

Public Lecture

Psychological Fundamentals in Studies on Science for Human Services¹⁾

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I. Introduction

The purpose of this lecture (this article) is to tell many students who are studying or will study the science for human services that they must always make efforts to have varieties of scientific knowledge about not only the basic research methods but also empirical findings in various fields of human sciences including the psychology and that the studies in this field must be made from the perspective of the living environment around us. If you students always try to do so, I believe that you could surely contribute to development of academic researches in the field of human services in near future and these results might be accepted to be practically useful and reliable knowledge by many people.

First of all, I would like to say that this lecture covers only a restricted scope of the studies on human services and cannot provide any topics of higher order for many attendant scholars who will make presentations of their project studies after my talk, because I would like to state only some opinions regarding the studies for human services from such a point of view as an old experimental psychologist in a field of the psychonomic science. Now, setting aside these excuses, I would like to introduce the words of Dr. Nagata Toyoomi, the former president of Ritsumeikan University (the present chairman), saying “Applied studies cannot exist without basic studies and interdisciplinary studies cannot exist without specialized studies of a major field.” I cannot remember in what context he made this remark, but I think it was well spoken and thus it is unforgettable for me, even now. Although I have no intention of concluding this lecture before it even begins, the words of Dr. Nagata are like concluding remarks of my lecture.

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- 1) This paper is the modified and corrected record of the special lecture in the Mid-term Reporting Session for the Ritsumeikan University Open Symposium on “The Establishment of Clinical Human Science” held on March 23, 2007. The subject of the lecture on that day was “Applied Human Science and Basic Psychology”. The subject of this article, however, was changed based on its contents, originally published in Ritsumeikan Journal of Human Sciences, No. 15, 157-168 (2007).
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II. Professional Practice supported by the Knowledge of Basic Science

The project studies that are presented today

in this open symposium have the vast scope of contents and they are summarized as the subject "The Establishment of Clinical Human Science." Thus I would like to speak about what I remember in terms of the "clinical" field. Ten years ago, in July 1997, the Ritsumeikan University Saturday Lecture Series was held under the theme "The Basics and Application of Psychology" (No. 2393-96) and four professors of this university were appointed as lecturers. I took on the task of a facilitator and as part of the task, I wrote an essay in "Letters on the Saturday Lectures" (No. 250), the leaflet used in the Lecture Series. While seeking permission from readers in advance to state my opinions in a rather unorthodox and provocative manner, the essay I wrote in my own words was to introduce part of the article which was written by Dr. Imada Hiroshi, the former president of Kwansei Gakuin University (a professor of psychology at that time), in the special issue entitled "Psychology Education and the Training of Specialists in Psychology in Universities" of *The Japanese Psychological Review* published in the previous year (1996, Vol.39, No.1). In this article, he discussed on what form the education of psychology should take especially for would-be professional practitioners of clinical or consulting psychology from perspective of basic psychology, while being based on the North American model (Boulder Model).

What I wrote at that time will be summarized by the following three points: 1) The practitioners of psychology should be above all specialists of it, 2) the specialists of psychology should be scientists that have a

high level of competence for study and complete knowledge as the foundation of the study, and therefore 3) those who intend to study psychology, no matter whether it is practice-oriented or scholarship-oriented, should equally start both from the basic study of psychology as a science and from the training of techniques and methods for the study thereof. As Dr. Imada is an authority on the academic world and has steadily fostered many professional practitioners of psychology as well as many scholars, his suggestions are much more convincing. Since then, of course, the times and conditions have changed. After much discussion, it is said that a new consensus has been formed on the education and training program for the professional practice of psychology in the United States, but the foundation of the consensus is ultimately "practice on a scientific basis." Applied, practical or clinical approaches in psychology couldn't have been materialized without the accumulation of knowledge based on methodologies deserving of the name of science, as well as flexible and intellectual treatments for individual cases.

Here I dare to say additionally, without fear of being misunderstood, about an article entitled "Should psychology be scientific?" in *Ritsumeikan Journal of Human Sciences* (2004, No.10). When I found this title and until I read through it, I felt something was very wrong with this article. The article, I remember, dealt with what should be meant by "scientific" in psychological researches, in particular the deep consideration of "psychological measurement" from the perspective of qualitative psychology. I still

had a negative impression even after reading through the entire article, because I think that “measurement” should still be indispensable for psychology and even qualitative psychology couldn’t be viable without the mental work of “measurement,” irrespective of its level. As many predecessors have pointed out, it is not a stretch to say that psychology as an empiric science has always faced the issue of the measurement of mental activities since its emergence.

