A Comparison of Japan's Newborn Hearing Screening Process to the State of Indiana Early Hearing Detection and Intervention Program

An Honors Thesis (HONR 499)

By

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Abstract

Healthcare is important in all societies. That includes hearing healthcare. This paper focuses on Newborn Hearing Screening, comparing screening, and follow-up procedures in Japan and the United States. Literature review and the expert knowledge and opinions of Japanese physicians were used as primary sources of information about screening practices in Japan. The Indiana Early Hearing Detection and Intervention program was used as a model of Newborn Hearing Screening practices in the United States. Additionally, the role of audiologists as hearing healthcare providers was explored. Findings suggest that audiologists do not play a primary role in Newborn Hearing Screenings or follow-up diagnostic evaluations in Japan. Also, Newborn Hearing Screening is not yet "universal" in Japan, whereas 98% of all infants are screened for hearing loss at birth in the United States.
Acknowledgements

First and foremost, I must thank Dr. Lauren Shaffer for accepting the role of project advisor for my senior thesis. I can’t express how grateful I am to her for patiently helping me work through different thesis ideas, as well as guiding me through the research and writing processes. Dr. Shaffer offered a lot of her time to help me through this project; without her guidance, I wouldn’t be as happy as I am with the final product. Thank you so much!

I must also send thanks to my friends and associates abroad and across the country. Masayo-san, you are the reason I was able to learn more about audiology in Japan in the first place; without your kindness and assistance, this project wouldn’t have been possible. I am so grateful to have met you. For helping me despite your busy schedule, thank you so very much!

The same goes for my friend, Nana – I was really in a bind until you agreed to help me. I can’t thank you enough for taking the time to contact the professionals whose input was necessary for my project. You were preoccupied with your own life, yet you still offered your hand, and for that I am truly grateful.

Also, to Keisuke, even though you couldn’t continue your aid with this project, I appreciate you taking the time to translate my questionnaire. That was an invaluable step in getting the information needed to complete this project. For all the time you spent on it, I can’t thank you enough.

Most importantly, the information about Japan’s Newborn Hearing Screenings couldn’t have been attained without the help of Dr. Mizuho Goto, Dr. Hideyuki Yamashita, and Dr. Yukina Ito. As working professionals, they took the time out of their busy days to answer the questionnaire for my project, and for that, I am terribly grateful. I’ve learned so much from them and am driven to learn even more.

Finally, to my family, thank you for always supporting me. Your encouragement and never-ending desire to help me succeed is why my passion for the Japanese culture and audiology flourished into what it is now. Through this project, let me show you what all your love and support has done for me! Thank you with all my heart!!!
INTRODUCTION

I've studied Japanese language and culture during my four years in college; audiology became my second major starting the summer before my sophomore year. During undergraduate study, I dedicated my time equally between the two, furthering my passions for each, though I've long desired to combine them in some manner. I've wondered how the profession and practice of audiology might differ between the United States and Japan. Therefore, for my senior thesis, I decided to investigate one aspect of audiology and how it might be implemented in both American and Japanese societies.

I was initially drawn to audiology by a sudden revelation, that hearing well is essential for learning written and spoken language, as well as for understanding and communicating with others. Although I have had a passion for learning other languages, I had never before considered the impact hearing could have on language learning. This impact is, of course, greatest in the first years of life during the critical language period. For this reason, I've chosen to compare newborn hearing screening practices in the United States and Japan.

The American Speech Language Hearing Association best states the importance of Newborn Hearing Screenings (NHS):

“Eighty percent (80%) of a child’s ability to learn speech, language and related cognitive skills is established by the time the child is thirty-six months of age, and hearing is vitally important to the healthy development of such language skills....[NHS allows for] appropriate screening and identification of newborns and Infants with hearing loss, [which will] facilitate early intervention and treatment in the critical time period for language development, and may therefore serve the public purposes of promoting the healthy development of children” (Model Universal..., n.d.).
If hearing is so vital to society, then newborn screenings and follow-up should be a top priority, in developed nations. Universal NHS began developing in the United States in the mid-1990s. Today, all states have a NHS program. This paper will compare the NHS procedures of the State of Indiana Early Hearing Detection and Intervention (EHDI) Program to the NHS practices in Japan. The Indiana EHDI program was chosen because it was among the early-established programs in the U.S. and because it has well developed screening, diagnostic follow-up and intervention procedures.

