The Explorer

Journal of USC Student Research

Volume 18 | April 2026

Herman Ostrow School of Dentistry of USC

Contents

THE **EXPLORER** 2026

DIVISION ARTICLES

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(PHOTO/PHIL CHANNING)

FROM THE **DEAN**

Dear Ostrow Students and Colleagues:

Welcome to the 2026 Research Day and the latest edition of The Explorer, the award-winning research journal published by Ostrow's Student Research Group. On the following pages, you will get an opportunity to delve into some of the innovative scientific inquiry taking place at Ostrow — including from our colleagues at the USC Mrs. T.H. Chan Division of Occupational Science and Occupational Therapy and the USC Division of Biokinesiology and Physical Therapy — and displayed proudly during Ostrow's annual Research Day.

It's likely no surprise that someone with my background as a clinician-scientist would be enamored with Research Day. This celebration, one of the only days dedicated exclusively to research and the largest research event at USC, gives our community a chance to learn more about scientific research, whether they're learning from our prestigious keynote speakers, the research presentations delivered by their peers or simply collegial banter over lunch. It inspires me to see our students so impassioned by the pursuit of knowledge. I love seeing their enthusiasm as they share their findings with their peers. I also love seeing the groundwork being laid for interdisciplinary collaborations as our dental students consume the research presentations prepared by their OT and PT colleagues —and vice versa! Most importantly, I love that Research Day represents a moment where the seed of lifelong learning is germinated, and our students learn to consume cutting-edge research that can challenge the traditional ways of thinking, enabling them to stay apace an ever-changing landscape and leading to better patient outcomes.

Research is the very lifeblood of our professions. It not only grounds us in evidence-based practice, but it also has the potential to transform the way we provide health care. As part of a research-intensive university, Ostrow has long championed scientific inquiry. Most recently, we continued our ascent in the National Institutes of Dental and Craniofacial Research (NIDCR) rankings to the nation's second-highest funded school — a testament to the respect, trust and confidence that the NIDCR-NIH has in our researchers.

I want to extend my congratulations to all our Research Day participants for your hard work, long hours and unwavering dedication in completing this year's research presentations. I would also like to thank the faculty and staff who organize this celebratory event, the students who write and edit The Explorer, and the faculty judges who volunteer their time to speak with our trainees about their award-worthy projects.

Fight On!

INTRODUCTION TO **RESEARCH DAY**

Dear Colleagues,

Welcome to the Herman Ostrow School of Dentistry of USC Research Day 2026! This annual event remains a highlight of our academic calendar, celebrating the outstanding research contributions of our students, staff, and faculty across Dentistry, Occupational Science, Occupational Therapy, Biokinesiology, and Physical Therapy. Today, we come together to showcase groundbreaking discoveries that reflect USC's unwavering commitment to advancing healthcare, scientific knowledge, and academic excellence.

As educators and mentors, we take pride in cultivating an environment where innovation thrives. Seeing our students engage in cutting-edge research—whether in labs, clinics, or interdisciplinary collaborations—reinforces the importance of our mission. Their work exemplifies the core values of the Herman Ostrow School of Dentistry: integrity, excellence, cultural engagement, well-being, open communication, and accountability. Our commitment to fostering critical thinking and scientific exploration ensures that students are well-prepared for their future roles as clinicians, educators, and researchers, making lasting contributions to patient care and healthcare advancements.

The discoveries presented today offer a glimpse into the future of our professions, and we are honored to support the next generation of scientific leaders. Their dedication and passion continue to push the boundaries of knowledge, strengthening our collective impact on global healthcare.

We are also excited to share this year's edition of The Explorer, highlighting the latest research projects and celebrating the achievements of our exceptional scholars at the Herman Ostrow School of Dentistry. Through its pages, you will find inspiring stories and pioneering work that reaffirm our commitment to research excellence. Please join me in congratulating all our students and researchers on their remarkable contributions. Let's take this opportunity to recognize and celebrate their success on Research Day 2026.

Fight on!

Amy E. Merrill, PhD

Associate Professor
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A MULTIDISCIPLINARY PERSPECTIVE ON LYMPHOMA IN DENTAL CARE: DR. YU-CHEN XIE

By Emanuel Harouni and Melody Yazdani

Dr. Yu-Chen Xie, a resident in the General Practice Residency (GPR) program at the Herman Ostrow School of Dentistry of USC and an incoming endodontics resident, has dedicated her training to understanding how systemic disease, particularly lymphoma, can first manifest through subtle dental or orofacial signs. Her research project, Dental Treatment of Patients with Lymphoma: A Multidisciplinary Approach, completed with Drs. Pooja Patel, Kathleen Chung, and Rebecca Dayanim, illustrates how dentists may be among the earliest clinicians to identify lymphoma when its presentation resembles common periodontal or endodontic pathology.

Dr. Xie's drive to improve patient care began long before residency. Growing up as the daughter of Chinese immigrants, she witnessed firsthand the contrast between emergency-based dental treatment in her parents' home country and the preventive care they received after moving to the United States. These early experiences shaped her understanding of dentistry as a profession that can restore comfort, function, and confidence, while also reducing fear and improving health literacy for culturally diverse communities. This foundation prepared her to embrace a patient-centered, empathetic approach to dental care.

Her interest in medically complex care deepened during her GPR experience, which exposed her to patients managing head and neck cancers and other life-altering systemic illnesses. This environment required her to approach each case holistically, considering radiographic, medical, functional, and psychosocial factors simultaneously. The experience carried personal meaning, as she navigated her father's terminal cancer diagnosis during the early years of her dental education. The empathy and attentiveness she brought to her own family became central to the way she cares for her patients.

The research that emerged from the GPR clinic reflects this comprehensive perspective. Multiple patients presented with dental symptoms that initially suggested routine pathology but were ultimately attributable to lymphoma. One such case, Patient ASB, demonstrated impaired healing following extractions, recurrent sinus involvement, and persistent oroantral communication that required obturator fabrication. Another patient, UR, presented with a full-thickness palatal defect that autodrained a phlegmonous infection, ultimately necessitating obturation to restore speech and function. A third patient, VBL, exhibited progressive maxillary destruction, serial pulpal necrosis of teeth without caries, and a pathological maxillary fracture caused by localized NK/T-cell lymphoma. These cases underscored the importance of correlating vitality testing, clinical findings, and radiographic patterns to ensure that diagnoses remain consistent with the full clinical picture. When these elements do not align, Dr. Xie emphasizes that clinicians must expand their differential diagnosis to include systemic pathology rather than relying on dental explanations alone.

A critical component of dental management in these patients, which Dr. Xie highlights as essential but often overlooked, is the fabrication of obturators for patients with oroantral or oronasal communications caused by lymphoma or its surgical management. Obturators—whether fixed or removable—restore separation between the oral and nasal cavities, enabling patients to speak clearly, swallow, drink, and maintain adequate nutrition. Working collaboratively with

maxillofacial prosthodontists, oral surgeons, and oncologic teams, the dental team can deliver immediate surgical obturators following maxillary resection, provide interim devices during healing, and reline or adjust obturators in general practice settings as the tissues evolve throughout cancer treatment. For patients like ASB and UR, obturator therapy was crucial not only for function but also for quality of life during the physically demanding phases of chemotherapy and radiation.

Interdisciplinary collaboration proved essential across all cases in the study. Dr. Xie frequently communicated with ENT specialists, hematologists, radiation oncologists, pathologists, and oral medicine faculty to determine the true origin of symptoms and ensure treatment safety. In some scenarios, medical teams unfamiliar with dental anatomy initially attributed symptoms to odontogenic infection. Dr. Xie found that dentists play a pivotal role in clarifying when the teeth are not the source of pathology and when dental intervention—especially extraction—may be contraindicated in compromised bone. Through coordinated imaging review, pathology consultation, and joint case discussions, the GPR team prevented unnecessary dental procedures and instead facilitated timely lymphoma diagnoses.

Dr. Yu-Chen Xie

The cases also revealed that lymphoma can present in young, otherwise healthy individuals—several patients were in their twenties—contradicting the common assumption that it primarily affects older adults. Because survival outcomes for lymphoma differ dramatically between early and late stages, early recognition within the dental setting can have life-changing implications. Dr. Xie encourages dental students and general practitioners to rely on foundational diagnostic tools, such as vitality testing, and to re-evaluate their assumptions whenever the clinical presentation deviates from expectations. She also emphasizes the importance of seeking faculty input for atypical cases and meticulously documenting all subjective and objective findings to differentiate between disease progression and odontogenic infection.

Looking ahead, Dr. Xie identifies opportunities for broader research, including larger case series to establish consistent patterns of dental presentation and the incorporation of direct biopsy of affected bone to better understand the cellular environment within areas of suspected lymphoma. Such data could provide invaluable insight into diagnostic markers that help distinguish systemic disease from odontogenic pathology earlier and more reliably.

As she embarks on her endodontic residency, Dr. Xie brings a deeply informed perspective on the intersection of systemic health and dental disease. Her experiences in the GPR program have prepared her to approach each case with clinical precision, medical awareness, and profound empathy. Her work underscores that dentistry extends far beyond tooth-centered care; it can be a critical entry point in recognizing systemic illness, coordinating interdisciplinary treatment, and preserving patients' speech, function, dignity, and quality of life.

Biomimetic Strategies for Enamel Repair and Regeneration

By Boules Attia and Miyi Wang

Dr. Janet Moradian-Oldak's research centers on applying principles of biomineralization to the regeneration of tooth enamel through biomimetic design. She explains that although seashells and human teeth differ in chemical composition, calcium carbonate in shells and calcium phosphate in enamel, the biological mechanisms that govern their formation share fundamental similarities. In both systems, mineralization is tightly regulated by proteins that control crystal nucleation, orientation, and hierarchical organization, resulting in highly ordered structures with specialized mechanical properties. Understanding these shared principles has allowed insights from one mineralized system to inform approaches to enamel regeneration, where controlled mineral organization is essential.

Translating this work toward clinical application presents substantial challenges. While laboratory studies have demonstrated promising results and confirmed the biocompatibility of the materials used, progression to human clinical trials requires extensive regulatory approval, including institutional review board and FDA clearance. These processes are time-intensive and resource-demanding, leading the research to remain primarily focused on foundational and translational studies. Clinical collaborations continue to play an important role, but further advancement depends on securing sufficient funding and completing the necessary safety evaluations.

Animal models for dental defects have not been utilized in Dr. Moradian-Oldak's lab due to their limited relevance to human dental conditions. Differences in oral microbiota, saliva composition, chewing forces, and patterns of dental disease reduce the applicability of animal data to human enamel repair. Because the intended application targets human-specific conditions such as early enamel lesions, experimental approaches must reflect the biological environment of the human oral cavity to yield clinically meaningful outcomes.

A defining feature of Dr. Moradian-Oldak's research is the use of the existing tooth structure as a natural scaffold for regeneration. Rather than constructing an artificial framework, the approach relies on a hydrogel delivery system that introduces a synthetic peptide modeled after native enamel proteins into subsurface enamel lesions. The hydrogel allows peptide penetration, while the peptide itself promotes organized mineral deposition by attracting calcium and phosphate ions and guiding crystal growth. This method does not aim to regenerate an entire tooth or fully reconstruct enamel, but instead supports the formation of organized, enamel-like layers that integrate with native tissue. By mimicking natural mineralization processes and minimizing invasiveness, this strategy represents a potential shift from conventional restorative treatments toward regenerative dental therapies.

Dr. Janet Moradian-Oldak's research highlights a deliberate shift away from stem-cell–based tissue engineering toward a peptide-driven, cell-free approach to enamel and dentin regeneration. In response to questions about why her work avoids living cells, she explained that enamel regeneration presents unique biological challenges because ameloblasts disappear after tooth development. Rather than relying on stem cells, which introduce significant complexity, cost, and regulatory barriers, her lab isolates functional pep-

tide sequences derived from natural enamel proteins. These peptides retain the ability to guide mineral formation while offering a more practical and clinically translatable strategy.

When discussing how closely regenerated enamel resembles native tooth tissue, Dr. Moradian-Oldak emphasized that her lab has been successful in recreating key microstructural features, particularly the aligned hydroxyapatite crystals that form enamel rods. However, she noted that the full hierarchical organization of enamel, especially the interwoven rod–interrod architecture, is extremely difficult to replicate. This complexity normally arises from tightly regulated cellular interactions during tooth development, which cannot yet be fully reproduced in a synthetic or cell-free system. As a result, current efforts prioritize restoring functional enamel-like layers rather than recreating the entire tissue architecture.

Another important aspect of Dr. Moradian-Oldak's responses was her discussion of the inherent biological limitations that make enamel regeneration uniquely challenging compared to other tissues. She emphasized that, unlike bone or dentin, enamel lacks the ability to remodel or repair itself once fully formed because the cells responsible for its formation are no longer present after eruption. This biological constraint reinforces the need for strategies that work with the existing tooth structure rather than attempting full tissue regeneration. By focusing on controlled mineral deposition at early lesion sites, her research aims to intervene before irreversible damage occurs, aligning regenerative design with the realities of enamel biology and clinical practice.

Dr. Janet Moradian-Oldak

A recurring theme in her responses was the importance of protein self-assembly in directing mineral growth. She explained that enamel proteins naturally fold and assemble into ordered structures that control crystal nucleation, orientation, and organization. By designing peptides that mimic these protein behaviors, her lab can guide calcium phosphate ions into organized, enamel-like arrangements. One of the most surprising insights from her work has been how effectively small peptide sequences can reproduce essential aspects of enamel mineralization, reshaping earlier assumptions that complex cellular systems were required for highly ordered mineral growth.

To determine whether engineered enamel truly mimics natural enamel, Dr. Moradian-Oldak described a rigorous evaluation process that extends beyond chemical composition. Her lab uses high-resolution imaging techniques, including scanning and transmission electron microscopy, to assess crystal alignment and hierarchical structure, along with additional methods to measure mineral density and mechanical relevance. These assessments ensure that regenerated materials are structurally and functionally meaningful, not merely mineral deposits. Collectively, her responses underscored how her research bridges fundamental biomineralization science with translational goals, advancing a regenerative approach that could ultimately reduce reliance on conventional restorative dental treatments.

Pushing the Boundaries of Cancer Biology: A Conversation with Dr. Dechen Lin

By Jacquelyn Bakshian and Mahziar Sakiani

Dr. Dechen Lin is currently an Assistant Professor at the Herman Ostrow School of Dentistry and serves as an Associate Director of the USC Head and Neck Center at the Keck School of Medicine, where he leads his own research team. His interest in research began during his undergraduate studies at Nanjing University. After receiving his degree in Biology, Dr. Lin pursued a PhD in Cell Biology at the Chinese Academy of Medical Sciences. Dr. Lin later completed postdoctoral training at Cedars-Sinai Medical Center and the Cancer Science Institute of Singapore at the National University of Singapore. In 2022, Dr. Lin joined the Ostrow community at the Center for Craniofacial Molecular Biology.

Dr. Dechen Lin

Dr. Lin was not always a cancer researcher. During his four years at Nanjing University, he studied primarily plants and fish. Dr. Lin was brought into the sphere of biomedical research during the final year of his degree, when he joined a lab for his thesis. There, he studied plant-based medications for the treatment of common genetic and immune diseases. Through this experience, he realized the significance of thinking outside the box of mainstream thought in medicine. Through the utilization of various techniques, such as mass spectrometry, Dr. Lin was able to advance his understanding of how minimal changes at the molecular level could have large impacts on disease. More importantly, this unique experience was where he developed the data-driven approach that would later define his research.

A few years later, Dr. Lin began his journey toward obtaining a PhD in Cell Biology. Although cancer was not a particularly prevalent disease in China at the time, Dr. Lin remained committed to the field due to the immense impact cancer had on his relatives. Dr. Lin found himself at the precipice of major changes in the field of cell biology. Upon receiving his PhD, the study of cancer genomics was beginning to make waves in the scientific community. The field of cancer genetics is based on the understanding that healthy cells contain two copies of each gene, one from each parent. However, in cancer cells, hundreds of copies of certain genes may exist. Thus, Dr. Lin found himself at the forefront of this new movement, and he cites two articles he published in Nature Genetics in 2014 as the turning point in his career. These articles, which have been cited a combined total of over one thousand times, hold both personal and professional significance to Dr. Lin, as they provided the basis for many grants, prompted his move to Los Angeles, served as the basis of his current research, and reminded him that "cancer biology needs more investigation, and

[that he is] not wasting [his] time doing something that's not important."

At Cedars-Sinai in Los Angeles, Dr. Lin completed a postdoctoral fellowship in cancer genetics. His work was rooted in next-generation sequencing to examine the entire cancer genome using improved technology and more representative models. He focused on understanding biomarkers and the mutational landscape of head and neck and esophageal cancer.

Now serving as an Associate Professor at the USC Herman Ostrow School of Dentistry and Associate Director of the USC Keck School of Medicine Head and Neck Center, Dr. Lin's current research is an extension of his postdoctoral work. One of the branches of his current research is a project on the development of organoid models, also known as tumor avatars. The current mouse models used in studying oral and gastrointestinal cancer are limited, as they are not affected by relevant risk factors that accurately mimic human disease conditions. Once again pushing the boundaries of scientific thought, Dr. Lin describes this project as the future of cancer genomics. In our conversation with Dr. Lin, his enthusiasm, excitement, and passion for the project were infectious. The tumor avatars grow in a way that reflects in vivo tumor growth, matching the three-dimensional microenvironment of the patient, and can be customized to carry individual mutations that mirror a patient's cancer sequencing. With these tumor avatars, researchers and physicians can predict which therapy will work best for the patient. If the tumor created in the laboratory does not respond well to chemotherapy, the patient can be predicted to respond poorly, and if the tumor does respond well to chemotherapy, the patient can be predicted to respond favorably.

"The organoid model is the future of precision medicine."

Another project currently underway in Dr. Lin's lab uses artificial intelligence (AI) to sequence tumor cells. Utilizing USC's supercomputer at the Center for Advanced Research Computing (CARC), biomathematics students in Dr. Lin's lab are using machine learning to deconvolute the vast number of variables and patterns in the genomes of individual patients. With this information, patients can be clustered into groups to determine mechanisms that lead to specific patterns of mutations.

Looking ahead, Dr. Lin sees the organoid models as "the future of precision medicine." His most recent publication with the organoid model was a smaller trial involving 20 patients, but he sees this number increasing to hundreds of patients with different disease features and risk factors. Dr. Lin also sees AI and the integration of machine learning as the future of biomedical research. According to Dr. Lin, the integration of single-cell sequencing allows researchers to collect data extremely quickly, but the analysis of this data remains a significant challenge. He envisions incorporating machine learning into high-dimensional sequencing datasets to identify important patterns in disease and better understand disease biology. In addition, Dr. Lin sees immunotherapy as a focus of discussion in terms of toxicity, resistance, and lack of response. He strongly believes that his organoid model could help address these concerns.

On a personal note, we wanted to mention that our conversation with Dr. Lin was an absolute pleasure. The pride and passion he holds for his work, his team's work, and the role of basic science research worldwide serve as inspiration for students interested in pursuing research. Dr. Lin stated that he is "really proud of [his] lab," emphasizing that they are "not working on something for profit, but for something for a better life." He added that "we are very proud of showing what we can do because we strongly believe in the power of our research." In discussing the role of research in the future, Dr. Lin wanted to remind the scientific community and the community at large that "what we're doing isn't something that can be cut" and that "basic scientific research is the future."

Ready for the Unexpected: Dr. McLeod on Anesthesia, Preparedness, and Purpose

By Ezinne Abba and Andrew Sung

Growing up in Bulgaria, Dr. Bilyana McLeod's journey to dentistry was anything but straightforward. Even though she may not have known it at a young age, her personality, passion, and desires led her to pursue a career in dentistry. She was adamant about being in a profession that involved talking and connecting with people, yet utilizing her creative skills to have a lasting impact on others. It dawned on her that dentistry was the perfect calling for her.

However, in Bulgaria, she recognized how difficult her journey would be, given the corrupt nature of the education system. She knew that, unlike in other countries, such as America, her hard work would not necessarily translate to achieving her dreams. Rather, corruption and bribery stood in her way. It was because of this drastic reason that Dr. McLeod decided to immigrate to the United States in search of a better educational opportunity, where she would eventually graduate from the University of Michigan. It was there that she would develop her love for teaching others. Like many college students who are looking to save some money, Dr. McLeod worked in some part-time jobs, including being a Resident Assistant for her dorm. However, her work as a tutor and Teaching Assistant (TA) solidified her passion for teaching others. She admits that initially her motivation for the work was for the money, but after being a TA for her first biology course, she realized how rewarding it was to guide others and has since maximized her opportunities to teach in every other course she could.

That passion for mentorship carried with her into dental school, where Dr. McLeod began to explore the broader responsibilities that accompany clinical practice. Early in her training, she gravitated toward emergency preparedness and anesthesiology, recognizing that dentistry requires not only technical skill, but also the ability to respond calmly and effectively in high-pressure situations. Her involvement with Dr. STAT, the school's emergency response team/dental anaesthesia selective, played a significant role in shaping her clinical mindset. As a member of Dr. STAT, she learned what it truly meant to be the doctor in the room–responsible for patient safety, decisive action, and team leadership when emergencies arise.

Dr. McLeod's interest in anesthesiology deepened through coursework and mentorship, particularly under Dr. James Tom, chair and professor in the Department of Anesthesiology and Emergency Medicine, whose calm, methodical approach left a lasting impression. Rather than offering immediate answers, he challenged students to think critically by responding to questions with questions. This teaching style emphasized control, preparation, and thoughtful decision-making, qualities Dr. McLeod deems essential in anesthesia and emergency medicine and something she carried into practice as a general dentist. Under his guidance, Dr. McLeod learned the importance of slowing down, even when situations feel urgent.

Seeking further exposure, she repeatedly returned to Dr. STAT "Solis" rotation, a week-long shadowing and assisting experience at Solis Surgical Arts Center, a dental sedation and anesthesia office located in Tarzana, California. During this rotation, she observed and assisted in "sleep dentistry" and general anesthesia cases, many involving patients with complex medical and developmental needs such as advanced Down Syndrome, Cerebral Palsy, and movement disorders. These experiences provided insight into the medical side of dentistry, including airway management and interdisciplinary care, while also highlighting the emotional and physical toll of repeated general anesthesia on both patients and their families. Although Dr. McLeod does not provide moderate or general sedation in private practice today, these rotations reinforced her belief that clinicians should always understand one step beyond the care they deliver.

Now, more than four years into private practice as a general dentist, Dr. McLeod continues to emphasize the importance of emergency preparedness. She recalls that one of her first priorities when interviewing for an associate role was whether the office was prepared in emergencies. This involved determining whether they had an Automated External Defibrillator (AED), whether the staff were prepared and knew their roles, and what type of system they had to facilitate communication and action in the event of an emergency. Even as a dental student, she knew that her responsibility as a healthcare professional lay beyond her patients' dental needs, and that out in a private practice, faculty would not be there to supervise an emergency. She was ultimately responsible for her

patients' safety and well-being.

Dr. McLeod notes that many emergencies in private practice involve staff rather than patients, with vasovagal episodes being particularly common. These experiences serve as reminders that medical emergencies are not rare anomalies, but realities that every dental provider must be prepared to manage. She finds some of her most rewarding moments in treating anxious patients who return to complete their treatment plans, often expressing gratitude for overcoming fears they once believed were insurmountable.

Alongside clinical practice, Dr. McLeod's return to teaching felt natural. Having served as a teaching assistant in nearly every course she could during dental school, she was inspired by mentors who made complex topics approachable and empowering. Although personal circumstances, including welcoming newborn twins, temporarily delayed her return to teaching, she later applied to become a volunteer faculty member in pre-clinical local anesthesia, a role that perfectly aligned with her clinical background and passion for education.

Dr. McLeod is excited for the opportunity to teach at the same institution that taught her her passion. Dr. McLeod strives to convey the same learning process she was taught by Dr. Tom to her very own students. In the pre-clinical lab, Dr. McLeod emphasizes preparation, understanding, and confidence. She wants her students to not be afraid to ask questions and emphasize how critical it is to be prepared, not only in this course, but in the profession as a whole. As a graduate of Herman Ostrow, however, Dr. McLeod understands how the course may be intimidating for current second-year students, but reiterates that preparedness and practice can go a long way in mitigating those fears. She wants her students to gain as much exposure in the course as possible, so that they are more prepared to treat their patients safely and effectively.

Patient communication is another cornerstone of her teaching philosophy. Dr. McLeod avoids trigger words such as "shot" or "needle," focusing instead on reassurance and control. She teaches students to deliver anesthesia slowly, retract properly, and minimize discomfort by addressing factors like pressure, temperature, and pH. Practical tips, such as warming anesthetic cartridges, using buffers, or choosing carbocaine for anxious patients, help students develop both technical skill and empathy. "Confidence is key," she often reminds them, emphasizing that patients can sense a provider's comfort level.

Dr. Bilyana McLeod

Balancing teaching with clinical practice and family requires intentionality. Dr. McLeod currently works four days a week in a general practice in Eagle Rock, focusing on restorative dentistry, pediatrics, extractions, veneers, dentures, and anxious patients. Wednesdays are reserved for time with her children, while Fridays allow for shorter clinical hours. During the spring semester, she teaches pre-clinical local anesthesia and nitrous oxide on Tuesday mornings before heading to work in the afternoon. While demanding, this balance allows her to pursue the aspects of dentistry she finds most fulfilling.

Looking ahead, Dr. McLeod is passionate about strengthening emergency preparedness education in dental schools and private practices alike. She believes emergency response training should be better integrated into both curricula and practice management, emphasizing that the responsibility ultimately falls on the provider. While not every student may pursue advanced anesthesia training, she advocates for expanding opportunities such as anesthesia selectives and emergency response teams, which allow interested students to develop essential skills.

Reflecting on her journey, Dr. McLeod encourages dental students to remain curious and proactive. She urges them to go beyond minimum requirements, seek additional clinical experiences, attend conferences, and ask questions. "Dental school is the time to explore," she emphasizes. Through her commitment to preparedness, mentorship, and patient-centered care, Dr. McLeod continues to exemplify the profound impact a thoughtful and engaged dentist can have, both in the clinic and the classroom.

Problem-Solving, Persistence, and the Science Behind the Root Canal: Dr. Yoseif Haddad

By Kate Fujii & Austin Yu

A nonlinear path into dentistry

Dr. Yoseif Haddad's path to endodontics did not follow a straight line, and he would argue that's exactly why it works. Raised in Dubai and accepted into dental school straight out of high school, he instead chose to move to Canada for undergraduate studies, unsure of exactly where in healthcare he belonged. Dentistry was not an inevitable destination, but rather a decision shaped by exploration, detours, and a growing fascination with how complex systems work, whether biological, mechanical, or digital.

After being accepted to dental school in Australia, Dr. Haddad deferred a year and worked outside of academia as a photographer and warehouse associate. When he began dental school in 2017, he arrived not just as a student, but as someone who had already learned how to work, adapt, and persist: skills that would later define both his research and clinical approach.

Finding endodontics through curiosity

Endodontics captured Dr. Haddad's interest early. Not because it was easy, but because it wasn't. The specialty's demand for precision, anticipation, and problem-solving aligned closely with his personality. Every case was different, unpredictable, and required preparation rather than assumption. While oral surgery also appealed to him, endodontics offered something unique: a space where meticulous planning meets real-time decision-making.

His approach to endodontics reflects this mindset. He is known for carefully organizing his workspace, ensuring every instrument is within reach before a patient arrives. This is not about routine. It is about building predictability in an unpredictable environment. For Dr. Haddad, endodontics is less about memorizing steps and more about managing complexity.

Research that refused to be easy

Dr. Haddad's introduction to research began not through obligation, but initiative. Early in dental school, he approached his endodontic program director to ask for a research project—an ask that evolved into a 3.5-year investigation into how glycocholic acid alters the antibacterial properties of sodium hypochlorite, a foundational irrigant in root canal therapy.

What followed was anything but straightforward. Sample collection involved cutting extracted molar roots, sometimes in his own backyard, followed by sterilization, instrumentation, and bacterial culturing. Early experimental setups failed. Bacterial contamination forced restarts. One mentor told him he simply "wasn't hardcore enough." Then COVID shut everything down.

Instead of walking away, Dr. Haddad doubled down.

When the lab reopened, he prepared more than 400 agar plates, spending nights in the lab to ensure the experiment would finally work. The project ultimately culminated in publication in the Australian Endodontic Journal, but Dr. Haddad is quick to point out that the most valuable part came afterward: the peer-review process. "They rip you apart," he says, "but you come out better." The experience reshaped how he thinks, writes, and designs research questions.

Beyond the technical hurdles, research taught Dr. Haddad intellectual humility. Designing experiments forced him to confront how little control exists in biological systems, and how assumptions, no matter how reasonable, can unravel under scrutiny. The discipline of documenting failure, refining methodology, and defending choices to anonymous reviewers sharpened his analytical thinking. These lessons translated directly to endodontics, where success often depends less on confidence and more on recognizing when a plan needs to change.

Since completing that project, Dr. Haddad has co-authored a systematic review in oral surgery and a CBCT anatomical study analyzing mandibular incisors. His current research interests sit at the intersection of biology, imaging, and surgical decision-making. He is particularly interested in how advanced imaging and microbial assessment tools can guide treatment planning—measuring bacterial load before and after instrumentation, and correlating those findings with healing outcomes.

He is also drawn to emerging work in endodontic surgery, including the use of platelet-rich fibrin (PRF) in managing large periapical lesions. Questions around when to use membranes, grafts, or biologic scaffolds are not just surgical preferences, but research problems waiting to be solved. For Dr. Haddad, these unanswered questions represent the future of endodontics: evidence-driven, biologically informed, and unapologetically curious.

Becoming competitive without becoming someone else

As Dr. Haddad moved closer to applying for endodontic residency, persistence took on a new meaning. The process was not instantaneous, nor was it guaranteed. Early on, mentors reminded him that finding the right program

often takes time. Not because applicants lack ability, but because fit matters.

Rather than reinventing himself, Dr. Haddad focused on steady, measurable growth. Each year, he strengthened a different pillar of his application: deeper clinical exposure in endodontics, consistent shadowing with the same endodontist week after week, stronger letters of recommendation, and a growing body of research. By 2023–2024 alone, he had contributed to three peer-reviewed publications, including his primary project and collaborative studies across institutions.

What changed was not who he was, but how clearly that was communicated—through experience, output, and maturity. "There may not be dramatic differences year to year," he explains, "but there is always progression." That philosophy mirrors his approach to both research and clinical care: incremental improvement, built on consistency rather than shortcuts.

A global perspective on care

Training in both Canada and Australia shaped how Dr. Haddad sees dentistry. He observed stark differences in philosophy. North American endodontics often prioritize efficiency, favoring single-visit treatments and immediate surgery. In contrast, his training in Australia emphasized a more conservative, biological approach where instrumentation followed up with a six-month observation period to ensure healing before finalization.

Dr. Yoseif Haddad

During rural rotations in Australia, he worked 4 full-day shifts from 8AM–5PM every week, managing a relentless flow of patients who presented with a broad range of various conditions.

These experiences reinforced a belief that now defines his approach: there is no universal "right way" to practice, only informed decisions made honestly.

Why honesty matters

In both research and clinical care, Dr. Haddad avoids one phrase entirely: "This will be easy."

He believes dentistry, and especially endodontics, demands respect for complexity. Some of his most meaningful moments have come from difficult cases: treating patients with special needs, resolving complications, or gaining trust through honesty rather than reassurance.

"If you tell a patient it's hard and it works," he says, "you look like a hero. If you say it's easy and it's not, you lose them."

Some of the most rewarding cases in his training involved patients others hesitated to treat: those with complex medical histories, special needs, or previous complications. In these moments, technical skill mattered, but trust mattered more. Being honest about uncertainty did not weaken the patient–provider relationship; it strengthened it. For Dr. Haddad, that trust is the true outcome measure, whether in the operatory or the lab.

In the operatory: teaching through doing

In the operatory, Dr. Haddad's philosophy becomes tangible. He is deliberate about preparation, but equally deliberate about communication, especially when cases are complex or outcomes uncertain. Rather than shielding students or patients from difficulty, he believes in naming it. "Endodontics teaches you very quickly that certainty is rare," he says. "What matters is how you respond when things don't go as planned."

He carries this mindset into mentorship. Students working alongside him are encouraged to think aloud, anticipate alternatives, and accept that not every outcome can be controlled. Mistakes are not treated as failures, but as data; signals that inform the next decision. In this way, his approach mirrors his research: observe carefully, adapt early, and remain accountable to the evidence in front of you.

For Dr. Haddad, teaching is not about transferring confidence, but about cultivating judgment. The goal is not to create clinicians who never struggle, but clinicians who know how to navigate complexity without losing composure or honesty.

Curiosity as a way of life

Outside of dentistry, Dr. Haddad's curiosity extends into photography, programming, AI, and electronics. A photographer since 2009, he later transitioned into software development, building apps, servers, and AI-driven tools. One recent project involved helping a colleague preserve their voice using AI after illness. Another has him learning electronics from scratch to build a microphone, simply because he wanted to understand how it works.

For Dr. Haddad, learning is not linear, limited, or confined to one field. It is a habit.

For the student reading this

Dr. Haddad's message to student researchers is not motivational fluff. It comes from lived experience. Expect research to be slow. Expect failure. Expect to doubt yourself. None of that disqualifies you. What matters is whether you stay. For someone once told to quit, who instead learned to stay, that lesson is not theoretical. It is the foundation of everything that followed.

From Curiosity to Commitment:
Dr. Mark Urata's Lifelong Dedication to Research, Equity, and Surgical Excellence

By Alisha Patel & Mustafa Zaghmouri

Background and Early Influences

Dr. Mark Urata's path into research and surgery was not one defined by a single decisive moment, but rather by a gradual alignment of curiosity, personality, and opportunity. Raised in the Bay Area before Silicon Valley transformed the region into a global technology hub, Dr. Urata came to the University of Southern California as an undergraduate with a clear goal: to become a dentist. Orthodontics, in particular, initially captured his interest. His orthodontist seemed approachable, successful, and calm, attributes that appealed to a young student envisioning his future.

While working as a work-study student at the USC dental school, Dr. Urata matriculated directly into dental school and began to recognize that his interests were evolving. Although orthodontics was intellectually impressive, he found himself less inspired by the slow pace of tooth movement and more captivated by the swift, tangible nature of surgery. Listening to surgeons discuss cases sparked something deeper, an alignment with his personality and desire to see tangible change.

That curiosity led him to the county hospital, where he worked closely with oral and maxillofacial surgeons. There, he became involved in a research project examining sagittal split osteotomies of the mandible and testing different screw configurations for fixation strength. The work required extracting mandibles from cadavers in the county morgue, often late at night, and performing controlled surgical experiments. The resulting publication in Oral Surgery, Oral Medicine, Oral Pathology in 1989 marked his first academic paper and his formal entry into research.

This experience profoundly shaped his understanding of how scientific inquiry could directly inform clinical practice. Decades later, Dr. Urata would encounter his own work cited during a board examination, a moment that underscored the lasting impact of even early research contributions.

Reengaging with Research Through Plastic Surgery

Although Dr. Urata continued limited research during his oral surgery residency, the demands of clinical training were substantial. It was not until his time as a plastic surgery resident that he fully reengaged with research. At that time, USC's plastic surgery research infrastructure was still developing, prompting Dr. Urata to seek opportunities elsewhere.

He found himself spending nights and weekends at UCLA, gaining hands-on experience in basic science laboratories. There, he worked with molecular techniques such as gel electrophoresis, histologic staining, and developmental biology models. His research focused on adipose tissue as a source of pluripotent stem cells, an emerging and largely unexplored field at the time. These experiences reinvigorated his passion for discovery and broadened his scientific foundation beyond the operating room. That renewed commitment carried into his early faculty years and beyond, forming the backbone of a career that bridges basic science, clinical research, and translational application.

Current Research and Collaborative Efforts

Today, Dr. Urata's research portfolio reflects both depth and breadth. Working closely with Dr. Yang Chai at the Center for Craniofacial Molecular Biology (CCMB), he has contributed to a wide range of projects spanning oral surgery and plastic surgery. What began as smaller side projects evolved into significant grant-funded work, including an NIH K08 award that later transitioned into an R34 grant as part of a multi-institutional study that continues today.

In parallel with basic science research, Dr. Urata has helped build a robust clinical research engine housed primarily at Children's Hospital Los Angeles. Alongside colleagues and trainees, including co-mentors such as Dr. Jeffrey Hammoudeh, this collaborative effort produces an estimated 30 to 40 peer-reviewed publications annually. These studies leverage both large clinical volumes and long-term follow-up, allowing the team to ask questions that few others are positioned to explore.

Clinical Impact and Surgical Innovation

One of the most tangible examples of Dr. Urata's research translating directly into patient care is his work on box osteotomies for children with craniofacial syndromes such as Apert, Crouzon, and Pfeiffer syndromes. The procedure involves temporarily removing the forehead, protecting

the brain, cutting precise "boxes" around the orbits, and repositioning the eye sockets to correct severe hypertelorism.

Through extensive cadaveric studies and clinical measurements, Dr. Urata and his team investigated how skeletal movements translate to soft-tissue changes, specifically examining whether reductions in bony orbital distance correspond proportionally to decreases in the distance between the eyes. Their findings highlighted the importance of preserving what they believe to be a third limb of the medial canthal tendon, a structure often overlooked in traditional approaches.

This research has refined surgical technique, improved aesthetic outcomes, and helped ensure more natural appearances for children undergoing these complex procedures, operations that many surgeons may perform only once or twice in an entire career, if at all.

Dr. Mark Urata

Addressing Sociodemographic Disparities in Care

Beyond technical innovation, Dr. Urata's research is deeply shaped by a commitment to health equity. Early in his training at USC's safety-net hospitals, he became acutely aware of the responsibility that comes with caring for patients who have limited healthcare choices. Many of these patients traveled long distances, relied on public transportation, and faced significant socioeconomic barriers.

This awareness extended into projects examining disparities in access to care for conditions such as cleft palate repair and mandibular distraction osteogenesis. Dr. Urata also led a telehealth initiative in California's Central Valley, working with mobile dental clinics serving migrant farmworkers and their families. The goal was to determine how telemedicine could support dental screening and early diagnosis in underserved communities.

Through this work, Dr. Urata has emphasized that delayed diagnoses are often not a matter of neglect, but rather the result of systemic limitations, overburdened providers, geographic isolation, and lack of specialty access. His research seeks not only to document these disparities, but to inform policies and systems that can address them.

Research as a Tool for Better Clinicians

Dr. Urata believes that research fundamentally changes how clinicians think, regardless of whether they pursue it long-term. Research trains practitioners to constantly ask questions: Why did a complication occur? What explains an unusual presentation? Is there evidence to support this decision? This internal application of the scientific method, forming hypotheses, seeking data, evaluating evidence, occurs countless times each day in clinical practice. According to Dr. Urata, it is this mindset, more than publications or grants, that makes research invaluable to patient care.

Challenges Behind the Scenes

Despite its rewards, Dr. Urata is candid about the challenges of research, particularly for surgeons. Research requires time, and time spent in the lab often comes at the expense of clinical productivity. Even with NIH funding, compensation for research efforts rarely matches that of operative work, creating a built-in disincentive for surgeon-scientists. This reality helps explain why many research positions are filled by international scholars and why fewer surgeons commit to long-term research careers. Dr. Urata believes these financial and structural challenges must be addressed transparently if the field hopes to sustain meaningful surgical research.

Looking Ahead and Mentorship

As the field of oral and maxillofacial surgery evolves, Dr. Urata is particularly attentive to the role artificial intelligence may play in shaping patient care, for better or worse. While he acknowledges AI's potential to enhance diagnostics and treatment planning, he also cautions against its misuse and unintended consequences.

Ultimately, Dr. Urata sees mentorship as his most enduring contribution. After more than two decades in practice and thousands of cases, his focus has shifted toward training and guiding the next generation. USC's oral and maxillofacial surgery program now leads the nation in abstract presentations at national meetings, a reflection of a culture that values inquiry, accountability, and impact.

"When you're surrounded by that mindset," Dr. Urata reflects, "it becomes part of your DNA." Through mentorship, research, and service, his career embodies that philosophy, one rooted in curiosity, responsibility, and a relentless pursuit of better care for all patients.

The Growth of Orofacial Pain– Past, Present, and Future– with Dr. Douglas Wall

By Sooyeon Park and Kyle Rex

For first year dental students, the curriculum often seems straightforward: find the cavity, prepare the tooth, and restore function. However, the reality of patient care is often found in the complex intersection where dentistry meets medicine, neurology, and musculoskeletal science. Dr. Douglas Wall, DDS, FACD is a dual-affiliate educator that thrives in this multidisciplinary space. He serves as an Adjunct Instructor of Clinical Dentistry at USC's Herman Ostrow School of Dentistry and as part time faculty at the UCLA School of Dentistry's Orofacial Pain Residency. His career path serves as a testament to the importance of looking beyond the dentition, a lesson he learned early in his training and one that he now passes on to students and residents at both universities.

Born and raised in Long Beach, Dr. Wall knew he wanted to be a dentist as early as high school. After earning his biology degree at Cal State Long Beach, he attended the Loyola University Chicago College of Dental Surgery. Yet it was his return to California for a General Practice Residency (GPR) at the Long Beach Veteran's Hospital that fundamentally altered his trajectory. The program was multidisciplinary and allowed him to rotate through anesthesia and medicine. It was during this time, while working alongside oral surgeons performing surgeries on the temporomandibular joint, that his interest in the joint was first ignited. Dr. Wall reflects that graduating dental students are still in the early stages of developing clinical confidence, and that residency offers a vital opportunity to broaden experience and refine skills before transitioning into independent private practice.

Following his residency, Dr. Wall spent decades balancing a private practice in Long Beach with academic pursuits. In the late 1980s, he began working with Dr. Glenn Clark at UCLA and immersed himself in the study of the TMJ. At that time, orofacial pain was not a recognized specialty but rather a developing frontier. Dr. Wall recalls the early days being focused primarily on the ability to diagnose the etiologies of patients with mechanical issues such as clicking, popping, and limited opening. At the time, Dr. Wall and his colleagues were part of the grassroots movement that legitimized the field, passing the one of the first ever board exams administered for the field to earn his certification for orofacial pain management in 1997. Yet at that point, there were still many years to pass for the study of orofacial pain to be where it is today.

Today, Dr. Wall maintains a unique practice model that separates his general dentistry work from his specialty care, allowing him to serve as a specialized referral source for complex cases. He frequently encounters patients referred by endodontists after multiple procedures failed to resolve their pain, simply because the source was never odontogenic. In one case, a patient presented after undergoing four root canals for persistent pain that was ultimately muscular or neural rather than dental in origin. This experience lies at the heart of why Dr. Wall believes the specialty is so essential. General dentists must be able to recognize when pain arises from muscular or neural sources to prevent irreversible treatment of healthy teeth. He encourages young dentists to pursue residency

Dr. Douglas Wall

training or mentorship to develop these diagnostic skills, emphasizing that knowing what not to treat is just as important as knowing how to treat. Dr. Wall highlights the importance of differential diagnosis, noting that if your only tool is a hammer, everything looks like a nail.

Dr. Wall also specializes in sleep dentistry, where he fabricates appliances for patients diagnosed with sleep-related breathing disorders, such as obstructive sleep apnea, that manipulate the positioning of the jaw and tongue during sleep to maintain airway patency. "Sleep dentistry" is now one of several disciplines within orofacial pain, a field that reflects how interconnected the oral cavity is with the broader physiological system. With the growth of the field, the scope of orofacial pain has expanded greatly from its roots to encompass not only temporomandibular disorders and sleep dentistry, but also migraines, neuropathic pain, and muscular dysfunction. Just as the discipline of orofacial pain has grown, so has the specialty. From its grassroots start in the 1990s as a certification process, orofacial pain was only formally recognized as an official specialty when it was named the twelfth specialty in dentistry in 2020, more than two decades later.

At Herman Ostrow, pre-doctoral students and post-doctoral residents are able to gain experience combining their general dentistry knowledge with the nuances behind orofacial pain management. Dr. Wall's instruction in the school's Orofacial Pain and Oral Medicine Clinic allows students to get a comprehensive look at patient care centered around pain that goes deeper than the teeth itself. At Herman Ostrow, the Orofacial Pain certificate residency program accepts two post-doctoral students who will rotate through the Orofacial Pain and Oral Medicine Clinic, Dr. Roseann Mulligan Special Patients Clinic, and even the Keck School of Medicine of USC. Here, residents will become experts in the field of orofacial pain, mastering knowledge in topics such as headaches, sleep-disordered breathing, temporomandibular disorders, and neurogenic orofacial pain.

Dr. Wall has been highly active in organized dentistry since starting his practice, serving as a long-time member and former president of the Harbor Dental Society as well as a member of the Judicial Council for the California Dental Association. For decades, he has dedicated roughly twenty percent of his work week to volunteering through these organizations, which he views as an important counterweight to the solitude of private practice. He emphasizes that without this connection, it is easy for practitioners to become "closed in" by the daily demands of overhead, technology, and management. Drawing from his extensive experience, Dr. Wall encourages new and future dentists to take an active role in their communities and in organized dentistry, noting that joining a local dental society can greatly benefit both clinicians and their colleagues. These organizations provide opportunities for the exchange of ideas and clinical insights, as well as access to mentors who can guide young dentists through the early stages of their careers. He also highlights that the financial realities of practice ownership—including mortgages, staffing, insurance, equipment, and other accumulating costs—can be overwhelming for first-time owners, but active participation in organized dentistry allows newer dentists to connect with experienced practitioners who can help them navigate these challenges. For Dr. Wall, time spent outside the clinic is essential to staying energized, supported, and connected to the broader profession.

Looking toward the future, Dr. Wall recognizes that the field of orofacial pain will continue to evolve alongside technology. He notes that diagnostic categories change constantly, and what was called one thing ten years ago often bears a different name today. He predicts that artificial intelligence will play a significant role in medicine and dentistry moving forward, but he offers a word of caution to the next generation of clinicians. While AI can generate answers, it can also fabricate information, making the principles of evidence based dentistry more critical than ever. Dr. Wall advises students to use these tools but to remain vigilant about fact checking, ensuring that human expertise and critical thinking remain at the core of patient care.

Dr. Wall's dedication to teaching and service is inspired by his own mentor, Dr. W. Howard Davis. Dr. Davis was an oral surgeon who remained disciplined, dedicated to science, and active in writing textbooks well into his 90s. Following in those footsteps, Dr. Wall offers reassurance to the current generation of dental students who often struggle with the pressure to be flawless. He observes that many students are extreme perfectionists who critique themselves too harshly. His advice is to "give yourself some rope" and realize that while one must strive for excellence, neuroticism over a single exercise is counterproductive. For Dr. Wall, the journey from a biology student in Long Beach to a leader in a newly minted specialty was not about being perfect. It was about remaining curious, staying connected to his colleagues, and always being willing to look deeper than the surface.

Guided by Curiosity, Driven by Compassion: *The Journey of Dr. Areeg Elmusrati*

By Samy Lahdab & Seena Samimi

Chronic orofacial pain is often invisible, misunderstood by patients and providers alike, yet its impact on quality of life can be profound. For Dr. Areeg Elmusrati, understanding pain has never been limited to identifying a single source or symptom. Instead, it has become a lifelong pursuit rooted in biology, shaped by clinical experience, and guided by compassion. "I don't see pain as an isolated symptom; it's a biological, neurological, and human experience that deserves careful listening and thoughtful care," she says, capturing the essence of her clinical philosophy.

Long before she began treating patients with complex orofacial pain, Dr. Areeg Elmusrati was drawn to a fundamental question: why do certain diseases destroy tissue, alter function, and profoundly change quality of life? That curiosity first led her to oral pathology and cancer biology, and eventually to a career that bridges scientific discovery, clinical care, and education. As a resident in Orofacial Pain and Oral Medicine at the Herman Ostrow School of Dentistry, USC, Dr. Elmusrati brings a rare translational perspective to dentistry, one shaped by years of research, teaching, and a deep commitment to understanding pain beyond its symptoms.

Global Perspective and Early Influences

Dr. Elmusrati's journey into dentistry was shaped early by a global and interdisciplinary outlook. Born and raised in the United States, native of Libyan heritage, she developed a strong sense of identity that emphasized resilience, education, and service. Dentistry, for her, was never simply about restoring teeth; it was a gateway to understanding disease as a biological, social, and human experience. This philosophy would become the throughline of her academic and clinical career.