In the prefatory note of the latest issue of *Psychology World* (2007, No. 36), the informational magazine of the Japanese Psychological Association, the essay titled “The Conditions of Psychology” written by my honored friend in the academic community, Dr. Nakatani Kazuo (a former professor of University of Tokyo), was published, referring to the “Identity of Those Who Pursue Studies.” In a brief outline of the essay he said, *“In the past, electrical engineering education began with soldering and medical education with the practice of dissection of a human body. Perhaps not for soldering in the field of electrical engineering today, but in the medical science, where technologies have drastically developed and advanced, there is recognition that the practice of dissection is still indispensable for establishing the identity of the world of medical science and it is the foundation for medical education still today. Then, what about psychology? Actually, psychology doesn’t have anything similar. If I dare say that psychology also has its own similar foundation, it may be the practice of psychological experiments.”* Speaking of the department of

psychology at Ritsumeikan University, courses in basic experimental practice and special experimental practice are compulsory for second year and third year students, respectively. This is perhaps because there is a common understanding that experimental practice must be essential for psychology education. As Dr. Nakatani pointed out, the experimental practice in psychology is not as intensive as the practice of dissection, but through the practice of psychological experiments, students can learn the research method, data processing and how to write a report. Dr. Nakatani has arrived at the conclusion, as someone who has long dealt with education and the study of psychology, that *“experimental practice would lead to the restructuring of a wide scope of basic knowledge or imperfect knowledge in psychology that has always been accepted as common sense, and as a result it might be a very important moment for forming the mentality of majoring in psychology as science”* and therefore *“we need to provide as many experimental practices in psychology education as possible.”*

For the knowledge of psychology, general objectivity must be assured. There are many specific methods of measurements and evaluations for accumulating such knowledge based on the principles of scientific methodologies. As psychology deals with flesh and blood people, it may be inevitable that it has some limitations on its application to actual individual cases. I think, however, that experimental practice would provide opportunities for understanding such limitations and fostering insight into them. Of

course, those who are actually involved in the professional practice or the applied study of psychology will rarely encounter what they experienced in the laboratory, and there will be few cases where they can handle actual cases directly by the use of knowledge learned in the laboratory. In spite of this, I think that the mentality of not accepting any vagueness in understanding and/or actions as a professional is considerably attributable to appropriate psychology education at an early stage. That is to say that the applied study is based on fundamental study and the professional practice is based on fundamental scientific knowledge.

I have mentioned the education and study of psychology up to now. In the science for human services, which has a wide scope of subjects for education and study, there may be the diversity of uniqueness in the kinds of knowledge that should be targeted, as well as the methods used for collecting them. Nevertheless, the principle of education and the study of the science for human services shouldn't be different from that of psychology.

III. Function as a Social Illuminator of Knowledge

This article is titled "Psychological Fundamentals" and I have mentioned the importance of fundamental knowledge as noted above. Now let me make this clear for the readers of this article because the title of my talk at that time was "Applied Human Science and Basic Psychology" as footnoted in the first page. The "Fundamentals" don't

refer to knowledge only in so-called "Basic Psychology" in the sense of psychonomic science, which is recognized as one area of psychology, but refer a variety of basic knowledge of psychology for understanding the mental processes and the actions of human being scientifically, in other words, "Fundamentals for how to understand things" which is common to all areas of psychology.

If fundamental knowledge is not taught, what kind of misunderstandings might happen? Let me talk about simple examples. When a chart indicating the measured values of changes in the weight of a human brain due to aging since birth shows a slightly jerky line of increases and decreases, rather than a smooth line of gradual increases, could it be interpreted as demonstrating that the weight of the human brain both increases and decreases in the growth process? As another example, I actually know someone who interpreted the cross-sectional data, not the longitudinal data, of the life-span development of people's height to mean that the height of people decreases by more than ten centimeters as they grow older. This is a very simple example and anyone can soon find that it is a misunderstanding. For slightly more complicated data, however, there may be the fear of a significant misunderstanding without sufficient knowledge of the methods and/or the data processing. Quite some time ago, I was surprised at an essay written by an educator referring to the changes in the weight of a person's brain as "The number of brain cells increases at a faster rate only in the first few years after his or her birth and therefore it is important not to miss this

opportunity for providing early education to children during this period.” Not to dismiss the effectiveness of early education, this misunderstanding is caused by not knowing the fact that there is no relation between the change in the weight of brain and the number of brain cells (the number of human brain cells is presumed to decrease by no less than several tens of thousands a day) or caused by a lack of accurate knowledge. As such examples are likely to be often seen in our society, I hope that those who work in practical fields as professional practitioners are social illuminators of accurate knowledge and therefore they should have a wide range of basic and scientific knowledge.

