Circular dichroism, liposome leakage, and vesicle clearance revealed lack of α-helical structure and loss of xAB2-membrane interaction in xAB2ΔL76-P86 relative to wild-type xAB2. Smaller deletions yielded intermediate membrane interaction. Western blotting and total protein assay uncovered decreases in amelogenin and overall protein content in molars of mice lacking seven hydrophobic residues within L76-P86. **Conclusion**: Our data revealed that deletion of key hydrophobic residues from the AH leads to loss of ameloblastin-membrane interaction and therefore the most dramatic loss of ameloblastin function. Pinpointing roles of residues within the MTD has important implications for the multifunctionality of ameloblastin including its interactions with amelogenin and cell membrane.

Poster #71

Title: Skull-meningeal lymphatic-brain communication impairment and restoration in craniosynostosis

Authors: Li Ma, Qing Chang, Fei Pei, Mengmeng Liu, Yang Chai, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: The meninges lie in the interface between the skull and brain, harboring lymphatic vasculature and skull mesenchymal progenitor cells (SPCs). How the skull functionally integrates with meningeal lymphatics and the brain remains largely unknown. Craniosynostosis is a congenital disorder characterized by the premature fusion of cranial suture(s) and skull deformity following the loss of SPCs. We recently established the first mouse model (*Twist1*$^{+/-}$) of neurological defects in craniosynostosis, recapitulating human Saethre-Chotzen syndrome, and demonstrated that cranial suture regeneration mitigates skull and neurocognitive defects in craniosynostosis. **Methods**: Here we used uDISCO, light sheet imaging, biomaterials, and stem cell transplantation along with pharmacological, genetic and behavioral approaches to investigate meningeal lymphatics in craniosynostosis. **Results**: We found that impaired meningeal lymphatics and brain perfusion drive neurocognitive defects in *Twist1*$^{+/-}$ mice. Loss of SPCs leads to skull deformities and elevated intracranial pressure (ICP), while transplanting SPCs back into mutant mice mitigates meningeal lymphatic and brain defects through two mechanisms: (i) decreasing elevated ICP by skull correction; (ii) promoting the growth and migration of lymphatic endothelial cells (LECs) via SPC-secreted vascular endothelial growth factor-C (VEGF-C). Treating *Twist1*$^{+/-}$ mice with VEGF-C promotes meningeal lymphatic growth and rescues defects in ICP, brain perfusion, and neurocognitive functions. **Conclusion**: Thus, our study unveils the functional integration of the skull and brain via meningeal lymphatic system, which is impaired in craniosynostosis and can be restored by Gli1+ SPC-driven lymphatic activation through VEGF-C.

Poster #72

Title: Exploring DNA Sequence Specificity in cGAS Activation and Innate Immune Response

Authors: Guoli Hou, Ali Can Savas, Xin Li, Yongzheng Liu, Yu Zhou, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: The cyclic GMP-AMP synthase (cGAS) is a key cytoplasmic sensor, detecting DNA from pathogens or tumors and activating the cGAS-STING pathway. Essential in triggering innate immune responses, previous research has suggested that cGAS activation by double-stranded DNA (dsDNA) depends on DNA length rather than sequence. This study aims to challenge this notion and investigate cGAS's potential sequence specificity in activation. **Purpose**: This research seeks to determine if cGAS recognizes specific DNA sequences, influencing innate immune response activation. **Methods**: We utilized DNA-protein interaction assays, innate immune signaling factor detection, DNA cloning, sequencing, and RT-qPCR. These methods focused on analyzing the interaction between cGAS and various DNA sequences, especially A-rich and G-rich dsDNA fragments. **Results**: Our study shows a new phenomenon that the preference of cGAS for specific DNA sequences. A-rich and G-rich dsDNA fragments were preferentially recognized, enhancing the innate immune response. These findings were supported by comprehensive biochemical assays and molecular analysis. **Conclusion**: This research revises our understanding of DNA sequence specificity in cGAS activation and suggests a nuanced mechanism of innate immune system activation. These insights have significant implications for developing targeted therapies for immune-related diseases and advancing our knowledge of immune responses.

Poster #73

Title: Human iPSC suture MSC and humanized mouse models for craniosynostosis

Authors: Wei Zhang, Li Ma, Supawadee Jariyasakulroj, Qing Chang, Ziyin Lin, Yang Chai, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Cranial suture mesenchymal stem cells (MSCs) are essential for suture development, homeostasis, and regeneration. Loss of suture MSCs leads to craniosynostosis, a major congenital craniofacial disorder. **Purpose**: The goal of this study is to develop human models of craniofacial stem cells and improve human cell-based therapeutic strategies for craniofacial disorders. **Methods**: Differentiate human induced pluripotent stem cells (iPSCs) into GLI1+ induced cranial MSCs (iMSCs) and implant these iMSCs for cranial suture and bone regeneration after suturectomy. **Results**: Here we generated GLI1-GFP reporter

human induced pluripotent stem cells (iPSCs) lines. Through screening the small molecules that can activate GLI1 reporter, we established a robust protocol of differentiating human iPSCs into highly uniformed GLI1+ induced cranial MSCs (iMSCs) in a defined xeno-free and serum-free culture condition. The GLI1+ iMSCs display clonal multipotency and self-renewal, and are capable to participate cranial suture and bone regeneration in mice after suturectomy, the surgical procedure to treat craniosynostosis in current clinic. Using CRISPR-Cas9 genome editing, we generated isogenic human iMSCs with craniosynostosis disease mutations in *TWIST1* and *TCF12* genes, which cause impaired proliferation and premature osteogenic differentiation of human iMSCs. **Conclusion**: Our iPSC suture MSC and humanized mouse models provide ex vivo human models to study craniosynostosis pathogenesis and treatment.

Poster #74

Title: Deletion of Protein Arginine Methyltransferase PRMT4 Induced Acute Heart Injuries

Authors: Jiang Qian, Siqi Tao, Kailin Liu, Ching-Ling Lien, and Jian Xu

Faculty Advisor: Jian Xu

Background: Protein arginine methyltransferase 4 (PRMT4), a type I protein arginine methyltransferase, is involved in many cellular processes, including proliferation, cell differentiation, and survival. It has been reported that overexpression of Prmt4 in infarcted mouse heart resulted in severe ventricular remodeling via promoting apoptosis. Overexpression of PRMT4 also accelerated ferroptosis to aggravate doxorubicin-induced cardiomyopathy. **Purpose**: We aim to investigate whether and how cardiac-specific deletion of PRMT4 affect heart injury responses. **Methods**: We generated cardiac-specific PRMT4 knockout mice models. **Results**: We found that tamoxifen-induced PRMT4 deletion in cardiomyocytes caused left ventricular dilation and dysfunction in 2 weeks. Immunohistostaining revealed accumulation of immune cells, particularly macrophages and neutrophils in these hearts. Picrosirius red staining showed that PRMT4 deletion promoted collagen deposition compared to control group. **Conclusion**: Our work suggested an essential role of PRMT4 in myocardial injury and remodeling.

Poster #75

Title: Segmental Distraction: A solution to cleft-related problems in archform

Authors: Fatemah Husain, Vesna Ferrer, Mark Urata, Jeffrey Hammoudeh, and Stephen Yen

Faculty Advisor: Stephen Yen

Background: The missing alveolar bone and collapse of the dental arch form in cleft lip and palate creates challenges in restoring the archform and replacing the missing bone. We use segmental distraction to create additional bone to narrow wide alveolar clefts, restore the archform and facilitate bone grafting. **Purpose**: We will illustrate the technique for creating alveolar segments without damaging dental roots and the application of segmental distraction to solve problems in cleft-related archform. **Methods**: Intraoral scans, conebeam CT and 3D printing of dental models provide the imaging technology to find spaces between dental roots for a straight osteotomy and to define the angles needed to position the osteotome during surgery. The path of insertion is drawn on models with sightings for the surgeon to use to check the position. This technique allows alveolar segments to be created with only a buccal flap to preserve the vascularity of the alveolar segment. The segmental osteotomy is used to close wide alveolar clefts that could not be grafted in previous attempts and to advance the anterior segment in a hypoplastic maxilla to correct the Class III malocclusion and dental crowding. **Results**: Segmental distraction created bone to bridge wide alveolar clefts. The new bone was initially lower in bone density which permitted rapid tooth movement to occur so that the orthodontic corrections were completed rapidly. **Conclusion**: Segmental distraction can be an effective technique for solving residual problems after bone grafting. The complication of root damage can be mitigated by the above technique for defining the path of osteotome insertion.

Poster #76

Title: Probing the role of NAMPT deamidation in Alzheimer's disease

Authors: Yu Zhou, Shu Zhang, Chao Qin, Zhenfeng Shu, Ali Can Savas, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Nicotinamide phosphoribosyltransferase (NAMPT), catalyzing the rate-limiting step in the mammalian nicotinamide adenine dinucleotide (NAD) salvage pathway, is an important regulator of the intracellular NAD pool. In various metabolic disorders and during ageing, levels of NAMPT and NAD are decreased. **Purpose**: Cellular glutamine amidotransferases (GATs) involved in the nucleotide synthesis have been demonstrated as protein deamidase, regulating protein function via deamidation. **Methods**: To investigate whether the activity of NAMPT is influenced by cellular GATs in Alzheimer's disease (AD), we have screened for GATs that targets NAMPT in neuronal cells. **Results**: Screening of cellular GATs identified carbamoyl-phosphate synthetase, aspartate transcarbamoylase and dihydroorotase (CAD), the rate-limiting enzyme of *de novo* pyrimidine synthesis, as the NAMPT-interacting protein. CAD is able to deamidate NAMPT both in vitro and in microglial cells, a brain-resident macrophage. The LC/MS analysis identified two NAMPT deamidation sites mediated by CAD, which led to decreased enzymatic activity of NAMPT. Moreover, analysis of NAMPT by two-dimensional gel electrophoresis (2DGE) revealed that NAMPT showed both neurodegeneration-related and age-dependent deamidation, indicating the potential role of NAMPT deamidation in the pathogenesis of neurodegeneration. **Conclusion**: Our study may reveal the NAD metabolic reprogramming underpinning neurodegeneration, thus advancing the understanding in AD pathogenesis.

UNDERGRADUATE & DDS STUDENTS - BASIC SCIENCES

Poster #77

Title: The potential role of Arl13b in palatogenesis and craniofacial myogenesis

Authors: Angelita Araujo-Villalba, Heliya Ziaei, Eva Janeckova, Jifan Feng, Tingwei Guo, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Craniofacial malformations are among the most common birth defects. 30% of ciliopathies are linked to craniofacial phenotypes, and cleft lip and palate is the most common one. Arl13b is a small GTPase of the RAS superfamily, required for ciliogenesis, making it a good target for studying the function of ciliogenesis in the craniofacial region. **Purpose**: The aim of this study is to investigate the potential role of cilia in palatogenesis. **Methods**: Immunofluorescence, RNA in situ hybridization, microCT, histology. **Results**: The widespread expression of Arl13b throughout the entire palatal region at different stages of palatal development was observed. To determine the potential influence of Arl13b on palate development, a *Wnt1-Cre;Arl13b*$^{fl/fl}$ mouse model was generated, in which Arl13b was deleted from CNC-derived mesenchymal cells. This mouse model displayed 100% penetrance of cleft soft palate and 80% penetrance of complete cleft palate. MicroCT analysis of craniofacial bones at E18.5 revealed alterations in the

maxillary and mandibular bones, and notably, a soft palatal muscle defect in terms of shape and size at E18.5. In order to further deeply investigate the underlying molecular changes leading to this phenotype, bulk RNA sequencing was performed at the E12.5 stage. Top altered genes in the mutant model were mostly enriched in the Wnt pathway and pathways related to muscle formation. **Conclusion**: Significant alterations in hard and soft palate formation of the *Wnt1-Cre;Arl13b*$^{fl/fl}$ mouse suggests that cilia might have a crucial role in palatogenesis. In the future, we will focus on exploring the possible regulation of palatal muscle formation through Wnt signaling.

Poster #78

Title: Smad7 Regulates Tooth Root Development through Cell Cycle Regulation

Authors: Oscar Peng, Peng Chen, Mengmeng Liu, Jifan Feng, Tingwei Guo, Lin Meng, Heliya Ziaei, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Despite its importance in organogenesis, the regulatory mechanisms of tooth root development remain largely unexplored. Smad7, an antagonist of TGF-β signaling, is known to interact with various cellular pathways, yet its role in tooth development has not been comprehensively understood. **Purpose**: This study aimed to elucidate the role of Smad7 in tooth root development, particularly focusing on its interaction with cell cycle regulation and subsequent effects on root progenitor cells. **Methods**: *Gli1-Cre*^{ERT2}*;Smad-7*$^{fl/fl}$ mice were generated to investigate the role of *Smad7*. Comparative analyses of root morphology were conducted using micro-CT, and bulk RNA sequencing was performed on tissues harvested from both mutant and control mice to analyze gene expression. **Results**: *Smad7* was found to be abundantly expressed in developing mouse molar roots, co-localizing with *Gli1+* cells. Mutants exhibited a shortened tooth root at PN21.5, and a marked absence of dentin sialophosphoprotein (*Dspp*) expression was observed, indicating delayed dentin differentiation. A decrease in Ki67+ proliferative cells in the apical dental mesenchyme and a significant reduction in the expression level of Ccnd1 were noted, suggesting that *Smad7* may mediate tooth root development through cell cycle regulation. **Conclusion**: Our findings highlight the critical role of *Smad7* in tooth root development, specifically through cell cycle regulation mechanisms. The discovery opens new pathways for further studies to identify downstream target genes of Smad7, offering deeper insights into the intricacies of root development.

Poster #79

Title: The mechanical ion channel Piezo2 maintains tissue homeostasis

Authors: Ara Hartounian, Mengmeng Liu, Aaron Harouni, Thach-Vu Ho, Shaohua Ge, and Yang Chai

Faculty Advisor: Yang Chai

Background: Mechanosensors play a critical role in perceiving and responding to mechanical forces, influencing both embryonic development and adult tissue maintenance. However, the precise molecular mechanisms governing mechanosensor function in tissue and organ morphogenesis remain unclear. **Purpose**: This study investigates the essential role of the mechanosensitive ion channel Piezo2 in maintaining tissue homeostasis during tooth root development, particularly its impact on mitochondrial function. **Methods**: We examined the effects of Piezo2 absence on Gli1+ root progenitor cells, revealing its influence on cell proliferation through Hedgehog (Hh) signaling, ultimately leading to shortened roots. **Results**: Our findings highlight the integral involvement of Piezo2 in regulating mitochondrial function during tooth root development, shedding light on its crucial role in tissue homeostasis. **Conclusion**: Understanding Piezo2's contribution to cellular processes is vital for proper tissue development, particularly during tooth root development. This research offers insights into potential therapeutic targets for conditions affecting dental tissue development and homeostasis.

Poster #80

Title: Piezo1's Role in Tooth Root Development: Creb-Hh-Ngf Signaling Mechanism

Authors: Aaron Harouni, Mengmeng Liu, Jifan Feng, Tingwei Guo, Mingyi Zhang, Peng Chen, Thach-Vu Ho, Sa Cha, Lin Meng, Ara Hartounian, Shaohua Ge, and Yang Chai

Faculty Advisor: Yang Chai

Background: Mechanosensors play a crucial role in sensing and responding to mechanical forces, converting them into electrical or chemical signals that influence both embryonic development and the maintenance of adult tissues. **Purpose**: Despite their importance, the molecular mechanisms governing how mechanosensors convert mechanical forces into the regulation of tissue and organ morphogenesis remain unclear. **Methods**: This study explores these mechanisms and uses mouse tooth roots as a model to analyze the role of Piezo1 in dental mesenchymal progenitor fate determination during tooth root development. **Results**: In our study, we reveal that the absence of Piezo1, a substantial mechanosensor in Gli1+ root progenitor cells, hampers cell proliferation through Hedgehog (Hh) signaling, resulting in shortened roots. We identified phosphorylated cAMP response element-binding protein (CREB) as a crucial upstream regulator of Hh signaling. Furthermore, our research uncovers that loss of Piezo1 from progenitor cells influences axonal growth in dental pulp through nerve growth factor (NGF) signaling during tooth root development. This downregulation of NGF signaling leads to impaired progenitor cell proliferation via the ERK signaling pathway. **Conclusion**: This study represents a significant advancement in understanding the intricate relationship between mechanical cues and cellular fate determination in tissue homeostasis. The implications of our findings extend beyond tooth root development, offering potential insights applicable to a diverse range of biological processes and tissue regeneration.

