Application of the Social Technology to the Sustainable Aged Society

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Abstract
Various social problems in an elderly society are global issues in today’s society. Aging proceeds globally in the world while Japan is expected to become a super-aged society in an unprecedented short term. An increase in the elderly population, including the disabled, demands the expansion of social security-related expenditures, which confers an unbearable burden to the following generation. These “Aging Crises” would give rise to the collapse of the social system. We are here to emphasize the importance of the integration of the elderly population toward the productive society and in the reform of the life cycle that is currently refined by education, labor, and retirement. In order to establish a sustainable society, in which the elderly can be independent, we need to explore the occupations that are suitable for the elderly and reduce social security-related expenditures. In our research scheme, we conjugated the related research fields including medical science, engineering, and social science in order to integrate the various aspects of a complex aged society. The recent progress in our research project is reported.

Key Words: New Japanese culture, Prevention of Aging Crisis, Integrated research, Re-acquirement of walking from a bedridden condition, Autonomous lifestyle

1 Introduction

This paper reports on the research that we developed to show that human beings, once bedridden, can attain the ability to walk again. Furthermore our research aims to prove that our studies positively affect the public welfare of the world. It also intends to prepare human minds, Japanese minds in particular, to live an autonomous lifestyle, therefore creating a new culture.

1.1. Progressive aging

The human species, uses the earth as well as rules it, and is increasing the number of aging people due to improvements in medical technology, sanitation, and nutrition.

The increase of the elderly population over the age of 85 is growing especially faster than the elderly over the age of 65 to 84. Fifty years from now, the population of the elderly between the ages of 65 to 84 is estimated to multiply by 3 times. Also, the population of elderly over 85 years old is estimated to multiply by 6 times. The “Elderly subordination rate”, which is the ratio of population of productive age to elderly population, was 6.8 to 1 in the developed countries in 1960, 4.5 to 1 in 2000, and in 2030, it is estimated to be 2.5 to 1.1

And the United Nations (UN) also said, “Fertility levels in developed countries, many of which experienced a “baby boom” during the 1950s and 1960s, have generally declined since 1970. Between the 1970s and the 1990s, there were also significant, though smaller, reductions in the fertility of developed countries, whose median total family size declined from 2.3 to 1.4 children per woman over the same period. Furthermore, in 14 developed countries, it was lower than 1.3 children per woman.”

It is already 25 percent under the ratio needed for the alternation of generations (birthrate of population reproduction level). Therefore it is estimated the peak of the total Japanese population to be 127.7 million in the year 2006 and in 2050 it is estimated to be 100.6 million2. But in reality this estimate is lower. The ratio of population of 65 years and older rose from 4.9% in 1950 to 14.6% in 1995, and in 2050, it will rapidly rise to 32.3%. Moreover, the speed of the aging is unprecedented

The 15th Japanese New Generation Life Prospect Society of the Social Policy Council reports, “The biggest problem lies in the people’s awareness and action, and changes in a society such as a social system not being able to cope with the rapid speed of aging.”
1.2. Change in the population characteristics

Many demographers considered the switchover from high rates of birth and high infant mortality to low birth and low premature death rates due to the attainment of a rich society. Such process of change shows an inverted age-population pyramid, and they can’t presume yet whether mankind can adapt himself to the new reality brought by this inversion.

The total population of Japan is said to begin to decrease from year 2006. In reference to Japanese over the age of 65, one out of four people will be part of the elderly population by 2020 and it will reach one out of three people. It is predicted that Japan will be a society with a decreasing birthrate because the number of children who are under 15 years will be 4 million less from now, which will be half the number of elderly.

The influences of women’s participation in society and of hormone disrupting chemicals have inevitably led to this, and we can predict that it will become accelerated furthermore.

(1) The elderly in need of nursing care

Under such social conditions, the number of the elderly who are in need of nursing care rises from 2 million in the year 1992 (of which 900,000 are bedridden) to approximately 5.3 million (of which 2.4 million are bedridden) by 2030 according to the farmer Welfare Ministry population problem laboratory. Moreover, this prediction value by the Japanese government hasn’t been changed since July 1992 until today.

(2) Three of the biggest causes of death in Japan

The 3 biggest causes of death “malignant neoplasm such as cancer, cerebrovascular diseases, and cardiovascular diseases” – as shown in Fig.1 are predicted to show a remarkable decrease in death rates. The decrease of cancer death rates will result from the medical treatment in the genetic level. The decrease of death rates from cerebrovascular disease will result from the improvement of preventive medicine against diabetes, hyperlipemia, high blood pressure, and other diseases. Finally, the decrease of death rates from cardiovascular diseases will result from the engineering and medical improvement of medical technology.

![Fig.1. Three of the biggest causes of death in Japan.](image)

This clearly states the possibility of lengthening one’s lifetime approximately 10 years. However, the number of those who recover and still have a disability should increase. The population of elderly with disabilities will continue to increase.

1.3. Social security expenditure

The Social security expenditure (Future prediction of former Ministry of Health and Welfare social security expenditure, 1993) is thought to increase from about 16.3% of the national income of 1993 (approximately 59 trillion yen), to about 28% of the national income of 2025 (approximately 375 trillion yen).

In the year 2000, it was predicted that in the case of maintaining the present system, the social security expenditure of the year 2025 would be 207 trillion yen. (78 trillion yen in 2000 compared to...
the country’s tax income 52 trillion yen.) In today’s prediction, published by Ministry of Welfare and Labor, they announced that 155 trillion yen is needed for the expenditure in 2025, compared to 78 trillion yen in 2004 shown in Table 1.

Against such an outlook, the total amount of civil salary in the year 2001 was approximately 214 trillion yen in a “Statistical Survey of Civilian Salary” generalized by Japanese National Tax Administration Agency. It has decreased for four years in a row, with no big increase to be expected in the future.

Table 1: Predictive value of year 2025

<table>
<thead>
<tr>
<th>Prediction Year</th>
<th>Numbers of the disabled elderly</th>
<th>Predicted expenditure Trillion Yen (Billion Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>5.2 million (5.3 million in 2030)</td>
<td>375 (340900)</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>207 (188180)</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td>182 (165450)</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td>155 (140900)</td>
</tr>
</tbody>
</table>

A study group of the former Japanese Economic Planning Agency predicted that the national contribution ratio will rise from 35.8% in year 1995 to 51.1% in 2025, if the present system is maintained. The national contribution ratio is the ratio of national income to the social security burden and tax burden accounts. As the former Japanese Ministry of Finance mentions based on the prediction mentioned above, the enlargement of budget deficit will affect the future public financial burden and consequently the latent national contribution ratio will rise up to the high rate of 73% in 2025.

