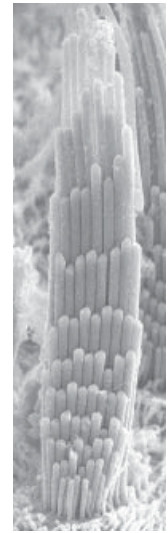


Why Does Grandpa Ignore Grandma? A Case Study in Hearing Loss

by

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Scanning electron micrographs showing a human sensory hair cell (left) and a hair bundle (right).

Part I—Introduction

Carla Marie Jackson, a first semester graduate student in Audiology, was having difficulty staying awake in her early afternoon class. “I knew I shouldn’t have eaten such a big lunch,” she thought to herself as her head jerked up for the third time in the past 15 minutes. She glanced at the clock and groaned when she realized 45 minutes still remained in the period—Professor Wilson would take every bit of that, plus more! Her mind began to drift to the upcoming spring break that would begin next week, when suddenly something Professor Wilson said took her back to an experience she had while visiting her grandparents the previous Christmas.

Carla was named for her maternal grandparents, Carl and Marie Wojahowski. She loved them both dearly even though there couldn’t have been two more different people in the world. Grandpa Carl was a calm and loving man who spent his working career as an auto mechanic in the small northeastern Wisconsin town of Marinette. Grandma Marie was a 5-foot-1-inch ball of fire with a high-pitched shrill voice who always wanted to accomplish more than was physically possible in a day. The only time she relaxed was when she slept. Grandma and Grandpa lived eight miles west of town in a two-story house with a wrap-around porch on a 160-acre farm. Carla’s mother, Kathy, the youngest of Carl and Marie’s six children, had married Bob Jackson, who she met in college, and they had raised their family 12 hours away in St. Louis. Carla was the oldest of their five children.

Many of Carla’s favorite childhood memories were of times she spent on the farm in the summers and at Christmas. She loved sitting on the porch with Grandpa Carl and working with him in his garden and orchard. He had tremendous patience with her as he showed her how to till the soil and care for the plants. She also loved working with Grandma Marie in the kitchen, although the pace and intensity was much greater than working with Grandpa in the yard. Preparing Christmas dinners was hectic as Grandma barked orders for six hours. Everything had to be perfect and if she did something wrong Grandma was “on her case” immediately. Carla smiled to herself when Grandma’s shrill voice cut the air, “Didn’t I tell you to cut those potatoes a quarter inch thick!” Grandma always meant well. She just got too excited, Carla always reminded herself. Besides, Grandma didn’t yell at her nearly as much as she yelled at Grandpa.

Professor Wilson now had Carla’s attention as he discussed age related problems affecting the auditory system. Carla thought back to a specific event the previous Christmas as she and her Mom prepared dinner under the watchful eye of Grandma Marie while Grandpa Carl and her Dad sat in the living room

watching the Green Bay Packers play the Chicago Bears on TV. Carla almost laughed out loud in class as she remembered the situation.

Grandma Marie: Daddy, would you take the garbage out to the trash can?

Grandpa Carl (*not responding to Grandma*): Wow, Bob, did you see that play? I don't think he caught the ball! I bet this one will be challenged.

Grandma Marie (*her voice a bit more shrill*): Daddy, I told you to take the garbage out to the trash can! Now get out of that chair and do it!

Grandpa Carl (*still does not respond*)

Grandma Marie (*turning to Carla*): He never listens to me! Every time I tell him to do something he just ignores me!

Carla: I don't think he can hear you, Grandma. He's pretty far away and the TV is going.

Grandma Marie (*comes into the living room, behind Grandpa Carl, trying to remain calm*): Daddy, I asked you to take the garbage out to the trash can. Now please get out of that chair and do it.

Grandpa Carl (*noticing Grandma, turns around, then turns and looks at Bob with a confused expression on his face*)

Bob (*calmly*): She would like you to take the garbage to the trash can.

