Biography and Future of the Biophilia Rehabilitation
(The Revolutions of Hope)

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Abstract
This article describes the steps we should undertake to establish a sustainable super-aged society. The article consists of the following chapters:
1. Foreword
2. The motive, process and progress of the approach
3. The reports on the established Takizawa Method and Motivative Exercise
4. Present social structure of Japan and the world
5. Features of the current rehabilitation medicine and medical treatment
6. Our studies
7. Results of studies
8. Conclusions, References and Acknowledgments.

The research findings about the brain functional activation by functional magnetic resonance imaging (fMRI) and functional Near-Infrared Spectroscopy (fNIRS) are shown. It is concluded that a clear verification of brain functional improvement and the randomized controlled trial (RCT) of the current method of rehabilitation against the Takizawa method are necessary from now on.

1. Foreword
Japan is a country where many people live to advanced age. This results from the development of medical treatment, hygiene, health and welfare. There are firm regulations in Japan which have helped obtain such a result. The rule-based control also concerns the rehabilitative medical treatment. However, the treatment result has inconsistency. Under the universal coverage of public health insurance of all the Japanese, the number of people who require care, based on the elderly care insurance, was 5 million in October, 2010. That was an increase by 680000 from 4320000 people at the end of March, 2006. All the people requiring such care received a treatment based on rehabilitation medicine. On the other hand, the analysis of the claim data of Medicare in a rehabilitation hospital in the USA from 1987 through 1994 shows the fact that the spinal cord injury, brain injury, stroke, femoral neck fracture, arthritis and other joint diseases made people stay longer in the hospital and increased the costs. The author of this article began to research the possibility of restructuring this ineffective rehabilitation medicine from 1987, almost 24 years ago.

Once Dr. Kunihiko Fukui who worked in rehabilitation medicine for 50 years as a pioneer of rehabilitative medical treatment in Japan said, “It comes to nothing; waste the time and effort without effect for the patients to continue the current rehabilitation medical treatment especially for the elderly.” At the congress of the Japanese
At the beginning of rehabilitation treatment tends to get less improvement. Also, a person who is over 65 years old tends to get less improvement over the time of his hospitalization.” Through these facts, the author argues and announces it all over the world that the innovation and restructuring of the rehabilitation medicine is a necessity in order to make society sustainable without the inordinate burden to the next generation. While looking back upon the past, the author presents how rehabilitation medicine should be changed against the current approach. It must be the Biophilia Rehabilitation consisting of the Takizawa method and Motivative exercise, the autonomous and programmed exercise. The newer approach is announced today for the dissemination to the world to contribute to the improvement of welfare of human beings.

The author of this article, who was an outsider in the rehabilitation medicine and who had been a member of Fujisawa city council states, has been tackling the following issues linked to the rehabilitation medicine:

(1) Why has an outsider aimed at restructuring the rehabilitation medicine?
(2) What advantages will the realization of restructuring of the rehabilitation medicine lead to?
(3) How people can enforce the Takizawa Method and Motivative Exercise?

Besides, the author asks for cooperation of professionals from other countries of the world in one major aspect of research, that is the implementation of a randomized controlled trial (RCT) comparing ours with the current method of rehabilitation. Since the rehabilitation medical treatment is under the rule-based control regarding the medical treatment fee, RCT is impossible to be carried out in Japan. We need to obtain a research partner and expect that the partner come out to restructure the rehabilitation medicine at the opportunity of the IBRC2011 workshop and the IBRC2012 workshop, which will be broadcasted all over the world.

2. The Motive, Process and Progress of the Approach

2.1 In 1971~

(1) The premonition of the social disruption (Aging Crisis) by baby-boomers aging

The author had a trip to Paris for studying French by the Trans-Siberian Railway in 1971. The Hotel des Invalids is a famous for sightseeing in Paris to this day. There had been many persons without a leg or legs in wheelchairs there wrapped in a warm sunlight at the park in Irkutsk, Siberia. The disabled veterans had come to the park. The meaning of the Hotel des Invalids of Paris was understood in this sight. Those people were not in Japan. Most of all Japanese disabled veterans had died. Remarkably numerous youths who are full of power at this moment of life will become elderly people in the future. They will require care. The author noticed this inevitability. The disabled veteran in the park and the Hotel des Invalids were a mirror which reflected my generation, baby boomer’s old age. This experience made the author start to work on the aging society problem especially for the baby-boomer at the study group of the municipal election in 1975.

