

The Biomechanics Forum: Guest Editorial



BY ROBERT D. PHILLIPS, DPM

Why Is Podiatry Turning Away from Biomechanics?

We are casting away an important part of our identity.

A year ago, Dr. Jarrod Shapiro's article "Why are Podiatry School Graduates Not Grasping Biomechanics?" appeared in *Podiatry Management* (June 2021) and since that time, the conversation has been continuing robustly on *PM News*, with many DPMs posting their responses to Dr. Shapiro's essay on the lack of biomechanics understanding by resident interviewees. I am grateful and encouraged by the numerous contributions to this important discussion; and while I agree with most of the points of the various responders, I would also like to consider a few additional points that may have contributed to the ongoing hand-wringing.

When I entered podiatry school in 1976, prospective podiatry students were required to take an aptitude test to predict their success in podiatry school. Part of this test was a 3D visualization section. This part of the exam alerted students that part of the curriculum would involve being able to visualize geometric shapes and what happened when they were rotated. I'm not sure how many prospective students it might have scared away from going into podiatry; however, it did make a point that there needed to be a geometric aptitude to be a good all-around podiatrist.

Somewhere along the way, podiatry schools decided that they needed to attract more of the medical school

applicant pool. To make it easier to do so, they started accepting the MCAT, which had no section that pointed to the need to be able to visualize 3D objects rotating in space. The Podiatry Aptitude test I took was modeled more after the Dental Aptitude Test, which has both a 90-ques-

'70s, there were few such journals, and most of the biomechanical knowledge was still being published in clinical journals such as *JAPMA*. Today, very little biomechanical research is being published in *JAPMA* and *JFAS*, and most of it is in such journals as *Gait & Posture* and *Clinical Biome-*

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tion 3D visualization section as well as a 40-question quantitative reasoning section—both of which are totally missing from the MCAT.

When I entered full time teaching at one of the podiatry schools in 1987, I found that many of the applicants I interviewed over the years had taken the MCAT, but seemed to be very unaware that some degree of mechanical visualization and computation could be required of a podiatrist. It would be very interesting to give new podiatry school students a sample of questions from DAT practice exams to see what our podiatry students' aptitudes are in geometrical assessments.

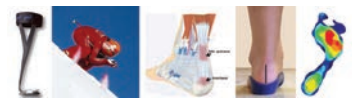
Today, there are a dozen or so journals devoted to biomechanics, and to read such, one has to have certain mathematical skills. In the 1960s and

chanics. My experience is that these biomechanical journals are not highly read by our podiatric students or residents. To read these journals does require basic trigonometric and calculus skills. I am appalled by the number in our profession today who openly profess extreme math phobia.

The idea that they might have to know what a sine or cosine is, or the definition of an integral or differential, sends them into a state of high anxiety. And now we are in a state when those who entered, taking the MCAT instead of a PCAT, are in the leadership of our educational pre-graduate and post-graduate programs, and we find the students echoing the phobias of their leaders.

It is time for the profession to

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realize that biomechanics is not a clinical science but actually a basic science that governs all animal movements, from microbes to blue whales. It governs principles of cardiac output and blood pressure. It governs the stability of being able to stand and to walk. It should be part of the basic science, not part of the clinical science part of the curriculum.

While it's impractical at this time to discontinue using the MCAT in favor of a podiatry college aptitude test, it may be possible right now to accept students into podiatry school who have taken the DAT instead of the MCAT. Schools should also start moving toward changing the pre-requisites for admission to include more mechanical and/or quantitative courses. I see nothing wrong with requiring a prerequisite course in some type of mechanical analysis—either biomechanics, basic mechanics, material analysis, etc.

Also, requiring a basic semester in calculus to help in understanding the mathematics of motion would greatly help our students and future practitioners to better communicate inter-professionally and participate in inter-professional research and symposiums in biomechanics.

A False Dichotomy

A great many practitioners today attended traditional podiatry schools which were divided into three basic departments: medicine, surgery, and biomechanics. While this may have been a way of trying to better teach students and administer the college, the end result has been disastrous in that it has created and fostered the idea that one either practices biomechanics or one practices surgery. Even in the discussions on *PM News*, I see the use of phrases that indicate people still believe that biomechanics is a non-surgical way of treating orthopedic deformities.

In the traditional school model, the people in surgery departments basically didn't do biomechanical examinations and people in biomechanics departments didn't do surgery. Dr. Leonard Levy pioneered at Des Moines University the move away from mak-

ing surgery and biomechanics different departments. With no departments, professors there were asked to teach something in any course that affected clinical practice of podiatry.