METHODS

A list of questions was developed to serve as a basis for comparing NHS practices in the U.S. and Japan. A literature search was undertaken to identify sources of information on NHS in both countries. Information provided in this paper about U.S. practice generally and the Indiana EHDI program specifically will come from the Indiana EHDI Program guidelines (n.d.; 2010; Shaffer, 2013), ASHA, and the Center for Disease Control unless otherwise indicated.

A search of various databases, revealed little research or information about NHS practices in Japan, and no information directly comparing Japanese and U.S. practices. To obtain expert information on Japanese NHS practices, health professionals were contacted in Japan. Three professionals were identified – two otolaryngologists and one pediatrician. These individuals were contacted through e-mail. For their convenience, questions were organized into a questionnaire, which was also translated into Japanese by an associate at a Japanese university. These questions did not ask
for detailed responses; they addressed general procedures for NHS and follow-up. Questions regarding their opinions about the field of audiology in Japan were also included. Their responses, along with the information gathered on NHS in Indiana, were organized into a table for comparison. This table and the questionnaire can be found in the appendix.

RESULTS AND DISCUSSION

Reviewing the collected data, it appears that hospital newborn hearing screening procedures in both the U.S. and Japan are very similar. In both countries, NHS are performed by nurses in hospitals around 1-3 days after birth (2-4 days in Japan, 1-3 days in the U.S.). Auditory Brainstem Responses (ABRs) and Otoacoustic Emissions (OAEs) are the most common methods of screening; in Japan, the ABR is the primary screener. Screening levels for normal hearing is around 40dB and below, while the frequency range varies slightly: 700-5000Hz in Japan and 500-4000Hz in Indiana.

Data for failed screen (REFER) and follow-up guidelines begin to show differences in procedures. While both Japan and Indiana try to perform the first hearing screening 1-3 days after birth for normal neonates, the rescreen for a REFER neonate in Japan is typically performed 1-2 days after the first screen, whereas Indiana attempts to rescreen a first REFER after 12 hours if OAEs have been used as the screening method and after just a few hours if ABR has been used. If there is a second REFER of a Japanese neonate, the goal time frame for another screening is around 1 month; should that infant still be considered as having "abnormal" hearing, then he/she will finally be referred to a specialized otolaryngologist. In the state of Indiana, should a
neonate fail the second screening, he/she is immediately referred to an audiologist for a full evaluation, which should be completed before 1 month of age. The procedure for premature neonates in the intensive care unit for both cultures is generally the same, except that the Japanese typically begin the NHS for preterm infants at around 36 weeks gestational age, while Indiana waits only 34 weeks.

Follow-up procedures, again, show similarities in process but differ in one specific area: the overseeing specialist. In the U.S., audiologists are the primary evaluators, diagnosers, assessors, and habilitators for hearing loss. Once they perform a full evaluation on a referred infant, if he/she is diagnosed with a hearing loss, the audiologist will oversee all aspects of care provided to the infant and his/her family. Other caregivers such as family physicians/pediatricians, speech pathologists, psychologists, and other early intervention professionals make up the team of professionals who oversee and provide necessary care for hearing impaired (HI) children in both Japan and America.

If an infant in Japan fails the newborn hearing screening, the doctor refers the family to an otolaryngologist (an ear, nose, throat doctor or ENT). It is the ENT who does the evaluation, assessment, and gives a diagnosis. The ENT is responsible for all counseling and follow-ups. In the U.S., otolaryngologists do play a significant role in assessing and diagnosing the etiology of the hearing loss and providing any necessary medical intervention. However, audiologists are the primary overseers for habilitation of hearing impaired children, not ENTs. The reason for this societal difference is speculative but, as will be discussed later, the profession of audiology serves a different role in Japanese society.
Procedures may appear to be similar, though implementation is one of the major differences between NHS in Japan versus America. For instance, every state in America is required to screen newborns; by 2005, the number of infants screened was 95%, and by 2013, it increased to 98% (Shaffer, 2013). In Japan, a country of 47 prefectures (equivalent to states in America), only 15 local governments required newborn hearing screenings in 2005 (Tsuchiya et. al., 2006); as of 2012, around 60% of infants were screened (Kansai et. al., 2012), while a 2014 estimate gave a range of 70-90% (personal communication, 2014). These statistics suggest that universal screening lags slightly behind the U.S. in its development.

A study published in 2008 by Fukushima et. al. showed that in addition to how few prefectures are involved in universal newborn hearing screenings (UNHS), there are some other reasons why the NHS rate is so low. Based in Okayama Prefecture, the first reason is that a significant number of infants are born through satogaeri bunben. Satogaeri Bunben is a Japanese tradition in which a mother returns to her family home to receive parental support for before, during, and after delivery. Lasting from 32-35 gestational weeks, as well as a couple months after birth, the movement of the mother from her own home to her parents' home makes tracking the newborn for rescreens or follow-ups difficult, which is why this tradition may in fact contribute to the low NHS rate. Fukushima et. al. also pointed out that gynecological clinics in Japan, while more numerous, are also much smaller [than in the United States].

