HSHM 497: Technology in American Medicine from Leeches to Surgical Robots
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By submitting this essay, I attest that it is my own work, completed in accordance with University regulations. — Kayla Yup

SpeechEasy: a “hearing aid” for stutterer

by Kayla Yup ’25

A rhinoceros snort, a trembling upper lip distorted like a cinched leather purse, a rapid flutter of the eyelashes — this is how writers throughout history have described the physical manifestation of their stutters (Bobrick, 1995). Yet stuttering remains largely an invisible disability, revealed only in episodes of disfluency during which a stutterer’s words are trapped by an invisible barricade: an uncontrollable speech blockage. This invisibility has invited numerous theories on the scientific roots of stuttering, conceiving variable treatments. Demosthenes, born in 384 BC and regarded as the greatest orator of ancient times, had a stutter. He sought to strengthen his voice by filling his mouth with stones and then trying to speak over the roar of the ocean. In the Middle Ages, bloodletting was attempted, alongside herbal nose drops that sought to ‘dehumidify’ the brain. The roots of stuttering were so elusive that doctors of the 1800s focused exceedingly on the tongue. Prussian surgeon J.F. Dieffenbach diagnosed stutterers with a lingual cramp, and would amputate a triangular wedge from the tongue (Dieffenbach, 1841). Frenectomies were performed on tongues thought to be too heavy (Bobrick, 1995). The cause of stuttering remained a mystery into the 1900s, with stuttering sucked into Sigmund Freud’s psychoanalytic vacuum, then on considered a psychological problem brought on by childhood trauma, repressed needs, strict parenting and sibling rivalry, and therefore subject to treatments such as electric shock therapy, psychoanalysis and hypnosis. Until the true biological roots of stuttering could be detected, there was no hope for a cure.

Sometime between kindergarten and first grade, as I began to read and build my arsenal of words, I became conscious of my stutter as abnormal. In one memory, I attempted to force words out in conversation with my mother, but my face was scrunched and my speech was blocked beyond comprehension. She stopped the conversation and asked if my words were stuck. I nodded aggressively and told her that my words "won't come out." I discovered that my struggle had a name: childhood-onset fluency disorder. But I did not undergo formal therapy in childhood because my mother said that speech therapy would be expensive and probably ineffective; she rejected my fourth grade teacher's recommendation of school-based therapy because she did not want me to feel self-conscious. Traditional speech therapy commonly emphasized slowing and prolonging speech, adapting breathing to be slower and calmer. But such treatment, which usually occurred over a few weeks, such as the Precision Fluency Shaping Program developed in 1980, had a relapse rate of 30-50%, cost thousands of dollars, and caused a stutterer's speech to sound unnatural: slow and lacking melody and inflection (Stoll, 1980). I had tried YouTube speech therapy, elongating my syllables and breathing intentionally— but it never sounded like me. My personal battle with stuttering was a self-guided, experimental foray.

A stuttering disorder is invisible, able to be masked as extreme nerves, repressed emotion or a simple loss of words. While working the front counter at Chick-Fil-A, I fought against my stutter in every guest interaction, with one customer even asking if I could speak English because of how I spoke. When the time came to be trained for the drive-thru, I donned a headset and talked to a never-ending line of disembodied voices. The headset echoed with every word from my mouth, replaying my speech at a slight delay and slightly off pitch. This odd feedback, likely a defect in the cheap headset, gave me hope — somehow, I could speak fluently because of it. I immediately went home and googled this phenomenon, wondering if I had stumbled upon a breakthrough. I found that there was a device called SpeechEasy which resembled a hearing aid and cost thousands of dollars. Without insurance coverage for the device, I gave up on trying SpeechEasy and instead settled for apps that delivered delayed auditory feedback. But nothing quite worked like that headset — I wondered how access to this device could have effortlessly lifted my burden. Due to my own lack of experience with the real device, I will draw upon user testimonials throughout this piece.