UNDERGRADUATE & DDS STUDENTS - CLINICAL SCIENCES

Poster #81

Title: Vibrational Biofeedback Splint Therapy for Sleep Bruxism: A Meta-analysis

Authors: Haeseong Lee, Jack Botros, Maryam Nakisa, Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Sleep bruxism (SB) involves involuntary grinding, clenching, or gnashing of teeth during sleep. Vibrational occlusal splint (VOS) therapy emerged as a promising biofeedback approach to mitigate SB by modulating neuromuscular activity. **Purpose**: This meta-analysis aims to evaluate the published data on the efficacy of VOS therapy to reduce duration and frequency of SB events. **Methods**: A search was conducted across databases to identify pertinent studies published up to August 2023. Studies were included if they (i) assessed the effects of VOS therapy on SB; (ii) used electromyograms and/or polysomnograms to diagnose bruxism; and (iii) reported quantitative data for bruxism duration and/or frequency outcomes. Quality and bias assessment were performed using the Cochrane Risk of Bias in Non-Randomized Studies (ROBINS-I). Fixed and random pooled effect sizes were assessed. **Results**: Five

studies (n=97) were included in the meta-analysis for bruxism frequency and four studies (n=78) for duration. Pooled effect sizes revealed a statistically significant reduction in both the bruxism duration (seconds/h) for fixed (standard difference in means (std) = 1.046, 95% confidence intervals (95%CI) = 0.710-1.382, P<0.001) and random effects (std = 1.046, 95% CI= 0.710-1.382, P<0.001). Frequency (number of episodes/h) of SB was also reduced following VOS therapy for fixed (std = 0.927, 95% CI= 0.626-1.228, P<0.001), and random effects (std = 1.044, 95% CI = 0.483-1.604, P<0.001). Moderate bias was observed due to potential confounders like medication use, baseline sleep patterns, sleep environment, and intervention compliance. **Conclusion**: VOS therapy may serve as an effective intervention for reducing the duration and frequency of SB episodes.

Poster #82

Title: Usability of Virtual Learning Environment for Orofacial Pain Competency Assessment

Authors: Haeseong Lee, Noam Rose, Luciano Nocera, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: The integration of virtual learning environments has paved the way for innovative approaches to assess clinical decision-making. A virtual patient game simulates realistic scenarios that mirror clinical challenges, serving as a dynamic tool in evaluating students' competency. **Purpose**: This study aimed to assess the usability of a virtual patient game designed as a competency assessment tool for the Orofacial Pain Rotation. **Methods**: The study evaluated whether the game seamlessly and effectively achieved the rotation's learning objectives related to clinical decision-making. Students were guided through a live demonstration of the virtual patient game and were informed about the evaluation standards. Post-completion satisfaction surveys were collected from eight student respondents. Student experience was investigated, and potential usability issues concerning navigation, user interface, and game design were identified. **Results**: While most participants were comfortable with virtual learning environments (n=5), some reported low usability (n=3). The game was generally perceived as a fair assessment of clinical decision-making, with six participants favoring it over traditional assessment methods, such as multiple-choice questions. Clear instructions and engagement were noted, with an average satisfaction rating of 3.25 on a scale of 1 to 5. Based on suggestions for improvement, written instructions, a concise case summary to underscore the significance of diagnostic skills, and fewer distractors for answer choices were incorporated. **Conclusion**: The game's effectiveness could be optimized through revisions that provide more precise guidance, facilitating successful completion and a positive user experience. Future, regular evaluations of the virtual patient game should be conducted to validate the effects of successive improvements on usability.

Poster #83

Title: Bilateral Dens Evaginatus and Subsequent Inflammatory Cystic Sequelae of Premolars

Authors: Haeseong Lee, Bach Le, and Parish Sedghizadeh

Faculty Advisor: Parish Sedghizadeh

Background: Dens evaginatus (DE) is a rare dental anomaly describing a tubercle that arises from the occlusal or lingual surface of posterior and anterior teeth, respectively. The protrusion of the extra cusp-like structure along the central groove of posterior teeth is often fractured or abraded due to occlusal trauma, which may result in pulpal or periapical complications, due to the presence of the pulp horn(s) within the protuberance. Consequently, pulp exposure followed by pulpitis or necrosis along with resultant inflammatory periapical lesions may be observed in DE associated teeth. **Purpose**: This case reports a 14-year-old Asian female patient who presented with occlusally reduced bilateral DE of vital mandibular second premolars and subsequent bilateral apical cysts. **Methods**: Endodontic testing confirmed the vitality of both teeth and radiographic examination revealed well-defined periapical radiolucencies. Histological assessment of the extracted premolars and apical tissue confirmed a diagnosis of inflammatory-apical cyst. **Results**: Aside from functional implications or esthetic concerns, DE presents a clinical conundrum due to its fragility and propensity to cause pulpal and periapical complications. **Conclusion**: Clinicians should heed the presence of DE during clinical examinations and avoid unnecessary grinding or smoothing of the tubercle, considering prophylactic or therapeutic intervention only when clinically indicated. Moreover, DE-associated apical cysts should be included in the differential diagnosis of diffuse bilateral periapical radiolucencies, especially in areas and patients that conform to the anomaly's site and ethnic predilection, respectively.

Poster #84

Title: Topical Imiquimod for the Treatment of Oral Epithelial Dysplasia

Authors: Haeseong Lee, Anette Vistoso, and Parish Sedghizadeh

Faculty Advisor: Anette Vistoso and Parish Sedghizadeh

Background: Imiquimod is an immunomodulatory topical agent used to treat actinic keratosis, superficial basal cell carcinoma, and warts in immunocompetent adults. Its indirect antiviral and antitumor effects have spurred its off-label use for treating premalignant oral lesions. **Purpose**: This study aims to describe using imiquimod cream to treat oral dysplasia. **Methods**: A web search was performed until June 2023, using medical subject heading (MeSH) terms related to topical imiquimod and oral dysplasia. Descriptive analysis was performed on eleven eligible case reports, case series, and correspondences that exclusively used topical imiquimod cream for treating biopsied dysplastic oral lesions on humans. **Results**: The most common lesions treated were leukoplakia (n=5), lichen planus (n=4), and actinic cheilitis (n=2) with varying levels of dysplasia, from mild dysplasia to carcinoma in situ. Direct application (n=14) was the most common method of delivery, while cover plates (n=1) and Orabase Paste (n=1) were also used to maximize imiquimod penetration at the lesion site. Overall, 50% (n=8) of the cases demonstrated a complete histological and clinical resolution with no signs of recurrence, while 16.6% (n=3) showed a marked reduction in dysplastic features. Diverse approaches were observed concerning the frequency of applications and duration of treatment, such as intermittent applications (n=9) and gradual tapering of the frequency of applications (n=4). Most cases (n=10) reported side effects, including flu-like symptoms, inflammation, irritation, pain, burning, erosions, and ulcerations. **Conclusion**: Topical imiquimod cream may be an effective non-surgical therapeutic for oral potentially malignant disorders. Future clinical trials should be conducted to determine imiquimod's long-term safety and efficacy.

Poster #85

Title: Evaluation of Student Decision-making in Utilizing Crown Lengthening vs Forced-Eruption

Authors: Niousha Aramimehr, Deena Fatehi, Sayyed Ourmazd Mohseni, and Hovhanness Ivan Shnorhokian

Faculty Advisor: Hovhanness Ivan Shnorhokian

Background: When faced with biological width invasion and insufficient length of crowns, providers prefer referring patients for crown lengthening.

While effective, such surgeries lead to undesirable outcomes including long recovery and poor prognosis. Forced eruption through orthodontics is an effective alternative to such treatments without the need for surgical intervention. However, it is rarely utilized. **Purpose**: We aimed to determine the cause of low rates of forced eruption referral. We hypothesized that the lack of sufficient knowledge and instruction on the procedure and interdisciplinary care are linked to such findings. **Methods**: An email containing a one-page brochure on the basics, advantages and disadvantages of crown lengthening and forced eruption with a 4-question survey was sent to students. Instructions included reading the packet and answering the survey subsequently. 4 cases were presented in which continuation of restorative care would result in biological width violation; thus, prompting choosing crown lengthening or forced eruption. **Results**: 95 answers were received. Scenarios included subgingival caries, horizontal crown fracture, retreatment of failed RCT and gingival hyperplasia. For the first case, 46.3% elected forced eruption vs 53.7% choosing crown lengthening. For the following scenarios, 70.5% vs 29.5% , 88.4% vs 11.6% and 56.8% vs 43.2% favored forced eruption respectively. **Conclusion**: Adequate information regarding forced eruption and its advantages led to more students selecting it over surgery. Such a discrepancy in frequency compared to private practice emphasizes the need for interdisciplinary education in orthodontics for better clinical decisions.

Poster #86

Title: Antibiotic Prescribing Habits of Dentists for Routine Dental Implant Placement

Authors: Yidan Zhang, Jacob Gurstein, Sabrina Alterman, Jonathan Alterman, David F. Levine, and John Costandi

Faculty Advisor: John Costandi

Background: Routine implant placement often involves antibiotic prophylaxis among dentists, yet a consensus on the preventive antibiotic protocol for postoperative complications is lacking in documented literature. **Purpose**: This study analyzes the current prophylactic antibiotic prescription patterns employed by dentists in California. **Methods**: A cross-sectional survey was distributed to practicing dentists affiliated with various organizations including AAOMS, CALAOMS, CDA, CSP, AO, and others to collect data on the antibiotic practices for routine implant placements. The anonymous survey queried about their preferences regarding antibiotic prescription, covering administration timing, indications, antibiotic choice, dosage, and duration of treatment. **Results**: Of the 176 eligible California-based respondents (152 oral and maxillofacial surgeons, 10 periodontists, 9 general dentists), 72.1% prescribe prophylactic antibiotics universally to all implant patients, 26.7% prescribe on a case-by-case basis, and 2.3% never prescribe antibiotics. Amoxicillin is most commonly prescribed (86.7%), often administered one hour pre-operatively (36.5%). The most common regimen employed is 500mg t.i.d. for 7 days. General dentists exhibit more selectivity in prescribing antibiotics on a case to case basis, whereas oral surgeons and periodontists lean towards prescribing antibiotics to every routine implant patient. **Conclusion**: While the majority of respondents recognize the common use of antibiotic prophylaxis, this study reveals notable variability in the prescription pattern and a lack of consensus among dentists in California for routine implant placement. These disparities underscore the need for an evidence-based protocol to guide antibiotic prescriptions, aiming to optimize implant success rates and prevent antibiotic overuse.

Poster #87

Title: Breathless: The Alarming Impact of Air Pollution in Dental Offices

Authors: Shanar Mardanpour, Sheiva Hodjati, Parmida Karimi, and Mehdi Mohammadi

Faculty Advisor: Mehdi Mohammadi

Background: This study aims to provide significant data on particulate matter (PM) and volatile organic compound (VOC) concentrations in dental settings. Aerosol-generating dental procedures and materials, such as ultrasonic scalers and bonding agents, release fine PM and VOCs. VOCs are also emitted by cleaning, sterilization supplies, resin, and primers. Scientific evidence suggests that the released VOCs and PM, known to cross the blood-brain barrier, may elevate dementia, Alzheimer's Disease in particular, and overall cognitive decline risks in older adults. **Purpose**: This presentation promotes the widespread adoption of solutions targeted at reducing PM and VOC levels in dental offices by dental facilities and workers, based on carefully evaluated research data that demonstrate these strategies' efficacy. The research intends to protect the oral health of older adults as well as their general systemic well-being by advocating these preventive measures. **Methods**: For the methods, we did a literature review where we extracted information from various articles. **Results**: The limited literature that is currently available shows that air purifiers, ventilators, and other measures that dentists can use in dental care facilities significantly lowers levels of PM and VOCs. **Conclusion**: The research intends to protect the oral health of older adults as well as their general systemic well-being by advocating these preventive measures.

Poster #88

Title: Learning Preclinical Orthodontic Cast Evaluation Utilizing Immersive 3D Virtual Reality

Authors: Stephanie Chai, Danika Banh, and Glenn Sameshima

Faculty Advisor: Glenn Sameshima

Purpose: Virtual reality (VR) has greatly enhanced the dental education experience. However, its applications in orthodontic education have not been fully explored. Our study examined whether immersive 3D VR could help augment preclinical orthodontic education and limit the need for patient models. **Methods**: Dental students who completed two trimesters of preclinical orthodontics courses were eligible to participate in this pilot study. Participants were instructed how to use the Oculus Rift headset and hand controllers to navigate the virtual test room. Participants answered questions by manipulating virtual models similarly to how they would physical models. Participants anonymously answered a 15-item survey using 5-point agreement Likert scales, rating scales, and free-response to assess their thoughts on incorporating VR into their curriculum and evaluating their experience. **Results**: Forty-four students volunteered to participate. More than half of participants (52.3%) never had experience with any form of VR. Most participants were interested in incorporating VR into their dental education (86.4%) and agreed that VR can help supplement (88.7%). In the future, 81.8% of participants would rather have a similar test format using VR versus physical models. Participants liked how the virtual room felt realistic, immersive, and similar to interacting with physical models. Participants believe VR allowed for more opportunity in limited spaces and felt more engaged in the learning experience. **Conclusion**: At a school with no current use of any form of VR in its curriculum, this study suggests

students are excited about and interested in the applications of immersive 3D VR to augment their dental education.

Poster #89

Title: Salivary Amylase as a Diagnostic Tool for Diabetes - Literature Review

Authors: Bahar Khalilian, Antranig Mesrobian, and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Diabetes mellitus poses a global health challenge. Traditional blood-based methods for diagnosis and monitoring, relying on glycosylated hemoglobin (HbA1c) and blood glucose levels, are effective but invasive, leading to needle-related anxieties and potential reluctance for routine testing. Seeking a less intrusive alternative, salivary amylase levels present a promising solution. **Purpose**: This literature review analyzed evidence supporting salivary amylase as a reliable biomarker for measuring glycemic control. **Methods**: Employing "(Salivary OR saliva) AND amylase AND diabetes" as keywords, our search spanned Scopus and PubMed databases (2018-2023). Inclusion criteria focused on human subjects, English language, and studies investigating salivary amylase in Type I and II diabetes. Exclusion criteria encompassed systemic diseases, conditions influencing glucose or salivary levels, and gestational diabetes. **Results**: From an initial 190 articles, the selection was refined to 9 studies after abstract and full-text screening. Of the 6 studies exploring amylase levels, all showed significant elevation in diabetic individuals during fasting and non-fasting conditions. In the remaining 3 studies measuring amylase activity, only 1 study indicated a substantial increase among diabetic patients, while the remaining two found no significant correlation. **Conclusion**: Salivary amylase level shows potential as a non-invasive biomarker for glycemic control evaluation. Methodological divergences, including variations in uncontrolled diabetes definition, emphasize the need for more comprehensive research. Standardizing collection and processing techniques, establishing defined values for diabetes diagnosis, and exploring factors, such as the method and level of glycemic control, patient demographics, and potential pharmacological effects, will optimize the clinical utility of salivary amylase.

Poster #90

Title: Orthodontic Elastic White Bands Inducing Gingival Enlargement: A Case Report

Authors: Deep Thakker, Greg S. Park, and Parish Sedghizadeh

Faculty Advisor: Parish Sedghizadeh

Background: The foreign body reaction is a complex process characterized by the development of inflammation and fibrosis. Immune cells, fibroblasts, and capillaries collaborate in response to encountered foreign bodies, releasing antibodies and inflammatory mediators to facilitate degradation. **Purpose**: This study presents a unique case of foreign body reaction manifesting as a rapidly growing, firm to palpation, and erythematous mass within a month of exposure. **Methods**: A 2.5-year-old patient sought dental attention for a persistent gum issue. The examination revealed a 2 cm smooth, white, firm-to-palpation mass with facial and lingual gingival expansion, causing mobility of lower front teeth and hindering eating due to pain and sensitivity. The movable white band consisted of two elastic bands wrapped around the lower four anterior primary teeth, triggering a foreign body reaction. **Results**: Removal of the elastic white bands led to the resolution of lesions. To our knowledge, this is the first reported case of orthodontic elastic white bands inducing gingival enlargement and tooth mobility, mimicking pathological conditions. **Conclusion**: This case highlights the need for further investigations into host responses to foreign objects in pediatric populations. Understanding these reactions is crucial for improving clinical management and preventing complications.

Poster #91

Title: Hand Hygiene for Safety and Environmental Sustainability: A Topical Review

Authors: Richard Lengkong, Aileen Ghobadi, Steffi Chen, and Arya Sahabi

Faculty Advisor: Yaara Berdan

Background: One of the United Nations Sustainable Development Goals is ensuring sustainable production and consumption patterns. As dentists, we could contribute and help with these goals by providing high quality care without damaging the environment. One aspect is to reduce the waste production from excessive glove use. **Purpose**: To study the compliance of healthcare professionals, especially dentists, in Hand Hygiene (HH), their knowledge in HH guidelines, the relationship between HH and microorganisms transfer in clinical settings, and how to develop a more sustainable practice. **Methods**: Eight research studies were used to provide insights in HH knowledge and practices amongst healthcare providers including dentists and dental students, gloves usage and non-sterile gloves (NSG) bacterial contamination, as well as whether and how staff at private dental practices could contribute into developing sustainability. The studies from the papers were then used to compile the findings and results to supplement this review. **Results**: Four studies showed poor HH compliance and knowledge among healthcare providers including dentists and dental students. Two of these studies revealed lower compliance and knowledge for the students. One study showed similar median colony-forming unit counts between hands after HH (n=107) and NSGs (n=85) suggesting improper HH routine which led to the gloves' contamination. **Conclusion**: HH compliance and knowledge are inadequate amongst dentists and dental students at private practices and dental schools. Further education and adherence of HH protocols according to CDC/WHO guidelines need to be promoted to assure patient safety and reduction of waste with judicious use of gloves.