This model seems to have been furthered as other podiatry schools have become just part of larger medical schools. Unfortunately, some may interpret the lack of an actual "biomechanics" department at a school as a statement that students don't need to know biomechanics; rather than a statement that biomechanics is part of almost everything a podiatrist does. Hopefully in a de-departmentalized podiatry college, bio-

who know how to follow a patient from entering the system until there is resolution of the problem. Part of the evaluation of the patient includes an assessment of function and causes of abnormal function.

The Biomechanics Exam

Dr. Jeffrey Robbins has recently suggested that an assessment of function that produces pathology should be renamed "the pathomechanical exam." I agree totally with his suggested change in terminology. I have found that in only a few select programs is biomechanical examination pushed as the path to good surgical

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mechanics will be taught by all the podiatric faculty, including those who specialize in surgical approaches and by those who specialize in conservative approaches.

Decreased Biomechanics Teaching

There continues to be a continued push to decrease biomechanics teaching at the residency level. When ABPM and ABFAS agreed that there should be a single podiatry residency training model, ABPM dropped its MAV for biomechanical exams from 150 to 75 over the three years of training. Now, a recent proposal in the rewrite for the new CPME 320 document shows that MAVs for biomechanical exams would be decreased from 75 minimum to 50 minimum. When I pushed the head of the ad hoc rewrite committee to explain the reasoning for this decrease, the only answer was that it came from the opinions of the "community of interest."

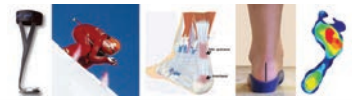
It was argued that many programs were having problems meeting the 75 number. This points to a problem that we continue to avoid addressing—we continue to push residency as a way of turning out highly competent surgical technicians instead of physicians

decision-making. How is it that we can say that it takes a minimum of 80 digital surgical procedures to make one competent to perform the needed procedures, but only 50 biomechanical exams are needed? One program that pushes more biomechanical evaluations than the minimum of 75 is that headed by Dr. Shapiro, who requires his residents to perform a minimum of 150 examinations as part of their training.

If biomechanics is the foundation upon which all musculoskeletal procedures are based, how can one justify asking a resident to perform a surgical procedure without doing the examination before? I noted recently one program where residents were being required to do all the pre-op H&Ps, yet few of these included a good biomechanical exam. Maybe it was because the H&Ps were being done in the last few minutes before the patient was rolled into the OR.

Good biomechanical examinations require time and also thought about how findings answer the question of why surgery is needed and what the result will be after surgery. The director of medical education at

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our local VA hospital recently told me that ACGME-approved programs are de-emphasizing the work load and instead are more emphasizing the evaluation and thought process that leads to making diagnosis and treatment decisions. Is that also a goal of the new CPME 320 document? My recommendation in the revised 320 regarding biomechanical examinations is that at least 50% of the biomechanical exams should be in the pre-operative evaluation of patients and another 10% be in the post-operative evaluation of patients.

Research and Publishing

Each school has specific instructors who are committed to biomechanics teaching; however, their time is so taken up between preparing and giving lectures, remediation, writing and grading tests, clinical work, and committee assignments that few have

a moment to spend in doing the research and writing the articles that are needed to improve biomechanics knowledge and applications. A few of the schools do have a biomechanics laboratory, some of them better equipped than others for doing research. One podiatry school has an extremely well-developed lab that has received a significant number of grants to do research, and has published a large number of papers in the podiatric journals and the biomechanics journals; however, it is the exception and not the rule.

Overall, how much importance does each school put on biomechanical research and publishing? I do know that a majority of the biomechanics research papers submitted to *JAPMA* come from outside the United States, and a majority of the reviewers of biomechanics papers are also outside the United States. It is evident that students are coming out of the schools, knowing more about sur-

gical principles than about the basic mechanics of how and why injuries and pain occur. If students are not understanding biomechanics principles and their application to both the surgical and non-surgical arenas with equal expertise and in the best interests of the patient, then I place the fault at the feet of the administrators and policymakers of the schools.

Have these administrators looked at how biomechanics research and publishing can be rewarded? With the number of podiatry schools now doubled from when I graduated from school, why has the number of new biomechanics texts produced by podiatrists since Root's 1977 book be counted on just a few fingers, and those not by the full-time faculty at any of the schools? The administrators and decision-makers at the schools need to re-address their missions in fostering biomechanics knowledge and research.