She earned her dental degree from the University of Tripoli, where her interest in disease mechanisms and diagnostic reasoning began to take shape. Rather than pursuing a conventional clinical path, she was drawn to oral pathology, a specialty that demanded rigorous scientific inquiry and offered insight into how disease alters tissues at the microscopic and molecular levels. That curiosity led her to the United Kingdom, where she pursued advanced training at the University of Sheffield's School of Clinical Dentistry, one of the few prestigious institutions offering specialized postgraduate education in Diagnostic Oral Pathology.

Translational Research and Clinical Implications

At Sheffield, Dr. Elmusrati immersed herself in both scholarship and teaching. "Teaching is not separate from discovery. It's how we shape clinicians who can think critically, collaborate across disciplines, and care with empathy," she reflects, emphasizing how her approach to mentorship informs her research and clinical work. She completed a Master of Medical Science (MMedSci) in Diagnostic Oral Pathology with Honors and was subsequently offered a position as a PhD candidate. Her doctoral research focused on the mechanisms of bone invasion in oral cancer, specifically examining the role of cancer-associated fibroblasts in driving aggressive tumor behavior. This work addressed a critical clinical challenge in oral oncology: the destructive invasion of cancer into surrounding bone, which often necessitates extensive surgical resection and profoundly affects patients' quality of life.

Her research quickly gained international recognition. Within months of beginning her PhD, Dr. Elmusrati published her findings in the British Journal of Cancer, contributing new insight into the tumor microenvironment and its role in cancer progression. Yet for her, the impact of this work extended beyond publication. Studying bone invasion brought into focus the devastating functional and sensory consequences of cancer pain, disfigurement, and loss of basic oral function that patients endure long after treatment ends. This realization would later shape her clinical direction.

Following the completion of her PhD, Dr. Elmusrati continued her academic training in the United States, undertaking a postdoctoral fellowship in oncology and cancer biology at the University of California, Los Angeles (UCLA) School of Dentistry. There, she expanded her translational research experience, working at the interface of laboratory science and clinical relevance. The fellowship further sharpened her understanding of how cancer therapies, particularly chemotherapy and immunotherap,y can give rise to long-term orofacial complications, including chronic pain syndromes that are often underrecognized and undertreated. Her scholarly work has been widely recognized through awards and invited presentations at national and international conferences, positioning her as an emerging voice at the intersection of research, clinical care, and education.

Bridging Cancer Biology and Pain Medicine

It was during this period that Dr. Elmusrati began to see a clear convergence between her background in cancer biology and an emerging interest in pain medicine. She observed that many cancer survivors struggled with persistent orofacial pain, neuropathic symptoms, and functional impairments long after their disease was in remission. "Many patients with chronic orofacial pain fall between specialties. My goal is to help bridge those gaps clinically and scientifically," she explains. "Orofacial pain patients often feel invisible. Many have lived with unresolved symptoms for years, affecting their sleep, diet, relationships, and mental health. My approach is to give them space to be heard, understood, and supported." The complexity of their

conditions resonated with her long-standing interest in mechanisms of disease and quality of life.

This convergence ultimately led her to pursue advanced clinical training in Orofacial Pain and Oral Medicine at USC's Herman Ostrow School of Dentistry. At USC, Dr. Elmusrati found an environment that valued interdisciplinary care, scientific inquiry, and academic leadership. As a senior resident, she integrates her extensive background in oral pathology and cancer research into the diagnosis and management of complex craniofacial disorders, including temporomandibular joint disease, neuropathic pain, headache disorders, and pain associated with systemic illness.

A Person-Centered Approach to Care

Her clinical approach is deeply informed by her research training. Rather than treating pain as an isolated symptom, she views it as a manifestation of underlying biological, neurological, and psychosocial processes. "One of my guiding principles is: 'We treat the person, not just the pain,'" she notes, emphasizing that comprehensive care requires addressing the whole individual. This perspective allows her to develop comprehensive, individualized treatment plans that prioritize both function and patient experience. Colleagues and trainees alike recognize her ability to synthesize complex information and translate it into thoughtful, evidence-based care.

Mentorship and Education at USC

In addition to her clinical responsibilities, Dr. Elmusrati plays an active role in education at USC Ostrow. She is involved in teaching dental students, emphasizing diagnostic reasoning, interdisciplinary collaboration, and compassionate patient care. Drawing from her own journey, she encourages trainees to see dentistry as an evolving medical discipline, one that demands lifelong learning and intellectual curiosity. Her mentorship style reflects her belief that strong clinicians are shaped not only by technical skill but by the ability to think critically and empathetically.

Dr. Elmusrati is also deeply engaged in research at USC, where she continues to explore questions at the intersection of pain, anatomy, and function. She is currently involved in developing innovative approaches that integrate clinical assessment and ultrasound imaging to better understand temporomandibular joint and masticatory muscle disorders. Part of this research is student-driven and directly supports her teaching: students learn to visualize live anatomy, interpret physiologic data, and connect knowledge to clinical scenarios through ultrasound-based protocols. Beyond ultrasound, her team has modernized patient education materials, transforming outdated handouts into AI-generated, visually engaging resources that improve patient understanding. Students have also developed an Instagram page dedicated to educating the public on temporomandibular disorders, enhancing both community outreach and student skills in communication and digital literacy. These efforts reflect her broader goal of advancing diagnostic precision in orofacial pain, improving outcomes for patients with complex conditions, and fostering the next generation of clinician-scientists. "The future of dentistry lies in integration of science and care, research and teaching, precision and compassion," she asserts, encapsulating the guiding philosophy of her work.

Vision for Academic Dentistry

Looking ahead, Dr. Elmusrati envisions a career in academic dentistry that seamlessly integrates clinical care, research, and education. Her long-term interests include chronic orofacial pain, cancer survivorship, and the long-term effects of oncologic therapies on craniofacial structures. She is particularly committed to addressing pain conditions that disproportionately affect vulnerable and overlooked populations whose symptoms are often minimized or misunderstood.

She also sees education as a powerful vehicle for change. By training future dentists to approach pain and disease through a multidisciplinary lens, she hopes to shift how these conditions are recognized and managed within the profession. Her aspiration is not only to contribute new knowledge, but to help shape a generation of clinicians who are equipped to deliver humane, evidence-based, and patient-centered care.

Integrating Curiosity, Purpose, and Impact

Reflecting on her journey, Dr. Elmusrati views each stage of her training as interconnected rather than linear. From pathology to cancer biology, from research to pain medicine, each step deepened her understanding of how disease affects the human experience. At USC Ostrow, she has found a place where these threads converge, allowing her to pursue a career defined by curiosity, purpose, and impact.

For Dr. Elmusrati, dentistry is ultimately about restoring more than oral health. It is about alleviating suffering, preserving dignity, and advancing knowledge in service of patients. As she continues her work as a clinician-scientist and educator, her career reflects the very spirit of USC Trojans. A commitment to pushing boundaries, asking meaningful questions, and improving lives through discovery and care.

Dr. Areeg Elmusrati

Bridging Digital Innovation, Thoughtful Diagnosis, and the Future of Orthodontic Education: Dr. Glenn Jou

By Talar Kevorkian and Nicholas Hy

At the Herman Ostrow School of Dentistry of USC, orthodontics is increasingly defined by a blend of digital innovation, evidence-based diagnosis, and a deep commitment to mentorship. Few faculty members embody this balance as fully as Dr. Glenn Jou, D.D.S., Assistant Professor of Clinical Dentistry and a recent graduate of USC's Orthodontics Residency Program. With a background rooted in both international dental training and cutting-edge clinical research, Dr. Jou represents a new generation of academic orthodontists—bridging conventional techniques with the latest in digital advancements.

A Foundation Built on Family and Early Exposure

For Dr. Jou, dentistry was never a distant or abstract career option. Growing up in Taiwan and New Zealand, in a family of dentists and physicians, he was immersed in the profession from an early age. His father is an orthodontist, and his mother is a pediatric dentist—both graduates of USC's dental programs in 1994—making the Trojan connection a long-standing family tradition.

"I kind of grew up around it," Dr. Jou reflects. "I started working in my father's orthodontic practice when I was in high school, so I was naturally drawn to the profession."

The early exposure to dentistry shaped not only his interest in dentistry, but also his long-term vision. Even as a dental student, Dr. Jou knew he wanted to specialize in orthodontics and potentially pursue a career in academia. Teaching, mentoring, and contributing to the advancement of the field were always part of the plan.

Dental Education in Taiwan and a Unique Internship Experience

Dr. Jou earned his dental degree from Taipei Medical University, graduating with the Presidential Award for Academic Excellence, the highest academic honor of his class. Following dental school, he completed a one-year hospital-based dental internship at National Taiwan University Hospital in 2021.

This experience reinforced his clinical foundation and further clarified his interest in orthodontics—particularly the diagnostic thinking that underpins long-term treatment planning.

Finding a Home at USC Orthodontics

In 2021, Dr. Jou moved to Los Angeles to begin his orthodontics residency at USC. What he found was a program that not only sharpened his clinical skills, but also shaped his identity as an educator. "The faculty members really made the difference," he says. "They're incredibly supportive. I feel comfortable texting any of them with questions, even now."

As a self-described introvert, Dr. Jou valued the culture of openness within the program. "Asking questions doesn't always come naturally to me, but the people at USC have always been supportive and willing to help. That environment really shaped me as a clinician." During residency, he found particular joy in mentoring junior residents. "I liked seeing things click for people—that epiphany moment. I enjoy helping others learn and grow."

Originally, Dr. Jou planned to return to Taiwan to work with his father after residency. But during his final year, he was offered the opportunity to stay on as faculty—a prospect that aligned perfectly with his long-held academic aspirations. In a full-circle turn, he later helped recruit his father to join the program as an adjunct faculty member, mentoring orthodontic residents. "I had a blast during my three years of residency," he says. "When they asked me to stay, I knew I wanted to continue working with such friendly, supportive people."

Transitioning from Resident to Faculty

In 2024, Dr. Jou officially joined the USC faculty as a Full-Time Assistant Professor of Clinical Dentistry and a Faculty Orthodontist in the USC Faculty Practice, shortly after graduating the residency program himself. The transition from resident to faculty came with unique challenges—especially given how recently he had been in the residents' shoes.

"It was different going from being called by my first name to being called Dr. Jou," he admits with a smile. "This coming May, my last group of co-residents will graduate." At the same time, being close in age to current residents has become one of his greatest strengths. "I'm closer to their stage in my career. Residents are more willing to ask questions because the barrier is lower," he says. Perhaps more importantly, his recent experience allows him to advocate for residents at the program level. "I remember what was confusing or overwhelming. Now I'm part of the team that can make changes to the program, and I still try to think like a resident when making decisions."

Teaching Philosophy and Core Courses

Dr. Jou is deeply involved in orthodontic education at USC, serving as course director, co-director, or instructor for multiple core classes. Among them is ORTH 704: Seminar—Orthodontics in Theory and Practice, a course designed to prepare residents for the American Board of Orthodontics (ABO) examination. He also teaches ORTH 721: Biomechanics and Ortho-

dontic Technique, a foundational course for first-year residents. "It's about the basics of orthodontic tooth movement from a biomechanical standpoint," he says. "You need a strong foundation before you can do anything advanced."

Across all his teaching, Dr. Jou emphasizes diagnosis-driven treatment planning. "Orthodontic treatment requires planning ahead," he notes. "You don't want to make a hasty plan. A solid system and foundation are everything."

Clinical Practice: A Digital-Forward Approach

Outside the classroom, Dr. Jou splits his time between teaching Monday through Thursday and seeing patients in the USC Faculty Practice on Fridays. The Faculty Practice clinic runs much like private practice, albeit at a slower pace—three to four chairs and anywhere from 15 to 40 patients per day—though the patient population is notably different.

"Most orthodontic practices see a lot of kids and teenagers," he says. "In faculty practice, most of our patients are adults, predominantly USC staff, faculty and PhD students." Approximately 70% of his cases are treated with Invisalign, reflecting both patient demographics and his interest in digital orthodontics. Still, he emphasizes that technology does not replace fundamentals. "Orthodontics is becoming a lot more digital, but there's still a craft to it," he says. "Technology is a tool, but it doesn't replace diagnosis."

Research Focus: Accuracy, Equity, and Clinical Relevance

Dr. Jou's research portfolio centers on digital accuracy and clinical applicability, particularly in cone beam computed tomography (CBCT) and intraoral scanning. One area of focus involves retrospective CBCT studies examining anatomical variability on infrazygomatic crest (IZC) miniscrew planning in Hispanic adults, addressing a significant gap in the literature.

The study evaluates cortical and total bone thickness at various insertion angles, aiming to improve safety and predictability in skeletal anchorage for Hispanic patients. In parallel, Dr. Jou is advising a prospective clinical trial examining the accuracy of interproximal space detection using the iTero Lumina® intraoral scanner. The study investigates whether saliva presence affects scan accuracy—a real-world question with direct clinical implications.

"Sometimes when there's saliva, you can't see interdental spaces clearly," he notes. "We want to know if drying is truly necessary or if modern scanners can compensate."

Dr. Glenn Jou

Digital Planning, AI, and the Future of Orthodontics

Dr. Jou is particularly passionate about digital treatment planning, especially for complex interdisciplinary and craniofacial cases. By creating fully segmented 3D digital patients, clinicians can refine treatment plans collaboratively and dynamically. "This is extremely beneficial for orthognathic surgery and craniofacial cases," he says. "You're no longer interpreting 3D problems from 2D images."

He has presented posters on digital workflows and has worked extensively with AI-assisted tools for research applications, including segmentation of CBCT scans and superimposition of intraoral scans.

While AI is not yet fully implemented in routine orthodontic clinics, Dr. Jou sees its value in treatment evaluation and standardization—particularly in cephalometric tracing. "Tracing can be subjective," he explains. "AI can help standardize it, but I still value manual tracing to emphasize specific landmarks."

Life Outside the Clinic

Outside of dentistry, Dr. Jou has always gravitated toward physically and mentally engaging hobbies. Growing up, badminton was a major part of his life—he played competitively from childhood through dental school.

Since moving to Los Angeles, he has taken up indoor bouldering, climbing weekly, and continues to indulge his interest in technology, 3D printing, and AI. He also attends conferences outside of dentistry, including large-scale AI and computer graphics events like the SIGGRAPH conference in Los Angeles. "I think it's important to see what's happening outside our field," he says. "A lot of ideas translate back into orthodontics."

Advice for Residents: Slow Down to Get It Right

When asked what he hopes residents take away from working with him, Dr. Jou cites a saying passed down from his grandfather: haste makes waste. Dr. Jou recognizes the importance of taking the time to analyze and assess when constructing an orthodontic treatment plan. "You want to do things fast," he says, "but sometimes you have to slow down—especially in orthodontics."

While many aspects of orthodontic treatment may become automated in the future, diagnosis remains irreplaceable. "That's the hardest part," he emphasizes. "And it's not something you want to rush."

In both his clinical practice and academic career, Dr. Glenn Jou exemplifies thoughtful, forward-looking orthodontics—grounded in precision, mentorship, and a commitment to doing things the right way, even if it takes a little longer.

Shaping Pediatric Dentistry Through Care, Creativity, and Advocacy

By Anaya Lahdab and Jasmine Shafa

Dr. Angela Navas is a board certified pediatric dentist whose career spans clinical care, teaching, and advocacy. She serves as an adjunct faculty member at the University of Southern California Herman Ostrow School of Dentistry, an attending pediatric dentist at Children's Hospital Los Angeles, and an associate pediatric dentist in private practice. Across these roles, she prioritizes prevention, thoughtful communication, and an unwavering focus on the child behind the chart.

She completed her Certificate in Pediatric Dentistry at USC from 2022 to 2024 after earning her DDS from the University of the Pacific Arthur A. Dugoni School of Dentistry, where she graduated in the top of her class. While her credentials reflect excellence, they only tell part of the story. What defines Dr. Navas most is the intentionality with which she chose dentistry and the care with which she continues to shape her role within it.

Finding Dentistry at the Intersection of Science, Art, and Balance

Dr. Navas grew up in Seattle, Washington in a household immersed in science. Both of her parents were involved in wet lab research, so her exposure to research and the sciences was constant. Despite being immersed in the sciences from a young age, she sought more than the solitary work that is often found in basic science research. This led to her shadowing in different healthcare fields that provided the intersection of science and working with others.

Dentistry offered a balance that drew her in. It provided meaningful care through precision and problem-solving. This practical approach resonated with another lifelong passion, art. From childhood, she gravitated toward sculpture, three-dimensional art, and hands-on crafts, attending camps that fostered patience and meticulous skill. Dentistry felt intuitive because it blended science and creativity while allowing her to work with her hands. She often reflects that, in another life, she would pursue ceramics, a medium that mirrors her appreciation for patience, refinement, and mastery through repetition.

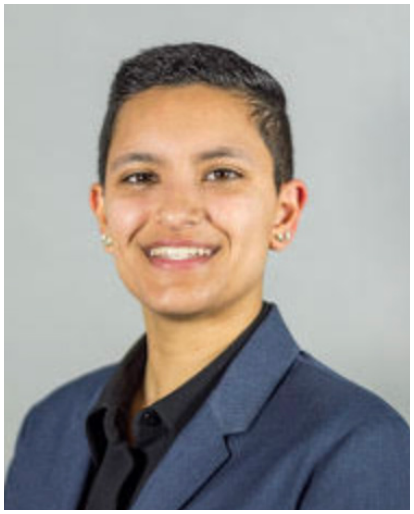
Despite these influences, Dr. Navas did not decide on dentistry immediately. She did not come from a family of dentists, and her path became clear only in the latter half of her undergraduate education at UCLA. Proactive outreach connected her with alumni and led to mentorship with an oral surgeon during her gap year. This experience solidified her commitment and allowed her to envision herself within the profession.

Discovering Pediatric Dentistry and the Power of Early Experiences

Dr. Navas' path to the pediatric specialty evolved gradually, as she did not initially see herself working with children. However, that perspective shifted after taking the pediatric dentistry course, which highlighted the depth and complexity of working with kids, understanding growth and development, emphasizing caries prevention over treatment, and behavior management. Her desire to pursue pediatric dentistry was further solidified during dental school after her first restorative procedure on a five-year-old patient. Observing faculty guide the interaction and demonstrate behavioral management transformed her understanding of pediatric care.

She realized that working with children comes with a unique responsibility. Unlike adults, pediatric patients cannot make healthcare decisions for themselves. Establishing trust, managing fear, and creating a positive experience requires patience and intentionality. Behavioral management is foundational in pediatrics, and she understood that building trust with a young child is about shaping how that child perceives dentistry for life.

This realization drew her towards prevention and early habit formation rather than simply treating caries. She became invested in intercepting disease early and helping families develop routines that support long-term oral health. Prevention, she came to see, is both clinically effective and ethically important, especially for families managing financial strain or competing medical priorities.



Dr. Angela Navas

Working with Families: Empathy, Boundaries, and Responsibility

Dr. Navas emphasizes the complexity of working with parents and caregivers, especially with families with children with special health care needs. Families are deeply invested, but may not always have the knowledge to make fully informed decisions or make positive changes to improve their child's oral health. She guides families through evidence-based anticipatory guidance while providing customization of her recommendations based on the child and their needs.

High-stakes situations, such as cases requiring treatment under general anesthesia, require careful preparation. She explains potential outcomes, including the need for extractions or full-coverage restorations, and supports families through the emotional impact. She holds firm to a guiding principle: every decision must prior-

itize safety and the child's long-term well-being. She views these moments as a profound responsibility that requires both clinical skill and emotional intelligence.

Leadership, Privilege, and Cultural Humility

Dr. Navas does not define leadership by titles. Throughout dental school and residency, she focused on involvement and authenticity rather than positions. She believes genuine engagement and consistent presence open doors organically. Over time, she developed confidence in seeking mentorship and advocating for herself and others.

She is thoughtful about how her background shapes her approach to care. Growing up with relative privilege, she recognizes that many families face barriers she did not encounter. She sees this as a responsibility to listen closely, explain clearly, and adapt care to each family's circumstances. Raised in a multilingual and multicultural environment and identifying as Hispanic, White, and Persian, Dr. Navas is comfortable working with non-native English speakers and Spanish-speaking families. This experience reinforces her belief that effective care requires cultural humility, flexibility, and a willingness to meet families where they are.

Advocacy and Understanding the Systems that Shape Care

Advocacy became a defining part of her professional identity during residency. Participation in AAPD Advocacy Day, CDA Advocacy Day, and pediatric oral health conferences revealed how policy affects access, reimbursement, and clinical feasibility, particularly for children with special healthcare needs including those diagnosed with craniofacial anomalies.

She learned that advocating is not only about speaking for patients, but also about educating policymakers. When providers remain unheard, progress stalls. Her work with children affected by cleft lip and palate, and other craniofacial conditions showed how delays can lead to poorer outcomes. For Dr. Navas, advocacy is inseparable from clinical responsibility.

Residency Training at USC and Caring for Medically Complex Patients

Dr. Navas chose USC for her residency because of the program's breadth and exposure to diverse clinical settings. Working across multiple sites challenged her to synthesize approaches and develop a clinical style rooted in adaptability. She valued being presented with multiple perspectives and learning how to determine what worked best for her patients.

Caring for patients with special healthcare needs, including children undergoing chemotherapy, heart transplant recipients, and oncology patients, transformed her clinical experience. These encounters increased her comfort with complex cases and reinforced the importance of interdisciplinary collaboration.

As Resident Liaison to the USC Pediatric Dental Association, she strengthened connections between residents and a robust pediatric alumni network. Organizing dinners, training sessions, and networking events created mentorship opportunities that often translated into employment after graduation.

Clinical Practice, Teaching, and Education

Today, Dr. Navas balances clinical care at CHLA, private practice in Huntington Beach, and teaching at USC. At CHLA, she functions as an attending provider for children with special healthcare needs. At USC, she teaches through clinic and sedation cases, emphasizing clinical reasoning. In private practice, she treats a routine patient population, characterized by lower caries rates, higher daily volume, and different parental expectations.

She values the contrast between collaborative hospital and academic environments, where colleagues are available for consultation, and private practice, where decisions must be made independently. Both settings sharpen clinical judgment in complementary ways. Her approach to teaching is informed by her residency and undergraduate education studies. She strives to make learning practical and efficient, recognizing that residents balance clinical demands, studying, and call. She views teaching as a service that builds confidence and fosters engagement, hoping to inspire future educators.

Research Grounded in Clinical Reality

Dr. Navas' research is driven by clinical relevance. During the COVID-19 pandemic, she co-created the "Karaoke Inspired Anesthesia" video to increase engagement and reinforce key principles of local anesthesia. The project focused on memorability, repetition, and technique to enhance skill acquisition during limited in-person instruction.

Her earlier research on reinforced glass ionomer restorative materials examined their mechanical properties and clinical applicability. This work challenged assumptions about the limitations of RMGIs and highlighted scenarios where they may be appropriate alternatives to composite, particularly for young or uncooperative patients. Her recent poster on dental anomalies in patients with Pierre Robin sequence following mandibular distraction osteogenesis reflects her clinical exposure at CHLA. Examining how early airway interventions affect long-term dental development highlights the importance of interdisciplinary awareness and early planning. These findings reinforce her evidence-based focused philosophy.

Looking Ahead: Teaching, Advocacy, and Impact

Dr. Navas envisions a career integrating clinical care, education, and advocacy. She hopes to expand her role as an educator through lectures and curriculum development to improve learner engagement and confidence. While research is not her primary focus, she remains committed to producing knowledge that informs real-world pediatric care.

Her advice to future dentists, especially those considering pediatric dentistry, is simple and intentional: genuinely love the work. Children's early experiences shape their lifelong perception of dentistry, and without attention to their psychological well-being, providers risk doing more harm than good. She emphasizes empathy, prevention, knowing when to refer, and maintaining a patient-centered mindset.

Through intention, humility, and care, Dr. Angela Navas continues to shape pediatric dentistry not through volume or visibility, but through thoughtful presence, one child, one family, and one learner at a time.

Preserving Natural Dentition Through Education and Prevention: Dr. Theresia Laksmana

By Nelita Barbara Santos & Emma Kraft

Dr. Theresia Laksmana's story feels familiar in the best way. It is grounded in family, strong mentors, and the kind of consistency that shows up in both patient care and teaching. Born in Indonesia and raised in Los Angeles, she grew up in L.A. while staying closely connected to her family and community. Early on, she knew she wanted to work in healthcare, but she also wanted a career that would allow her to be present at home. For a time, she considered psychiatry, but later realized that dentistry was a better fit for her goals, giving her the chance to care for patients while still maintaining balance with family life.

She completed her undergraduate education at the University of Pennsylvania in Philadelphia, then headed to the East Coast again for dental school at Tufts University. Although she loves Los Angeles, she also described wanting to experience something different, stepping outside what was familiar, and seeing where life would take her. In a way, that willingness to explore became a theme throughout her career: learn, grow, then bring that experience back into the communities and institutions that matter most.

Education and Path to Periodontics

After college, Dr. Laksmana took a year to reflect and decide what direction she wanted to take long-term. During that time, she participated in research at UCLA, where she met a mentor who became deeply influential in her path, a PhD periodontist she described as a "rock star." That mentorship gave her early exposure to periodontics and helped her see the specialty as more than just a subject in the curriculum. It became something that made sense for her both intellectually and personally.

While she was in dental school in Boston, her mentor also helped connect her to additional research opportunities, allowing her to continue exploring periodontics during her training. Between that early exposure and her research experience, she began to feel confident that this was the specialty for her. Periodontics was not just interesting, it felt right. She later applied to the periodontology program at USC and went straight into residency, already knowing she enjoyed the surgical side and did not feel the need to delay that path.

She completed her periodontal residency at the Herman Ostrow School of Dentistry of USC, returning home to Los Angeles for specialty education and finding a strong sense of belonging within the department. She speaks about the faculty not only as colleagues, but as people she genuinely enjoys being around. That connection to the department is one of the reasons she later returned to USC as a faculty member.

After residency, she spent two years teaching in San Francisco, an experience that strengthened her interest in academic dentistry and reinforced her passion for educating the next generation of clinicians. Eventually, she returned to Los Angeles, where she now balances academic leadership, teaching, and private practice.

Role at USC and What She Teaches

Dr. Laksmana currently serves as the Predoctoral Periodontics Program Director at USC. In this leadership role, she helps guide periodontal education across the predoctoral curriculum and supports students as they develop both skills and clinical judgment. She emphasizes that periodontal care does not exist in isolation, and that strong communication between specialties is essential for long-term success. Working in academia has allowed her to build close relationships with clinicians in other fields, both at USC and in private practice, which helps reinforce the importance of multidisciplinary treatment planning. She also remains clinically active in private practice, which allows her to stay connected to real-world patient care while remaining deeply invested in teaching.

She described how her schedule evolved over time. For years, she balanced part-time academics with part-time private practice, then transitioned to a more full-time academic role while still maintaining private practice about once a week. She was also candid about the reality behind that balance. Dentistry is physically demanding, and she remembers how difficult the early years after residency were on her body. The volume of surgery took a toll on her back, and over time, that physical reality, along with motherhood, shaped how she thinks about sustainability in the profession.

Why Periodontics and What She Loves About It

Dr. Laksmana's reasons for choosing periodontics are both honest and practical. She shared that blood never bothered her, and that she enjoys the focus and precision of surgical procedures. She also values tangible outcomes, when a procedure goes well and healing follows as expected. There is a specific satisfaction in periodontics when treatment works, when inflammation decreases, and when patients begin to recognize what stability feels like.

While surgery is often perceived as the most complex part of periodontics, Dr. Laksmana believes patient education is the true challenge. Procedures may correct structural problems, but long-term success depends heavily on daily habits, maintenance, and patient understanding. Whether performing deep cleanings, soft tissue grafts, or osseous surgeries, she emphasizes that outcomes rely largely on

what patients do at home after leaving the chair.

She defines successful periodontal treatment not by perfect clinical numbers alone, but by improving the patient's quality of life. Reduced discomfort, improved function, and better understanding of disease processes all contribute to meaningful care, even when ideal textbook outcomes are not always achievable. "If you've improved a patient's quality of life, you know you've done something right," she explains.

From her perspective, preserving natural dentition whenever possible remains the ideal goal. She encourages students to value conservative treatment options and to consider long-term outcomes, especially in environments where marketing and patient expectations may emphasize speed and immediate esthetic results. She stresses the importance of understanding the scientific literature behind new materials and techniques in order to avoid being influenced by marketing or products that do not offer benefit for the patient. She also questions the growing emphasis on speed in treatment, explaining that cutting corners to save a few months does not make sense when the goal is for results to last for decades. In her view, taking the time to follow sound biological principles leads to more stable and predictable long-term outcomes.

Dr. Theresia Laksmana

Learning Beyond the Clinic: Evidence and Mentorship

Dr. Laksmana shared a refreshing perspective on evidence-based dentistry. In her view, periodontics has always been rooted in evidence and that this foundation should be assumed rather than redefined.

The specialty has "mountains of literature" behind it, and learning how to evaluate studies is essential, especially when marketing can frame products or techniques as "proven" without real long-term support.

When asked what she finds most rewarding about teaching, her answer was immediate: "When it clicks." She loves watching students evolve from second year to fourth year, not only gaining hand skills, but developing critical thinking. The best moments are when students begin to understand how everything fits together, how periodontal health supports all of dentistry, and how patient outcomes depend on consistent, thoughtful care.

She also spoke about how much mentorship matters, especially during the transition from dental school into practice. She shared that she has raised the idea of creating a more formal mentorship structure at the school, and that in the survey project she is currently working on, one of the main findings was that students and recent graduates want more one-on-one guidance. She recognizes the challenge of implementing this at a large institution, but believes structured support could make a meaningful difference.

Personal Side and Closing Reflection

Outside of school, Dr. Laksmana places a strong emphasis on being present for her daughter. She spoke openly about how difficult it is to balance career and motherhood, even though people often say you can "have it all." Her daughter will not always want her in the same way, she explained, and she wants to be there while that window is still open. At the same time, she also wants her daughter to see her as a role model, a woman who works hard, continues to grow, and builds a meaningful career.

For her own "me time," she ends each day reading fiction on her Kindle. She also prioritizes exercise, not only for wellness, but because dentistry is physically demanding and longevity in the profession requires caring for your body.

She recognizes that juggling work and home life can be challenging, but she believes that prioritizing both her family and her career is an important example to set for her daughter. Her goal is to strike a balance between being there for her daughter while also being a role model to her.

As her parting advice to students, Dr. Laksmana encourages them to go beyond minimum requirements. Dental school is exhausting, but it is also short. She wants students to take advantage of resources that will not be available after graduation, to learn more, assist more, volunteer more, and build confidence while they are surrounded by faculty and specialists who can guide them. In her view, education never reaches a final finish line. "Whatever our best is, it always has to keep getting better."

Balancing Life and Occlusion: Dr. Tae Jun Ahn

By Justin Shimizu and Megan Huh

A Trojan Through and Through

Nominated as the featured faculty member for Herman Ostrow School of Dentistry's Advanced Prosthodontics division, Dr. Tae Jun Ahn is recognized for his decades long commitment to training the next generation of advanced prosthodontics residents at one of the most formative stages of their professional education. For many residents entering the program, Dr. Ahn is among the first faculty members they encounter, helping to orient them not only to the technical demands of the specialty, but also to the mindset required for success. Since beginning his teaching role in 2004 as an instructor for Orientation to Advanced Prosthodontics and Advanced Fixed Prosthodontic Technique, Dr. Ahn has remained a constant presence within the program. However, his relationship with USC extends far beyond the classroom.

Dr. Ahn's journey at USC began in 1988, when he enrolled at the Viterbi School of Engineering. There, he pursued a Bachelor of Science in Electrical Engineering, graduating in December of 1991. Although his early academic training lay outside dentistry, the analytical foundation developed during this time would later influence his approach to diagnosis, treatment planning, and problem solving. He went on to complete his doctoral education at the Herman Ostrow School of Dentistry of USC, earning his DDS in 1996. Rather than leaving the university after graduation, Dr. Ahn continued his path as a Trojan, completing USC's Advanced Prosthodontics program and formally entering the specialty of prosthodontics.

His commitment to lifelong learning did not end with specialty training. Dr. Ahn pursued postdoctoral certification through the American Board of Prosthodontics, earning Diplomate status, a distinction that reflects advanced clinical knowledge and professional dedication. He later completed a master's degree in Geriatric Dentistry, further expanding his understanding of comprehensive, patient centered care across the lifespan.

For Dr. Ahn, USC has become far more than an institution. He often describes it as being in his blood, a place that feels deeply like home. After more than thirty years of affiliation, it is the sense of community, shared purpose, and the way Trojans consistently look out for one another that continue to anchor him to the program. This continuity and support, he explains, are central to why he has remained committed to USC throughout his career.

Calling the Plays

When asked what first sparked his interest in prosthodontics, Dr. Ahn points to the specialty's unique position as the final stage of restorative care. Prosthodontics allows clinicians to oversee the full arc of treatment planning, integrating surgical, periodontal, orthodontic, and restorative considerations into a cohesive vision. It also offers the opportunity to deliver the final outcome to the patient, bringing complex interdisciplinary planning to completion.

"We always compare prosthodontics to football," Dr. Ahn explained, "where the prosthodontist is the quarterback who calls the plays." In this role, prosthodontists coordinate care across specialties while maintaining responsibility for the overall treatment direction. They must anticipate challenges, adapt to changing conditions, and balance ideal outcomes with realistic limitations. For Dr. Ahn, being able to see both the process and the final result is what makes the field especially meaningful.

While Dr. Ahn's passion for prosthodontics is evident, his dedication to teaching is equally strong. His desire to pass on the knowledge gained from mentors and personal experience is a central reason he has devoted decades to USC and its students. Having benefited from strong mentorship himself, Dr. Ahn understands the lasting impact a thoughtful educator can have on a student's development. He was trained by renowned prosthodontist Bernard Levin, whose influence continues to shape Dr. Ahn's clinical philosophy and approach to education. Many of the principles and techniques learned during his training remain integral to his practice today.

Dr. Tae Jun Ahn

Many Paths to the Summit

Dr. Ahn acknowledges that becoming an effective educator did not come easily. Like many clinicians who transition into teaching, he had to learn how to translate experience into instruction that resonated with learners at different stages. Over the years, he has continually adapted his teaching methods to better serve his students, guided by the belief that good teaching requires flexibility and open mindedness from both instructor and student.

He encourages residents entering the prosthodontics program to approach their training with humility and curiosity, willing to temporarily set aside familiar habits in order to explore new methods and perspectives. "There are many ways to reach the summit," Dr. Ahn explained. "The challenge is that a student may only know one path, and that path may be very easy or very difficult. Learning different paths helps them determine which approach works best."

This philosophy is especially important during the early months of the Advanced Prosthodontics program, when residents arrive with diverse educational backgrounds and clinical experience. Some enter directly from dental school, while others return after years in private practice with established routines and preferences. Rather than asking residents to discard what they know, Dr. Ahn encourages them to temporarily set it aside, creating space to engage with unfamiliar approaches and perspectives.

Exposure to multiple faculty members and teaching styles is a deliberate component of his educational approach. By working with different instructors and observing varied techniques, residents begin to understand that prosthodontics rarely offers a single correct solution. Clinical decision making often involves weighing risks, understanding limitations, and choosing the most appropriate option for each individual patient. Over time, residents are encouraged to synthesize these perspectives and develop a clinical approach grounded in their own judgment rather than imitation.

The Stick and Carrot Approach

As residents progress through the program, Dr. Ahn believes that meaningful growth requires more than exposure to different perspectives alone. Openness must be paired with guidance and accountability to ensure that judgment and technical skills develop together. To achieve this balance, Dr. Ahn employs what he refers to as the "stick and carrot" approach to teaching. While he acknowledges that finding the right balance between encouragement and correction is not always easy, he views both as essential components of effective education. "When residents are doing well, you need to recognize that and encourage them as much as possible," he explained. Positive reinforcement helps residents build confidence and recognize successful decision making. At the same time, mistakes must be addressed directly, not to discourage, but to prevent small errors from becoming ingrained habits or leading to more serious consequences.

"But when they make a mistake," Dr. Ahn continued, "we need to recognize it, evaluate how serious it is or how serious it could be, and then determine how to approach it." This evaluation process is central to his teaching philosophy. Not all mistakes carry the same weight, and understanding their potential impact helps residents develop clinical judgment, rather than fear of failure. From there, Dr. Ahn tailors his response to the individual resident. Recognizing that each student has a distinct learning and communication style, he adapts his feedback through discussion, visual schematic, or real time clinical guidance. Regardless of the issue, Dr. Ahn strives to promote growth while maintaining high standards

Through this balanced method, residents learn to accept both praise and correction as integral parts of professional development. The stick and carrot approach reinforces accountability without undermining confidence, helping residents cultivate the prudence and self-awareness needed to evaluate their own work. Over time, this balance prepares them to assume responsibility for increasingly complex clinical decisions with confidence and integrity.

Beyond the Clinic

Beyond technical skills and clinical decision making, Dr. Ahn views teaching as an opportunity to share values that extend beyond dentistry. While mastery of procedures is essential, he believes education should also help students develop perspective and balance in their lives. A narrow focus on productivity, prestige, or material success risks obscuring the broader purpose of both dentistry and life.

He encourages residents to step back, reflect, and recognize that dentistry is only one part of a meaningful life. Maintaining balance, he believes, ultimately makes clinicians better providers, colleagues, and mentors. Perspective allows practitioners to approach patients with empathy, manage stress more effectively, and sustain long term fulfillment in their careers. For Dr. Ahn, teaching is not simply about preparing students for practice, but about helping them develop the mindset needed to navigate both professional and personal challenges.

When asked what message he would leave for the next generation of prosthodontists, Dr. Ahn returned to the importance of perspective and thoughtful decision making. Prosthodontics, he explained, requires looking beyond individual teeth to consider the full mouth, the whole patient, and the long-term consequences of every treatment choice. While modern dentistry offers an expanding array of tools and technologies, no single approach should be viewed as definitive.

Implants, for example, are a powerful solution, but not the solution. Preserving natural dentition whenever possible remains a fundamental principle, as every intervention carries inherent risks and limitations. Thoughtful prosthodontic care requires restraint as much as innovation, balancing what can be done with what should be done. Ultimately, Dr. Ahn hopes the future of prosthodontics remains thoughtful, adaptable, and grounded in sound clinical reasoning. By resisting shortcuts and focusing on the whole picture, future prosthodontists can provide care that is not only effective but enduring. Through decades of teaching, mentorship, and service, Dr. Ahn continues to shape that future, one resident at a time.

A Journey in Service, Mentorship, and Community:
The Story of Professor Rebecca Ortiz Bodensteiner

By Arman Zograbyan and Brianna Farahmand

A Calling to Serve Patients

When Professor Rebecca Ortiz Bodensteiner looks back on her career, a common theme appears: respect for people, a commitment to service, and a lifelong passion for learning. Today, as an Assistant Professor of Clinical Dentistry in the Department of Special Patients, Geriatric, and Behavioral Dentistry at USC's Herman Ostrow School of Dentistry, her responsibilities lie within community dentistry and academia. Yet beyond the titles, her story began much earlier, with curiosity, natural ability, and a belief that learning and service are connected.

Growing up in the Santa Ana and Tustin area of Southern California, Ortiz Bodensteiner began exploring dentistry at a young age. At just 18 years old, she started working as a dental assistant and trained under three dentists who trusted her with an opportunity for hands-on learning. In this setting, she found a passion for connecting with individuals across different backgrounds and life stages. No one in her family had worked in healthcare, but she had found something she loved, which confirmed her decision to pursue a bachelor's degree in dental hygiene. Ortiz Bodensteiner was also creating her own path as a first-generation college student, a responsibility she took seriously. She would go on to graduate from USC's Dental Hygiene program at 21 years old; at the time, this was a dream come true, but it would only mark the beginning of a career defined by service, teaching, and community.

Building a Life in Central California

At 24, she and her spouse, Michael, a practicing dentist, moved to Central California, where he had accepted an associate position that led to unforeseen opportunities. They discovered an opportunity to build a practice using their USC training to provide the community with the best patient care and experience possible. They would eventually purchase a dental practice in Tulare and later transition it to Visalia.

For 25 years, they operated the practice dedicated to the community, living in the same city as the patients they served. Driven by a focus on quality care, Ortiz Bodensteiner pursued extensive continuing education to help better serve the dental team and patients. Her husband, she notes, became one of her greatest mentors. Along their shared path, she developed leadership and communication skills, which would later help her transition into academia.

The Path to Academia

Ortiz Bodensteiner stayed focused on education throughout. After some time, she returned to USC for a Master of Arts in Teaching. Balancing graduate school, clinical work, and family duties took effort, but she embraced the pressure and looked forward to discovering how teaching would be applied.

By late 2020, as she and her husband began phasing out of private practice and exploring a move back to Los Angeles to be closer to family, a faculty position at Ostrow had opened. In March 2021, she was offered a part-time teaching position; this time returning to USC with an opportunity to shape the next generation of oral healthcare providers.

Today, she is a faculty member in the Special Patients Clinic and also in Ostrow's Distance Learning Programs. Being a double Trojan, she says, is both a privilege and a responsibility. "It's a compliment to be recognized as being at the caliber USC expects of its faculty and students. I take that seriously. I want to meet, and exceed, those expectations."

Serving Vulnerable Populations

Ortiz Bodensteiner is licensed as a RDHAP (Registered Dental Hygienist in Alternative Practice), which better equips her to provide care beyond standard clinics. Her training supports the ability to care for vulnerable and medically complex individuals.

When she was a student in the early 1990s, the USC Special Patients Clinic had been in operation for just four years. Nearly three decades later, when she was interviewing for a faculty position, she was excited to learn that the opening would be in that clinic. "Everything came back full circle," she says.

She identifies some important challenges in specific patient groups, such as transportation, competing daily priorities, and limited awareness of how oral health affects systemic health and well-being. Instead of assuming understanding, she states that it is important to teach so that patients are better able to grasp their situations, with the ultimate goal of including tailored home care and treatment around everyday routines.

Clinical Wisdom that Shapes Teaching

Ortiz Bodensteiner's past experience helping run a practice has influenced how she teaches today. With patients

at the forefront of dental care, she mentions that students must be taught to treat with both skill and empathy.

One instance she recalls involves a young man in the community who was missing front teeth. He eventually opened up about his smile, and their family-run clinic was able to deliver a removable prosthesis for him. That small initial step of seeking treatment ultimately turned into regular, ongoing dental care for the patient, and a renewed sense of belonging within the community. To her, it's these experiences that show how dental care can empower patients to take control of their confidence and quality of life. In her teaching philosophy, she hopes to use these stories to help students understand that care is not only being provided to the teeth, but to the person as a whole.

For Ortiz Bodensteiner, these experiences reveal the unique position dentists and hygienists hold to identify unmet needs and to provide life-changing care. In her teaching philosophy, she uses such stories to help students understand that dentistry is not just about restoring teeth, but rather about restoring dignity, confidence, and overall well-being.

A Vision for the Future

Ortiz Bodensteiner contributes to Ostrow's Community Oral Health online programs, helping train students to assess community needs, design interventions, and become powerful advocates. Her perspective focuses on building empathy along with practical abilities to reduce disparities across broader groups. This focus, she states, often creates further interest among students in advocacy or public wellness for vulnerable populations, while also helping them recognize their role as oral health educators.

Looking ahead, she hopes the future brings more standardized methods of communication with patients, ideally supported by digital tools. She envisions AI-driven communication tools and health-literacy assessments so that patients can better understand their treatment needs and become more active in their decisions.

In addition to teaching, Ortiz Bodensteiner is also currently overseeing graduate students on research studies centered on community oral health. She is also a volunteer with some of USC's Mobile Dental Clinics, helping bring care directly to underserved areas. The most rewarding part of her journey, she explains, is seeing students find joy in their education, engage with communities, and grow into caring providers. To her, being a role model in how people communicate, understand others, and apply their professional training is what matters most.

Family, Faith, and Lifelong Learning

Despite all her professional achievements, when asked about her proudest accomplishments, she speaks not of awards or titles, but of family. Her husband, her children, and her faith continue to motivate and influence her approach to everyday life.

Running has also played a key role in her development. What began as a casual invite to run with a local running group turned into a place of mentorship and meaningful life lessons. In 2014, after years of preparation, she completed the Boston Marathon, driven by early morning training, discipline, and support that guided her. Through these experiences, she encourages students to embrace opportunities, as they can shape their journeys in unexpected ways. To Professor Ortiz Bodensteiner, growth never stops, and she hopes to continue writing her story through opportunities that shape each new chapter.

A Future in Cardinal and Gold

In the journey ahead, her values remain to help people care for their oral health, educate the next generation, and support our communities.

The future, she says with a smile, "is cardinal and gold." She recalls her father being a patient at the USC School of Dentistry when she was a child—a memory that has shaped her admiration for the Trojan Dental Community.

Whether it is in mentorship, patient care, or service, Professor Rebecca Ortiz Bodensteiner continues to embody what it means to be a Trojan at heart.

Rebecca Ortiz Bodensteiner

Looking into the Future of 3D-Printed Materials in Restorative Dentistry:

Dr. Jordi Llena Prats

By Andrew Euredjian & Ghazal Ardalan

As digital dentistry continues to evolve, additive manufacturing has emerged as one of the most transformative technologies shaping the future of restorative care. Dr. Jordi Llena Prats, a clinician and researcher trained at the University of Barcelona, has been at the forefront of evaluating this shift, focusing on the physical and mechanical behavior of newly introduced 3D-printed dental materials. Through his research, Dr. Llena Prats aims to bridge the gap between rapid technological innovation and evidence-based clinical decision-making, ensuring that new materials meet the demands of long-term patient care.

Dr. Llena Prats earned his Doctor of Dental Surgery (D.D.S.) degree from the University of Barcelona in 2019. During his academic training, he became increasingly interested in dental materials science, particularly as digital workflows began to replace traditional analog techniques. His research experience culminated in an extensive investigation of additively manufactured materials for permanent restorations, conducted in collaboration with faculty mentors and fellow graduate researchers. This work addressed a critical question facing modern dentistry: are newly marketed 3D-printed materials truly ready for definitive clinical use?

The central focus of Dr. Llena Prats' research was the evaluation of novel CAD/CAM resin-based materials designed for 3D printing. While conventional research has extensively examined factors such as bonding strength, fracture resistance, and color stability, many newly introduced materials have entered the market without comprehensive long-term performance data. Given the rapid pace of material development and aggressive marketing claims from manufacturers, Dr. Llena Prats and his colleagues sought to critically assess how these materials behave under simulated functional conditions.

"Bridging innovation and evidence ensures that digital dentistry serves patients, not just progress."

His study, titled "Wear Resistance Analysis of Additively Manufactured Materials for Permanent Restorations," evaluated the two-body wear of three resin-based CAD/CAM materials—Lava Ultimate, VarseoSmile Crown Plus, and Ceramic Crown—against a ceramic antagonist (Empress CAD). Using a dual-axis chewing simulator, samples were subjected to 120,000 cycles under standardized load and movement parameters, simulating functional mastication over time. Surface analyses were performed at multiple stages to quantify volumetric and vertical material loss.

The results demonstrated that wear behavior was highly material-dependent. Among the materials tested, Ceramic Crown exhibited significantly less volumetric and vertical loss compared to Lava Ultimate and VarseoSmile Crown Plus. Additionally, wear increased consistently with the number of cycles, underscoring the importance of both material composition and functional duration in determining clinical durability. These findings highlight that while some 3D-printed materials show promising performance, others raise important questions regarding their long-term use in definitive restorations.

Dr. Llena Prats emphasizes that these findings are particularly relevant to clinical practice, where adoption of new materials often lags behind innovation due to the need for robust supporting data. In academic clinical environments especially, materials must demonstrate safety, predictability, and durability before being introduced into patient care. While short-term clinical experiences with 3D-printed restorations have been encouraging, the absence of long-term

evidence remains a limitation. His research helps provide clinicians with objective data to guide material selection and manage patient expectations.