What I had discovered with the headset was not new, but rather the result of decades of stuttering research that could be summed up in one device. By the mid-20th century, stuttering was found to not be psychological, but rather an inheritable condition caused by a neurological defect in the auditory feedback loop (Bobrick, 1995). The brain uses auditory feedback of one's speech, heard through the ear, to monitor and control speech production, thereby guiding sensory prediction by a person's motor system (Daliri et al., 2015). Through the auditory feedback loop, a child is naturally trained to associate sounds with the vocal movements necessary for their production. Stuttering arises when a stutterer hears their voice, but their auditory feedback loop does not properly process the information, leading to a defect in speech motor planning and execution. The issue behind stuttering lies in the ear, not the tongue.

The link between speech and hearing had been foreshadowed: stuttering is uncommon in people with deafness (Bobrick 1995). Stutterers have found that various situations can temporarily alleviate speech blockages: singing, whispering, speaking in unison, etc. Many inventors have designed anti-stuttering devices around this: in 1959, a device called Derazne Correctophone was designed to deliver a loud masking noise, similar to white noise, to stutterers through large earphones (Molt, 2005). Other altered auditory feedback (AAF) devices used delayed auditory feedback (DAF) and frequency altered feedback (FAF) to decrease stuttering.

At East Carolina University, three researchers — including stutterer Joseph Kalinowski — had studied AAF throughout the 1990s, finally patenting the design for their SpeechEasy hearing aid-style device in 1999 and selling it to the public in 2001. Marketed by Janus Development Group, the device consists of three versions: BTE, in-the-canal (ITC) and completely-in-canal (CIC), and is worn in only one ear. The device has a microphone, control unit and speaker/earphone. SpeechEasy sought to innovate by not only combining FAF and DAF, but implementing an advanced noise reduction system to field out background noise. This hearing aid-like device works by triggering the "choral effect," a phenomenon in which stutterers are generally able to speak fluently when speaking in unison with another. Similarly, the echo in my Chick-fil-A headset made it sound like another person was speaking with me.

A ScienceDaily article from 2004 details researcher Peter Ramig's finding that 25 percent to 30 percent of stutterers who had not had success with traditional speech therapy were "significantly" helped by SpeechEasy (UC Boulder Press, 2004). But Ramig also found that 20 of 55 study participants experienced minimal or no fluency enhancing effect from SpeechEasy, and the device showed a decreased effectiveness over time. A New York Times piece further quoted Ramig as saying that while adults can be significantly helped by the device, it was not a cure (Pollack, 2006). But newspaper advertisements claimed the typical "your satisfaction is 100% guaranteed" and emphasized how small and discreet the device was (Arizona Republic, 2005).

The marketing for SpeechEasy directly relates the device to hearing aids (Arizona Republic, 2005). This tactic appears to want to normalize its usage, encouraging stutterers to make the invisible, visible — no matter how tiny the device claims to be. Both stuttering and deafness are conditions which are isolating, invisible and heavily stigmatized, making the hunt for a cure more dramatic. As Virdi discusses in “Hearing Happiness,” the feel-good stories of ‘deaf people hearing for the first time’ gloss over real struggles with adjustment, therapy challenges, and extreme costs associated with treatment (Virdi, 2020). Virdi stated that the price of one aid ranged from $2000 to $8000. SpeechEasy also comes at a steep price, with one aid sold at between $2500 to $4500 (SpeechEasy, 2018). Usually, neither are covered by medical insurance — unless you are a child looking for hearing aids. Further, the effectiveness of both are not uniform in their target populations. Stuttering and deafness have their respective spectrums, some people having more severe cases than others.