On February 8, 2007, the Asahi Shinbun newspaper reported on a product purported to improve one’s memory by making use of a certain kind of hypersonic, super-high frequency sounds. Why did such unreliable product get in news? This reminds me of “*Aruaru Daijiten II*,” the TV program that became famous for its fabricated contents in the past. True or not, when we record the activity of the human brain (EEG) while they are functioning to remember something, the record of EEG might be similar to that when super-high frequency sound is applied to them. Regarding the news, two scientists studying super-high frequency sound, Dr. Ohashi Tsutomu (Foundation for Advancement of International Science) and Dr. Honda Manabu (National Institution of Neuroscience) immediately made negative comments in the same section of the paper. Every scientist, however, doesn’t always have a clear conscience. Pretending to be scientific, too

much unreliable information emerged or was used intentionally around us. In actual fact, such unreliable and/or false information, with a cause-and-effect relation that cannot be proven, are too numerous to mention. More than 10 years ago, Dr. Ohashi talked at ATR (Advanced Telecommunications Research Institute International) that the voice of Matsutoya Yumi, whose songs are very popular, contained some components of super-high frequency beyond 20,000Hz unlike ordinary people. He said that such voice components might function something that moves the hearts of people emotionally, even though they cannot be heard as sounds. If I dare to connect what he suggested with the aforementioned effect of improving one’s memory, super-high frequency sound may enrich the minds of people and stabilize their feelings, which might lead to such improvements in human memory. We must be careful not to be misled by unreliable rumor.

Data fabrication driven by ambition has long been reported, even in the world of pure natural science. Much more in the world of proclaiming applicative and practical effects, there are possibly some scientists who are involved in delivering false information while skillfully avoiding criticism. By the way, Dr. Yoro Takeshi recently wrote an essay for the magazine “*Bungei Shunju*,” saying “most books on childcare contain falsehoods that offer justification after the fact.” Some people may say that those who believe in such falsehoods are to be blamed, but most ordinary people in today’s mass communication society don’t have any insight into the truth or falsehood or the advantages or disadvantages

of excessive information. Those who are involved in education and the practice of human services as professionals, or at least those who are involved in psychology as a profession, should play a role in ascertaining the facts amidst the overflow of information and also providing them properly, if necessary. In this sense, I think that those who intend to study the science for human services are expected to develop both basic and scientific knowledge and also to take on the role of enlightening our society.

IV. Human Services—Issues Familiar to Everyone

I have used the words “Science for Human Services” without thinking much about their meaning until now, but I actually don’t know their precise definition. Since the word “Services” is used, the study and practical activities for human services should target many kinds of immediate and direct supportive activities derived from love for others (altruism), including such activities as extending a helping hand to someone around us, making donations for indirectly contributing to the lives of those who need help, improving our living environment for such people and so on. On the other hand, it must be recognized that the activities for human services should also include support and environmental development for the general public, not being limited to only that mentioned above. That is to say, the subjects of science for human services include issues of contributing to the quality of life (QOL) of

everyone in the general public, i.e., all living people, not being limited to only those who need help. The scope of the education, study and practical activities of the science for human services is very wide. Its issues are not only for a certain minority.

This makes sense when we think of the issues surrounding the concept of “barrier-free,” which is one of the topics of the report on the project studies to be given here later. Ten years ago, Mr. Mano Tetsuo (then the assistant chief editor of “Tenji Mainichi”) wrote an article on the concept of barrier-free in a journal of IATSS (*International Association of Traffic and Safety Science*) (1997, Vol.23, No.1). In summary, he said the following: *“Talking about barrier-free, the word “barrier” immediately reminds us of physical barriers in machines and devices, architecture and the urban environment, etc. In addition to those, however, psychological barriers exist in our minds and attitudes, as do social barriers in various systems and programs. To really achieve a barrier-free society, it is indispensable to make every effort to remove every kind of barrier concurrently. An environment that is easy for the handicapped and the elderly to use is really a barrier-free living environment that is easy for anyone to use and live in.”* Saying again, human services are issues related to the QOL of everyone, not being limited to a minority.

It is difficult to solve the problems in our living environment, however. Please let me introduce one example here. In the NHK TV program “Close-up Gendai,” which was broadcast in Feb. 2, 2007, the topic of pedestrian accidents caused by bicycles was

brought up. The program introduced the case of Oita City, in which bicycles and pedestrians on sidewalks were separated on a trial basis by differentiating the heights of the sidewalks in order to prevent such accidents. While the idea might have seemed like a good one, unexpected complaints were made against the idea by residents. They complained that it would put pedestrians at risk because the bicycles would increase their speed. Ultimately, the idea of an exclusive lane for bicycles wasn't accepted. This TV program also introduced a test in Nagoya City that decided to use the sidewalk on one side of the road for pedestrians and the other sidewalk on the other side of the road for bicycles during certain time periods throughout the day. As a matter of course, most pedestrians don't require any particular help. It must be natural for the elderly and the handicapped to feel fear more deeply while walking along a sidewalk.

In Kyoto City, as you may know, exclusive lanes for bicycles have been introduced on some sidewalks. Some people who saw the lanes might have thought that they were strange. The lanes for bicycles are set on the road side of the sidewalks by differentiating the color of the pavement and rough sketches of bicycles and arrows are drawn on the lanes. To my surprise, the lanes are set with no consideration for bus stops. They go straight through the feet of those who are waiting for the bus, without any signs urging bicycle riders to detour or dismount from their bicycles. Although I cannot suggest any proposals for improvement here because I haven't conducted any research or observed

the actual conditions of the lanes by using the appropriate methods, I conjecture that bicycle riders and other pedestrians as well as those who are waiting for the bus may be puzzled differently as to the conditions. Several years ago, I have researched the actual conditions of wheelchair ramps constructed in public facilities in Kyoto City together with graduate students. Results showed that many wheelchair ramps at public facilities in Kyoto City were not appropriate for the handicapped (Article was published in *Ritsumeikan Journal of Human Sciences*, No. 3, 2002). As I pointed out in the article, only enacting regulations, setting exclusive lanes and constructing ramps for mere appearance' sake are insufficient for achieving a barrier-free society.