By the prediction of the Synthetic Economic Data Bank of the Nihon Keizai Shimbun, Inc., the national contribution ratio of social security is 6.18 million yen per worker in 2020, which is 3 times larger than the number in 1995 (2.09 million yen).

Due to the increase of elderly, the financial and social collapse will occur if we keep the existing pension and finance system. We call the collapse, the “Aging Crisis”. We haven’t experienced such a collapse yet, however, we know that it is progressing, as seen in the increase of the government’s debt.

1.4. The Condition of the United States
The Kerry-Danforth Committee working for president Clinton reported research on the dynamics of population and how it influenced social security related expenditure. According to the report, the total sum of expenditures of five benefit programs; Social security, Medicare (a government program of medical care for the aged), Medicaid (a program of medical aid designed for low income earners unable to afford regular medical service), Federal Government Staff Member pension, and Veteran pension, will exceed the total annual federal revenue amount by 2030.

The future prediction such as the Aging Crisis of both Japan and the United States will also occur in other countries in the future.

1.5. The Baby Boomers
Baby Boomers in Japan are people who were born from 1947 to 1949. The numbers of each population at birth were over 2.6 million and the total populations of them were more than 8 million.

This phenomenon has created unprecedented situations such as an increase of the number of students, competition in school entrance examinations and company entrance, and a growing labor force. The baby boomers are the ones who took part in the high Japanese economic growth period, and compared to other generations, they were exceptionally talented to “the teamwork and analysis ability” in their enterprise. They were also said to be “highly loyal to their own working company”. On the other hand, establishment of the individual are not sufficient for them; a strong sense of belonging to the company shows their strong dependency in their life.

(1) Social Surroundings of the Baby Boomer Generation
When the baby boomers reached working age, the policy that made the handicapped live in facilities started as well as the spread of the small family, or “nuclear family” trend. For them, it
seemed as though their freedom increased. However, there were opinions that generosity among people and dynamism decreased. The baby boomers were always targeted because of the large amount of people and the resulting strong influence on this population. Some Japanese companies took typical measures against them for that reason. Mazda Motor Company targeted them for early retirement and the Nissan Motor Company’s “Revival Plan” seemed to start with the removal of the baby boomers.

The early members gain more as new members increase, such as in pyramid finance with the Pay-As-You-Go pension system. From the standpoint mentioned above, the baby boomer generation seemed to support others by increasing their numbers. If Japan maintains the present public pension system, it will collapse because the new members (the descendents) will decrease by declining birthrate and the aged baby boomers (receivers) will increase. In addition to this, the increase in both the number of people in need of care and the amount of healthcare expense with advancing age will affect the baby boomers directly.

(2) Must Develop an Independent Life

The baby boomers recognize “the decline in a physical function, which occurs from various reasons, meant becoming bedridden and/or being cared for” and “this also meant there is little possibility for someone’s life cycle to end in a sense of well-being” through their experience of taking care of their parents. The suicide numbers of baby boomers seems to increase by their recognition as mentioned. In addition to this, it affects a cause of their suicides through their little independence and strong dependency towards own working company, turnover and retirement rates among them are increasing now.

To prevent a situation like this, the baby boomers must develop an independent life in every “Life Stage”4).

In the year 2000, the people ages 50 and over - including the baby boomers – numbered to about 38% of the population: this is about 48.23 million people. They have gained a long life due to the development of health sanitation and medical improvement. This population is expected to form the coming elderly society.

1.6. National Consciousness

“It is easy to adopt the contour of the civilization but it is hard to adopt the ethos. Although the Japanese have a talent for imitation, they are no good at inventing. They are able to accept written knowledge, but do not question to change it, thus, it can be named a ‘semi-civilization’ 5).”

Some analysts cited ‘dependency’ as a Japanese characteristic left from their early civilizations as agricultural tribes. Village communities united with rice cultivation did not require strong leadership. And one of analysts cited, “From early times, Japanese carried a destiny to work hard in unity by the village community. Willful acceptance in a village community as in a rice-cultivating group was strong. This production form through such a situation forms a social structure6).”

1.7. Interdependent Relation as the National Characteristics

The interdependent relation produces mild thoughtfulness for others. It influenced an educational ideal and its goals as well. Interdependence even led in the equality of results. An example is to illustrate the graduation ceremonies in which each of all the students says a phrase instead of the represented speech. All students are required to take part in the addresses carried out in such ceremonies. Thus the kindness of the Japanese allowed the disabled elderly (who were injured by cerebrovascular disease, bone fractures, and so on.) to depend on caregivers in nursing homes, facilities, or in their own homes.

Caring for their disabled parents let the baby boomers realize the need for one to receive care in the future. This made them foresee the reality of economical burdens in providing the fragile elderly with care.

1.8. Aging Crisis

Even when the burden for keeping the aged society was pointed out to the public, very few people recognized the Aging Crisis.

An Aging Crisis will occur in Japan when the baby boomer generation becomes aged senior
citizens due to maintaining the aged society. Furthermore it will occur through increasing a society burdened with nursery care in facilities and/or at home by improving the recovery and survival rates from cancer, cerebrovascular disease and bone fracture accidents as mentioned above.

In order to avoid this;
- baby boomers must not depend on others but live independently such as an autonomous lifestyle,
- they must not rely on nursing care completely, and
- they must keep to contribute to the society even they aged and/or even if they had these diseases and accidents.

Our research as the following aims them to live in such life and we expect to enable it.

2. Beginning of the Research

2.1. Past National Policies and Fujisawa City

In 1975, the Welfare Ministry introduced the Silver City Plan and others, based on the population prediction. The ratio of 65 years old and above to the whole population in 2025 is predicted to be 1 to 5. One councilman amended the estimation of dynamics in population by computer and clearly stated “a population ratio of 1 to 4 in Fujisawa City in 2025” at Fujisawa Municipal Council in 1980.

The arrival of the aged society due to the aging of the baby boomers was recognized, therefore the arrival of an aging society due to the aging of the baby boomer generation in Fujisawa City was predicted. Therefore an establishment and implementation of a new policy to improve the existing elderly health care and general social programs were submitted.