So it appears that the practice of satogaeri bunben, combined with numerous small clinics and less financial support creates challenges for universal implementation and thorough follow-up of newborn hearing screenings in Japan. Two studies on NHS
in Japan recognize the need for universal newborn hearing screenings in Japan, emphasizing that “it is vital to expand this program” (Tsuchiya et al., 2006) and “expansion of NHS programs to other prefectures all over Japan may help solve” the problem of poor screening rates in Japan (Fukushima et al., 2008).

The efficiency of NHS in Japan and the U.S. is one way the procedures differ in these countries. The other notable difference is with how they perform follow-ups. The first area of concern lies with the overseeing professional who performs the full hearing evaluation, and follows through with assessment, diagnosis, and necessary treatment/habilitation. In the U.S., the ones responsible for this are audiologists, hearing specialists. An excerpt from ASHA’s 2007 Position Statement on early hearing detection and intervention lists the responsibilities of the American audiologist:

“They provide newborn hearing screening program development, management, quality assessment, service coordination and referral for audiologic diagnosis, and audiologic treatment and management. For the follow-up component, audiologists provide comprehensive audiologic diagnostic assessment to confirm the existence of the hearing loss, ensure that parents understand the significance of the hearing loss, evaluate the infant for candidacy for amplification and other sensory devices and assistive technology, and ensure prompt referral to early intervention programs. For the treatment and management component, audiologists provide timely fitting and monitoring of amplification,” (JCIH, 2007).

In Japan, the professionals given the same responsibilities as U.S. audiologists are the ENTs. Ironically, audiologists – hearing specialists – “are not well known in Japan,” where they “lack the recognition of audiologists” (personal communication, 2014). If they contribute to the team of specialists established to support a hearing impaired newborn, it would only be in habilitation, which is something a speech pathologist would
already be doing. In the U.S. there is division of labor between the audiologist, who is the hearing specialist and the otolaryngologist, who is the ear (nose and throat) medical specialist. In Japan, the otolaryngologist may be qualified for all of these responsibilities. More efficiency might be achieved by having professionals who specialize in hearing take primary responsibility for NHS and follow-up. However because this study did not address the training of audiologists in Japan, it is not known whether or not diagnostic hearing evaluation is included in Japan's audiology training programs.

A study of early intervention for the hearing impaired in Japan did emphasize that with "more than 60% of newborn infants currently receiv[ing] UNHS in Japan, the establishment of a robust system for the post-hearing screening period is required.... One possible way to achieve this goal is to enhance the existing health checkup system for 18-month-old infants and 36-month-old toddlers" (Kansai et. al., 2012). Whether or not a lack of audiologists is the main issue, it may still contribute to the low screening rate. As previously noted, the follow-up screens and evaluations for potential hearing impaired infants are not very strict, thus the reason for Kansai et. al.'s concern. There is the possibility that increasing the number of overseeing audiologists could also improve screening and checkup procedures because these specialists would have the lone responsibility. Unlike otolaryngologists, who must attend to three different areas of practice and then must also preside over the care given to hearing impaired children, audiologists in Japan currently have little variation in responsibilities. Should they take over for otolaryngologists as primary evaluators, diagnosers, and habilitators of hearing loss, there may be a chance that the rate of screenings would increase, that more stringent procedures would be implemented, that the rate of follow-through would
increase, and that more hearing impaired children will be given necessary care and support at younger ages.

After researching the differing NHS procedures in Japan and the United States, many questions remain. Why is the profession of audiology in Japan so different from in the U.S.? How do audiology training programs differ between the societies? Could there be a cultural element that has lead to the professions developing so differently? What is the Japanese attitude towards hearing loss and the profession of audiology, and how has that impacted advancements in newborn hearing screenings, hearing evaluations, and re/habilitation? The current research has distinguished practice differences in the early hearing detection and intervention programs of the two countries, but has not identified the underlying causes of these differences.