(2) The member of a city council of City Fujisawa

The author was elected a member of the Fujisawa city council in 1979. The author made then a proposition that the Fujisawa administration should make preparations to meet the requirements of the aged society and to establish the foundation for them in the city parliament. The author continued proposing for the aged society preparations. The popularization of the Gateball game (ball game done in the park) and the welfare taxi were proposed and they were realized. However, there was no visible result in policy proposal realization of the Aging Crises evasion for these 12 years. Associates elected during the same election became two mayors and a deputy minister of the judicial-affairs of Japan later on.

(3) Estimate of population

The Ministry of Health and Welfare (at that time) predicted the population ratio of the elderly aged 65 and over to be 1 to 5 in 2025, by the 1975 year’s estimate of the population, and introduced the silver city plan, etc. The author announced the population ratio in the City Fujisawa should rather be expected as 1 to 4 or more in 2025.
2025, based on the compensation presumption of the population dynamics by using the computer in the City parliament.

(4) Rehabilitation in the Fujisawa Shimin Hospital (FSH) differs from the usual rehabilitation

Rehabilitation was carried out in 15000 or more patients per year by one physiotherapist with two assistants at the FSH in 1975. It is possible to say it was done three times more efficiently than in other hospitals. There was a discussion that Rehabilitation in the FSH was different from normal rehabilitation by a Socialist Party member at the Fujisawa city parliament in 1985 due to a remarkable labor saving. Owing to that, the author recognized that rehabilitation performed by Kyoko Takizawa, a physiotherapist, the author's mother, was different from other types of rehabilitation.

2.2 In 1987- "To be the system from the God hand"

(1) Rehabilitative treatment to the patients who was diagnosed as having a physical impairment

The organization of city functional training (Training Meeting) for the disabled elderly being at home was established by Chigasaki City, next to Fujisawa City from April of 1987. The first Training Meeting of Fujisawa City was held in October 1987. After a half-year discussion and negotiation, the Fujisawa Medical Association accepted the decision to hold the Training Meeting under the condition of accepting only the disabled elderly who had been diagnosed with the disuse syndrome, being in chronic phase, or suffering from impairment with no curative effect anticipated. As a domestic lawmaker, the author recognized the fact that the functional training meeting were set up for the persons who actually could never recover.

(2) Uptrend concerning the number of persons requiring nursing care and policy

The Ministry of Health and Welfare had groped with the issue of disabled elderly and made efforts for developing institutions for the elderly, termed the Gold Plan decided in 1989. The expense burden for to care dependents and for the promotion of institution development policy would be large. Therefore, the author recognized that if the issue had been neglected Japan and Fujisawa City would face the Aging Crisis when we the baby boomers became elderly. The author conceived that to avoid this, when baby boomers became elderly, they should not be care dependents but be independent and should keep on making a social contribution. However, the survival rate after cerebrovascular disorder increases rapidly, and the number of the elderly with fractured bones is on the rise as well. In other words, the Aging Crisis must happen because a social burden would increase with the increase in the number people receiving care, be it at home or institution.

(3) Discovery of the rehabilitation which makes independent living possible

Success in the election was achieved with the fourth place for the third term as a member of the city council in 1987. The author observed, through the activities of this election campaign, which patients of Kyoko Takizawa, a physiotherapist (following said SPT), regained the ability to walk and to begin an independent everyday life. The orthosis, the cushion and the walker helped their lives. As treatment, the autonomous kinetic rehabilitation with the developed devices was carried out.