With the Gold Plan in 1989, the former Japanese Welfare Ministry made a new policy to improve the facilities and to extend its numbers in Japan for the elderly. This policy expended the burden of expenses for the elderly.

2.2. Physical Training Meeting held by the City

The first Training Meeting in Chigasaki City, Kanagawa Prefecture for the disabled elderly living at home was held in April 1987 based on the Elderly Health Law.

In Fujisawa City, located adjacent to Chigasaki City, the first Training Meeting of Fujisawa City was held in October 1987. After a half-year discussion, the Fujisawa Medical Association accepted the decision to hold the Training Meeting with the understanding that only the disabled elderly suffering from impairment would be accepted into the Training Meeting. Through the arguments in these six months, the conclusion seemed to be that only people who the doctor determined an impairment level of ‘not able to recover’ were capable of participating in the Training Meetings of Fujisawa City for the councilman.

2.3. Improvement (Reinstatement) from Impairment

(1) Efficiency of Rehabilitation

By using the orthosis, cushion, and devices for independence that were invented by Kyoko Takizawa (a physical therapist), rehabilitation patients re-acquired walking and became independent in their daily life, despite their heavy aftereffects.

Takizawa’s previous job was as a physical therapist in Fujisawa Citizen Hospital, and there, she had rehabilitated 15,000 patients for a year, an extremely large number performed by one physical therapist. The process included the same rehabilitation technique, and obtaining cooperation from two assistants, while one physical therapist rehabilitated from 9 to 18 patients a day and currently, 3600 patients in a year at a maximum (refer to Table 2).

(2) Effectiveness of Rehabilitation

Takizawa had rehabilitated bedridden patients at the “Elderly Patients' Hospital for Intensive Care”, and the disabled elderly who had been diagnosed “unable to recover” at the Fujisawa Function Training Meeting in 1988. She produced remarkable results within the half a year as the following patients improved from their symptoms, patients returned to the working world, and patients who had hinted at suicide expressed new hope to others.
Also, there were many cases of bedridden patients who re-acquired walking in the Nagaoka Hospital, where Takizawa was employed during this same time. Scientific research of this matter was not sought after, since Takizawa strongly stated that it was indeed her “spiritual hands” that did the curing, and not the power of technology.

### Table 2: The rehabilitation department’s business conditions, Fujiwasa citizen hospital

<table>
<thead>
<tr>
<th>Year: 1975</th>
<th>Item</th>
<th>Total</th>
<th>Monthly average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outpatient</td>
<td>Inpatient</td>
<td>Outpatient</td>
</tr>
<tr>
<td>Evaluation</td>
<td>296</td>
<td>280</td>
<td>25</td>
</tr>
<tr>
<td>Exercise therapy</td>
<td>3970</td>
<td>6,466</td>
<td>331</td>
</tr>
<tr>
<td>Water therapy</td>
<td>1,919</td>
<td>1,203</td>
<td>160</td>
</tr>
<tr>
<td>Thermotherapy</td>
<td>4,704</td>
<td>4,351</td>
<td>409</td>
</tr>
<tr>
<td>Correction</td>
<td>1,399</td>
<td>4,054</td>
<td>117</td>
</tr>
<tr>
<td>Traction</td>
<td>2,707</td>
<td>164</td>
<td>226</td>
</tr>
<tr>
<td>Patient real number</td>
<td>7,352</td>
<td>7,730</td>
<td>613</td>
</tr>
</tbody>
</table>

(3) Research Began

The Biophilia research program began when one city councilman had recognized a great influence and contribution to the society. He was aware that the senior population needed to maintain physical and mental health, in order for them to continue an autonomous lifestyle even as they aged. Such a successful rehabilitation technique could almost prevent the Aging Crisis. He persuaded Takizawa to start scientific research, but unfortunately, she would repeat, “You are a councilman! Stop barging into other businesses!” He then resigned from his office, and contributed his daily life to persuading Takizawa. At the end of the seventh year of persuasion, his patience paid off. Takizawa finally accepted the former-councilman’s request, and the analyzing of systems, cataloging of procedures, and researching of rehabilitation results commenced. The book of the result was published.

The research of rehabilitation eventually became an interdisciplinary association, as its fields of study grew to reach wider visions.

### 3. The Progress of the Research

#### 3.1. Rehabilitation for the Elderly

It was reported that there were very few people who had shown positive effects after rehabilitation medical treatment for acroparalysis patients who did not have any physical illnesses, or the elderly patients in the Rehabilitation Hospital for Intensive Care in Hiroshima. It has been said that the 20% of people who have gone through femoral head fractures have been bedridden. It is also true that the systematic rehabilitation for the social welfare facility for the aged was difficult, due to the few personnel, clinical equipments and/or supplies available.

Even with such conditions, the success of Power Rehabilitation has been recently reported.

#### 3.2. Our Clinical Rehabilitation Research

(1) Rehabilitation effect in the geriatric hospital for the bedridden

Rehabilitation has been performed on 193 patients in a geriatric hospital for the bedridden, and 59 of them have re-acquired walking. Noting this progress, we have defined the rehabilitation technique, the “Takizawa Method and/or Motivative Exercise based on the Takizawa method”.

(2) Rehabilitation Effect of Using Walker with Caster Sleds

The living condition of the 35 patients judged as “in need of a walker with caster sleds” are, 11 who need nursery care only in bed, 10 who need care with all transportation, 5 who are independent only in their room, 6 who are independent indoors, and 3 who are able to walk outside by caster
walker with tires. Twenty-seven of them were able to continue using it, and 8 were unable to use it within 3 days of installation. By synthetic FIM points by chart (16), three groups showed significant improvement. The results have been reported (17). Details will be shown in Table 3.

Table 3: Functional Independence Measure points by chart of the 27 Who Used the Caster Sleds Walker Occasionally

<table>
<thead>
<tr>
<th>Time</th>
<th>Installation period</th>
<th>1 month later</th>
<th>3 months later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Score</td>
<td>83.6 points</td>
<td>93.3 points</td>
<td>98.5 points</td>
</tr>
</tbody>
</table>

Furthermore, the therapeutic trial by Tokyo University’s Faculty of Medicine (18), done during 1993 and 1995 grants from NEDO (New Industry and Energy Development Organization) have been added and analyzed, confirming its usage effect (19).