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Measuring and Making the Device

In the 1970s, almost all podiatrists made their own orthotics for their patients. If one wants to learn a lot of biomechanical principles, make a device, put it on the patient, have them wear it and report back on whether or not it is working. Then, if it's not working, fix it. Today, almost no podiatric graduate has any idea about the process of making an orthotic or brace or what goes into the design of it. We have turned almost all the design and fabrication over to "professional orthotic companies" with trained pedorthists and prosthetists. So many podiatrists, then, act as only the middleman in the biomechanics chain of custody.

For many years, many taught that there was only one biomechanics rule, "Take a neutral cast." Now, many clinicians don't even take the cast. I remember Dr. John Weed explaining that he felt that taking a good neutral cast was much more difficult to do than good hammertoe surgery. So many physicians today write a two or three-word prescription to their orthotists to just make orthotics for their patients with no instructions on how to take the cast nor any instructions on how to make the orthotic. Many clinicians find that if the first pair of orthotics don't work, they don't fix the problem; they just send the orthotic back to the lab or send that patient back to the orthotist, or they just say that orthotics didn't work and recommend that the patient needs surgery. How many podiatrists keep track of whether the orthotics and braces that they prescribed are still being worn by their patients one year later?

I cannot enumerate the number of patients over the years who have come to see me with a whole bag of orthotics that didn't work. Where do I start?—with the basic biomechanical examination. I have been astonished that almost every one of these patients is totally amazed that I have them lie on their stomach and pull out a measuring instrument to find simple anthropometric ranges that I can work within. If we are going

to prescribe orthotics, we've got to do more measuring and actual prescribing. It is important to remember that a science cannot exist if there is no measurement possible. I continue to be chagrined at the number of podiatrists who do not even attempt to measure either the anthropometrics or the kinematics of the patient. We see fancy offices where there are thousands of dollars of instruments in inventory for performing basic palliations, yet one is hard pressed to find a few hundred dollars of tools to measure form and function.

Prejudices Against Podiatry

The prejudices against podiatry continue to dwindle, yet many are still institutionally there. The new ICD-10 codes have one basic code for any type of abnormally pronated foot—an archaic term "pes planus." It is incredible to see ICD-10 break down so many codes for every imaginable infectious organism, and somewhat humorous for them to distinguish so many causes of injuries in the ICD-10 codes, yet the ICD-10 cannot discriminate between a pronated foot due to a rearfoot varus and a pronated foot due to a forefoot varus.

The prejudices also carry over to the procedural billing codes, most of which are CPT codes, which are owned by a self-serving professional organization, the AMA. One has to question why "non-partisan" payers of medical bills still utilize partisan coding systems. While additional HCPCs codes have been added by the government, the coding system used by the government is still a quagmire of confusion for the practitioner to understand and bill correctly.

The fact that people have had difficulty being paid for the time doing a good pathomechanical exam of the lower extremity has been frustrating for many well-meaning practitioners. Let's hope that new E&M guidelines that permit billing for time spent in examining the patient instead of just considering the number of systems examined will lead to podiatrists spending more of their time in measuring and evaluating the causes of abnormal function of their patients.

Many of the prejudices against our profession have been broken

down by those who did do surgery. By putting on surgical scrubs, they were better identified by the public and the medical center administrators as being real doctors. Because many podiatrists in the pre-1980s had their own office surgical suites, hospital administrators saw podiatrists doing surgery in their own facilities as major cash lost. So they took steps to make sure that that cash was redirected into their hospital systems.

On the other hand, arch supports are being sold in every marketing corner possible, from TV advertisements to pharmacies to department stores that will 3D print your orthotics while your shop, to mall kiosks, etc.—all of them claiming to be biomechanically sound, and few using little to any technology, and none using hands-on examination. So, if a podiatrist isn't doing surgery, will the public recognize that podiatrist as a real doctor? A recent game show had a contestant who the host recognized as being a podiatrist. The podiatrist corrected the host by noting they were a "foot surgeon." Only the mature podiatrist can feel secure in his/her self-image as a physician if he/she isn't in the operating room.

A Dearth of Lectures

While some of the big CME programs do feature some very good biomechanics lectures and speakers, many of these lectures are poorly attended, especially by the young practitioners. Currently, there is only one American podiatric conference that is devoted purely to biomechanics thoughts and it is attended only by a few hundred podiatrists. Hopefully, this will change.

Conclusion

There are many reasons, some of them deeply rooted in tradition and history, that have brought us to the concerns that today's graduates may not understand biomechanics. I welcome this invigorating discussion as everyone concerned puts their energies into solving the problem to see podiatry take the lead again in foot and lower extremity biomechanics. **PM**

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