Saying in addition, the situations where issues surrounding barriers are most talked about are probably related to the structures of stations, bus stops and roads. I heard that the Road Structure Ordinance in Japan was partially revised in 1993 and barrier-free measures for wheelchair users were clearly stated. While I don't have full knowledge of the ordinance, let me explain the revision partially. Roads in Japan are classified by class and grade. The minimum width of the pedestrian/bicycle lane in 1st and 2nd Grade Class 4 roads, the space that is commonly used by pedestrian traffic and bicycle traffic, was decided as 4m and in case of this lane, the width for bicycles was set at 2m and the width for pedestrians was set at 2m. For 3rd and 4th Grade Class 4 roads, the minimum width was decided as 3m including 2m for pedestrians. I heard that the width of the lane

for pedestrians was set by taking into consideration the passing of two wheelchairs coming from opposite directions. Even in the case of sidewalks 2m in minimum width, which have no room for setting a lane exclusively for bicycles, a structure enabling the passing of two wheelchairs coming from opposite directions was required. Not only the width of the lane, but also many other rules, including lowering sidewalks at crossings to the level of the roadway, were implemented. Other than by constructing new roads, guaranteeing the barrier-free requirements imposed by the ordinance might be actually impossible in old cities like Kyoto. I hope somebody will research the actual state of barriers in the living environment of Kyoto City. By the way, riding a bicycle on a narrow sidewalk without a "Bicycles Allowed" sign is a violation of the Road Traffic Law. The bad behavior of bicycle riders, including passing through a sidewalk that is too narrow for people to even avoid brushing against each other as if they were lording it over the sidewalk, is too much to tolerate. Moreover, news of malicious accidents that have lead to the arrest of bicycle riders who have hurt pedestrians has been broadcast of late.

I have mentioned very familiar examples of the concept of barrier-free. Indeed, I think that the science for human services must be considered from the perspective of the daily living environment. To make some proposals for barrier-free environment, however, it is important to follow the procedures for accumulating knowledge, i.e., looking around our living environment to find the point of issue, carefully observing similar conditions to

review the identified problems or if necessary, sometimes investigating the problems under experimentally controlled conditions, and then applying the results obtained from observation or experiment to the actual life scenes for verifying the propriety and/or adequacy of the knowledge. Only through these procedures, as I mentioned before, the knowledge with objectivity and public reliance can be obtained. While it might be important to speculate the issues familiar to our living environment idealistically at a desk and to discuss them with full consideration, what is produced only through speculation and consideration is not appropriate for psychology, no matter how plausible the insistence and suggestions may be.

V. Examples of Hardness of Hearing and Sound Environment

I might have emphasized my opinion too strongly. Still, I would like to raise some issues by mentioning some specific examples seen in our everyday lives in order to encourage young students to be interested in studying human services. First, let me talk about sound and the ears.

A few years ago, a newspaper carried an article about a bone conduction mobile phone that would soon be released by KDDI, writing that it was very good for the elderly who might be hard of hearing. While the effect of bone conduction may have been scientifically proven, some people might doubt that the release of such a mobile phone was really good news for the elderly. Since the developed

equipment is a result of careful verification on an empirical basis, it may be wrong to doubt it, but yet I think it is important to make a habit of doubting. Actually, hardness of hearing (hearing loss) is categorized into two large classes in terms of causes in the middle ear (conductive hearing loss) and the inner ear (sensory hearing loss). I have heard that hearing loss due to aging is caused by impaired receptors (hair cells) of Corti's organ within the cochlea of the inner ear. I have also heard that an ordinary hearing aid can be expected to improve the hearing ability of those who have conductive hearing loss, while its effect on sensory hearing loss is limited. Although hearing loss may be caused by both types of hearing loss mentioned above, I haven't seen detailed data of how effectively vibrations directly transmitted to the inner ear via bone conduction can improve hearing loss nor do I have any data of how widely the bone conduction mobile phones has been used. Bone conduction mobile phones may be useful when people with normal hearing abilities use them in a noisy environment, but I have never heard whether that is true or not.

Speaking of hearing aids, the device for hearing-impaired persons, it is estimated that the number of habitual users is much smaller than that of the number of hearing aids sold. Research carried out by the industry has revealed that 400,000 to 500,000 hearing aids are sold each year, while the number of habitual users is said to be less than 1,500,000 at the most. I wonder why those who wear hearing aids are far fewer than those who bought them. Is this because hearing aids are

not very effective for age-related hearing loss? Is there difficulty in fitting them? Only troublesome in wearing them? Or are there any other reasons?