(3) Rehabilitation Effect in the Geriatric Health Services Facility (or GHSF from here after)

3 patients could return home among 29 patients who were evaluated worse than “B”* have received rehabilitation training in time of entering, has left the GHSF with caster sled walker walking or crutch walking, and 5 stayed at the facility but were able to go to the restrooms by themselves (some kind of care is needed). It showed that re-acquisition of walking became available from bedridden by their improvement (20, 21).

However, there was no significant difference on the evaluation by using total of all the items of FIM points by chart, which were done four times (22).

*: Care is needed for indoor life, a sitting position is available but can’t walk and staying on the bed in the daytime by the qualitative evaluation in the Japanese daily life independence rate of the disabled elderly.

(4) Statistical Evaluation for the Rehabilitation of GHSF

The patients mentioned above, who were in Shonan-No-Oka GHSF and were rehabilitated using the Takizawa Method, have been studied by a team of doctors and therapists for a statistical evaluation on effects in order to find the pattern of rehabilitation effects. While the result of using a total of all the items of FIM points by chart as mentioned above, ‘L. walking, wheelchair’ was evaluated as a significant effective in either assay, although the effect of ‘H. Bowel management’ was admitted in Sign approval due to examining by items respectively (23).

(5) Result of At-home Rehabilitation

We have operated the at-home rehabilitation by motivative exercise under the Takizawa method. The results were as follows:

Hemiplegia in the right and aphasia by the cerebral hemorrhage (67 years old) improved the Japanese degree of the care point from “4” to “3” (24). 2. Parkinson disease (70 years old) improved 11 points By FIM points by chart through the methodized at-home rehabilitation and 3. Parkinsonian disease and the postoperative of femoral head replacement (74 years old) improved 13 points in FIM points by chart through (25).

Table 4: Changes of the at-home rehabilitation

<table>
<thead>
<tr>
<th>Case (Age)</th>
<th>Improvement</th>
<th>FIM points by chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hemiplegia (67)</td>
<td>Degree of the care point (JP) from “4” to “3”</td>
<td></td>
</tr>
<tr>
<td>2. Parkinson disease (70)</td>
<td>Improved 11 points</td>
<td>(87→98)</td>
</tr>
<tr>
<td>3. Parkinsonian (74)</td>
<td>Improved 13</td>
<td>(83→96)</td>
</tr>
</tbody>
</table>

(6) Supplementary Examination of Rehabilitation Execution

Except for the at-home rehabilitation report, Takizawa did all of the rehabilitation, therefore a supplementary examination was needed. In order to evaluate the rehabilitation method, we had to report the results excluding Takizawa’s influence (26).
(7) Research on Evaluation Method
In the facility for social welfare for the aged including GHSF, or the bedridden elderly hospitals, there are very few examples of living people in GHSF or patients evaluated as a level of impairment to gain gait from bedridden. Therefore it was impossible to discover an evaluation method covering from bedridden to living daily life independently in the range of investigation.

With a purpose of solving that problem, we have manufactured several types of evaluation charts with referring classification of the level of bedridden in accordance with the research for many years[27], [28], [29], [30]. One of those is the simple entry table of the Functional Independent Measure[31].

In the sides of clinic rehabilitation research, the standardization of the evaluation method, wide additional tests and group dividing awaits.

3.3. Engineering Research. Development of Initial Devices
Development of devices started out with a walker with caster sleds[32], [33], [34], [35], [36], [37] and simple lower extremities training devices[38].

Afterwards, it proceeded into development of devices for training systemization in the training rooms[39], [40].

Keeping sitting position not only enriches bedridden elders’ daily life, but it is also important for training execution, so a cushion was developed and used[41], [42], [43].

We have developed and used a walking orthosis easy to use for those who have slight varus contracture on their ankles[44].

(1) Development of the Lower Extremities Training Devices
Since we confirmed a remarkable effect, we have done a characteristic research of lower extremities training devices[45].

(2) Engineering Approach to the Clarification of the Mechanism
Research for the clarification of the mechanism of the methodized rehabilitation started as a cooperative research of lower extremities function training measurement device[46].

In addition, the reliability evaluation of the LEFTM started in another cooperative research[47].

With the effective results of re-acquired walking through training, the team began to study an analysis of the method by the other cooperative research with a motion picture analysis[48].

(3) Researches on the Devices Needed in the Future
A cooperative research on an upper extremities training and nursing care lifting device was done by many research organizations[49].

The research for the input device using eyeshot technology which is capable of assisting disabled people with their last physical function, was started[50].

3.4. Social Science Research

(1) The Diffusion Research
The diffusion research of this rehabilitation method is done in order to diffuse the effects on the clinical researches and to promote social progress by the rehabilitation method with the grant of Ministry of Education, Culture, Sports, Science and Technology (or MECSST)[51].

(2) Inter-professional Group
A need to change marketing targets was recognized due to increasing the elderly and the independent handicapped elderly in the future by the aging of the Baby Boomers. Therefore, so do the needs for the wide area’s research including business field. An inter-professional group of businesses was established for diffusion of devices in order to build up the independently living society[52].

(3) Elders’ Consumption Activity
The National Consumer Affair Center has announced some information about depraved marketing methods in order to lead the elders’ consumption activity well and has abundantly reported those to the public. However, many people are being deceived[53].
We organized a study of the ways of good consumption for the elderly, the slight dementia elderly and the disabled elderly who can live independently by the grant of MECSST. In order for disabled elders to live within an area community, we have experimentally manufactured and tested an evaluation chart that was able to examine the living ability in our consumer education research.

3.5. Civil Engineering Research
This research seems a medical sociology in one way, but it is composed of the engineering, social science, medical research and so on. At the same time, we are studying the approach to reduce the social security-related expenditure in order to build the sustainable society on the basis of the research result for the rehabilitation.

In other words, the research is related to affiliate together a public policy for aging society and a necessary technological development including rehabilitation method in order to establish a sustainable society.

A Non- Profit Academy was re-organized and established through the Method’s Diffusion research. We named it Biophilia Rehabilitation Academy to exemplify the research that related from the human mind to technology and society organization. The name is represented with meaning of the Spirit and/or a will that people wish to continue to live as a respectful human even after being disabled. Dr. Tetsuhiko Kimura, a guest professor of Japan Medical University was elected president of this academy.