Grandpa Carl: Oh, OK. (*he gets up and heads to the kitchen to get the garbage*)

Grandma Marie (*now furious, screaming at Grandpa*): You'll listen to him, but you won't listen to me! I don't know why I have put up with you for the past 54 years!

Grandpa Carl (*calmly heads to the kitchen to get the garbage, confused by Grandma's frustration*)

Questions

1. What is the general purpose of the sensory nervous system and the specific purpose of the auditory system?
2. Trace the path of sound from the outer ear to interpretation by the brain, detailing what happens at each step in the pathway.
3. What are the environmental factors that might have prevented Grandpa Carl from hearing Grandma Marie?
4. Why was Bob able to hear Grandma Marie when Grandpa Carl could not.

Part II—The Check-Up

After thinking about the information provided by Professor Wilson in class Carla decided to go to Wisconsin during spring break and take Grandpa Carl, who was now 84, to an audiologist to look into his condition. She knew she might have some trouble with Grandma Marie because she was not at all convinced that Grandpa had anything wrong with him. In her mind, Grandpa just did not pay attention to her when she was talking to him. Carla remembered her mother suggesting to Grandma at Christmas that she take Grandpa to a doctor to check his hearing. “He doesn’t have any hearing problems. He just won’t listen to me. Selective hearing loss is what I call it. Besides, doctors never really do anything for you other than tell you what you already know and take your money; I have no use for them,” Grandma had said.

Carla called her mother and told her what she had discovered in class and that she would like to take Grandpa Carl to an audiologist to see if there was anything they could do for him. Kathy knew her mother would have difficulty with her father going to the doctor, but after 48 years she had learned how to handle her mother. “You set up an appointment for Grandpa and I’ll deal with your grandmother, but whatever you do, don’t tell either of them what we are up to,” she told Carla.

Two days later Carla and her mother were making the trip north to the farm and house they both loved. They arrived late on Saturday evening and within an hour Kathy had the fireplace blazing. While Grandpa stared at the fire, mother, daughter, and granddaughter had a wonderful conversation catching up on all that had happened since they were together at Christmas.

“Mom, could you take me over to Menominee to see the place where you grew up and to visit Grandma and Grandpa’s graves?” Kathy asked her mother at breakfast on Wednesday morning. “Carla has some studying to do and I know Dad likes to take a late morning nap so I thought maybe we could spend the day together retracing my heritage.”

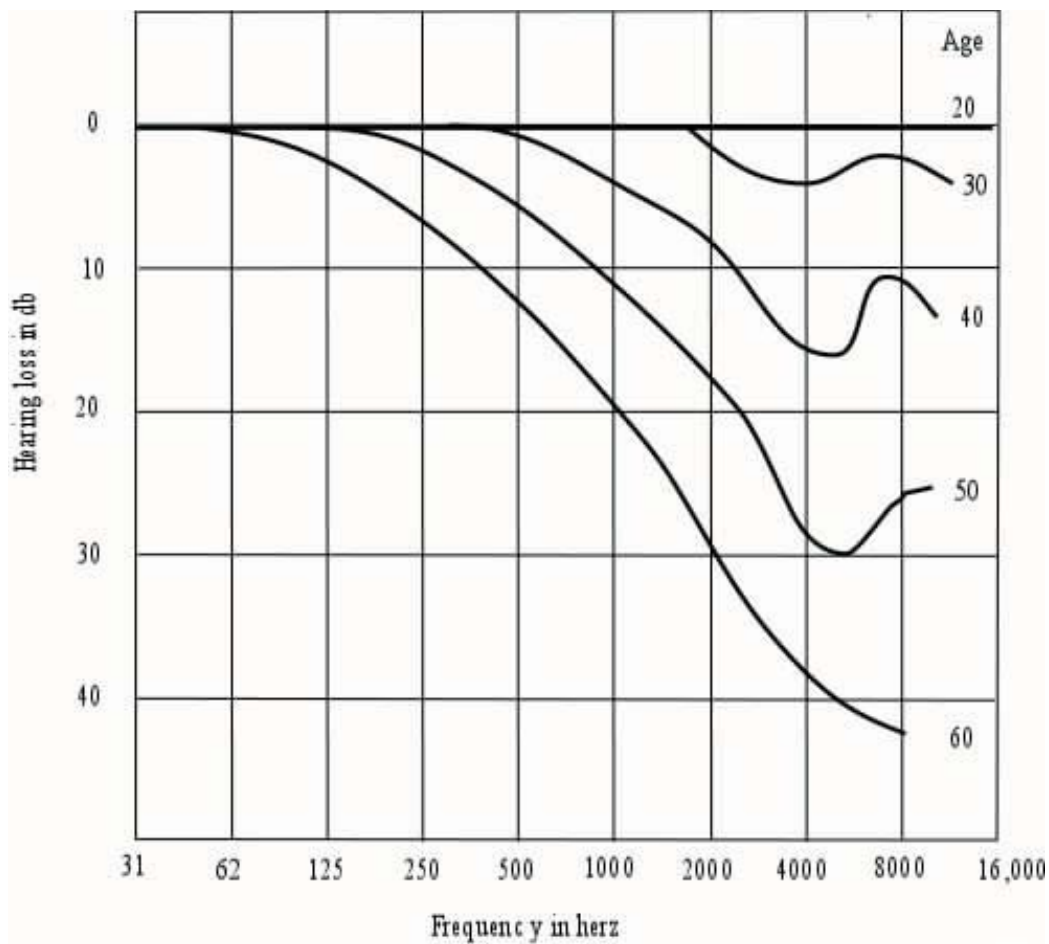
“I would love to, Kathy, you were always my sentimental child,” her mother responded. “Have a productive study time,” Kathy said, winking at Carla as she and Grandma headed out the door.