BIOKINESIOLOGY & PHYSICAL THERAPY - PHD CANDIDATES & POST-DOCTORAL ASSOCIATES

Poster #92

Title: Vestibulo-spinal pathways do not contribute to alpha-band Intermuscular coherence

Authors: Angelo Bartsch-Jiménez and Francisco Javier Valero-Cuevas

Faculty Advisor: Francisco Javier Valero-Cuevas

Background: Intermuscular coherence (IMC) quantifies the degree of synchronization between two electromyography (EMG) signals to reveal their shared neural drive. As such, it is gaining popularity as a means to pinpoint the origin of neural drive causing upper extremity pathological synergies in stroke—as multiple pathways are possible. **Purpose**: While the imbalance of cortico- and reticulo-spinal tracts contributes to pathological synergies, this study aims to exclude the vestibulo-spinal tract as a potential contributor to arm muscle IMC. **Methods**: As a first step in unimpaired adults, we recorded IMC during Galvanic Vestibular Stimulation (GVS), Sham, and no Stimulation. We tested 16 young adults (19.2 ± 2.2 years old) at rest and during voluntary reaching movement with the right arm in these three conditions while EMG signals were recorded from three upper extremity muscles (Biceps Brachii, Bic, Middle Head of Deltoid, MDelt, and Upper Trapezius, UTrap) and one neck muscle (Sternocleidomastoid, SCM), as a control.

Magnitude squared coherence from 8 to 50Hz from EMG was estimated across muscle pairs. Statistical Parametric Mapping (SPM) determined the frequencies at which there were differences across conditions. **Results and Conclusion**: GVS did not increase IMC coherence between arm muscles from the rest and sham conditions—excluding the vestibulospinal tract as a contributor to neural drive to arm muscles during voluntary movement. As expected, GVS induced SCM-UTrap IMC between 11 and 50HZ (spanning alpha, beta and gamma frequency bands). This allows us to more confidently interpret the source of disruptions in IMC in stroke survivors.

Poster #93

Title: The effects of high-force eccentric training on muscle function

Authors: Antonio Squillante and E. Todd Schroeder

Faculty Advisor: E. Todd Schroeder

Background: High-force eccentric training has been shown to increase passive stiffness, altering the mechanical behavior of skeletal muscles under load and improving muscle function. **Purpose**: This study aims to compare the effect of high-force eccentric training in combination with conventional resistance training on knee extension torque and the rate of torque development. **Methods**: 6 healthy adults (age 23 ± 4.5, height 169.8 ± 5.1cm, body mass 75.7 ± 18.4 kg) were randomly assigned to one of two groups: the control group underwent 6 weeks of conventional resistance training (75-85% 1RM) whereas the intervention group used a combination of conventional resistance training (75-85% 1RM) and high-force eccentric training (110-130% 1RM). Isokinetic testing (Humac, Cybex) was used to measure knee extension torque and rate of torque development pre and post-training. **Results**: A paired t-test was used to measure the difference in torque and rate of torque development pre- and post-training. A significant difference in knee extension rate of torque development emerged between groups ($p<0.05$). The intervention group showed a more meaningful increase in knee extension rate of torque development (299.21 ± 48.22 N/ms; 25.1%) when compared to the control group (86.21 ± 89.05 N/ms; 6.8%). No significant difference emerged in knee extension peak torque. **Conclusion**: A combination of conventional resistance training (75-85% 1RM) and high-force eccentric training (110-130% 1RM) seems to increase rate of torque development to a greater extent than conventional resistance training alone.

Poster #94

Title: Modifiable Physical Factors Related to Elbow Torque in Baseball Pitchers

Authors: Adam J. Barrack, Motoki Sakurai, Choo Phei Wee, Andrew R. Karduna, Christopher M. Powers, and Lori A. Michener

Faculty Advisor: Christopher M. Powers and Lori A. Michener

Background: A mechanism of UCL injury during pitching is excessive elbow varus torque (EVT), which can increase with higher ball velocities (BV). Modifiable physical factors may explain individual variation seen in the EVT-BV relationship. **Purpose**: Identify physical characteristics that relate to the EVT-BV relationship during pitching. **Methods**: EVT and BV were measured during 5 maximal-effort fastballs in N=87 NCAA Division-1 pitchers. 57 physical factors and bodyweight were obtained from each participant. Physical factors of interest were derived from bilateral measurements of shoulder range of motion, upper and lower extremity strength and lumbopelvic stability. Each was expressed as a unilateral and symmetry variable (dominant - non-dominant). Physical factors were entered into univariate linear mixed models to predict EVT, covarying for BV. Variable reduction was based on random forest-derived variable importance and significant univariate relationships. Multivariate linear mixed models predicting EVT containing physical factors, demographics, and covarying for BV were created using backwards elimination. **Results**: In the final model, a 1 m/s increase in mean BV elicited a 1.85 Nm increase in mean EVT. Variables found to increase EVT while controlling for BV included increased grip strength symmetry, lead leg lumbopelvic stability, and bodyweight. Decreased EVT was predicted by increased dominant shoulder internal rotation strength, dominant shoulder flexion ROM and scaption strength symmetry, controlling for BV. **Conclusion**: Several modifiable physical measures predicted EVT as BV increased. Defining the effects of physical capacities on EVT identifies access points for practitioners to consider for optimizing the EVT-BV relationship in pitchers.

Poster #95

Title: Differences between responders and non-responders to exercise for shoulder tendinopathy

Authors: Oscar Vila Dieguez and Lori A. Michener

Faculty Advisor: Lori A. Michener

Background: Neuromuscular factors, psychosocial factors, and pain sensitivity play a role in RCtend. It is unclear which of these factors change with exercise, and which ones may predict a negative or delayed response to exercise. **Purpose**: In this study, we characterize how baseline factors and their early change after a 2-week resisted exercise protocol differentiate responders (RES) from non-responders (NonRES) to resisted exercise. **Methods**: Neuromuscular factors were defined by: Rate of Force Development (RFD) from 50-100ms and Peak Force (PF) recorded during a maximal external rotation isometric contraction recorded with a load cell at 1000Hz. Psychosocial factors were characterized using the OSPRO yellow flag (YF) screening tool. Pain pressure threshold (PPT) on both shoulders and tibialis anterior defined pain sensitivity. The Penn Shoulder Score (PENN) assessed outcome. Participants underwent a 2-week progressive resistance exercise program. Participants with RCtend (n=24, mean age= 31+/-11). **Results**: Differences between RES (n=17) and NonRES (n=7) are provided as '(Mean Difference [95% CI])'. RES had greater deficits in baseline RFD (-179 N/s [-583, 224]), and improved from baseline to 2-weeks [137N/s (-146, 421), p=0.04], whereas NonRES had no difference. NonRES had significantly more yellow flags at baseline (3 YF [0, 6]; p=0.01). **Conclusion**: RES after resistance exercise had deficits in RFD at baseline which were improved after intervention. NonRES did not have neuromuscular deficits, instead had more psychosocial factors and these did not improve after intervention. These results suggest that additional interventions to target psychological factors are required for those RCtend patients with predominance of these deficits.

Poster #96

Title: Clinical methods for identifying knee loading deficits during squats post-ACLr

Authors: Jiaqi Wang and Susan Sigward

Faculty Advisor: Susan Sigward

Background: In contrast to expectations, knee extensor moment (KEM) as large as 38% during bilateral squats exist 3-4 months post-ACLr and persist at 5 months. These deficits are difficult to detect as they occur without observable joint angle differences; likely contributing to their persistence. **Purpose**: To determine the diagnostic accuracy of a method for estimating KEM deficits using force plate

and video data compared to the gold standard 3D motion analysis. **Methods**: Twenty-two individuals (age: 25.7±10.3 years; sex: 14 females, 8 males) 110±18 days post-ACLr. Data collected using 3D motion capture and force platforms during bilateral squats were used to calculate knee extensor moments (KEM). Sagittal plane knee moment arm (MA) was measured as the horizontal distance from the knee lateral epicondyle to the GRF vector. Estimated KEM (eKEM) was calculated as the product of MA and GRF magnitude. KEM deficits characterized using limb symmetry index (LSI: surgical (Sx)/non-surgical (NSx)) for both methods were analyzed. Simple linear regression and ICC(2,k) assessed method agreement and AUC, specificity, and sensitivity assessed diagnostic accuracy of LSI 0.85. **Results**: eKEM and KEM were positively related (R=0.92, R^2=0.85, p<0.001), ICC=0.93 (95% CI [0.84, 0.97]), and AUC=0.975 (95% CI [0.91, 1]). Sensitivity=1 (95% CI [0.83, 1]), specificity= 0.5 (95% CI [0.01, 0.99]). **Conclusion**: Excellent agreement and high sensitivity suggest that eKEM provides a reasonable alternative for detecting KEM deficits. Translation of these procedures to commercially available technology will allow for clinical detection of deficits which will allow for more targeted rehabilitation.

Poster #97

Title: Golf Recreational Exercise for Enhanced Survivorship (GREENS) in Individuals with Prostate Cancer undergoing Hormone Therapy

Authors: Guanrong Cai and George Salem

Faculty Advisor: George Salem

Background: Prostate cancer (PCa) is the second most common type of cancer in males with a high survival rate (>95%). The cancer-related and hormone therapy side-effects exacerbate effects of aging, which compromise PCa survivors' function and quality of life (QoL). There is a need to provide holistic care to improve QoL of individuals with PCa undergoing hormone therapy. Golf is a multimodal activity that is beneficial to physical, cognitive, and psychosocial health. Golf also promotes long-term physical activity engagement, which is beneficial to improving function and QoL; however, the effects of golf have not been investigated in individuals with PCa. **Description**: GREENS is a 10-week (90 min/session, twice/week) progressive golf training program, which includes golf-specific warm-up exercises, pelvic floor muscle (PFM) activation exercises, golf practice, and on-course golf play. A greater proportion of time will be spent on warm-up and PFM exercises in the beginning of the program. This time will progressively decrease to allow more on-course golf play. GREENS proposes to enroll 15 participants in this pilot feasibility phase and use a delayed-entry, within-subject design. **Significance**: The pilot study will provide information regarding GREENS' program safety, feasibility, adherence, and effect sizes for sample size calculation for future RCT. GREENS is a multimodal recreational program, and proving its feasibility in individuals with PCa will validate the concept of using multimodal recreational programs to improve QoL in clinical populations.

Poster #98

Title: Quantification of tibiofemoral loading in subgroups of individuals post-ACL reconstruction

Authors: Willa Ma, Russell Johnson, and Susan Sigward

Faculty Advisor: Susan Sigward

Background: Lower knee net joint moments during gait are observed in the surgical (Sx) limb on average following ACL reconstruction (ACLr) suggesting that Sx knee joint loading is also lower. However, this characterization is challenged by the consideration of the population as a whole and the assumption that net moments translate to joint forces. Consideration of data from mechanics-driven subgroups in musculoskeletal models that consider individual muscle forces are needed to understand the implications of different gait recovery profiles on joint loading. **Purpose**: Determine if tibiofemoral joint contact force (TFCF) differs between limbs in subgroups of individuals post-ACLr. **Methods**: Marker trajectory and ground reaction force data collected during gait were considered in a muscle-driven model (OpenSim) to estimate TFCF for four individuals 126.5 ± 8 days post-ACLr from symmetrical (n=2) and asymmetrical (n=2) recovery subgroups. Subgroups were previously determined from a larger cohort (n=54) using k-means clustering. TFCF impulse calculated across stance (total), and during loading response, midstance, and terminal stance phases. Effect size (ES) was used to indicate the strength of between-limb differences. **Results**: Greater Sx knee TFCF impulse was observed during total stance (ES: 1.95), loading response (ES: 0.39), midstance (ES: 1.07) and terminal stance (ES: 3.23) in the Symmetrical subgroup. Small effect sizes for limb comparisons in the Asymmetrical subgroup. **Conclusion**: Greater Sx knee TFCF in the Symmetrical group contrasts the lower net moments and suggests incomplete recovery of gait mechanics. The absence of differences in the Asymmetrical group reflects varied biomechanical profiles. Larger cohorts are required.

Poster #99

Title: Perception of Risk when Walking with Balance Perturbations

Authors: Shreya Jain, Nicolas Schweighofer, and James Finley

Faculty Advisor: James Finley

Background: Falls and fall-related injuries can be exacerbated by several risk factors. While there are assessments for physiological and psychological fall risk factors, there are currently none that capture how people make behavioral decisions when navigating their environments. These decisions can have devastating consequences, particularly if they lead to risky behaviors. **Purpose**: Here, we investigated how people perceive risk in their walking experiences and applied computational models from behavioral economics to understand the underlying decision-making processes. **Methods**: Young (n=20) and older adult (n=19) participants experienced two bouts of walking, each with two perturbations, on a split-belt treadmill. One bout had equal perturbations ("FIXED") while the other did not ("VARIABLE"). Participants then answered this question - "If we randomly pick one trip for you to repeat, which bout should we pick it from?". The "FIXED" bout is a safer choice as its outcome is known, whereas the "VARIABLE" bout is risky as any one of the two different perturbations could be repeated. **Results**: Using the Mean-Variance model of decision-making, which evaluates walking bouts as a function of the mean and variance of the perturbations in it, we found both age groups to be risk-averse. Despite no group-level differences in risk-sensitivity, two older adults appeared to be risk-neutral and made random choices, while this was not observed in any young adults. **Conclusion**: This work will provide insight into how people evaluate and decide between risky walking options, allowing us to quantify and potentially mitigate risky behaviors in individuals prone to falls.

Poster #100

Title: Longitudinal brain connectivity changes associated with chronic pelvic pain fluctuations

Authors: Natalie McLain and Jason Kutch

Faculty Advisor: Jason Kutch

Background: Fluctuations in pain intensity for individuals with chronic pain conditions are a common but poorly

understood phenomenon. **Purpose**: Identify the changes in brain activity that underlie these fluctuations and assess how important clinical phenotypes (depression, anxiety, painDETECT, multisite pain, catastrophizing) modify this relationship. **Methods**: We collected average self-reported pain, clinical questionnaire data, and resting-state functional magnetic resonance imaging (rs-fMRI) data in a population of 492 urologic chronic pelvic pain syndrome (UCPPS) patients. We assessed the link between pain and functional connectivity by regressing connectivity features onto pain measures from one baseline and three follow-up visits (6, 18, 36 months). We ran additional regressions with an interaction between pain and each of the clinical characteristics of interest to determine their impact on the relationship between pain and functional connectivity. p-values for key effects were FDR corrected ($q<0.05$). **Results**: We found that the areas of connectivity most likely to vary as a person experienced more or less pelvic pain were medial and lateral sensorimotor regions, bilateral insula, cingulate, and ventromedial prefrontal cortex after controlling for site, age, scan type, and sex. Additionally, we found that of the five clinical markers, only multisite pain significantly enhanced the relationship between pain and connectivity, particularly in the sensorimotor regions, precuneus, and superior frontal gyrus. **Conclusion**: These results suggest that functional connectivity changes in a common set of regions underlie the fluctuations in pain that UCPPS patients experience and that multisite pain is potentially indicative of central amplification of pain signals.

Poster #101

Title: Predictors of lateral patellar cartilage volume following ACL reconstruction

Authors: Thomas Demirjian, Gillian Northrup, Olivia Tu, and Christopher M. Powers

Faculty Advisor: Christopher M. Powers

Background: Persons who have undergone anterior cruciate ligament reconstruction (ACLR) exhibit early onset patellofemoral joint osteoarthritis (PFJOA). Elevated patellofemoral joint (PFJ) stress may be contributory. **Purpose**: To compare PFJ loading during single leg landing and lateral patellar cartilage volume between females who have undergone ACLR and healthy controls, and to determine if measures of patellofemoral joint loading are associated with lateral patellar cartilage volume. **Methods**: Seventeen females who had previously undergone ACLR (previous 6-12 months), and 17 healthy matched controls participated. Each underwent MRI assessment of the PFJ and biomechanical assessment of single leg drop landing (12-inch box). A previously described biomechanical model of the PFJ was used to calculate peak PFJS and average rate of loading. Lateral patella cartilage volume was obtained from the MR images and normalized to patella width. T-tests were used to compare differences between groups. Pearson's correlations were used to determine the associations between the time to peak PFJS, peak PFJS and total cartilage volume. **Results**: No group difference in peak PFJS was observed. However, the ACLR group exhibited a significantly higher average rate of loading than controls (ACLR=0.13 vs. 0.08, $p=0.02$). The ACLR group exhibited significantly lower normalized lateral patella cartilage volume than controls (ACLR=3.4 mm^3/mm vs. 4.5 mm^3/mm, $p<0.001$). Cartilage volume was associated with average rate of loading ($r=-0.60$, $p=0.009$) and peak PFJS ($r=-0.50$, $p=0.03$). **Conclusion**: Females who have undergone ACLR exhibit higher loading rates of patellofemoral stress development and lower lateral patella cartilage volume compared to healthy controls.