Looking toward the future, Dr. Llena Prats strongly believes that additive manufacturing has the potential to significantly improve patient care. As milling technologies and materials have largely plateaued, 3D printing continues to evolve rapidly, attracting substantial investment from industry and driving continuous innovation. The speed, cost-effectiveness, and accessibility of 3D printing make it particularly valuable for clinics with limited access to advanced milling equipment, as well as for patient populations who may benefit from more affordable restorative options.

However, Dr. Llena Prats is careful to note that many 3D-printed materials are fundamentally composite-based rather than true ceramics, which affects their indications and expected longevity. While these materials may not yet be suitable for all cases, they fill an important niche in restorative dentistry. Continued research is essential to define appropriate clinical applications and to ensure that materials are used in a manner consistent with their physical limitations.

Among all aspects of the research process, Dr. Llena Prats most enjoys the hands-on, experimental component. His work required innovative problem-solving, including the development of a modular mounting system—constructed using LEGO components—to allow for repeated removal and analysis of samples during wear testing. This creative approach exemplifies his enthusiasm for experimental design and collaborative problem-solving, qualities that were shared among his research peers as each developed unique methods to address their individual projects.

Dr. Jordi Llena Prats

Dr. Llena Prats is particularly excited by the increasing accessibility of digital tools in dentistry. The flexibility of digital workflows allows clinicians to develop personalized approaches to treatment planning and fabrication, in contrast to the rigid steps required by traditional analog methods. From intraoral scanning to milling and 3D printing, digital dentistry offers multiple pathways to achieve predictable outcomes, fostering creativity and innovation within the profession.

As new CAD/CAM resin materials continue to enter the market, Dr. Llena Prats' work underscores the importance of rigorous, evidence-based research to support their clinical use. By critically evaluating the performance of additively manufactured materials, he contributes valuable insights that help ensure restorations are not only efficient and aesthetic, but also durable and reliable. Through his research-driven approach, Dr. Llena Prats exemplifies how thoughtful investigation can guide the responsible integration of emerging technologies into modern dental practice.

Mouth, Mind, and Meaning:

Aging, Equity, and the Public Health Vision of Dr. Piedad Suarez-Durall

By Ryan Harris & Aashika Desai

Dr. Piedad Suarez-Durall

A Public Health View of Dentistry

Dr. Piedad Suarez-Durall is an accomplished Professor of Clinical Dentistry at Herman Ostrow School of Dentistry of USC. She grew up in Costa Rica where she attained her DDS at the Universidad de Costa Rica, San Jose Costa Rica. She received her certificate in Orofacial Pain and Oral Medicine from Ostrow as well and received her MS degree from the USC Davis School of Gerontology.

Dr. Suarez's path towards Orofacial pain and geriatric dentistry was molded by personal experience and clinical exposure. As someone who struggled with major migraines and headaches, Dr. Suarez found connection in learning more about myofascial pain and fibromyalgia, an emerging new diagnosis at the time. This interest became more profound while working in the Special Patients Clinic where she was able to treat patients with HIV and geriatric populations that had various systemic diseases and a variety of comorbidities. Dr. Suarez remained in Los Angeles after a position offer that allowed her to continue working with vulnerable populations. After years of experience, focus on HIV clinical care, and training in gerontology, Dr. Suarez developed a well-rounded understanding of systemic disease, aging, and the social determinants of health that helped cultivate her interdisciplinary yet patient-centered path to the dental field.

From Clinic to Community

Dr. Suarez's research trajectory reflects a steady expansion from clinically driven interests to a broader, interdisciplinary public health focus in direct patient care. Dr. Suarez practiced in private practice for over a decade before pursuing advanced training in orofacial pain and oral medicine at Herman Ostrow School of Dentistry, where she was part of the program's inaugural cohort. Her early interests were shaped by both personal experience with migraine disorders and professional exposure to emerging understandings of myofascial pain, headaches, and systemic disease manifestations in the oral cavity.

As her role in the school's Special Patients Clinic grew, Dr. Suarez's research focus naturally shifted toward caring for medically complex and underserved populations, particularly patients living with HIV/AIDS and older adults. Her involvement in long-standing, federally supported HIV care programs placed her work at the intersection of dentistry, medicine, and public health, with a strong emphasis on improving access to care and addressing stigma. Additionally, completing a master's degree in gerontology represented a pivotal transition in her career, deepening her research focus on aging, social determinants of health, and oral health complications commonly affecting older adults.

Dr. Suarez's research has positioned dentistry as a critical component of holistic care for vulnerable populations, aligning her contributions with movements in geriatric special care and population based oral health research.

Oral Disease and Cognitive Aging

Dr. Suarez's research focuses on a simple but largely unexplored question: whether oral disease plays a direct role in cognitive decline and dementia, separate from the socioeconomic and lifestyle factors that complicate most research in industrialized settings. To examine this, her recent work centers on Indigenous Amazonian populations with high levels of tooth loss and periodontal disease but unexpectedly low rates of cardiovascular disease and Alzheimer's disease and related dementias (ADRD).

This work is part of a long standing, interuniversity collaboration that brings together researchers in anthropology, gerontology, medicine, psychology, cardiology, and neurology. The study follows adults aged 45 and older from two Amerindian groups, the Tsimane and the Moseten, whose diets, access to markets, and oral health profiles differ in meaningful ways. Participants undergo detailed dental examinations assessing tooth loss, periodontal status, and oral microbiota, along with saliva and blood sampling for biomarker analysis. These data are paired with neuroimaging and cardiovascular assessments to evaluate brain volume, arterial calcification, and established ADRD-related markers such as amyloid and tau. By combining oral, systemic, genetic, and cognitive measures, the project explores infectious, nutritional, and genetic pathways that may link periodontal disease to brain aging.

While the study is still being conducted, some of the early findings have revealed interesting new patterns. Even with severe dental disease and little access to dental care, these populations show very low rates of dementia and cardiovascular disease. This contradicts findings from industrialized populations and suggests that oral health may be influenced by broader lifestyle factors, such as diet, physical activity, and social environment, when it comes to cognitive health. In addition, clear differences in periodontal disease between men and women point to possible sex-specific differences in how the brain ages.

Aging Populations and Access to Care

Additionally, Dr. Suarez has expanded her research to underserved aging populations in the United States, including medically and psychologically vulnerable older adults and veterans, particularly in the aftermath of COVID-19. Through systematic reviews and needs assessments, she has highlighted persistent gaps in geriatric oral health research, especially among adults over 65 and centenarians who are frequently excluded from clinical studies. Together, these efforts position oral health as a critical, yet often overlooked, component of healthy aging and population level dementia prevention.

Caring for the Whole Patient

In her research looking at depression and social isolation among geriatric patients, Dr. Suarez made a meaningful contribution to the dental field by highlighting an often overlooked aspect of patient care: mental health. Her work unpacked the prevalent taboo surrounding talks of depression and isolation within the dental field. This unveiled that dental visits can serve as critical areas for identifying psychosocial strain in older adults. During initial screening questionnaires, many patients openly expressed emotions related to loneliness and depression which were responses that demonstrated the magnitude of these problems.

Although these research findings were not formally published, the research had significant impact by influencing awareness and showcasing how crucial holistic care and full patient focus truly is. Dr. Suarez also uncovered critical barriers to translating research into practice, including financial limitations, the lack of reimbursement for complex geriatric cases, and the emotional toll placed on providers caring for patients with life-limiting conditions. Her work connected dentistry with behavioral health, emphasizing the need for interdisciplinary approaches when treating vulnerable populations. By bringing attention to the emotional well-being of geriatric patients, her research helped reveal future directions for dental screening practices and laid the groundwork for placing mental health discussion into dental care.

Emerging Directions in Prevention

An important emerging direction in dental research that Dr. Suarez has taken interest in is the development of amelogenin-based biomaterials aimed at enamel regeneration rather than traditional restorative repair. Ongoing work led by Dr. Oldak has shown the potential of amelogenin–chitosan hydrogels to promote biomineralization and repair enamel damage at the molecular level. Dr. Suarez is interested in exploring the translational and public-health relevance of this research, with particular attention to its use in aging populations.

Dr. Suarez's interest lies in how such regenerative approaches could be translated to older adult care, a population that commonly experiences cumulative enamel loss and often faces barriers to extensive restorative treatment. By shifting the emphasis from surgical intervention to prevention and regeneration, amelogenin-based therapies could offer a less invasive and more accessible strategy for maintaining oral health in later life. More broadly, this line of work highlights the value of interdisciplinary collaboration among dentistry, biomaterials science, and public health, aligning with Dr. Suarez's research focuses on improving equity and prevention in oral health care rather than the development of the underlying technology itself.

A Broader Vision for Oral Health

Dr. Suarez's scholarly contributions reflect a deep commitment to advancing oral health through compassion, interdisciplinary collaboration, and a focus on underserved populations. By integrating dentistry with gerontology, public health, and behavioral science, her work has broadened the boundaries of how oral health is understood in relation to aging, systemic disease, and overall well-being. She has brought attention to populations often overlooked in both research and clinical care, challenged traditional assumptions within the field, and emphasized the importance of treating patients as whole individuals rather than isolated diagnoses. Dr. Suarez's impact extends beyond academia, shaping a more inclusive, preventive, and human-centered vision for the future of dentistry.

Redefining Pediatric Rehabilitation Through Functional Movement: *Dr. Kari Kretch*

By Shirley Xu and Hana Hekmat

Dr. Kari Kretch, DPT '19, has a mission to improve function for children with developmental disabilities through her research. Her current research focuses on clinical interventions to provide children with Cerebral Palsy and Down Syndrome with the skills required to function and learn. Her biggest message is that functional movement matters more than doing a skill "the right way." What matters is that the child is moving, practicing, and participating in age-appropriate activities.

Dr. Kari Kretch

She currently serves as an assistant professor of Physical Therapy and Biokinesiology, as well as a principal investigator and mentor to many aspiring students from different disciplines. Hailing from Cleveland, OH, she earned a BA in psychology. Her rather unconventional path to becoming a Doctor of Physical Therapy (DPT) followed a series of unexpected twists from her original path of becoming a mental health therapist. Following college, she realized her interest lay in psychology as a science, as well as using experimentation and observation to understand human behavior, specifically child development. Searching for experience before applying to graduate school led her to a position at a New York University (NYU) research lab focusing on infant motor development. Despite her initial plan to study social development in preschool-aged children, the available position focused on infant motor development, a field she knew little about. Soon, however, her fascination with the lab's work led to NYU becoming her scientific home throughout her doctoral studies.

Pediatric Physical Therapy: A Door To New Possibilities

A few years into her PhD, Dr. Kretch describes having a feeling that something was missing. She wanted her work to have a more direct impact and clinical relevance. Her interactions with pediatric physical therapy researchers opened her eyes to a field she hadn't even known existed. "I had never heard of pediatric physical therapy before. I thought physical therapy was just something you did when you hurt your knee." Her work at NYU and her interactions with pediatric physical therapy researchers sparked her interest in pursuing a second doctorate. Dr. Kretch graduated with her PhD in May and started her Doctor of Physical Therapy program at USC that same August. Although a bold decision, she states it aligned with her long-term goal to blend clinical practice and research, a vision that would ultimately shape the rest of her career.

After earning her PT license, she worked as a pediatric physical therapist in early intervention and served children from birth to age three with developmental delays or disabilities. When the pandemic forced her clinic to shut down and made it difficult to continue growing clinically, she found a postdoctoral position at USC in pediatric rehabilitation research within the Division of Biokinesiology and Physical Therapy. In September 2021, she joined the USC faculty, and in January 2024, she obtained a tenure-track position and launched her own research lab.

Measuring Movement in Everyday Life

Dr. Kretch's lab operates with two overarching goals: One is conducting basic research to understand motor behavior and development in children with and without disabilities, and the other is developing interventions that support motor development and participation in everyday life. The primary conditions her team focuses on are Cerebral Palsy and Down Syndrome. One of the lab's major innovations involves capturing how infants and children actually move throughout their entire day, not just during brief clinic visits. "Traditionally, we observe children for short periods in controlled settings, like a 20-minute lab visit. That's a tiny fraction of a child's life," Dr. Kretch explains. Her team employs two complementary approaches to solve this problem.

The first uses ecological momentary assessments, where parents receive short surveys approximately ten times a day for eight days, asking what their child is doing at that precise moment. This method provides a comprehensive picture of how children spend their time across different contexts and activities.

Her second goal is more applied. It revolves around the incorporation of wearable sensor technology, which is a small device that children wear throughout a continuous period of time, ranging from a day to an entire week. These sensors can measure body position, determine whether a child is sitting, standing, or lying down, and track stepping activity as children develop independent walking. "Wearable sensors and step counters allow us to study behavior over long periods, in natural environments, without constant observation," Dr. Kretch notes. "This is especially important for children with developmental disabilities, because intervention doesn't happen during one hour a week with a therapist, it happens in what the child practices all week long." Rather than making inferences from brief snapshots, Dr. Kretch's team can now observe patterns across days and weeks to understand how children's motor behaviors change in response to different environments, times of day, and social contexts; stressing, once again, her overarching goal of providing these children with the functionality needed to navigate daily tasks and build skills.

Developing New Interventions

Dr. Kretch's lab isn't just measuring behavior, though. They're also creating and testing new interventions. One project involves a supportive seating system that looks like a pop-up canopy. Kids who can't sit up on their own are supported in an upright position so they can play with toys and interact with their parents. This matters because being able to sit up and use your hands opens up so many learning opportunities that children miss out on when they're lying down all the time.

Another major project focuses on helping children with Down Syndrome learn to walk. Kids with Down Syndrome typically start walking much later than other children, sometimes a year or two later. Previous research has looked at using treadmills for walking practice, but treadmills have obvious limitations. Walking on a treadmill isn't the same as actually moving through space, exploring your environment, and participating in real activities. A current focus of hers is developing a walker intervention that the children can take around their home and outdoors. Results of the observational study seem promising, with children taking more steps with the walker and parents preferring to have the walker as an intervention versus the treadmill.

Making A Measurable Difference

Perhaps Dr. Kretch's most powerful contribution is her philosophy about what truly matters in early motor development. She emphasizes that children need the skills required to function and learn, and that functional movement matters more than doing a skill in textbook-perfect form. If a child can accomplish their goal, whether that's reaching a toy, moving across a room, or sitting to play with a parent, then they're doing it the right way, regardless of whether their movement pattern matches what therapy textbooks might prescribe as ideal.

This perspective challenges traditional approaches that prioritize movement quality over quantity and participation. Dr. Kretch advocates for high volumes of movement and practice above all else. She envisions a future where children receive stepping prescriptions similar to the step goals given to adults recovering from a stroke. The appearance of the steps doesn't matter if they're messy or not perfectly aligned; it matters far less than the fact that the child is moving, practicing, and participating in age-appropriate activities. It's a philosophy grounded in both motor learning science and a deep respect for children's functional needs.

While her contributions to the field comprise a long list, Dr. Kretch believes that "no one person or no one discipline has all of the knowledge necessary to solve a problem." She goes on to say that the belief that one person, a PI, in her case, is going to have all the skills to do every part of the job can be limiting. Working with engineers, for instance, has been a huge part of her research and understanding of how to build new devices or develop new algorithms. The significance of building interdisciplinary collaboration networks is similarly seen between clinical researchers collaborating with basic researchers. This understanding has played a huge part in her ability to bring together teams of researchers to optimally tackle problems, leading to the research projects' higher clinical impact. She also recalls the first time she felt the impact of her work collaborating with experts across varying areas as a subject matter expert, developing educational materials for pre-school teachers or childcare providers with a focus on current evidence and documents inclusive to children's disabilities.

Looking Forward: Bridging Research and Practice

Dr. Kretch hopes to build stronger collaboration channels between clinicians and researchers. "There seems to be, sometimes, a lack of communication and collaboration between scientists and physicians," she states. This lack of communication has led to what she believes is a troublesome disconnect in the field. "So the things that are happening in clinical practice aren't always informed by research evidence, and the things that are happening in the state-of-the-art research don't always take into account the needs of clinicians," she stated. This challenge simultaneously presents an exciting opportunity for the field with questions and a heightened need for strong researchers, mentorship, and training opportunities. Addressing this challenge, in her view, will also lead to a brighter future with impactful clinical interventions focused on state-of-the-art science.

Mentorship, she believes, is the most important factor for any physical therapist, but especially for pediatrics. Her advice for aspiring graduate students and DPTs hoping to pursue pediatrics is to find a good support system. Eventually, "the more clinicians that we can get involved in research careers, the better our science will be in the end," she states.

Using Data Science and Artificial Intelligence to Empower Rehabilitation Research: Dr. Sook-Lei Liew

By Octavio Marin-Pardo

Thanks to medical advances over the last few decades, stroke mortality has seen a substantial decrease. However, most survivors will only partially recover, and strokes remain a leading cause of adult disability. Despite significant efforts to understand and enhance stroke recovery, accurately predicting clinical outcomes and selecting the most appropriate interventions remain major challenges in the neurorehabilitation field. As Professor Sook-Lei Liew from the Chan Division points out: "We have seen that in stroke recovery, one size does not fit all… but with the help of the latest advances in data science and rehabilitation technologies, we aim to be able to better guide and personalize the rehabilitation journey for each individual patient." Such is the north star that, for the past 10 years, has guided Dr. Liew's efforts to uncover the mysteries of how the brain affects our ability to engage in daily occupations and to develop more effective neurorehabilitation strategies and interventions to help people recover after a stroke.

From sport science to occupational science, a neuroscientist's quest to improve stroke recovery

Ever since she was a child, Dr. Liew has had a strong passion for learning new things, from homemade science experiments to creative school assignments. However, it wasn't until college that she found that such creativity could also be applied to helping people do what is important to them. "I double-majored in English (because I loved reading) and Kinesiology (because I loved being active)," she recalls. "But I didn't know how that would get me a job after college, so I took a career test, which suggested I become a farmer or an occupational therapist." As she had not heard about occupational therapy before, she began shadowing a local pediatric occupational therapist and fell in love with the creativity and flexibility of the helping profession.

After completing her undergraduate education at Rice University, Dr. Liew joined USC to earn a Master's degree in Occupational Therapy. "The first course of my MA program at USC was Neuroscience, and I was fascinated by how the brain and nervous system affect people's everyday lives." This newfound passion grew so much that she stayed to complete a PhD in Occupational Science with a focus on cognitive neuroscience, during which she gained expertise in measuring brain activity using neuroimaging and behavioral methods.

Then, to connect her research skills with her clinical expertise, she completed a postdoctoral fellowship at the National Institutes of Neurological Disorders and Stroke (NINDS) at the NIH, where she studied mechanisms of neural plasticity and neural repair using noninvasive brain stimulation and brain-computer interfaces. During this time, she also completed collaborations at the University of Tübingen and at the Johns Hopkins School of Medicine. "Through all of these experiences, I learned more about ways to modulate brain activity in people with stroke, which then established the foundation of my early work as a faculty member." Dr Liew has been affiliated with the USC Chan Division of Occupational Science and Occupational Therapy since January 2015 and currently has joint appointments in Biokinesiology and Physical Therapy, Biomedical Engineering, Neuroscience, and Neurology.

As the Director of the Neural Plasticity and Neurorehabilitation Laboratory (NPNL) and founder and chair of the ENIGMA Stroke Recovery Working Group, Dr. Liew's work focuses on using big data and neuroimaging approaches to identify brain-behavior relationships in people post-stroke. The overall mission of the NPNL is to enhance neural plasticity in a wide population of individuals to improve their quality of life and engagement in meaningful activities. To this end, the laboratory focuses their efforts on several key goals.

Use big-data neuroimaging to characterize neural changes throughout stroke recovery

Since recovery after stroke is extremely heterogeneous, large datasets are needed to identify robust patterns of neural recovery. However, generating and analyzing large post-stroke neuroimaging datasets is challenging. "As founder and chair of the ENIGMA Stroke Recovery working group, my goal has been to harmonize and analyze thousands of post-stroke MRIs from over 60 research sites worldwide and

Dr. Sook-Lei Liew

counting," Dr. Liew highlighted. "Such collaborative effort provides the opportunity to bring together the brain imaging and rehabilitation communities worldwide to solve biomedical problems that no one group could answer alone."

Results from this working group have resulted in over 13 peer-reviewed publications and robustly demonstrated relationships between post-stroke sensorimotor behavior and global brain health (GBH) indicators, such as brain age, white matter hyperintensities, waste clearance systems, and hippocampal volume. Such research suggests that GBH is associated with better post-stroke outcomes and may be a proxy of protective mechanisms against brain damage. However, measuring GBH requires using research-grade MRIs, which are not typically available to most stroke survivors. Thankfully, with a newly awarded $2.9 million R01 grant from the NINDS, Dr. Liew aims to leverage advances in artificial intelligence (AI) to build more accurate models to predict stroke recovery trajectories using standard clinical MRIs.

Using AI models of stroke recovery to inform clinical decision-making

Dr. Liew's latest work will take low-resolution MRIs (those typically acquired in hospitals upon admission of a patient who has just had a stroke) and use AI algorithms to generate high-resolution images of the same brains (similar to the high-quality images acquired at large research institutions). "The goal is to use routine clinical MRIs that most stroke patients get when they come into the hospital, and augment them with AI to provide clearer data for predicting patient outcomes and empowering rehab providers."

After validating their predictive models, the research team will build an open-source, downloadable software toolkit that allows clinicians or researchers to input standard clinical MRI images and generate AI-generated images and metrics to predict 12-month post-stroke outcomes. "Ultimately, the goal is to help clinicians deliver customized care that gives every stroke survivor the best possible chance at recovery by bringing precision rehabilitation into clinical practice," Dr. Liew commented.

In addition to bringing closer the promise of precision rehabilitation for stroke survivors, Dr. Liew aims to take the lessons learned and the tools developed for such a task into broader populations. And with a recently awarded $6.5 million P50 grant from the National Center for Medical Rehabilitation Research at the NIH, she and her team are ready to tackle the challenge.

A center to prepare rehabilitation data for the AI revolution

Professor Liew is also the principal investigator of the Data Science and Analytics for Precision Rehabilitation (DAPR) Center, which aims to generate large, harmonized rehabilitation datasets to leverage advances in data science, machine learning, and AI to improve the rigor of medical rehabilitation research. "By building large, harmonized, and accessible datasets, we're laying the foundation for truly personalized, data-driven rehabilitation," Liew said. "This is a transformative step for our field and will enable rehabilitation researchers nationwide to work together, identify critical scientific insights, and ultimately deliver the right rehabilitation treatment, at the right time, for each individual."

In addition to bringing together many different types of data, the DAPR Center will provide hands-on consulting in data management and analysis best practices, build accessible educational resources, and create user-friendly data harmonization tools. Importantly, DAPR will also incorporate the insights from people with lived experiences of stroke, Parkinson's, and cerebral palsy to ensure the advances in precision rehabilitation are translated into improved health and quality of life of people with physical disabilities.

Enhancing neural plasticity and neural recovery using noninvasive brain stimulation and brain-computer interfaces

Since its inception, one of the goals of the NPNL has been to explore how to harness technology to promote neural recovery. Over the years, the laboratory has used non-invasive brain stimulation (transcranial direct current and magnetic stimulation), brain-computer interfaces via functional Magnetic Resonance Imaging (MRI), Electroencephalography (EEG), electromyography, and virtual reality (VR) in laboratory-based and home interventions to allow individuals to regain control of their neural signals using biofeedback. The ultimate goal is to use the precision rehabilitation algorithms she is developing and then apply them to identify specific treatments to help maximize each patient's recovery potential.

Dr. Liew on the motivations behind an impactful career

Outside of work, Dr. Liew loves hanging out with her family, volunteering at her daughter's school, running, reading science fiction books, cooking, and eating fried foods.

Throughout her career, Dr. Liew has established strong, meaningful partnerships with researchers, clinicians, and faculty within and across fields, building a legacy of collaborations that extends far beyond NPNL and USC. In addition to the ENIGMA Stroke Recovery Group and the DAPR Center, she also co-directed a center to study and develop VR interventions (USC SMART-VR Center), co-created the USC HealthTech Makerspace, and co-directs an NIH-funded research education program to teach data science to rehabilitation researchers (ReproRehab).

"In any career, it's important to know what drives and motivates you, and to make sure that what you're doing is in alignment with those underlying motivations so that you can enjoy your work and also pivot to different directions that still fulfill the same overarching goals as needed," she mentions. "In my case, I think my biggest motivators are: (1) to help others, (2) to continually learn, (3) to be creative and (4) to work with great people. I would encourage others to think deeply about what is most important to them and to find career paths that align with those values."

Schedule of Events

08:30 AM – 9:00 AM
Registration

09:00 AM – 11:30 AM
Poster Presentation Judging

11:30 AM – 12:00 PM
Lunch

12:00 PM – 12:15 PM
Opening Remarks

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

Yang Chai, DDS, PhD
Dean
Herman Ostrow School of
Dentistry of USC

Amy E. Merrill, PhD
Acting Associate Dean of Research
Herman Ostrow School of
Dentistry of USC

12:15 PM – 12:40 PM
Keynote Speaker

Uttam Sinha, MD, MS, FACS
Professor
Otolaryngology–Head & Neck Surgery
Keck School of Medicine of USC

12:45 PM – 1:10 PM
Keynote Speaker

Dechen Lin, PhD
Assistant Professor
Center for Craniofacial Molecular Biology
Herman Ostrow School of Dentistry of USC

1:15 PM – 1:40 PM
Keynote Speaker

Amber Angell, PhD, OTR/L
Assistant Professor
Chan Division of Occupational Science & Occupational Therapy
Herman Ostrow School of Dentistry of USC

1:45 PM – 2:10 PM
Keynote Speaker

Kristan Leech, PhD, DPT, PT
Assistant Professor
Division of Biokinesiology and Physical Therapy
Herman Ostrow School of Dentistry of USC

02:15 PM – 03:00 PM
Poster Viewing and Refreshments

03:00 PM – 03:50 PM
Student/Trainee Presentations

04:00 PM – 04:30 PM
Award Presentations

Keynote Speakers

Uttam
SINHA
MD, MS, FACS

12:15 PM – 12:40 PM

Uttam K. Sinha is a tenured Professor of Otolaryngology–Head and Neck Surgery, Director of the USC Head and Neck Center at the Keck School of Medicine of USC, and the Watt Family Endowed Chair in Head and Neck Cancer Research. He completed a Research Fellowship in Molecular Oncology and residency at USC, followed by fellowships in Microvascular, Plastic and Reconstructive Surgery at Mount Sinai and Laryngology in Lyon, France. He is an internationally renowned surgeon-scientist and has authored more than 150 peer-reviewed publications and maintained continuous federal, foundation, and industry grant support in precision oncology, liquid biopsy, molecular imaging, and regenerative technologies. His work has been instrumental in translating laboratory discoveries to applications directly impacting patient care. In addition to being a dedicated educator and mentor, Dr. Sinha was the former President of the Society of University Otolaryngologists–Head and Neck Surgeons. He also founded the nationally recognized USC Head and Neck Cancer Survivorship Program.

Dechen
LIN
PhD

12:45 PM – 01:10 PM

Dr. Dechen Lin is an Assistant Professor at the Herman Ostrow School of Dentistry of USC and Associate Director for the USC Head and Neck Center at the Keck School of Medicine. He leads a research program at the USC Center for Craniofacial Molecular Biology focused on cancer genomics, transcriptional regulation, with an emphasis on head, neck and esophageal cancers. His work uses advanced genomic and organoid models to study cancer progression and immune evasion, including identifying regulators of tumor-infiltrating lymphocytes that improves immunotherapy response. Dr. Lin has received multiple honors, including the NIH/NCI R37 MERIT Award, and has published over 100 peer-reviewed articles, which has been cited more than 14,500 times.

Amber
ANGELL
PhD, OTR/L

01:15 PM – 01:40 PM

Dr. Amber Angell is an Assistant Professor in the Chan Division of Occupational Science and Occupational Therapy in the USC Ostrow School of Dentistry and holds a joint appointment in the Department of Pediatrics of the USC Keck School of Medicine. She is the director of the Disparity Reduction and Equity in Autism Services (DREAmS) Lab, where she leads interdisciplinary teams to conduct multi-method, community-engaged research in collaboration with the Autistic Lived Experience Collaborators, a stakeholder group of autistic adults. Her work has been funded by the Health Resources and Services Administration, the American Occupational Therapy Foundation, and the National Institutes of Health. Current funded projects investigate gastrointestinal symptoms among autistic children and adults, funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development; and adverse mental health outcomes for autistic children and youth, funded by the National Institute of Mental Health.

Kristan
LEECH
PhD, DPT, PT

01:45 PM – 02:10 PM

Kristan Leech, PhD, DPT, PT, is an Assistant Professor in the Division of Biokinesiology and Physical Therapy. Her research focuses on the mechanisms of walking and mobility recovery after neurologic injury, with particular emphasis on high-intensity gait training, motor learning, and cognitive–motor interactions after stroke. Using a combination of biomechanical, neurophysiologic, and clinically translational approaches, her work aims to optimize rehabilitation strategies that improve functional mobility and participation for individuals with neurologic conditions.

RESEARCH DAY
POSTER ABSTRACTS

ADVANCED SPECIALTY PROGRAM RESIDENT

Poster #1

Title: Navigating Screw-Retained Restoration Complications with Custom Implant Abutments: Case Series

Authors: Reem Alfadhli, George Cho, Sangho Byun, and Cheryl Park

Faculty Advisor: Cheryl Park

Background: Titanium abutments serve to retain implant restorations. Occasionally, mechanical complications of these abutments can occur, and custom abutments can be utilized to mitigate their recurrence. **Purpose**: To showcase several abutment-related mechanical complications, and managing them with custom implant abutments. **Methods**: Case 1: A patient presents with a fractured implant crown #19, showing a cross-section fracture located in the titanium abutment wall. A cut-back preparation of the wax-up pattern was used to fabricate the custom abutment through copy-milling, this ensures control over abutment design and adequate restorative space for zirconia. Case 2: Another patient presents with a cross-section fracture of titanium abutments supporting a splinted two-unit implant restoration #12-13. A three-unit splinted implant restoration (with #14 pre-existing implant) #12i-13i-14i is planned to minimize non-axial mechanical forces. A splinted custom abutment serves as framework supporting the zirconia superstructure to maximize strength. A pattern resin replica of the restoration is prepared to simulate the framework design and digitally superimposed on a provisional restoration scan to measure material space before fabrication. Case 3: An implant-supported FPD #18i-19p-20i is completely de-cemented from abutments. Restorative space is limited, and height of the abutments was 3 & 3.75 mm respectively. Custom abutments were utilized to maximize surface area and parallelism improving retention. The prosthesis is re-approximated, scanned, and abutments were designed subtractively through CAD from original restorative contours. **Conclusion**: The cases reported demonstrate that custom implant abutments can be used to overcome mechanical complications of implant restorations that result from structural limitations of standard titanium abutments.

Poster #2

Title: Long-Term Effects of NAM on Maxillary Growth in BCLP Patients

Authors: Nikki Aflatooni, Jaemin Ko, Naya Okeke, Bryan Lei, Stephen Yen

Faculty Advisor: Stephen Yen

Background: Nasoalveolar molding (NAM) is a presurgical orthopedic technique used in patients with cleft lip and palate to reposition the premaxilla posteriorly before surgical repair. However, the long-term effects of NAM on the maxillary arch in patients with bilateral cleft lip and palate (BCLP) have not been fully understood. This study aims to evaluate the long-term premaxillary growth in bilateral cleft lip and palate patients who underwent NAM therapy, versus those who did not, using a 3-dimensional cast analysis approach. **Methods**: This retrospective study compared study models of BCLP patients, aged 6 to 10 years, between a NAM and non-NAM group. Based on our inclusion criteria, 30 individuals were included in the NAM treatment group, while 52 individuals were included in the non-NAM group. Transverse widths, anteroposterior projection, angular deviation, and vertical height of the premaxilla were evaluated on 3-dimensional casts using Dolphin Imaging software. **Results**: There were no significant differences in measurements between the NAM and non-NAM groups, indicating no significant difference in long-term premaxillary growth outcomes between the two populations. **Conclusion**: NAM therapy may not be necessary to achieve favorable outcomes in the treatment of BCLP patients. This finding can guide clinicians in decision-making when evaluating patients with moderate premaxillary displacement or those who may face limitations in accessing or tolerating NAM treatment.

Poster #3

Title: Short Root Anomaly in Vietnamese Population

Authors: Rebecca Long and Glenn Jou

Faculty Advisor: Glenn Jou

Background: Short Root Anomaly (SRA) is a genetic condition characterized by bilaterally symmetric short roots with crown-to-root ratios of 1.1 or less. Previous research demonstrates significant ethnic predilection, with reported prevalence rates of 12% in Hispanics, 10% in Japanese populations, and 2% in general Asian cohorts. However, no studies have specifically examined SRA prevalence in Vietnamese patients, despite Vietnam representing a distinct Southeast Asian population. Understanding ethnic-specific SRA prevalence is critical for orthodontic treatment planning, as patients with SRA face increased risk of external root resorption during orthodontic tooth movement. **Purpose**: To determine the prevalence of SRA in pre-treatment Vietnamese orthodontic patients and compare findings to established ethnic predilection data. **Methods**: A retrospective analysis of 119 panoramic radiographs from Vietnamese orthodontic patients (ages 16-29 years, mean 20 years; 66 females, 53 males) was conducted. Radiographs were evaluated for SRA using strict diagnostic criteria including bilateral symmetry, crown-to-root ratios ≤1.1, and rounded apices, specifically examining maxillary central incisors and mandibular second premolars. **Results**: Zero patients met the diagnostic criteria for SRA. While 42 patients presented with individual short roots, none demonstrated the bilateral symmetry required for SRA diagnosis, yielding a 0% prevalence rate. **Conclusion**: Vietnamese patients demonstrate remarkably low SRA prevalence compared to other Asian populations and Hispanics. This finding has significant clinical implications: orthodontists treating Vietnamese patients can proceed with standard treatment protocols without heightened concern for SRA-related root resorption. These results highlight the importance of population-specific risk assessment rather than broad ethnic categorization in orthodontic diagnosis and treatment planning.

Poster #4

Title: Accuracy of Interproximal Space Scanning Using the iTero Lumina®

Authors: Alexander Koenig and Glenn Jou

Faculty Advisor: Glenn Jou

Background: Digital orthodontic treatment planning and aligner fabrication rely on accurate intraoral scans to create reliable 3D models. Undetected interproximal spaces can compromise treatment outcomes, hygiene, and esthetics. The effect of saliva on interproximal space accuracy with modern intraoral scanners

requires more exploration. **Purpose**: This prospective clinical study aimed to evaluate the effect of saliva on interproximal space detection using the iTero Lumina® scanner by comparing digital measurements to intraoral measurements as the gold standard. **Methods**: 20 orthodontic patients with at least one interproximal space ≥0.15 mm were included. Spaces were measured intraorally using calibrated interproximal reduction (IPR) gauges. Each participant's arches were scanned under two conditions: natural saliva present (wet) and after saliva removal (dry) via air drying and cotton roll isolation. Digital STL models were generated, blinded, coded, and analyzed using Autodesk Fusion™. Three evaluators measured interproximal spaces on each model. Dimensional accuracy and intra-/inter-operator reliability were assessed. **Results**: Statistical analysis pending. We will evaluate differences in interproximal space detection accuracy between different scanning conditions (with and without saliva) and assess measurement reliability across evaluators. We will also determine the minimum interproximal space size that can be consistently detected by the iTero Lumina scanner under each condition. **Conclusion**: Pending.

Poster #5

Title: Clinical management of unserviceable implants: Case report

Authors: Donghwan Park and Cheryl Park

Faculty Advisor: Cheryl Park

Background: Patients today often present with existing dental implants. When there is a need to incorporate existing implants into patient's treatment plan, this poses a clinical challenge especially for implants that are unserviceable due to unfavorable position or implant systems that do not have readily available components. **Methods**: A 65-year-old Asian male was screened at the Advanced Prosthodontics clinic of USC, presenting with a complaint of pain and swelling associated with a maxillary right implant-supported FPD. After some efforts to contact the previous office, patient was able to obtain the implant system information. Unfortunately, it was identified as a non-FDA approved system, with original and third-party compatible components that are not available in the US. **Results**: Clinical examination revealed malpositioned implants and open gaps between the implant abutments and platforms. Implants #3,12,13 and 16 were deemed unfavorable and planned to be explanted while existing implant restoration over #51,1,2 were modified to serve as a healing abutment to retain implants #51,1,2. Retention of #51,1,2 was decided based on lack of active peri-implant disease, proximity to the sinus, and morbidity of bone loss due to explantation of 3 implants in close proximity. **Conclusion**: This case demonstrates the clinical challenges associated with malpositioned or non-FDA approved implants lacking compatible components in the US. Through careful assessment of implant health, anatomical considerations, and prosthetic limitations, an alternative approach was implemented by modifying existing restorations into healing abutments, thereby preserving implants to minimize surgical morbidity.

Poster #6

Title: Beyond the Uniform: Bridging Critical Gaps in Veterans' Oral Healthcare

Authors: Robert Peters, Piedad Suarez-Durall, Sanaz Feresteh, Reyes Enciso, and Roseann Mulligan

Faculty Advisor: Piedad Suarez-Duvall, Sanaz Feresteh, Reyes Enciso, Roseann Mulligan

Background: Nearly 9 million veterans are enrolled in VA healthcare, yet 85% are not eligible for dental coverage or care. Nationally, veterans' oral health demonstrates significantly higher rates of untreated caries, tooth loss, and periodontal disease compared to non-veterans. Since 2010, Herman Ostrow School of Dentistry of USC's veteran outreach program has addressed this public health crisis through stand downs and comprehensive clinics. **Purpose**: To review oral health data collected from at-risk veterans living in Southern California and examine USC interventions. **Methods**: USC's veterans outreach program datasets from 2010-2025 were examined. **Results**: USC's mobile dental clinic program partnered with non-profit organizations including the US Veterans Initiative Stand Downs, Village for Vets, and the Veterans Home of California for 15 outreach events providing care to 1,572 veterans (35.8% aged 65 or over). A total of 14,485 procedures were delivered including restorative (48.0%), periodontal (30.5%), oral surgery (12.8%), endodontic (6.3%), and prosthetics (2.3%), valued at over $1,052,000. **Conclusion**: The USC program evolved from 2010 to 2025; initially being problem-focused and later evolving to a comprehensive treatment model. Academic dental institutions can be part of addressing veterans' oral health needs through expanded community partnerships, advocacy for integrated VA medical-dental care models, legislative support for broadened eligibility, and curriculum development to prepare future dentists to serve this vulnerable population.

Poster #7

Title: Outcomes of USC's Hybrid Online Geriatric Dentistry Advanced Programs

Authors: Robert Peters, Nazanin Sharifi, Piedad Suarez Durall, and Roseann Mulligan

Faculty Advisor: Nazanin Sharifi, Piedad Suarez Durall, and Roseann Mulligan

Background: As the population ages, the need for dentists trained in geriatric care is increasing. USC's hybrid online Geriatric Dentistry program (GDEN) meets this demand by offering certificate and master's pathways for advanced training. **Purpose**: To analyze program distribution, demographics, geographic trends, and career paths of graduates of GDEN. **Methods**: A retrospective analysis and a prospective survey were performed of GDEN graduates from 2017 to 2025. Data extracted included program type, graduation year, demographics, geographic origin, current location, and professional practice status. Invitations to an online survey were emailed to all graduates. **Results**: Nine certificate and 24 master's graduates completed the program (N = 33), 63.6% female, representing 18 ethnic backgrounds, with White/Caucasian and Asian as the largest groups. The mean graduation age was 42.4 years, reflecting mid career professionals. Of 18 (54.5%) survey respondents, 83.3% are practicing in the U.S., with additional graduates practicing in Canada, Australia, and the UAE pursuing careers focused on delivering care in fixed and mobile clinical settings, private homes, community health centers, academia, and further advanced training. Over 83% of graduates strongly agreed the program was worth the investment in advancing career goals, citing increased confidence and knowledge in geriatrics, complex patient management, and evidence-based treatment. Their reflections emphasized renewed motivation, greater resilience, and readiness to expand their practices to meet the growing needs of geriatric patients. **Conclusion**: USC's Geriatric Dentistry program trains a diverse group of dental professionals at various career stages. Its flexible online format enables clinicians to gain specialized training while practicing.

Poster #8

Title: Oral Health of Autistic Children: Clinical Findings from an RCT

Authors: Maile Osborne, Lily Shkhyan, Jose Polido, and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Autistic children

experience well-documented oral health disparities, which may be influenced by sensory sensitivities, communication differences, challenges with daily oral hygiene routines, dietary patterns, and barriers to accessing appropriate dental care. Despite recognition of these challenges, existing literature characterizing oral health in autistic children is limited by small sample sizes, heterogeneous methodologies, and inconsistent use of standardized clinical measures. This gap is particularly notable given the rising prevalence of autism, currently estimated at 1 in 31 children. **Purpose**: The purpose of this study was to examine oral health status in a large sample of autistic children using standardized clinical measures of caries experience, gingival health, and plaque accumulation. **Methods**: Participants were autistic children (n=220; 6-12 years at time of enrollment) participating in a large randomized controlled trial. Widely accepted measures of oral health, including decayed, missing, and filled teeth (dmft/DMFT) scores, Plaque Index, Gingival Index, and the Oral Hygiene Index were assessed at the first of two study-related dental cleanings and used in these analyses. Parent-reported measures of toothbrushing frequency and independence-level were also collected. **Results**: Final data pending. **Conclusion**: Using a large sample and standardized outcome measures, this study will provide a comprehensive characterization of oral health status in autistic children. Findings have the potential to inform prevention strategies, clinical care planning, and future interventions aimed at reducing oral health disparities and advancing oral health equity for this population.

Poster #9

Title: Infrazygomatic Crest Miniscrew Planning in Hispanic Adults: a Cone Beam

Authors: Dev Ardeshna, Talar Mardourian Zilifian, and Glenn Jou

Faculty Advisor: Glenn Jou

Background: Infrazygomatic crest (IZC) miniscrews are increasingly used in orthodontics for skeletal anchorage in maxillary distalization, vertical control, and en-masse retraction. Proper insertion site and angulation are critical to avoid iatrogenic complications, including sinus perforation, inadequate bone purchase, or root damage. Clinical safety depends on the quantity and quality of IZC cortical and total bone thickness. Previous cone beam computed tomography (CBCT) studies have mapped IZC anatomy in limited populations. Roig et al. (AJODO, 2025) quantified IZC total and intra-alveolar lengths in White Spanish adults and provided recommendations for screw length and angulation. Additional studies in Asian populations (AJTR, 2023) evaluated cortical bone thickness and sinus relationships, reporting differences associated with sex, skeletal class, and vertical facial pattern. Collectively, these studies highlight variability in IZC bone dimensions across populations. Despite a growing Hispanic/Latino population in the United States, particularly in Southern California, no CBCT study has systematically characterized IZC anatomy in Hispanic adults. Given known ethnic variability in craniofacial morphology, extrapolating IZC measurements from White or Asian cohorts may not accurately guide clinical miniscrew placement in Hispanic patients, representing a clinically relevant gap. **Purpose**: To quantify IZC overall bone thickness (OBT) and assess root proximity/contact of proposed miniscrew trajectories in Hispanic adults using existing CBCT scans at insertion angles of 50°, 60°, and 70° and heights of 8, 10, and 12 mm from the cemento-enamel junction (CEJ) at the buccal roots of the maxillary first and second molars. **Methods**: Retrospective observational CBCT study using Dolphin Imaging. Scans will be reoriented to the Frankfort horizontal plane. Cortical bone thickness (CBT) and OBT will be measured bilaterally at specified sites and angles. Root proximity/contact will be assessed. **Results**: Pending. **Conclusion**: Pending.

Poster #10

Title: Soft Tissue Augmentation in Peri-Implant Disease Management

Authors: Sydney Kidd, Mirali Pandya, and Kian Kar

Faculty Advisor: Kian Kar

Background: Peri-implant diseases, including peri-implant mucositis and peri-implantitis, are prevalent inflammatory conditions that compromise implant longevity. While peri-implantitis is associated with progressive bone loss, peri-implant mucositis represents a reversible inflammatory stage limited to soft tissues. Increasing evidence suggests that modifying peri-implant soft tissue phenotype, including keratinized mucosa width and mucosal thickness, may influence inflammation control and treatment outcomes. However, the role of soft tissue augmentation and conditioning procedures in the management of peri-implant diseases remains unclear. **Purpose**: To evaluate the clinical outcomes of soft tissue augmentation and conditioning procedures performed as part of treating peri-implant diseases, with a primary focus on peri-implantitis and secondary consideration of peri-implant mucositis. **Methods**: A systematic review was conducted following PRISMA 2020 guidelines. Electronic searches of PubMed, Cochrane Central Register of Controlled Trials, and Google Scholar were performed from January 1970 through October 2025. Randomized controlled trials, prospective and retrospective cohort studies, and prospective case series involving adult patients with peri-implant diseases treated with soft tissue augmentation or conditioning were included. A random effects meta-analysis was performed, with results presented as risk ratios and their associated 95% confidence intervals. Outcomes assessed included probing depth, bleeding on probing, keratinized mucosa width, mucosal thickness, radiographic bone levels, and disease resolution. **Results**: Eight clinical studies met the inclusion criteria, comprising seven peri-implantitis studies and one peri-implant mucositis study included as secondary evidence. Soft tissue augmentation was consistently associated with increases in keratinized mucosa, reductions in probing depth, and decreased bleeding on probing. The peri-implant mucositis study demonstrated significant improvements in mucosal thickness and inflammatory parameters following soft tissue phenotype modification.

Poster #11

Title: Prevalence of Maxillary Sinusitis of Endodontic Origin: Hidden Sinus Tract

Authors: Stephanie Ha, Kim Yen Tran, and Rafael Roges

Faculty Advisor: Rafael Roges

Background: Maxillary sinusitis of endodontic origin (MSEO) is a sinus tract draining into the maxillary sinus often lacking typical dental symptoms and not visible in periapical radiographs. **Purpose**: This study aimed to determine the prevalence of MSEO, as visualized by cone-beam computed tomography (CBCT), in a population of patients presenting for initial endodontic treatment of maxillary posterior teeth. **Methods**: This retrospective study analyzed records from 15 patients presenting to the USC Advanced Endodontic Clinic for treatment of maxillary posterior teeth. Limited FOV CBCT scans of the maxillofacial region were evaluated for signs of MSEO, including periapical radiolucencies (PARLs), periapical osteoperiostitis (PAO), or periapical mucositis (PAM), directly traceable to the index tooth. The primary outcome was the prevalence of MSEO in the study cohort. **Results**: Of the total endodontic cases evaluated, 11 (73.33%) exhibited observable Maxillary Sinusitis of Endodontic Origin (MSEO) on CBCT. The prevalence of MSEO was comparable in initial root canal treatment cases (66.66% involvement) compared to teeth with previously treated cases (66.66% involvement). Periapical mucositis was the most common associated CBCT finding, present in 60%

of MSEO cases. **Conclusion**: Endodontic pathology is strongly associated with radiographic Maxillary Sinusitis of Endodontic Origin (MSEO), with 73.33% of all posterior maxillary endodontic cases exhibiting involvement upon CBCT evaluation. This high prevalence confirms that endodontic infection frequently extends beyond the alveolar bone and advocates for CBCT assessment prior to endodontic treatment of maxillary posterior teeth to facilitate interdisciplinary referral and appropriate treatment.

Poster #12

Title: Eruption timing of the permanent dentition in Vietnamese adolescents

Authors: Vy Ngo and Glenn Jou

Faculty Advisor: Glenn Jou

Background: It is important for the practitioner to have a clear understanding of the average age of eruption of different populations for diagnostic purposes and for the determination of current treatment timing. There is a concentration of the Vietnamese population in California, and it is a reasonable assumption that a percentage of patients in any given practice will belong to this group. Therefore, it is relevant to attempt to create an eruption timing guideline for Vietnamese adolescents. **Purpose**: The purpose of this study is the determine the average eruption age of the permanent dentition in Vietnamese adolescents compared to current standards based on Caucasian adolescents. Sexual dimorphism in eruption timing will also be evaluated. **Methods**: The level of research will be clinical, and the independent variables include ethnic group, gender, and age. Dependent variable is erupted teeth. Selection criteria will be Vietnamese ethnicity, ages 8 to 12 at the time of records, study models and panoramic radiographs to evaluate erupted and unerupted permanent dentition. All information will be recorded on a spreadsheet by one examiner. **Results**: Pending. Descriptive statistics will be calculated for the sample. Ethnicity, gender, and number of erupted teeth will be analyzed using Pearson's Chi-square tests and Fisher's exact test. The level of significance will be alpha < 0.05, where $p \geq 0.05$ is considered not significant. **Conclusion**: Pending.