(4) The method of rehabilitation which makes the disabled elderly live independently

SPT performed the autonomous kinetic rehabilitation to bedridden patients at the Nagaoka Hospital, Elderly Patients' Hospital for Intensive Care, and to the disabled elderly who were diagnosed with “chronic disuse atrophy with presupposed no curative effects” at the Fujisawa Function Training Meeting in 1988. The results were remarkably effective. Based on these facts, the author persuaded her to admit that the way of rehabilitation she practiced was new systematic approach right. She never accepted the persuasion. And she persisted, “My hand is a hand of magic. My patients say that you are like a God. They all could walk because of me.” A three-generation living home was built in 1989 and the author lived by the extended family with her. Since then the author was persistent in constant persuading her argued she responded back “The political activity is your work. Don’t interfere in my job.” Persuasion was continued for six or more years since 1987.
(5) Reintegrated into their own society

The participants who were diagnosed as having a physical impairment, reintegrated into society at the Fujisawa Training Meeting at mid-term of 1989. Patients who had previously disclosed their want to suicide expressed their hope and joy to live. SPT told that to the author delightedly “Come to see as a domestic lawmaker.” The author advocated “It is meaningless unless you accept that your rehabilitation way is not by divine but is based on the method.”

2.3 In 1989 - 21st century Rehabilitation Study Meeting (21 RSM)

(1) The necessity of social recognition of the method of the autonomous kinetic rehabilitation

The author believed that the social recognition of the method of the autonomous kinetic rehabilitation was necessary not to ravage the next generation with increasing burden due to a greater number of the disabled elderly when we, the baby boomers became the elderly. The author bound himself to give to the world the Method of rehabilitation which everybody could use.

(2) 21 RSM was established with one member

In order to realize it, resigning from the post of domestic lawmaker was unavoidable. The author decided about it while going up stairs of the newly build home and said to the wife "I don't run in the next election". Although the inception of the study was 1987, it can be said that 21 RSM was established by one member at this moment. After that, something was different from the day before, and the author’s father escaped from home, telling that the daily persuasions were too noisy.

Several years passed in this way. The author thought that there were two ways for making use of this method to the society. “One is to include it with the enforcement in the Fujisawa administration by the local government and promote it, and the other is to make society recognize it as a new basic approach of rehabilitation medicine”. However, it was obvious that it was necessary to verify the method academically as a new approach of rehabilitation medicine for the citizens’ service by the administration.

(3) Determination as a person engaged in politics.

In1991, the author resigned from the job without running for a lawmaker position to establish the method and to diffuse it in the world. In Japan, the salary of a domestic lawmaker is almost the same as that of a university professor. The author made that decision, although he was engaged in politics, because he judged it was important and of the highest priority to provide the method to society even if the political career and the income obtained would have been given up.

2.4 In 1992 - Devices development and medical article

(1) Walker development (Devices development)

The flexible lower extremity orthosis 7) and a cushion 8) were produced at first. Moreover, exercise devices were developed and also a handmade walker was developed, with the recommendation of Mitsuyo Makita 9), a physiotherapist at St. Marianna University School of Medicine Hospital. In 1992, the author requested Hideo Kijima, chairman of the Fujisawa Clinical Orthopedic Meeting (FCOM), to exhibit this walker at the meeting of the Japanese Clinical Orthopedic Association (JCOA). Kijima already knew that the author had resigned as a domestic lawmaker and helped the rehabilitation of SPT. He stated that he was so surprised at the action about the rehabilitation and carrying it out at the cost resigning from a good job.

(2) The first medical article

The author got the opportunity to present it at the FCOM regular meeting and exhibited at the JCOA exhibition by Kijima's efforts. After that, the author was asked for the article to publish in the FCOM news and it was published in 1993. This is the first article 10) for medical use and for the beginning of my study. The author thanked to the orthopedist Ken-u Hiyama for a help in describing the method, which is still viable even today. The cooperation was similarly obtained from SPT and that led to the SPT’s presentation 11) about the condition of a
patient of the Nagaoka Hospital at the Kanagawa PT association in November, 1994.