Now, noise-induced hearing loss is another type of hearing loss. Noise-induced hearing loss is caused by an impaired nervous system within the cochlea of the inner ear (acoustic trauma), being damaged by exposure to loud noise. Usually the hearing loss by sound exposure occurs temporarily at first and then gradually becomes chronic. Typical noise-induced hearing loss includes industrial hearing loss, for which workers in noisy environments such as subway drivers and aircraft mechanics, as well as individuals who are involved in the processing of plate metal or woodworking, should be careful. Apart from occupations, sound environments harmful to the ears can often be found in our everyday lives. Many people, who wear earphones while commuting to or from the office or school, as well as rock concert lovers, may be at risk of becoming hearing-impaired. Loud noise at rock concerts is well over 100 decibels and the period of tolerance to these noisy sounds is said to be no more than 7 minutes. Even noises that are not obtrusive, such as from household appliances including vacuum cleaners and those heard on the street or in a car, may cause temporary hearing loss if people are exposed to them continuously for a long time. Unfortunately, the adaptation of the human ear to the loudness of sounds is quick and extreme, and therefore people don't realize the adverse effects of noisy sounds. There is a possibility that irreversible chronic hearing loss has

already occurred before they become aware of it. This should be avoided. The reason why I talk about these examples is that enlightening the general public about these harmful living environments should be expected as one of the roles of the science for human services.

If the science for human services actually has the important role of enlightening people, I hope it is supported by the fundamental knowledge of psychology at the minimum. I have mentioned hearing loss and used the word “decibel” here. No matter how well decibel (dB) is understood as the unit indicating the intensity of sound and also the unit indicating the result of a hearing test or a noise meter on a street corner, it would be insufficient if those who have roles to be enlightening the general public don’t know the meaning and nature of the unit. Although it may be unnecessary for scholars here, I would like to explain decibel briefly. The difference in the intensity of sounds means the magnitude of the sound pressure (amplitude of sound wave temporally changing in units of micropascals) and sound pressure corresponds to the amount of sound energy passing a given surface perpendicular to the direction of the sound passing it at a given instant in time. A decibel is originally a dimensionless unit expressing the ratio of two amounts of sound energy. A bel is a logarithmic unit of the ratio and a decibel is 10 times a bel. Since the ratio alone cannot be used as a unit, the energy of minimum audible sound (threshold of hearing) is used for the denominator of the ratio as a specified reference level. Thus the intensity of other

arbitrary amounts of sound energy (the numerator of the ratio) is physically defined. As the amount of sound energy is proportional to the square of the sound pressure, the intensity of the sound can be expressed in decibels as a sound pressure level (dB_{SPL}) by multiplying the logarithm of the sound pressure ratio by 20.

Allow me to explain further. The intensity of minimum audible sound (threshold of hearing in dB) significantly varies according to the frequency of sound wave (the pitch of the sound) expressed in Hertz (Hz). For example, most young people are sensible to 10dB sound of 1000Hz (pure tone) but do not detect even 30dB sound of 100Hz. Another matter of importance is that the dB value defining the physical intensity of sound differs from the dB value used in hearing test. The dB value in the case “The hearing level for 4000Hz sound is 20dB” is not the physical intensity of the 4000Hz sound heard but the level of the hearing loss, i.e., the sound that cannot be heard unless it is 20dB stronger than the dB value of the minimum audible sound of someone with normal hearing. In this case, declaration such as “The hearing loss of 4000Hz sound is 20dB” would be easier to understand intuitively. In hearing test, the hearing level (hearing loss) is measured at seven stages of frequencies from 125Hz to 8000Hz using a JIS audiometer and the results are plotted on the prescribed form (audiogram), from which the predisposition of hearing loss can be inferred.

On the other hand, the dB values expressing the noise level in our living environment are different in meaning, both from those

expressing the physical intensity of sound and those expressing the results of a hearing test. In the past, noise was measured in phon, but now it is expressed in dB. I would like to explain a little about this. Whether or not sounds can be heard by the human ear differs depending on their frequencies, even if the sounds have the same physical intensity. Even if the sound can be heard, its subjective loudness at one's ear also differs significantly depending on the frequency. For example, when the physical intensity is 40dB, a sound of 50Hz cannot be heard while that of 200Hz can be heard as a faint sound and that of 1000Hz can be fully heard as a loud sound. Half a century ago, sounds subjectively perceived to be the same loudness were examined at various intensity levels in a wide range of frequencies and the results were plotted on a graph that indicated physical intensity on the vertical axis and frequency on the horizontal axis. Thus, the equal loudness contours were measured. Naturally, it is desirable that the equal loudness contours should be reflected in expressing the levels of noise our ears hear. For this purpose, a measuring instrument into which the correction circuit for the equal loudness contours was electrically integrated was created and for unit expressing the levels of noise, the dB value of physical intensity for 1000Hz sound was used. That instrument is the JIS sound level meter. That is to say, the dB value indicating the levels of noise (loudness of noise) is the one measured by the JIS sound level meter.