Poster #13

Title: Clinical Evaluation of a Novel Endodontic Device For Assessment of Root Canal Disinfection

Authors: Stephanie Fukawa, Manuel Perea, Payam Shaaf, Elnaz Mousavi, Yoseif Haddad, Ali Ahaddad, Stefan Zweig, Rafael Roges, Ramon Roges, and Casey Chen

Faculty Advisor: Stefan Zweig and Rafael Roges

Background: Despite the advancements of endodontic irrigation and disinfection protocols, clinicians lack objective, real-time metrics to verify canal disinfection prior to obturation of the root canal system. This study evaluates the Endocator, an ATP-bioluminescence device, to: (1) establish disinfection thresholds, (2) correlate readings with long-term clinical/radiographic healing, (3) assess the impact of Calcium Hydroxide (Ca(OH)2) on ATP levels, and (4) correlate pre-operative symptoms with initial microbial load. The null hypothesis is that the Endocator readings are not associated with clinical outcomes. **Methods**: This is a prospective cohort study at the USC Advanced Endodontics Clinic which involves individuals aged 18 or older with apical periodontitis. ATP readings (Relative Light Units, 0-100) on the Endocator device are recorded at access, post-instrumentation, and—in multi-visit cases—pre- and post-Ca(OH) medication of the canal. Follow-ups are conducted at 6, 12, and 24 months. The primary predictor is the Endocator score, and the primary outcome is treatment success based on clinical symptomology and radiographic assessment at the follow-ups. **Results**: Preliminary data indicate no significant correlation between pre-operative symptoms and initial Endocator readings ($p > 0.05$). Interestingly, teeth medicated with Ca(OH) exhibited rebound or elevated ATP levels upon re-access, suggesting either incomplete microbial suppression or biochemical interference. **Conclusion**: Initial findings suggest that pre-operative symptomatology is not correlated with intracanal ATP levels. Furthermore, the inconsistent ATP response following Ca(OH) application highlights the need for further research to refine thresholds for clinical decision making.

Poster #14

Title: SMDI: An Index for Measuring Subgingival Microbial Dysbiosis

Authors: Hanfrey Deng, Natalia Tjokro, and Casey Chen

Faculty Advisor: Casey Chen

Background: The subgingival microbial dysbiosis index (SMDI) is a novel index developed by Chen et al. in 2022 to measure subgingival microbial dysbiosis. This index serves as a summary statistic of the subgingival microbiome profile, and was based on machine-learning analysis of published periodontitis/health 16S microbiome data. Clinically, this index can be used to identify patients or sites at risk of periodontitis, and to evaluate the microbial response to dental treatment. **Purpose**: To determine the accuracy of SMDI in patients diagnosed as healthy/gingivitis and periodontitis. **Methods**: This cross-sectional study, conducted at the USC Advanced Periodontology clinic, included 9 subjects (4 with health/gingivitis, 5 with periodontitis, according to the 2017 AAP World Workshop). Subgingival plaque was collected with paper points and subjected to 16S rDNA profiling of the v4 region. The SMDI was computed at the species & genus level. **Results**: In general, the SMDI of periodontitis was higher than that of health/gingivitis, but the difference was not statistically significant. Subsequently, two cases of potential misdiagnosis were excluded from the analysis. The SMDI of the remaining subjects at the Gini cutoff point of 0.1 showed 1.21 for periodontitis (N=4) and -0.68 for health/gingivitis (N=3) with a statistically significant difference by t-test (p=0.042). **Conclusion**: The SMDI shows promise in clinical diagnosis. Further research is needed to determine how it changes after periodontal therapy.

Poster #15

Title: Persistent Dentoalveolar Pain: A Retrospective Study

Authors: Shradhdha Trivedi, Douglas Wall, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Persistent dentoalveolar pain (PDAP), classified in the International Classification of Orofacial Pain (ICOP) as a chronic intraoral pain disorder, is defined by ongoing dental or alveolar pain without identifiable local pathology. It is often misattributed to odontogenic causes, resulting in unnecessary dental procedures and delayed pain-directed management. **Purpose**: This study aimed to characterize clinical features, prior dental treatment, and treatment outcomes in patients diagnosed with PDAP. **Methods**: A retrospective chart review was conducted of patients evaluated for PDAP at a university-based orofacial pain clinic between 2017 and 2025. Extracted variables included affected dental quadrant, history of dental treatment related to the pain, baseline pain severity, treatment modality, and percentage pain reduction at follow-up. Treatments were grouped as systemic pharmacologic therapy; non-systemic topical or local therapy or supplements; or multimodal therapy, defined as two or more categories. Outcomes were summarized using descriptive statistics with exploratory non-parametric comparisons. **Results**: 105 patients met diagnostic inclusion criteria; 99 with quantifiable follow-up outcomes available. PDAP occurred both following dental procedures and in a substantial proportion of patients with no prior dental treatment. Mean baseline pain severity was 7.2/10. Mean pain reduction at follow-up was 70.3%, with 82.8% of patients achieving at least 50 percent improvement and 21.2% re-

porting pain resolution. Meaningful improvement occurred more frequently with multimodal therapy than single-modality treatment, in a ratio of 1.3 to 1. **Conclusion**: These findings suggest that PDAP may arise independently of dental procedures and that multimodal neuropathic pain-directed management is associated with better outcomes and may reduce unneccesary dental interventions.

Poster #16

Title: Generalized Tooth Mobility in a Young Female: A Case Study

Authors: Sabrina Alterman, Natalia Tjokro, Casey Chen, Kian Kar, and Mirali Pandya

Faculty Advisor: Mirali Pandya

Background: A 29-year old female with generalized anxiety disorder presents to USC Advanced Periodontics Clinic with worsening mobility in all teeth. **Purpose**: The aim of this case study is to document the effect of non-surgical periodontal treatment of a patient with generalized mobility through scaling and root planing, microbial sampling, and ultrasound imaging. **Methods**: Clinical examination including periodontal charting and full mouth radiograph analysis was conducted. Microbial sampling from three teeth including one healthy and two diseased sites and saliva were processed for microbial analysis. Ultrasound imaging of the entire dentition was performed. The patient underwent non surgical periodontal therapy and re-evaluation at 6 weeks. Microbial testing was repeated at this time. Occlusal adjustment was done at subsequent appointments and re-evaluation performed at 2-4 week intervals. **Results**: A diagnosis of generalized biofilm induced gingivitis was determined. Several species were 10-fold or higher in pretreatment diseased sites than in pretreatment healthy sites with relative abundance of 0.1% or higher, including the following known pathogenic species: *Fusobacterium vincentii*, *Prevotella intermedia*, *Porphyromonas endodontalis*, *Streptococcus intermedius*, and *Porphyromonas gingivalis*. Treatment reduced levels of these species in subgingival plaque. Notably, these species, while constituting minorities of the saliva microbiome, increased in relative abundances in saliva after treatment. Ultrasound scanning revealed a thin buccal plate of maxillary and mandibular anterior teeth. Occlusal adjustment improved mobility of posterior teeth with minor improvement in anterior teeth. **Conclusion**: The use of microbial sampling and ultrasound imaging can help guide the periodontal treatment of patients with severe mobility.

Poster #17

Title: CBCT Evaluation of CEJ-MB2 Canal Relationships

Authors: Kim Yen Tran, Stephanie Ha, and Rafael Roges

Faculty Advisor: Rafael Roges

Background: Failure to identify the second mesiobuccal (MB2) canal in maxillary first molars remains a common cause of endodontic treatment failure. Anatomical variation may obscure MB2 canal location, particularly in relation to external landmarks such as the cemento-enamel junction (CEJ). Improved understanding of this relationship may enhance canal detection. **Purpose**: To evaluate the spatial relationship between the CEJ and the MB2 canal orifice in maxillary first molars using cone-beam computed tomography (CBCT). **Methods**: This retrospective cross-sectional study analyzed previously acquired CBCT scans of adult patients. Measurements included the vertical distance from the CEJ to the MB2 canal orifice and the horizontal distances from the CEJ to the MB1 and MB2 canal orifices. Two calibrated, blinded examiners performed all measurements using standardized CBCT viewing protocols. **Results**: The MB2 canal was identifiable in 17 of 18 maxillary first molars. Horizontally, the CEJ-to-MB2 distance ranged from approximately 2.0 to 3.7 mm, while the CEJ-to-MB1 distance ranged from approximately 1.7 to 3.6 mm. The vertical distance from the CEJ to the MB2 canal orifice demonstrated variability, with a median value at the level of the CEJ. When located apical to the CEJ, vertical measurements ranged from approximately 2.0 to 3.7 mm. The horizontal distance between MB1 and MB2 canal orifices remained relatively consistent, ranging from approximately 1.3 to 3.3 mm. **Conclusion**: Characterization of the CEJ-MB2 relationship using CBCT may assist clinicians in more predictably locating the MB2 canal and improving endodontic treatment outcomes.

Poster #18

Title: Application of Ultrasonography for Evaluation of Clinical Probing Depths

Authors: Eric Madsen, Mirali Pandya, Bryant Tran, Youyoung Min, Mohammadreza Amjadian, Suhel Khan, Jesse Jokerst, and Casey Chen

Faculty Advisor: Casey Chen

Background: Ultrasonography is an emerging technology in periodontology with several key advantages such as lack of ionizing radiation and ability to resolve both hard and soft tissues. Ultrasonography could present a painless, more efficient, and more accurate method of measuring probing depths and attachment loss than traditional periodontal probing. **Purpose**: The objective of this study was to determine if ultrasonographic measurements are correlated with clinical probing measurements. **Methods**: 32 dentate patients at the Herman Ostrow School of Dentistry were recruited for the study. Full periodontal charting was completed and each patient was classified as either periodontally healthy or periodontally diseased. A 40-MHz ultrasound system (Visualsonics) was used to image the facial and lingual surfaces of each tooth. Images were analyzed with ImageJ software to measure the distances between three landmarks: the cementoenamel junction (CEJ), the gingival margin (GM), and the alveolar bone crest (ABC). Probing depths were predicted by subtracting the assumed supracrestal tissue attachment width of 2 mm from the GM to ABC distance. The ultrasound probing depths were compared to the clinical probing depths. **Results**: Preliminary data on 7 patients demonstrates an average ultrasonic probing depth of 2.01±0.95mm and clinical probing depth of 2.89±0.71 mm with an average difference of 0.88±0.95 mm. Regression analysis demonstrates an R square value of 0.14. The consistently higher clinical probing depths can be explained by the difference between probing pocket depths and the anatomical sulcus. **Conclusion**: The consistent measurements of the ultrasound imaging suggests that ultrasonography could be a useful tool for predicting pocket depths.

Poster #19

Title: Incidence of Dr. STAT Emergency Calls in a Dental Clinic

Authors: Nicole Mehdian, James Tom, and Rafael Roges

Faculty Advisor: Rafael Roges

Background: Dr. STAT is the internal medical emergency response system at the Herman Ostrow School of Dentistry of USC, providing rapid assistance during in-clinic medical emergencies. Although each activation is documented, no structured multi-year analysis evaluates the frequency, nature, or outcomes of these events. Understanding emergency patterns in a dental school setting is important for patient safety, emergency preparedness, and clinical education. **Purpose**: This study aims to evaluate the five-year incidence and nature of Dr. STAT medical emergency activations within the USC dental clinics and to assess immediate outcomes. **Methods**: This study involves a retrospective review of Dr. STAT activation logs and corresponding electronic health records from 2021-2025. All documented Dr. STAT calls meeting inclusion criteria are identified. Variables including patient demographics, ASA classification, type of emergency, clinical setting, interventions, and outcomes are extracted using study identification numbers. All HIPAA

identifiers are removed prior to analysis. Descriptive statistics evaluate frequencies, percentages, and trends. No patient interaction occurs. **Results**: Dr. STAT activations most frequently involve vasovagal syncope and hypoglycemic events. These emergencies commonly occur with patient anxiety, local anesthesia administration, or prolonged procedures. Most incidents are managed chairside with supportive measures such as repositioning, oxygen, and glucose. Less frequently, cardiovascular-related symptoms prompt emergency medical services activation. **Conclusion**: Vasovagal syncope and hypoglycemia represent the most common medical emergencies requiring Dr. STAT activation in a dental school clinic. Most events are managed successfully within the clinic, emphasizing the importance of rapid recognition, effective response protocols, and continued emergency preparedness training.

Poster #20

Title: Coronal Restoration Status and Asymptomatic Apical Periodontitis

Authors: Youram Farzam and Rafael Roges

Faculty Advisor: Rafael Roges

Background: Asymptomatic apical periodontitis (AAP) is often associated with periapical radiolucency that is detected on radiographs. Restorations could result in limiting the number of microorganisms that are introduced to the root canal system. The integrity of coronal restorations have been suggested to influence the development of lesions, but evidence remains inconsistent. **Purpose**: This study aimed to evaluate the relationship between coronal restoration and the prevalence of AAP in adult patients. **Methods**: This retrospective study analyzed existing CBCT scans from the USC School of Dentistry imaging database. Adult patients with at least one restored tooth and high-quality scans were included. Tooth number, restoration type, restoration integrity, and presence of periapical lesions were recorded. Lesion size was measured in millimeters using standardized imaging software. Two independent, observers assessed all scans. Statistical analyses included t-tests for lesion size comparisons and logistic regression to determine odds of AAP based on restoration status, adjusting for age and sex. **Results**: Data analysis is ongoing. Preliminary observations suggest AAP prevalence and lesion size may be associated large restoration as compared to SAP being exposed to oral cavity. **Conclusion**: Understanding the relationship between coronal restoration status and AAP could explain the effect of microorganism in patients' symptoms. For instance, in case of coronal restoration, the communication with oral cavity is limited and number of bacteria are low; leading to asymptomatic apical periodontitis. On the other hand, we would like to examine to see if the root canal system is exposed to the oral cavity, whether the patient will experience more symptoms.

Poster #21

Title: The Effectiveness of Biologics in Peri-Implantitis Treatment: A Systematic Review

Authors: Jinnu Kim, Kian Kar, and Mirali Pandya

Faculty Advisor: Kian Kar and Mirali Pandya

Background: Peri-implantitis is a progressive inflammatory condition characterized by soft tissue inflammation and bone loss around dental implants. Conventional treatments—ranging from mechanical debridement to surgical approaches—often fail to achieve predictable regeneration. The adjunctive use of biologics, including enamel matrix derivative (EMD), platelet-rich fibrin (PRF), bone morphogenetic proteins (BMPs), and recombinant growth factors, has emerged as a promising regenerative strategy. **Purpose**: This systematic review aims to assess the clinical effectiveness of biologic agents in both surgical and non-surgical treatment of peri-implantitis, with emphasis on hard and soft tissue outcomes. **Methods**: A comprehensive literature search was performed across PubMed, Cochrane, and Google Scholar for human clinical studies published between 2000 and 2025. Included studies were randomized controlled trials, cohort studies, or case series that evaluated the adjunctive use of biologics in peri-implantitis therapy. Outcomes assessed included probing depth (PD), clinical attachment level (CAL), bleeding on probing (BOP), radiographic bone fill, and implant survival. A random-effects meta-analysis was conducted, with results expressed as risk ratios and 95% confidence intervals. **Results**: Fifteen studies met the inclusion criteria. Biologic use demonstrated consistent improvement in PD reduction (2-4 mm), bone gain (1-2 mm), and BOP reduction. PRF and EMD adjuncts showed superior results compared to control groups. However, variability in study design and short follow-up durations limited the strength of pooled analyses. **Conclusion**: Biologics may enhance regenerative outcomes in peri-implantitis treatment, particularly in sites with contained defects. Standardized protocols and longer-term studies are needed to validate these findings.

CBY/PIBBS GRADUATE STUDENT

Poster #22

Title: PRMT1-SFPQ regulates intron retention to control matrix gene expression during craniofacial development

Authors: Julia Raulino Lima, Nicha Ungvijanpunya, Qing Chen, Hoang Quoc Hai Pham, Tal Rosen, Greg Park, Mohammadreza Vatankhah, Steven Yen, Yang Chai, Amy Merrill-Brugger, Zhaoyang Liu, Jianfu Chen, Yanzhong Yang, Weiqun Peng, and Jian Xu

Faculty Advisor: Jian Xu

Background: Craniofacial mesenchyme is essential for facial structure formation and is primarily derived from cranial neural crest cells (CNCCs). In CNCCs, mutations in spliceosome-related factors can disrupt pre-mRNA processing and lead to craniofacial abnormalities commonly observed in spliceosomopathies, a class of disorders caused by alterations in spliceosome-associated genes. Intron retention (IR), a type of alternative splicing, is increasingly recognized as an important regulatory mechanism in development and disease, yet its control in CNCCs remains largely unexplored. **Purpose**: This study investigates the previously underappreciated role of the PRMT1-SFPQ axis in regulating IR in CNCCs during craniofacial development. **Methods**: CNCC-specific deletion of PRMT1 was performed using *Wnt1-Cre; Prmt1*$^{fl/fl}$ embryos at embryonic day 13.5 (E13.5). Proximity ligation assay, immunofluorescence, Western blotting, and FACS analysis were used to evaluate PRMT1-dependent regulation of SFPQ activity and intron splicing. To examine downstream transcriptional effects, RNA sequencing was conducted on primary CNCCs transfected with siRNAs targeting SFPQ, enabling assessment of PRMT1-mediated SFPQ methylation in gene expression control. **Results**: Loss of PRMT1 led to elevated IR in extracellular matrix gene transcripts, promoting nonsense-mediated decay (NMD) and reducing matrix mRNA levels. SFPQ was identified as a PRMT1 substrate, requiring PRMT1-dependent arginine methylation for proper expression and function. SFPQ depletion in CNCCs phenocopied PRMT1 loss, increasing IR and decreasing expression of matrix genes, Wnt signaling components, and neuronal genes. Notably, SFPQ-regulated targets were enriched among longer genes. **Conclusion**: The PRMT1-SFPQ pathway regulates extracellular matrix, Wnt signaling, and neuronal gene expression by controlling intron retention in CNCCs, supporting proper craniofacial development.

Poster #23

Title: Theory of amplitude control by frequency detuning in the rodent

Authors: Adam C. Lu, Seyed AmirHossein Ourang*, and Jeffrey D. Moore *Presenting author

Faculty Advisor: Jeffrey D. Moore

Background: Orofacial behaviors, including licking, chewing, and suckling, are generated by central pattern generators (CPGs) that produce rhythmic, coordinated muscle activity while still allowing flexible kinematics to meet behavioral demands. Whisking, the rhythmic sweeping of the vibrissae that rodents use for haptic perception, is one such behavior. Whisking is controlled by a brainstem oscillator circuit that is tightly synchronized with breathing; however, the mechanisms by which whisking amplitude is dynamically modulated to serve different perceptual goals remains unknown. **Purpose**: To evaluate the hypothesis that interactions between the whisking and breathing oscillator circuits implement frequency detuning as a mechanism for amplitude control in an orofacial CPG. **Methods**: A re-analysis of whisking and breathing data from rats was performed to identify kinematic signatures of a resonant oscillator in vibrissa trajectories. A biologically constrained neuronal network model of the whisking CPG, receiving rhythmic input from the respiratory oscillator, was constructed to simulate how shifts in intrinsic whisking oscillator frequency relative to breathing affect whisking amplitude. **Results**: The kinematic analysis revealed that whisking demonstrates signatures of resonance with breathing, consistent with a driven oscillator system. Neuronal network simulations showed that whisking amplitude is maximized when the intrinsic whisking oscillator frequency matches the breathing frequency, and that systematic detuning between the two oscillators smoothly modulates whisking amplitude. **Conclusion**: These findings suggest that frequency detuning between coupled neuronal oscillators provides a biologically plausible mechanism for amplitude control in whisking and may extend to other rhythmic behaviors.

Poster #24

Title: Transcriptional-cellular changes in the temporomandibular joint following anterior disc displacement

Authors: Maria Pacheco-Vergara, Barbara Flores, Daniela Gioia, Andrew Sung, and Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger

Background: Over 10-15% of the adult population are affected by temporomandibular joint disorders (TMD), especially women during reproductive years. 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-cellular changes that occur in the temporomandibular joint (TMJ) following ADD. **Purpose**: The aims of this study are to characterize the TMJ's molecular and cellular response following partial and complete ADD, combining genomics and genetics in a mouse surgical model. **Methods**: Unilateral surgical ADD was performed on 6-week-old C57/B6 female mice by accessing the temporomandibular joint through the masseter muscle and severing the retrodiscal attachments. At 5 dps, control and ADD discs were collected for bulk RNAseq and scRNAseq. For spatial transcriptomics, control and ADD samples (5 dps) were processed at the single-cell level with sequential fluorescence in situ hybridization. For genetic lineage tracing, ScxCreERT2; tdTomato mice were induced with Tamoxifen previous to ADD surgery. **Results**: The transcriptional-cellular response in complete ADD surgery led to condylar cartilage degeneration, synovial overgrowth, increased fibrotic- and neural-related pathways, and increased Scx-lineage cells, while partial ADD surgery led to a subdued response. **Conclusion**: This model replicates key aspects of human ADD with and without reduction, in which disc displacement often precedes temporomandibular joint degeneration. It provides tools to identify future potential therapeutic targets by identifying genes that play a key role in the ADD response.

Poster #25

Title: Complex Interaction of AHR and BMP Pathways During Osteogenic Differentiation

Authors: Mohammadreza Vatankhah, Prerna Sehgal, Julia Raulino Lima, and Jian Xu

Faculty Advisor: Jian Xu

Background: Dioxins, toxic environmental pollutants found in cigarette smoke and industrial emissions, cause osteogenic disruption and craniofacial defects. The aryl hydrocarbon receptor (AHR), a ligand-activated transcription factor, mediates dioxin toxicity, while the bone morphogenetic protein (BMP) pathway is essential for osteogenic differentiation. However, the mechanisms by which 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the most potent dioxin, disrupts osteogenic differentiation remain poorly understood. Understanding this interaction is crucial for developing therapeutic strategies to prevent or treat dioxin-induced skeletal abnormalities. **Purpose**: To investigate how AHR mediates TCDD-induced disruption of BMP-driven osteogenic differentiation. **Methods**: Using ST2 mesenchymal cells, we employed siRNA-mediated knockdown, RNA-sequencing, qPCR, immunostaining, Western blot, alkaline phosphatase staining, and ChIP-qPCR analyses. **Results**: TCDD activated the AHR pathway, downregulated osteogenic gene expression including *Alpl*, *Runx2*, and *Sp7*, and reduced alkaline phosphatase activity. Unexpectedly, *Ahr* knockdown also inhibited BMP-induced osteogenic differentiation, revealing a previously unrecognized requirement for AHR in osteogenesis. Reciprocally, BMP pathway activation downregulated AHR pathway components including *Ahr* and *Cyp1a1*. Mechanistically, *Ahr* knockdown reduced SMAD1/5 phosphorylation, suggesting AHR modulates BMP signaling at the level of receptor-activated SMAD activation. **Conclusion**: AHR serves a dual regulatory role, supporting BMP-induced osteogenic differentiation while also mediating TCDD toxicity. This complex AHR-BMP crosstalk provides mechanistic insight into how dioxin exposure disrupts bone formation.

Poster #26

Title: Thermoplastic Dental Compound Mounting for Hydrated Tissue Nanoindentation

Authors: Mohammadreza Vatankhah, Junxi Guo, Julia Raulino Lima, and Jian Xu

Faculty Advisor: Jian Xu

Background: Nanoindentation of hydrated biological tissues requires mounting strategies that provide mechanical stability without introducing artifacts from dehydration or adhesive infiltration. Conventional adhesive-based methods often fail under aqueous conditions or contaminate tissue surfaces, compromising measurement reliability. An ideal approach would mechanically stabilize specimens while maintaining full hydration and avoiding chemical contact with the test surface. **Purpose**: To develop and validate a thermoplastic dental compound-based mounting method for nanoindentation of hydrated biological tissues and to create a software tool for spatial analysis of indentation data. **Methods**: Fresh postnatal day 21 (P21) mouse tissues were harvested and mounted using thermoplastic dental compound (Kerr Impression Compound). Specimens were embedded from the non-measured surface into heat-softened compound, then fully immersed in phosphate-buffered saline. Nanoindentation was performed using an Anton Paar UNHT^{3}Bio with a 500 µm spherical probe on femoral, tibial, and TMJ condylar cartilage surfaces. We developed IndentView, a web-based application for spatial visualization and statistical analysis of indentation data. **Results**: The protocol enabled stable nanoindentation across joint cartilage with varying mechanical properties. Indentation modulus values were 2.08 ± 0.90 MPa for femur (n=255), 1.68 ± 1.22 MPa for tibia (n=320), and 0.34 ± 0.07 MPa for TMJ condyle (n=127). IndentView provided 3D spatial mapping and zoned

statistical analysis. **Conclusion**: Thermoplastic dental compound mounting provides a simple, reproducible approach for nanoindentation of hydrated tissues without adhesive contact to the test surface. Combined with IndentView, this enables detailed spatial characterization of joint cartilage mechanics.

Poster #27

Title: Role of Sox9 in vSSC During Disc Development and Degeneration

Authors: Katherine Johnson and Zhaoyang Liu

Faculty Advisor: Zhaoyang Liu

Background: Degeneration of the intervertebral discs (IVDs) is a significant contributor to disability around the world. Previous works have demonstrated a crucial role of SOX9 in spine alignment and IVD homeostasis, but the precise role of SOX9 in the vertebral skeletal stem cells (vSSC) in axial skeleton development and IVD maintenance has yet to be uncovered. **Purpose**: To study the role of SOX9 in vSSC for spine development and IVD homeostasis. **Methods**: *Sox9* was conditionally knocked-out in vSSC by *Zic1Cre*. Skeletal preparation, histological assay, and lineage tracing were performed on P1 and P10 control, heterozygous mutant, and homozygous mutant mice. MicroCT was performed to assess spine deformities. **Results**: Our preliminary results show that (1) *Zic1*-expression vSSC contributes remarkably to the dorsal region of the axial skeleton, and ZIC1 maintains expression in the cartilaginous tissues of the adult IVD. (2) Ablation of *Sox9* in vSSC exhibits dose-dependent defects in the cervical, thoracic, and lumbar regions of the spine. Homozygous mutants were perinatal lethal with severe axial skeletal defects. Heterozygous mutants had premature fusion of the spinal elements and presented a spectrum of IVD degeneration severity in adulthood, with disc degeneration consistently occurring in the dorsal region of the spine. **Conclusion**: These results highlight the role of SOX9 in vSSC for spine development and revealed a link between *Sox9* dosage and IVD degeneration. Our future directions will center around RNA-seq and CUT&RUN to identify SOX9 targets in the spine.

Poster #28

Title: Spatial profiling reveals an Lgr5+ tendon-specific progenitor in the jaw

Authors: Arshia Bhojwani, Audrey C. Nickle, Kuo-Chang (Ted) Tseng, Ryan R. Roberts, J. Gage Crump, and Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger and Gage Crump

Background and Purpose: The temporomandibular joint (TMJ) of the mammalian jaw is a complex structure composed of skeletal and connective tissues derived from cranial neural crest-derived cells. Whether skeletal and connective tissue components derive from common or distinct progenitors has remained unclear. **Methods and Results**: By integrating single-cell RNA sequencing and spatial genomics of the embryonic mouse jaw, we reveal spatial heterogeneity of skeletal and connective tissue types, including discrete force-transmitting and muscle-anchoring tendon, ligament, TMJ disc, and progenitor populations in and around the jaw joint. We also identity discrete progenitors for skeletal and connective tissues in the periosteum surrounding the jaw processes. Whereas Gli1 expression marks skeletal progenitors in the inner periosteum, we find that Lgr5 expression marks tendon and disc progenitors in the outer periosteum. Consistently, embryonic lineage tracing with Lgr5:GFP-CreER shows contributions to tendons and the ligament-like disc of the jaw joint, but not skeleton. In contrast, embryonic lineage tracing with Gli1:CreER shows contribution to the angular and condyle skeleton but not to Lgr5+ progenitors or the force-transmitting tendons and disc. This role of LGRs in jaw connective tissue development appears to be conserved in zebrafish as I detect lgr4 and lgr6 expression in putative tendon and ligament progenitors of the fish jaw. By generating an lgr4:nlsEOS knock-in line to perform short-term photoconversion-based lineage tracing, I show that lgr4+ cells contribute to jaw tendons in fish. **Conclusion**: These findings highlight the power of spatially resolved transcriptomics to reveal lineage-specific progenitors in the mammalian jaw.

Poster #29

Title: Tooth Sensory Innervation Requires Epigenetic Control of Mesenchymal BMP Signaling

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

Faculty Advisor: Yang Chai

Background: Sensory innervation is essential for pulp vitality and tissue regeneration, yet the mechanisms by which surrounding mesenchymal tissues guide axonal growth and branching within the dental pulp remain poorly understood. **Purpose**: This study investigates how the histone demethylase KDM6B and its antagonist EZH2 epigenetically regulate BMP signaling to control trigeminal sensory innervation during tooth development. **Methods**: *Kdm6b* was conditionally deleted from dental mesenchymal cells (*Osr2-Cre;Kdm6b*$^{fl/fl}$). Pulp morphology and nerve patterning were analyzed by microCT, histology, and whole-mount nerve staining. Transcriptomic and chromatin profiling were performed using RNA-seq and CUT&RUN-sequencing, and functional rescue was tested in *Ezh2*- or *Bmpr1a*-haploinsufficient *Kdm6b* mutant mice. All experiments were performed in at least three biological replicates ($P < 0.05$). **Results**: Loss of *Kdm6b* resulted in a significant reduction of trigeminal axon extension and pulpal innervation, preceding root structural changes. Transcriptomic and chromatin analyses revealed that *Kdm6b* maintains BMP signaling homeostasis in the dental mesenchyme by sustaining expression of the BMP inhibitor *Bambi* and the neurotrophic factor *Ngf*. *Kdm6b* deletion caused BMP hyperactivation and increased SMAD5 binding at the *Ngf* promoter, leading to reduced *Ngf* transcription, impaired neurotrophic signaling, and reduced axonal growth and branching. Partial restoration of *Ngf* expression, tooth innervation, and root elongation in *Ezh2*- and *Bmpr1a*-haploinsufficient mice confirmed an antagonistic KDM6B-EZH2 mechanism maintaining mesenchymal BMP balance and axonal growth. **Conclusion**: Epigenetic regulation of mesenchymal BMP signaling by Kdm6b reveals a previously unrecognized mechanism governing neurotrophic support for pulp innervation and identifies tissue-intrinsic pathways relevant to regenerative endodontics.

Poster #30

Title: Distinct Biological and Biomechanical Features in TMJ and Knee Cartilages

Authors: Jingyu He, Hong Colleen Feng, Holly Katherine Johnson, Courtney Leong, Fangzhou Bian, Laura Voskanyan, and Zhaoyang Liu

Faculty Advisor: Zhaoyang Liu

Background: The temporomandibular joint (TMJ) and knee joint are among the most frequently used joints in the body; however, mechanisms regulating the homeostasis of the cartilage populations in these joints remain poorly understood. **Purpose**: To perform a comprehensive comparison of the biological and biomechanical properties of the mandibular condylar cartilage (MCC) in the TMJ and the articular cartilage (AC) in the knee joint in mice. **Methods**: Histological analysis was performed on MCC and AC in mice at P1, P20, 3 months, and 10 months. Extracellular matrix (ECM) components and key transcriptional factor expression were analyzed with immunostaining. The contribution of Scx-expressing cells to MCC development and the pattern of slow-cycling cells was assessed by lineage tracing and EdU incorporation, respectively. Biomechanical analysis was performed with a bio-indentator. **Results**: We observed the most pronounced structural differences between MCC and AC at P21, coinciding with occlusion

establishment. We identified a progenitor-like cell niche in the posterior MCC enriched in slow-cycling cells, overlapping with the region that highly expresses SOX9 and RUNX2. Lineage tracing revealed that Scx-expressing cells substantially contribute to the postnatal MCC development. Biomechanically, we found that MCC exhibited significantly lower elasticity than AC with the highest elasticity obaserved at the anterior region. We further revealed that the biomechanical properties is correlated with the compositional ratio of the collagen II (+) and collagen X (+) ECM. **Conclusion**: Our findings demonstrate distinct biological and biomechanical characteristics of MCC and AC and establish a link between ECM and MCC mechanical properties.

Poster #31

Title: A Cartilage-Enriched GPCR Maintains Articular Cartilage Homeostasis via Gs Signaling

Authors: Fangzhou Bian, Jingyu He, Hong Feng, Ryan Scott Gray, Jennifer Harrell and Zhaoyang Liu

Faculty Advisor: Zhaoyang Liu

Background: Osteoarthritis (OA) is a widespread cartilage degeneration disease with no disease-modifying therapeutics available. G protein-coupled receptors (GPCRs) are potential viable targets for promoting anabolism in the articular cartilage of OA knee joints. **Purpose**: This study aims to identify the top-enriched GPCR in non-hypertrophic chondrocytes and investigate its role in articular cartilage homeostasis. **Methods**: We performed scRNA-seq analysis in human and mouse articular cartilage datasets to identify GPCRs in different cell populations. We generated genetic mouse models to study the tissue-specific role of ADGRG6 and Gs-mediated signaling. We detected gene and protein expression on tissue sections with in situ hybridization and immunostaining. We analyzed *Adgrg6* KO and control mouse knees after performing destabilization of the medial meniscus (DMM) surgery. **Results**: scRNA-seq reveals *Adgrg6* as the most enriched GPCR in non-hypertrophic chondrocytes in humans and mice, with reduced expression in degenerative versus healthy cartilage. Ablation of *Adgrg6* in osteochondral progenitor cells and mature chondrocytes causes OA-like joint degradation at 8-9 months. DMM injury causes more severe cartilage loss in heterozygous *Adgrg6* mutant mice at 8 weeks post-surgery. Loss of *Adgrg6* reduces Gs/cAMP activation and alters expression of extracellular matrix and ossification-related genes. Forskolin (FSK) restores impaired chondrogenesis in ATDC5 cultures. Activation of Gs signaling via Gs-coupled DREADD allele (*Col2Cre; Rosa-GsD$^{f/+}$*) promotes cartilage anabolism (increased area/thickness) and partially rescues *Col2Cre; Adgrg6$^{f/f}$* cartilage degeneration. **Conclusion**: Our study suggests that ADGRG6, the top-enriched GPCR in non-hypertrophic chondrocytes, plays a crucial role in maintaining postnatal articular homeostasis via promoting anabolism while suppressing osteogenic differentiation through activating Gs signaling.

Poster #32

Title: Mechanisms Driving Premature Synchondrosis Fusion in Bent Bone Dysplasia Syndrome

Authors: Britany Hansten Monterrozo, Sebastian Ko, and Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger

Background: Mutations in Fibroblast Growth Factor (FGF) receptors are common in craniofacial disorders, including the *FGFR2^{M391R}* and *FGFR2^{Y381D}* mutations that cause bent bone dysplasia syndrome (BBDS). Midface hypoplasia is partially attributed to early fusion of the skull base through the cartilage growth centers, or synchondroses. The perichondrium is the connective tissue that promotes maintenance of the synchondroses and is its primary source of FGFR2. Our lab has found that nuclear Fgfr2 affects proliferation and osteoblast differentiation through interaction with transcription regulators. **Purpose**: Although clinically significant, cellular and molecular mechanisms of premature synchondrosis fusion are understudied. **Methods**: We have developed a Cre-inducible knock-in of the *Fgfr2^{M391R}* allele modeling BBDS. Activation of the *Fgfr2^{M391R}* allele through the *Wnt1-Cre* cranial neural crest cell specific driver prompts midface hypoplasia by premature fusion of the intersphenoid synchondrosis (ISS). Using skeletal preparations and histology, I see ectopic bone driving premature ISS fusion. **Results**: Additionally, I observe thickening and invasion of the perichondrium into the ISS, suggesting that the perichondrium is involved in early fusion. As there is no detailed characterization of ISS, our lab generated the first bulk and single-cell RNA sequencing data of the ISS. Preliminary analysis of these data has shown multiple chondrocyte and perichondrial subtypes as well as differentially expressed genes involved in epithelial-mesenchymal transition, cell invasion/migration and cell adhesion. **Conclusion**: Here we describe midface hypoplasia driven by FGFR2 and begin exploring the cellular makeup of the ISS thus providing insight into the mechanisms of synchondroses growth in BBDS and in craniofacial development.

Poster #33

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

Authors: Taolin Xie, Chi Liang, Hansong Xia, Anjie Lu, Chao Qin, Xinchi Xie, Wayne Yeh, Zhenhao An, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: CAD (**C**arbamoyl-phosphate synthetase, **A**spartate transcarbamoylase and **D**ihydroorotase) catalyzes the first three steps of *de novo* pyrimidine synthesis. Our previous findings characterized CAD as a protein deamidase that deamidates NF-κB transcriptional factor RelA, which shunts RelA from mediating inflammation to aerobic glycolysis. We propose that this process serves as a balance between immune activation and cell proliferation. However, it remains unknown whether CAD activity can be regulated by immune signaling in response to infection. **Purpose**: This study aims at determining whether CAD activity is impaired by immune response and deciphering the underlying mechanism. **Methods**: CAD activity was measured by two-dimensional gel electrophresis (2DGE) and isotope tracing assay. The post-translational modification of CAD was characterized by liquid chromatography - mass spectrometry (LC-MS). **Results**: We found that CAD enzymatic activity is inhibited upon immune activation in colon cancer cells. Mechanistically, CAD is phosphorylated by TANK-binding kinase-1 (TBK1) and inhibitor of nuclear factor κB kinase-β (IKKβ) at multiple sites, which attenuates both pyrimidine synthetase and protein deamidase activity of CAD, subsequently inhibiting cancer cell proliferation and increasing chemosensitivity. As such, pharmacological activating intratumoral innate immune signaling by STING agonists can synergize with chemotherapy via CAD inhibition. Moreover, when TBK1 plays oncogenic roles in cancer cells, it is switched from inhibiting to activating CAD. **Conclusion**: Our findings highlight a novel crosstalk between innate immune signaling and pyrimidine synthesis, and offer a mechanistic rationale for combining STING agonists with chemotherapy as a highly potent combinational therapy.

Poster #34

Title: Notch signaling promotes specification of mouse jaw attachment progenitors

Authors: Michaela Ince, Arshia Bhojwani, Ryan Roberts, and Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger

Background: Precise integration of tendons, muscles and bone/cartilage is necessary for jaw function. These integra-

tions occur at tendon-bone attachments; organized zones of tendon, fibrocartilage, and bone. Tripotent jaw attachment progenitors (APs) establish these interfaces through graded expression of *Scx*, *Sox9*, or *Runx2*. However, the mechanism of AP specification remains unknown. Previous work in our lab showed that loss of *Fgfr2* in cranial neural crest cells (CNCCs) leads to loss of Notch signaling in jaw APs, promoting skeletogenic components over connective tissue. **Purpose**: This project investigates the role of Notch signaling in development of the tendon-bone attachment of the jaw. **Methods**: Wnt1-Cre-mediated recombination of *Notch2* and its ligand *Jag1* knocks out these genes in murine CNCCs. Histological staining and skeletal preparations visualize tissue-specific changes of the jaw. Single cell RNA-sequencing (scRNA-seq) and RNA *in-situ* hybridization (ISH) analyze gene expression changes. **Results**: Loss of *Notch2* in CNCCS results in dysmorphism of jaw attachment processes that worsens over time. scRNA-seq of the E16.5/E18.5 jaw joint shows expression of *Notch2* and *Jag1* in proliferating tendon and tendon/ligament populations. Spatial transcriptomics identified periskeletal tissue clusters around the angular and condyle that express *Notch2* and *Jag1*. However, RNA ISH of E18.5 jaw joints shows that *Scx+*, *Sox9+*, and *Runx2+* cells persist following loss of *Notch2* in CNCCs. **Conclusion**: Notch signaling functions downstream of *Fgfr2* to promote maturation of APs into tenocytes, osteoblasts, and chondrocytes. This ongoing work will provide understanding of Notch-associated syndromes such as Alagille syndrome.

Poster #35

Title: Human synovial organoids reveal fibroblast-macrophage interactions driving TMJ arthritis pain

Authors: Jingyi Chen, Qing Chang, Ziying Lin, Yang Shu, David Ahn, Anette Vistoso Monreal, Glenn Thomas Clark, Yang Chai, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Temporomandibular joint (TMJ) arthritis is a degenerative craniofacial arthropathy characterized by cartilage remodeling, synovial inflammation, bone degeneration, and chronic pain. A lack of human new approach methodologies (NAMs) limits mechanistic understanding of disease pathogenesis and hinders the development of effective therapies. Synovial fibroblasts and macrophages are major drivers of inflammatory remodeling, yet their interactions in human TMJ arthritis remain poorly defined. **Purpose**: This study aimed to investigate how synovial fibroblasts and macrophages interact under inflammatory conditions and to determine the role of fibroblast-derived NETRIN-1 in TMJ arthritis–associated inflammation and pain. **Methods**: We established a human synovial organoid model using iPSC-derived synovial fibroblasts and primary human macrophages to recapitulate inflammatory cellular crosstalk. Molecular and phenotypic changes were analyzed using immunostaining and cytokine measurements. TMJ synovial tissues from painful arthritis patients were examined to validate *in vitro* findings. *In vivo* functional studies were performed using fibroblast-specific Netrin-1 conditional knockout (cKO) mice. **Results**: Activated macrophages reprogrammed synovial fibroblasts toward a pro-inflammatory phenotype characterized by increased IL-1β expression and enhanced cytokine production. Patient tissues showed close spatial associations between $CD68^+$ macrophages and IL-1β-high fibroblasts. These inflammatory fibroblasts exhibited elevated secretion of NETRIN-1, which was increased in patient synovial fluid. Deletion of fibroblast-derived-Netrin-1 reduced macrophage activation, synovial inflammation, $CGRP^+$ nociceptive nerve fiber density, and orofacial pain in mice. **Conclusion**: These findings demonstrate that fibroblast–macrophage communication mediated by NETRIN-1 plays a central role in TMJ arthritis pathogenesis and pain. Targeting this signaling axis may provide a promising therapeutic strategy for treating TMJ arthritis.

Poster #36

Title: Meningeal Lymphatic Activation Mitigates Cerebrovascular Defects in Craniosynostosis

Authors: Dongyi Lan, Qing Chang, Naomi Sta Maria, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Meningeal lymphatic vessels (MLVs) reside within the dura mater, the outermost layer of the meninges surrounding the brain and spinal cord and play a critical role in brain fluid drainage and homeostasis. The *Twist1*$^{+/-}$ mouse is a well-established model of craniosynostosis that recapitulates human Saethre-Chotzen syndrome, including impaired meningeal lymphatic function and neurocognitive deficits. **Purpose**: To investigate how meningeal lymphatics interact with the cerebrovascular system in craniosynostosis. **Methods**: We used dynamic susceptibility contrast (DSC)-MRI to detect cerebral blood flow and cerebral blood volume, and dynamic contrast-enhanced (DCE)-MRI to assess cerebrovascular permeability. By treating *Twist1*$^{+/-}$ mice with VEGF-C to promote meningeal lymphatic gain-of-function. **Results**: We found that *Twist1*$^{+/-}$ mice exhibit significant cerebrovascular dysfunction, characterized by reduced cerebral blood flow and cerebral blood volume as measured by DSC-MRI, along with increased cerebrovascular permeability assessed by DCE-MRI. These vascular abnormalities were accompanied by reduced brain and ventricular volumes and increased neuroinflammatory responses. Treatment of *Twist1*$^{+/-}$ mice with VEGF-C to promote meningeal lymphatic activation significantly improved cerebrovascular perfusion, restored cerebrovascular permeability, and rescued brain and ventricular volumes while attenuating neuroinflammation. **Conclusion**: The cerebrovascular system is functionally coupled to meningeal lymphatic function and activation of meningeal lymphatics can mitigate cerebrovascular and brain structural defects in craniosynostosis. This work identifies meningeal lymphatic-vascular interactions as a potential therapeutic target for craniosynostosis and related neurovascular disorders.

Poster #37

Title: Targeting CTPS1 to Suppress Tumor Growth in Breast Cancer

Authors: Zhenhao An, Qin Chao, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: Nucleotide metabolic enzymes are increasingly recognized as promising cancer targets due to their essential roles in DNA/RNA synthesis and their impact on tumor cell growth and survival. Cytidine triphosphate synthase 1 (CTPS1) are key enzymes in pyrimidine biosynthesis. Beyond its role in pyrimidine synthesis, we also discovered that CTPS1 suppresses interferon (IFN) production by deamidating IRF3 (Rao et al., 2024). **Purpose**: This dual functionality—supporting cancer cell proliferation while dampening innate immune responses—makes CTPS1 an attractive therapeutic target. Recently, a study showed that TP53 deletion or mutation is associated with upregulated CTPS1 expression in myeloma cells (Durand et al., 2024), supporting our hypothesis that CTPS1 is a critical vulnerability in different cancer cell lines, especially breast cancer. **Methods**: To target CTPS1 for antitumor therapy, we developed a CTPS1 inhibitor B5, which covalently binds with catalytic cysteine (C399) of CTPS1 GAT domain. **Results**: Our preliminary studies revealed that: (1) B5 potently inhibited proliferation of different cancer cell lines at sub-micromolar concentration; (2) B5 induced interferon and ISG expression in different cancer cell lines in a dose-dependent manner; and (3) B5 suppressed IRF3 deamidation in different cancer cell lines as shown by two-dimensional gel electrophoresis (2DGE). **Conclusion**: Successful completion of this study will: (1) provide strong pharmacological evidence for CTPS1 as a therapeutic target in cancer;

(2) reveal an unprecedented mechanistic link between pyrimidine metabolism and innate immune signaling; and (3) establish B5 as a highly potent CTPS1 inhibitor that blocks CTP synthesis and restores IFN induction, thereby impairing tumor growth.

Poster #38

Title: Modeling KMT2C-Loss Epigenomic Reprogramming in HPV-Negative HNSCC Organoids

Authors: Yuhao Pan, Hua Zhao, Chehyun Nam, Qiong Mao, Haiyi Huang, and Dechen Lin

Faculty Advisor: Dechen Lin

Background and Purpose: We use mouse tongue-derived squamous organoids to model the preneoplastic-to-neoplastic transition of HPV-negative head and neck squamous cell carcinoma (HNSCC), a lethal malignancy with ~890,000 new cases and ~450,000 deaths annually. HPV-negative tumors account for >75% of HNSCC and are frequently driven by recurrent alterations in tumor suppressors and epigenetic regulators. KMT2C (MLL3) encodes an H3K4 mono-/di-methyltransferase, and loss-of-function mutations occur in ~9-14% of HPV-negative HNSCC, often co-occurring with TP53 and CDKN2A mutations and correlating with disease progression and poor overall and disease-free survival. **Methods**: To define how Kmt2c loss promotes early malignant progression, we generated mouse tongue-derived organoids with combined knockout of Cdkn2a, Tp53, and Kmt2c (triple knockout; TK) and compared them to Tp53/Cdkn2a double-knockout (DK) preneoplastic organoids. We performed morphological assays and multi-omic profiling to evaluate Kmt2c-dependent cell-state changes and underlying mechanisms. **Results**: Relative to DK organoids, TK organoids exhibited increased proliferation and dedifferentiation, with reduced squamous differentiation and a higher-grade cancer signature. These phenotypes were recapitulated in syngeneic in vivo tumors, supporting physiological relevance. Transcriptomic profiling validated the morphological findings, revealing downregulation of squamous differentiation programs and upregulation of interferon signaling pathways in TK models. **Conclusion**: Together, our data support a model in which Kmt2c loss accelerates preneoplastic progression by reshaping tumor cell state, suppressing differentiation, and activating inflammatory signaling programs that may facilitate malignant transition.