2.5 In 1994 - A clinical trial and the abandonment of a lawmaker position at the prefectural assembly


(1) Nomination to succeed a member of the prefectural assembly

Since positive cooperation of SPT could not be obtained, the author was nominated and accepted the position of to succeed by Kanagawa prefectural assembly chairperson, Kisaburo Kumayama in 1994. The salary of prefectural lawmaker was now double that of a university professor. A decision to run for a prefectural assembly election was made, and the author obtained permission from the person in charge (Section Chief Yoshikazu Goto) of NEDO. However, this meant giving up socialization of the autonomous kinetic rehabilitation method.

(2) Clinical trial

However, before then, the author had asked some physiotherapists to join the Walker Development Study Committee for NEDO grant. Just at that time, a letter of acceptance arrived from Hiroshi Nagasawa, Mitsuyo Makita, Nobuko kikuchi, Hidekazu Takeda, Hiroyuki Jinnai, Kazu Animoto, Yukihiro Saito, Kyoko Kubota, Yasuji Hatakenaka, Takako Tomoi, Satoshi Endo and Hiroshi Akita (Later omission). Additionally, the physiotherapists of the orthopedics department, Keiichi Mochizuki of Tokyo University asked for the application of the clinical trial to university authorities about the walker with sleds. The clinical trial started with a senior assistant of the medical staff at Tokyo University (that time), Takashi Ooe, as a person in charge, and the study of development was published by Kimura[^14] and others later.

2.6 In 1995 - acquisition of walking

(1) Human beings can live a shining life all over the world.

The author felt certain that the rehabilitation, which SPT have been enforcing and announcing as “God Hand” could be socialized. And the method of it could be published also in a book with the cooptation of the listed physiotherapists. Consequently, the author gave up the candidacy which received prefectural assembly chairperson’s nomination with the retirement of his own. The backgrounds were reported by the Nikkan Kogyo Shimbun in detail.[^15] The author renewed his own mind to the dream to establish the society that all the people and the elderly in the world, even if one having a disability, could live independently in activities of daily living, especially about toileting, and could have a bright life all along. Since then, the author has acted so until today.

(2) The 21 RSM: the second member

The author continued persuasion of SPT. Since the author did not run as a candidate for the election for the prefectural assembly, which has naturally considered by her as a form of a political situation, SPT finally accepted that the author is committed to the rehabilitation development. It was in the early spring of 1995. The second most important member participated in the 21 RSM at last. The author's father had been hearing the persuasion every day till then and had passed away in 1997, with leaving the words, “Name this Takizawa method”.

2.7 In 1996 - Research by the study group centering on physiotherapists

(1) Disclosure of information, and the organization of the 21 RSM

Then, the research started with the disclosure of medical record of the Nagaoka Hospital which SPT had chronicled. The day which was determined as the most suitable for publishing from the chart with Endo and Makita is always fresh in memory. The author wrote "Re-acquirement of walking from bedridden" from 1995 to 1996 in cooperation with SPT and receiving instruction of Makita and others. In addition to authoring, the 21 RSM was organized by some of the people who cooperated in this writing, and made SPT into the chairman.

(2) The Fujisawa city mayoral election in order to do away with the bedridden elderly

The galley proof of this book went up in January, 1996. However, the author felt that it was inadequate in a
quest to develop research because there was no participation of doctors in the book. And the author considered that it could not be recognized as a new method of Rehabilitation medicine. So then, the author ran the Fujisawa mayoral election as a candidate with the campaign “No bedridden elderly” to insist on the opinion making as the other means of achieving progress, even there was no preparation for it. Although defeated, this candidacy brought a big effect later on.

Some of the friends said that if you ran as a candidate for a prefectural assembly election and played as you were, there was a chance to be a Diet Member and it had been greatly possible from the political situation of Fujisawa City at the time. Nevertheless, to make the aged society sustainable, the author had no choice but to give up a prefectural lawmaker, and it meant to give up the Diet member and being a deputy minister as the result, because it was necessary to obtain information disclosure of SPT for making the autonomous kinetic rehabilitation the method.