Thirty minutes later Carla found Grandpa sitting on the porch reading the morning paper. “Let’s go for a ride, Grandpa,” she said, “I have someone I would like you to meet. I think you’ll like her.”

Carla took her grandfather to Dr. Susan Dlugopolski, an audiologist in Marinette who had recently graduated from the University of Wisconsin—Madison and come back to the town where she had grown up. Grandpa Carl had worked with Susan’s grandfather at the Chrysler dealership in Marinette for 37 years and, while Grandpa and Susan did not know each other well, her outgoing and friendly demeanor immediately put him at ease.

For the next 30 minutes Susan carefully explained to Grandpa Carl and Carla that there were a number of things that could contribute to hearing loss as an individual ages, a condition known as presbycusis. Carla listened intently to her explanations, asked many questions, and learned as much in half an hour as she had all semester long in class. Like many people she always learned more when she could put facts into some context, and this experience with her grandfather provided a wonderful learning opportunity.

Following some testing, Susan informed both Grandpa Carl and Carla that she found significant hearing loss, but she did not find significant metabolic dysfunction in the cochlea, nor did she find significant dysfunction of the auditory nerve. To illustrate some of the main points of their discussion, Susan showed Carla and Grandpa Carl the following chart.



Questions

1. Provide a precise definition of presbycusis and identify the classic types of the disorder.
2. What do the data suggest might be the likely cause of Grandpa Carl's hearing problems?
3. What are the physiological mechanisms that might lead to this hearing loss?
4. What, if any, possible treatments could improve Grandpa Carl's hearing?

Source Information for Graph: Redrawn with minor updates by David R. Hill, Prof. Emeritus, University of Calgary. Versions of this diagram appear in several places across the decades. You will find it in the 9th edition of *Best & Taylor's Physiological Basis of Medical Practice* (The Williams & Wilkins Co., Baltimore, 1973—J.R. Brobeck editor, page 8–36). They attribute it to J.C.R. Licklider's chapter in S.S. Steven's book *Handbook of Experimental Psychology* (John Wiley: New York 1951, page 997). Licklider attributes it to C.T. Morgan's *Physiological Psychology* (McGraw-Hill: New York 1943) "after Bunch, 1929" (Bunch, CC, "Age variations in Auditory Acuity," *Arch. Otolaryng.* 1929, Vol 9, pages 620–623).

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