Poster #102

Title: Advanced Achilles Tendinopathy Reduces Ankle Power Absorption Contribution During Hopping

Authors: David Ortiz-Weissberg and Kornelia Kulig

Faculty Advisor: Kornelia Kulig

Background: The Achilles tendon is vital for energy absorption/generation during activities of daily living and athletic activities. Previous research has described neuromechanical adaptations to advanced alterations in Achilles morphology; these adaptations may be an attempt to maintain the ankle's ability to absorb and generate energy. It is unknown whether these adaptations achieve this goal. Since active movement control requires adequate energy absorption/generation, analyzing mechanical energy is ideal for examining ankle function. **Purpose**: To investigate how advanced alterations in Achilles morphology affect the ankle joint contribution to whole-limb power absorption. **Methods:** Sample: 12 persons with alterations in Achilles morphology, 10 without Achilles symptoms/degeneration. Task: Single-leg hopping at 2.33 Hz. We integrated the ankle/knee/hip net joint moment power for the braking phase then divided the outcome by the phase duration, resulting in average power. The relative ankle contribution to whole-limb power absorption was calculated as the ratio of the individual joint power to the sum across all joints, expressed as a percent. Robust mixed effects models were used to assess the difference in ankle contribution to whole-limb absorption between groups (healthy controls, persons with minimal alterations in Achilles morphology, persons with advanced alterations in morphology). **Results**: Persons with advanced alterations in Achilles morphology displayed a statistically significantly lower relative ankle contribution to whole-limb energy absorption than controls. **Conclusion**: The results indicate that persons with advanced alterations in Achilles morphology demonstrate a reduction in ankle joint energy absorption, relative to the demands of the whole limb. Future analyses should investigate whether this reduced contribution stems from reduced energy transfer from the thigh to the shank/foot.

BIOKINESIOLOGY & PHYSICAL THERAPY - PHD STUDENTS, MS STUDENTS, & RESIDENTS

Poster #103

Title: Validation of Vertical Force Measures during Hopping using Pressure Insoles

Authors: Andrew Cho, Erin Cagle, Sylwia Lipior, and Susan Sigward

Faculty Advisor: Susan Sigward

Background: Assessment of vertical ground reaction forces during jump tasks is commonly used as a tool to quantify post-injury limb loading. Embedded force plates are the current gold standard, but cost and poor ecological validity limit their feasibility for on-field assessment. Pressure insoles measure plantar pressure wirelessly and may provide a potential alternative. Previous studies have assessed the validity of insoles with varying results. Few have considered tasks involving both vertical and horizontal forces similarly encountered in sport agility tasks. This has important implications for clinical use outside the laboratory setting. **Purpose**: To determine the concurrent validity of pressure insoles and force plates in measuring vertical loading force during hop tasks. **Methods**: Fifteen healthy individuals participated, and force data were collected concurrently during single limb stance (SLS), forward hop (FH) and lateral hop (LH) tasks using triaxial force plates (AMTI, 1500 Hz) and pressure insoles (Moticon OpenGo, 25 Hz). Impulse was calculated as the area under the vertical force-time curve normalized to body

weight. Three trials per task were used to examine the relationship and agreement between methods. **Results**: Impulse from insoles was positively related to force plates during SLS (r = .71, p<.05), FH (r=.85, p<.05), and LH (r=.89, p<.05). ICC were SLS (.32, p<.05), FH (.83, p<.05) and LH (.89, p<.05). **Conclusion**: After normalizing by body weight, vertical force from insoles and force plates were highly correlated and showed excellent agreement. Pressure insoles may be a practical tool for assessing dynamic limb loading outside the laboratory setting.

Poster #104

Title: Anatomical-Biomechanical Interactions Increase Risk for a Secondary Non-contact ACL Injury

Authors: Daniel Edon and Christopher M. Powers

Faculty Advisor: Christopher M. Powers

Background: Anatomical and biomechanical risk factors for initial and secondary ACL injury have reported. However, these risk factors have been studied in isolation with low to moderate predictive ability. **Purpose**: To examine whether the combination of anatomical and biomechanical risk factors better predicts secondary ACL injury compared to when each is considered in isolation. **Methods**: Biomechanical and imaging data were obtained from 20 females who had undergone ACL reconstruction. Over a three-year follow-up period, 10 had experienced a second ipsilateral ACL injury (cases), while 10 successfully returned to sport without re-injury (controls). Biomechanical variables of interest were obtained from a double limb drop jump task and consisted of 2D surrogates of known risk factors for ACL injury (peak vertical ground reaction force and elevated knee extensor moment). Anatomical risk factors included measures of lateral posterior tibial slope and medial tibial slope depth. Cumulative risk (CR) z-scores were obtained for the 2 anatomical variables, the 2 biomechanical variables, and all 4 variables combined. Each CR z-score was used in separate logistic regression models to predict re-injury. **Results**: The anatomical CR z-score significantly predicted re-injury with 75% sensitivity (p=0.038). The biomechanical CR z-score did not predict re-injury (p=0.142). The combined anatomical and biomechanical CR z-score significantly predicted re-injury with 90% sensitivity (p=0.22). **Conclusion**: This preliminary analysis suggests that the combination of anatomical and biomechanical risk factors may provide better predictive ability for secondary ACL injury, compared to when each is considered in isolation. In this cohort, anatomical risk factors appear to be more influential than biomechanical factors.

Poster #105

Title: Brain and Tendon Biomarkers for Recovery in Rotator Cuff Tendinopathy

Authors: Matthew Heindel, Jason Kutch, and Lori A. Michener

Faculty Advisor: Lori A. Michener

Background: Increased tendon thickness (TT) defines RCtend but has a limited relationship to symptoms. Pain/sensorimotor deficits are also common in RCtend. To understand the relative contributions of TT and pain/sensorimotor processing to pain, function, and clinical outcomes, concurrent measurements of TT and brain activity are required. **Purpose**: Identify relative contributions of TT and brain activity to symptom severity and clinical outcomes following resistance exercise. **Methods**: RCtend (n=13) and healthy controls (n=13) were recruited. Supraspinatus TT was measured with ultrasound. Brain activity was measured with whole-brain resting-state functional connectivity (FC) with functional magnetic resonance imaging. Measurements were taken at baseline in both groups, and 4- and 8-weeks in those with RCtend. Those with RCtend underwent an 8-week resistance exercise program. **Results**: RCtend had increased TT (mean difference= 0.9mm [95%CI:0.4, 1.5], p=0.003). A dorsal attention network hub was increasingly connected to 4 nodes within the shoulder-specific sensorimotor areas (mean difference= 0.8 [95% CI:0.2, 1.3]; p=0.009). TT relates positively to pain (r= 0.35, p=0.25) and negatively to function (r= -0.49, p=0.1), while FC relates positively to function (r=0.56, p=0.04) and negatively to pain (r=-0.48, p=0.1). TT was increased at baseline in those who recovered (mean: 5.0mm ±0.5) compared to those who did not recover (mean: 4.0mm ±0.5) and controls (mean: 3.9mm ±0.5). Those who failed to respond (mean: 0.9 ±0.2) also had increased functional connectivity compared to those who positively responded (0.25 ±0.5). **Conclusion**: Those with deficits in TT responded positively to resistance exercise while those with deficits in pain/sensorimotor processing did not.

Poster #106

Title: Inflammatory Response Following HIIT across Different Exercise Modalities: Pilot Study

Authors: Bailey McLagan, Juliet Moore, and George Salem

Faculty Advisor: Todd Schroeder

Background: Exercise-related muscular contractions produce and release numerous myokines, namely interleukins (IL) 6, 8, and 10. To date, the effect of 4x4 High-Intensity Interval Training (HIIT) and modality on the inflammatory response to exercise have not been reported. **Purpose**: This pilot investigation characterized the inflammatory biomarker response to HIIT 4x4 running and cycling protocols. **Methods**: Five young, recreationally active volunteers (1 female; 27.20 ± 3.42 years) completed a heart rate max (HR_{max}) test monitored with a Polar HR chest strap. This was followed by randomized completion of a 4x4 HIIT protocol (4-minute 85-95% HR_{max} active; 3-minute 60-70% HR_{max} recovery) on a treadmill and a stationary bike. A licensed phlebotomist collected blood before and after exercise. Samples were centrifuged at 3000 RPM for 10 minutes before plasma was aliquoted and frozen at -80ºC. Circulating levels of IL-6/8/10 from baseline and post-exercise were analyzed using a multiplexed Luminex system. Data are presented as fold changes ((post-baseline)/baseline), and are shown as mean ± SD. **Results**: All inflammatory myokines had a positive fold change following the cycling protocol (IL-6: Δ=0.57 ± 1.30; IL-10: Δ = 0.15 ± 0.36; IL-8: Δ = 0.16 ± 0.29). Only IL-6 and IL-10 had positive fold changes following the running exercise (Δ = 0.07 ± 0.12; Δ = 0.05 ± 0.08, respectively), while IL-8 had a negative fold change (Δ = -0.01 ± 0.17). **Conclusion**: The results of this pilot study suggest that the IL-6 driven inflammatory response to HIIT exercise may be higher in cycling compared to running.

Poster #107

Title: Identification of High-Risk Landing Strategies Associated with ACL Injury Risk

Authors: Stanley Smith and Christopher M. Powers

Faculty Advisor: Christopher M. Powers

Background: Tears of the anterior cruciate ligament (ACL) are common among athletes who participate in sports involving rapid decelerations and direction changes. ACL injuries are more prevalent in female athletes compared to their male counterparts. **Purpose**: The purpose of this investigation is to use K-means clustering to ascertain whether a high-risk landing strategy could be identified during the drop-jump task as determined by the presence of multiple co-existing risk factors. We also sought to determine whether a greater proportion of females would be assigned to the high-risk cluster. **Methods**: Kinematic and kinetic data from 74 healthy athletes (31 males and 43 females) were obtained during a drop-jump task.

Variables of interest included 8 variables previously shown in prospective studies to be predictive of future ACL injury. K-means clustering (k=2) was used to determine the presence of high and low risk strategies. Statistical analysis included independent T-tests to assess between-cluster differences for each biomechanical variable of interest, and a chi-square test was utilized to explore the gender distribution across the clusters. **Results**: K-means clustering categorized athletes into 2 groups (Cluster 1: N=36; Cluster 2: N=38). T-tests revealed statistically significant differences in 7 of the 8 variables used in the clustering analysis. In general, participants assigned to Cluster 1, exhibited differences that would be considered "higher risk". The proportion of females assigned to Cluster 1 was 69.4% (N= 25), compared to 30.6% males (N=11). **Conclusion**: Our findings further support the drop-jump task as a tool used to identify individuals who may be at risk for ACL injury.

Poster #108

Title: The cerebellum compensates to promote visuomotor learning in Parkinson's Disease

Authors: Pooja C. Iyer and Beth E. Fisher

Faculty Advisor: Beth E. Fisher

Background: Despite basal ganglia (BG) dysfunction, several studies show intact motor learning in people with Parkinson's Disease (PwPD). Neuroimaging studies in PwPD performing motor tasks demonstrate increased cerebellar activity than older adults (OA), suggesting that cerebellar compensation alleviates BG dysfunction. However, the idea that cerebellar compensation enables motor learning in PwPD must be tested. Hence, using transcranial magnetic stimulation, we measured cerebellar activity, i.e., cerebellar inhibitory output (CBI) to the motor cortex (M1), in PwPD and OA while they learned a BG-driven reinforcement task. **Methods**: Reinforcement Task: 2 PwPD (63±2years) and 2 OA (63±2years) performed reaching movements using the index finger during baseline, 25° visual perturbation, and post-perturbation trials. Subjects learned the task only when the reach angles (RA; the angle between the target and the cursor) differed between the post-perturbation and baseline trials. CBI-measurement: Test Stimulus (TS) to first dorsal interossei representation in the motor cortex produced motor-evoked potential (MEP) of 1mV. Conditioning Stimulus (CS) to the ipsilateral cerebellum applied 5ms prior to TS produced MEPs <1mV. CBI ratio was indexed as the MEP amplitude achieved by (CS-TS)/(TS_{only}). CBI-ratio was calculated at baseline, early (start of performance-asymptote), and end of perturbation trials. **Results**: The RA differed between baseline and post-perturbation trials for OA by -10.67°±5.13°and PwPD by -70±4.130, demonstrating learning. CBI-ratio increased only in PwPD during early perturbation trials (0.89mV) compared to baseline (0.75mV) and the end of the perturbation trials (0.55mV). **Conclusion**: We showed that CBI changes in PwPD might contribute to successful learning, warranting further testing.

Poster #109

Title: Reliability of a short and semi-automatized Action Research Arm Test (ARAT)

Authors: Rukshana Poudel, Yan Wen, Emily R. Rosario, David Reinkensmeyer, Carolee Winstein, and Nicolas Schweighofer

Faculty Advisor: Nicolas Schweighofer

Background: The Action Research Arm Test (ARAT) is a reliable measure of post-stroke unilateral upper extremity (UE) capacity. However, its time demands limit practicality in clinical settings and large-scale research trials. A shorter version of ARAT, integrated into a self-administered home-based rehabilitation system with real-time sensor data, could swiftly and reliably assess post-stroke arm function. **Purpose**: We aimed to develop and validate proxy-ARAT (p-ARAT) based on a sensor-based rehabilitation tool, FitMi. FitMi consists of force and motion sensors and provides audiovisual feedback for UE tasks. It measures the repetition rate for each task. We also aimed to determine the test-retest reliability of p-ARAT. **Methods**: We developed p-ARAT referring to the shortened version of ARAT (ARAT-DT), using FitMi tasks in addition to a reaching task. Thirty chronic stroke participants were assessed on 5 items of p-ARAT for 15 seconds each with less affected UE followed by more affected UE. Familiarization with each task was provided beforehand. Re-testing of the more affected UE was done one hour later. **Results**: Normalized test-retest scores for each p-ARAT task showed strong consistency and reliability (ICC=0.933, $p<0.001$). Linear regression revealed a significant correlation between normalized p-ARAT scores and log-transformed ARAT scores (r^2 = 0.71, $p<0.001$). p-ARAT score predicted ARAT score significantly ($p<0.001$). **Conclusion**: The p-ARAT is a reliable and time-efficient tool for assessing UE function post-stroke. It is suitable for research, clinical settings, and home-based rehabilitation. Its integration into therapy sessions allows for regular monitoring of UE recovery.

Poster #110

Title: Movement time affects arm choice via delay discounting

Authors: Tanya Subash, Dongze Ye, and Nicolas Schweighofer

Faculty Advisor: Nicolas Schweighofer

Background: Reaching movements post-stroke with the more affected arm are variable, effortful, and slow. Our previous modeling and behavioral work (Schweighofer et al. 2015, Kim et al. 2022) showed that paretic arm choice is decreased by success rates, effort, and side of lesion. It has been proposed that the duration of movements as fast as saccades and arm movements acts as an implicit delay in the acquisition of reward (Shadmehr et al. 2010, Haith et al. 2012, Berret and Jean 2022). **Purpose**: We consider the possible effect of longer movement time in the paretic arm on choice. The arm choice model is based on competition between action values that combine a reward discounted term and an effort term estimated using inverse dynamics. Models with hyperbolic and exponential discounting of movement time are analyzed. **Methods**: To evaluate the effect of movement time on arm choice via discounting, we designed a computational and behavioral study where we manipulated the movement time of one arm by changing target size and distance (via Fitts law) and adding screen lag to the visible cursor. **Results**: Results with both synthetic and actual data from young participants, show 1) a strong effect of discounting on arm choice, and 2) that the estimated discounted factor varies greatly across participants. **Conclusion**: Our results may explain at least in part the commonly observed "non-use" phenomenon post-stroke, in which individuals can perform movements (albeit slower) but choose not to and compensate with the other arm.