3.6. International Cooperative Research
Celia B. Lamkin, M.D. who had belonged to the Commonwealth of Northern Mariana Islands (or CNMI) has visited Japan and participated in the research. She thought that the research of various aspects of rehabilitation will contribute to people living in their own country, and led to hold the first international conference with Thomas J. Camacho, Executive Director of Assistive Technology Center for Persons with Disabilities CNMI Council on Developmental Disabilities. It was their desire to hold the international conference because the presentation, which reported re-acquiring walking from bedridden, was included. As the evidence of it, a keynote lecture and general presentations were introduced to the public for five days and the outline was published by the newspaper.

4. The Future of the Research
In order to establish a sustainable society, we aim to cut back on the elderly who needed nursing care less than 10% of in all of the elderly in the future due to diffusion of this rehabilitation.

We are continuing the research for rehabilitation, the engineering such as the development and to establish the independent life society in Japan, as shown in Fig 2. Furthermore we try to internationalize our research and those results. We standardize it in order not to become an inverted age-population pyramid a negative factor for the human being.

4.1. Rehabilitation Research in Future
(1) Mechanism Verification of the Methodized Rehabilitation by the Molecular Genetics
The activation of neural stem cells is promoted by the exercise in the mice of the experiment. There are neural stem cells in the human’s brain that are activated, though it was thought that there were neither neural stem cells in the brain nor were they activated. By referencing changed numbers of neural stem cells of an exercising group of mice, we discovered that exercise is needed for continuing cell divisions through a long period of time. It is confirmed that over 30% of elderly, including those over the age of 85 in disuse atrophy preservation stage, re-acquired walking by the motivative exercise based on the Takizawa method. Fukui formed a hypothesis about motivative exercise.

Our team has formed a hypothesis that the motivative exercise by Takizawa method promotes the communicating signals to the brain of the affected side causes facilitation from the unaffected side extremity’s movement. Therefore this technique facilitates spastic paralysis.
At Present <21st century> Care dependency

The number of disabled elderly population

Family and the disabled elderly both hold back from each other and the elderly simply settle in the facility

Great difficulty in living one self with independence and cohabit with the community, neighboring society.

Abandonment of elderly people

Until year 2025: Aging Crisis due to bursting number of the elderly population including disabled elderly
- High cost on social contribution
- High burden on pension
- Severe entitlement
- Shortage of personal service
- Shortage of care facilities

Research & New Culture

Genesis/Expansion Idea of Biophilia, and Biophilia rehabilitation. Autonomous lifestyle within the Biophilia rehab network.

Time series
The number of disabled elderly population

LARGE
Living in Autonomous lifestyle
-To live with restroom independence, even with difficulty.
-To live by one self with independence
-Cohabit with the community, neighboring society and young generation

SMALL
Family and the disabled elderly both hold back from each other and the elderly simply settle in the facility

Great difficulty in living one self with independence and cohabit with the community, neighboring society.

Possibilities and effects of previous research

> 30% of bedridden elderly could reacquire walking
> Prevent disable by using the devices for independence.
> Nurturing wholesome consumers
> Possibility of reduction on expenses related to social security

Further research

1) Research related to rehabilitation
2) Engineering research
3) Evaluation Research
4) Autonomous lifestyle
5) Internationalization/Standardization

(Research, public understanding)

Interindustry analysis
The amount of reduced expenses spent for the care of baby boomer generation is used for investment-Consumed for joy

Fig. 2 Society Overhead View
The predictable mechanism of our hypothesis is as follows:

- The exercise for the nerve stem cells activation to the patient in the condition of impairment has the same outcome in both the motivative exercise of the Takizawa method and the experiment with mice. More specifically, it enables the activation of the nerve stem cells.
- The activated nerve stem cells enable the patients, who are in the impairment stage, to actualize synapse formation in their brain of affected side.
- Reconstruction of neural transmission is implemented in realizing synapse formation, thereupon both excitable synapse and inhibitory synapse are balanced.
- The adjustment between agonist, antagonist, and the muscle group for stability can be taken so that the purpose movement can be smoothly completed.

We are expecting that the progress of genetic research will enable us to prove our hypothesis.

2) Mechanism Verification of Rehabilitation by Randomized Control Test

Most evaluated cases were operated by a specific physical therapist. Only three patients of the supplementary examination were rehabilitated while living far away from Takizawa. To evaluate the validity of this method, setting a randomized control test is necessary, and which Makita has been studying. The research will be to clarify that the rehabilitation method works effectively under the guidance of any physical therapist.

3) Development of Devices and Proof of Rehabilitation Mechanism by Data Analysis

By using the LEFTM that has already been developed, we are trying to clarify the mechanism by measuring body information and recovery effects by using an infrared camera, electromyograph and electrocardiograph.

4.2. Engineering research

1) Evaluation device development with the information technology (or IT)

A joint range of motion test in sitting position was introduced into this rehabilitation method focusing on the re-acquirement of walking. Therefore research that relates to an automated test for joint range of motion and movement areas of lower extremities are planning to enforce motivative exercise at home, especially for

2) Development of Evaluation device by Using IT

By improvement of the defects on walking analysis research, we are going to develop a position specifying system, motion picture analysis system and an evaluation machine for training to walk with parallel bars. It enables the methodized rehabilitation to standardize, especially for
re-acquirement of walking.

(3) Development of At-Home Rehabilitation device with Using IT

Most of the baby boomer generation will be forced to live in their own home even if they have disabilities for daily life. We are developing a training device in which a remote control system using IT is equipped in order to maintain the elderly’s health and to overcome their disorders at-home.

(4) Development of Device Using the Visual Line

A device using the visual line to transmit one’s intention is being developed. It enables a person to transmit one’s intention through IT under a given condition without using special tools unlike previous devices. The research is proceeding based on the report 72).

(5) The Upper Limbs Training and Lift Dual Device

The practical use of the wheel movable lift is rare in contemporary Japan. In addition to that, it was desirable but difficult for the disabled elderly to gain their independence through nursing care.

We will make the motivative exercises possible at home, and we will develop the lift device for upper limb training and care in order to gain independence from nursing care. The Feasibility Study by the grant of Japan Small Business Corporation has been carried out, and now we will develop it for a practical application in order to overcome the elderly disorders at-home 73), 74).

4.3. Evaluation Research

(1) Function Evaluation

When the methodized rehabilitation is carried out it is important and necessary to evaluate the condition and improvement of the patients as mentioned in 3.2 (7) 30). Since it was done, until today, by Takizawa with her experience, the evaluation had been done without any hindrances or trouble by her. But in order to generalize it, an evaluation standard is necessary. Thereafter the others can enforce the process of re-acquiring walking from the bedridden condition.