Poster #39

Title: Investigating the Role of Goosecoid in Craniofacial Development

Authors: Aanya Singh, Arshia Bhojwani, Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger

Background: Goosecoid (Gsc) encodes a highly conserved paired-like homeobox transcription factor with important cell-autonomous roles in craniofacial development. In humans, dysregulation of GSC is associated with SAMS syndrome, a rare malformation disorder characterized by short stature, mandibular hypoplasia, auditory canal atresia, and additional craniofacial and skeletal abnormalities. In mouse models, complete loss of Gsc results in perinatal lethality accompanied by severe craniofacial abnormalities affecting the mandible, nasal capsule, and middle ear mesenchyme, underscoring a critical requirement for Gsc in craniofacial morphogenesis. Despite these striking phenotypes, the molecular and cellular mechanisms through which Gsc regulates craniofacial development remain inadequately defined, including its downstream transcriptional targets and interacting developmental signaling pathways. **Purpose**: Here, we hypothesize that Gsc regulates skeletal cell fate determination during craniofacial development. The goal of this project is to elucidate the role of Gsc in craniofacial patterning and tissue differentiation using Gsc-null neonatal mouse models at E15.5 and E18.5. **Methods**: We will combine skeletal preparations to assess gross craniofacial morphology with histological analyses to examine tissue organization and differentiation within affected structures. In parallel, RNAscope *in-situ* hybridization will be used to define spatial changes in gene expression associated with loss of Gsc, for identification of downstream pathways and cell populations impacted by Gsc deficiency. **Expected Results and Conclusion**: Together, these studies will provide mechanistic insight into how Gsc regulates craniofacial development and establish a framework for understanding how its dysregulation contributes to congenital craniofacial defects and disease.

Poster #40

Title: Severity-dependent immune activation and neural sensitization in TMJ disc displacement

Authors: Barbara Flores, Maria Pacheco Vergara, Daniela Gioia, Amy E. Merrill-Brugger

Faculty Advisor: Amy E. Merrill-Brugger

Background: Temporomandibular joint disorders (TMDs) affect approximately 34% of the global population and are a major cause of chronic orofacial pain and joint dysfunction. Arthrogenous TMD, commonly caused by anterior disc displacement (ADD), is associated with inflammation, joint degeneration, and pain; however, mechanisms linking disc displacement severity to long-term outcomes remain poorly understood. **Purpose**: This study aims to determine how partial versus complete TMJ disc displacement differentially regulates immune and neural responses following injury. **Methods**: A clinically relevant mouse model of partial and complete ADD is being utilized. TMJ tissues were collected at defined time points following surgery for histological and transcriptomic analyses. Gene Ontology pathway enrichment identified early molecular programs activated following disc displacement. Ongoing studies include immunofluorescence-based characterization of immune and neural remodeling and assessment of mechanical pain sensitivity. **Results**: Histological analyses revealed severity-dependent structural outcomes, with complete ADD producing osteoarthritis-like degeneration by 15 days post-surgery, while partial ADD resulted in milder articular changes. Transcriptomic profiling at 5 days post-surgery demonstrated enrichment of neuronal signaling pathways in both injury severities. Increased expression of pain-associated genes, including *Piezo2*, together with early alterations in Schwann cell populations, suggests rapid neural sensitization following TMJ injury. **Conclusion**: These findings indicate that early immune and neural activation occurs following TMJ disc displacement, while long-term structural outcomes diverge based on injury severity. Defining how these responses resolve or persist may provide insight into mechanisms driving chronic TMJ pain and degeneration and identify potential therapeutic targets.

DENTISTRY & CCMB POSTDOCTORAL TRAINEES

Poster #41

Title: Mechanical Force Regulates Stem Cell Fate via *Piezo2*+ Sensory Neurons

Authors: Guanchen Ye, Tingwei Guo, Mingyi Zhang, Jifan Feng, Lin Meng, Lu Gao, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Stem cell niches integrate physical cues to orchestrate tissue homeostasis. While *Piezo2* is a key mechanosensor, its role in regulating mesenchymal stem cell (MSC) fate remains unclear. **Purpose**: This study investigates how *Piezo2* in sensory neurons governs the behavior of MSCs in the mouse incisor. **Methods**: We established a mechanical unloading model for the mouse incisor and generated *AvCreERT2*; *Piezo2*$^{fl/fl}$ and *Gli1-CreER; Piezo2*$^{fl/fl}$ mice for specific deletion of *Piezo2* in sensory neurons and dental MSCs,

respectively. We employed RNAscope *in situ* hybridization, immunofluorescence, micro-CT, tissue clearing, and bulk and single-cell RNA sequencing for comprehensive analysis. **Results**: Mechanical unloading impaired incisor growth and disrupted tissue homeostasis by reducing the number and differentiation potential of transit-amplifying cells (TACs) and altering the distribution of *Gli1+* MSCs. We further identified that incisor mechanosensation is mediated by *Piezo2+* sensory neurons rather than *Piezo2+* dental MSCs. Notably, *AvCreERT2;Piezo2*$^{fl/fl}$ mice exhibited a reduced growth rate similar to mechanically unloaded incisor, leading to stacked dentin and a narrowed pulp cavity. Single-cell RNA sequencing revealed reductions in the pre-odontoblast and dental pulp populations, along with an expansion of the dental follicle population. We also identified specialized sensory neuron subtypes: *Calca*+ nerves innervate the dental pulp, while *Rem2*+ mechanosensitive nerves occupy the dental follicle. Loss of *Piezo2* in sensory neurons selectively reduced *Rem2* expression, leading to aberrant nerve branching in the dental follicle, disrupted spatiotemporal FGF1 deposition, and altered stem cell lineage commitment. **Conclusions**: Mechanical force regulates incisor stem cell fate through *Piezo2*-mediated nerve-MSC interactions.

Poster #42

Title: Integrative Omics Analyses Associate Pathogenic *KIF1B* Mutation With Craniofacial Microsomia

Authors: Waheed Awotoye, Pedro Sanchez, Emily Farrow, Huojun Cao, Aline Petrin, Lina Moreno-Uribe, Shankar Rengasamy Venugopalan, and Stephen Yen

Faculty Advisor: Stephen Yen

Background: Craniofacial microsomia (CFM) is the second most common facial birth defect characterized by underdevelopment of the ears, jaws, ocular, masticatory and facial muscles as well as some cranial nerves (V and VII). These anomalies often result in hearing loss, facial paralysis, and respiratory difficulties, posing significant burdens on affected individuals and their families. Most cases occur sporadically, and the genetic underpinnings remain poorly understood. **Methods**: This study employed an integrative omics approach to uncover novel genetic contributors to CFM. We recruited 10 families with CFM and obtained swab DNA from affected and unaffected facial sides of probands, as well as their parents. We performed an integrated analysis combining epigenomic mapping using human craniofacial super-enhancers (hCFSEs) and whole-exome sequencing (WES) to identify both germline and somatic pathogenic variants that would explain developmental pathogenesis of this syndrome in the families. **Results**: Epigenomic analysis revealed that several CFM candidate genes were significantly enriched within hCFSE regions. Integration with WES data led to the discovery of a novel pathogenic variant in *KIF1B* (c.2525T>C), a gene not previously linked to CFM. Transcriptomic data from mouse models showed *Kif1b* expression in the pharyngeal arches, and knockout mice exhibited craniofacial anomalies, including ear defects. Bioinformatic analysis indicated that the variant disrupts a key functional domain of KIF1B, altering its interactome and affecting transport and apoptotic pathways critical for craniofacial development. **Conclusion**: This study identifies *KIF1B* as a novel candidate gene for CFM and demonstrates the power of integrative omics in elucidating the molecular basis of craniofacial anomalies.

Poster #43

Title: Perturbations of Ameloblastin Amphipathic Helix Motif Impact Prismatic Enamel Formation

Authors: Gayathri Visakan, Rucha Arun Bapat, Jing Cai, Marziyeh Aghazadeh, and Janet Moradian-Oldak

Faculty Advisor: Janet Moradian-Oldak

Background: Ameloblastin promotes the elongation and polarization of ameloblasts in 3D culture. A cell binding amphipathic helix (AH) motif in Ambn is evolutionarily correlated with the emergence of prismatic enamel. **Purpose**: To investigate the implications of disruption of Ambn AH motif on enamel formation. **Methods**: Mutant mouse lines that delete eleven hydrophobic amino acids within the Ambn AH motif were generated (Ambn$^{\Delta L76\text{-}P86}$) using CRISPR-Cas9 technology at UC Davis. 7-week-old mouse incisors were analyzed by Micro-CT and SEM. Postnatal-8-day old incisor secretory ameloblast morphology, polarization and function (enamel matrix secretion) were evaluated using immunolabeling for Pard3, claudin-1, GM130, Amel, Ambn, beta-catenin and pSMAD 2/3 and total RhoA. **Results**: The enamel of *Ambn*$^{\Delta L76\text{-}P86\text{-}/\text{-}}$ mice appeared chalky white and significant blunting of incisal tips. Micro-CT and SEM revealed the presence of hypo-mineralized enamel with normal thickness and a lack of prismatic enamel architecture in the Ambn $^{\Delta L76\text{-}P86\text{-}/\text{-}}$ mutants. Ambn immunolabeling in secretory sage revealed a lack of Ambn - ameloblast distal membrane interactions in the Ambn$^{\Delta L76\text{-}P86\text{-}/\text{-}}$ mutants. Immunolocalization of Pard3, Cldn1 and GM130 in presecretory and secretory ameloblasts of Ambn$^{\Delta L76\text{-}P86\text{-}/\text{-}}$ revealed a lack of polarity at the cell membrane and intracellular organelle level. Enamel matrix protein secretion was defective in the *Ambn*$^{\Delta L76\text{-}P86\text{-}/\text{-}}$ mutants, and a decrease in RhoA signal intensity was observed in the *Ambn*$^{\Delta L76\text{-}P86\text{-}/\text{-}}$ mutants. **Conclusions**: Ameloblastin AH motif is essential for polarization of ameloblasts. We propose that Ambn is a matricellular protein that functions to establish a prismatic enamel microstructure through the initiation and maintenance of polarized ameloblast morphology with Tomes' processes.

Poster #44

Title: Evolutionarily acquired dental progenitors balance bone-ligament fates via P53-Hippo signaling

Authors: Tingwei Guo, Fei Pei, Mingyi Zhang, Jifan Feng, Calista Ly, Kerollos Roufael, Heliya Ziaei, Lin Lan, Jie Lei, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: The mandible has undergone remarkable changes during vertebrate evolution, with two major innovations that enhanced chewing efficiency and auditory function: the emergence of teeth and the temporomandibular joint. Evolution of dentition allowed vertebrates to diversify their diets as they evolved from having the simple, continuously replaced teeth of fish to the complex, specialized teeth of mammals. The mechanisms and selective pressures that drove the loss of continuous regeneration in favor of a more sophisticated mastication organ with limited regenerative capacity remain unclear. **Methods**: The transgenic mouse model used in this study was *Gli1-CreER;Trp53*$^{fl/fl}$. Techniques used in this study included immunohistochemistry, RNAscope, CUT&RUN-seq, bioinformatic analyses, and cell culture. **Results**: Here, we identify apical dental follicle progenitors as an evolutionarily acquired cell population unique to most mammals. Distinct subpopulations of these progenitors differentially contribute to periodontal ligament and alveolar bone, and their precise balance is essential for proper formation of soft and hard tissues at the tooth root. These subpopulations show functional parallels in the temporomandibular joint, another cranial neural crest-derived structure composed of bone and ligament, suggesting shared mechanisms in the coordinated development of hard and soft tissues. Cross-species comparisons combined with multiomic analysis reveal that P53-Hippo signaling regulates the dual lineage fate of these progenitors. **Conclusion**: Our findings highlight that the emergence of new cell types drives major evolutionary transitions in vertebrate anatomy, leads to refined physiological function, and provides a framework for investigating the origins of other complex tissues.

Poster #45

Title: Postnatal established *Pax9+* stem cells regulate adult mouse incisor homeostasis

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

Faculty Advisor: Yang Chai

Background: During embryonic and postnatal development, progenitor cells contribute to organ formation, and later in life, adult stem cells support the renewal of organs such as the hair follicle, intestine, and continuously growing rodent incisor. **Purpose**: Our understanding of the similarities and differences between developmental progenitors and adult stem cell populations remains limited, particularly due to lacking knowledge of *in vivo* markers that identify them. **Methods**: Using single-cell RNA sequencing analysis combined with *in vivo* lineage tracing methods. **Results**: We identify a *Pax9+* mesenchymal stem/progenitor cell population that supports postnatal development as well as tissue homeostasis and regeneration of the adult mouse incisor mesenchyme. Mechanistically, loss of *Pax9+* cells disturbs adult stem cell quiescence and causes transit-amplifying cell arrest, resulting in impaired differentiation ability. **Conclusion**: Our findings establish *Pax9* as a mesenchyme-specific marker of both developmental and adult stem/progenitor cells, improving our understanding of the stem cell heterogeneity that supports lifelong organogenesis in mammalian tissues and offering an excellent tool for molecular and cellular studies of mesenchymal stem/progenitor cells.

Poster #46

Title: Dissecting Ameloblastin Amphipathic Helix Reveals Specific Functions in Enamel Formation

Authors: Rucha Arun Bapat, Gayathri Visakan, Jing Cai, Marziyeh Aghazadeh, Elva Nguyen, Jaimie Nguyen, Natalie C. Kegulian, and Janet Moradian-Oldak

Faculty Advisor: Janet Moradian-Oldak

Background: Ameloblast lineage cells (ALC) spread and polarized effectively in the presence of recombinant Ameloblastin. However, mutant ameloblastin with deletion of six amino acids (KALNSL) within the amphipathic helix (AH) region, caused lack of ALC spreading and elongation. To investigate the functions of this region *in vivo*, we engineered a mouse model with this mutation. **Purpose**: To determine the function of the KALNSL region of ameloblastin in maintaining ameloblast morphology. **Methods**: Amino acids 74-79 (KALNSL) of mouse ameloblastin were deleted using CRISPR-Cas9 to generate $Ambn^{\Delta K74\text{-}L79}$ mice. Enamel mineral density was quantified using micro-CT and enamel microstructure was observed using SEM. Ameloblast cell morphology was observed by H&E staining. Cytoskeletal gene and protein expressions were quantified using qPCR and immunofluorescence. **Results**: $Ambn^{\Delta K74\text{-}L79\text{-}/\text{-}}$ mutants had occasional chalky white patches on incisors and friable incisor tips. The enamel mineral density of mutant incisors decreased in the secretory stage but had normalized by the time of eruption. Patches of abnormal prismatic structure were observed in SEM analysis. Secretory ameloblasts from $Ambn^{\Delta K74\text{-}L79\text{-}/\text{-}}$ mutants were shorter in height as compared to WT. Cytoskeletal proteins were upregulated in the $Ambn^{\Delta K74\text{-}L79\text{-}/\text{-}}$ molar ameloblasts. **Conclusion**: Specific deletion in the AH domain of ameloblastin protein caused a delay in the onset of enamel mineralization, abnormal cytoskeletal gene expression, and reduced ameloblast cell height. The mutation did not affect enamel thickness, but some abnormal prismatic structure was observed in the mutants. The data suggest that KALNSL region of the AH motif is critical for ameloblast morphology and normal prismatic enamel maturation.

Poster #47

Title: Dura-suture coordination restores temporally sensitive FGFR2-RA signaling to rescue craniosynostosis

Authors: Lu Gao, Peng Chen, Jifan Feng, Tingwei Guo, Mingyi Zhang, Thach-Vu Ho, Jianfu Chen, and Yang Chai

Faculty Advisor: Yang Chai

Background: FGFR mutations cause the majority of syndromic craniosynostosis. Gain-of-function mutations of FGFRs can cause cranial suture synostosis. However, the function of FGFR2 signaling in cranial progenitor cells that cause craniosynostosis is still largely unknown. **Purpose**: Clarify the cellular mechanisms behind the FGFR2 mutation-related craniosynostosis. **Methods**: The *Gli1-Cre^{ERT2};Fgfr2IIIc$^{fl/+}$* mouse model is generated to study the potential calvarial developmental defects and the underlying molecular mechanisms. **Results**: We identified a key FGFR2-retinoic acid signaling axis regulating early postnatal development of the coronal cranial suture, coordinated by dura mater-suture mesenchyme interaction. After birth, FGFR2 signaling gradually declines, accompanied by reduced retinoic acid signaling, maintaining moderate expression of *Aldh1a3* in the dura mater and suture mesenchyme alongside *Rbp1* in the dura mater, preserving GLI1+ progenitors and restraining osteogenesis to keep the suture patent. However, FGFR2 overactivation at early postnatal time window P3.5, but not P7.5, disrupts this physiological decline by upregulating *Rbp1* and *Aldh1a3* through overactivation of enhanced P38 signaling, therefore increases retinoic acid synthesis, promotes premature osteogenic differentiation of GLI1+ progenitors, and finally leads to craniosynostosis. Significantly, genetic restoration of retinoic acid signaling rescues craniosynostosis in *Fgfr2IIIc* mutant mice, confirming retinoic acid signaling as a key downstream effector of FGFR2 signaling, functioning by suture mesenchyme-dura mater coordination. **Conclusion**: Our results identify a critical FGFR2-RA signaling axis in the craniosynostosis process *in vivo* and provide potential therapeutic targets for eliminating the craniosynostosis disease. A better understanding of FGFR2-RA signaling interaction could help develop novel treatment strategies for craniosynostosis.

Poster #48

Title: Characterization of Osteogenic Lineage Specification During Craniofacial Bone Development

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

Faculty Advisor: Yang Chai

Background: The differentiation of multipotent cranial neural crest cells (CNCCs) into distinct mesenchymal subpopulations is essential for establishing the structural and functional integrity of the craniofacial region. **Purpose**: In this study, we investigate the molecular mechanisms that regulate the fate diversification of CNCC-derived mesenchymal cells into osteogenic lineages during craniofacial morphogenesis. **Methods**: RNAscope *in situ* hybridization was performed to detect *Sox6* expression. *Sox6-CreER* mice were utilized for lineage tracing of osteogenic progenitors. Single-cell RNA sequencing (scRNA-seq) datasets were analyzed using R and Python packages. **Results**: The expression of *Sox6*, a specific marker we recently identified for osteogenic populations in the maxilla, was spatially restricted to osteogenic mesenchyme in the maxilla, mandible, and calvaria during later developmental stages (after embryonic day (E) 15.5) when anatomical structures are established. Moreover, *Sox6* expression was already region-specific at earlier stages (E12.5-E13.5) prior to the formation of these structures, suggesting an association with the establishment of early cell identity. Lineage tracing using *Sox6-CreER* at E11.5 demonstrated that these early *Sox6+* osteogenic progenitors contributed to osteogenic lineages in the maxillary, mandibular, and calvarial bones, supporting the conclusion that *Sox6* marks progenitors contributing to all major craniofacial bones. Notably, *Sox6-CreER* did not

label odontogenic cells, which share several markers with osteogenic lineages. We are currently performing bioinformatic analyses of scRNA-seq datasets from the palate, mandible, and cranial sutures to identify transcriptional regulatory networks and signaling pathways associated with *Sox6+* osteogenic progenitor fate determination. **Conclusions**: *Sox6* serves as a specific early osteogenic progenitor marker across craniofacial regions.

Poster #49

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

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

Faculty Advisor: Michael L. Paine

Background: Enamel formation requires tightly regulated phosphate transport to support proper mineral deposition and crystal growth. Disruption of phosphate export pathways may compromise ameloblast function and lead to structural enamel defects. **Purpose**: To investigate the role of Xenotropic and Polytropic Retroviral Receptor 1 (XPR1), a key phosphate exporter, in enamel development. **Methods**: Three groups were examined: wild-type mice (WT), (*Odam-IRESCre+/–/Xpr1*$^{fl/fl}$, Mut), and mice carrying the *Xpr1*$^{fl/fl}$ allele without Cre-mediated recombination (*Xpr1*$^{fl/fl}$). RNA expression patterns of Odam, Cre recombinase, Amelx, and Ambn were analyzed across secretory, transition, and maturation stages using in situ hybridization. *XPR1* RNA and protein expression were assessed by qRT-PCR, western blotting, in situ hybridization, and immunofluorescence. Enamel morphology and microstructure were evaluated by light microscopy and SEM, and enamel mineral density was measured by micro-CT. **Results**: XPR1 protein was predominantly expressed during the maturation stage. Cre recombinase expression was detected only in Mut mice, confirming targeted recombination. Odam, Amelx, and Ambn expression patterns were unchanged among groups; however, *Xpr1* expression was markedly reduced or absent in Mut mice, validating gene silencing. Mut mice showed enamel discoloration, pitting, chipping, and accelerated wear. SEM demonstrated preserved interrod architecture, but enamel rod crystals were poorly defined in Mut mice. Micro-CT revealed significantly reduced enamel mineral density in Mut mice compared with both controls. **Conclusion**: *XPR1* is a critical regulator of enamel mineralization and structural integrity, highlighting the importance of phosphate export during amelogenesis and providing mechanistic insight into enamel defects.

Poster #50

Title: Prospective Clinical Trial of Topical Imiquimod for Oral Epithelial Dysplasia

Authors: Shermineh Roshan, Jasmine Shafa, Donya Kaveh, Yuyueyang Qiu, Parish Sedghizadeh, Dechen Lin, and Anette Vistoso Monreal

Faculty Advisor: Anette Vistoso Monreal and Parish Sedghizadeh

Background: Oral squamous cell carcinoma (OSCC) accounts for the majority of oral cavity cancers and carries significant morbidity and mortality. Many cases develop from oral leukoplakia (OL), a potentially malignant disorder characterized by unpredictable progression. When surgical excision or laser ablation is not feasible, therapeutic options for oral epithelial dysplasia remain limited. **Purpose**: To evaluate the safety and efficacy of topical 5% imiquimod immunotherapy in patients with biopsy-confirmed oral epithelial dysplasia through the first IRB/FDA-approved prospective clinical trial (ClinicalTrials.gov: NCT07210775). **Methods**: Following a comprehensive literature review, we developed a standardized treatment protocol and enrolled patients with dysplastic oral lesions unsuitable for surgical or laser intervention. Participants applied topical 5% imiquimod once daily for one hour, five days weekly, over seven weeks. Clinical response was assessed through serial examinations and standardized intraoral photography. Post-treatment biopsies evaluated histopathologic response and were compared to baseline specimens. Adverse reactions were systematically documented and managed. **Results**: Topical imiquimod therapy demonstrated both clinical and histopathologic regression of dysplastic oral lesions with acceptable tolerability. Follow-up biopsies confirmed treatment-associated improvements in enrolled patients. **Conclusion**: Topical imiquimod offers a promising non-invasive alternative for managing oral epithelial dysplasia in patients unsuitable for surgery. Histopathologically confirmed responses support its potential to reduce malignant transformation risk and warrant larger-scale investigation to establish its role in OSCC prevention.

Poster #51

Title: Sensory innervation is required for maintaining postnatal coronal suture patency

Authors: Lin Xu, Lu Gao, Jifan Feng, Tingwei Guo, Mingyi Zhang, Sa Cha, Lin Meng, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Premature cranial suture fusion results in craniosynostosis, a common congenital disorder characterized by abnormal cranial morphology and potential neurodevelopmental impairment in humans. Although intrinsic osteogenic signaling pathways governing suture patency have been extensively characterized, increasing evidence suggests that extrinsic cues from the local tissue microenvironment also contribute to suture maintenance. Peripheral sensory innervation is abundant in the developing skull; however, its functional role in maintaining cranial suture patency remains incompletely understood. **Purpose**: To define the spatiotemporal distribution of sensory innervation in the developing skull and to determine whether sensory neurons are required to maintain cranial suture patency. **Methods**: Sensory nerve distribution in the mouse skull was examined by immunostaining for neuronal markers across multiple developmental stages. *Advillin-Cre*^{ERT2}*;Rosa-DTA* mice were used to inducibly ablate *Advillin*-expressing sensory neurons, followed by morphological analysis of the calvaria. **Results**: The developing skull was found to be highly innervated, with sensory nerve fibers closely associated with cranial sutures. Postnatal ablation of *Advillin*-positive sensory neurons resulted in premature coronal suture closure, characterized by fusion of the osteogenic fronts of the frontal and parietal bones. **Conclusion**: These findings identify sensory neurons as critical extrinsic regulators of postnatal coronal suture patency and suggest that disruption of sensory innervation may contribute to early pathogenic events in craniosynostosis. This work establishes a foundation for future studies aimed at elucidating the molecular mechanisms regulating cranial suture maintenance.

Poster #52

Title: Dormancy of *Aggregatibacter actinomycetemcomitans*

Authors: Natalia O. Tjokro, Bryant T. Tran, and Casey Chen

Faculty Advisor: Casey Chen

Background: Microbes encountering nutrient scarcity may enter dormancy to survive. *Aggregatibacter actinomycetemcomitans* (*Aa*) exhibited a dormancy-like phenotype in nutrient-limited (NL) and nutrient-deficient (ND) media, but not in nutrient-enriched (NE) medium. **Purpose**: This study investigated *Aa* during dormancy to assess its (1) long-term viability, (2) metabolic activity, (3) phenotypic reversal upon transfer to NE medium, and (4) genetic mutations. **Methods**: Dormancy was induced in the clinical strain D7S1 using ND and NL media, with NE trypticase soy broth as the control. Metabolic activity was assessed using Alamar Blue assays. Selected isolates underwent whole-genome sequencing (WGS) via Illumina, and non-synonymous mutations were identified in

Geneious Prime. **Results**: *Aa* exhibited up to 5 logs of growth reduction and remained viable for up to ~350 days in ND and NL media. An initial ~3-log decline occurred within 14 days, followed by a markedly slower rate of reduction thereafter. Metabolic activity became undetectable by Day 28 but resumed rapidly–with a >10-fold increase–following transfer to NE medium. Conversely, *Aa* in NE medium became uncultivable by Day 7. WGS of 97 isolates from ND and NL cultures revealed 12 isolates without non-synonymous mutations, while 85 carried between 1-6 mutations (average=2 per isolate). The most frequent mutations were found in L-lactate permease (D7S_RS02260) and ABC transporter ATP-binding protein (D7S_RS03915). The functional relevance of these mutations remains unknown. **Conclusion**: *Aa* exhibited a reversible dormancy phenotype under nutrient-limited conditions, maintaining a prolonged viable but non-replicating phenotype with undetectable metabolic activities. Non-synonymous mutations arose during dormancy; however, their functional significance requires further investigation.

Poster #53

Title: NaPiIIb Regulates Phosphate Uptake During Enamel Development

Authors: Mehrnaz Zarinfar, Yanbin Ji, Marziyeh Aghazadeh, Rucha Arun Bapat, Alexis E. Bauer, David C. Evans, Andres Stucky, Joseph G. Hacia, Yan Zhou, and Michael L. Paine

Faculty Advisor: Michael L. Paine

Background: Enamel development requires precise regulation of mineral ion homeostasis during amelogenesis. While phosphate availability is essential for ameloblast function, the specific role of the type IIb sodium-phosphate cotransporter SLC34A2 (NaPi-IIb) in enamel formation remains poorly understood. To address this, we used the *Odam-IRES-Cre* mouse model to selectively ablate *Slc34a2* expression in ameloblasts and assess its contribution to enamel development. **Purpose**: This study investigates the role of the phosphate importer Slc34a2/NaPiIIb in enamel mineralization, based on the hypothesis that NaPiIIb is essential for proper ameloblast function during tooth development. **Methods**: Wild-type, ameloblast-specific NaPiIIb-deficient, and floxed$^{+/+}$ control mice were analyzed to determine the role of the type IIb sodium-phosphate cotransporter *Slc34a2* during amelogenesis. Gene and protein expression across developmental stages were/will be assessed using molecular and imaging approaches, while enamel structure and mineral density will be evaluated by microscopy and micro-computed tomography. **Results**: Preliminary immunolocalization analyses reveal strong NaPiIIb enrichment at the apical plasma membrane of both early and late maturation-stage ameloblasts. This is in contrast to the expression of other phosphate transporters, such as Xpr1, which is restricted to the apical membrane during the maturation stage and is first detectable at postnatal day 7 (PN7). **Conclusion**: Preliminary findings demonstrate that NaPiIIb is expressed throughout all phases of enamel development, with a spatially and temporally regulated pattern that coincides with heightened mineral requirements and the RA-SA transitions characteristic of maturation. Ongoing analyses and future studies will clarify how NaPiIIb contributes to the molecular mechanisms underlying amelogenesis.

Poster #54

Title: AI-Driven Educational Framework in Assessment and Treatment

Authors: Parishi Marfatia, Anette Vistoso Monreal, Glenn Clark, David Goldizen, Nicolas Veas, and Anette Vistoso Monreal

Faculty Advisor: Anette Vistoso Monreal

Background: Advances in artificial intelligence are reshaping healthcare education, offering new opportunities to enhance teaching efficiency, standardize assessment, and improve student learning outcomes. The Distance Learning Office has developed an AI platform, an interactive AI-enhanced learning platform designed to revolutionize educational experiences for both faculty and students through comprehensive digital tools that support institutional expectations for instructional quality, innovation, and clinical preparedness. **Purpose**: This educational study aims to describe the AI platform's dual-interface design and its integration of AI-mediated tools that support faculty in content creation and assessment while providing students with interactive resources for knowledge reinforcement, clinical skill development, and competency-based learning aligned with USC's commitment to academic excellence. **Methods**: The AI platform encompasses two primary domains. Teaching resources provide faculty with document submission for creating standardized patients and cases, AI-assisted test creation with auto-grading capabilities and customizable rubrics, collaboration hubs for resource sharing, and analytics dashboards for monitoring student performance and curriculum effectiveness. Student resources include interactive flashcards, centralized course manuals, AI-driven practice cases with diagnostic feedback, adaptive practice examinations, progress tracking systems, virtual patient simulations with real-time interaction, and personalized learning recommendations based on performance analytics. **Results**: AI Platform successfully integrates teaching and learning functionalities within a unified platform, streamlining case creation and test development while providing multi-modal learning experiences through virtual patients, adaptive assessments, and personalized learning pathways. **Conclusion**: The AI platform positions USC Ostrow as a leader in educational technology innovation, offering a scalable model for AI integration in dental education that enhances teaching efficiency, supports personalized learning, and prepares digitally competent healthcare professionals.

Poster #55

Title: *Hic1* regulates palatogenesis and soft palatal muscle development through tissue-tissue interactions

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

Faculty Advisor: Yang Chai

Background: Craniofacial muscle development requires precise tissue-tissue interactions between cranial neural crest (CNC)-derived mesenchyme and adjacent myogenic populations. Our previous work identified *Hic1* as a critical regulator expressed in perimysial fibroblasts surrounding soft palatal muscles. Deletion of *Hic1* led to cleft soft palate and impaired muscle patterning. However, the downstream molecular consequences of *Hic1* loss remained unclear. **Purpose**: This study investigates the regulatory role of *Hic1* in the differentiation and development of mouse soft palatal muscles. **Methods**: We used a *Wnt1-Cre;Hic1$^{fl/fl}$* mouse model to delete *Hic1* specifically in CNC-derived mesenchyme. Morphological defects were evaluated using MicroCT and histology. ScRNA-seq, bulk RNA-seq, RNAscope, and immunofluorescence were used to study cellular changes and signaling pathway alterations. **Results**: We first examined the spatiotemporal expression pattern of *Hic1* during soft palate development. *Hic1* is primarily expressed in mesenchymal perimysial cells in the palatal region, especially surrounding the soft palatal muscles. The specific deletion of *Hic1* from CNC-derived mesenchymal cells leads to reduced proliferation of soft palate mesenchymal cells, resulting in failure of soft palate fusion and cleft soft palate, accompanied by severe defects in the soft palate muscles. The main phenotypes include absence of levator veli palatini and palatoglossus muscles, structural abnormalities of tensor veli palatini and palatopharyngeus muscles. **Conclusion**: This study demonstrates that *Hic1*

is crucial for the growth and morphological development of the palate. The specific loss of *Hic1* in CNC-derived mesenchymal cells leads to cleft soft palate and significant defects in soft palatal muscles.

Poster #56

Title: Gene-environment interactions disrupt MSC ciliogenesis and fate leading to craniosynostosis

Authors: Wei Zhang, Ziying Lin, Pao-Fen Ko, Qing Chang, Yang Chai, and Jianfu Chen

Faculty Advisor: Jianfu Chen

Background: Craniosynostosis is a congenital disorder caused by premature cranial suture fusion and involves both genetic and environmental risk factors. How stem cells integrate genetic susceptibility and environmental exposure to regulate fate decisions remains poorly understood. **Purpose**: To identify mesenchymal stem cell (MSC) ciliogenesis as a central node mediating gene-environment interactions that regulate cranial suture homeostasis, the disruption of which leads to craniosynostosis. **Methods/Results**: Using human induced pluripotent stem cell (iPSC)-derived cranial MSC (iMSC) and complementary mouse models, we show that craniosynostosis environmental risk factor citalopram, a selective serotonin reuptake inhibitor (SSRI) antidepressant, disrupts MSC ciliogenesis, proliferation, and cell fate. Transcriptomic profiling identifies the craniosynostosis gene *Tcf12* as a key environmentally responsive regulator of MSC function. While *Tcf12* haploinsufficiency alone is insufficient to cause suture fusion, prenatal citalopram exposure synergistically exacerbates craniosynostosis in *Tcf12*$^{+/-}$ mice. Mechanistically, citalopram impairs ciliogenesis and MSC proliferation while reducing *Tcf12* expression, collectively driving MSC depletion and premature osteogenic differentiation. **Conclusion**: Together, these findings reveal MSC ciliogenesis as a key integrator of genetic and environmental cues, providing a stem cell-based framework for understanding variable craniosynostosis penetrance.

Poster #57

Title: Uridine-rescued CAD inhibition activates inflammation and suppresses breast tumors

Authors: Yuchan Li, Chao Qin, Taolin Xie, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: De novo pyrimidine synthesis supports tumor growth but is also essential for immune effector programs. Purpose: We developed TCP12, a CAD inhibitor, and evaluated whether uridine can restore immune function without compromising antitumor efficacy. **Methods**: CAD inhibition was assessed by carbamoyl-aspartate synthesis and stable-isotope tracing to dihydroorotate (DHO) and UMP. Breast cancer proliferation, inflammatory signaling, and metabolism were measured in 4T1/E0771 cells; immune readouts were tested in T cells and macrophages with ± uridine. Antitumor activity and immune infiltration were evaluated in 4T1 and E0771 tumor models. **Results**: TCP12 bound CAD and dose-dependently suppressed carbamoyl-aspartate production, reducing 15N incorporation into DHO and UMP. TCP12 inhibited proliferation across breast cancer lines,and exogenous uridine rescued growth and pyrimidine limitation. Mechanistically, TCP12 reduced RelA deamidation and increased inflammatory transcripts (Il6, Ccl5, Il1b, Cxcl2). 13C tracing revealed reduced lactate labeling and decreased flux into the pentose phosphate and serine/glycine pathways, accompanied by altered G6PD and PHGDH. In immune cells, TCP12 suppressed T-cell IFN-γ responses and long-term expansion and reduced macrophage IL-12; uridine fully reversed these defects. In vivo, TCP12 limited breast tumor growth, and TCP12+uridine maintained or improved tumor control while increasing intratumoral CD45+, CD3+, CD8+ T cells and NK cells and reducing immunosuppressive features. Combination treatment induced interferon/antigen-presentation signatures in E0771 tumors (H2-K1, Cxcl10, Stat1, Irf1, Cd274). **Conclusion**: CAD inhibition couples pyrimidine restriction to tumor-intrinsic inflammatory activation but transiently constrains immunity; uridine co-therapy restores immune competence and may widen the therapeutic window.

Poster #58

Title: Monocyte-hybrid EMT Tumor Crosstalk Modulates Tumor plasticity in HNSCC

Authors: Chehyun Nam, Young Min Park, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Head and neck squamous cell carcinoma (HNSCC) evolves within a complex tumor microenvironment, yet how tumor-intrinsic transcriptional states functionally interact with immune cells to drive disease progression remains incompletely understood. **Purpose**: This study aimed to define tumor-immune interactions linking malignant cell state heterogeneity with functional reprogramming of myeloid cells and to experimentally validate how these interactions reinforce tumor plasticity in HNSCC. **Methods**: We integrated newly generated and published single-cell RNA sequencing datasets to assemble 167 samples from 114 HNSCC patients spanning normal epithelium to metastatic disease. Tumor-myeloid crosstalk was examined using co-culture systems combining patient PBMC-derived monocytes with HNSCC cancer cells or patient-derived organoids (PDOs). Gene expression changes were assessed by qRT-PCR, immunoblotting, and immunofluorescence, and spatial relationships were evaluated using Visium HD spatial transcriptomics. **Results**: We identified a tumor-enriched monocyte state marked by high epiregulin expression (Mono_EREG) with an angiogenesis-associated program predicting poor survival. Recurrent malignant heterogeneity programs were defined, including a hybrid epithelial-to-mesenchymal transition (hEMT) program validated in patient-derived organoids (PDOs). Functionally, co-culture with cancer cells or hEMT-high PDOs induced EREG and the Mono_EREG signature in monocytes, while Mono_EREG-conditioned monocytes enhanced hEMT programs in cancer cells and PDOs. **Conclusion**: These findings establish a reciprocal tumor-myeloid feedback loop linking hEMT plasticity and a pro-tumorigenic Mono_EREG state, highlighting the Mono_EREG-hEMT axis as a potential therapeutic target in HNSCC with implications for disrupting tumor plasticity and immune suppression within the tumor microenvironment.

Poster #59

Title: *PIK3CA*-mediated suppression of an oral-immune program during early squamous evolution

Authors: Hua Zhao, Young Min Park, Qiong Mao, Fanyi Mo, Yuhao Pan, Uttam K. Sinha, Parish Sedghizadeh, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Head and neck squamous cell carcinoma (HNSCC) is an aggressive and lethal neoplasm, yet its early neoplastic transformation mechanisms remain elusive. **Purpose**: To dissect crucial early events in neoplastic progression and enable rigorous interrogation of genotype-phenotype relationships. **Methods**: We developed two complementary, cross-species, genetically defined organoid systems: a genome-sequenced patient-derived platform spanning normal tissue, precursor lesions, and tumors, and a CRISPR/Cas9-engineered human and mouse organoid platform targeting key HNSCC drivers (*TP53, CDKN2A,* and *PIK3CA*) to reconstruct the continuum of squamous malignant transformation. Organoids were characterized by histology, immunofluorescence, cell viability assays, allograft transplantation, single-cell RNA sequencing, and in vitro coculture. **Results**: *TP53/CDKN2A* double-knockout (DKO) organoids exhibited dysplasia, hyperproliferation, loss of squamous differentiation, and tumorigenicity, phenotypes further exacerbated by

mutant *PIK3CA*^{E545K} (DKOP). Single-cell RNA sequencing revealed expansion of basal and proliferative squamous populations with depletion of differentiated cells. An Oral-Immune transcriptional program characteristic of normal squamous epithelium was attenuated in DKO organoids and further suppressed in DKOP. This program correlated strongly with intratumoral CD8$^+$ T-cell infiltration, IFN-pathway activation, and immune checkpoint blockade response in HNSCC, outperforming established immune signatures. Both Oral-Immune and CD8$^+$ T-cell scores were inversely associated with *PIK3CA* mutation status. Functionally, mutant PIK3CA reduced Oral-Immune program expression and CD8$^+$ T-cell infiltration *in vitro* and *in vivo*, effects reversible by PI3K inhibition. **Conclusion**: We identify the Oral-Immune program as a determinant of immune-inflamed tumors, reveal *PIK3CA*-driven immune evasion during early squamous neoplastic evolution, and highlight the utility of genetically defined organoid models.

Poster #60

Title: Decoding transcriptional identity and functional diversity of developing trigeminal neurons

Authors: Sa Cha, Peng Chen, Lin Meng, Tingwei Guo, Jifan Feng, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Trigeminal ganglia (TGs) play a crucial role in processing sensory information in the orofacial region by integrating diverse sensory modalities, including touch, pain, and mechanosensation. Precise development and diversification of trigeminal sensory neurons are therefore fundamental to the establishment of functional sensory circuits that ensure coordinated craniofacial behaviors. However, the molecular mechanisms governing the specification and diversification of trigeminal sensory neuron subtypes during embryonic development remain incompletely understood. **Purpose**: The purpose of this study is to elucidate the developmental programs and regulatory principles underlying the formation and diversification of trigeminal sensory neurons. **Methods**: We utilized single-cell RNA sequencing and spatial transcriptomics of mouse embryonic TGs at E13.5, E15.5, and E18.5 to systematically profile cellular heterogeneity and developmental dynamics. Integrative analyses were performed to delineate transcriptional regulatory hierarchies and signaling pathways that drive sensory progenitor differentiation and neuronal diversification across developmental stages. **Results**: This atlas reveals extensive cellular diversity within developing TGs and identifies distinct sensory progenitor and neuronal subtypes. We highlight both extrinsic signaling cues and intrinsic regulatory hierarchies that guide cell fate decisions, including branch determination and sensory neuron subtype differentiation and specification. **Conclusion**: Our research elucidates multilevel signaling pathways and transcriptional regulatory networks that underpin the developmental diversification of somatosensory neurons, providing a comprehensive framework for understanding trigeminal sensory neuron development and functional organization.

Poster #61

Title: Decoding FGFR2 Mutations: Molecular Drivers of Bent Bone Dysplasia Syndrome

Authors: Ze Liu, Britany Hansten, Sabastian Ko, Georgina Macakiage, and Amy Merrill-Brugger

Faculty Advisor: Amy Merrill-Brugger

Background: Fibroblast growth factor receptor 2 (FGFR2) is a critical regulator of skeletal development, controlling osteoprogenitor cell proliferation and differentiation during embryogenesis. Pathogenic FGFR2 mutations, including Y381D and M391R, cause bent bone dysplasia syndrome (BBDS), a rare perinatally lethal skeletal disorder characterized by impaired bone mineralization and severe skeletal abnormalities. These mutations reduce FGFR2 signaling at the plasma membrane while promoting abnormal nuclear and nucleolar localization, disrupting ribosome biogenesis and activating a p53-mediated stress response. **Purpose**: This study aims to define the molecular mechanisms driving FGFR2 nuclear translocation and to determine how BBDS-associated mutations alter receptor structure, signaling, and downstream gene regulation. **Methods**: Wild-type and mutant FGFR2 are compared using an integrated computational and experimental approach. Structural changes are predicted using AlphaFold3 modeling. Receptor dimerization and spatial interactions are assessed by co-immunoprecipitation and proximity ligation assays. FGFR2 activation and downstream signaling are evaluated by Western blotting. Post-translational modifications and protein-protein interactions are analyzed via mass spectrometry. Alternative splicing is examined using RT-PCR and RNA sequencing. Changes in gene expression and transcriptional regulation are assessed by qPCR, RNA-seq, and ChIP-seq. **Results**: Structural modeling and biochemical analyses indicate that BBDS-associated mutations disrupt FGFR2 dimerization, ligand binding, and autophosphorylation, leading to impaired membrane signaling and enhanced aberrant nuclear activity. **Conclusions**: These findings clarify how FGFR2 mutations alter receptor function during skeletal development and provide mechanistic insight into BBDS pathogenesis, informing future therapeutic strategies for FGFR2-related skeletal disorders.

UNDERGRADUATE & DDS STUDENTS - BASIC SCIENCES

Poster #62

Title: Dual Inhibition of CAD Activities Restrains Cancer Cell Proliferation

Authors: Jacquelyn Bakshian, Yuchan Li, Chao Qin, and Pinghui Feng

Faculty Advisor: Pinghui Feng

Background: A hallmark of cancer cells is rapid proliferation necessitating macromolecular biosynthesis. Beyond established roles, metabolic enzymes exhibit non-canonical ("moonlighting") functions that promote proliferation, making them promising targets for antitumor therapy. Carbamoyl-phosphate synthetase, aspartate transcarbamoylase and dihydroorotase (CAD) is the rate-limiting enzyme of *de novo* pyrimidine synthesis. We previously reported that CAD possesses protein-deamidating activity that reprograms cellular metabolism independent of pyrimidine synthesis. Specifically, CAD deamidates RelA, diverting it from inflammatory signaling toward aerobic glycolysis, fueling cancer cell proliferation. **Purpose**: We have developed a CAD inhibitor, TCP12, that targets the glutamine amidotransferase activity of CAD. This study evaluated whether TCP12 can inhibit *de novo* pyrimidine synthesis, block CAD-mediated RelA deamidation, and suppress cancer cell proliferation. **Methods**: Cell Proliferation Assay, Real-time PCR, Isotope Tracing Experiment, LC-MS, Two-dimensional Gel Electrophoresis. **Results**: In cancer cells, TCP12 reduced synthesis of dihydroorotate, an immediate CAD product, and downstream pyrimidine metabolites, demonstrating inhibition of de novo pyrimidine synthesis. Two-dimensional gel electrophoresis showed reduced RelA deamidation with TCP12 treatment. Real-time PCR revealed TCP12 increased NF-κB-responsive gene expression and decreased glycolytic gene expression. TCP12 caused a significant, dose-dependent reduction in proliferation across multiple cancer cell lines, including CT26, LLC, 4T1, MC38, and E0771. **Conclusion**: CAD inhibition by TCP12 is a promising cancer therapeutic strategy through dual inhibition of pyrimidine biosynthetic and deamidase activities. TCP12 treatment increases inflammatory gene expression, potentially enhancing immune recruitment and antitumor immunity.

Poster #63

Title: *Arl13b* Is Essential for Coordinating Palatogenesis and Craniofacial Myogenesis

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

Faculty Advisor: Yang Chai

Background: Craniofacial malformations are among the most common congenital anomalies. Approximately 30% of ciliopathies exhibit craniofacial phenotypes, with cleft lip and/or palate being the most prevalent. Arl13b, a small GTPase of the RAS superfamily essential for ciliogenesis, provides a model to study the contribution of primary cilia to craniofacial development, but its role in coordinating palatogenesis and craniofacial myogenesis remains poorly understood. **Purpose**: This study aims to determine how loss of *Arl13b* in cranial neural crest (CNC)-derived mesenchyme affects palate development and to identify downstream cilia-dependent signaling pathways, focusing on Wnt-mediated craniofacial myogenesis. **Methods**: *Arl13b* was conditionally deleted in CNC-derived mesenchymal cells using *Wnt1-Cre;Arl13b*$^{fl/fl}$ mice. Palatal morphology and craniofacial skeletal development were assessed by histology and microCT. Gene expression was analyzed using immunofluorescence, RNAscope, scRNA-seq, seq-FISH, and bulk RNA-seq. **Results**: *Arl13b* was broadly expressed throughout the developing palate. Conditional deletion resulted in 100% penetrance of cleft soft palate and 80% penetrance of complete cleft palate, accompanied by severe craniofacial skeletal abnormalities and defective soft palate muscle formation. Transcriptomic analyses revealed Wnt and muscle pathway dysregulation, with scRNA-seq identifying widespread *Wnt16* expression in palatal mesenchyme that was significantly reduced in mutants, indicating *Wnt16* as a potential downstream effector of *Arl13b*-dependent ciliary signaling. **Conclusion**: *Arl13b* is a key regulator of palatogenesis and craniofacial myogenesis. Loss of *Arl13b* disrupts cilia-dependent, non-canonical Wnt signaling, particularly *Wnt16*, within CNC-derived mesenchyme, impairing the regulation of craniofacial skeletal and muscular development and leading to cleft palate formation.

Poster #64

Title: Epigenetic regulation of dental follicle controls postnatal tooth root development

Authors: Yiming Kuang, Mingyi Zhang, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Tooth root development requires coordinated regulation of tissue-tissue interactions and transcriptional programs. However, the regulatory role of the dental follicle, particularly during postnatal tooth root development, remains poorly understood. **Purpose**: To define the role of the dental follicle in regulating tooth root development and identify key regulatory factors governing this process. **Methods**: scRNA-seq analysis and genetic mouse models. **Results**: Using comprehensive scRNA-seq analysis, we identified *Tfap2b* as a specific marker of the apical dental follicle. Lineage-tracing experiments revealed that *Tfap2b+* cells contribute to the formation of alveolar bone (AB), periodontal ligament (PDL), and cementum. We further identified *Bcl11b* as a dental follicle-enriched epigenetic regulator. Loss of *Bcl11b* in the *Tfap2b+* lineage reduced AB formation and widened the PDL, resulting in impaired tooth root development. **Conclusion**: These findings establish the dental follicle as an essential regulator of postnatal tooth root development. *Tfap2b+* dental follicle cells give rise to key root supporting tissues, while *Bcl11b*-mediated epigenetic regulation within this lineage is required for proper alveolar bone formation and periodontal ligament organization. Disruption of this regulatory program leads to defective tooth root development.