Poster #111

Title: Neural Control of Muscles in Dexterity Tasks: Brain, Spinal cord

Authors: Majid Abbasi Sisara, Mohammad Hesam Azadjou, Lama Almofeez, and Francisco Valero-Cuevas

Faculty Advisor: Francisco Valero-Cuevas

Background: Experiencing a loss of control over the movement of both upper and

lower limbs is a prevalent occurrence in patients with conditions such as stroke, traumatic brain injury (TBI), and neurodegenerative disorders like Alzheimer's disease (AD) and Parkinson's disease (PD). **Purpose**: We explore the dysregulation of cortical and sub-cortical pathways throughout the neuroaxis as a contributing factor to motor dysfunction. We propose to measure the degree of collaboration and competition between higher-level circuits (slower cortical pathways) and lower-level circuits (faster sub-cortical pathways) across various levels of dexterity. **Methods**: We propose to use simultaneous EEG and surface EMG recordings from leg and hand muscles while participants engaged in leg and hand dexterity tasks, respectively. We will use time-frequency analysis to identify differences between-groups (patients and healthy controls) and within-groups (high and low dexterity). **Results**: None to date. **Impact**: Gaining insight into the involvement of cortical and sub-cortical communication in controlling muscles during dexterity tasks is a crucial step toward improved evaluation and therapy. Our findings will assist in employing suitable rehabilitation methods for addressing dysfunction across the neuroaxis.

Poster #112

Title: Aging influences the speed-accuracy tradeoff during precision walking

Authors: Isaiah J. Lachica and James M. Finley

Faculty Advisor: James M. Finley

Background: The speed-accuracy tradeoff states that faster movements lead to greater errors, and this has been demonstrated in various walking tasks. Aging appears to impact this tradeoff as older adults have larger decrements in speed than young adults with increasing accuracy requirements in upper extremity tasks. However, it's unclear if aging also affects this tradeoff in gait, which has additional demands, such as maintaining balance to prevent falls. **Purpose**: Investigate how aging impacts the speed-accuracy tradeoff during precision walking. **Methods**: Five young and three older adults completed a precision walking task on a treadmill, which required them to accurately match their step lengths with varying step length targets. They completed this task at several walking speeds while viewing a screen showing real-time feedback of their step lengths and the step length targets. We quantified accuracy by calculating the median absolute difference between actual step lengths and step length targets at each speed. **Results**: Errors increased with gait speed in young adults, consistent with the speed-accuracy tradeoff. One older adult showed similar results, while another had their errors decrease as gait speed increased. In contrast, the last older adult had the lowest errors at self-selected walking speed, which increased as their gait speed deviated from it. **Conclusion**: There may not be a consistent effect of age on the speed-accuracy tradeoff, possibly due to inter-individual differences in balance ability. Understanding this relationship in older adults is important as impairments in adapting gait to various demands like uneven terrain may increase fall risk.

Poster #113

Title: Flat-foot Contact is Associated with Excessive Knee Flexion in Swing

Authors: Maxfield Munk, Christopher M. Powers, and Beth E. Fisher

Faculty Advisor: Beth E. Fisher and Christopher M. Powers

Background: While swing phase abnormalities observed in chronic stroke patients are often attributed to motor dysfunction of the paretic lower limb, clinical evidence suggests that flat-foot contact with the non-paretic limb may halt forward progression and reduce swing phase motion of the paretic limb. **Purpose**: We used spatiotemporal data collected during walking in healthy subjects and chronic stroke survivors to characterize the relationship between non-paretic foot position at initial contact and paretic limb knee flexion during swing. We hypothesized that subjects who display flat-foot contact, as opposed to heel contact, at initial contact with the non-paretic limb will display lower degrees of knee flexion in the paretic limb during swing phase. **Methods**: We used previously collected motion capture data from 5 healthy controls and 5 chronic stroke survivors. Spatiotemporal data was collected at 100Hz while subjects walked on a treadmill. **Results**: Two stroke survivors displayed flat-foot initial contact of the paretic limb. They excessively flexed their non-paretic knee during swing phase (~70 degrees) compared to healthy speed matched controls (~55 degrees). **Conclusion**: Our hypothesis was not supported as no subjects made flat-foot initial contact with their non-paretic limb, perhaps because subjects were uncomfortable halting forward progression on the constantly moving treadmill surface. Interestingly, two subjects displayed flat-foot contact with their paretic limb and excessively flexed their non-paretic knee during swing. Increased knee flexion increases limb advancement and step length which may be a compensation for reduced forward progression due to flat-foot contact with the paretic leg.

Poster #114

Title: Validity of APSP scores conducted via telehealth in preterm infants.

Authors: Arya Salgaonkar, Becky Molinini, Claire Rhee, Ketaki Inamdar, Shaaron Brown, Jennifer Burnsed, Richard Stevenson, Amy Harper, Mary Shall, Karen D. Hendricks-Munoz, and Stacey Dusing

Faculty Advisor: Stacey Dusing

Background: The Assessment of Problem-Solving Skills in Play (APSP) is a play-based assessment of problem-solving, used to monitor progress in children with motor impairments. The COVID-19 pandemic required an adaptation to telehealth which was found to be feasible. **Purpose**: To complete a preliminary study of the validity of APSP scores administered via telehealth. **Methods**: A total of 18 preterm infants underwent APSP assessment via telehealth as a part of a large clinical trial. A trained assessor coached the parents during the APSP which was recorded via Zoom. Standardized toys: popups, cups, and gumballs were used. Families were instructed on camera positioning, supporting the child, and avoiding distractions during the 2-minute interaction between the child and each toy. Two regression equations were created each comparing time vs APSP total weighted score. The first included both in-person and telehealth APSP scores. The second regression equation only included telehealth and predicted telehealth scores. Differences in the R^2 values were compared visually for the group and individually. **Results**: Regression for all visits (tele+IP) is R^2=0.93 and for only in-person R^2= 0.94. Visual inspection suggests no difference. **Conclusion**: Based on this preliminary study it looks promising that APSP conducted via telehealth provides valid interpretable scores similar to APSP administered in person. Further studies are required to statistically prove the validity of APSP for remote assessment.

Poster #115

Title: Locomotor exploratory behaviors of infants born preterm

Authors: Nora Almoadi, Stacey Dusing, James Finley, L. Prosser, F. Choudhury, and Barbara Sargent

Faculty Advisor: Barbara Sargent

Background: Infants born preterm (PT) walk later than infants born full-term (FT). Locomotor exploratory behaviors that may contribute to the walking delay are unknown.

We hypothesized that using dynamic weight support (DWS) for pre-walking infants born PT may promote more exploratory locomotor behaviors. **Purpose**: For infants born PT and FT, compare differences in walking skills and path length with and without DWS and with adult motivation. **Methods**: Four infants born FT participated in 2 days of DWS. On both days, walking skills and path length were measured for 30 minutes during three 10 min conditions. Day 1: (a) independent exploration without DWS, (b) independent exploration with DWS, (c) independent exploration in DWS with adult motivation. Day 2: (a) independent exploration with DWS, (b) independent exploration in DWS with adult motivation, (c) independent exploration with DWS. **Results**: Three infants spent more time in specific tasks during spontaneous play in the DWS, compared to spontaneous play without it, and even more when motivated by adults (40% increase for infant 1, 60% increase for infant 2, 90% increase for infant 3). One infant's path length during play increased in the DWS with adult motivation, measuring 39 meters compared to 21 meters during spontaneous play. **Conclusion**: Infants born FT demonstrate more time in specific walking tasks and cover longer distances using DWS. The next step will involve assessing infants born PT and comparing their performance to infants born FT.

Poster #116

Title: Determining trade-offs between risk and effort during walking

Authors: Jackeline Tafur-Oviedo and James Finley

Faculty Advisor: James Finley

Background: Walking involves a decision-making process between at least two forms of cost: physical effort and risk of falling. We often prioritize minimizing physical effort. However, faced with the possibility of a fall, we may begin to prioritize balance. This trade-off between risk and effort can potentially determine people's gait behaviors and their risk of falling. We hypothesize that people are willing to expend more effort to reduce risk and that this trade-off differs between young and older adults. **Purpose**: To understand the trade-offs between risk and effort during walking based on decision-making. **Methods**: We varied physical effort by changing walking speed and introduced risk using split-belt treadmill forward perturbations (0.3 to 0.6 m/s). Participants walked for 5 minutes at 6 randomly assigned speeds, followed by 5 minute-trials at their comfortable walking speed while being randomly perturbed every 10 seconds. Metabolic expenditure and perceived effort were measured along both walking tasks. **Results**: Preliminary results show that metabolic rate increased with speed for young adults (n = 6, mean correlation coefficient: 0.98, sd: 0.0070) and older adults (n=3, mean correlation coefficient: 0.99, sd: 0.0023). Perceived effort also scaled with speed for young adults (mean correlation coefficient: 0.97, sd: 0.0077) and older adults (n=1, mean correlation coefficient: 0.98). Although perturbed walking had a higher metabolic rate than unperturbed walking, changes in metabolic rate and perceived effort between the perturbation magnitudes were small. **Conclusion**: Walking in a perturbing environment led to small increases in effort.

Poster #117

Title: Reliability assessment of medial elbow stiffness: an anatomic study

Authors: Jerick K.M. Nomura, KeyShawn L. Carter, Antonio Squillante, Bennett Tabaracci, Sebastian Klich, E. Todd Schroeder, Lori A. Michener, and Jonathan C. Sum

Faculty Advisor: Jonathan C. Sum

Background: The ulnar collateral ligament (UCL) is commonly injured in baseball pitchers due to high valgus stress imparted to the medial elbow joint during pitching. Medial elbow musculature provides support to resist valgus stress. Muscular stiffness of the medial elbow may be adaptive and can impact UCL health in pitchers. Tissue stiffness can be measured via myotonometer such as the MyotonPRO. No study to date has assessed medial elbow muscle stiffness using myotonometry. **Purpose**: The purpose of this study is to determine the intertester and intratester reliability of measurement of muscle stiffness (MS) of the medial elbow using myotonometry. **Methods**: Participants (n=40) are healthy asymptomatic subjects between 18-40 years old with no previous self-reported history of injury to shoulder or elbow from throwing. A consistent topographical location at the medial elbow will be marked. A 5 lb valgus load will be applied while medial elbow MS will be measured using the MyotonPRO, per protocol. MS measurement will be measured on the same limb at a consistent topographical location on the dorsal forearm for additional reference reliability, per protocol. Each measurement will be taken three times by three different testers at the same testing session. **Results**: Intratester and intertester reliability will be determined via intraclass correlation coefficients and 95% CI and Bland-Altman plots. This is a study protocol; no data has been collected. **Conclusion**: Reliability of myotonometry of the medial elbow can validate subjective and objective assessment of MS in throwing athletes and inform clinicians about efficacy of interventions targeting medial elbow stiffness.

OCCUPATIONAL SCIENCE & OCCUPATIONAL THERAPY - DOCTORAL STUDENTS & POST-DOCTORAL SCHOLARS

Poster #118

Title: Test-Retest Reliability of the Sensory Experiences Questionnaire Version 3.0

Authors: Yu (Tony) Tang, Elizabeth Nye, Stephanie Magana, Julia Lisle, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Parent-report measures provide valuable insight into daily sensory experiences and foster a family-centered approach to care. Test-retest reliability assesses the consistency and stability of measurements over time. Strong reliability in parent-report measures ensures practitioners have confidence in the accuracy of results. **Purpose**: The Sensory Experiences Questionnaire Version 3.0 (SEQv.3.0) is a 105-item measure used to evaluate sensory features in daily occupations for children ages 2-12 years. This measure assesses four Sensory Response Patterns (Hyperresponsiveness, Hyporesponsiveness, Sensory Interests Repetitions and Seeking Behavior, and Enhanced Perception), six Sensory Modalities (Tactile, Auditory, Visual, Gustatory, Movement, Multisensory), and two Sensory Contexts (Social and Nonsocial). The current study aims to test the reliability of the SEQv.3.0. **Methods**: This psychometric study used online questionnaires completed by caregivers with a child between 2-12 years of age in the United States. A total of 33 caregivers were recruited through social media and completed the SEQv3.0 twice within an average of 11 days. Twins and responses filled out by different caregivers were excluded. The Intraclass Correlation Coefficients (ICC) were calculated based on a single-measurement, absolute-agreement, 2-way mixed-effects model. **Results**: Total Score (0.90) and Sensory Contexts (Social=0.91, Nonsocial=0.90) demonstrate excellent test-retest reliability. Sensory Response Patterns ranging from 0.84 to 0.93 indicate good to excellent reliability. Sensory Modalities

ranging from 0.73 to 0.89 reveal moderate to good reliability. **Conclusion**: The excellent test-rest reliability of the SEQv.3.0 supports its ability to stably capture children's sensory features. Clinicians and researchers can be confident that their SEQv3.0 scores are reliable to inform practice.

Poster #119

Title: Conceptualization of a Healthy Lifestyle in Chinese Social Media: Expanding a Culturally Sensitive Lifestyle Redesign® Practice in Type 2 Diabetes

Authors: Yujia Mo, Zhixin Liu, and Elizabeth Pyatak

Faculty Advisor: Elizabeth Pyatak

Background: Type 2 Diabetes (T2D) is a common metabolic chronic condition in Chinese and can be effectively intervened by lifestyle interventions. Lifestyle Redesign® - Occupational Therapy (LR®-OT) is a practical approach for self-management in chronic conditions shedding light on its potential for T2D. Given the culture-loaded nature of lifestyle and an acculturation trend happening globally, social media takes an emerging role in capturing everyday lifestyles in T2D. **Purpose**: 1) To understand the folk-perceived healthy lifestyle in Chinese social media. 2) To compare the distinction between the perceived lifestyle in social media and the scientific evidence. 3) To investigate the expansion of LR®-OT content area. **Methods**: The social media data are collected from three commonly used platforms (all need registered accounts of users) among older Chinese adults from 2023. 11-12, including WeChat, Weibo, and TikTok (Douyin), with search terms 'Type 2 Diabetes' and 'lifestyle' in Chinese. Thematic analysis is applied to generate themes. **Results**: 25 posts are collected from each of the three platforms. Chinese social media users interpret healthy lifestyles of T2D as diet, exercise, sleep hygiene, and optimal control of glucose levels. The specific approach to achieving self-management in T2D includes individuals' active/positive attitudes, family involvement, and professional support. **Conclusion**: The outcome reveals the nuance between academically defined lifestyle and folk-perceived healthy lifestyle in Chinese T2D and the necessity to apply deep-level cultural adaptation to existing lifestyle interventions. Culturally sensitive practices are yet to be implemented in both lifestyle intervention and future research.

Poster #120

Title: Autistic Adults' Experiences with Primary Healthcare Encounters

Authors: Lily Shkhyan, Willa Giffin, and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Primary care, designed to manage health concerns, contribute to preventive care, and provide medical care coordination, may be especially vital for autistic individuals who disproportionately experience psychiatric and physical health conditions. However, autistic adults often face barriers to receiving primary care, and first-hand accountings of these challenges are limited. **Purpose**: To describe barriers and facilitators to primary care encounters as reported by autistic adults. **Methods**: Interviews were conducted with 34 autistic adults in Los Angeles and Philadelphia, lasted an average of 26 minutes, were transcribed verbatim, and analyzed using thematic analysis. This dataset is part of a larger study that interviewed autistic adults, caregivers, and primary care providers (PCPs). **Results**: Participants were primarily White (71%) and non-Hispanic (82%), with a mean age of 32 years. Five overarching themes emerged from the interviews, including: (1) *Access*, describing challenges with continuity of care and finding a provider; (2) *Inclusion of Support Individuals*, examining the impact of caregivers on healthcare visits and decision-making dynamics; (3) *Office Environment*, exploring the physical, sensory, and social aspects of healthcare encounters; (4) *PCP Attributes*, illustrating the positive and negative characteristics of providers; and (5) *Strategies*, including insights into an idealized healthcare visit and strategies suggested by autistic adults. **Conclusion**: Findings provide a nuanced understanding of the primary care experiences of autistic adults, highlighting barriers and facilitators to these healthcare encounters. This offers valuable insights to developing interventions to improve the accessibility and quality of care for autistic individuals, filling a crucial gap in the existing literature.

Poster #121

Title: Armenian Identity, Trauma, and Mental Health Stigma: Theoretical Insights

Authors: Lily Shkhyan and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Challenges accessing and utilizing mental health services are common in a variety of cultures. Specific to the American-Armenian community, the widespread stigma associated with mental illness and the effects of generational trauma feed a cycle of suffering and silence that further complicates mental health seeking behavior. However, there is a lack of research on the complex relationship between intergenerational trauma, mental health stigma, and the Armenian identity in the American-Armenian community. **Purpose**: Occupational science can provide insight into this relationship, allowing an examination of the impact of collective trauma on occupational identity. **Methods**: Drawing from personal experience and a comprehensive review of Armenian history, culture, and values, the pervasive stigma surrounding mental health in the Armenian community is investigated. Three pillars of the Armenian culture were identified, including family expectations, faith-based perspectives, and the preservation of culture; these pillars also serve as the primary source of mental health-related stigma within the community. **Results**: Taking into consideration the impact of historical narratives and cultural dynamics, possible strategies to destigmatize mental health in the Armenian community include fostering open-mindedness within families, challenging faith-based misconceptions, cultivating culturally sensitive therapy, and incorporating occupation-based interventions. **Conclusion**: The occupational science lens highlights a critical role that culturally appropriate occupations play in the well-being of the American-Armenian community and provides insights into the relationship between meaning and experiences with mental health. This perspective allows for a nuanced understanding of the impact of stigma and generational trauma on individuals' daily activities, relationships, and overall quality of life.