The more important matter is that, while the equal loudness contours are reflected in

the sound level meter, the high and low dB values measured by the meter mean only the order of the sound loudness, not a psychological scale calibrated at even intervals. A noise of 20dB is louder than that of 10dB, but is not heard twice as loudly as that of 10dB. The subjective loudness of the sound of 60dB is neither twice as much as that of 30dB, nor half of 120dB. That's why a psychological measure is necessary. Half a century ago, S.S. Stevens proposed the psychological scale of loudness named "sone scale." By the way, the relation between sone (S) and loudness (P) was approximately formularized as $\log_{10} S = 0.03 (P - 40)$, in which 40dB loudness is assumed to be 1 sone. When the sound increases in increments of 10dB from 30dB to 70dB, the approximate loudness of sound perceived by the ear increases in geometric progression from 0.5 sone to 1 sone, 2 sone, 4 sone and 10 sone, respectively. I hear that sone scale has been adopted by the ISO, but it hasn't been widely used yet. When we think of the living environment contributing to the QOL of everybody, it is important to look at things from the perspective of psychological measurement.

In relation to the aforementioned items, I will show an everyday example. Today in Japan, local government ordinances against the noise have been enacted in many cities and the maximum noise, for example, is set for both the day and night separately, such as 55dB and 45dB in a residential district, 65dB and 55dB in a commercial district and 70dB and 60dB in an industrial district. This may lead to significant misunderstandings, however, unless the difference between the

physical measurement and the psychological measurement is understood. As you can see by the explanation of the sone scale above, decreasing noise by 10 dB at night doesn't mean decreasing it slightly, but means that noise in the living environment at night should be half of that in the daytime. The increase of noise from 120dB to 130dB because of the beginning of jumbo jet flights is significantly different from a price increase of 10 yen from 120 yen to 130 yen.

Some of what I have mentioned above has also been written in *Basic Psychology for the "Perceptually Insufficient"*, which I published in February, 2007. When we want to contribute to the QOL of everybody as a theme, it is very important to consider and understand things from a psychological perspective and therefore it is necessary to establish intellectual sophistication as a base for teaching knowledge to the general public. This isn't limited to issues on noise mentioned above.

VI. Examples Related to Visual Dysfunction

I have mentioned before that situations where issues surrounding barriers are brought up in our living environment almost relate to the structures of stations, bus stops and roads, and illustrated that point by way of the example of pedestrian, wheelchair and bicycle lanes set on sidewalks. Roads and stations are of course often used by visually-impaired persons, the number of which is estimated to be around 350,000 in Japan. Such visually-impaired persons often have accidents while walking and we often hear

about them falling from platforms in stations. I remember Mr. Ozeki Ikuzo, who was a blind person and received the Asahi Award as one of the developers of a Braille typewriter. When he was involved in my joint research for another issue around 40 years ago, he said that he was afraid of steep drops in the road level especially in days when it snowed, since there is little sound reverberation which helps visually-impaired people to sense their surroundings.

Almost every day, you can see line-mounted blocks (indicating the walking direction) and dot-mounted blocks (providing warnings and indicating positions) for visually-impaired persons on roads and in stations. I don't know the grounds for the present standards, the reasons for where they were installed or how they are used by visually-impaired persons because I have never researched such matters. Nevertheless, I don't think it is best to walk on the line blocks foot by foot. If the actual situation is investigated, further improvement would be expected, especially for how to lay sidewalks with line-blocks. I hear that there is a voice sign guidance system using with those blocks, however, it may be difficult to bring it into wide use for now. So, I'd like to recommend a reexamination of those blocks for visually-impaired persons once again.

Speaking of Braille characters, perhaps you have seen the indoor guide plates with Braille characters on walls. Although sighted persons cannot read the characters with their fingers, such plates are installed in the elevators and near the doors of the lavatories in our university. Fortunately, I have never found

any that don't take the alignment effect into account, but it may be necessary to investigate those in public buildings and streets in our living environment whether or not they are relevantly installed for visually-impaired persons. In general, the alignment effect occurs when the position or orientation of maps or guide plates and the orientation of the persons who look at them may affect people's understanding of the space around them. In the case of fixed guide plates, they are the most understandable when they are set with their upper side corresponding to the place ahead of those who look at them. If they are not set as above, it is necessary to rotate the guide plates in mind (mental rotation) as they are fixed and don't actually move. What will happen in a case of guide plates for visually-impaired persons? For those who are congenitally blind or have lost their sight by the age of 3 to 5 (early blindness), however, I think that it is impossible to expect such mental rotation because they have difficulty in transforming tactile information to visual images. The reason why I talk about this matter is that the guide plates for sighted persons often don't take the alignment effect into account, which may throw those who use them into considerable confusion. What those who look at the guide plates want to know is the relative position of the four quarters (front, rear, left and right), not the four points of the compass (north, south, east and west). Even at the same crossing, the guide plates must be set with their left, right, top and bottom corresponding to the orientation of those who are looking at them in dependence on the place and orientation of how they are

set. Even sighted persons may run into problems. For setting guide plates for helping visually-impaired persons, further care should be given so as not to cause them trouble. Before that, in what way can visually-impaired persons understand whether and where there are guide plates? Maybe it is not so easy for them to find guide plates.