Poster #65

Title: Missed Dental Appointments Among Unhoused Adults: Examining Retrospective Trends

Authors: Farzaneh Delpisheh Mobashery, Hannie Tran, Saige Culler, Mehdi Mohammadi, and Rebecca Ortiz Bodensteiner

Faculty Advisor: Mehdi Mohammadi and Rebecca Ortiz Bodensteiner

Background: Missed dental appointments, through cancellations and no-shows, in community clinics disrupt care and limit access for underserved adults. Evidence shows missed dental visits lead to untreated disease, motivating interest in examining retrospective rates of non-show patterns in community clinic settings. National data indicate that delayed dental visits are common and are associated with higher rates of untreated caries. **Purpose**: To quantify missed dental appointments among unhoused individuals in URM from 2023-2025. In 2022, California's adult past-year dental utilization was 66.2%. Interpreting community clinic patterns can support strategies to improve appointment completion and continuity of care. **Methods**: Aggregate scheduling data from URM dental clinics (2023-2025) were used for a retrospective secondary analysis of all scheduled adult visits (≥18 years). Annual completion, cancellation, and no-show rates were calculated and summarized descriptively over time. National databases such as NHANES were used for comparison and reference only. **Results**: URM no-show rates were stable at ~24% (2023-2025), and cancellations further reduced visit completion. Nationally, ~66% of U.S. adults report a past-year dental visit, yet ~44 million report no visit for ≥3 years, which is linked to ~3x higher odds of untreated caries. **Conclusion**: Stable, persistent rates of missed dental appointments for this population in community dental settings support the need for equity-focused strategies to reduce missed visits and improve continuity of care and health outcomes.

Poster #66

Title: Time-Dependent Zone-Specific TMJ Cartilage Remodeling After Anterior Disc Displacement

Authors: Daniela Gioia, Maria Pacheco, and Amy E. Merrill

Faculty Advisor: Amy E. Merrill

Background: Temporomandibular joint disorders (TMDs) affect 5-15% of adults and frequently involve anterior disc displacement (ADD), which alters joint mechanics and promotes cartilage degeneration. While structural changes in the TMJ have been described, the time-dependent, zone-specific molecular responses of condylar cartilage following ADD remain poorly understood. **Purpose**: This study aims to characterize temporal and zone-specific changes in condylar cartilage protein expression following anterior disc displacement using immunohistochemistry (IHC). **Methods**: A mouse surgical model of partial and complete ADD was used to induce TMJ derangement, with control and sham groups included. Samples were harvested at 5, 10, 15, 30, and 60 days post-surgery. Sagittal paraffin sections were prepared to preserve condylar cartilage architecture. Histological staining and immunohistochemistry were performed to assess the expression of Collagen I, Collagen II, Collagen X, SOX9, and PRG4 across cartilage zones. Staining patterns were analyzed qualitatively across timepoints to evaluate cartilage remodeling and degeneration. **Results**: Preliminary analyses reveal time-dependent, zone-specific alterations in cartilage marker expression following ADD. Early changes include disruptions in SOX9 expression and matrix organization, followed by increased fibrotic and hypertrophic markers at later timepoints. These patterns suggest progressive remodeling of fibrocartilage and activation of degenerative pathways in response to altered joint mechanics. **Conclusion**: These findings demonstrate that anterior disc displacement induces dynamic, zone-specific molecular changes in TMJ condylar cartilage over time. Mapping these IHC signatures provides insight into the progression

of arthrogenous TMD and establishes a framework for identifying therapeutic targets aimed at preserving cartilage integrity.

Poster #67

Title: KDM6B Safeguards Tissue Homeostasis from Overload through *Piezo1*'s Epigenetic Control

Authors: Hana Hekmat, Lin Meng, Mingyi Zhang, Jifan Feng, Tingwei Guo, Heliya Ziaei, Peng Chen, Aaron Harouni, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Mechanical forces shape the growth and regeneration of mineralized tissues, yet how these tissues adapt to sustained mechanical stress remains poorly understood. Epigenetic modifications represent a critical regulatory layer governing cell fate specification during embryogenesis and tissue homeostasis throughout an organism's lifespan. KDM6B has emerged as a pivotal regulator of gene networks controlling organogenesis, bone formation, dental cementogenesis, and lineage specification. Furthermore, it is required for osteogenesis of the periodontal ligament under orthodontic force. **Purpose**: Understand how epigenetic regulation intersects with mechanotransduction to maintain tissue integrity. **Methods**: Genetically engineered mechanical loading mouse models with inducible Cre-loxP-mediated gene manipulation were used to study incisor biology, with tamoxifen-induced recombination followed by mandibular tissue collection. Samples were analyzed using histology, immunofluorescence, *in situ* hybridization, and molecular assays. **Results**: Using mouse incisor models experiencing different mechanical loads, we found that loss of Kdm6b impairs mineralized tissue homeostasis under high mechanical loading by enhancing PIEZO1-dependent mechanotransduction, leading to excessive Ca2+ influx and apoptosis in TACs. Mechanistically, *Kdm6b* deficiency increases H3K27me3 at the Bmi1 promoter, silencing its expression and derepressing Piezo1 expression. Importantly, *Piezo1* haploinsufficiency in Kdm6b-deficient mice restores Ca2+ influx restriction, rescuing TAC defects and tissue homeostasis. **Conclusion**: Our data suggest that histone demethylation via KDM6B functions as a cellular "mechanostat," tuning transcriptional programs in response to biomechanical stimuli. These findings open new avenues for therapeutic intervention, suggesting that modulation of chromatin states could help mitigate tissue damage and enhance regenerative capacity in mechanically stressed environments.

UNDERGRADUATE & DDS STUDENTS - CLINICAL SCIENCES

Poster #68

Title: EMG Versus Self-Report in Detecting Awake Bruxism

Authors: Nicholas Hy, Arman Zograbyan, Talar Kevorkian, and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Awake bruxism (AB) is commonly identified using patient self-report; however, electromyography (EMG) is an objective method that can improve diagnostic accuracy. The agreement between subjective awareness and EMG activity during wakefulness remains unclear. **Purpose**: To evaluate the diagnostic accuracy of surface EMG compared with self-reported measures of detecting AB in adults. **Methods**: A PubMed search (2020-2025) conducted by independent researchers identified six studies that compared self-reported AB with daytime EMG. Studies that involved adult patients (≥18 years) and explored various modalities of self-report were included, while reviews and sleep assessment cases were excluded. Extracted outcomes included self-reported awake bruxism awareness and EMG-defined presence of awake bruxism based on study-specific thresholds. **Results**: Across all identified studies (N=33-227), self-reported awareness of AB had poor agreement with EMG findings. Individuals who reported AB had EMG activity statistically indistinguishable from those denying it (p=0.306), and large overlaps in bursts/hour were present across all samples. EMG frequently identified sufficient AB activity in participants who denied symptoms, with ~21-23% of "unaware" individuals meeting EMG criteria for AB. Conversely, ~12% of individuals reporting AB showed insufficient EMG activity. One study directly reporting diagnostic performance found that self-report demonstrated a sensitivity of 55%, specificity of 84%, positive predictive value of 50%, and negative predictive value of 86% when compared with 24-hour EMG monitoring. **Conclusion**: Self-reported AB shows limited diagnostic agreement with EMG monitoring. Subjective awareness does not reliably identify AB and supports the use of EMG for diagnostic accuracy.

Poster #69

Title: Effects of Rapid Maxillary Expansion on AHI in Pediatric OSA

Authors: Arman Zograbyan, Talar Kevorkian, Rabee Almahdi, and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Pediatric obstructive sleep apnea (OSA) is frequently associated with maxillary transverse deficiency. Rapid maxillary expansion (RME) has been proposed as an orthodontic intervention that may reduce airway obstruction and improve the apnea hypopnea index (AHI); however, reported effects vary across studies. **Purpose**: To evaluate the effects of RME on AHI in pediatric OSA patients. **Methods**: A PubMed search (2015-2025) conducted by independent researchers identified seven studies that explored AHI before and after RME intervention in pediatric OSA patients. Randomized controlled trials and comparative clinical studies were included, while studies involving co-treatment, slow palatal expansion, or reviews were excluded. **Results**: Two RCTs in children with mild-to-moderate OSA reported 40-66% reductions in AHI at 6 months. Other studies with 12-month follow-up showed decreases from 4.7 to 1.6 events/hour and from 5.8 to 1.6 events/hour. In contrast, trials in children with mixed OSA severity or low baseline AHI reported no significant changes, especially with shorter follow-up intervals. **Conclusion**: RME may reduce AHI in select pediatric OSA populations, particularly non-obese children with mild-to-moderate disease and longer treatment intervals. However, outcomes are inconsistent across studies, especially in patients with low baseline AHI. Additional studies with standardized inclusion criteria are needed to better define the role of RME in pediatric OSA management.

Poster #70

Title: Diagnosis and treatment of idiopathic bone cavity in the mandible

Authors: Bryan Do Nguyen, Elham Radan, and Parish Sedghizadeh

Faculty Advisor: Elham Radan

Background: Idiopathic bone cavity (IBC), also known as simple bone cyst or traumatic bone cyst, is an uncommon, asymptomatic lesion of the mandible that lacks an epithelial lining. It unclear pathogenesis and etiology present diagnostic and treatment challenges to oral health clinicians. A 19-year-old male presented with a radiolucency incidentally discovered on the right side of the mandible. The patient reported a dull, intraoral sensation of pain on the right of his mandible during biting. **Methods**: Panoramic examination observed a unilocular, well-defined radiolucent area associated with the roots of teeth #29, #30, #31, and the mesial surface of the unerupted tooth #32. A biopsy was performed curettage triggered bleeding within the cavity. **Results**: The surgical procedure revealed the absence of an epithelial lining, a definitive characteristic of traumatic bone cavity, and the biopsy of

the buccal cortical bone plate sample confirmed the diagnosis of idiopathic bone cavity. A 5-month follow-up panoramic radiograph was taken on the patient and showed evidence of healing and bone formation. **Conclusion**: The case highlights the importance of surgical treatment and biopsy in treating and diagnosing idiopathic bone cavity. Regular follow-up screenings are recommended to monitor the progress of healing or any signs of recurrence. Further research is needed to improve diagnosis, treatment, and management of idiopathic bone cavity.

Poster #71

Title: Effects of Maxillomandibular Advancement on Adult Obstructive Sleep Apnea

Authors: Rabee Almahdi, Ronny Almahdi, Arman Zograbyan, and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Maxillomandibular advancement (MMA) is a surgical treatment for adult obstructive sleep apnea (OSA) that advances the maxilla and mandible to enlarge the upper airway space. The effects on apnea-hypopnea index (AHI) and airway dimensions vary across existing studies. **Purpose**: To evaluate changes in AHI and upper airway measurements following MMA in adult OSA patients. **Methods**: A PubMed search (2014-2025) was conducted by independent researchers to review post-operative AHI outcomes following MMA in OSA patients ≥ 18 years old. Studies reporting polysomnography performed at least 3 months after surgery and sample sizes of at least 10 patients were included, while cases involving craniofacial syndromes and single jaw surgery were excluded. The extracted outcomes analyzed changes in AHI and airway dimensions measured using cephalometry or cone-beam computed tomography. **Results**: Baseline AHI values varied from 27.7 to 117.9 events/hour in the eight studies that were selected for review. Post operatively, AHI was reduced to 2 to 16.1 events/hour (~69-95.5% decrease), with five studies reporting AHI values below 10 events/hour. Surgical success rates, defined as ≥50% reduction in AHI and/or post-operative AHI <20 events/hour, ranged from 67-73%. Similarly, OSA cure rates were reported as 40-70%, with <5 events/hour. Multiple studies showed increases in posterior airway space, minimum cross-sectional area, and total oropharyngeal airway volume following MMA, with the airway volume increasing from ranges of ~25-237%. **Conclusion**: MMA is associated with decreased AHI and increased upper airway dimensions in adult patients with OSA.

Poster #72

Title: Multidimensional Impact of Temporomandibular Joint Disorders on Quality of Life

Authors: Iman Shamseldin, Ezinne Abba, and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Temporomandibular joint disorder (TMD) is a multifactorial condition that extends beyond localized jaw pain and may adversely affect psychological well-being, daily functioning, and overall quality of life. Understanding its broader impact is essential for comprehensive patient care. **Purpose**: To evaluate whether temporomandibular joint disorders negatively impact patients' quality of life. **Methods**: A narrative review of original research studies published between 2015 and 2025 was conducted. Ten studies evaluating adult patients with TMD were included. Health-related or oral health-related quality of life (HRQoL/OHRQoL) outcomes were assessed using validated instruments, including OHIP-14, OHIP-TMD, EQ-5D, and WHOQOL-BREF. Cross-sectional, case-control, and clinical studies were reviewed to examine associations between TMD symptom characteristics and quality-of-life outcomes. **Results**: TMD was consistently associated with significantly poorer quality of life. Patients with painful and multiple TMD symptoms demonstrated greater psychological distress and worse HRQoL and OHRQoL scores. Painful TMD was linked to reduced HRQoL, increased functional burden, higher prevalence of sick leave, and significantly lower EQ-5D scores ($p < .001$). Greater symptom number and severity were strongly correlated with worse OHRQoL and psychological distress. Global OHIP scores showed moderate to strong correlations with pain intensity, symptom duration, and pain-related interference. Comorbid conditions, including otologic symptoms, parafunctional behaviors, jaw functional limitations, and anxiety or depression, further exacerbated quality-of-life impairment ($p < .001$), with combined muscle and joint involvement showing the greatest impact ($p = .02$). **Conclusion**: TMD symptom severity and complexity are strongly associated with diminished quality of life, supporting the need for multidisciplinary management approaches.

Poster #73

Title: Disparities in Denture Access Among Unhoused Edentulous Adults

Authors: Sarina Haghighat, Shanar Mardanpour, Yena Jang, Sheiva Hodjati, and Mehdi Mohammadi

Faculty Advisor: Mehdi Mohammadi

Background: Edentulism remains a significant public health concern due to associations with impaired mastication, reduced dietary quality, and overall health decline. Dentures are the primary prosthetic interventions to restore oral function; however, access to such care may differ between housed and unhoused populations. Malnutrition is prevalent among unhoused populations, with dietary patterns predominantly characterized by inadequate protein consumption and high carbohydrate and triglyceride intake. **Purpose**: This study compares the proportion of edentulous unhoused individuals who have received partial or complete removable prosthesis dentures in USC + URM dental clinic with the general population, with the expectation that access to dental dentures among edentulous individuals is similar across groups. **Methods**: A retrospective analysis of 572 patients who received care at the USC + URM dental clinic in downtown Los Angeles from 2023 to 2025 was quantified and stratified by age, edentulous status, and denture provision over multiple years. Findings are compared with population-level estimates derived from NHANES data. **Results**: We anticipate a higher prevalence of edentulism among unhoused adults, with a concomitant need for increased prosthodontic support, given the high prevalence of malnutrition in this population. These patterns are clinically salient, as untreated edentulism exacerbates barriers to adequate food intake, favors softer and less nutrient-dense diets, and worsens overall health vulnerability. **Conclusion**: This study highlights disparities in access in receiving dental care, mainly dental prostheses, among unhoused adults and underscores the need to integrate access to prosthodontic care into safety-net dental services to improve oral function, nutrition, and overall well-being.

Poster #74

Title: Evaluating saliva microbiome dysbiosis in periodontitis and non-periodontitis patients

Authors: Edward Kim, Natalia Tjokro, and Casey Chen

Faculty Advisor: Casey Chen

Background: Conventional periodontal diagnosis is based on assessing loss of periodontium, pocket depth, and inflammation, with significant overlaps between periodontitis and non-periodontitis. The diagnoses of the same patients could vary widely among clinicians, leading to different treatment recommendations. The oral microbiome is known to be associated with periodontitis. Assessing oral microbiome dysbiosis offers a potential solution to clinical diagnosis. **Purpose**: To evaluate the relationship between the salivary microbiome dysbiosis by SMDI (https://bioinformatics.forsyth.org/smdi/index.php) and periodontal diagnosis. **Methods**: Adult patients at the Ostrow Clinic were recruited (IRB pro-

tocol HS-24-00312), excluding subjects with conditions known to affect the oral microbiome (e.g., recent antibiotic treatment). Patients received a comprehensive examination, diagnosis, and treatment plan. Five milliliters of non-stimulated saliva were collected. Salivary DNA was extracted using a standard protocol and subjected to 16S rDNA profiling of the V4 region. The SMDI analysis was performed according to the instructions on the website. **Results**: Thirty patients were included, divided evenly between periodontitis and gingivitis/health. SMDI in periodontitis was higher than in gingivitis/health. The differences were statistically significant if the analysis excluded rare taxa. For periodontitis and gingivitis/health, the genus-level SMDIs were -1.26 and -7.10, respectively, at a Gini cutoff of 2.0 (t-test, $p = 0.019$). Factors that influenced the diagnostic accuracy of SMDI included the analysis setting, oral conditions (e.g., caries), and calibration in diagnosis. **Conclusion**: Microbiome dysbiosis analysis shows promise in improving clinical periodontal diagnosis.

Poster #75

Title: Sphenopalatine ganglion block in orofacial pain and headache disorders

Authors: Isabelle Mollicone, Chinmayee Patil, Areeg Elmusrati, Joan C. Wang, Douglas R. Wall, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: The sphenopalatine ganglion (SPG) plays a key role in trigeminal nociceptive and autonomic pathways involved in orofacial pain and headache disorders. SPG block has therefore emerged as a minimally invasive therapeutic approach aimed at modulating these pathways to provide pain relief in craniofacial pain conditions. **Purpose**: To review and synthesize published case reports on the use of sphenopalatine ganglion (SPG) block in orofacial and headache disorders, focusing on techniques and clinical outcomes. **Methods**: A review of 55 case reports and series extracted data on 29 papers, including diagnoses, SPG block technique, anesthetic or drug, outcomes, and adverse effects. **Results**: SPG block was reported in trigeminal neuralgia and neuropathies, burning mouth syndrome, non-specified facial pain, autonomic cephalalgias, migraine, tension type headache, COVID related headache and acute cephalalgias. The most frequently used technique was intranasal with cotton tip applicators, with lidocaine 2-10% as the most common agent. Most reports document relief, but long-term data is not available. Neurogenic pain conditions and migraine showed superior therapeutic responses to the SPG block procedure. **Conclusion**: SPG block appears to be a safe and potentially effective intervention for a variety of orofacial and headache pain conditions; however, high-level evidence is lacking. The findings support further rigorous clinical studies to establish efficacy, optimal protocols, and long-term outcomes.

Poster #76

Title: Consistency Analysis of AI-Generated Sketches from US-Produced TMJ Images

Authors: Yaman Da'As, Andrew Euredjian, Areeg Elmusrati, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Ultrasound (US) is a noninvasive imaging modality that relies on differences in acoustic impedance to generate images based on tissue density and composition. These variations create characteristic patterns that allow visualization of anatomical structures. Although US is widely used in medicine, its application in temporomandibular joint disorder (TMD) assessment remains limited due to operator dependence and variability in interpretation. Advances in artificial intelligence (AI) offer opportunities to improve image standardization and diagnostic confidence. **Purpose**: This study evaluates the use of AI-generated anatomical sketches to assess TMJ ultrasound image consistency. **Methods**: Ten TMJ ultrasound images were obtained from five healthy student volunteers (three male, two female) with no history of temporomandibular disorders using a portable General Electric VScan Air ultrasound unit. Participants opened their mouths, not exceeding a 30 mm interincisal distance. Images were digitally stored and systematically coded using VScan Air software. Each image underwent AI-assisted conversion into an anatomical sketch, and consistency of anatomical landmark representation was evaluated using ChatGPT-5.2 (IRB: HS-25-00463). **Results**: The generated sketches demonstrated consistent morphological and tonal features across all images. Gradual tonal transitions reflected expected acoustic interfaces between adjacent tissues. A recurring dome- or ovoid-shaped disruption of horizontal tissue planes corresponded to the expected position of the mandibular condyle. Superficial layers appeared lighter and diffuse, while deeper structures showed darker, denser rendering consistent with bone. **Conclusion**: These findings suggest that AI-generated anatomical sketches can capture key TMJ landmarks and may serve as a standardization tool for portable TMJ ultrasound interpretation. Further validation with larger datasets is required.

Poster #77

Title: Comparing Educational Platform Usability in Orofacial Pain Education

Authors: Ezinne Abba, Savera Ahmed, Areeg Elmusrati, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Effective patient education is essential for high-quality care, particularly in the management of chronic conditions such as orofacial pain. While educational content is critical, the method of delivery plays a significant role in comprehension, engagement, and usability. With the increasing use of digital platforms, it is important to evaluate the effectiveness of emerging formats, including social media, for health education. **Purpose**: This study evaluated dental students' perceptions of usability across three educational formats for orofacial pain management to identify which delivery method best supports learning and engagement. **Methods**: Three educational formats were compared: Clinical Pearls (five-page blog-style modules), AI-generated Instagram posts (five visual posts with concise content), and printed handouts (five condensed summary documents). A convenience sample of 12 dental students reviewed five orofacial pain topics presented in each format. Participants then completed the System Usability Scale (SUS), a validated 10-item Likert questionnaire measuring user experience and interface usability. SUS scores were calculated and compared across formats. **Results**: All formats achieved acceptable usability scores (SUS >68). Printed handouts received the highest usability rating (79.41), followed by Clinical Pearls (73.60). AI-generated Instagram posts had the lowest score (68.55). **Conclusion**: Printed handouts and structured digital formats demonstrated higher perceived usability than AI-generated social media content. These findings suggest that traditional and organized educational formats may be more effective for medical education. Further research involving patient populations is warranted to determine optimal platforms for patient-centered education.

Poster #78

Title: Beyond NSAIDs: Alternative Therapies for Orthodontic Pain

Authors: Jessica Woo and Azadeh Ahmadieh

Faculty Advisor: Azadeh Ahmadieh

Background: Orthodontic treatment is commonly associated with pain that may negatively affect patient compliance and satisfaction. Although nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen are widely prescribed, concerns regarding adverse effects and potential influence on orthodontic tooth movement have increased interest

in alternative and adjunctive pain-control therapies. **Purpose**: To evaluate the effectiveness of non-pharmacological and adjunctive interventions for pain associated with pre- and post-orthodontic treatment. **Methods**: A literature review of randomized controlled clinical trials published between January 2020, and December 2025, was conducted. Included studies evaluated human orthodontic patients undergoing separator placement or fixed appliance therapy and investigated non-pharmacological or adjunctive pain-control interventions, including acupressure, bromelain with or without turmeric, low-intensity pulsed ultrasound (LIPUS), and photobiomodulation therapy. Outcomes focused on patient-reported pain intensity measured using visual analog scales (VAS). Systematic reviews, meta-analyses, animal studies, and studies lacking quantitative pain outcomes were excluded. **Results**: Acupressure and ibuprofen both reduced post-separator pain compared with the control group, with peak pain at 4 hours (VAS 7.60 ± 1.65 control vs 6.46 ± 2.49 ibuprofen and 5.88 ± 2.42 acupressure). Bromelain-based therapies demonstrated significantly lower pain than ibuprofen at 2 and 6 hours post-placement. LIPUS significantly reduced pain at 24 hours and on days 4 and 5 compared with controls. Photobiomodulation therapy consistently reduced pain intensity across multiple post-treatment time points. **Conclusion**: Non-pharmacological and adjunctive therapies demonstrated promising analgesic effects in orthodontic patients and may reduce reliance on NSAIDs. Further standardized clinical trials are needed to determine optimal protocols and confirm long-term efficacy.

Poster #79

Title: Oral and Maxillofacial Manifestations of Sagliker Syndrome: Two Cases

Authors: Emanuel Harouni, Parish Sedghizadeh, and Anette Vistoso Monreal

Faculty Advisor: Parish Sedghizadeh

Background: Sagliker syndrome is a rare and severe manifestation of chronic kidney disease-mineral and bone disorder resulting from prolonged, inadequately controlled secondary hyperparathyroidism. The condition is characterized by progressive skeletal deformities, with particularly striking involvement of the craniofacial skeleton. Because oral and maxillofacial findings may be prominent, dental clinicians may play a critical role in early recognition. **Purpose**: The purpose of this report was to describe the oral and maxillofacial manifestations of Sagliker syndrome and to highlight the diagnostic and clinical significance of these findings for providers. **Methods**: Two patients with advanced Sagliker syndrome were evaluated clinically, radiographically, and histopathologically. A comprehensive review of medical history, laboratory findings, imaging studies, and oral examinations was performed. Relevant literature was reviewed to contextualize the findings. **Results**: Both patients demonstrated severe maxillary and mandibular enlargement, malocclusion, tooth displacement, and functional impairment. Radiographic evaluation revealed diffuse jaw enlargement, loss of lamina dura, ground-glass trabecular patterns, and condylar erosion consistent with advanced osteitis fibrosa. Histopathologic findings supported the diagnosis. Despite prior medical and surgical management of secondary hyperparathyroidism, established craniofacial deformities persisted. **Conclusion**: Sagliker syndrome represents a rare but devastating complication of chronic kidney disease in which oral and maxillofacial findings may dominate the clinical presentation. Early recognition by dental clinicians and timely multidisciplinary referral are essential to limit disease progression and mitigate functional and psychosocial morbidity.

Poster #80

Title: Analysis of Diagnostic and Therapeutic Decision Errors in Virtual Orofacial Pain Learning

Authors: Eli Elisha, Shradhdha Trivedi, Luciano Nocera, and Mariela Padilla

Faculty Advisor: Mariela Padilla

Background: Temporomandibular disorders (TMDs) are prevalent conditions affecting the temporomandibular joint and masticatory muscles, often resulting in pain and functional impairment. Despite CODA's mandate to integrate TMD management into predoctoral curricula, variability exists in educational delivery. **Purpose**: This study aimed to evaluate the effectiveness of virtual patient scenarios in identifying learning gaps related to myofascial pain (MFP) and disc displacement (DD) among dental students, focusing on diagnostic test selection, primary diagnosis, and treatment planning. **Methods**: Dental students completing the Orofacial Pain and Oral Medicine rotation at USC engaged with five virtual patient scenarios. We analyzed data from 149 MFP and 80 DD cases, which were offered between October 2024 and August 2025. Student selections for diagnostic tests, final diagnoses, and treatment plans were coded as correct or incorrect based on expert consensus. Correlation analyses examined relationships between test selection, diagnostic accuracy, and overall case performance. **Results**: For MFP cases, 81% of students passed, with a moderate positive correlation ($r = 0.487$) between correct primary diagnosis and passing. For DD cases, 58% passed, with a similar correlation ($r = 0.476$). Over-selection of diagnostic tests was the primary contributor to failure in both scenarios. Some students passed despite incorrect diagnoses, while others failed despite correct diagnoses, highlighting gaps in integrated clinical reasoning. **Conclusion**: Virtual patient scenarios provide a safe, flexible environment to assess and develop diagnostic reasoning in TMDs, revealing persistent gaps in test prioritization and treatment planning. These findings support the value of simulation-based education for dental curricula and emphasize the need for integrated teaching strategies to enhance clinical reasoning and decision-making.

Poster #81

Title: Prosthetic-Driven Reconstruction of a Post-Maxillectomy Defect

Authors: Boules Attia, Kalvyn Ngo, Xuan Yuo, Arushi Atluri, and John Costandi

Faculty Advisor: John Costandi

Background: Patients with advanced squamous cell carcinoma of the hard palate often undergo extensive surgical resection and radiation therapy, resulting in complex composite defects involving both hard and soft tissues of the midface. This case describes a 49-year-old male with a history of T4N2 squamous cell carcinoma of the anterior hard palate status post partial palatectomy, anterior maxillectomy, partial rhinectomy, bilateral neck dissection, and adjuvant radiation therapy, leaving significant maxillary bone loss, oro-nasal communication, facial collapse, and complete edentulism. **Purpose**: The primary goal was to restore oral function, facial esthetics, nasal integrity, and dentition using the most effective and predictable reconstructive strategy. **Methods**: A focused literature review was performed to evaluate reconstructive options for irradiated patients with combined hard and soft tissue defects, including free flap reconstruction, prosthodontic rehabilitation, and combined surgical-prosthetic approaches. Virtual surgical planning was used to design a prosthetic-driven pre-prosthetic reconstruction, incorporating predictive fixation holes to guide accurate hardware placement and optimize implant positioning relative to the planned occlusion. This approach allowed precise restoration of maxillary projection and oral-nasal separation while minimizing surgical morbidity. Surgical reconstruction was completed in approximately four hours. **Results**: Postoperatively, the patient demonstrated restoration of facial form, elimination of oro-nasal communication, and return of functional oral activities, including speech and eating. **Conclusion**: This case demonstrates that predictive, prosthetic-driven reconstruc-

tion using virtual planning can successfully restore both function and esthetics in patients with complex post-maxillectomy defects and highlights the value of multidisciplinary planning in head and neck cancer rehabilitation.

Poster #82

Title: Improving MRONJ Awareness, Prevention and Prognosis through Patient Health Literacy

Authors: Alisa Chew, Anette Vistoso Monreal, and Parish Sedghizadeh

Faculty Advisor: Parish Sedghizadeh and Anette Vistoso Monreal

Background: In Chinese culture, the concept of 補身体 (bǔ shēntǐ) reflects the belief that physician-prescribed medications inherently strengthen the body. However, pharmaceutical benefits may vary across populations. In 1994, the WHO established bone density standards based on Caucasian women, contributing to higher osteoporosis diagnoses among Asian women, who have lower average bone density. Common treatments, like bisphosphonates and denosumab, suppress bone resorption essential for remodeling. Prolonged suppression is linked to microfractures, infection, and medication-related osteonecrosis of the jaw (MRONJ). **Purpose**: To develop and evaluate a patient-centered health literacy intervention to improve MRONJ awareness, prevention, and outcomes among Asian patients receiving antiresorptive therapies. **Methods**: Patient-facing MRONJ educational brochures were developed using the CDC and HHS Health Literacy Toolkit. Materials will be disseminated at the USC Herman Ostrow School of Dentistry and affiliates. Patient health literacy will be assessed using surveys aligned with Nutbeam's three levels of health literacy: functional, interactive, and critical. Structured clinical and radiographic data will be analyzed to support translational correlations and outcomes assessment in the study population. Outcome measures: Primary outcomes include changes in patient health literacy. Secondary outcomes include MRONJ awareness, preventive behaviors, clinical outcomes, incidence and prognosis of medication-related complications. **Results**: We anticipate improved functional, interactive, and critical health literacy, leading to increased patient empowerment, informed decision-making, greater engagement in preventive dental care, and improved clinical outcomes among patients at risk of MRONJ. **Conclusion**: A culturally informed, health literacy-based intervention may reduce gaps in MRONJ awareness and lower medication-related complications in a high-risk patient population.

Poster #83

Title: Advancing Periodontal Diagnosis with Ultrasound Technology

Authors: Melody Yazdani, Dondis Maxey-Moreland, Harrison Chang, Youyoung Min, Jesse Jokerst, Mirali Pandya, and Casey Chen

Faculty Advisor: Casey Chen and Mirali Pandya

Background: Periodontitis is a site-specific disease traditionally evaluated using probing depths and radiographic assessment of alveolar bone levels over time. Conventional techniques are invasive, technique-sensitive, and limited in their ability to detect early or minor changes in periodontal structures. **Purpose**: Our goal is to develop an accurate clinical assessment that is essential for periodontal diagnosis, treatment planning, and monitoring disease progression. High-frequency ultrasound imaging offers a noninvasive, radiation-free modality capable of visualizing both soft and hard periodontal tissues and may address these diagnostic limitations. This can be especially beneficial for patients that have progressive periodontal disease and would require close monitoring of oral health. **Methods**: Ultrasound scans were obtained using a 40 MHz high-frequency ultrasound transducer at midfacial and midlingual tooth surfaces. Ultrasound imaging was performed for over 37 patients diagnosed with health and periodontal disease. Additionally, patients undergoing periodontal surgical procedures including osseous surgery, crown lengthening, implant placement, and soft tissue grafting were evaluated with preoperative and postoperative ultrasound scans of the surgical sites. Ultrasound findings were compared with conventional clinical periodontal assessments. **Results**: Initial findings demonstrate consistent visualization of key dental anatomic landmarks, including the cementoenamel junction, gingival margin, and alveolar bone crest. Ultrasound-based measurements showed promising agreement with clinical probing depths and demonstrated the ability to identify and monitor changes in alveolar bone levels with acceptable sensitivity and specificity. **Conclusion**: High-frequency ultrasound is a promising adjunctive tool for periodontal assessment, offering a precise, non-invasive, and radiation free approach with potential applications in periodontal and implant-related diagnostics.

DENTISTRY & CCMB FACULTY

Poster #84

Title: Comparing Student's Perception of Problem-based Learning Facilitators: In-person vs. Zoom

Authors: Mahvash Navazesh and Xi (Anna) Chen

Background: Since the pandemic, the Ostrow School of Dentistry of University of Southern California (USC) has been delivering the Biomedical Sciences curriculum through small-group, problem-based learning (PBL) sessions via Zoom. Students' performances from the in-person and remote instructional methods have been comparable and reported before. **Purpose**: A key question is how students perceive faculty-student dynamic when instructional method changes. **Methods**: An anonymous evaluation which included 18 positive and negative traits was conducted to gauge students' perceptions of their facilitators. A linear mixed-effects model was used to examine each trait rated by students and accounted for variability and clustering among facilitators. Sample size included 20 instructors who facilitated the same PBL cases in-person before COVID and via Zoom since COVID. Evaluations were provided to 576 students who received the curriculum in-person and the other 576 receiving it via Zoom. The study received USC IRB exemption (UP-25-00496). **Results**: No difference was found in 14 out of 18 traits between two instructional modes. Four descriptors showed an increase during the Zoom PBL sessions: accessible (p=0.010), engaged (p=0.024), critical (p=0.005) and judgmental (p=0.011). The results indicate that faculty-student dynamic were largely unaffected by the shift of instructional methods. Compared to in-person PBL sessions, faculty were seen as more accessible and engaging, yet also more critical and judgmental when facilitating Zoom sessions. **Conclusion**: Interactive remote sessions can be comparably effective in learning Biomedical Sciences and offer more faculty accessibility and engagement. Faculty development should emphasize supportive feedback and clarity to minimize negativity in remote settings.

Poster #85

Title: Educational Resource Modality Preferences in an Orofacial Pain Module

Authors: Azadeh Ahmadieh and Mahvash Navazesh

Background: The flipped classroom Orofacial Pain module ("Maria's Lingering Pain") presented to both DDS and ASPID class of 2027 (total of 177 students). This module has been presented to the third year DDS and first year ASPID students since 2020. Multiple resource modalities, including videos, podcasts, a book chapter, and scientific articles are provided to the students through Brightspace prior to beginning the module. **Purpose**: This study aimed to evaluate the DDS and ASPID

students' interest in accessing different types of educational resources aligned with the learning objectives of the Orofacial Pain module. **Methods**: The learning objectives of the module and their associated references were reviewed. Each learning objective included one or more resource modalities. The frequency of DDS and ASPID students' access to each resource type was documented using Brightspace analytics reports. **Results**: Brightspace reports indicated that access frequencies across all resource modalities (videos, podcasts, book chapter, and scientific articles) ranged from 75 to 135. Videos were the most frequently accessed resource by both DDS and ASPID students. Podcasts were the second most used modality for both groups. Among DDS students, the book chapter ranked after podcasts, while scientific articles were accessed least frequently. In contrast, ASPID students accessed scientific articles more often than the book chapter. **Conclusion**: These findings suggest that both DDS and ASPID students most frequently utilized video resources, followed by podcasts. Future studies involving larger student cohorts are warranted to better understand trends in resource utilization and learning preferences over time.

Poster #86

Title: Advancing Information Literacy and Citation Accuracy in the Age of AI

Authors: Hannah M. Schilperoort

Background: Large language models (LLMs) can produce reference citations that look authentic but are fake or incorrect. AI-generated interpretations of sources can convey incorrect, incomplete, or biased information. Propagation of fake or incorrect references and claims leads to misinformation and loss of integrity in health sciences education, research, and clinical practice. **Purpose**: Provide reliable strategies for verifying the existence and accuracy of AI-generated citations. **Methods**: Review of available literature, product evaluations, and AI literacy models to determine the best strategies for verifying the accuracy of AI-generated citations and content interpretation. **Results**: Every AI-generated citation must be checked by a human to verify existence and accuracy. AI detection tools (e.g., Turnitin) cannot reliably identify AI-generated content, fake citations, or misinformation. DOIs, journal websites, Crossref, and other search engines (e.g., Semantic Scholar, OpenAlex, PubMed) can be used to verify the existence of articles. WorldCat or ISBN Search can be used to verify the existence of books. Google Scholar should not be relied upon to verify AI-generated citations because it is known to index fake citations that have been included as references in published and/or retracted articles. For authentic citations, the researcher must evaluate the original source and cross-check against other credible sources. **Conclusion**: As part of broader efforts to ethically and responsibly integrate AI into dental education, dental school administrators, faculty, and librarians can collaborate to provide information and AI literacy learning opportunities that include strategies for verifying citation accuracy and evaluating primary sources.

Poster #87

Title: Vertical Integration: Enhancing the Differential Diagnosis Process Through Analytic Reasoning

Authors: Nasrin Bahari Chopiuk and Sibel Dincer

Background: The transition from classroom learner to clinical diagnostician requires a shift from memorizing facts to executing complex analytic reasoning. Proficient diagnosticians are known for their ability to connect clinical signs to underlying biological causes. Implementing this integration early in a curriculum remains a significant pedagogical challenge, requiring a structured framework to move students beyond simple pattern recognition toward a more deliberate, evidence-based diagnostic process. **Purpose**: This study explores the pedagogical methodology of vertical integration at Herman Ostrow School of Dentistry of USC (HOSD), which incorporates biomedical sciences and clinical reasoning together from day one to foster deeper analytic reasoning, the deliberate, evidence-based process required for accurate differential diagnosis (DDx). **Methods**: The methodology employs a multi-phase approach. The curriculum is structured as a "Spiral", where the complexity of the DDx process increases as the student moves through three distinct phases: Problem-Based Learning cases, P3 assessment, and Patient Assessment throughout their clinical experiences. **Results**: This vertical integration effectively mitigates 'premature diagnosis', the common error seen in a novice learner's clinical practice. Analytical reasoning connects biological processes underlying clinical signs and symptoms, thereby enhancing diagnostic precision and clinical proficiency. **Conclusion**: Developing analytic reasoning through vertical integration prepares dental students to become clinicians. This methodology ensures that the differential diagnosis process is not merely a checklist, but a sophisticated cognitive framework that enhances patient safety and clinical outcomes.

DENTISTRY & CCMB AFFILIATES

Poster #88

Title: Rabbit Calvaria Bone Regeneration Using a 3D-printed Scaffold and BMA

Authors: 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**: We want to find if our scaffold, when combined with bone marrow aspirate (BMA), can regenerate bone in two bilateral circular calvarial CSDs. **Methods**: BMA was collected from the rabbit's tibial crest. Two bilateral 1 cm circular defects were made in the calvaria. The BMA was combined with 3D-printed osteoconductive scaffolds of hydroxyapatite and tricalcium phosphate (HA/TCP) and placed into the defect sites. The rabbits were allowed to heal over three and six months. **Results**: BMA combined with our 3D-printed scaffold successfully regenerated complex cortical bone that integrated with native bone in this model. Micro-CT and histology indicated the regenerated bone was of good quality and sound structure compared to native bone. Immunostaining confirmed there were no adverse effects to the dura or the brain. **Conclusion**: This study represents a unique opportunity to utilize MSC-mediated tissue regeneration in improving care for human patients with calvarial CSDs.

Poster #89

Title: The Effect of ALK5 in Palate and Craniofacial Development

Authors: Angeline Reyes-Cruz and Yang Chai

Faculty Advisor: Yang Chai

Background: Cleft palate is a common birth defect that occurs when the roof of the mouth doesn't fully form before birth. It affects 1 in 1,700 babies and can lead to feeding, speech, and breathing difficulties. ALK5 helps guide cell growth, organization, and the development during palate formation. When ALK5 signaling is disrupted, craniofacial development may be affected. **Purpose**: Examine how the loss of ALK5 in cranial neural crest cells affects the palate and craniofacial development in a mouse model. Understanding how ALK5 functions during palate formation may help explain how cleft palate develops. **Methods**: Wnt1-Cre;ALK5 mutant and control mice were produced using a genetic test cross. Genotyping was done to identify mutants and control mice. Craniofa-

cial tissues were embedded, sectioned, and stained for histological analysis to examine the palatal shelf growth. CT imaging was used to view 3D structure of the skull and palate, mutant mice were compared to controls. **Results**: CT imaging showed clear craniofacial differences in ALK5 mutant mice compared to controls. The mandible bones were smaller, the premaxilla was reduced, and difficult to identify. In some mutants, nasal bones were partially or completely absent. **Conclusion**: ALK5 mutant mice have severe craniofacial defects, including a split in the roof of the mouth, facial clefts, and delayed tooth development. This means ALK5 is important for the palate to form correctly, and it helps understand why cleft palate occurs.

Poster #90

Title: Investigating Tooth Root Development in *Gli1-Cre^{ERT2};Igfr1$^{fl/fl}$* mice

Authors: Belen Delgado and Yang Chai

Faculty Advisor: Yang Chai

Background: Proper tooth development, especially in root growth, is essential to mastication and properly articulated speech. Throughout tooth development, mutations in genes can lead to the absence of proper root growth. These mutations can lead to adverse effects that make life difficult. **Purpose**: The purpose of this study is to evaluate the extent to which the *Igfr1* mutations prohibit the development of mouse tooth roots. **Methods**: Sample sizes of nine for the *Gli1-Cre^{ERT2};Igfr1$^{fl/fl}$* mutants and five controls were measured from the end of the anatomic crown to the end of the root. The measurements were then graphed and compared. **Results**: The results indicate a difference in the length of the mutated root (mean = 0.71mm) compared to the control roots (mean = 0.95mm). The results suggest that *Igfr1* is critical for root development in the mouse and potentially in humans. **Conclusion**: Research on tooth development and regulation is important for human oral health. Understanding these complex regulations would allow for better research in the future. We have seen progress in knowing the effects of these mutations.

Poster #91

Title: Empowering Early-Career Researchers in Developmental Biology

Authors: Thach-Vu Ho, Jesse Anderson-Ramirez, Ishmael Howard, Brian Alvarado, and Yang Chai

Faculty Advisor: Yang Chai

Background: The USC STAR Program serves as a premier model for preparing high school students for careers in STEM through immersive research in craniofacial development. **Methods**: Participants in Dr. Yang Chai's laboratory utilize comprehensive datasets from FaceBase, a multi-institution repository, to conduct sophisticated morphometric analyses of craniofacial bones. **Results**: By applying established anatomical landmarks to microCT data, students quantitatively evaluate the size and shape of skeletal structures. This computational training is paired with foundational laboratory techniques, including genotyping, biochemical assays, and animal handling. The program culminates in a formal research symposium at USC, where students present their findings. **Conclusion**: Historically, STAR alums have leveraged this rigorous experience to secure academic scholarships and gain admission to top-tier research institutions.

Poster #92

Title: Cellular Neighborhood Reorganization in Periodontitis and HNSCC

Authors: Thomas Tilton, Uttam Sinha, and Dechen Lin

Faculty Advisor: Dechen Lin

Background: Periodontitis and HNSCC exhibit chronic inflammation, immune dysregulation, and tissue remodeling. Cellular neighborhood reorganization in these diseases remains unclear at single-cell resolution. Illuminating the cellular covariance may reveal biomarkers and therapeutic targets. **Methods**: We applied CoVarNet, an NMF-based cellular co-variation framework, to large single-cell datasets to characterize cellular neighborhood changes in two parallel comparisons: normal gingiva versus periodontitis, and normal adjacent tissue versus HPV-positive and HPV-negative HNSCC. We analyzed public and private scRNA-seq datasets: periodontal (n=30) and HNSCC cohorts (n=98). CoVarNet identifies cellular modules representing functional niches where cell types co-vary across patients. **Results**: In periodontitis, fibroblasts shifted from homeostatic partners (T cells, cDC, MAIT) to inflammatory partners (venule endothelium, plasma cells, pDC). T cells concentrated in Th17/neutrophil-driven inflammatory modules rather than distributed surveillance patterns. In HPV-negative HNSCC, fibroblasts partnered with immunosuppressive TAMs (SPP1+) and CAFs (MMP11+), with effector T cells trapped in these suppressive populations, suggesting compromised antitumor immunity. T cell subtypes segregated into separate modules. Conversely, HPV-positive tumors maintained organized cellular relationships: multiple T cell subtypes coexisted in shared modules, and TLS components unified. **Conclusion**: Both periodontitis and HPV-negative HNSCC show fibroblasts losing homeostatic partners for disease-associated cells, but through different mechanisms: Th17-driven inflammation versus immunosuppressive T cell trapping. HPV-positive HNSCC maintains coordinated immune organization, consistent with better prognosis. These findings suggest immune cell organization as a biomarker and CAF-TAM interactions as therapeutic targets.

Poster #93

Title: Genetic and Phenotypic Analysis of *Aggregatibacter actinomycetemcomitans* in Dormancy

Authors: Bryant T. Tran, Natalia O. Tjokro, and Casey Chen

Faculty Advisor: Casey Chen

Background: *Aggregatibacter actinomycetemcomitans* (*Aa*), an oral pathogen, may enter dormancy in nutrient-limited (NL) and nutrient-deficient (ND) media to survive. **Purpose**: This study aimed to examine the mutations among isolates from dormancy and the potential growth advantage of these mutants. **Methods**: Ninety-seven isolates derived from a clinical strain D7S1 cultured in dormancy-inducing media of variable lengths (14-343 days) were included in the study. The isolates were subjected to whole-genome sequencing by Illumina. The mutations in CDS were identified in Geneious Prime (Biomatters Ltd). Selected isolates were evaluated for viability after 28 days in NL and NE (nutrient-enriched) media with wildtype D7S1 as the control. **Results**: Using a stringent criterion of 0.8 variant frequency and a minimum of 100 coverage, 85 of the 97 isolates had 1-6 nonsynonymous mutations (NSN) but no synonymous mutations. There was a trend for more NSN in the later phase of dormancy. Most of the NSN identified in the earlier isolates were also found in the later isolates, suggesting a clonality. However, distinct mutants may emerge in the same cultures over time. No significant difference was found in the survival rates of the mutants after 28 days of culturing in NL. The significance of these mutations to the dormancy phenotype of *Aa* is unknown. **Conclusion**: Multiple distinct clones of mutants may emerge in dormancy. While most of the mutations appear to accumulate over time, the results did not support an evolutionary convergence and adaptation to the media that induced dormancy.

Poster #94

Title: Understanding ERK2's effect on neural crest cells in craniofacial development

Authors: Esteban Cobo Espuny, Thach-Vu Ho, and Yang Chai

Faculty Advisor: Yang Chai

Background: Neural crest

cells are an integral part of craniofacial development, serving as a group of migratory cells that contribute to the formation of facial structures such as the Palate. The extracellular signal-related kinase 2 (ERK2) signaling pathway is key in regulating cell proliferation, migration, and differentiation, and disruptions in this pathway have been linked to developmental abnormalities, suggesting proper regulation is vital for normal facial formation. **Purpose**: In this study, we investigated how knockout mice Wnt1-Cre;Erk2$^{fl/fl}$, displayed irregularities in palatogenesis, specifically in palate shelf fusion. **Methods**: Wnt1-Cre, Erk2$^{fl/fl}$ knockout and control mice were crossed to produce the phenotypic malformation, with DNA genotyping done to confirm fl/fl (homozygous) and fl/+ (heterozygous). Craniofacial tissues were then embedded and sectioned along the coronal plane for histological analysis to examine palatal shelf growth and tissue structure. CT was used to analyze the structure of the palate and skull, comparing mutant mice to controls. **Results**: When comparing mutant mice to controls, CT revealed distinct craniofacial changes: the premaxilla was diminished, the mandible was smaller, and overall craniofacial landmarks were harder to recognize. These findings were further supported by 3D CT reconstructions, which isolated and visualized defects in skeletal patterning and structural development. Histological analysis also showed abnormal tissue organization in the craniofacial region further confirming impaired craniofacial development in the mutants. **Conclusion**: Overall, Erk2 has a significant influence on the development of many craniofacial structures and has demonstrated links to the Pierre Robin Sequence (PRS), in which micrognathia (small jaw) results in a secondary cleft palate.