Poster #122

Title: Behavioral Health Items in LTSS Level-Of-Care Assessments Nationwide

Authors: Janice Seol, Heldevam Pereira, and Joy Agner

Faculty Advisor: Joy Agner

Background: Medicaid-funded long-term services and supports (LTSS) have provided crucial assistance for low-income adults with disabilities for over 50 years. LTSS is provided in home and community-based or institutional settings and includes services like caregiving support, medical equipment, medical transportation, and occupational therapy, which can result in improved quality of life and health outcomes. However, people with mental illness experience decreased access to LTSS. This may be due to the exclusion of functional limitations related to mental illness in level-of-care (LOC) assessments, which determine eligibility for LTSS as well

as authorization of particular services. **Purpose**: This study examines the inclusion of functional limitations associated with mental health conditions in LOC assessments nationwide. **Methods**: We performed a content analysis of LTSS LOC forms nationwide to determine how state Medicaid programs assessed functional limitations related to behavioral health. We included all states that offered LTSS with publicly available LOC forms (n=25). We extracted items related to behavioral health, parsed and grouped them thematically to identify content areas, scoring strategies, and clinical implications. **Results**: Most states had a very limited number of items related to behavioral health compared to physical or cognitive limitations. There was no consistent approach to defining functional limitations related to behavioral health and overall, scoring strategy varied widely. **Conclusion**: Incoherent strategy to address functional limitations related to behavioral health limitations may impede access to LTSS for older adults with mental health conditions, thereby increasing their risk of rapid functional decline and poor health.

Poster #123

Title: The Validity of Sensory Exposure Quantification Methods in the NICU

Authors: Yang Li and Roberta Pineda

Faculty Advisor: Roberta Pineda

Background: There is an increasing focus on the sensory environment in the NICU. To quantify and benchmark early sensory exposures in the NICU, accurate methods of documenting sensory exposures are needed. **Purpose**: This study aimed to assess different methods for quantifying sensory exposures preterm infants receive each day of NICU hospitalization. **Methods**: To assess 2 different methods of quantifying sensory exposures in the NICU (24-hour video recording coding and parent/health professional documentation), data was used from 10 preterm infants born ≤ 32 weeks who were enrolled within the first week of life. The type and amount of daily sensory exposures (such as kangaroo care, holding, being read to, and playing music) were identified by doing a 24-hour daily videorecording and by having healthcare professionals and parents document sensory activities they did with the infant each day. The recordings were coded to quantify sensory exposures, and data from the logging sheets were combined to quantify sensory exposures. T-tests will be used to investigate differences in auditory and tactile exposures across the two different methods. **Results**: 10 infants have been enrolled and have had data captured. Data analysis will be completed by the time of the conference. **Conclusion**: Understanding valid methods to quantify the daily sensory exposures of infants in the NICU will improve accurate and cost-effective data capture for future research endeavors.

Poster #124

Title: Multiple masks: A theoretical overview of autistic intersectional performativity

Authors: Elinor E. Taylor, Dani Florindez, Jessica Rios, and Amber M. Angell

Faculty Advisor: Amber M. Angell

Background: *Performativity* refers to how social categories (e.g., gender) are performed through 'doings' such as dressing, speaking, and behaving. Autistic masking encompasses the conscious and implicit ways that autistic people perform as non-autistic. In addition to masking, autistic self-advocates report engaging in other forms of performativity. These include: enacting masculinity or femininity; 'passing' as a different sexual orientation; and 'code-switching' as other races/ethnicities. Autistic people often engage in intersectional performativity for safety, yet risk health consequences from its demands. **Purpose**: We will provide a theoretical overview of autistic intersectional performativity and insights from autistic lived expertise on how masking intersects with gender, sexual orientation, and racial/ethnic performativity. We intend to spark discussion on how researchers and clinicians may address autistic intersectional performativity to promote greater equity for underserved autism populations. **Methods/Results**: We will argue that overlapping oppression forces many autistic people to engage in intersectional performativity for survival. Further, we will outline the potential repercussions these 'multiple masks' may have on autistic people's health and well-being. We will draw from autistic self-advocate quotes/narratives to support our analyses. Finally, we will note the potential implications of these topics for future occupational science and healthcare research. **Conclusion**: Autistic self-advocates describe engaging in intersectional performativity for survival, with consequences for their health and well-being. We will contend this engagement is driven by overlapping oppression, which healthcare professionals can mitigate through addressing the systemic drivers (e.g., ableism, sexism, and racism) of autistic intersectional performativity.

Poster #125

Title: Chinese Little Developmental Coordination Disorder Questionnaire: Psychometric Properties and Application

Authors: Wenlei Wu and Sharon A. Cermak

Faculty Advisor: Sharon A. Cermak

Background: Developmental coordination disorder (DCD) is characterized by motor skill challenges, limiting physical and social participation at home, school, and in the community. Globally, DCD prevalence in children aged 5 to 11 is 5% - 6%, with a higher rate of 8.3% in China. **Purpose**: This study examines research on the psychometric properties of the Little Developmental Coordination Disorder Questionnaire-Chinese version (LDCDQ-C) and Taiwanese version (LDCDQ-TW) and current studies that utilize LDCDQ in China. **Methods**: Searching literature on PubMed and CNKI, using 'LDCDQ', 'China', and 'Chinese' as keywords. **Results**: Six articles were identified. The LDCDQ-C and LDCDQ-TW were translated into Mandarin Chinese. The LDCDQ-C has good high internal consistency (Cronbach's alpha coefficients of all items were > 0.9), good split-half reliability (Guttman coefficient = 0.934), and reasonable validity. It was used as a screening tool to identify suspected DCD to explore the impact of different gestational ages, excessive screen exposure (ESE), prenatal second-hand smoke (SHS) exposure, and prenatal and early childhood exposure to $PM_{2.5}$ (an air pollutant) on preschool children in China. The LDCDQ-TW has good internal consistency (IC = 0.95), excellent test-retest reliability (ICC = 0.97), poor interrater (teacher/parent) reliability (ICC = 0.47), sensitivity = 0.96, specificity = 0.68. Both versions defined total scores ≤ 15th percentile as suspected DCD. **Conclusion**: The LDCDQ is effective in the early identification of suspected DCD children in China.

Poster #126

Title: 'Early Signs' of Autism Among Diverse Families of Autistic Girls

Authors: Marshae D. Franklin, Daniella C. Florindez, Jennifer Lopez, Elinor Taylor, Melanie Guzman, Tavia L. Lawson, Jessica Rios, and Amber M. Angell

Faculty Advisor: Amber M. Angell

Background: Girls have been identified as an under-studied autism sub-group. However, little is known about how families of racially/ethnically diverse autistic girls recognize, interpret, and respond to early autism signs. **Purpose**: This qualitative study addresses

this gap by exploring the early signs of autism as narrated by diverse families of autistic girls. **Methods**: We recruited 21 diverse families of 18 girls (one with twin girls) aged 3 to 11 from a Los Angeles area Regional Center. Our sample identified as Latine (67%), multiracial identity (28%), and Asian (5%). We conducted semi-narrative interviews between September 2021 and April 2022 (10 in Spanish, 8 in English) and thematically analyzed the data to identify overarching themes related to early signs. At least two team members (diverse in race, ethnicity, and neurotype) coded each transcript in NVivo. **Results**: Our eight themes included: 1) Delayed language; 2) not responding to name; 3) 'fussy babies;' 4) early readers; 5) sleep challenges; 6) gastrointestinal and feeding challenges; 7) 'stim' behaviors (both common and less common); and 8) a need for sameness. We also identified various ways that families interpreted and responded to these signs vis-à-vis family culture and gender expectations and how healthcare providers responded, e.g., 'let's wait and see' or assuring parents of typical child development. **Conclusion**: These descriptive findings illuminate the nuanced ways that diverse families of autistic girls experienced, interpreted, and responded to the early signs of autism, providing a useful starting point for clinicians to consider regarding autism identification and diagnosis.

Poster #127

Title: Autistic Individuals' Experience of the Primary Care Environment: Scoping Review

Authors: Willa Giffin and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Autistic individuals frequently face barriers accessing primary care, which may be related to environmental factors– the physical, social, attitudinal, and political environments in which people live and conduct their lives– as described by the International Classification of Functioning, Disability, and Health (ICF). **Purpose**: To examine environmentally-related barriers and facilitators to primary healthcare encounters for autistic individuals, as categorized by ICF factors. **Methods**: Following PRISMA guidelines, 16 databases were systematically searched for peer-reviewed articles examining autism and primary care in Western cultures (excluding autism diagnosis) published 2012-2022. **Results**: Included articles (n=163) portrayed barriers and facilitators to care, organized by the ICF environmental categories. *Products/Technology* described communication difficulties and tools to aid communication during care. *Natural Environment* examined sensory-based challenges and potential mitigating strategies. *Support/Relationships* depicted hardships with general support, utilizing supporters during healthcare encounters, and care coordination; facilitators emphasized building supportive relationships, both for autistic patients and caregivers. *Attitudes* illustrated the perceived impact of stigma on healthcare encounters, with no attitude-based interventions identified. *Health Services, Systems, and Policies* examined the contribution of policies on limited visit times and prolonged wait periods; solutions suggested policy-level changes to increase reimbursement. *Education and Training Services, Systems and Policies* described the lack of provider's autism-specific knowledge, highlighting the importance of additional training and education. **Conclusion**: This review consolidates information on environmentally-related challenges and best practices for treating autistic patients in a primary care setting, which can aid in the development or modification of interventions that are tailored to the individual needs of this population.

Poster #128

Title: Infant-Parent Physiological Synchrony and Associations with Parent Responsiveness in Infants

Authors: Savannah Gluck, Julia Lisle, Sapir Soker-Elimaliah, John Sideris, Linda R. Watson, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Increased sensory reactivity and decreased cardiac activity are associated with elevated likelihood of autism (ELA). Respiratory sinus arrhythmia (RSA) indicates how active the parasympathetic nervous system is. Infant-parent synchrony can be measured to indicate the extent that the dyad responds to their environment. Parents responsiveness (PR) to infants cues is lower in ELA infants; however, synchrony has not been studied in relation to PR. **Purpose**: To examine the extent to which infant-parent synchrony predicts PR in infants at varying likelihood of autism. **Methods**: Participants were infant-parent dyads (n=30) at variable likelihood of autism ages 11-16 months. RSA data were collected during a five-minute play activity. Videos were rated (1-7) for PR to sensory reactivity. Hierarchical models were run with PR as the dependent variable; independent variables were synchrony, First Years Inventory (FYI) v.3.b scores, infant sex, and age. Synchrony was the difference between parent and infant RSA across time. **Results**: Infant-parent synchrony (greater synchrony) significantly predicted higher PR to sensory reactivity (B = -0.14, p = <.01); the FYI (B = 0.03, p = 0.02) had a weak but significant association with parent responsiveness, after controlling for age (B = 0.14, p = .05), and sex (B = 0.61, p = <.01). **Conclusion**: This is the first study to demonstrate that infant-parent synchrony may be more vulnerable to dysregulation over time in ELA versus LLA dyads and establish the association between PR and synchrony. This study highlights the complex relationship between infant-parent physiologies and has implications for early intervention.

Poster #129

Title: Scoping review of visualization strategies for longitudinal individual patient data

Authors: Eunhye Cho, Archie Patel, Correon Potts, and Alison M. Cogan

Faculty Advisor: Alison M. Cogan

Background: Data visualization is the graphical representation of information and data. In healthcare, there are opportunities to use data visualization strategies to make patient data more accessible and understandable for both clinicians and patients, enabling shared decision-making and better patient-client communication. In particular, visualization of longitudinal patient data can help to track progress and fluctuation over time. **Purpose**: The purpose of this scoping review is to synthesize evidence about visualization approaches for longitudinal health data. **Methods**: We searched six databases (PubMed, Web of Science, CINAHL Complete, Scopus, Embase, and Social Sciences in ProQuest) for literature published between January 1, 2018, and September 7, 2023. We included English-language articles that developed or evaluated data visualization tools for longitudinal data. Out of 877 articles generated from our search strategy, 12 met all inclusion criteria. **Results**: In 10 of 12 studies, design of data visualization included clinicians, patients, or both. The goals of visualization encompassed enhancing physician-patient communication, facilitating shared decision-making, and improving physician work performance. Common visualization strategies included line graphs, especially for longitudinal data, and bar charts. Colored bands and lines were incorporated to indicate desirable ranges for values on a given measure. Users reported that visualization enhanced patients' understanding of their condition and improved

physician-patient interactions. **Conclusion**: Although many health systems use data visualization, there are limited reports of development processes. Inclusion of end-users in design of data visualization is a commonly used approach. More research is needed to identify best practices for design and implementation of data visualization.

Poster #130

Title: Sonographers' Safety: Occupational Therapy Insights on Equipment and Work Environment Impact

Authors: Tanmay R. Khese, Ryan J. Walsh, Kevin D. Evans, Carolyn M. Sommerich, and Shawn C. Roll

Faculty Advisor: Shawn C. Roll

Background: Sonographers experience a high prevalence of work-related injuries, resulting from suboptimal interactions among worker, tasks, and work environment factors. Better understanding of these interactions from an occupational therapy lens may enable approaches to optimizing fit among worker, environment, and tasks for worker health and well-being. **Purpose**: We explored how sonographers prioritize and perceive improvements to worker, task, and work environment factors to optimize sonographer health in workplaces. **Methods**: We employed a multi-method convergent approach with quantitative and qualitative data to investigate perspectives on worker, task, and work environment factors impacting their health and well-being. Sonographers completed an online survey with structured quantitative rating questions and open-ended qualitative questions about experiences with equipment use and workplace layout. We ranked equipment use and workplace layout priorities and examined differences among specialty areas and those with and without musculoskeletal conditions. Qualitative analyses elaborated on priorities. **Results**: 1,314 sonographers participated. Equipment design and workspace layout were most often prioritized, with 32.9% wanting exam room furniture and layout changes. Factors related to room conditions and computer workstation set-ups were less important. Only 5.3% prioritized workstation improvements. Sonographers in obstetrics/gynecology and with elbow/forearm issues were more likely to prioritize transducer redesign. Participants desired involvement in resource allocation decisions, adjustable equipment, and less cluttered workspaces. **Conclusion**: This study suggests priorities in addressing equipment design, workspace layout, and decision-making processes for improving worker, task, and work environment factors. Occupational therapy may play a role in applying human-centered design and worker-informed solutions to act on these priorities and optimize sonographer well-being.

Poster #131

Title: Predicting infant sensory-regulatory functioning from prematurity

Authors: Claire Needham, Julia Lisle, Elizabeth Choi, John Sideris, Allison Q. Phillips, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Severity of prematurity and birthweight are associated with elevated autism likelihood in preterm infants. Preterm infants are also at a higher risk for atypical sensory processing. With growing support for early autism screening in high-risk populations, it is critical to understand how prematurity may impact performance on sensory domains of autism screeners. **Purpose**: To investigate whether severity of prematurity predicts higher risk in sensory regulatory functioning of preterm infants on an autism screener. **Method**: Seventeen preterm infants between 11-16 months adjusted age were recruited from a high-risk follow-up clinic. Parents completed the FYIv3.1, an early autism screening tool. The sensory-regulatory (SR) risk score was calculated, adjusted for gestational age. A linear regression model was performed with SR as the outcome as predicted by severity of prematurity and birthweight. **Results**: The regression model included severity of prematurity ($B = 0.7$, $p = 0.08$) and birthweight ($B = -0.5$, $p = 0.2$) showing some overlap between birthweight and severity of prematurity in their associations with SR (Model $R^2 = 0.2$). **Conclusion**: These findings support the literature suggesting that children who are more premature are at risk for sensory processing difficulties. Further research is needed to better understand how severity of prematurity is utilized and incorporated in autism screenings of preterm infants.