(3) The eagerness to do away with the bedridden elderly and the vice-director of the Hospital of Research Institute of National Rehabilitation Center for Persons with Disabilities

The author published "Re-acquirement of walking from bedridden" after the election immediately in April 1996. Just after the book was issued, the author notified about it the prosthetic official of the Ministry of Health and Welfare (at that time), and asked to introduce the suitable doctor for a verification. The special official in charge of prosthetic inspected the actual autonomous kinetic rehabilitation. Tetsuhiko Kimura the vice-director of the Hospital of Research Institute of National Rehabilitation Center for Persons with Disabilities was introduced. Shortly after he read it, he said that after putting in doctors, he could also write the foreword of the 2nd edition, and he encouraged us for a further study together.

(4) Shonan Nursing School

Just after the election terminated, the author attended a meeting with old friends associated with the Junior Chamber of Commerce, Kijima seated next to me. The author brought many books to sell them to participants at the meeting. Kijima immediately purchased 50 copies for students of the Shonan Nursing School. Besides, he asked the author to work there as a teacher and the author taught at the school for 12 years since then. He accepted the campaign pledge to dissolve the bedridden elderly as the truth, which the author asserted strongly in the mayoral election. This mayoral election had the large meaning of social education, and the campaign pledge of the election did not mention social infrastructures, such as school maintenance and a road construction, or a sewer. There were only two, "New Job using Internet" and “To do away with the bedridden elderly by the method of rehabilitation.”

2.8 In 1997 – To explore the medical verification.

(1) Doctors’ participation to the 21 RSM

In 1996, in response to the end of a walker development by the NEDO Grant, the author requested Kijima for the re-lecture in the Fujisawa Clinical Orthopedic Meeting and carried it out. The actual condition of rehabilitation in the Nagaoka Hospital was presented in the lecture. Also, the author visited the orthopedists all over Japan with an introduction from Shiro Kanai who was the former president of the Japanese Clinical Orthopedic Association, and reported on the walker development and new method of rehabilitation. This presentation with Kijima, Kanai and others was published on the journal of the Japanese Clinical Orthopaedic Association later on. Kunihiko Fukui, the famous medical doctor for rehabilitation medicine, began to work with SPT in Nagaoka Hospital by chance. And the name of the Takizawa Method was accepted by him due to the above-mentioned method of rehabilitation was unique. And simultaneously he acceded to the second 21RSM president instead of SPT.

(2) Participation - the director of the Hospital of Research Institute of National Rehabilitation Center for Persons with Disabilities (HRINRCPD)

Kijima acceded to the third president of the 21RSM in 1998. He referred the reason for assumption of this that the author announced to abolish bedridden. He said, “ I want to ascertain as a doctor how he can do”.
response, Kimura was visited for the second time. Although Kimura was working as the director of the HRINRCPD, he participated in 21RSM as an adviser. He indicated and showed an advanced plan as a field test and medical verification from now on. This encouraged the 21RSM participant centering on PT, especially me truly. This meeting was broadcasted as news of NHK. The study was published by the author at CSUN.

(3) Motivative Exercises (Sodo undo in Japanese)

Name of Motivative Exercises, Sodo undo in Japanese, was defined by the vote of study group members. Although both of votes “Sodo undo (Motivative exercise)” and “Sodo undo (exercise doing simultaneously)” were the same numbers, as English showed, it selected in view of the importance of having a motive. In addition, the English name is the author's coined word, and the United States Patent Agency has the record.

2.9 In 2000 - Establishment of the Biophilia Rehabilitation Academy

(1) From a study group to the Academy (research purpose)

Kimura, who experienced the vice-director, the director of HRINRCPD and the professor of Nippon Medical School, guided us as the fourth President for 10 years until 2009. He acceded to the fourth president after the third Kijima. The study group held the conferences by Kimura as a chair, and the proceedings were published.