(2) Daily life Activity Evaluation

Examination of an evaluation chart was actually used as the social science research. Furthermore we are going to study it for the statistic point of view and generalize it.

(3) Clinical History and Daily Life Ability Evaluation Software

We will study and develop the simple software that relates to clinical history and living ability based on the experiences of a skillful doctor and a physical therapist in order to increase the social activities of the elderly and also to equally measure available levels of a dementia.

4.4. Independent society building research

(1) Consumer Education 1

The Los Angeles Times drew the rate of elderly of the Japanese population and stated that there was little possibility of the expansion of consumption expenditure in the future 75). We researched the present situation of consumer education for the old elderly and the disabled elderly in Japan in order to expand consumption expenditure through it 54), so will do all over the world.

(2) Consumer Education 2

Doctors experientially said, “The elderly with a cerebrovascular dementia got better”. We examine the possibility for quantification of dementia evaluation. Therefore we will try to build a database in order to evaluate dementia in accordance with evaluating brain atrophy by MRI images, brain blood flow volume by PET and brain oxygen intake rate, and the face-to-face evaluation. Through the research, we will examine the possibility for creating a standard for consumer education for the elderly and slight dementia elderly.

(3) Nutrition Control

A Nutrition Screening Test Table was reported 76). While using this table, the carrying meal
service network for people needing care at-home will be tested in Akishima City, Tokyo.

(4) Trial of Local Biophilia Rehabilitation Network

We will try to establish a community rehabilitation network (Biophilia rehabilitation network) composed of meal services, a wide range of rehabilitation and at-home care for people in Mie-Cho, Ooita Prefecture.

There was some previous research related to Mie-Cho in order to integrate the various aspects of a complex aged society by the grant of MECSST\(^{(77), (78)}\).

(5) Proposition to the Labor Law

In the Labor Standards Act, a rule exists to control the amount of weight moved by working women (in hard labor and dangerous occupations). For example, women of eighteen years and over are forbidden working with weights beyond 20 kilograms in continuous work. However, doctors, nurses and household labor are excluded.

The use of the lift is already stipulated by regulations and/or laws in various foreign countries. In England, there is a report that use of the lift was connected to the reduction of medical expenses by decreasing the number of lumbago patients\(^{(79)}\). Improvement of the Labor Law is necessary in order to reduce work-related disorders.

(6) Population Forecast

The National Institute of Population and Social Security Research had estimated the Japanese population Forecast every 5 years until today. Recently, the newest estimation is becoming regarded as miss leading; the real figure is lower than the estimation. In other words, after every five-year period, it became clear that the estimated figures were wrong. We will forecast the reliable numbers of the population in order to predict the economic foundation.

(7) National Awareness

We want to predict the amount of possible reduction of social security expenditure in the case where the baby boomers live with the autonomous lifestyle. Therefore we will study a method to measure the prediction of the benefited amount of our proposal that the baby boomers live with the autonomous lifestyle. We will survey from ones aged term to death of the baby boomers using its value. We will also do a quantity survey with the predicted value by the method. The amount of the quantity survey enables the estimate of the amount of input to an interindustry-relations table. The amount of output from an inter industry relations analysis enables baby boomers to understand the necessity of a new life culture such as living with the autonomous lifestyle. In other words, the announcement of the reduction of social security expenditure by our study would be a trigger for the baby boomer’s preparedness for the new life culture and will affect the baby boomers to live in an autonomous lifestyle in the new life culture.

4.5. Internationalization/Standardization

(1) Training Standard

There is a necessity to standardize the amount of exercise for every physical condition level. This standardization is also good for every country of the world. Therefore it is necessary to clarify and to unify words and terms.

Furthermore, through the evaluation, we will clarify a level of independence and physical condition. We are developing the device to examine the patients’ physical functional level automatically by analyzing visual data. This will make the process more efficient to examine and manage the physical functional level of numbers of patients in one session of functional training by a therapist.

(2) Technology Transfer

We will translate the Summary, the Detail, the Technological documents and the Manual. Thereafter they will be published in order to share the research results for motivative exercise based on the method all over the world. Moreover we clarify the difference and substitutability between the Passive Exercise and the Motivative Exercise.
(3) International Organization
We will continue to study the contents mentioned above in order to establish a sustainable aged society in the world. To ensure the internationalization of our study, we organize our research center using IT as our foundation.

5. Conclusion

5.1. National characters and our independence
The words “SOKUIN NO JYOU”** shows the kindness of Japanese in one sense from the consciousness of the national character stated in 1.6. This kindness is a national characteristic. After raising their children, most parents may need care because of cerebrovascular disease and/or bone fracture, etc. Their children must put diapers on their own parents and this assistance perplexes the parents. Because of a parents’ kindness toward their children, and that they do not want to rely on their children to this degree of care, parents agree to become an inpatient in an elderly care facility. A child then shows kindness toward their parent by sending them to a care facility. In this way, they become an inpatient of a nursing home and/or a hospital. As a result, it seems normal to depend on others for all of their care.

In the previous research and development, we clarified the way to improve one’s condition from bedridden to re-acquired walking ability, through the Takizawa method of rehabilitation, regardless of their level of disability or impairment. And our studies relating to this rehabilitation enable the elderly to live an independent daily life with little care and/or dependence.

In general, it is easier for caregivers to care for a patient who is bedridden, especially in disabled elderly facilities. For example, a researcher once stated that to live independently from bedridden was “your wish and not mine”. He seemed to reject the idea to live independently.

It is certainly difficult for the disabled elderly to live independent daily lives due to the wants of both children and their old parents to live in the facility and within the bedridden, as well as social situations. It is important to make the people who are not disabled now, such as the young baby boomers (currently ages 55-57), have the motivation toward independent life in the future by verifying the effect of our studies. In other words, it is also very important to turn the consciousness from the national characters of “kindness and dependence to the others” to the independence. In addition, we must establish the desirable independent people’s society as Fukuzawa stated5). It is necessary to overcome the national characters of depending on others. Reversion of peoples’ minds enable human beings to attain positive influences on the society and economy even in the case of an inverted age-population pyramid.