Poster #95

Title: Genomic Disruption from HPV Integration in Head and Neck Cancer

Authors: Ella P. Jackert, Shu-Yun Cheng, and Albert Han

Faculty Advisor: Albert Han

Background: Rising incidence of human papillomavirus-associated head and neck cancer (HPV+ HNC) highlights the need for risk stratification beyond binary HPV status. HPV integration-associated genomic disruption may underlie clinical heterogeneity and inform personalized risk assessment. **Methods**: Tumor tissue or site-directed mucosal swabs were obtained intraoperatively from patients with HPV+ HNC and DNA was subsequently extracted. HPV positivity was confirmed by PCR and histology prior to sequencing. DNA was used for library preparation followed by targeted hybridization capture for high-risk HPV and Illumina sequencing. Reads were aligned to a combined human (hg38) and HPV reference genome, and integration sites were identified using discordant pairs and soft-clipped split reads, with ≥5 supporting reads defining high-confidence events. **Results**: Three HPV+ cell lines and nine patient-derived samples met quality control criteria. HPV16 accounted for 10 samples (83.3%), with HPV33 and HPV45 each identified in one sample. A total of 34 high-confidence integration sites were identified across 11 chromosomes, most frequently chromosomes 2 (n=6), 3 (n=4), and 17 (n=4). Viral breakpoints were enriched within E1 (n=8), L1 (n=7) and L2 (n=7). Host genes proximal to integration sites included TP63, SLC47A2, and NR4A2, implicating epithelial differentiation and transcriptional regulation pathways. Long-read Oxford Nanopore sequencing is ongoing in a subset of samples to resolve full-length viral-host junctions and associated structural variants. **Conclusion**: Preferential integration within viral regulatory regions and near cancer- and immune-related host genes supports the existence of a biologically distinct, integration-dense subset of HPV+ head and neck cancer with clinically relevant genomic burden.

Poster #96

Title: Autophagy-driven survival in nutrient restricted tumor region of HNSCC

Authors: Shu-Yun Cheng, Ella Jackert, Liyang Tang, Daniel Kwon, Niels Kokot, Uttam Sinha, Yang Chai, and Albert Han

Faculty Advisor: Albert Han

Background: Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cancer worldwide. HNSCC often results in the development of a neck mass with nutrient-replete peripheral and nutrient-poor tumor core. Within the nutrient-poor core, autophagy is thought to support tumor cell survival by recycling intracellular macromolecules, including glutamine. However, our understanding of autophagy-driven glutamine metabolism and transport remains limited in HNSCC. **Methods**: Tonsil tissue is obtained from tonsillectomy and processed for organoid generation. Through mechanical and enzymatic dissociation, tonsil tissue is dissociated into single cell suspension and plated in extracellular matrices. HPV16 lentivirus is used to infect tonsil organoids and used as premalignant HPV16-positive HNSCC model. V-9302, an ASCT2 competitive antagonist, was treated to the organoids for IC_{50}. **Results**: In this study, glutamine transporter, ASCT2, were investigated in patient-derived normal tonsil and HPV16+ tonsil organoids. Both organoid models exhibit ASCT2 through qPCR analysis, with HPV16+ tonsil organoids exhibiting less ASCT2 (FC 0.64 $p<0.001$) than normal. To see if ASCT2 can be a therapeutic target, V-9302 was treated to normal tonsil organoids and HPV+ tonsil organoids. V-9302 IC_{50} of the organoids were obtained, with HPV16+ organoids being more sensitive (IC_{50}: 15.37 μM) than normal tonsil organoids (IC_{50}: 20.50 μM). **Conclusion**: Glutamine is an essential amino acid for cell growth and proliferation, especially in fast growing tumors. With HPV16+ organoids being more sensitive to V-9302, glutamine depletion shows the potential to be used as a therapeutic target for HNSCC treatment. Future studies will focus on mechanism of autophagy-driven glutamine metabolism.

BIOKINESIOLOGY & PHYSICAL THERAPY - PHD CANDIDATES & POSTDOCTORAL ASSOCIATES

Poster #97

Title: The Menstrual Cycle and Markers of Exercise-Induced Muscle Damage

Authors: Bailey McLagan, Stacey Dusing, Susan Sigward, Nicole Strock, and E. Todd Schroeder

Faculty Advisor: E. Todd Schroeder

Background: Estrogen is thought to protect skeletal muscle from exercise-induced damage (EIMD); however, the influence of fluctuations in this hormone, alongside progesterone, across the menstrual cycle (MC) remains unclear. **Purpose**: To investigate the influence of the MC on markers of muscle damage. **Methods**: Six premenopausal females (27 +/- 3 years old; 24.5 +/- 2.8 kg/m^2) used a three-step validation of MC, including calendar counting, daily urinalysis using an at-home fertility tracker, and serum confirmation to confirm menstrual cycle phases. A 10-set, 10-repetition maximal eccentric leg extension (60 deg/s; 30s rest) was performed across the three phases: early follicular (EFP), late follicular (LFP), and mid-luteal phases (MLP), in randomized order. Blood was drawn at baseline and at 1 and 24-hours after exercise to measure myoglobin (Mb). Data are reported as fold change from baseline (+/- SE). **Results**: The EFP had the highest change in Mb immediately (0.347 +/- 0.122), 1-hour (0.550 +/- 0.261), and 24-hours (0.281 +/- 0.135) after exercise. The fold change of Mb was the smallest in LFP immediately (0.097 +/- 0.064), 1-hour (0.284 +/- 0.154), and 24-hours after (-0.105 +/- 0.065). Lastly, the change in Mb in the MLP was highest immediately (0.232 +/- 0.111), 1-hour (0.521 +/- 0.238), and 24-hours after (0.258 +/- 0.126). **Conclusion**: The smaller increase in Mb in the LFP, when estrogen levels

are heightened, suggests that estrogen may protect muscle from damage caused by eccentric exercises.

Poster #98

Title: Tibial plateau morphology amplifies biomechanical risk for ACL reinjury

Authors: Daniel Edon, Rachel Straub, Bert Mandelbaum, and Christopher Powers

Faculty Advisor: Christopher Powers

Background: Risk factors for primary and secondary non-contact anterior cruciate ligament (ACL) injury are commonly classified as anatomical (bony morphology) or biomechanical (movement behavior). These factors are often evaluated independently, resulting in moderate predictive accuracy. ACL reinjury risk may be amplified when anatomical and biomechanical risk factors coexist. **Purpose**: To determine whether anatomical risk factors amplify the risk of ACL reinjury in the presence of biomechanical risk factors. **Methods**: Female athletes who underwent ACL reconstruction and completed a two-dimensional video assessment prior to return to sport were included. Reinjury status was determined by post-return-to-sport survey. Athletes sustaining a non-contact ACL reinjury (n = 11) were matched 1:1 with non-reinjured athletes (n = 11) based on age, graft type, sport level, annual athletic exposures, and activity rating. The biomechanical predictor was a previously reported two-dimensional composite score reflecting greater reliance on knee extensors relative to hip extensors across five dynamic tasks. The anatomical predictor was a tibial plateau composite score derived from MRI-based measures of medial and lateral tibial slope, medial tibial depth, and tibial spine height. Binary logistic regression compared biomechanical-only and combined models. **Results**: Reinjured athletes exhibited higher biomechanical and tibial plateau composite scores than controls ($p \leq 0.03$). The biomechanical composite predicted reinjury (OR=2.14, p=0.04). Adding the tibial plateau composite improved prediction (OR=2.79, $p = 0.02$), model fit ($\chi^2 = 15.14$, $p < 0.001$), discrimination (AUC: 0.97 vs. 0.76), and sensitivity (90.9% vs. 81.8%). **Conclusion**: Anatomical morphology amplifies the influence of high-risk biomechanics on ACL reinjury risk, supporting a synergistic, multifactorial injury model.

Poster #99

Title: Investigating Thalamocortical Mechanisms of Pain Processing Using Virtual Reality Surfing

Authors: Jayati Upadhyay and Jason Kutch

Faculty Advisor: Jason Kutch

Background: Peak alpha frequency (PAF), the dominant oscillatory frequency within the alpha band, measured using electroencephalography (EEG) reflects the dynamic coordination of cortical and thalamocortical networks. PAF has been studied across multiple clinical and cognitive conditions, including chronic pain, depression, post-traumatic stress disorder, autism spectrum disorder, and cognitive aging, positioning it as a promising biomarker of complex neural network function. Lower PAF has been consistently associated with increased pain sensitivity, suggesting relevance to pain processing. Despite this, how PAF can be modulated and leveraged to inform targeted, mechanism-based interventions remains poorly understood. **Purpose**: This work aims to advance a mechanistic framework for understanding how Virtual Reality (VR) surfing that incorporates attentional and physical demands influences PAF and thalamocortical mechanisms relevant to pain processing. **Methods**: This study will use a within-subject experimental design in healthy adults to examine dynamic neural changes induced by VR surfing. EEG will be recorded before and after exposure with multiple post-intervention timepoints at intervals of 15 minutes to capture the temporal trajectory of PAF. Experimental conditions manipulate attentional and physical demands, enabling investigation of how these factors modulate PAF. This design allows controlled assessment of how thalamocortical networks respond to cognitive and physical state manipulations. **Conclusion**: The proposed work aims to elucidate how intervention dynamically modulates PAF, providing a mechanistic framework to guide the development of tailored, brain-targeted therapies. In doing so, this work moves the field towards individualized treatment strategies.

Poster #100

Title: Identification of High-Risk Landing Strategies for ACL Injury in Females

Authors: Stanley Smith and Chistopher Powers

Faculty Advisor: Christopher Powers

Background: Previous research has identified kinematic and kinetic risk factors for non-contact ACL injury based on data obtained using 3D motion capture and forceplates. Recently, the use of 2D video has been reported to provide reasonable estimates of 3D risk factors collected in a laboratory setting. Providing evidence that 2D surrogates of 3D risk factors can characterize persons at risk for ACL injury is an important step in developing clinic-friendly approaches to ACL injury prevention. **Purpose**: To determine whether 2D surrogates of 3D biomechanical variables previously associated with ACL injury risk can be used to characterize landing strategies as high-risk in active females. **Methods**: 3D kinematic and kinetic data and 2D video were obtained simultaneously from 24 healthy female athletes during a drop-jump task. Variables of interest included those reported in prospective studies to be predictive of ACL injury, as well as the associated 2D surrogate measures. Separate k-means clustering analyses (k=2) were conducted to group participants based on the 3D data and 2D data. The percentage of athletes assigned to the high-risk group using both the 3D data and 2D surrogate measures was the primary outcome of interest. **Results**: The number of athletes assigned to the high-risk cluster using the 3D data and 2D surrogate measures was 10 and 11, respectively. 95.8% of these individuals were assigned to the high-risk cluster in both situations. **Conclusion**: These findings suggest that high-risk landing strategies can be identified in female athletes with reasonable accuracy using 2D surrogates of 3D biomechanical risk factors.

Poster #101

Title: Motivational Impairments in Post-Stroke Apathy across Motor Tasks

Authors: Morgan Kelly, Amelia Cain, and Kristan Leech

Faculty Advisor: Kristan Leech

Background: Post-stroke apathy affects forty percent of stroke survivors and is associated with increased disability. Theoretically, apathy is caused by an impairment in the decision-making process that weighs the costs and benefits of actions to energize behavior. In other neurologic populations, people with apathy exhibit reduced willingness to exert effort for reward during upper-extremity tasks. We do not know if apathetic people with chronic stroke exhibit impaired willingness to exert effort for reward, and if this influences choices about walking speed – a key functional outcome measure. **Purpose**: To quantify the influence of apathy on willingness to exert effort for reward in chronic stroke survivors across upper extremity and walking tasks. **Methods**: Apathy is measured on the Apathy Evaluation Scale-Clinician Version, from 18-72, with higher scores indicating more apathy. Willingness to exert effort for reward is measured as the proportion of offers accepted, from 0-100%. **Results**: Preliminary data are presented as mean (SD) for 4 pilot participants. Apathy scores were 27.8 (4.6), and all were below the clinical cut-off of 34. Participants accepted 66.3% (18.6%) of offers on the upper extremity task and 73.8% (19.2%) on the

walking task. Further analysis will be done when a larger sample is collected. **Conclusion**: Data collection is ongoing. Post-stroke apathy may influence the willingness to exert effort for reward during upper-extremity and walking tasks.

Poster #102

Title: Motor Learning across Stroke Recovery: A Longitudinal Feasibility Study

Authors: Rukshana Poudel, Hinshing Mai, Hannah Cone, Niko Fullmer, Emily Rosario, Carolee Winstein, and Nicolas Schweighofer

Faculty Advisor: Nicolas Schweighofer

Background: Motor learning is critical for post-stroke recovery, supporting relearning of motor skills and neural plasticity. Three key processes—motor adaptation, reinforcement learning, and motor skill learning—are central to rehabilitation. However, how these processes evolve across recovery stages, particularly during the early critical window, remains unclear. This gap limits stage-specific intervention and highlights the need for longitudinal investigation. **Purpose**: To evaluate the feasibility of longitudinally assessing motor adaptation, reinforcement learning, and skill learning across early subacute (7 days–3 months), late subacute (3–6 months), and chronic (>6 months) stages of stroke recovery. **Methods**: Patients with cerebellar stroke, hemineglect, or MoCA <20 were excluded. Participants completed three remote motor learning tasks with their less-affected hand every two weeks: (1) visuomotor rotation (adaptation), (2) reward-based target exploration (reinforcement learning), and (3) mirrored star tracing to assess speed-accuracy trade-off (skill learning). Arm Capacity and Movement test, and online visuospatial working memory were assessed biweekly. **Results**: Over six months, 30 stroke survivors were screened and 7 enrolled (≈2/month; 1 dropout). Six participants (mean age 50.85 ± 13.78 years; 4 males/2 females; time since stroke 0.98 ± 0.47 months) with mild-moderate impairment (FMA-UE 45.67 ± 7.36; ARAT 42.5 ± 13.04) completed 30 motor learning sessions. Adherence was high, with all sessions completed within 3-4 days of the planned date. Sessions lasted ~1 hour, with complete data capture and no adverse events. **Conclusion**: Remote biweekly longitudinal assessment of multiple motor learning processes during the first six months post-stroke is feasible, safe, and well-tolerated, supporting larger studies of motor learning evolution after stroke.

Poster #103

Title: Adaptation of Arm Choice under a Time Perturbation

Authors: Tanya Subash, Dongze Ye, Payam Piray, and Nicolas Schweighofer

Faculty Advisor: Nicolas Schweighofer

Background: Reaching movements post-stroke are variable, effortful, and slow. Prior work showed that paretic arm choice is influenced by variability and physical effort. **Purpose**: Here, we considered the potential impact of longer reaching time (*MT*) on arm choice. The duration of fast movements acts as an implicit delay during reward acquisition (Shadmehr et al., 2016). Therefore, we hypothesize that: 1. *MT* acts as a cost, reducing the likelihood of selecting the slower arm through temporal discounting. 2. The update of choice is gradual when the *MT* is increased for one arm as the expected *MT* values are updated internally. **Methods**: We conducted an online Virtual Reality experiment to assess the effect of *MT* on arm choice. On each trial, participants were presented with two targets varying in distance, size (Fitts' Law), and angle to elicit a range of *MT*s. We modeled arm choice as a competition between action values for each arm, which combine a reward discounted by *MT* and effort estimated using inverse dynamics. Using hierarchical Bayesian methods, we estimated the discounting rate (k), reward-effort trade-off, choice randomness, and handedness bias. **Results**: Data from right-handed, neurotypical participants show nearly equal selection of both arms before the perturbation. In separate groups, we perturbed either the dominant or non-dominant arm. Parameter estimation shows that *MT* affects decisions via a positive discounting parameter k, supporting our hypothesis. **Conclusion**: These results highlight how movement time and hand dominance affect arm choice and are relevant to understanding arm use post-stroke.

Poster #104

Title: The bilateral brain networks for dexterous manipulation are severely compromised by TBI

Authors: Majid Abbasi Sisara, Hesam Azadjou, and Francisco J. Valero-Cuevas

Faculty Advisor: Francisco J. Valero-Cuevas

Background: This study provides novel insights for evaluating and characterization of the severity of TBI, based on alterations in whole-brain networks and their laterality. **Purpose**: To investigate whether axonal shearing during traumatic brain injury affects the bilateral dexterity-dependent networks for dexterous manipulation. **Methods**: Whole brain functional Magnetic Resonance Imaging (fMRI) on a right-handed traumatic brain injury (TBI) subject and his identical healthy twin compared BOLD signal as they used one hand to compress a slender spring to instability (at 2N of force) vs. a stable wooden dowel (at 1N and 2N) between the thumb and index finger. The spring was compliant but stable when compressed at 1N of force. The tasks were done separately with each hand. **Results**: As expected, compressing the stable dowel at 1 and 2N produced activity in the contralateral somatosensory cortex; which we also saw with the spring at 1N of compression, albeit with some ipsilateral activity. In contracts, as the compressing of the spring to 2N induced instability, we saw ipsilateral-dominant bilateral brain activity. In the TBI patient, however, all compressions resulted only in contralateral brain activity. **Conclusions**: The dexterity-dependent networks for dexterous manipulation were largely extinguished in this patient with TBI.

Poster #105

Title: Locomotor Exploratory Behaviors of Infants Born Preterm, Compared to Full-term

Authors: Nora Almoadi, Stacey Dusing, James Finley, Laura Prosser, Farzana Choudhury, and Barbara Sargent

Faculty Advisor: Barbara Sargent

Background: Infants born preterm (PT) walk later than infants born full-term (FT). Pre-walking infants born FT placed in Dynamic Weight Support (DWS) exhibit more advanced walking skills. It is unknown if DWS will promote more advanced locomotor exploratory behaviors in infants born PT and FT. **Purpose**: For pre-walking infants born PT and FT, compare differences in walking skills, path length, and step length with repeated exposure to DWS. **Methods**: Ten infants born PT and 30 infants born FT participated in 2 days of DWS. On both days, walking skills, path length, and step length were measured during 10-min conditions. Day 1 included: play without DWS, play in DWS-1, play in DWS with adult motivation-1. Day 2 included: play in DWS-2, play in DWS with adult motivation-2, play in DWS-3, play without DWS. **Results**: On Day 1, infants born FT spent more time in walking skills with DWS than without it, with no differences in path or step length. On Day 2, infants born FT spent more time walking in DWS-2 and DWS-3 than in DWS-1, and walked longer paths and showed longer step lengths in DWS-3 compared to DWS-1. Infants born PT showed no changes in all variables across all comparisons. **Conclusions**: Infants born FT showed increased time spent in walking skills and longer path lengths and step lengths with DWS, whereas infants born PT showed no changes. The next step is to increase the sample size of infants born PT and evaluate differences between the PT and FT groups.

Poster #106

Title: Biomechanical Metrics to Estimate the Effort Cost of Perturbed Walking

Authors: Jackeline Tafur-Oviedo and James Finley

Faculty Advisor: James Finley

Background: Determining the physical cost of balance recovery is essential for understanding human walking stability, yet the specific mechanical demands of sagittal-plane perturbations remain poorly defined. This study investigated biomechanical metrics derived from ground reaction forces to characterize the effort required to recover from sudden treadmill-induced perturbations. We expected biomechanical effort to increase with perturbation magnitude. **Methods**: Participants walked at their self-selected walking speed on an instrumented split-belt treadmill while trip-like perturbations were induced by rapidly accelerating one belt. Five perturbation magnitudes (20-60% of self-selected walking speed) were tested. Each trial consisted of 30 perturbations randomly applied to the left or right limb every 10 seconds. Ground reaction forces were recorded to quantify vertical loading and anteroposterior braking and propulsive impulses during the perturbed step and subsequent recovery steps. Subjective perceived effort was assessed at fixed intervals using the Borg scale. **Results**: Step-by-step changes revealed a measurable biomechanical effort associated with recovery that was not confined to the perturbed step. During the perturbation, participants regulated forward momentum primarily by suppressing braking impulses and increasing propulsion. This immediate response was followed by a pronounced mechanical compensation during the first recovery step, where vertical loading forces increased substantially, indicating elevated effort for body support. **Conclusion**: Recovery from sagittal-plane perturbations incurs a measurable biomechanical effort cost that is distributed across recovery steps rather than resolved within a single step. These findings highlight the importance of biomechanical metrics for quantifying the effort demands of perturbed walking.

Poster #107

Title: Evaluating the convergent validity of a motor-based problem-solving assessment tool.

Authors: Arya Salgaonkar, Rebecca Molinini, Ketaki Inamdar, Shaaron Brown, Stacey C. Dusing, and SPEEDI Team

Faculty Advisor: Stacey C. Dusing

Background: Young preterm infants present unique cognitive developmental trajectories. This may influence their scores on motor-based problem-solving tools aimed at measuring cognition. Assessment of Problem Solving in Play (APSP) has demonstrated construct validity and responsiveness when compared to the gold standard Bayley Scales of Infant and Toddler Development (BSID III) to assess cognition in a broader population of high-risk infants aged 7-27 months. Convergent validity (a type of construct validity) is defined as the agreement between two attempts to measure the same trait through maximally different methods. APSP has not been validated against the BSID IV in preterm infants and at younger ages, as early as 3 months. Demonstrating APSP's convergent validity in preterm infants supports its utility as a short, practical, play-based assessment tool to complement traditional cognitive assessments in research and clinical settings. **Methods**: 31 preterm infants <32 weeks of gestation who are part of the Supporting Play Exploration and Early Development Intervention (SPEEDI) clinical trial (No: NCT02153736) were included in this analysis. **Results**: The overall correlation between APSP-RPM scores and Bayley cognitive scores across the full sample was moderate (r = 0.47) but was statistically significant, which supports preliminary convergent validity. **Conclusion**: Future studies with larger samples should incorporate intraclass correlation coefficients (ICC) to further examine agreement between measures and provide a more comprehensive evaluation of convergent validity. It highlights the potential of a short, sensitive, and play-based tool for monitoring cognition early on in very young preterm infants.

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

Poster #108

Title: Independent component analysis identifies functional thalamic subregions and cortical networks

Authors: Jason Cherin, Matthew Heindel, and Jason Kutch

Faculty Advisor: Jason Kutch

Background: The thalamus serves as both a sensory relay and a regulator of affective processing, making it a critical hub in pain-related brain circuits. Emerging evidence suggests that differences in thalamocortical dynamics may underlie distinct patterns of pain distribution in chronic pain populations. However, most prior work has defined thalamic subregions using anatomical atlases, which may obscure functionally distinct subcircuits. **Purpose**: The aim of this study was to functionally parcellate the thalamus using group independent component analysis (ICA) and examine the cortical connectivity of the resulting components, providing a functionally grounded framework for investigating thalamocortical dysfunction in chronic pain. **Methods**: Resting-state fMRI data from 52 healthy participants (31 males, 21 females; mean age: 28.37±7.48) were analyzed using a thalamus-restricted group ICA. The resulting independent components were then used as seeds in a seed-to-voxel functional connectivity analysis to characterize their cortical networks. Multiple ICAs were conducted with varying numbers of components. **Results**: A four-component solution provided the cleanest separation of the thalamus at the lowest model order, revealing reproducible posterolateral and anteromedial divisions. Functional connectivity analyses showed strong coupling between the posterolateral component and occipital, sensorimotor, and posterior insular cortices, whereas the anteromedial component exhibited strong connectivity with frontal, prefrontal, and cingulate regions. **Conclusion**: These findings demonstrate that group ICA can isolate temporally distinct thalamic subregions whose connectivity profiles align with established sensory and affective thalamocortical circuits, providing a robust foundation for future studies examining how disruptions in specific pathways may contribute to chronic pain subtypes.

Poster #109

Title: Quadriceps Strength and Confidence Predict Hop Symmetry after ACL Reconstruction

Authors: Yanyi Qu and Christopher Powers

Faculty Advisor: Christopher Powers

Background: Triple-hop limb symmetry is commonly used to guide return-to-sport decision-making following anterior cruciate ligament reconstruction (ACLr). Quadriceps strength asymmetry and reduced confidence have each been associated with impaired hop performance after ACLr, yet these factors are often examined in isolation. Whether hop asymmetry primarily reflects residual strength deficits, diminished confidence, or their combined influence remains unclear. **Purpose**: To examine the independent and combined contributions of quadriceps strength symmetry and confidence in predicting triple-hop symmetry after ACLr. **Methods**: Athletes who underwent ACLr and completed postoperative isometric quadriceps strength testing, confidence assessment, and triple-hop testing were identified from a clinical database. Participants with asymmetric hop performance (limb symmetry index [LSI] <90%; n=30) were

matched 1:1 with those demonstrating symmetric performance (n=30) based on age, sex, graft type, time from surgery, and body mass index. Triple-hop symmetry status (symmetric vs asymmetric) was the dependent variable. Independent predictors included quadriceps strength LSI and confidence measured using the Injury-Psychological Readiness to Return to Sport scale. Conditional logistic regression with standardized predictors compared strength-only, confidence-only, additive, and interaction models using Akaike Information Criterion. **Results**: Greater quadriceps strength symmetry (OR=2.11, 95% CI: 1.04-4.30) and higher confidence (OR=4.68, 95% CI: 1.30-16.86) were associated with higher odds of hop symmetry. The additive model demonstrated the best fit (AIC=27.19), whereas the interaction term was not significant. **Conclusions**: Quadriceps strength symmetry and confidence additively predict triple-hop symmetry following ACLr and should inform hop test interpretation for return-to-sport decisions.

Poster #110

Title: Characterizing Spontaneous Locomotion in Infants With and Without Down Syndrome

Authors: Juliette Pope, Florencia Enriques, Jeannie Liu, Emory Schlanger, Anaaya Mehra, Christina Hospodar, and Kari Kretch

Faculty Advisor: Kari Kretch

Background: Infants with Down syndrome (DS) exhibit delays in independent walking and immature gait patterns compared to infants with typical development (TD). However, little is known about how infants with DS walk in naturalistic environments. **Purpose**: The aim of this study is to characterize and examine the effects of walking skill on spontaneous stepping in infants with and without DS. **Methods**: We tested *N*=47 infants (30 TD, 17 DS); all were able to cruise or walk independently, with up to 6 months of walking experience. Infants were video-recorded playing for 20 minutes in a lab playroom, and videos were scored for total steps, number of steps per walking bout, and number of falls. We administered the walking dimension of the Gross Motor Function Measure to assess walking skill. **Results**: Infants with greater walking skill took more steps per minute (B=1.395, p<0.001). Overall step rate did not differ between groups, but there was a differing effect of walking skill on stepping characteristics: For TD infants only, increased walking skill was associated with fewer short bouts (B=-0.016, p<0.001) and more long bouts (B=0.011, p<0.001). For infants with Down syndrome, increased walking skill did not affect number of short (B=-0.006, p=0.06) or long (B=0.005, p=0.07) bouts. There was an effect of walking skill on falls per minute spent in motion for all infants (B=-0.076, p=0.003). **Conclusion**: Overall, findings suggest standardized measures are associated with spontaneous walking performance, but the relation may differ for infants with and without DS.

Poster #111

Title: Motor Control Differences in Pre-Crawling Infants Born Preterm and Full-Term

Authors: Ai-Tzu Chan, Stacey Dusing, Kathryn Havens, Bobbi Pineda, Farzana Choudhury, and Barbara Sargent

Faculty Advisor: Barbara Sargent

Background: Infants born preterm (PT) attain hands-and-knees crawling 2-3 months later than infants born full-term (FT), yet no studies have investigated differences in crawling behaviors between these infant groups. Dynamic weight support (DWS) promotes walking skills of pre-walking infants born FT. We hypothesize that pre-crawling infants born PT and FT will exhibit differences in crawling behaviors in DWS. **Purpose**: To examine differences in advanced prone skills (belly crawling, quadruped, hands-and-knees crawling), path length, and interlimb coordination between pre-crawling infants born PT and FT with and without DWS. **Methods**: Six pre-crawling infants born FT and one infant born PT participated when they belly crawled, but not yet hands-and-knees crawled. All infants completed two consecutive days of prone play consisting of: 5-minutes without DWS, 10-minutes with DWS, and 5-minutes without DWS. Position and video data were collected using a Qualisys motion capture system with synchronized video. Advanced prone skills were coded from video using Datavyu. Path length and interlimb coordination were calculated using custom MATLAB programs. **Results**: Four of six infants born FT showed longer durations of advanced prone skills, and two showed longer path lengths, during DWS and the final no-DWS condition compared to the initial no-DWS condition. One infant born FT and the infant born PT showed no changes across conditions. Interlimb coordination analyses are ongoing. **Conclusion**: Preliminary findings suggest differences in crawling behaviors between infants born PT and FT. The next step is to complete the sample of 25 infants born PT and 25 infants born FT.

Poster #112

Title: Influence of environment modification on antigravity kicking in 2-4 months old infants

Authors: Radhika Attal, Barbara Sargent, Nicholas Schweighofer, Kate Havens, Narayan Iyer, and Stacey Dusing

Faculty Advisor: Stacey Dusing

Background: Infants with Bronchopulmonary Dysplasia (BPD) demonstrate elevated resting energy expenditure at term age compared to infants without BPD. This increased metabolic cost may render anti-gravity limb movements more energetically demanding, potentially constraining opportunities for sustained postural activity, movement, and exploration. Previous kicking research in 3.5-month-old preterm infants has revealed reduced hip torque compared to term infants, indicating diminished force-generating capacity in hip muscles that may influence anti-gravity kicking. Environment modification may assist infants in anti-gravity kicking. **Purpose**: This study aims to assess the immediate influence of pelvic wedge support on anti-gravity kicking performance in 2 to 4 months-old term, and preterm infants with and without BPD. **Methods**: Infants were placed supine while 4 minutes of spontaneous kicking and 4 minutes with a 1.75-inch wedge positioned beneath their pelvis. Video recording from the right and left leg were coded in datavyu software for surface-based kicks, anti-gravity kicks, resting floor position, anti-gravity hold, and nothing (not enough movement). Pilot data has been collected on 3 term infants of which data from 1 infant (4 months old) has been coded. **Results**: We found that from no-wedge to wedge condition: number of floor kicks (23.7% to 21.9%) and antigravity kicks (76.3% to 78.082%) remained similar. However, floor time (floor kicks + resting floor time) reduced from 81.3% to 52.5%, whereas antigravity time (antigravity kicks + hold) increased from 11.0% to 42.8%. **Conclusion**: Environmental modification enabled increase in time spent in anti-gravity position. Further recruitment may help solidify our conclusion, informing early intervention strategies.

Poster #113

Title: Post-Stroke Arm Musculotendinous Property Estimation via Bayesian Hill model

Authors: Yi Yu, Yannick Darmon, Russell Johnson, Carolee Winstein, Victor Barradas, Emily Rosario, Gerald Loeb, James Finley, and Nicolas Schweighofer

Faculty Advisor: Nicoloas Schweighofer

Background: The contribution of neural vs musculotendinous factors in motor deficits in the chronic phase post-stroke cannot be easily distinguished using typical clinical measures. **Purpose**: Using data from 42 participants in the FAST clinical trial (Darmon et al., 2025), we examined how chronic stroke alters elbow musculotendinous properties using a Hill-type

muscle model fitted to EMG and torque data via Bayesian estimation. **Methods**: Surface EMG and net elbow torque were recorded during isometric flexion/extension for both arms at baseline, 3 days, and 1-month post-treatment. A Hill-type muscle model, fitted with a hierarchical Bayesian framework, was used to estimate five subject-specific parameters (flexor and extensor force scales, tendon slack length scale, moment arm scale, and a nonlinear EMG-force factor). Covariates were included to test associations between muscle properties and time since stroke, age, concordance (paretic-arm dominance), and UEFM score. **Results**: Force scales were lower on the more- affected than the less-affected side. On the more-affected side, force scales were negatively associated with time since stroke and positively associated with concordance and UEFM. There was no systematic change of force scales across sessions on the paretic side, and the tendon properties did not differ across conditions. **Conclusions**: Chronic stroke is associated with reduced muscle force on the paretic side, while tendon properties remain preserved. Force deficits worsen with time since stroke and are less pronounced when dominant arm is affected. The lack of training-related changes suggests that the observed functional gains are driven primarily by neural rather than intrinsic musculotendinous changes.

Poster #114

Title: Examining feedforward motor control capacity and walking speed post-stroke

Authors: Christina K. Holl and Kristan A. Leech

Faculty Advisor: Kristan Leech

Background: While most stroke survivors regain some degree of walking function, many continue to walk slowly compared to age-matched neurotypical individuals. Improving walking speed after a stroke is a priority for stroke survivors and physical therapists alike, as research indicates that reduced walking speed is strongly associated with decreased quality of life and increased mortality. One possible explanation for reduced walking speed post-stroke is feedforward motor control deficits. Feedforward control prepares motor commands in advance of movement, allowing for fast and coordinated movements. Upper extremity studies have demonstrated impaired feedforward motor control in people post-stroke. However, less is known about how feedforward control impacts walking speed post-stroke. **Purpose**: Investigate the association between feedforward motor control and fastest walking speed in individuals living with chronic stroke. **Methods**: People with chronic stroke (>6 months from onset) will perform 3 tasks: (1) pendulum catch, (2) rapid shoulder flexion, and (3) gait initiation. We will then employ a Principal Components Analysis to derive a single comprehensive measure of feedforward motor control capacity from the 3 tasks. Fastest walking speed will be determined using the 10 Meter Walk Test. **Results**: We expect that individuals post-stroke with reduced feedforward motor control capacity will walk at slower speeds. **Conclusion**: Addressing persistent slow walking speed in people post-stroke is vital to improving quality of life and decreasing mortality. This work may inform physical therapy practice to focus on tuning feedforward control mechanisms during walking rehabilitation.

Poster #115

Title: Using GPS to Measure Community Mobility in Adults with Stroke

Authors: Amelia Cain and Kristan Leech

Faculty Advisor: Kristan Leech

Background: Community mobility, or movement outside the home to participate in meaningful life situations, is critical for participation after stroke. However, there is no gold standard and limited objective measure of community mobility post-stroke. **Purpose**: We assessed the validity of GPS-derived activity space as a measure of community mobility in adults with chronic stroke. **Methods**: Participants were monitored over 7 days using GPS and accelerometer data. The following were derived from their GPS data: number and classification of destinations, daily path area, minimum convex hull, standard deviational ellipse, percent of time outside the home, and time travelling in a vehicle. Steps-per-day were determined from accelerometer data. We assessed convergent validity of Daily Path Area with a subjective assessment of community mobility, the Life-Space Assessment, and with physical activity, measured with steps-per-day. We assessed face validity through participant rankings of each measure on its representativeness of their community mobility and elaborations on these rankings in semi-structured interviews. **Results**: Preliminary results of five adults with stroke (2F/3M, ages 57 ± 12) do not show a significant relationship between Daily Path Area and Life-Space Assessment ($p = 0.45$) or steps-per-day ($p = 0.68$). Participants identified Daily Path Area as "most representative" of their community mobility, which was supported by their qualitative interviews. **Conclusion**: Preliminary quantitative and qualitative results diverge regarding the validity of Daily Path Area as a measure of community mobility in stroke; however, we anticipate a larger sample size will provide more sufficient range in measures to adequately evaluate these relationships.

Poster #116

Title: Investigating the role of memory in implicit locomotor learning post-stroke

Authors: Sylwia Lipior and Kristan A. Leech

Faculty Advisor: Kristan A. Leech

Background: Following a stroke, patients experience varying levels of cognitive and motor impairment. Motor rehabilitation leverages sensorimotor adaptation to restore function. This adaptation occurs when an external perturbation induces a sensory prediction error, which is defined as a mismatch between predicted and actual sensory feedback. The nervous system utilizes these errors to update motor commands via two collaborative systems comprising the dual-state model: a fast process that adapts rapidly but decays quickly, and a slow process that adapts gradually with higher retention. Previous evidence suggests that the fast process may share neural resources with declarative memory. Therefore, individuals with impaired memory following a stroke may show specific impairment in the fast process. **Purpose**: To investigate whether declarative memory is associated with retention of the fast process within a dual-state computational model of locomotor adaptation. **Methods**: 21 individuals with chronic stroke and 17 healthy controls completed a split-belt walking task that consisted of four four-minute split-belt walking trials (with a 2:1 belt speed ratio) and a four-minute deadaptation trial at baseline gait speed. Kinematic data was collected throughout each trial and used to calculate step length asymmetry. Cognition was assessed using the Repeatable Battery for Assessment of Neuropsychological Status (RBANS). **Results**: We expect that the declarative memory subscore of the RBANS will be positively associated with the fast process retention parameter. Results are pending. **Conclusion**: This work may inform physical therapy practice by clarifying the relationship between cognitive function and motor learning.

Poster #117

Title: Exploratory Analysis of Humeral Elevation Control in Rotator Cuff Tendinopathy

Authors: Chethan Reddy, Daniel McPherson, and Lori Michener

Faculty Advisor: Lori Michener

Background: Rotator cuff (RC) tendinopathy affects

nearly 25% of the general population. Individuals with RC tendinopathy often demonstrate altered kinematics that may modify tissue-loading mechanics and contribute to maladaptive stress pathways. How these altered movement patterns reflect underlying motor control strategies remains unclear. Most prior work relies on discrete and interval difference methods, which may obscure meaningful temporal features. Continuous-time analysis offers a more complete representation of motor control strategies. **Purpose**: In this study, we identify kinematic patterns that may indicate motor control differences in individuals with RC tendinopathy. **Methods**: 52 participants diagnosed with RC tendinopathy and 52 matched controls performed a standardized bilateral humeral elevation task while following a verbal cadence. Humeral kinematics for the affected side were collected using electromagnetic tracking. Data processing and analysis was conducted in Matlab. Velocity and acceleration profiles were obtained by numerical differentiation. Statistical Parametric Mapping (SPM) two-sample t-tests were applied to position, velocity, and acceleration waveforms. **Results**: Two significant regions of interest emerged for velocity during the eccentric phase: a mid-range (100-75°) interval ($p < 0.001$) and a late-range (30-20°) interval ($p = 0.002$). Patients exhibited higher magnitude velocities during the mid-range interval, but lower magnitude velocities during the late-range interval. No significant group differences were identified for humeral elevation position or acceleration. **Conclusion**: Individuals with RC tendinopathy exhibited altered eccentric control characterized by modified angular velocity profiles, which may reflect reduced active resistance to gravity at higher humeral elevations. These findings suggest deficits in dynamic eccentric control may characterize RC tendinopathy.

Poster #118

Title: The effect of HIT on dynamic balance in individuals post-stroke

Authors: Seong Won Hwang, Christina Holl, Kristan Leech, and James Finley

Faculty Advisor: James Finley

Background: Gait dysfunction is a common consequence of stroke and is associated with slower walking speed and an increased risk of falls. Gait speed is an important clinical outcome in post-stroke rehabilitation related to community mobility and quality of life after stroke. High-intensity gait training (HIT) has been shown to be effective in increasing gait speed, but whether HIT improves balance and potentially mitigates the increased risk of falls is unknown. **Purpose**: To investigate if HIT is effective in improving proactive and reactive dynamic balance capabilities amongst post-stroke individuals. **Methods**: A sample of people with chronic stroke underwent 12 HIT walking sessions. Dynamic balance was assessed pre- and post-training via expected and unexpected split-belt treadmill accelerations, measuring center of mass velocity (VCOM) and margin of stability (MOS). We hypothesized that participants would reduce peak VCOM and increase MOS during both the perturbation (proactive) and recovery (reactive) steps post-HIT. **Results**: Participants displayed an average increase of self-selected walking speed of 0.28m/s (44%). Participants improved proactive balance control after HIT with an average increase in MOS of 5.76cm (±9.01cm, 80%). Reactive balance control responses were mixed, with an average increase of MOS by 3.85cm (±6.14cm, 30.89%). Peak VCOM change was minimal for both proactive (0.02m/s, 3.2%), and reactive (0.07m/s, 6.64%) components. **Conclusion**: HIT was effective in improving gait speed and showed promise in increasing dynamic balance control. Further investigation with a larger sample size is warranted to confirm these findings.

Poster #119

Title: Spontaneous Dance Behavior in Infants With and Without Down Syndrome

Authors: Florencia Enriques, Juliette Pope, Amber Wang, Jeannie Liu, Kat Coto, and Kari Kretch

Faculty Advisor: Kari Kretch

Background: Dance is a form of physical activity that emerges early in development. Dance is inherently social, and parents report frequently dancing with their infants. Moreover, dance is used as a therapeutic intervention in individuals with physical disabilities, including children and adults with Down syndrome (DS). **Purpose**: This study aimed to measure *how* and *how* often infants—with and without DS—and their parents dance, and how infant and parent dance are related. **Methods**: Seven infants with typical development (10-17 months old) and 7 with DS (19-28 months old) participated. Groups were matched for motor development, and all were new or emerging walkers. Infants and parents were video-recorded for 10 minutes of free play with music playing and 10 minutes of play without music. Infant motor skill was measured with the Gross Motor Function Measure-88; periods of dancing were coded from video. **Results**: All infants and all parents danced. Dancing was more frequent with music than without (B=0.051, p<0.001), but there was no difference between groups (B=-0.004, p=0.814) or between infants and parents (B=-0.012, p=0.316). With music, infants danced M=8% of the time (range 0.8%-21%), and parents danced M=7% of the time (0.3%-19%). Infant dancing was not associated with motor skill (B=-0.002, p=0.454), but was socially influenced: Parents who danced more had infants who danced more (r(12)=0.55, p=0.043). Infants usually used their upper body for dancing, while parents used their whole body. **Conclusion**: Overall, findings suggest that dance is frequent and related to parent dance for infants with and without DS.

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

Poster #120

Title: International Occupational Therapy Alumni: Exploring Sense of Belonging through Photovoice

Authors: Svitlana Stremousova, Yousef Babish, Daniel Park, Marshae Franklin, and Amber Angell

Faculty Advisor: Amber Angell

Background: International occupational therapy students in the U.S. often face visa and work authorization limitations, creating uncertainty and in-betweenness that impact their sense of belonging and identity development as clinicians. Many experience isolation, making social networks critical for supporting their participation and community building. **Purpose**: This study aimed to understand how international occupational therapy alumni experience and build a sense of belonging after graduation. **Methods**: This qualitative participatory study used Photovoice in collaboration with the Global Initiatives Office at USC Chan Division. Inclusion criteria: a) age 18 or above; b) English fluency; and c) able to take photos using a digital device. Six alumni (n = 6) participated through needs assessment interview, collaborative planning, photo collection and analysis, and member-checking. Inductive thematic analysis using the SHOWeD framework guided interpretation. **Results**: Five interconnected themes emerged showing how international occupational therapy alumni build belonging: 1) food opportunities and shared meals that create cultural connections; 2) third places outside home and work that foster safety and reflection; 3) relationships and support systems; 4) co-occupations and cultural celebrations; and 5) shared struggles and resilience building solidarity through collective challenges. Member-checking confirmed strong resonance with participant experiences, with relationships and connections receiving unanimous validation. **Conclusion**: Newly graduated international occupational therapy alumni cultivate a sense of belonging

through multifaceted strategies centered on food, community spaces, relationships, cultural practices, and shared resilience. Occupational therapy programs should recognize and facilitate these essential belonging-building practices throughout students' educational journey and into their professional transitions.

Poster #121

Title: Reconceptualizing Wandering of Autistic People Through the Lens of Occupation

Authors: Svitlana Stremousova, Elinor E. Taylor, and Mary C. Lawlor

Faculty Advisor: Mary C. Lawlor

Background: Within autism literature, scientists, clinicians, and family members often discuss wandering as an imminent health and safety concern. Research tends to portray it as a problematic behavior that often lacks purpose. Prevention of wandering is frequently seen as an equivalent to achieving safety. However, some autistic individuals describe wandering as an embodied, intentional, and purposeful experience. A better understanding of wandering would provide resources for supporting safety and well-being. **Purpose**: This presentation appraises wandering among autistic people and suggests its reconceptualization. We aim to contribute to the body of knowledge supporting first-person perspectives, community engagement, and the well-being of individuals and families. **Theoretical Argument**: Wandering is often presumed to be a personal or familial matter rather than a collective or societal concern. It is framed as a "problem" that needs to be extinguished. Without denying that wandering carries bodily risks and the stress of families trying to keep their loved ones safe, we suggest looking at it through the lens of occupational science. In this paper, we appraise wandering through the interconnected dimensions we arrived at by reviewing the relevant research literature, published works by autistic people, and the authors' lived experiences. **Conclusion**: Wandering is a multifaceted phenomenon associated with meaning-making, engagement, and connection to the world, all central domains of occupational science. The selected dimensions highlight the complex balance of individual preferences, meaningful engagement, and safety considerations. Occupational science is well-suited to improve the knowledge of wandering and its aspects and to advance autism research, services, and advocacy.

Poster #122

Title: Exploring the Impact of Infant Feeding on Parental Mental Health

Authors: Kiana Naimi, Polly Kellner, and Bobbi Pineda

Faculty Advisor: Julie Cederbaum and Roberta Pineda

Background: Feeding difficulties are common among preterm infants in the neonatal intensive care unit (NICU) and may represent a salient stressor for parents. **Purpose**: Guided by the Stress Process Model, which conceptualizes health outcomes as shaped by exposure to stressors and resources, this study examined infant feeding performance as a potential stressor associated with parental mental health. **Methods**: This prospective observational study enrolled 101 very preterm (<32 weeks gestational age) parent-infant dyads. At term age, prior to NICU discharge, infant feeding performance was assessed using the Neonatal Eating Outcome Assessment (NEO), a clinician-observed measure of oral feeding skills, and the Neonatal Eating Assessment Tool (Neo-EAT), a parent-reported measure of perceived feeding difficulty. Parental mental health outcomes were assessed prior to discharge and included measures of NICU-related stress, parenting stress, posttraumatic stress symptoms, depressive symptoms, anxiety, perceived birth experience, maternal confidence, and perceptions of infant emotionality. **Results**: In unadjusted models, greater caregiver-perceived feeding difficulty (higher Neo-EAT bottle-feeding scores) was associated with higher parenting stress ($\beta = 0.96$, $p = .001$, 95% CI [0.44, 1.48]), greater anxiety ($\beta = 0.42$, $p = .013$, 95% CI [0.09, 0.74]), and lower maternal confidence ($\beta = -0.03$, $p = .001$, 95% CI [–0.05, –0.02]), with trend-level associations for birth experience and infant emotionality. Associations between clinician-observed feeding performance (NEO) and parental mental health were attenuated and no longer significant after adjustment. **Conclusion**: Parent-perceived feeding difficulty emerged as a stronger correlate of parental psychological well-being than clinician-observed feeding performance, highlighting feeding as an emotionally meaningful stressor in the NICU.

Poster #123

Title: Using Student Strengths to Promote Inclusion in the Elementary Classroom

Authors: Shannon Roux and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: Meaningfully including students with disabilities into the general education classroom yields social and academic benefits for both students with and without disabilities. However, the complex and ongoing process of including students with disabilities (SWDs) in the general education classroom continues to pose a prominent challenge in the field of special education. Researchers and practitioners have proposed a strengths-based approach as a path to understanding and implementing inclusion in the classroom. However, little is known about how strengths operate in daily school life, making it difficult to implement a strengths-based approach to inclusion in practice. **Purpose**: The purpose of this qualitative descriptive study was to explore the relationship between SWDs' strengths and inclusion through engagement in daily school activities. **Methods**: Student:teacher dyads were individually interviewed (student mean duration = 51 ±13 minutes; teacher mean duration = 40 ±5 minutes), with semi-structured interview questions focusing on student strengths, day-to-day school activities, and belonging in the inclusion classroom. Interviews were transcribed verbatim and thematically analyzed. **Results**: Three overarching themes emerged, illustrating the importance of highlighting, leveraging, and integrating SWDs' strengths. First, *highlighting* SWDs' strengths through engagement in well-aligned occupations, supported student confidence and positive peer perceptions. Second, *leveraging* individual strengths and interests had the potential to improve participation in non-preferred school occupations. Lastly, *integrating* collective strengths throughout the class promoted inclusion through shared engagement in occupations. **Conclusion**: This study yields practical and theoretical implications for the use of strengths-based approaches to support inclusion of SWDs in the classroom.

