

Kakenhi and Me
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When I was approached to write a short essay with the title “Kakenhi and Me,” I wasn’t sure at first whether to accept. But when I looked back on my research life as a member of the university faculty, and reflected on how essential the support of Grants-in-Aid for Scientific Research had been in allowing me to continue my research, I decided to accept as a small way of paying back a little of what I have received over the course of my career. Another factor was nostalgia. My first personal experience of the power and importance of Grants-in-Aid for Scientific Research (Kakenhi) was during my time in graduate school as a master’s and later Ph.D. student in the late 1970s and early 1980s. I witnessed the entire process in the research lab to which I belonged, from the initial applications to using allocated funding after approval, all the way to the final reports. For the first time in a long while I remembered the anxiety we all felt when applying for Kakenhi grants more than 30 years ago, and the rush of relief when an application was approved. So this opportunity to look back and remember my younger days was another thing I gained from the invitation to contribute this short essay.

During my time as a graduate student my research looked at the perception of pitch in normal children and hearing-impaired children, and tried to establish the Difference Limen of Frequency (DLF) for various stimulus sounds in childhood. For this purpose, I needed to have apparatus that would produce the appropriate range of sounds under controlled conditions. But in those days computers that could control an entire experiment were still huge and lacked portability and I had to carry out my experiments by making my own apparatus.

I was working in those days in the laboratory of Shizuo Hiki, then an assistant professor in the Research Institute of Electrical Communication at Tohoku University. The first step in conducting my experiments was to build the apparatus that could produce the stimulus sounds, under Professor Hiki’s instruction. By combining synchroscope sweep circuits and control signal selection circuits that could provide a wide range of control voltages to function generators, I was

eventually able to complete an apparatus that allowed me to select the fundamental frequencies of the standard and comparative tones, the amount of change in these fundamental frequencies, the direction of change (up or down), the duration of the signal, the pause time for a response, and to switch between simple tones and a variety of complex tones, all by setting a dial.

My field of study was psychology and I had zero knowledge about electrical engineering. But Professor Hiki was very strict and was always teaching me to do things myself and not to rely on other people. It took me much longer to put together assemble the apparatus than the other engineering students in the same laboratory. But I am grateful now for this experience, which played a crucial part in helping me to establish the foundations of my later life as a researcher. All this research was carried out with support from Kakenhi grants, and I was extremely lucky to obtain such considerable benefits.

After gaining a position at Tokyo Gakugei University based on these experiences, I continued to teach the graduate students in my lab to plan for the future and took care to guide them about the proper way to apply for Kakenhi grants. Sometimes I would stay up all night in discussions with them based on my own application materials. When they graduated and took up their first positions as university faculty or researchers, it was when they got in touch to tell me they had been approved for large Kakenhi grants that I knew they were now ready to stand on their own feet.

When I took up my position at Tokyo Gakugei University, there was almost no experimental research being done in Japan on speech perception and language development among newborn babies. This line of research required me to find out about auditory development in babies shortly after birth, and I started a series of perception experiments on newborn infants based on sucking reactions. Sucking refers to the motion of babies' mouths when they suck on their mother's milk or a bottle. The sucking response of newborn babies changes in response to auditory stimuli, and this is reflected in the frequency of the sucking-response. I was therefore able to use sucking frequency as a parameter to evaluate the auditory perception ability of newborns, including such factors as their ability to distinguish human speech, and particularly their ability to distinguish the prosodic feature of the mother language from that of other languages. This gives babies the ability to

distinguish sounds that do not exist in the phonological system of Japanese or any other given language, and therefore to distinguish between linguistic and non-linguistic sounds.

I tried various methods of measuring frequency of sucking, but eventually settled on using a sensor to measure the changes in the air pressure (waveform) within an empty nursing bottle. Connecting this to a computer and measuring the peak of waveform made it possible to measure the frequency of sucking accurately. Considerable investments of time and money were required not only for the apparatus for measuring sucking frequency, but also for the computers, which were nothing like as advanced as they are today, that I used to digitize analogue data and display sucking frequency per minute as a graph. Again, it was support from Kakenhi grants that made this research possible.

One difficulty was to find the newborn babies to help with our research. In this respect I received great help from the doctors at the National Children's Hospital (now the National Center for Child Health and Development) and at the ear, nose, and throat department of Kyorin University Hospital. My second son came to the university almost on a daily basis starting from when he was just 11 days old to help with my research.

The results of this research started to attract the attention of researchers in medicine and cognitive psychology, and I was added as a researcher to the team on a Grant-in-Aid for Scientific Research for Priority Areas project led by Professor Shigeru Kiritani at the Faculty of Medicine of the University of Tokyo. The project received a generous funding allocation each year, and I was also fortunate to have the opportunity to study experimental methodology under Professor P. Kuhl at the University of Washington at Seattle, then one of the world's best-known figures in the field of speech perception in infants.

Later our relationship with the University of Washington developed to the point where we carried out joint research projects, and we were able to receive instruction and advice about experiments from Professor P. Kuhl and her staff for around a month at Tokyo Gakugei University, helping with setting up experiment facilities and other matters. One of the most important things we gained from this series of experiments was the wide network of contacts we built up with research

institutions not just in Japan but around the world. Even after the project funded by Kakenhi ended, these connections continued and we maintain a relationship of one type or another to this day with many of the members of that team, including Professor Shozo Kojima and Assistant Professor Nobuo Masataka of the Kyoto University Primate Research Institute, Professor Morio Kono of the Kobe City University of Foreign Languages, Professor Seiji Niimi and Assistant Professor Satoshi Imaizumi of the Faculty of Medicine of the University of Tokyo.

When I first took up my position at Tokyo Gakugei University relatively few members of the faculty applied for Kakenhi funding and preparing the application materials was a cumbersome process. Today, however, in the context of declining Management Expenses Grants for national universities, faculty are actively encouraged to secure outside funding, and the university holds seminars to explain the process of applying. As a result of this, in fiscal 2015 Tokyo Gakugei University was in eleventh place out of the 30 top-ranked institutions by approvals for new research projects (and in third place among national universities). I hope that all our faculty will make sure that the graduate students they teach understand from an early stage in their careers the importance of Kakenhi and how grateful we should all be that such a system exists. It is my hope that in this way the practice of using Kakenhi funding to carry our scientific research forward will be passed on to the next generation.