**The sympathy from compassion of Japanese: To try not to see any inconvenient things.

(1) The Social Life of the Disabled Elderly
The current economic condition forces baby boomers to live in their own home and precludes to keep and/or to construct enough elderly facilities for the generation. Even today, bankruptcies of nursing facilities have been reported in Australia.

There are many people who worry about disabled living when it comes to their future. There are concerns such as, “we worry that the disabled people may cause serious accidents such as a fire” or “why do the family members allow the disabled elderly to live alone?”

We must accept the elderly with disability as a neighbor and a member of the community. The baby boomers must realize that it is no longer possible to live while depending on others’ favors. And so the baby boomers must keep on contributing to the society.

(2) Possibility for Independent Living
We continue our research in order to state clearly, “Even with disability, it is possible to live independently”, against the question of “what happens if a person becomes bedridden because of cerebrovascular disease or bone fracture?” The elderly with disability who would be bedridden until today can re-acquire independent walking by the Takizawa Rehabilitation Method and can live alone with a little care, as mentioned in 3.2.

It is necessary for all of us to prepare the social condition to accept the disabled elderly as
neighbors and to live together. Therewith the society enables the disabled elderly to live independently.

In addition, there is a necessity for the elderly to become a mature consumer to live independently. We started the research to realize the consumer habits of elderly in order to provide the consumer education training to them.

5.2. Population prediction

The Japanese population of elderly people over 65 years old is estimated to reach 34.726 million people in 2025 (33.116 million people according to the 1997 prediction) \(^2\). The number of elderly people needing care in 2002 accounts for only a fraction of the 12.3% of elderly people. However, it is estimated that by 2007, this number will account for a fraction the 17.0% of elderly people of Tokyo, one of the youthful cities \(^80\).

The predictions by the National Social Security and Population Problem Laboratory have been different on every occasion. In other words, their predictions were incorrect.

The social security benefit fee prediction shown in table 1 has changed. However, the prediction of the number of disabled elderly in need of care had never been changed, even the figure in the Tokyo Metropolitan area had been changed. Moreover, it is obvious that the decrease of deaths by cerebrovascular disease leaves people disabled by the after effects of cerebrovascular disease.

While the rate of death due to cerebrovascular disease is decreasing, the disease is leaving many more people disabled.

Adding to that, The Yomiuri reported that US Strategic International Problem Laboratory stated, “Japanese average duration of life might be exceed 90 years old with probability 5/6.”\(^81\) The elderly and the disabled elderly increase all the more.

The rates of the number of elderly in need of care among the elderly population were 12.8% in 2001 and estimated to be 16.6% in 2007 in Mie Prefecture. The number of elderly people in the east Kishu area is 21.3% of the population. This shows very high growth\(^82\). One in five elderly will be in need of support or care for daily living activities.

At present, the prefectures with high rates of elderly population are confronted with the decreasing population of younger generations. However, as baby boomers grow older, a rapid aging of the city’s inhabitants will continue, as shown in Tokyo’s prediction. An increase of the disabled elderly does not only apply to the Mie Prefecture but to all the cities in Japan.

In order to estimate the social security-related expenditure in the future, it is necessary to prepare the dynamic statistics of population based on real figures.

5.3. Occupation suitable for the healthy elderly

The working rate of the older persons, 55-69 years old, is 70.9% for men and 44.2% for women, according to the national investigation in September 2000\(^83\). In most of Western Europe, many workers hope for early retirement. On the other hand, the working rate of Japanese elderly is very high, and the retirement age is also apt to be delayed statutorily.

However, under today’s economic conditions, few enterprises can hold on to such delay. Many big companies plan to restructure. Risona Bank, one of the major Japanese banks, plans to reduce its staff by about 4000 employees from 20000 to about 16000. The Tokyu Department Store reduced its workers by 500 people. The Daily Industry newspaper, which specializes in industry, reduced its employees by 240 people.

The elderly who have special skills can make use of their talents on the job. For others, they should try and use new approaches including IT. Agriculture and service industries may be apt employment candidates for the retired.

If the pensioners engage in agriculture, the cost of the labor will be lowered and the price of the products will also decrease. This means that Japanese products will be able to compete against low-priced imported products. The Kanagawa Prefecture government organized a renunciation area for cultivation. The “middle aged home farmer system” was enacted as a policy in the Kanagawa Prefecture starting this year. In accordance with the Kanagawa Prefecture’s policy, farmland was provided for rental to people who want to start farming.

In many communities there are clubs consisting of elderly and older elderly people who volunteer their time to take part in neighborhood cleaning activities and various other volunteer activities. We
anticipate that elderly club members will work as local nursing care volunteers.

5.4. International Joint Research
Immediately after the International conference, participants worked to learn skills presented at the conference. The first conference was hosted in the CNMI and the second conference was hosted in Canada. In September 2004, the conference will be held in Manila, Philippines.

Due to the success of the conferences, the host countries, including Nepal, requested permission to implement methodize rehabilitation in their countries. It was partially agreed. We will also try to educate developing countries on our studies through academic conferences.

Interchange for the kinematics between the universities has already begun through the International conference.

5.5. Biophilia
It has been dispassionately reported that the number of suicides has exceeded 30,000 people for each of the past 6 years in Japan. In the United States, public opinion is split in regards to the Vietnam War, which lasted 8 years and resulted in 45,662 deaths of American soldiers. Depression from the worries of life seems to be the cause of suicide. Those numbers of suicides in Japan are much higher than numbers of people killed during Vietnam War.

Gillian Tett stated “Hoping that silence and luck alone will solve Japan's fiscal woes seems a truly kamikaze policy - in the English sense of the word.” in the Financial Times.

She also stated that “kamikaze” has multiple meanings as follows:

First, a truly kamikaze policy means “when the Mongols were about to invade Japan many centuries ago, Japan was saved by a typhoon “Kamikaze” that destroyed the Mongol boats.”

Secondly, it means “the government would simply stick with current policies and hope for a sudden miracle to resolve the problem.”

Third, the English sense of the word, for many non-Japanese, the phrase implies "self-destruction", because the suicide bombers of the Second World War were called "kamikaze" pilots.

Worries about employment, pension, and medical insurance seem to make people think, “Getting old is no good”.

This mindset becomes the power for eliminating the fears and worries of people to recognize that: even if we get disabilities as we age, we can live independently; and even if we become physically handicapped, we can continue to contribute the society through IT (information communication). Furthermore, it will become the source of will to try to live and to have dignity as a human being despite having a disability.