Speaking of visual dysfunction, a color vision defect is another type. Simply speaking, as for dichromatism, which is commonly known as color blindness, males who are significantly red-blind (protanopia) and green-blind (deutanopia) each account for around 1% of all males. There is little difference in how the colors look between the red-blind and the green-blind, thus both groups (around 2% of all males) have been categorized popularly as red-green color blindness. (The typical colors that are difficult to distinguish visually are dull red and green.) For reference, the largest group of color vision defects is the green-weakness (deutanomaly), at 4-5% of all males, which is one type of anomalous trichromatism. Those people say that they are leading normal lives with no particular difficulties in terms of colors. It is also said that the color vision defect is no more than one specific trait in color vision which can only be detected by a test.

These days, coloring is often used for nonverbal symbols. It is important as one aspect of design to avoid arrangements of colors that are difficult to distinguish. Of course, the meaning of most symbols can be understood by their shapes, even if their colors cannot be distinguished. As for the symbol of a newly-licensed driver and that of

an elderly driver, for example, the position of the colors isn't a matter of decisive importance. Even people with total color blindness (monochromatism), which is very rare at 2 to 3 per 100,000 people, can identify those symbols visually.

In spite of that fact, some people often doubt whether color-blind persons can distinguish traffic lights or not. They may have a typical psychological barrier, known as a prejudice. Some other people may suspect that they distinguish the traffic lights by the positions, not by the colors. Fortunately, this is not true, except for persons of total color blindness. Still, it is necessary to take measures for a color barrier-free society as one of the actions for improving the living environment for people who are color-blind.

Here I would like to talk additionally in relation to the colors of the traffic lights and their positions, although it may be a distraction from the theme of this lecture. Nothing is vaguer than the memory of the positions of colors placed vertically or horizontally. For example, do you remember precisely the positions of traffic lights with three colors mounted horizontally at a road intersection or those of two colors mounted vertically for pedestrians? Imagine the traffic signals in your mind and then verify whether your image is correct or not. Probably you can answer the center of the sequence of traffic lights correctly as amber (or orange), but you may be uncertain to remember the positions of "red" and "green" correctly in spite of seeing them many times every day. (In Japan, the green light that means "you can go" is referred to as a "blue" light

according to the Road Traffic Law. It is a "green light" internationally, however.) I conducted a preliminary survey of how vague the memory of traffic lights was, targeting the students of our university in October last year. About 70% of the students recalled the sequence of traffic lights correctly and when they were asked to select the correct one from two choices again, 75% answered correctly. As for the sequence of traffic lights for pedestrians, 64% could recall it correctly and then 75% selected the correct one from two choices. For reference, 68% of the students correctly recalled the position of the colors used for the symbol of a newly-licensed driver as well as could select the correct one from two choices. For the symbol of an elderly driver, the rates of students who recalled the positions correctly were only 25% and those who selected the correct one from two were 46%. I have only briefly mentioned this story, but, nevertheless, it has the important implication that the position of the colors used for symbols shouldn't have a decisive meaning.

VII. Examples of the Elderly

I have explained about the structure of sidewalks and age-related hearing loss before in this lecture. When we observe our living environment in relation to the elderly, the issues to be considered from the perspective of the science for human services are too numerous to mention. These days, serious traffic accidents involving the elderly occur frequently. Ten years ago, elderly people aged

65 or over who were killed in traffic accidents already accounted for more than 30% of the total. That percentage may be approaching 40% now. I hope that the characteristics of body and mind specific to the elderly, such as typical attenuation of their attention, judgment, motion, and so on, are reflected in necessary measures.

It is said that the elderly are not good at searching for something. Why? I remember that an article about visual search tests targeting the elderly carried out by Mr. Miya Hiroaki appeared in a journal published from the Institute of Educational Science (1997, No.11), the predecessor of the Institute of Human Science. Although his article was a report of laboratory experiment, I think, by accumulating suchlike fundamental studies from a wide range of perspectives, it may well be that practical and effective ideas will result.

Also it is said that one grows forgetful with age. Forgetfulness includes the failure to recall a memory of "what I did" (retrospective memory) and the failure to recall a memory of "what will be done" (prospective memory). Forgetfulness more serious for the elderly is the failure to recall a memory of "what I will do." I myself think that, looking back on myself. Among the areas of psychology, the study of memory has a history as long as the history of psychology itself, but the study of prospective memory is a relatively new theme. Although one of the graduate students at our university has devoted himself to this study, there are not many studies targeting the elderly. The study of memory has been developing into a more detailed discipline,

both in terms of methodology and techniques. Thus efforts for basic and practical studies focusing on the elderly are also expected.