Poster #132

Title: Associations between parent-reported and observational autism risk measures in infants

Authors: Elizabeth Nye, Julia Lisle, Allison Phillips, John Sideris, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Effective early screening for autism plays a critical role in providing access to services which promote foundational skills important for a child's development. Implementing a screening approach using both parent-report measures and observational measures may enhance accurate identification of infants at risk for autism. **Purpose**: To determine the extent to which parent-report and play-based observational measures of autism risk are associated in infancy. **Methods**: A community sample of 30 infants and their parents were recruited to complete the First Years Inventory version 3.1 (FYI), a parent-report screener, and the BioBehavioral Assessment (BB), an observational play-based assessment to identify autism risk status. Infants were between 11-13 months at the time of assessment. Correlations were run between the seven FYI factors and BB total scores, controlling for age. **Results**: BB total scores were positively associated with the following FYI factors: sensory hyperresponsiveness ($r=.428$, $p=.021$), sensory hyporesponsiveness ($r=.384$, $p=.040$), self-regulation in daily routines ($r=.227$, $p=.236$), and sensory interests, repetitions, and seeking behaviors ($r=.547$, $p=.002$). BB total scores were negatively correlated with the following FYI factors: communication, imitation and play ($r=-.534$, $p=.003$), social attention and affective engagement ($r=-.648$, $p<.001$), and motor coordination and milestones ($r=-.385$, $p=.039$). **Conclusion**: Positive correlations between FYI sensory-based factors and the BB suggests moderate convergent validity between parent-reported sensory features and the impact of sensory functioning on participation in this novel play-based assessment. Conversely, negative correlations between communication and developmental factors on the FYI and BB total scores were surprising and suggests the need to further analyze the subscales.

Poster #133

Title: Impact of Disgusting Odor on Moral Decisions in Autistic Youth

Authors: Aditya Jayashankar, Sofronia Ringold, Nandita Raman, Shruti Kamath, Riley McGuire, and Lisa Aziz-Zadeh

Faculty Advisor: Lisa Aziz-Zadeh

Background: Exposure to disgusting odors shapes moral evaluations, particularly in individuals with heightened interoceptive awareness. Here, we aimed to understand if similar patterns would be found in autism. This is particularly relevant, given that autistic individuals are more likely to give harsher moral evaluations and attribute blame in accidental situations than non-autistic peers. **Purpose**: To investigate how disgust processing impacts moral decisions in autistic children.

Methods: Participants (17 TD; 13 ASD; aged 8-17) completed a behavioral task involving moral decision-making using vignettes, either in a room with a disgusting smell or a neutral smelling room. In a separate neutral environment, participants completed: Disgust Propensity and Sensitivity Scale (DPSS-R), Sensory Experiences Questionnaire (SEQ), Alexithymia Questionnaire for Children (AQC), Autism Spectrum Quotient (AQ), and a heartbeat counting task. Statistical analysis included Spearman's correlation and mixed-effects ANCOVA. **Results**: In the autism group, odor priming influenced wrongness ratings, with moral/purity violations rated highest when in the disgust smelling room. Additionally, ASD>TD significant differences were found for disgust propensity, SEQ, AQ, and AQC scores. Disgust propensity was higher in ASD, correlating with SEQ, AQ, and AQC. Wrongness and punishment ratings correlated with disgust propensity across conditions, especially for moral and purity violations. **Conclusion**: In autistic individuals with high disgust propensity, feelings of physical disgust influenced harsher moral evaluations. This data highlights the complex interplay of sensori-emotional factors in moral decision-making in autism. Limitations include small sample sizes and low number of females, warranting further research to better understand the relationships in diverse populations.

Poster #134

Title: The feasibility of an active seating system among older adults

Authors: Jiehong Shi, Chelsea Ramirez, Matthew Niemiec, and Stacey L. Schepens Niemiec

Faculty Advisor: Stacey L. Schepens Niemiec

Background: Seated occupations are common in older adults, which can contribute to general sedentariness. *Activ Sitting*, Inc. developed a treadle-based seating system–*FitSitt*–to intervene on older adults' immobile sitting. **Purpose**: Examine the feasibility and acceptability of *FitSitt* among older adults. **Methods**: 39 older adults ($\bar{x}$ age=72 years; 16 male; 18 non-white) self-reported their daily sitting time (categorical hr/day), and confidence to exercise on the Self-efficacy for Exercise scale (score range 0-90). They trialed *FitSitt* either in lab or in home for up to 72 hours. Users' initial impressions of *FitSitt* were captured with a 15-item (0=*strongly disagree*; 4=*strongly agree*) study-specific questionnaire. Daily sitting time was dichotomized for analysis: high sitters (HS; >4 hours/day, n=25) vs. low sitters (LS; ≤4 hours/day, n=14). **Results**: Users had generally medium-to-high exercise self-efficacy ($\bar{x}$=60.5±20.4) and neutral impressions of *FitSitt* ($\bar{x}$=2.4±0.8). There was no significant difference between HS's and LS's exercise self-efficacy (p=0.798) or initial impressions of *FitSitt* (p=0.437). Although no significant correlation between user impressions and exercise self-efficacy was detected (r=0.252; p=0.122), *FitSitt* impressions were significantly correlated with daily minutes users envisioned themselves pedaling on *FitSitt* (r=0.454, p=0.004). **Conclusion**: Regardless of daily sitting time, results suggest that *FitSitt* is somewhat feasible and acceptable as a sedentary time disrupter. More development is necessary to increase the likelihood that older adults will opt to interrupt immobile sitting using *FitSitt*.

Poster #135

Title: Representation Matters: Understanding Ultrasound Users' Ability to Inform Workplace Well-Being

Authors: Madeline R. Parga, Kevin D. Evans, Carolyn M. Sommerich, A. Nicole Stigall-Weikle, and Shawn C. Roll

Faculty Advisor: Shawn C. Roll

Background: Work-related injuries are estimated to impact over 90% of ultrasound users. In response, the WRMSD Grand Challenge longitudinal registry was launched to sample sonographers for potential solutions. A survey distributed to the registry in 2021 resulted in findings heavily focused on workers' pandemic experiences, with our analysis highlighting the constraints of the healthcare work system. This inspired further investigation into the systemic and organizational factors influencing ultrasound users' workplace wellness. **Purpose**: To examine how sonographers ideate workplace injury prevention at various levels of influence. **Methods**: In June 2022, we distributed a survey to 3,659 sonographers and received 1,276 responses. We conducted an inductive thematic analysis in which we analyzed open-ended responses to the question, "Please share any ideas or potential solutions that you think might address or improve ultrasound user health and well-being" posed with regards to the organizational work environment, training, and general health factors. **Results**: We generated five themes to characterize respondents' solutions for broadly addressing their health and well-being. We found that these five themes aligned with Neville Moray's systems model of ergonomics, which we adapted to form a model for understanding the supports implicated in sonographer responses. This conceptual model served as a tool to consider systemic influence more generally by visualizing our five solution themes within respective administrative levels of influence. **Conclusion**: We observed a top-down effect between sonographer solutions at different administrative levels. This hierarchy of solutions enabled us to arrive at the overarching conclusion that risk reduction relies on proper employee representation.

Poster #136

Title: Comparison of Techniques when Analyzing Electrodermal Activity

Authors: Elizabeth B. Israelowitz, Sharon A. Cermak, and Leah I. Stein Duker

Faculty Advisor: Sharon A. Cermak

Background: Electrodermal activity (EDA) is a psychophysiological measure of sympathetic arousal. However, traditional EDA data analysis is rigorous and time-intensive. **Purpose**: To compare traditional EDA analysis versus analysis in a programming platform (MATLAB). **Methods**: Baseline EDA data from a pilot study collected from autistic (n=21) and neurotypical (n=21) children (age=6-12yrs) using the BIOPAC MP150 system was analyzed. Traditional scoring used the AcqKnowledge software, followed by hand-checking to determine skin conductance level (SCL) and skin conductance responses (SCRs). A training dataset from the original data was utilized to develop the MATLAB custom guided user interface (GUI) and script for data analysis. **Results**: Conversion of data to MATLAB files required testing multiple scripts, and success depended on the AcqKnowledge hardware and software version. Flagged locations in the original data were not transferable to MATLAB, requiring additional adjustments and reliability checks for wave segments. Despite these challenges, average agreement between traditional and MATLAB results was >95%. **Conclusion**: MATLAB provides a reliable and time-efficient EDA analysis method. However, researchers must be aware that data flags may not transfer, leading to noticeable differences in study results, particularly for segments with atypical duration. Therefore, careful planning, data preprocessing (e.g., clipping), training, and documentation should be employed throughout data collection and processing. MATLAB code can be developed for larger data sets, allowing a more efficient experience; however, for those with limited coding experience, MATLAB programs can be challenging to develop and apply. Overall, script development required coding knowledge but was less time and personnel-intensive than traditional analyses.

Poster #137

Title: Therapy practice under value-based Medicare reimbursement models: a scoping review

Authors: Caitlin G. Dobson and Alison M. Cogan

Faculty Advisor: Alison M. Cogan

Background: In 2019, Medicare reimbursement for post-acute care (home health (HH) and skilled nursing facilities (SNFs)) transitioned from volume-based to value-based payments. Volume-based models prioritized total therapy time, thus incentivizing higher utilization, whereas value-based models aim to reduce unnecessary services. It is unclear whether this payment structure impacts therapy provision, staffing, and patient outcomes. **Purpose**: To identify how Medicare reimbursement changes affected therapists and patients in HH and SNFs. **Methods**: Scoping review of peer-reviewed literature and poster presentations in Web of Science and PubMed from 2019 through January 12, 2024 using the models as search terms ("patient driven groupings model" OR "patient driven payment model"). Eligible studies collected data on how the models affected therapy provision, staffing, or patient outcomes. **Results**: Ten studies met the inclusion criteria. All reported either decreased therapy staffing or time provided to patients following value-based model implementation. SNF patient outcomes were unchanged. HH therapists perceived patients as receiving insufficient or lower quality therapy (n=2), with therapists in one study reporting lower functional levels at discharge. Studies showing low levels of reduced pay and benefits (n=2), higher productivity expectations of therapists (n=1), and conflicting reports on employers determining therapy frequency (n=2). **Conclusion**: Value-based reimbursement decreased therapy time in SNF and HH. It is unclear whether all patients are still receiving necessary therapies or if unnecessary services are reduced. Further analysis is needed to determine how healthcare organizations' responses to value-based reimbursement affect setting-specific therapist perspectives, quality measures, and patient outcomes.

Poster #138

Title: Socio-spatial methods primed for application in occupational science

Authors: Heldevam Pereira Campos, Adriana Botero, Haley Churchill, Maileen Liu, Tyra Kaukau, Lisa Nakamura, and Joy Agner

Faculty Advisor: Joy Agner

Background: Foundational perspectives, theories, and models in occupational science, such as the person-environment-occupation model and transactionalism, recognize the pivotal role that place plays in relation to occupation. However, methods and measures to analyze occupational engagement often overlook spatial patterns and social connectedness, or exclusively assess them qualitatively. This methodological gap limits our ability to assess the impact of environmental features on human occupation. **Purpose**: To identify methods that effectively capture and interlink physical environments, engagement, and social connection. **Methods**: We conducted a scoping review of socio-spatial methods, which include spatial data, social connection, and engagement. We analyze them using the following criteria: 1) individual or collective, 2) socially interactive, 3) place-based, and 4) perception or behavior. Additionally, we examine strengths, limitations, and potential application in occupational science. **Results**: We found 11 unique socio-spatial methods from various settings primed for application in occupational science, and related disciplines, to examine the relationship between engagement, physical environments, and social connection. This includes: Sociograms, Community Maps, Activity Spaces, Satellite Activity Logs, Time-Lapse Photography, Dot Maps, Behavioral Mapping, Occupational Mapping, Photovoice, Geocaching Games, and Participatory Photo-mapping. **Conclusion**: These methods can enhance the integration of person-environment interactions in contextually situated occupational science research. We anticipate that these methods will be useful for advancing the study of occupation, as well as development and analysis of occupation-centered interventions, while capturing the interplay between people and space.

Poster #139

Title: Advocacy and Resource-Seeking among Families of Autistic Children During COVID-19

Authors: Svitlana Stremousova, Brigid Connelly, Erna Blanche, and Mary C. Lawlor

Faculty Advisor: Mary C. Lawlor

Background: During COVID-19, autistic children and their families were vulnerable due to experiencing occupational disruptions, structural barriers, and racial and social inequities (Dallman et al., 2022; Panjwani et al., 2021). While resourcefulness may shape occupational engagement, research on caregiver advocacy and resource-seeking remains limited (Aldrich et al., 2017; Cantor et al., 2022). **Purpose**: This paper aims to contribute to understanding the particularities of advocacy and resource-seeking among caregivers of autistic children during COVID-19 by interpreting caregiver narratives. **Methods**: We utilized narrative phenomenological and thematic analysis approaches to investigate the complexity of advocacy and resource-seeking during COVID-19. The paper utilizes caregiver interviews, a subcorpus of data that is part of a larger study, which gathered multiple perspectives on experiences during the COVID-19 pandemic. **Results**: COVID-19 mandates caused multiple shifts in daily occupations, which exacerbated inequities and created additional challenges for some families. Most caregivers engaged in advocacy for their children and seeking resources to obtain what they deemed necessary for their children's education and development during the pandemic. Preliminary themes include virtual advocacy and resource seeking, sense of loss, and shifts in future goals. **Conclusion**: COVID-19 caused disruptions to schooling and support services, and a sense of loss to some families stemming from experienced inequities and reduced educational and social opportunities for their autistic children. Many parents faced barriers in their advocacy and resource-seeking efforts, leading caregivers to draw on their resilience and creativity to create a better future for their families. Findings can assist researchers and practitioners with applying their skills of system navigation to increase responsiveness to the needs of families.

Poster #140

Title: Occupational disruption during COVID-19 among NICU graduates and their families

Authors: Sahar Ghahramani, Amber M. Angell, and Roberta Pineda

Faculty Advisor: Roberta Pineda

Background: The global pandemic significantly altered occupational engagement patterns, disrupting families' daily lives and routines. **Purpose**: This study aimed to examine relationships between perceived mental health, developmental regression, family supervision, and the impact of COVID-19 in infants who were born preterm. **Methods**: Ninety-eight parents of preterm infants born <32 weeks gestation completed *The COVID-19 Children and Families Impact Survey*, which was designed to assess the parent's perceptions of their child's sadness, anxiety, and developmental regression, as well as the amount of family supervision provided and the

overall impact of the pandemic on the family. **Results**: 39 (40.6%) of families identified a significant impact of COVID-19 on their families. 67 (68.4%) indicated that they provided high levels of supervision during the pandemic. Chi-square analysis demonstrated relationships between children's anxiety and both COVID-19 impact and family supervision (p=0.042 and p=<.001, respectively). It also showed relationships between overall developmental regression and both COVID-19 impact and family supervision (p=0.021 and p=0.042, respectively). No significant relationships were found between children's sadness and COVID-19 impact or parental supervision. **Conclusion**: This study contributes valuable insights into the impact of COVID-19 on NICU graduates and their families. Understanding various factors that contribute to perceptions about the impact of the pandemic can lead to successful interventions.

Poster #141

Title: Belonging is related to psychosocial health, meaning in life, and prosocial behavior

Authors: Shruti Kamath, Akila Kadambi, Aditya Jayashankar, Sofronia Ringold, Nandita Raman, and Lisa Aziz-Zadeh

Faculty Advisor: Lisa Aziz Zadeh

Background: Belonging is a fundamental motivational drive, essential for survival. It is one of the four core concepts of occupation, along with doing, being, and becoming. However, few studies have been conducted on belonging and how it interacts with other psychosocial factors. **Purpose**: The study aims to investigate the association between feelings of belonging and personality traits, which can help guide our interactions and interventions from a foundational perspective. **Methods**: We conducted a study on 30 English-as-first-language adults born and raised in the USA (18-33 years). Participants completed measures of belonging and personality (e.g., Belonging barometer, Short dark triad). Spearman's correlation was used to assess the associations. **Results**: Our preliminary analyses indicate that higher levels of belonging are significantly correlated with positive personality traits. Participants who exhibited higher scores on the general belongingness scale exhibited increased belief in internal locus of control, resilience, emotional stability, positive affect, integrity, and meaning in one's life. Increased belonging was also significantly negatively correlated with negative socioemotional personality traits, including decreased levels of anxiety, alexithymia, emotional ability, negative affect, codependency, and loneliness. Finally, an increased feeling of belonging with one's friends was significantly related to positive social outcomes, including increased prosocial behavior and altruism (all $p<.05$). **Conclusion**: Data suggest that increased feelings of belonging are linked with positive psychological and social states, which grounds the role of belonging in the development of strong personhood, in line with previous occupational science research. A deeper understanding of these relations can help improve therapeutic interactions and interventions, with the goal that increasing belonging will lead to psychosocial benefits, though more work is needed to determine causality.