Masao Saito, professor emeritus at the Tokyo University and famous for welfare engineering, and Seisi Sawamura, president of the JAPAN ASSOCIATION OF REHABILITATION HOSPITAL AND INSTITUTION participated in this Academy as honorary advisors.

(2) Participation of the former Tokyo University professor of the rehabilitation department

By introduction by Hiroshi Nagasawa, the assistant professor of Kitasato University (that time), Professor Shuichi Kakurai, Kitasato University medical health faculty held the 6th Biophilia Rehabilitation Conference as a chair. He had been the professor of the rehabilitation medicine department of Tokyo University and president of the Japanese society of Prosthetics and Orthotics. The author visited him and expressed gratitude, because it was an extraordinary action for such a person in such a high position. At that time, he stated “one of the candidates for the Fujisawa mayoral election in February is my old friend, therefore I watched all of your campaign, so I took it on.” Election candidacy of brought result of 2.8 and this, and became a big power to promote our research.

(3) Expectation for resumption of political activity

The opinion was "the author flung away to be the member of the prefectural assembly” and “the son made her present it" about the presentation shown in 2. 4 (2) at the preparation meeting to set up the 21RSM. The members who knew such facts spoke up, “Wasn’t he able to do it, as a lawmaker?” and "It is better for you to return to lawmaking again" even now. Related to this, Yoshiyasu Takefuji, professor at Keio University environment information faculty who has been working with the present researches said "you should try to become a mayor or a Member of Parliament". The author however has been saying, "Any political election is not possible", because of the study life for 20 years without any incomings. But Takefuji said “it is now possible to run the election campaign even if you don’t have any money. Is running the election campaign dreadful for you?”

The author has been receiving such a strong recommendation. The author expects that any statesman will make the studies based on the studies of the Biophilia Rehabilitation Academy into a policy. Moreover, the social science research has been planned and such an approach has started.

3. The reports on the established Takizawa Method and Motivative Exercise

3-1 Takizawa Method by Motivative exercise

The outline of Takizawa Method are shown in following (1) - (9). The devices and Stage to use are shown in Table 1.

(1) At the time of rehabilitation training, don’t give any pain to patients.
(2) By using the devices developed, the motivative exercise to both feet will be done with the assistance of one’s own functional extremity. ROM exercise by passive exercise on mats is never done in the training room.
(3) At a training room, patients train using devices, including walker, in a wheelchair seating position, a chair sitting position, or a standing position, without using a training mat.

(4) For the patients who can’t take a sitting position posture, it will be made by using Cushion.

(5) Acquisition of walking is an end goal, and training with a patient is carried out according to the condition and capability at the time of training.

(6) The rehabilitation is done from the early stages of training shown in Table 1, as following; An upper-limbs training machine (pulley) is used for upper-limbs training. The ankle plantar flexion and knee extension and flexion training devices are used for lower limbs training. Moreover, the belt of weight, which is attached near to the ankle on the training leg is also performed for the muscular power strengthening and range of motion expansion.

(7) At convalescence stage, the seating position balance and trunk training will be performed in a wheelchair and then a standing position may become possible.

(8) At Chronic stage, all kinds of exercises shown in the table 1 are performed.

(9) This method is already compiled in a manual, so that a care worker or a family member can assist its enforcement.

Table 1 (Adaptation of Takizawa Method)

<table>
<thead>
<tr>
<th>Term</th>
<th>Stage</th>
<th>Convalescence</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>physique position</td>
<td>bed rest, sitting</td>
<td>sitting</td>
</tr>
<tr>
<td>Developed</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>PATA / KORO Leg training devices</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Flexible leg brace</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Raku walker</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Both</td>
<td>Upper-limbs training device</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Market goods</td>
<td>Spindle band</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Parallel bars</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Results of Re-acquirement of walking
10 Patients with dementia could work but the remaining inpatients were in a bedridden state at the time of hospitalization or at the time of the rehabilitation started in 1988.