Poster #124

Title: Efficacy of Psychoeducational Family Interventions in Italy: A Systematic Review

Authors: Yousef R. Babish, Heldevam Pereira, Yu Tang, and Joy L. Agner

Faculty Advisor: Joy L. Agner

Background: Italy's 1978 psychiatric reform shifted mental health care from institutional to community settings, increasing the number of individuals with serious mental illness living in the community. This transformation reshaped the everyday occupations of individuals and their families, prompting a need for greater support and leading to substantial research on psychoeducational family interventions (PFIs). Thus far, this Italian body of research has not been synthesized collectively. **Purpose**: To synthesize and integrate evidence on the efficacy of PFIs delivered within Italian mental health services, focusing on both patient and family outcomes. **Methods**: A systematic literature search was conducted across seven databases for peer-reviewed studies pub-

lished in English after 1978 that implemented PFIs in outpatient settings. The PRISMA guidelines and Synthesis Without Meta-Analysis were followed. **Results**: Nine studies were identified, encompassing 936 individuals with schizophrenia and bipolar I disorders and their families. All were controlled trials and followed a manualized protocol delivered by mental health professionals. The dose and frequency varied from 8 to 48 sessions, delivered over 4 to 24 months, with sessions lasting 60 to 105 minutes. Robust evidence was found for reducing hospitalization rates and for improving caregiver coping strategies. Benefits for medication adherence, patients' social functioning, and symptom reduction were also evident, though these were more variable across studies. Impacts on caregiver burden and family expressed emotion were mixed or limited. **Conclusion**: PFIs demonstrated significant benefits overall for both patients and their families within the community mental health system, although efficacy varied across different outcomes.

Poster #125

Title: Understanding American Armenian Healthcare Experiences: A Narrative Review

Authors: Lily Shkhyan and Leah I. Stein Duker

Faculty Advisor: Leah I. Stein Duker

Background: It is well-documented that culture strongly shapes healthcare experiences, particularly in beliefs about illness, treatment, and the relationship between patients and providers. While the influence of culture on healthcare experiences has been studied in various minority groups within the United States, American Armenians remain understudied. **Purpose**: Synthesize existing literature describing American Armenian healthcare experiences. **Methods**: Five databases (PubMed, Web of Science, CINAHL, ProQuest, PsycINFO), Google Scholar, and reference lists were searched through May 2025. Included articles were research studies published in peer-reviewed journals or in dissertation/thesis databases that explored the healthcare experiences of American Armenians. Data from articles were thematically analyzed. **Results**: Among the included articles (n=16), the majority examined mental health (n=12). Four overarching themes emerged: *Cultural Stigma* described how illness was often perceived as a personal failing, leading to avoidance of healthcare seeking. *Acculturation* into American culture was associated with greater openness to healthcare and fewer concerns about public opinion. *Gender Roles* described how American Armenian men experience pressure to appear self-reliant, discouraging them from seeking support, while women were expected to maintain family cohesion, leading to hesitancy to disclose hardships. *Family and Community* both supported (e.g., treatment adherence) and hindered (e.g., family needs take precedence over individual needs, stigma) health-seeking behaviors. **Conclusion**: Similar to other minority ethnic groups, American Armenians often struggle to seek treatment due to healthcare-related stigma in their community.

Poster #126

Title: Convergent Validity of the FYIv3.1 with the VABS-3 in Infants

Authors: Brianna Stevens, Julia Lisle, Allison Madrid, John Sideris, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: The First Years Inventory version 3.1 (FYIv3.1) is a parent-report measure with 7 constructs designed to detect autism likelihood in infants 6-16 months. Higher scores on the FYIv3.1 indicate deficits, so negative correlations with the Vineland Adaptive Behavior Scales third edition (VABS-3) are expected. **Purpose**: To examine the convergent validity of 3 FYIv3.1 constructs [Communication, Imitation, and Play (CIP), Social Attention and Affective Engagement (SAE), and Self-Regulation in Daily Routines (SREG)] with 3 VABS-3 subscales (Communication, Socialization, and Daily Living Skills). Earlier FYI versions showed significant associations with the VABS-3 at 12 months. We hypothesize that CIP will be most strongly negatively correlated with Communication, SREG with Daily Living Skills, and SAE with Socialization, as these tap similar constructs. **Methods**: Parents of a community sample of 73 infants ages 6-16 months (M_{age}=11.86) completed the FYIv3.1 and VABS-3. Rescaled Item Scores (RISc) means were calculated for the 3 FYIv3.1 constructs, and Pearson correlations were used to test associations with the 3 VABS-3 subscale standard scores. **Results**: CIP was correlated with Communication (r=-0.39, p=0.001), Daily Living Skills (r=-0.34, p=0.005), and Socialization (r=-0.33, p=0.006). SAE was correlated with Socialization (r=-0.35, p=0.004), Communication (r=-0.29, p=0.016), and Daily Living Skills (r=-0.25, p=0.042). Correlations of SREG and VABS-3 subscales were non-significant. **Conclusion**: CIP and SAE were most correlated with Communication and Socialization as predicted. Unexpectedly, SREG was not correlated with VABS-3 subscales. Further investigation is needed on the relationships between SREG and the VABS-3.

Poster #127

Title: Meeting Occupational Needs Through Cancer Support Groups: A Participatory Photovoice

Authors: Holly Carrington, Caitlin G. Dobson, Shannon Roux, Alycia Villasana, Monica Gibbs, Rhonda Bulwer, Xixi Hu, Marshae D. Franklin, and Amber M. Angell

Faculty Advisor: Alison M. Cogan

Background: Cancer support groups offer opportunities for individuals impacted by cancer to rebuild routines, form new relationships, and engage in meaningful occupations across the cancer trajectory. Research demonstrates group-based interventions support individuals with varied, evolving needs. However, less is known about how individuals impacted by cancer use support groups to fulfill their occupational needs, and what constraints surround unmet needs. **Purpose**: To explore how individuals impacted by cancer meet varied occupational needs through support groups and identify factors obstructing unmet needs. **Methods**: This participatory action research study used photovoice to examine support group and occupation use across the cancer trajectory. Four individuals from the Cancer Support Community of Los Angeles (CSCLA) served as study partners. Partners participated in semi-structured interviews to co-develop the photovoice prompt, followed by a two-week photo-taking session and photo analysis interview. Collaborative, inductive thematic analysis of photo-narratives and interviews was conducted by researchers and partners. Findings culminated in an action component presented to CSCLA administrative leadership. **Results**: Analysis generated four themes: (1) varied and complex needs; (2) groups as a "lifeline" for diverse needs and connection to people who "get it"; (3) barriers to participation, including availability, scheduling, and accessibility; and (4) group members as experts through leadership and knowledge sharing. Findings were shared with CSCLA leadership as the photovoice action component. **Conclusion**: Addressing occupational needs is critical for quality of life of individuals impacted by cancer. Effective support groups should be accessible, flexible, responsive to changing capacities, and centered on members' expertise and occupational priorities.

Poster #128

Title: Environmentally-Related Barriers and Facilitators to Dental Care for Autistic Children

Authors: Sahar Ghahramani, Riley McGuire, and Leah Stein Duker

Faculty Advisor: Leah Stein Duker

Background: Despite extensive literature exploring the challenges of dental care for autistic children, no research has comprehensively explored

the environmentally-related barriers and facilitators to this care. **Purpose**: To synthesize existing literature to identify environmentally-related barriers and facilitators to dental care for autistic children using the International Classification of Functioning, Disability, and Health (ICF) framework. **Methods**: A systematic review was conducted across five databases. Included articles were peer-reviewed qualitative studies focused on clinical dental care experiences of autistic children, as reported by children, caregivers, and/or dental health professionals (DHPs), with no publication date limitations. Data was analyzed utilizing template coding aligned with the five environmental categories of the ICF framework. **Results**: Of the 16 studies included, the most endorsed ICF categories were *services, systems, and policies* (94%), *support and relationships* (87.5%), and *products and technology* (62.5%). While practical solutions such as interdisciplinary care, clearer communication, supportive care strategies, and adaptations to the physical environment emerged, the majority of findings emphasized barriers. These barriers were reported at the individual-level (e.g., communication and sensory mismatch, DHP's attitudes, lack of DHP knowledge/experience) and the system-level (e.g., lack of DHP training, referrals , cost constraints), negatively impacting the experience of dental visits for children, caregivers, and DHPs. **Conclusion**: Findings emphasize the need for individualized, interdisciplinary, and multidimensional approaches to address environmental barriers in dental care for autistic children. Future research should evaluate the effectiveness of DHP training protocols, sensory-focused innovations, and the simultaneous use of multiple supportive care strategies.

Poster #129

Title: Sensory Experiences and Occupational Engagement in Children with Developmental Disabilities

Authors: Yu Tang, Savannah Gluck, Megan Kim, Julia Lisle, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Research shows that 40-80% of children with neurodevelopmental disabilities and 60-95% of those with autism experience sensory differences that affect their ability to modulate, integrate, or discriminate sensory input. While sensory processing is increasingly studied, its connection to key concepts in occupational science—such as engagement in occupation and social participation—remains underexplored. **Purpose**: This study aims to identify children and family occupations influenced by the positive and negative sensory experiences. **Methods**: Thematic analysis was applied to extant data from qualitative interviews (N = 33) with caregivers of children with known developmental disabilities. We adapted the nine categories of occupations identified in the Occupational Therapy Practice Framework: Domain and Process (Fourth Edition) and quantified the reported occupations within these categories. **Results**: The most frequently reported category of occupation was Activities of Daily Living (ADLs) (26 instances), with 18 examples linked to negative and 8 to positive sensory experiences. Play was the second most reported category of occupation (20 instances), exclusively associated with positive sensory experiences. Social participation was reported 9 times, always in connection with negative sensory experiences. Leisure was reported 5 times, with one instance linked to a negative experience. Health management was reported 3 times; all tied to negative sensory experiences. **Conclusion**: Challenges in engagement in occupations during negative sensory experiences align with previous findings in OTOS. To better achieve holistic care through the 'just-right' challenge, occupations associated with positive experiences should also be incorporated into interventions and daily life.

Poster #130

Title: Demographic Factors and Neurodevelopmental Risk in an Infant Community Sample

Authors: Savannah Gluck, Julia Lisle-Wier, Kat Hayes, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: Recruiting a representative community sample of infants is important to measure risk for neurodevelopmental conditions. However, many factors challenge recruitment, especially for families at risk from the general population, including parental time and resources. The recruitment method has practical and interpretive implications. State vital records (VR) can offer accurate prenatal health data, but it is costly. Social media (SM) recruitment is growing in popularity and requires fewer resources. **Purpose**: Examine differences in neurodevelopmental risk and demographic factors in a community sample of infants for two different recruitment sources (vital records and social media). **Methods**: Parents of infants 6-16 months born in California completed a neurodevelopmental screening tool, the First Years Inventory and provided demographic information via SM (N=234) and VR (N=881). We used Chi-square to test differences between sources. **Results**: The overall association between race/ethnicity (White, Asian, or Hispanic) and recruitment source was significant: $X^{2\,(2,\,1{,}115)} = 57.2$, $p < 0.01$. The overall association between education level and recruitment source was significant: $X^{2\,(2,\,605)} = 58.2$, $p < .01$. The overall association between neurodevelopmental risk and recruitment source was not significant: $X^{2\,(2,\,349)} = 1.10$, $p = 0.58$. **Conclusion**: Methodological influence on findings is often overlooked and understudied, but may change how researchers interpret the findings and decrease generalizability. Importantly, there were no differences on key study variables (neurodevelopmental risk), which is of most relevance to possible interpretations of findings.

Poster #131

Title: Perivascular Space morphology changes predict sensorimotor outcomes at 3 months

Authors: Stuti Chakraborty, Giuseppe Barisano, Mahir H. Khan, Octavio Marin-Pardo, Michael R. Borich, Mayerly Castillo, Steven C. Cramer, Emily E. Fokas, Niko H. Fullmer, Jeanette R. Gumarang, Leticia Hayes, Amisha Kumar, Emily A. Marks, Emily R. Rosario, Heidi M. Schambra, Nicholas Schweighofer, Grace C. Song, Myriam Taga, Bethany P. Tavenner, Carolee Winstein, and Sook-Lei Liew

Faculty Advisor: Sook-Lei Liew

Background: Perivascular spaces (PVS) are fluid-filled compartments integral to the brain's glymphatic fluid system, facilitating metabolic waste clearance. Alterations to PVS morphology may be indicative of poor brain health. However, their relationship with sensorimotor outcomes post-stroke is unknown. **Purpose**: To examine the longitudinal relationship between PVS morphology and post-stroke sensorimotor outcomes. **Methods**: 65 adult stroke survivors across 3 research cohorts were recruited. Data was acquired at baseline and 3 months after stroke, which included sensorimotor impairment scores (Fugl-Meyer Upper Extremity (FMUE), Action Research Arm Test (ARAT)), a T1-weighted brain MRI and manually segmented stroke lesion. PVS morphological features (count, volume) from the basal ganglia (BG) and white matter (WM) were obtained using a validated segmentation algorithm (ICC >0.8). Four separate robust mixed effects regression models were used to examine the longitudinal relationship (baseline to 3 months) between post-stroke sensorimotor outcomes and PVS morphology (BG/WM) with clinical factors (e.g., hypertension), and demographics as fixed effects covariates and site as a random effect. **Results**: Increase in PVS volume from baseline to 3 months was associated with higher FMUE ($b = 0.62$, $p = 0.026$) and ARAT ($b = 0.90$,

p = 0.023) scores. Presence of hypertension at baseline was associated with associated with worse FMUE (b = -0.26, p = 0.007) and ARAT (b = -0.37, p = 0.008) scores at 3 months. **Conclusion**: Increased PVS volume over the first three months post-stroke may be indicative of better glymphatic fluid drainage and improved waste clearance and may relate to better sensorimotor outcomes.

Poster #132

Title: A Qualitative Exploration of Office Workers' Stress Perception and Management

Authors: Madeline R. Parga, Chelsea Okundolor, Burçin Becerik-Gerber, Gale M. Lucas, Shrikanth Narayanan, and Shawn C. Roll

Faculty Advisor: Shawn C. Roll

Background: While "negative" stress experiences can lead to harmful outcomes such as burnout, "positive" stress may provide an appropriate challenge that serves as motivation. To inform solutions that reduce harmful stress and optimize useful stress, we must better understand experiences of stress. **Purpose**: To elicit foundational meanings of stress and advance towards understanding key differences in work-related stress perceptions and management. **Methods**: We interviewed 19 participants with varying levels of work control and demand regarding how they conceptualize stress and how these ideas influence coping strategies. We used a semi-structured interview guide constructed under a realist lens and pursued an inductive, iterative analysis. Two researchers and a volunteer applied open coding and held discussions to develop initial codes and subsequent codebook iterations. The researchers independently created initial categories describing trends in excerpts, and an external expert was consulted for collaboration on final identification and description of themes. **Results**: We determined participants could be described by a *Stress Orientation*: as an *Acceptor*, who felt there is such a thing as positive stress, or a *Rejector*, who broadly perceived all stress as bad. Within the two stress orientations, there were four primary *Roles of Stress* that indicated participants' perception of stress' role that influenced their stress management approach. We identified perceived roles of stress as: *Motivator for Personal Growth, Obligation to be Met, Reality to be Regulated, and Barrier to be Reduced*. **Conclusion**: These results suggest that stress management solutions may benefit from targeted and tailored approaches to workers' stress orientation and roles.

Poster #133

Title: Occupational Therapy's Role in Supporting Self-determination Among Cancer Survivors

Authors: Jordan Segal, Melissa Ochoa, Karissa Nakayama, and Alix Sleight

Faculty Advisor: Alix Sleight

Background: Health behavior recommendations (HBR) refer to lifestyle changes that could reduce risks of recurrence among cancer survivors. However, due to long-term post-treatment side effects and lack of ongoing support, adherence to HBR remains low. RISE (Reinvent, Integrate, Strengthen, Expand) is a newly developed intervention that provides personalized occupational therapy (OT) for cancer survivors, aimed at promoting survivors' adherence to HBR. Beyond synergizing elements of Lifestyle Redesign and Lifestyle Medicine, RISE was also guided by the framework of the self-determination theory (SDT). **Purpose**: The purpose of this qualitative analysis is to examine the ways the RISE self-management intervention may align with the three core needs of SDT: competence, relatedness, and autonomy. **Methods**: This qualitative secondary analysis drew on semi-structured interviews from a pilot study. Fourteen cancer survivors completed twelve OT-led RISE sessions, participating in exit interviews three months post-intervention. We conducted a deductive thematic analysis by following SDT's pillars of competence, relatedness, and autonomy. **Results**: Participant narratives reflected all three SDT domains. Competence was supported by education, self-efficacy, self-management strategies, and awareness of personal needs. Relatedness emerged through strong therapeutic rapport, one-on-one attention, and nonjudgmental accountability. Autonomy was fostered via personalized, occupation-focused, practical goal setting. These goals aligned with participants' values and capacities, often supporting sustained motivation beyond the program. **Conclusion**: Findings suggest that the RISE intervention effectively operationalizes SDT principles through OT practice. By emphasizing personalization, meaningful occupations, and supportive therapeutic relationships, OT may play a critical role in promoting self-determination and sustained health behavior change in cancer survivorship.

Poster #134

Title: How Nature-Based Third Places Support Health in Older Adults

Authors: Laura Kim, Taylor Kamemoto, Debbie Laliberte Rudman, and Rebecca Aldrich

Faculty Advisor: Rebecca Aldrich

Background: Third places, spaces outside of home and work, can provide aging populations with opportunities for social interaction, thus supporting positive health outcomes. **Purpose**: This study aims to explore how elements of nature-based third places, such as trees and lakes, impact the physical, mental, and social health of older adults. **Methods**: An ongoing North American empirical study further examined the third places of retired (N=12) and precarious worker (N=4) populations in the U.S. to better understand the relevance of spaces with nature-based elements to workers without stable workplaces. This prompted a further literature review on how nature-based spaces are taken up as third places. Identification of ten peer-reviewed studies published between 2012 and 2022 addressed the impact of natural and outdoor spaces on the health of older adults. **Results**: Nature-based third places designed with features such as walkability, accessibility, connectivity, safety, and a "homely" atmosphere support older adults in increased social connection, maintenance of habits and routines, stress reduction, and tranquility. **Conclusion**: These findings demonstrate the importance of incorporating natural elements in existing and future third places. Further consideration of accessibility in the design of nature-based third places can aid in supporting the health of aging populations and their participation in daily occupations.

Poster #135

Title: Trust Dynamics in Self-Management among Young Adults with Type 1 Diabetes

Authors: Yujia Mo, Joy Agner, and Elizabeth Pyatak

Faculty Advisor: Elizabeth Pyatak

Background: Trust is central to health information uptake and technology adoption. Among young adults (YAs) with type 1 diabetes (T1D), information demands are ongoing, and diabetes devices are integral to self-management. Little is known about how trust is dynamically shaped across information and technologies used in this population. **Purpose**: The study examines the trust dynamics underlying diabetes-related information and device use among YAs with T1D, and how trust processes impact self-management. **Methods**: Qualitative data were drawn from a grounded theory study focusing on the diabetes identity journey among YAs with T1D (18-30 years). Twenty-two in-depth, semi-structured interviews were conducted via Zoom. **Results**: Trust dynamics shaped both device use and information uptake. Device and information trust was commonly delegated to parents or healthcare providers following diagnosis. Through self-management, device trust remained largely invisible until disruptions prompted trust calibration, with increased distress. Information trust shifted

beyond the clinic when education failed to address everyday uncertainty, activating multiple trust strategies. When trust was consistently established, information and device use supported optimal self-management. **Conclusion**: Trust dynamics appear central to self-management among YAs with T1D. Attending to trust dynamics may help clinicians anticipate trust disruption, support trust calibration, and strengthen education on using non-clinical information sources.

Poster #136

Title: Primary Care OT Clinical Trial: Health, Utilization, and Cost Outcomes

Authors: Valerie Tapia, Stacey Schepens Niemiec, Jaime D. Leite, Jesus Diaz, Josh Banerjee, Jagruti Shukla, and Elizabeth Pyatak

Faculty Advisor: Elizabeth Pyatak

Background: In primary care (PC) clinical, healthcare utilization, and financial outcomes associated with Lifestyle Redesign® Occupational Therapy (LR-OT), a framework that incorporates healthy habits into daily routines, are not well documented in the United States. **Purpose**: (1) Compare clinical outcomes, healthcare utilization, and associated cost differences between patients who received LR-OT and a control group. (2) Assess the investment required integrate LR-OT into PC. **Methods**: LR-OT was integrated into a safety-net PC clinic. In a hybrid effectiveness-implementation clinical trial (#NCT03293914), clinical [glycated hemoglobin A1c (HbA1c), blood pressure, cholesterol, and body mass index] and utilization [outpatient, emergency department (ED), hospital visits] data were extracted from medical records of provider-referred adults with diabetes (HbA1c ≧ 9.0%) who were willing to make lifestyle changes. **Results**: Of 155 referred patients, 142 were randomized to LR-OT (n=73) or a control group (n=69), and 42 completed 8 LR-OT sessions within six months. Underpowered clinical outcomes indicated no significant change, with aggregated trends suggesting LR-OT supports sustained cardiometabolic improvement. Savings of $250,518.96 is attributed to LR-OT, driven by significant decreases in ED visits (p = 0.03) and hospital days (p = 0.03), despite non-significant increases in outpatient utilization. The projected cost-benefit of integrating a full-time LR-OT in PC is $352,326.72 with a 236% return on investment. **Conclusion**: Clinical trends and significant reductions in acute care services drove healthcare-wide cost savings, demonstrating clinical and financial value of integrating LR-OT into PC.

Poster #137

Title: The Interplay between the Occupation of Sleep and Sensory Processing

Authors: Lan Carrico, Kali Walker, Savannah Gluck, Marissa Palanza, and Grace T. Baranek

Faculty Advisor: Grace T. Baranek

Background: This studies the relationship between sensory processing and sleep difficulties, and what clinical population require sleep intervention. Further efforts are needed to advance clinician's knowledge in sleep. The long-term goal of this project is to develop appropriate sleep screening protocol to detect if sleep intervention is required and to develop an evidence-based sleep intervention program. **Purpose**: The purpose of this study is to further understand the associations between sensory processing, sleep, and the environmental aspects in children at an outpatient pediatric therapy clinic. **Methods**: 51 children, ages 2-10 years-old, with a diverse range of diagnoses, including Autism Spectrum Disorder, Down Syndrome, Cerebral Palsy and other developmental disorders, were evaluated for therapy services and their guardians from an outpatient pediatric therapy clinic. Measurement: Three quantitative parent measures were used: The Children's Sleep Habits Questionnaire (CSHQ), The Sensory Profile - 2nd Edition (SP-2) and an additional questionnaire was created. Multiple linear regression models were used, and correlational data were evaluated over a 15-month time frame. **Results**: An association was found between total CSHQ score and sensory avoidance quadrant from the SP-2 ($p<0.01$) suggesting that children having sleep disturbances also demonstrate higher levels of sensory avoidance. There were no significant associations between total CSHQ scores and other sensory patterns. **Conclusion**: Children with sensory processing problems primarily hypersensitive or avoidance of sensory input may present with sleep difficulties. Clinicians/Researchers need to focus on this area because it may impact performance, and in turn can affect a child's physical, cognitive, and social emotional development.

Poster #138

Title: Construction Workers' Experiences of Sensory Components of Teleoperation Workstations

Authors: Min Ji Song, Yiyang Fang, Burcin Becerik-Gerber, Gale M. Lucas, Lucio Soibelman, and Shawn C. Roll

Faculty Advisor: Shawn C. Roll

Background: Teleoperation workstations for construction demolition should provide sufficient information for a worker to successfully operate a robot from a distance without overwhelming them with excessive input. Currently, safety and performance are constrained by a reliance on limited sensory input for teleoperators. **Purpose**: This study examined whether operator workload is affected by a sensory-enhanced workstation that provides multimodal sensory information, as compared to a standard workstation. **Methods**: In this experimental study, 95 construction workers were randomly assigned to either a standard (n=45) or a sensory-enhanced workstation (n=50). Participants teleoperated a demolition robot using their assigned workstation through an obstacle course simulating a construction site. Workload was measured post-experiment using the National Aeronautics and Space Administration Task Load Index (NASA-TLX). Data were analyzed using descriptive statistics and independent two-sample t-tests to compare the overall workload, mental strain, physical demand, and performance between the two groups. **Results**: There were no significant differences in overall workload, mental strain, physical demand, and performance between the sensory-enhanced (M=28.0, SD=16.8; M=28.0, SD=20.4; M=9.8, SD=16.3; M=53.6, SD=33.4) and standard workstations (M=29.6, SD=19.2; M=31.1, SD=22.2; M=11.13, SD=16.8; M=56.2, SD=37.2; $p>.05$ for all). Effect sizes across outcomes ranged from d=0.08-0.12, suggesting that if any difference exists, it is smaller than our study could reliably detect, and the practical significance would be minimal. **Conclusion**: These findings suggest that the multimodal sensory features of a sensory-enhanced workstation likely do not affect workload during teleoperation. The findings support further exploration of the use of a sensory-enhanced teleoperation workstation on safety and performance.

Poster #139

Title: The Occupational Selection of Physical Activity in Type 1 Diabetes

Authors: Ngozi Deborah Nnoli and Elizabeth Pyatak

Faculty Advisor: Elizabeth Pyatak

Background: Health behavior and Occupational Science (OS) intervention research has yet to collaboratively address how physical activity (PA) behaviors unfold through meaningful forms of doing for adults living with Type 1 diabetes (T1D). **Purpose**: This paper proposes a theoretical model integrating cognitive-behavioral and transactional perspectives to understand PA through the lens of occupation-focused

action. **Methods**: The model synthesizes cognitive-behavioral constructs, including Tolman's purposive behavior and Skinner's covert behaviorism, with transactional philosophies that emphasize consequential experiences (satisfying/unpleasant), meaningful experiences (stabilizing/interfering), and their role in shaping future occupation-focused action. Existing qualitative findings from people living with T1D provide concrete examples supporting the model. **Results**: In T1D-related narratives, decisions to engage in PA arises from a reflexive, experience-based occupational selection process that functions as an occupation-focused action. Through a transactional view of occupation, individuals orient themselves to a past-present-future context where past glycemic consequences and anticipated encounters influence the decision-making process and co-constitute the ultimate decision. From this transaction, cognitive (decision-making) and physical (active/inactive) behavioral-decisions emerge as a two-fold meaningful form of doing. Consequently, PA behavior is the outcome of purpose- and meaning-driven action guided by the phenomenological totality of decision-making. **Conclusion**: This model positions OS to support the health behavior field by directing attention to the reflexive, experience-based occupational selection process of PA. The totality of this experience (navigating glycemic consequences in past-present-future contexts) before reaching a decision showcases someone functioning through diabetes self-care and awareness. Thus, the decision-making phenomenon itself may be the intervention point: supporting decision-making under glycemic and social constraints to influence PA behavior.

Poster #140

Title: Occupational Identity and Advocacy Among Hispanic/Latine Mothers

Authors: Jessica M. Cogger, Kimberly Rochin Quiroa, Daniélla C. Floríndez, and Amber M. Angell

Faculty Advisor: Amber M. Angell

Background: Mothering is a culturally shaped occupation that profoundly influences women's occupational identity. For Hispanic and Latine mothers of autistic girls, mothering occurs within intersecting contexts of cultural expectations, gendered caregiving norms, and systemic inequities in autism diagnostic and support services. Despite growing research on autism caregiving, limited scholarship examines how occupational identity shifts for Hispanic and Latine mothers across their autistic daughters' diagnostic journeys. **Purpose**: This study explores how Hispanic and Latine mothers experience changes in occupational identity while navigating their autistic daughters' diagnostic and service-seeking journeys. **Methods**: This secondary, latent thematic analysis draws on semi-structured interviews from a larger mixed-methods study examining autism diagnosis pathways for girls. The current analysis includes a subcorpus of seven English-language and eight Spanish-language interviews with Latine-identified mothers. **Results**: Findings highlight expanded mothering roles characterized by intensified advocacy, care coordination, and knowledge acquisition, alongside challenges asserting maternal authority within healthcare and family systems. **Conclusion**: These findings underscore mothering as an evolving occupational identity shaped by cultural context and systemic interactions. Ongoing analysis of Spanish-language interviews will extend this work by incorporating the experiences of monolingual Spanish-speaking mothers. Recognizing these dynamics can inform culturally responsive occupational therapy and support practices for families navigating autism diagnostic and support services.

OCCUPATIONAL SCIENCE & OCCUPATIONAL THERAPY - PROFESSIONAL STUDENTS

Poster #141

Title: The Effectiveness of Mirror Therapy on Reducing Phantom Limb Pain

Authors: Ting-Hsuan Chang, Kuan-Rong Rebecca Wong, En-Jou Hsieh, and Julia Lisle

Faculty Advisor: Julia Lisle

Introduction: Phantom limb pain (PLP) is a prevalent and distressing neuropathic condition among amputees, which hinders rehabilitation and quality of life (QoL) (Colquhoun et al., 2019; Sinha et al., 2011). As pharmacological and surgical treatments show limited effectiveness in reducing PLP, mirror therapy (MT) has gained attention as a non-pharmacological approach, though evidence remains inconsistent. **Purpose**: To evaluate the effectiveness of MT on amputees to reduce PLP intensity. **Methods**: We searched the PubMed database for randomized controlled trials (RCTs), systematic reviews and meta-analyses published within the past five years that examined the effectiveness of MT in reducing PLP. **Results**: Five articles were included: three systematic reviews (two with meta-analyses) and two RCTs. Two meta-analyses reported a significant reduction in pain intensity at the 4 weeks follow-up with MT compared to controls (Wang et al., 2021; Xie et al., 2022). One RCT showed that preventive MT significantly reduced PLP incidence at three and six months (Purushothaman et al., 2023), while another supported MT as a complementary intervention with physiotherapy for reducing PLP (Noureen et al., 2025). However, one systematic review found no clear evidence supporting MT's effectiveness for PLP (Guémann et al., 2022). **Conclusion**: Our review indicates that the effectiveness of MT for reducing PLP remains inconclusive. This uncertainty is due to factors such as confounding medication use, high heterogeneity among studies, and limited reporting of effect sizes. Future research should recruit larger samples, use true placebo controls, include long-term follow-up, ensure methodological rigor, and incorporate occupation-focused and QOL outcomes.

Poster #142

Title: Effectiveness of Animal Assisted Therapy on Cognitive Skills in Dementia

Authors: Ning-Yun Chang, Ho Lin Chen, Mariam Husain, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Animal assisted therapy (AAT) is a non-pharmacological intervention where an animal participates in the therapeutic process (Kamioka et al., 2014, as cited in Tanaka et al., 2019). Cognitive deficits, depression, and agitation impair daily function of older adults with dementia, leading to the use of various non-pharmacological interventions, including AAT. However, the relationship between AAT and cognitive outcomes in older adults with dementia remains unclear (Lordgren & Engstrom, 2014, as cited in Parra et al., 2021). **Purpose**: To evaluate AAT's effectiveness on cognition among older adults with dementia. **Methods**: A PubMed search was conducted using older adults, dementia, AAT, and cognition as keywords. NOT Alzheimer was used to broaden the search to dementia overall. Studies involving older adults with dementia, assessing cognitive outcomes, and published between 2011-2025 were included. Three systematic reviews and two controlled trials were analyzed. **Results**: Three systematic reviews and one controlled trial found AAT has no effects on cognition, while one controlled trial showed short-term improvement. However, AAT showed promising emotional and behavioral effects. All studies integrated AAT with other therapies, such as occupational or physical therapy. Notably, none reported power analyses or effect-size calculations, limiting conclusion strength. **Conclusion**: AAT is not superior to regular therapy for improving cognition in dementia. Nevertheless, it provides meaningful emotional and psychosocial benefits that enhance wellbeing. Further studies with rigorous methodology and statistical reporting are needed.

Poster #143

Title: Hippotherapy Increases Postural Stability in Children with Autism

Authors: Jane Chang, Enya Tien, Hayes Tsai, Deborah Shieh, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Children with autism commonly experience challenges with postural stability, a foundational motor skill necessary for balance, functional mobility, and participation in daily occupations. Deficits in postural stability may limit engagement at home, school, and in the community. Hippotherapy uses the rhythmic and multidimensional movement of horses to provide continuous vestibular, proprioceptive, and postural input to clients, which may support motor skill development. Examining the effectiveness of hippotherapy for improving postural stability in children with autism is clinically relevant for pediatric occupational therapy practice. **Purpose**: We aim to examine the effect of hippotherapy on postural stability in children with autism. **Methods**: A literature search was conducted in PubMed for peer-reviewed, quantitative studies in English examining postural stability outcomes in children with autism receiving hippotherapy. Four studies met inclusion criteria and were appraised and synthesized. **Results**: Across studies, findings were suggestive of improvements in postural stability and postural control following hippotherapy. Evidence indicated reductions in postural sway, improved balance responses, and enhanced trunk control, with some studies demonstrating immediate effects and others showing maintained gains following intervention. Improvements were more pronounced in children with autism compared to typically developing peers. Overall, trends across study designs support hippotherapy as a promising intervention for postural stability. **Conclusion**: Hippotherapy may be a beneficial complementary intervention for improving postural stability in children with autism and supporting occupational engagement. Further research with rigorous designs is needed to strengthen evidence and guide clinical implementation.

Poster #144

Title: Critical Appraisal of Energy Conservation In Adult Outpatient Oncology Care

Authors: Haemin Lee, Raagavi Kumaravel, Ditiksha Patel, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Adults with cancer receiving outpatient chemotherapy often experience cancer-related fatigue (CRF), which limits activities of daily livings and occupational engagement. Energy conservation strategies, including planning, prioritizing, pacing, activity modification, and planned rest, are widely used in occupational therapy to support participation and reduce CRF. **Purpose**: We aim to appraise the highest quality articles, looking at the effect of energy conservation techniques on CRF in adults with cancer who are receiving chemotherapy in outpatient care. **Methods**: A systematic literature search was conducted using keywords related to oncology patients, energy-saving techniques, and CRF. Studies were included if they involved adults with cancer, used energy conservation-based interventions, employed high-quality research designs, were published in English within the past 10 years, and measured CRF as a primary outcome. Three randomized controlled trials (RCTs) met inclusion criteria and were critically appraised and synthesized. **Results**: Across all three RCTs, energy conservation interventions reduced CRF. Evidence was appraised as suggestive because studies used randomized designs, validated fatigue measures, and demonstrated consistent improvements despite variations in delivery format, duration, or cultural context. Limitations include short follow-up and single-center recruitment. Although samples only involved women, the intervention addresses universal fatigue mechanisms, supporting applicability to broader adult oncology populations. **Conclusion**: Energy conservation strategies are a feasible, low-risk, and effective occupational therapy intervention for reducing CRF in adults receiving outpatient chemotherapy. Despite limitations in generalizability, current evidence supports their clinical use to improve fatigue management and occupational engagement in this population.

Poster #145

Title: Dental Student Preparedness to Treat Patients with Special Healthcare Needs

Authors: Audrey Mokhtarzadeh, Russell Sakurai, and Leah Stein Duker

Faculty Advisor: Leah Stein Duker

Background: Patients with special healthcare needs (PSHCNs) experience persistent oral health disparities and significant barriers accessing dental care. Dental professionals frequently cite insufficient education, training, and clinical preparation as contributing factors. Despite this, limited research has examined dental students' perceptions of their preparedness and confidence to treat PSHCNs during predoctoral training. **Purpose**: To synthesize existing research examining dental students' knowledge, confidence, and perceived preparedness to treat PSHCNs. **Methods**: This narrative review searched PubMed, Google Scholar, and reference lists. Included studies were peer-reviewed articles published within the past decade that examined dental students' or recent graduates' preparedness, attitudes, and educational experiences related to treating PSHCNs. **Results**: Included articles (n=17) suggest that dental students feel unprepared and lack confidence when treating PSHCNs (n=14). Studies identified a need for curriculum revisions, particularly increased clinical exposure to PSHCNs (n=11). Four articles reported moderate improvements in dental students' knowledge, attitudes, and skills following targeted educational interventions; two clinic-based interventions (i.e., rotation in specialized SHCNs clinic) reported success in improving student confidence, preparedness, and reduced concerns related to treating PSHCNs. **Conclusion**: Few studies have directly explored dental students' perceived preparedness to treat PSHCNs, which is necessary to identify educational gaps and inform curriculum development. Findings highlight the need for expanded clinical exposure and experiential learning opportunities to enhance student preparedness and confidence. Specifically, problem-based learning and/or training sessions involving or led by PSHCNs may support student learning. Further research is needed to assess dental students' readiness and inform curriculum development prioritizing inclusive dental care.

Poster #146

Title: Early Active Mobilization in Flexor Tendon Injury For Adults

Authors: Jui Yu (Jasmine) Chien, Megha Gala, Vannah Alvarez, and Julia Lisle

Faculty Advisor: Julia Lisle

Background: Flexor tendon injuries (FTIs) commonly result from lacerations or high-force trauma and typically require surgical repair. Despite successful repair, many patients experience impaired hand motion due to tendon adhesions, stiffness, and limited tendon gliding. **Purpose**: This critically appraised topic evaluates whether early active motion provides superior functional grasp recovery compared with passive or protective rehabilitation after flexor tendon injury. **Methods**: We identified peer-reviewed randomized controlled trials published within the past 10 years involving adults (≥18 years) after flexor tendon repair. Studies were included if they reported functional outcomes. Three studies met inclusion criteria. **Results**: In adults treated by experienced surgeons and hand therapists, early active mobilization (EAM) did not directly improve functional grasp but supported range of motion, grip strength, and tendon glide. Both early active and passive protocols improved

motion at different stages of recovery. EAM showed slightly faster gains within the first 3-12 months; however, no consistent short- or mid-term functional differences were observed. Passive or place-and-hold protocols demonstrated small long-term advantages, including greater range of motion and fewer contractures at five years. **Conclusion**: Although EAM improves early range of motion, current evidence does not demonstrate a clear benefit for functional grasp or real-world hand performance when used alone. Range of motion contributes to grasp recovery but does not guarantee functional improvement. EAM may therefore represent one component of a comprehensive rehabilitation strategy, used selectively when early mobilization is clinically indicated and when patients have stable repairs, high adherence, and access to skilled hand therapy.

Poster #147

Title: Translating Prediction Models for Post-Acute Rehabilitation Outcomes to Clinical Practice

Authors: Gloria Hernandez, Stacey L. Schepens Niemiec, Clarisa Martinez, and Alison M. Cogan

Faculty Advisor: Alison M. Cogan

Background: Adoption of data-driven outcome prediction models to aid clinical decision-making in post-acute rehabilitation remains limited. Although such models have potential to improve treatment planning and interdisciplinary communication, many clinicians report difficulty interpreting and applying model outputs in practice. A lack of clear translation strategies and user-friendly tools represents a key barrier to implementation in real-world rehabilitation settings. **Purpose**: To develop a clinician-informed translation and implementation strategy for applying prediction models in inpatient stroke rehabilitation practice. **Methods**: Semi-structured interviews and focus groups were conducted with occupational, physical, and speech-language therapists with experience in inpatient stroke rehabilitation. Questions explore clinicians' knowledge of prediction models, perceived benefits, and implementation barriers. Data analysis is iterative and uses rapid qualitative methods. **Results**: Data has been collected from 10 out of 25 participants. Preliminary findings indicate substantial variability in clinicians' familiarity and comfort with outcome prediction models. Perceived benefits include establishing shared understanding of projected patient outcomes across the interdisciplinary rehabilitation team. Absence of easy-to-use tools that show predicted outcomes values for individual patients were reported as a barrier. **Conclusion**: This study is ongoing. Findings will inform the design of practical translation support tools and tailored implementation strategies to support clinical uptake of prediction models.

Poster #148

Title: Facilitators and Barriers to Success in a Cancer Survivorship Intervention

Authors: Allison Schachter, Jordan Segal, and Alix Sleight

Faculty Advisor: Alix Sleight

Background: Adopting a healthy lifestyle after a cancer diagnosis is associated with fewer comorbidities, reduced recurrence, and increased survival. Yet, less than 25% of survivors adhere to recommended health behaviors. Occupational therapy (OT)-led self-management programs have improved adherence and health outcomes in other chronic conditions but remain underutilized for cancer survivors. The RISE (Re-invent, Integrate, Strengthen, Expand) program, developed in 2020, is a personalized, OT self-management program designed to promote healthy lifestyles among cancer survivors through strategic planning of daily activities, individualized education, self-determination, and habit formation. **Purpose**: Guided by the socioecological model, this study explored the facilitators and barriers to health behavior change for cancer survivors participating in the RISE program across intrapersonal, interpersonal, organizational, and structural levels. **Methods**: Fourteen semi-structured interviews were conducted with adults who had completed cancer treatment within the past five years. Participants engaged in twelve OT sessions focused on goal setting, health behavior coaching, and daily tracking of diet and exercise. Data were thematically analyzed using Dedoose software. **Results**: Participant narratives revealed multi-level factors impacting engagement with the RISE intervention. Key facilitators of health behavior change included self-efficacy, therapist rapport, and personalization. Barriers included emotional/physical challenges, competing responsibilities, and lack of post-intervention follow-up. Structural barriers (e.g., physical environment) also shaped engagement. **Conclusion**: Findings highlight how RISE promoted health behavior change through tailored education, practical goal-setting, and supportive accountability. Participant feedback offers valuable insights to refine the intervention. Programs like RISE may support sustained healthy lifestyle behaviors, improving long-term outcomes for cancer survivors.

Poster #149

Title: Artificial Intelligence in Occupational Therapy Intervention: A Literature Review

Authors: Xuege Tong,Nandita Raman, Akila Kadambi, Benjamin Miller-Mills, and Lisa Aziz-Zadeh

Faculty Advisor: Nandita Raman and Lisa Aziz-Zadeh

Background: The use of artificial intelligence (AI) in healthcare, including the field of occupational therapy (OT), has been growing exponentially, underscoring the need to examine its current applications in order to realize its full potential. **Purpose**: The aim of this literature review is to examine the application of AI interventions in OT to identify trends, gaps, and potential areas for growth. **Methods**: From the PubMed database, peer-reviewed full-text articles published between 2015 and 2025 were reviewed. Search terms related to AI and OT intervention were considered. From PubMed, 71 articles were identified, and after reference mining, a total of 20 studies were identified as relevant to this search. **Results**: Within the pediatric population, the use of AI was commonly seen in addressing social skill training in children with ASD[3,11,10] and handwriting training in typically developing children,[1] as well as children at risk for DCD.[4] In adult populations, the use of AI interventions was commonly seen in combination with robotics for upper extremity functional mobility training in stroke patients,[5,2,6,8] pain management for patients with upper extremity phantom limb pain,[12] and the development of AI-driven rehabilitative gloves in healthy adults.[9,7] **Conclusion**: This literature review identified interesting patterns for our target populations, their intervention outcomes, and the modes of administration commonly used when integrating AI in OT interventions. Future directions include a review of articles from the American Journal of Occupational Therapy (AJOT) and the Google Scholar database.

Poster #150

Title: Improving Occupational Performance in Diabetic Foot Ulcer Self-management

Authors: Christopher F. Lopez, Tze-Woei Tan, Marilyn Thompson, and Stacey L. Schepens Niemiec

Faculty Advisor: Stacey L. Schepens Niemiec

Background: Diabetic foot ulcer (DFU) self-management is embedded in daily routines and roles, yet little is known about specific lifestyle demands involved or how lifestyle-based interventions address them. **Purpose**: (1) To characterize occupational performance goals of individuals with DFUs. (2) To examine changes in perceived performance and satisfaction following a pilot DFU-tailored Lifestyle Redesign® occupational therapy (LR-OT) intervention. **Methods**: A mixed-methods analysis was conducted using data from a pilot pre-post DFU-tailored LR-OT intervention. Canadian Occupa-

tional Performance Measure (COPM) performance and satisfaction scores were analyzed using paired t-tests with effect sizes (Cohen's *d*). Goals were qualitatively coded using the Occupational Therapy Practice Framework (OTPF-4) occupational domains and cross-tabulated with COPM categories. **Results**: Eighteen participants identified 138 goals. Most goals were classified as self-care (92%), with limited representation of productivity (6%) and leisure (2%). When mapped to OTPF-4 domains, goals primarily addressed health management (77%) and rest and sleep (13%), with few targeting ADL, instrumental ADL, work, or leisure; no goals addressed social participation or education. COPM performance (pre: M=5.3, SD=2.4; post: M=8.3, SD=1.5; p<0.001; d=1.5) and satisfaction (pre: M=5.3, SD=2.5; post: M=8.1, SD=1.7; p<0.001; d=1.1) increased significantly. **Conclusion**: Increases in perceived occupational performance and satisfaction occurred alongside a narrow concentration of DFU-related goals in health management. This contrasts with literature describing DFU-related barriers across broader occupational domains, suggesting that goal-setting processes and intervention structure may influence how occupational challenges are identified. These findings inform ongoing refinement of a DFU-tailored LR-OT intervention to support engagement across a wider range of occupations.

Poster #151

Title: Assessing Behavioral and Psychophysiological Touch Responses of Children with Autism

Authors: Lexee Sutton, Hannah Lee, and Elizabeth Brough Isralowitz

Faculty Advisor: Elizabeth Brough Isralowitz

Background: Social touch is a foundational component of early social communication. Children with autism spectrum disorder (ASD) often demonstrate hypo- or hyperreactivity to social touch, which may influence caregiver-child interactions and social engagement. However, the behavioral and physiological responses underlying social touch in ASD remain insufficiently understood. **Purpose**: This study examined the behavioral and psychophysiological responses of children with autism to caregiver social touch during a structured play activity. **Methods**: Using a repeated-measures design, 34 children aged 3-7 years participated in a baseline and interactive story activity. Autonomic arousal was monitored via electrodermal activity (EDA). Behavioral responses, including tactile defensiveness and attention-orienting, were coded from video recordings. Sensory responsiveness and social skills were assessed to examine associations with physiological and behavioral outcomes. **Results**: Compared to baseline, children demonstrated increased tonic skin conductance levels (SCL) and greater variability (standard deviation of the SCL) during the interactive story condition, indicating heightened autonomic arousal. No significant differences were observed in phasic EDA reactivity. Sensory features and social skills predicted select physiological and behavioral responses, with sensory hyporesponsiveness associated with increased tactile defensiveness. **Conclusion**: Findings highlight the complex interplay between sensory processing, physiological arousal, and social touch in children with ASD and support the importance of caregiver-mediated interactions in promoting social engagement and regulation.

ABOUT THE **COVER**

This cover image presents a whole-mount view of a postnatal day 5.5 (P5.5) *Gli1-CreERT2;tdTomato* mouse skull (bone, periosteum, and dura mater) following tamoxifen induction at P3.5. GLI1-lineage cells are visualized in green (tdTomato signal), while CD31 immunostaining marks the network of vessels in red. The image reveals the spatial organization of GLI1+ cells and their relationship with CD31+ vessels across the developing cranial vault. GLI1+ cells are predominantly enriched within cranial suture regions, including the coronal, sagittal, lambdoid, and interfrontal sutures, as well as the posterior skull, particularly the interparietal bones. Furthermore, CD31+ vessels form an extensive vascular network spanning the entire skull, with larger vessels extending from posterior to anterior regions. Notably, CD31+ vessels traverse cranial sutures in bridge-like patterns, highlighting the intimate structural and spatial coupling between suture mesenchyme and the cranial vasculature during early postnatal development.

-Lu Gao, PhD

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FROM THE EDITORS

To our fellow students, faculty, and staff:

It is our honor and privilege to present to you the Eighteenth 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 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, Dr. Amy E. Merrill, 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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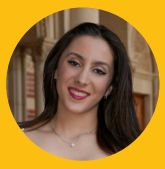
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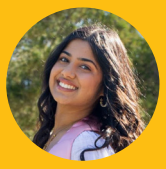
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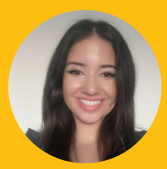
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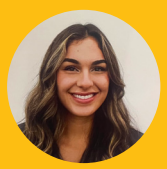
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