Another expectation for studies related to the elderly is about tone signals and alarms. In the case of ring tones as a familiar example, I hear that the frequency of ring tones for a landline telephone is usually 4000 to 8000Hz and its volume is initially set at around 70dB near the sound source. Recently the volume of the ring tone can be adjusted by the user. Is only being able to control the volume enough for an elderly person who has poor hearing? The hearing loss typical of age-related hardness of hearing occurs significantly in the high frequency sounds and thus the maximum audible frequency of the elderly aged 70 to 80 decreases to several thousand Hz, no matter how much the volume is increased. Due to such characteristics of frequency response in the elderly, simply turning up the volume of the ring tone doesn't help them, not to mention being too noisy for their families. Although it is a time when not only controlling the volume but also selecting a ring tone melody freely is possible and it might have already been possible to select a ring tone melody with a low frequency, I still think that a telephone with an old familiar ring tone of discontinuous sounds, which are audible to the elderly, might be convenient.

Other than ring tones, a variety of signals and alarms from various kinds of electric equipments flood our homes. Many of them use a discontinuous or a continuous sound produced electronically or by a buzzer. Why isn't there a rule of using the same sound for the signal or alarm of the same kind of

machine among manufacturers? This is the matter of “What form signals or alarms should take,” which means here that conveying the meaning of a sound on a sound-dependent basis, not on a condition-dependent basis, should be pursued. More specifically, when an elderly person hears the signal of a microwave oven or a washing machine, he or she should be able to “open the microwave oven” or “stop the water,” not depending on the condition such as “I operated a microwave oven some time ago” or “I started adding water a few minutes ago.” The sound the elderly person hears should directly convey what they should do now, even if they forget what they have done before. If the machine stops automatically at the same time as the signal or an alarm sounds, it would just end up even in a case of “I have forgotten.” If not, however, an awful accident may easily happen. As mentioned before, the fact that the elderly have poorer prospective memories than younger people, they often fail in doing things that they have planned to do and the fact that they have difficulty in hearing high frequency sounds such as those generated by electronic devices should be fully taken into account in developing sound-dependent signals and alarms.

VIII. Concluding remarks

Here I would like to conclude this article by adding some issues that couldn't be brought up in my talk due to lack of time.

Issue in human services has been dealt

with as an important theme of study in the field of social psychology, under the name of altruistic behavior or helping behavior. The mode of manifestation of such helping behavior is not always the same among individuals, as well as among the interactions of the same individual with others. One of the decisive factors of why people do or don't help others is said to be deeply related to the state of mind of both those who help others and those who receive the help, such as the maintenance and uplifting of self-respect (self-esteem) or the threat to same. In addition, people in a group tend to act differently from how they act as individuals. Thus it is often seen that people in a crowd don't help another person who ask them for helping because of the majority. That is to say, social loafing caused by dispersion and dilution of a sense of responsibility tends to occur. Thus when we think of human services from a wide variety of perspectives, it is very important to give consideration of basic knowledge and methodologies in social psychology in relation to the issues on psychological and social barriers already mentioned in this article.

As indicated previously at the beginning, the purpose of this lecture was to express my expectations for young students who are studying or will study of the science for human services, and therefore what I have stated in my talk may be rambling and useless for the scholars here. It is needless to say that every scholar is making an effort for the study of human services by each style based on “basic” and “specialized” knowledge indispensable for each field. Finally, however,

I would like to respectfully speak to erudite and experienced scholars here about my thoughts in relation to what form the education should take. I request that in their professional education in universities, especially in the education of undergraduates, they should do their best to provide students with instruction that is effective for obtaining fundamental knowledge, methods and techniques for study as well as a foundation of how to understand things at the first step to start studying the science for human services. I hope you scholars not to introduce the students from the beginning to study only the specific issue of your primary concern and interest before instructing the students to learn a wide range of fundamental knowledge regarding the human sciences. If not so, I am afraid that students who participate in practical and applied study or interdisciplinary study without sufficient fundamental and specialized knowledge wouldn't be able to develop their ability as the research workers of the future, or worse, they would come to follow a self-satisfied study style based on vague knowledge and methods for work.

Now I may be able to go back to the beginning of this lecture. I hope that those who intend to study the science for human

services in the future would understand what I said here. As I mentioned in every part of this article, there are many issues that are expected to contribute to the progress of human services in our daily living environment. I hope that those who intend to study the science for human services would build up the habit of accumulating efforts for detecting and solving such issues in a circular manner, i.e., reviewing the issues from a scientific perspective based on fundamental and specialized knowledge, not overlooking them without much thought, examining these issues empirically and verifying obtained practical findings in line with the living environment once again. Through such accumulation, I think, the progress contributing to the establishment of the science for human services that is positively helpful for all people will be made.

Finally, I'd like to express my sincere appreciation to Professor Mochizuki Akira, who is the chief of the Institute of Human Science and who gave me this opportunity to speak, as well as to those who are involved in the project studies.

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