As someone who admires and respects both Japanese culture and audiology, I hope to continue research in this area. Specifically, I hope to investigate Japanese newborn hearing screening procedures in more depth. Additionally I hope to study cultural influences on the development of the profession of audiology so that I may better understand how the same field and related programs could develop to have such different societal roles.
Works Cited


# Comparison of Newborn Hearing Process

## Appendix

### I. Table comparing information on Newborn Hearing Screenings in Japan to those in the state of Indiana

<table>
<thead>
<tr>
<th>Questions pertaining to NHS</th>
<th>Japan</th>
<th>Indiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where are NHS done?</td>
<td>hospitals</td>
<td>hospitals</td>
</tr>
<tr>
<td>When are NHS done?</td>
<td>2-4 days after birth</td>
<td>1-3 days after birth</td>
</tr>
<tr>
<td>Who usually performs NHS?</td>
<td>nurses</td>
<td>nurses**</td>
</tr>
<tr>
<td>What equipment is used to screen?</td>
<td>ABR* most often, OAEs** in small hospitals</td>
<td>OAEs and ABRs</td>
</tr>
<tr>
<td>What is the range for normal hearing used for screening?</td>
<td>35-40dB, 700-5000Hz (ABR)</td>
<td>30-40dB*, 500-4000Hz</td>
</tr>
<tr>
<td>What is the general procedure for NHS?</td>
<td>normal neonates: ABR or OAE at 2-4 days old, repeat screen after 1-2 days following a REFER, repeat at 1 month old if another REFER, then send to specialized ENT center if continues to be abnormal premature (NICU): same procedure, except will begin after neonate is 36 weeks gestational age***</td>
<td>normal neonates: ABR or OAE at 2-3 days old, repeat screen after 12 hours for OAE or several hours for ABR following a REFER, send to audiologist for full evaluation before 1 month old if continues to be abnormal premature (NICU): Automated ABR only, may be done after neonate is 34 weeks gestational age**</td>
</tr>
<tr>
<td>If identified as having hearing within normal range, what procedures follow?</td>
<td>must have passed ABR and OAE at 35-40dB; should see a doctor for regular follow-up after a few months</td>
<td>those passing who identified as high risk should have follow-ups with an audiologist every 6 months until 3 years old; for PASS and low risk, recommended yearly hearing evaluations (like yearly health check-up)</td>
</tr>
<tr>
<td>If identified as having hearing loss, what procedures follow?</td>
<td>attending doctor refers infant to a facility that specializes in early support; team consists of pediatric otolaryngologist in charge of counseling and follow-ups, speech pathologist/therapist, public health nurse, and clinical psychologist; parents are also referred to support groups/counseling</td>
<td>attending doctor refers infant to audiologist who will oversee evaluation, diagnosis, assessment, and necessary treatment/habilitation; team will also consist of family physician/pediatrician, otolaryngologist, speech pathologist, early intervention professionals, and care coordinator; parents will also be referred to support groups/counseling</td>
</tr>
<tr>
<td>Who performs the full hearing evaluation?</td>
<td>pediatric otolaryngologist, at a facility designated by the Oto-Rhino-Laryngologist Society of Japan</td>
<td>Audiologists, at Level I Diagnostic Facilities</td>
</tr>
<tr>
<td>What tests are done?</td>
<td>behavioral observation audiometry, tympanometry, conditioned orientation reflex audiometry, ABR, OAE</td>
<td>visual reinforcement audiometry &amp; conditioning play audiometry (behavioral observation audiometry), ABR, OAE, acoustic immitance (high frequency tympanometry &amp; acoustic reflex threshold testing)</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Questions pertaining to the field of Audiology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What role do audiologists play in society?</td>
<td>primarily audiological rehabilitation</td>
<td>audioligic diagnosis, identification, assessment, nonmedical and nonsurgical treatment (i.e amplification devices, habilitation)</td>
</tr>
<tr>
<td>Where do they work?</td>
<td>mostly specialized hospitals (i.e. children's hospital or university hospital)</td>
<td>private practice, ENT practice, hospitals, university clinics, schools, military, etc</td>
</tr>
<tr>
<td>Are audiologists considered the primary evaluators, diagnosers, and rehabilitators of hearing loss?</td>
<td>no; otolaryngologists and speech therapists are</td>
<td>yes, as well as otolaryngologists (evaluating and diagnosing) and speech therapists (identification of loss and rehabilitation)</td>
</tr>
</tbody>
</table>

*Automated Brainstem Response
**Otoacoustic Emissions
***age during pregnancy
^30dB (American Speech), 40dB (Shaffer, 2013)

** some of this data could not be found within Indiana EHDI guidelines and, thus, was taken from Tennessee Newborn Hearing guidelines (2009)
II. Questionnaire used when interviewing Japanese professionals on Newborn Hearing Screenings in Japan

*Original English Questions by Cynda Harris*

Questions about NHS in Japan:

1. Where are NHS done?
   (a) In hospitals?
   (b) At otolaryngologists' practices?
   (c) Somewhere else?

2. When are NHS done? (How many hours/days after birth?)

3. Who usually performs the NHS?
   (a) Audiologist?
   (b) Doctor?
   (c) Nurse?
   (d) Otolaryngologist?
   (e) Someone else?

