



Hillary Diffie
Resident Research Award
University of North Carolina at Chapel Hill

1. Short Biography

Hillary Anne Diffie, DMD, is a third-year Orthodontic Resident at the University of North Carolina at Chapel Hill, pursuing a Master of Science in Orthodontics under the mentorship of Dr. Laura Jacox. Hillary earned her BS in Biology with a Minor in Communication Studies, from the University of Florida (2014) and her DMD from the University of Alabama at Birmingham (2018). Hillary was an honored recipient of the Navy Health Professions Scholarship Program and proudly commissioned in the U.S. Navy as a dental officer in 2018. Hillary completed her Advanced Education in General Dentistry at Naval Station Norfolk, followed by a two-year tour aboard the aircraft carrier JOHN C STENNIS and a two-year tour as Division Officer of the Dam Neck Medical and Dental Facilities. She was also honored to travel with the USNS COMFORT hospital ship on a humanitarian healthcare mission to the Caribbean in 2022. Following separation from the Navy, Hillary practiced general dentistry in private practice for one year, prior to returning to UNC for residency. Hillary is a 2025 Southern Society of Orthodontics Resident Research Award recipient. At UNC, she is leading the development and clinical evaluation of *ElastoMERIT* as Principal Investigator. Upon graduation, she would love to return to UNC Orthodontics as part-time faculty, continuing to mentor the next generation of residents.

2. Description of the Project

Patient non-compliance with prescribed intraoral elastics is among the most persistent barriers to efficient orthodontic treatment, contributing to extended treatment times, increased health risks, doctor burden, and patient dissatisfaction [1,2]. Despite the demonstrated success of mobile health technology in other areas of healthcare compliance [3], no behaviorally-informed digital tool currently exists for orthodontic elastic wear. *ElastoMERIT* is a novel mobile application developed to address this gap, using an intervention mapping framework grounded in the Health Action Process Approach (HAPA) and habit formation theory. Core features include a patient-specific prescription tab, personalized daily and nightly reminders, a habit-tracking calendar with a gamified star reward system, and optional camera check-in for accountability. A parent interface supports caregiver involvement; a provider interface offers compliance trend monitoring, prescription management, and direct patient communication. The app provides objective, real-time elastic wear data, enabling earlier provider intervention and supporting honest patient self-reporting.

Aim 1 is currently underway: *ElastoMERIT* is being pre-tested with patients (N=10), parents (N=10), and providers (N=10) through structured qualitative interviews, with iterative improvements implemented until user satisfaction is reached.

Aim 2 will evaluate app efficacy in a randomized controlled trial at the UNC Graduate Orthodontics Clinic (N=100; 1:1 app vs. verbal instruction control) over four to five months, with outcomes measured at T0, T1, and T2 using quantitative occlusal measurements, weekly self-report surveys, participant interviews and app analytics. UNC's Graduate Clinic enrolls 270–290 new Phase II patients annually, ensuring robust enrollment. AAOF funding has supported the hire of an experienced app engineer and directly supports the participant incentive structure essential for retention in this longitudinal design.

3. How Orthodontic Education Will Benefit from This Award

This project advances orthodontic education on three levels. First, it introduces residents to a behavioral science approach to compliance and provides hands-on experience in clinical trial design, IRB management, qualitative research, and longitudinal data collection. Second, *ElastoMERIT* is generating the first evidence base for a mobile behavioral intervention targeting elastic compliance, with findings to be presented at national meetings and submitted for peer-reviewed publication, advancing what the specialty understands and teaches about patient adherence. Third, the application itself serves as a patient and family education tool, extending the clinical encounter beyond the chair through visual prescriptions, daily behavioral reinforcement, and caregiver engagement—a scalable, low-cost model with broad implications for compliance education across practices.

4. Why the Foundation Is Important to This Project

The AAOF Resident Research Aid Award has entirely made this thesis possible, turning a passion project into an opportunity to grow my own skills while contributing large-scale to the field of orthodontics. *ElastoMERIT* was initiated and built without industry sponsorship or federal funding. What stands today as a high impact, published app began with brainstorming sessions with my committee about what this “dream app” would look like/include. My team and I put in immeasurable effort to create a baseline app that included the functionality we desired. With the generous award of this grant from the Foundation, doors opened to high-level software support and engineering, allowing us to dream bigger and realize the full potential of what we imagined for this product and randomized trial. AAOF support is also directly funding the participant incentives that make the study statistically viable—without it, enrollment might be insufficient to achieve adequate power and generate publishable results. The funding of this project is truly an investment in the next generation of orthodontic innovation. I am deeply honored and grateful to receive this support and will be proud to carry it forward!

5. How Foundation Funding Is Expected to Benefit My Career

The AAOF award has had immediate and lasting impact on my development as an investigator. It has enabled me to conduct a properly-powered randomized control trial as a resident—an uncommon opportunity that will certainly distinguish my research experience during residency. Managing every dimension of this trial has built competencies in trial design, behavioral science,

qualitative methodology, and mobile health technology that will make me a more motivating provider, efficient clinician, stronger mentor, and a more credible academic contributor.

This project has become a platform for innovation in orthodontics. My committee and I identified a recognizable gap in patient support — an area where our field had been relying on verbal instruction alone to drive one of the most compliance-dependent aspects of treatment. Our project aims to bridge this gap. If our study with *ElastoMERIT* demonstrates that structured digital behavioral intervention can meaningfully improve patient outcomes, it could open the door to broader adoption of technology in orthodontic care — in compliance monitoring, patient communication, habit formation, and beyond. I would be so proud to help lead these important conversations as my career progresses.

Most importantly, the Foundation's investment has helped establish a research identity centered on behavioral innovation and patient-centered outcomes in orthodontics — one I intend to carry forward in the years of practice and teaching to come, in service to the specialty I love.

References

1. Kamisetty SK, et al. Elasticity in elastics — an in-vitro study. *J Int Oral Health*. 2014;6(2):96–105.
2. Moresca R. Orthodontic treatment time: can it be shortened? *Dental Press J Orthod*. 2018;23(6):90–105.
3. Li X, et al. Effect of intervention using a messaging app on compliance and duration of treatment in orthodontic patients. *Clin Oral Investig*. 2016;20:1849–1859.