Poster #142

Title: Occupational identity shifts in individuals with long COVID

Authors: Zama Dlamini, Rebecca M. Aldrich, Madeline Parga, Allison Schachter, Ryan Walsh, Gorety Nguyen, Jamieson Wilcox, Shawn C. Roll, and Alexis Stewart

Faculty Advisor: Rebecca M. Aldrich and Shawn C. Roll

Background: The COVID-19 pandemic led to the emergence of a new disability, known as long COVID. Individuals affected by long COVID face unique challenges due to the disability's novelty and its varying nature from person to person. **Purpose**: The purpose of this study is to gain insight into the experiences of individuals living with long COVID and its impact on identities. **Methods**: This study is part of a larger study that aims to facilitate the return-to-work (RTW) process and outcomes of individuals after recovering from COVID-19. It involved 25 participants from three stakeholder groups - patients, healthcare providers, and employers - involved in the RTW process for individuals with long COVID. For this study, data from only the patient group were considered. Eleven patients were interviewed about their illness, recovery, job position, RTW expectations, rehabilitation experiences, as well as how their daily occupations changed due to their COVID-19 diagnosis, symptoms, and recovery process. An iterative narrative approach to identify themes within and across interviews was used in the analysis process. **Results**: The study will highlight the impact of long COVID on the professional, familial, social, and personal lives of individuals with the condition. Additionally, it will enhance the understanding of identity transitions that accompany long COVID experiences and how those transitions lead to disruptions and transformations in identity. **Conclusion**: Understanding the experiences of adults with long COVID and the consequences of the experience on identities and sense of self can inform research, care, and treatment for people with the condition.

Poster #143

Title: Factors predicting impairment vs. function-based performance in chronic stroke patients

Authors: Stuti Chakraborty, Octavio-Marin Pardo, Mahir Khan, and Sook-Lei Liew

Faculty Advisor: Sook-Lei Liew

Background: Characterizing phenotypes of stroke recovery is a priority for stroke research. According to the current timeline of stroke recovery, most rapid behavioral changes are observed within the first weeks-to-months and continue in the chronic stage (>6 months post-stroke). However, there is a need to understand if further improvements occur in the chronic stage. **Purpose**: The purpose of this paper is to a) determine the percentage of people who show improvements in the chronic stage in impairment-based (Fugl-Meyer Upper Extremity Score - FMUE) and function-based (Wolf-Motor Function Test - WMFT) clinical outcome measures, and b) determine if any/what factors predict chronic change. **Methods**: Chronic subjects (≥180 days post-stroke) with FMUE and WMFT scores at two timepoints were identified from the ENIGMA stroke recovery working group database. A robust linear mixed effects model was used to determine the factors predicting chronic scores. **Results**: 205 participants were included in this analysis. 75.38% (n=130) showed a positive change across two time points in FMUE (M=1.130, SD=3.904). 45.33% (n=75) subjects showed positive change in the WMFT (M=-0.005, SD=0.19). The baseline score (time point 1) for both FMUE (t=15.503, p=<0.001) and WMFT (t=12.521, p=<0.001) was a statistically significant predictor of performance in the chronic stage (time point 2). No other factors predicted change in performance. **Conclusion**: These results show that behavioral recovery occurs in the chronic stage. Impairment/function may predict subsequent gains, irrespective of chronicity and baseline performance.

Poster #144

Title: Exploring Work Systems Factors Associated with Sonographer Burnout

Authors: Ryan Walsh, Kevin Evans, Carolyn Sommerich, and Shawn C. Roll

Faculty Advisor: Shawn C. Roll

Background: Burnout in healthcare professionals is

pervasive and detrimental to both workers and patients. Although increasing evidence suggests that sonographers also experience high levels of burnout, few large-scale studies of complex work systems in this profession exist to investigate specific factors associated with burnout. **Purpose**: We aimed to identify the prevalence of burnout among a large registry of U.S. and Canadian sonographers, as well as influential work systems factors at the level of the worker, the workplace, work, and health associated with burnout. **Methods**: We invited 3,659 sonographers to complete a survey about worker, workplace, work, and health factors potentially associated with burnout. We used the Copenhagen Burnout Inventory to assess personal, work-related, and client burnout and reported the prevalence of each. Then, we created simple and multiple linear regression models to identify work systems factors associated with burnout. **Results**: 1,389 sonographers responded to the survey. 55.6% reported moderate-to-severe work-related burnout, and 25.5% reported moderate-to-severe client burnout. Lower job satisfaction and lower sleep quality were influential predictors of both work-related and client burnout. Additional factors such as lower supervisor support, more hours worked, fewer break hours taken, working full-time, and lower overall health status were influential predictors of work-related burnout. **Conclusion**: Our findings indicated that burnout is pervasive among sonographers and associated with complex work systems factors. Sonographers, administrators, and researchers may collaborate to better understand how to address and mitigate the influence of factors such as low job satisfaction and demanding work schedules on burnout in the sonography workforce.

OCCUPATIONAL SCIENCE & OCCUPATIONAL THERAPY - PROFESSIONAL STUDENTS

Poster #145

Title: Knowledge Mobilization of Third Places Scoping Review through Video Creation

Authors: Taylor Kamemoto, Julie Vo, Gorety Nguyen, Debbie Laliberte Rudman, and Rebecca M. Aldrich

Faculty Advisor: Rebecca M. Aldrich

Background: Knowledge mobilization emphasizes disseminating knowledge to the general public and relevant partners. Mobilizing knowledge can help research findings span past the academic setting through means such as presentations, social media, or videos. **Purpose**: This video project aims to mobilize knowledge related to precarity, social isolation, and third places. Third places refer to spaces outside of the home and work that foster a sense of novelty, social opportunity, belonging, resource sharing, and connection, which may play an increasingly important role in precarious lives. Precarity refers to the instability experienced across various aspects of life including work and social realms. **Methods**: Selected literature on third places and precarity, including a scoping review, provided a foundation for the video's content. The video project was initiated through creating a storyboard to outline the script and graphics. After drafting a full script and compiling an extensive stock image bank, we used Canva software to create a video. **Results**: The first draft of the video is 3 minutes long, focused on the theme of precarity and how economic shifts, technological advancements, and societal changes influence the increasing amount of precarity present in today's society. The next video sections will delve into contributions of third places for precarious populations. **Conclusion**: The process of mobilizing knowledge is complex. Challenges within creating the video included shifting academic language into a script that made sense to a general audience and identifying diverse photos that portrayed precarious experiences of third places.

Poster #146

Title: The Effect of Mirror Therapy in Upper Extremity Stroke Patients

Authors: Yung-Hsin Chang, Sanskruti Sonawane, Sherry Shang, Roseanne Blanco, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Stroke often causes upper limb motor deficits, impacting activities of daily living. Mirror therapy is a cost-effective intervention using the reflection of unimpaired movements to facilitate activation of brain pathways controlling the impaired limb, improving motor function. **Purpose**: This critically appraised topic summarizes existing evidence on the effectiveness of mirror therapy for improving upper extremity motor function in stroke patients. **Methods**: Occupational therapy studies published in English from 2019 to 2021 focusing on the effectiveness of mirror therapy on upper extremity function in the Asian population. As a result, three randomized controlled trials were selected. The three studies were then screened for rigor and chosen due to their rigorous design. Studies that had sample sizes less than 30 and used different therapy interventions/modalities other than OT and mirror therapy were excluded. **Results**: All three studies found significant within-group improvements in upper limb motor function for mirror therapy groups despite having different intervention intervals. Between-group analysis showed mirror therapy provided additional benefits beyond standard therapy for upper extremity motor recovery based on Fugl-Meyer Assessment scores. However, functional outcomes, including manual dexterity, were inconsistent among these three studies. **Conclusion**: The affordability, accessibility, and effectiveness of mirror therapy make it a viable rehabilitation option. While motor improvements were consistently demonstrated, more research is needed to determine the long-term functional benefits on the daily task performances. Overall, the findings of this review support integrating mirror therapy with conventional occupational therapy to optimize post-stroke upper extremity motor rehabilitation.

Poster #147

Title: Developing and Validating the Spanish Measure Yourself Medical Outcome Profile®

Authors: Dayannara Campos Medina, Jocelyn Arteaga, Celso Delgado, Jesús Díaz, and Stacey L. Schepens Niemiec

Faculty Advisor: Stacey L. Schepens Niemiec

Background: The Measure Yourself Medical Outcome Profile® (MYMOP) is a patient-centered questionnaire that assesses well-being and the impact of symptoms on activity participation. Currently, a validated Spanish version is not available. **Purpose**: Develop a culturally relevant Spanish translation of the MYMOP for Spanish-speaking Latinos in the USA. **Methods**: The MYMOP translation process began by culturally adapting the tool for a USA audience and forward translating the original British-English content to American English. The resultant version was sent to a professional translation company for dual forward translation, reconciliation, and dual backward translation. Spanish-speaking research personnel reviewed and edited the resultant translation. The revised Spanish version was tested for comprehensibility and cultural relevance in 40 midlife-to-older (45+ years) Spanish-speakers who reported ≥1 chronic health condition. Participants completed background questionnaires and a

60-minute cognitive interview of the orally administered Spanish MYMOP. **Results**: Respondents suggested changes to the Spanish-translated MYMOP, citing that phrasing for several items was confusing or unclear. The researchers identified additional areas that required improvement based on participants' requests for clarification. **Conclusion**: Health assessment tools should be culturally appropriate and linguistically accessible to respondents. The newly translated Spanish MYMOP requires edits to improve the interpretability for the Spanish-speaking community. Further development and validation of the Spanish MYMOP is warranted.

Poster #148

Title: Oral health of adolescents/adults with Intellectual and Developmental Disabilities

Authors: Jasmin Sanchez, Riley McGuire, and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Oral health is an essential part of overall health. Although the oral health of children with intellectual and developmental disabilities (IDD) has been examined, little is known about the oral health experiences of adolescents/adults with IDD. **Purpose**: To systematically review the literature describing the oral health of adolescents/adults with IDD. **Methods**: The PubMed database was searched using PRISMA guidelines. Keywords included "oral health", "dental care", and "intellectual and developmental disabilit*", as well as variations of these keywords; references were also hand-searched. Articles were included if they were published in English and described the oral health of adolescents/adults with IDD; no restrictions were placed on publication date. **Results**: Twenty-six articles met inclusion criteria, clustering broadly into four categories (four articles were placed into multiple categories). *Barriers to Care* (n=13) described access to care, insurance/reimbursement, and anxiety-producing factors (e.g., waiting, dental environment). *Dental Education* (n=8) emphasized the lack of provider comfort and education treating patients with IDD, curricula innovations to improve care, and the desire for caregiver dental-specific training. Patient-Factors Related to Oral Health (n=5) included toothbrushing skills, behavior, and equipment, as well as patient cooperation and attention. *Facilitators* to Care (n=4) described use of pharmacological methods, additional care personnel, and caregiver support. **Conclusion**: Additional research is necessary to elucidate the oral health behaviors and outcomes for adolescents/adults with IDD. It is essential to understand the oral health status and experiences of this population in order to develop new interventions to improve both home and professional oral care.

Poster #149

Title: Lived experiences of children and families living with interoception differences

Authors: Joseph Quiambao, Savannah Gluck, Stephanie Magana, Grace T. Baranek, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Interoception involves the central nervous system sensing and interpreting internal signals, playing a crucial role in individuals' sensory experience, bodily cue processing, and emotional perception. Interoceptive awareness can impact engagement, emotional regulation, and social participation. **Purpose**: The purpose of the study is to understand how parents perceive their child's interception differences in various contexts and describe how interoception impacts participation. **Methods**: Ninety-one caregivers of children with and without autism were interviewed about their child's sensory experiences. Eighteen caregivers identified their child's experiences which were impacted by interoceptive differences. Interviews were coded using a content-categorical approach to organize sensory experiences by the sensory pattern, system, context, and impact on participation. **Results**: Parents reported interoceptive differences as awareness of pain (n=6), body temperature (n=8), and gastrointestinal functions (n=5). Lack of responsiveness to pain was reported as affecting play (n=5) and self-injurious behavior (n=1). Differences in body temperature sensation were reported as affecting outdoor play (n=7) and mealtime (n=1). Gastrointestinal sensations affected toilet training (n=1), play (n=1), and mealtime (n=2). Inconsistencies in the child's interoceptive experiences compared to those of family members or peers may disrupt shared occupations. **Conclusion**: Understanding the contexts in which parents perceive their child's interoception differences highlights areas in which therapeutic evaluation and intervention may be needed to best support families.

Poster #150

Title: The Effect of Computer-Assisted Cognitive Training in Adults with MCI

Authors: Cheng-Ho Lin, Yu-An Chen, Fan-Hsuan Chou, Devika Devarajan, Shraddha Savla, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Studies showed the importance of early intervention for mild cognitive impairment (MCI) patients to preserve cognitive function and delay progression to dementia. Several studies have demonstrated the effectiveness of computer-assisted cognitive training (CCT) in improving cognitive functions for those with MCI and dementia. **Purpose**: This Critically Appraised Topic aims to evaluate whether CCT could enhance or help maintain overall cognitive function in older adults with MCI. **Methods**: After applying advanced PubMed filters such as "mild cognitive impairment" and "computer-assisted cognitive training", limiting to rigorous study types, and focusing on adults above the age of 45, 15 articles published between 2017 and 2023 were identified. The 4 most best-fit articles were finalized to be appraised, including 3 RCTs and 1 which is both systematic review and meta-analysis. **Results**: CCT was proven effective in enhancing cognitive function for older individuals with MCI. The findings across articles highlight the effectiveness of CCT in addressing issues related to memory and attention, suggesting its potential as a beneficial approach for those with MCI. **Conclusion**: Significant short-term and long-term improvements in specific cognitive domains were observed in CCT, applicable to both home and clinical settings. Therapists should choose CCT programs to meet patients' specific cognitive needs. Appropriate CCT can effectively delay the progression of MCI and maintain cognitive function.

FROM THE EDITORS

To our fellow students, faculty, and staff:

It is our honor and privilege to present to you the Sixteenth Edition of *The Explorer* Journal of USC Student Research. This year, our talented student authors have highlighted the exciting and innovative research being conducted at the Herman Ostrow School of Dentistry of USC, including the Mrs. T.H. Chan Division of Occupational Science and Occupational Therapy and the Division of Biokinesiology and Physical Therapy, all of which are proud members of the Ostrow Family.

We would like to acknowledge the discoveries of all our fellow classmates and faculty who are engaged in research and those who continue to make meaningful breakthroughs for our profession. Our keynote speakers showcase the efforts our community is making toward advancing science. Now, more than ever, we highly encourage all our fellow students to pursue research. There are so many exciting opportunities available here at USC—such as exploring how technological advancements can improve benchside research and clinical practice in dentistry, occupational therapy, and biokinesiology/physical therapy. We hope the projects presented in this journal will spark curiosity and interest in pursuing research.

Lastly, we would like to thank everyone who has helped in organizing Research Day. The success of Research Day would not be possible without the immense support we have received from our faculty advisors, Dr. Yang Chai, Dr. Parish Sedghizadeh, and the entire Research Day planning committee that have worked tirelessly behind the scenes in order to host Research Day in person and make today a success. We are also very fortunate to have an amazing group of writers, photographers, and leaders in the Student Research Group without whom this journal would not be possible. We hope you enjoy this issue of *The Explorer*!

Thank you so much for all the support, and Fight On!

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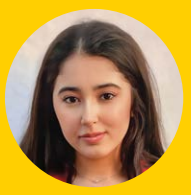
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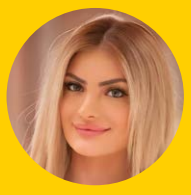
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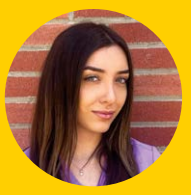
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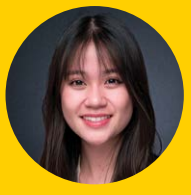
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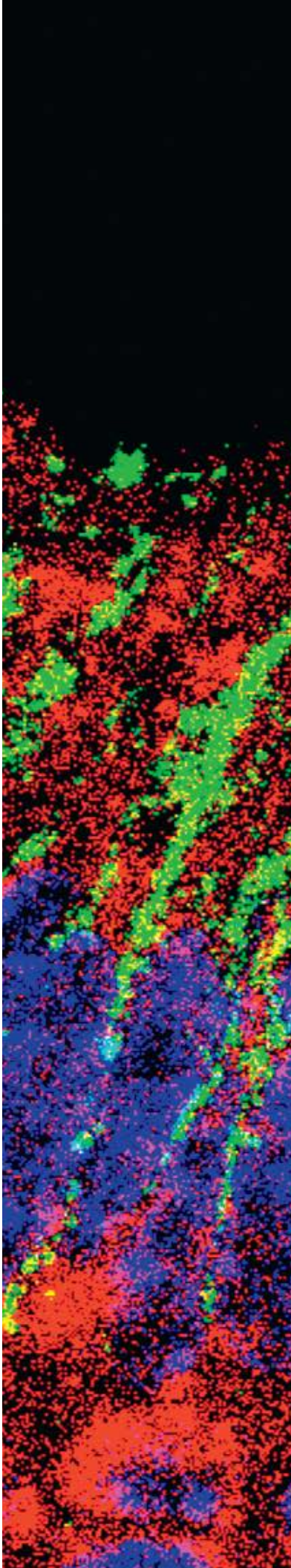
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