<table>
<thead>
<tr>
<th>(End of 1993)</th>
<th>(End of 1994)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers of Re-acquirement of walking</td>
<td>Numbers of Re-acquirement of walking</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td>The items of inpatients' diseases</td>
<td>The items of inpatients' diseases</td>
</tr>
<tr>
<td>94 rehabilitation room 28 Bed side</td>
<td>127 rehabilitation room 66 Bed side</td>
</tr>
<tr>
<td>92 cerebrovascular disease, 22 bone and joint disease, 14 viscera, 9 dementia, 5 else</td>
<td>143 cerebrovascular disease, 63 bone and joint disease, 71 viscera, 14 dementia, 28 else</td>
</tr>
</tbody>
</table>

Person walking oneself
Crutch walking
Walker walking
Raku walker walking
Walking in the parallel bars

13
3-2 The first study and publication
The book “Re-acquirement of walking from bedridden” shown in 2.7 (1) was published by verifying the enforcement result and an effect of the medical record of the Elderly Patients' Hospital for Intensive Care which SPT was chronicling. The results are shown in Table 2.

4. The Present Social Structure

4.1 The predicted number of the elderly requiring care
According to the prediction of the Health, Labour and Welfare Ministry (MHLW) in 1993, the elderly who need care will number 5.2 million people (of which 2.3 million people will be bedridden) in 2025. Moreover, this prediction by the MHLW hasn't been changed until today. It seems that they forgot this. The calculation of the care required elderly of the Long-Term Care Insurance is 4350000 in 2006. Because the number of the elderly, 25940000 (the number of rights-based insured person who are 65 and over), 30 million people in 2012, and 38.6 million people predicted by MHLW, it will reach the prediction value in 2012 and exceed the prediction value of 2025. The MHLW has announced that the number of the aged people requiring care will be 5 million people in October, 2010.

4.2 Death causes
A 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. 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 disabled elderly will continue to increase.

4.3 The Condition of the United States
The financial circumstances of the U.S. whose national assets have been degraded, can be said to disturb the world economy. The Kerry-Danforth Committee of U.S. 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 the year 2030. Due to an increase in the number of the elderly, the financial and social collapse will occur if we keep the existing pension and finance system. We call the collapse, the "Aging Crisis". The Aging Crisis of both Japan and the United States shown in the future prediction will also occur in other countries in the future.

5. Features of the Present Rehabilitation Medicine and Medical Treatment

5.1 Are rehabilitative medical treatments wrong? What does rehabilitative medical treatment lead to?
The Japanese receive rehabilitative medical treatment from acute phase by the national health insurance system that encompasses all citizens. However a large number of disabled elderly is in need of nursing care and/or home care. Although the number of aged people requiring care was shown in Chapter 4 "The present social structure", the current prediction by far exceeds the previous one. Although rehabilitative medical treatment is received, those who became to need care after rehabilitative treatment are increasing in number sharply. It is regrettable for the author that there is a specialist who advocates that this fact is not a correct fact.
5.2 The number of doctors and therapists increases

According to the Japanese Physical Therapy Association, there were physiotherapists (PT) 23,321 in 2000 and 66,256 membership in 2011, an increase of 2.8 times. The number of rehabilitation medical specialist was 1,787 in 2011 and it increased by 30-50 persons' rate every year from 1980 onward. Their number increased by 403 from 1,384 in 2007.

(1) Why not to cure.

The committee consisting of 5 academies, the Japanese Society of Neurology, the Japanese Stroke Society, the Japan Neurosurgical Society, the Japanese Society of Neurological Therapeutics and The Japanese Association of Rehabilitation Medicine and 3 research groups of the MHLW has published the apoplexy medical treatment guideline (2004 version)\(^{28}\). This committee reported “Most of stroke patients are subject to rehabilitation medicine and actually, 30% of the cause of bedridden patients is stroke, and the number of patients who suffer the aftereffects of it is estimated at about 1700000 people.”

(2) Rehabilitation medicine does not cure.