4. What equipment is used to screen?
   (a) ABR?
   (b) OAEs?
   (c) Both?
   (d) Something else?

5. What is the range for normal hearing used for screening?
   (a) Below 20dB?
   (b) Below 15dB?
   (c) At what frequencies? (may depend on equipment used to screen)

6. In detailed summary, what is the general procedure for NHS?
   (a) (Q 1-5)
   (b) For normal neonates? Pass/Refer procedure?
   (c) For NICU neonates? Pass/Refer procedure?

7. If referred, in detailed summary, what’s the general process for a full hearing evaluation?
   (a) Who does it? (e.g. audiologist?)
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(b) Where is it done? (e.g. hospital?)
(c) What tests are done? (e.g. tympanogram? pure tone audiometry?)
(d) If identified as having hearing within normal range, what is further procedure?
   ① What is considered “normal range” in Japan?
(e) If identified as having hearing loss, what procedures follow?
   ① What does the evaluator do for the parents/baby?
   ② What steps will be taken to address the hearing loss?
   ③ Strategies for improved hearing?
   ④ Amplification?
   ⑤ What?

Questions about Audiology in Japan
1. What role do “audiologists” play in Japanese society?
2. What is their education/training/certification?
3. Where do they work?
   (a) Hospitals?
   (b) Private practice?
   (c) Etc.
4. Audiologists in America are the primary evaluators, diagnosers, and rehabilitators of hearing loss – is it the same for audiologists in Japan?
   (a) If they aren’t as common for the above roles, who is/are?
5. What is your opinion towards hearing loss/impairment and the field of audiology?
   (a) What is the Japanese attitude towards hearing loss and the role of audiologists in Japan?
   (b) What is the Japanese attitude towards hearing science and re/habilitation?
日本における新生児聴覚スクリーニング(NHS)対アメリカ(特にインディアナ)

日本におけるNHSについての質問
1. どこで行われていますか？
   (a) 病院
   (b) 耳鼻咽喉科医の診療所
   (c) その他

2. いつ行われていますか？(出生後何日／何時間)

3. 一般的にNHSを行うのは誰ですか？
   (a) 聴覚学者
   (b) 医師
   (c) 看護師
   (d) 耳鼻咽喉科医
   (e) その他

4. スクリーニンにはどの器具が使われていますか？
   (a) ABR
   (b) OAEs
   (c) a, b両方
   (d) その他

5. 通常スクリーニング時の領域は何dbぐらいですか？また、周波数はどのくらいですか？(器具によって異なると思いますが、...)
   (a) 20db以下 周波数
   (b) 15db以下 周波数

6. NHSはどの順番で行われていますか？
   (a) Q 1-5と同じ
   (b) 一般の新生児の場合は？
   (c) 集中治療室にいる新生児の場合は？

7. 聴覚判断のための一般的なプロセスは？
   (a) 誰が行いますか？
   (b) どこで行われていますか？
   (c) どのような検査を行なっていますか？
   (d) 聴力が標準であると分かったら、その後どのような手順を踏みますか？
   また日本での標準領域は、どのくらいだと考えられていますか？
   (e) 耳が聞こえないと分かった場合、どのような手順を踏みますか？
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またその際、検査を行った人が両親、新生児に、どのようなことをしますか？
耳が聞こえないことに対処するためどのようなステップを踏みますか？(例、聴力が良くなるように方法を考えるなど)

日本における聴覚学についての質問
1. 日本の社会では聴覚学者はどのような役割を担っていますか？

2. 聴覚学者はどのような教育や訓練を受け、どのような資格を持っていますか？

3. 聴覚学者はどこで働いていますか？
(a) 病院
(b) 個人の診療所
(c) その他

4. アメリカでは聴覚学者が耳が聞こえない人の初期の検査や診断をしたり、リハビリを行っています。一日本の聴覚学者も同じことをしていますか？
(a) 上記と同じでない場合、誰がその役割を担っていますか？

5. 耳が聞こえないこと、耳の機能障害、聴覚学の分野に対してどのような意見をお持ちですか？
(a) 日本人は耳が聞こえないことや日本での聴覚学者の役割についてどのように考えていますか？
(b) また日本人はヒアリングサイエンスやリハビリについてどのように考えていますか？