A competing patent by Thomas Kehoe in 2003 included user testimonials that described SpeechEasy as creating a “buzzing whirl of confusion” in noisy environments due to the omnidirectional microphone (Kehoe, 2003). Both of the cited users described having to frequently take out their SpeechEasy devices due to this background noise issue. Some hearing-impaired people similarly have declined to wear an aid after growing tired of the “cacophony drumming into their ears” (Virdi, 2020). Virdi described months of agonizing migraines as her brain adjusted to the digital sounds, and being able to hear conversations down the street but not the person standing right next to her. Likewise, one SpeechEasy user review said “a lot of conditioning” was required to use the device, which “essentially tries to trick the motor system” (SpeechEasy, 2018). While I only donned the drive-thru headset for a few hours, I had practiced with DAF mobile apps, and no matter how helpful they were, I could not stand always having another voice in my head for too long. SpeechEasy and hearing aids are meant to force the ear to hear differently than it naturally does — for both, chronic, daily usage can create a cacophony of noise that sacrifices comfort for assimilation.

SpeechEasy piggybacked on the developmental journey of hearing aids from an ear trumpet to the miniaturized digital options currently on the market. Both SpeechEasy and the latest hearing aid models are designed to be inconspicuous, and follow a long history of quack cures. Desmothenes' mouth full of stones mirrors Virdi's finding of airplane diving as a past suggestion for treatment for deafness (Virdi, 2020). While the stigmatization of disabilities in general encourages the discreet design of chronically used medical devices, stuttering and deafness are both conditions for which treatment can allow a person to 'pass' as normal. Virdi mentioned how people comment that she speaks "really well for a deaf person" (Virdi, 2020). Similarly, following years of practice and improvement, people have said that they cannot tell I have a stutter. In the broader history of normalcy, as deaf people have grappled with the insult 'what are you, deaf?,' stutterers face the 'did I stutter?' analogue. It is no wonder that hearing aids and SpeechEasy ads would emphasize the inconspicuous nature of the devices — both communities have hunted for cures for centuries in hopes of achieving a function that comes naturally to others. But these devices are not cures. Hearing aids for people with deafness can only amplify sounds, not restore hearing; SpeechEasy can only alter one's auditory feedback, it cannot fix a defect in the stutterer's auditory processing loop. Neither can fix a person's biology, they merely attach to the ear. When SpeechEasy is not in use, the fluency-enhancing effect does not carry over (Howell, 2004). The stutterer resets. When the hearing aid comes off, a person with deafness is once again back to their normal level of hearing. Neither device promises longevity.

Despite these similarities, the devices remain different at their core. Miniature ear trumpets were popular in the 1930s, preceded by even earlier variations of this acoustic aid (Virdi, 2020). Hearing aids are more normalized than SpeechEasy. While hearing aids are now offered over-the-counter, AAF anti-stuttering devices remain relatively unknown, even to a stutterer like myself. While hearing aids have become a primary tool for people with deafness, SpeechEasy is never the first treatment to be recommended, speech therapy is. While daily users of SpeechEasy risk eventually adapting to and growing resistant to its fluency-enhancing effects, hearing aids should promise the same amplifying effects unless a person's hearing diminishes independently of the device. But stutterers also have situations where fluency can momentarily be achieved naturally, such as while singing, whereas people with deafness usually cannot naturally acquire perfect hearing.

Both devices are merely temporary solutions for permanent conditions. They allow the user to return to their normal state, and come to terms with the absence of a perfect cure. With the headphones donned, my speech had been fluent and effortless — it was liberating. But it still could not compare to the freedom I felt in conversation with other stutterers. Together we would finally relax, and allow stuttering to slip back into our speech, letting go of the self-consciousness required for anti-stuttering techniques. To always be conscious of one's voice — even if it achieves fluency — will never feel fully natural. I understand why Virdi would sometimes prefer to take out her hearing aids and return to her quiet world. After devouring user testimonials of other stutterers' successes and failures with SpeechEasy, I no longer regret not acquiring one. Truth is, medical technology can be exhausting and usually not worth the glorification it attracts. The arduous quest for a cure will not end with SpeechEasy, and that no longer pains me.

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