Because there are many human beings who live to old age, this academy aims to contribute to the stability of peoples’ lives and the improvement of mankind’s welfare, especially for the Japanese. In our Biophilia Rehabilitation Research scheme, we called together the related research fields, including medical science, engineering, and social science, in order to integrate the various aspects of a complex aged society.

The motive of our research is to actualize, through the diffusion of Biophilia Rehabilitation, a society that can afford dignity to those who are elderly and disabled, allow people to become independent from care-reliance, and at the same time, increase life expectancy to a healthy level for those who live to old age.

Such society will be established by Biophilia (the mind of each person; the heart and /or will that motivates a person to keep a respectful life even when they become handicapped), through the research of Biophilia Rehabilitation Academy, motative exercise (using devices, and by an exercise from people with disabilities themselves), following Takizawa method (operation method of motative exercise for elderly with disabilities in sitting posture), and at-home care (at-home nursing, at-home care, meal guidance).

The diffusion of Biophilia rehabilitation actualizes a society in which people can transition from care reliance to the independence.

Fig. 2 Society overhead view (sustainable aged society conceptual diagram) shows the outline of the society that our research will enable us to attain in the future.

Keeping the national characteristic of our kindness, but not depending on it, the imminent Aging
Crises will be a chance to switch to a civilized society. Independent citizens, composed of the super-aging population of society, will ride semicivilization, which Fukuzawa feared. This is the chance to prevail one side of ongoing Japanese culture since the Edo Period.

We will continue to research. And we believe that it enables the establishment of the new civilized society, which consists of the new life culture, and doesn't cause increases in the elderly a negative factor.

**Acknowledgment**

As the Conference Chair, I was honored to have been able to hold the Second International Biophilia Rehabilitation Conference in Windsor. I would like to take this opportunity to appreciate your close attention towards the search for better science.

Biophilia Rehabilitation Academy is a Japanese Non-Profit Organization with an objective to further spread the study of Biophilia Rehabilitation. The members as the following established this academy; Honorary Members, President emeritus; Ms. Kyoko Takizawa (RPT), Dr. Kunihiko Fukui (MD), Dr. Hideo Kijima (MD), Honorary adviser; Dr. Masao Saito, Dr. Shouich Kakurai (MD), Dr. Seishi Sawamura (MD). Board of Directors on Biophilia Rehabilitation Academy in Japan; President; Dr. Tetsuhiho Kimura (MD), Vice president; Dr. Yoshiyasi Takefuji, Dr. Yuzo Okamoto (MD), Mr. Satoshi Endo (RPT), Dr. Hiroshi Nagasawa (RPT), Ms. Mitsuyo Makita (RPT), Dr. Yoshiko Morita (MD), Mr. Koujiro Matsuoka, Director; Mr. Junichi Ozawa, Mr. Toshiaki Murao, Dr. Shouji Kawai (MD), Dr. Hajime Takada, Dr. Ichiro Watanabe (MD), Dr. Kenji Ushizawa, Dr. Takuji Shirasawa (MD), Mr. Tomoji Ishimaru (RPT), Ms. Rika Wada (RPT), Ms. Kyoko San (RPT), Mr. Nobuo Aoki, Ms. Estuko Sato, Auditors; Dr. Toshiiho Neyazaki (PHD), Dr. Shinichi Fujita (PHD).

I planned this Conference with the help of all the members above and through a personal relationship with Dr. Charles James and the City of Windsor, a sister city of my hometown.

We have announced our most advanced research at this international conference. The general presentations, useful for everyone’s life improvement were introduced to people all over the world through J-STAGE (Japanese National Scientific Database). The First International Conference in 2002 was a joint effort with the Commonwealth of the Northern Marianas Islands Governor’s Council on Developmental Disabilities and successfully proved the importance of this method for elderly care throughout the world.

With great difficulty and preparation, the conference realized the effort of everyone in the scientific committee and the City of Windsor. I express gratitude and pay respect to the City of Windsor and people there, especially Mr. Paul Louiviere, Mr. Michael G. Chantler, Dr. Charles James, Dr. Jim Weese, Dr. Sheila Cameron and all of members of our academy.

The research is accomplished by the help fund of Ms. Kyoko Takizawa (My mother), Ms. Yumiko Takizawa (My wife), Mr. Nobuo Aoki (My brother in low) and Ms. Reiko Aoki (My sister). I truly appreciate them, my daughter Ayu, sons Satoru and Isamu because I did not have time to spend my time with the children together, but they accepted my study.

The author also expresses his sincere gratitude to Dr. Yoshiyasu Takefuji, Mr. Junichi Ozawa and Dr. Hajime Takada for their valuable suggestions.

This research supported by the following grant;

The development of the walker with new 4 wheels and sleds by Grants of New Energy and Industrial Technology Development Organization through Rehabiliaid Inc. (1993-1997)

Development of devices of the rehabilitation measurement station concerned with the lower extremities by Grants of the Kanagawa Industrial Technology Research Institute through Dr. Iemoto A. (1998-2001)

The investigation research of ADL improvement of the aged bone fracture patient and their independence by the Grant of The Association for Technical Aids through Nippon Medical School (2000-2001)

FS investigation research for development of the Motivative exercise and lifting aid dual device by Grants of the Japan Small and Medium Enterprise Corporation through Rehabiliaid Inc. (2001-2002)

Research on the rehabilitation technique diffusion toward the reduction of the bedridden elderly by the Grant of Japanese Ministry of Education, Culture, Sports, Science and Technology through Sanno University (2001-2003)

The research of the reality and the future of the consumer education to the elderly by the Grant of Japanese

The Device diffusion research for the ADL improvement of the aged lower extremities bone fracture patient and his/her independence by the Grant of The Association for Technical Aids through Biophilia Rehab. Academy (2003-04)

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Received: June 3, 2004, Reviewed: June 30, 2004, Published: August 7, 2004

This article was published as above in the Japanese Journal as an original research article. The Japanese one became a predecessor journal of the BIOPHILIA. As a memorial edition for the getting ISSN-L and for a help of the English readers to find this article, we permitted to reprint and publish in the BOPHILIA journal.

The permission date by accomplished the review on February 17, 2015.

The Biophilia editorial board obtained the publication request and copyright holder’s permission, reprinted it after the review and published this article as renamed “Application of the Social Technology To the Sustainable Aged Society” on April 30, 2015.