A rehabilitation team of committee by MHLW\(^{28}\) stated about the effect of rehabilitation medicine and medical treatment that the adequacy of the method of treatment and training in stroke patients is insufficient concerning the validity of the evidence and we need more research in the future as per the guidelines of the 2004 version\(^{28}\). In the Japanese Association of Rehabilitation Medicine, the example of a certain hospital shown in the foreword is reported by Tanaka and others \(^{4}\). A bad tendency was seen in those who had a low ADL at the time of the rehabilitation start by improvement evaluation and the elderly aged 65 and over have not improved with the time of hospitalization.

5.3 Rehabilitation medicine and Acceptance of disability\(^{29}\)

The important concept "acceptance of disability" of the rehabilitation medicine is defined as "acceptance of disability is not abandonment, but it is a conversion of the sense of values to the disability and a change to a positive life attitude by conquering the consciousness and the inferiority complex of shame based on the recognition and learning from experience of having a disability that the humane value isn't reduced by it.” As "a value conversion is the essence of acceptance of disability ", it can be said that no cure but acceptance of disability is the key approach. This approach is thought to increase the number of aged people who require care.

5.4 The purpose of the present rehabilitation medicine class

(Life reconstruction by accepting the disability) \(^{30}\)

The present rehabilitation medicine class also notes that life reconstruction is the end goal in the aftermath of suffering disabilities, such as paralysis of hand and foot, loss of muscle strength, disturbance of sensation, etc. Although medical treatment for reducing these disabilities as much as possible is performed, they often remain. However, medical treatment does not finish in that case, while carrying out the rehabilitative medical treatment for a maximum return of the patient's residual function and residual capability. We support a higher quality life after examining living environment of a person. The author considers that this is the proximate cause to be increased in aged people requiring care.

5.5 The method of the rehabilitative medical treatment

Most of all disabled elderly who are severely in need of nursing care and/or home care have received the rehabilitative medical treatment from the Japanese national health insurance system. Although the MHLW aims at shortening the medical-examination days on the rehabilitation medicine, we consider that cut-down of the days did not have an adverse effect on the result but the present method of rehabilitation medicine has problems.
5.6 National consciousnesses of the no curative effect of rehabilitative medical treatment (economic merit to hospital and welfare facilities)

Long-term hospitalization is expectable. If the degree of care increases, the profit from patients and/or government will increase in Japan. Leighton Chan analyzed Medicare claims data for 190921 discharges from 69 rehabilitation hospitals from 1987 through 1994. They compared total charges, length of stay, and interim payments before, during, and after each hospital's base year. Analysis of data on patients according to diagnosis - for example, spinal cord injury, brain injury, stroke, amputation or deformity, hip fracture, and arthritis or other joint disorders - showed similar findings for each, with increases in charges and the length of stay in the base year.

5.7 National consciousnesses to the no curative effect of rehabilitative medical treatment (economic demerit to tax and insurance cost payers)

Although all local governments set forth the policy "To be able to go about one's daily life at own house independently ", citizens are wishing "I want special institutions and let make the elderly be able to enter any institution immediately." Institution entrance is attained after the long term home care with families who have the disabled elderly requiring care. The situation which actually is in Japan is only a trouble with the disabled elderly when he comes back home to be further cared for by families. And then it means that the economical merit is lost for the health care facilities because that less care creates economical demerit to them. If the result of rehabilitative medical treatment is not a full recovery, it becomes the reason for an increase of social security cost for tax and insurance payers based on the economic demerit to the families and facilities as explained.

6. Our Studies

The author aims at “Overcome the disability.” And the aim is to realize the establishment of a person’s life which realizes "To independence from care reliance." The research since 1987 was summarized and the book named "Asking paradigm shifts to baby boomers" was published in June, 2008. Since then, the keynote lectures have been performed on the basis of the contents as the 3 times chair person of the international conferences. The contents were summarized under a title called; "paradigm shift of rehabilitation medicine" in 2008, "social security measure concerning the knowledge of technology and longevity of the human beings" in 2009, and "Biophilia rehabilitation in an aged society, aging to China, Japan, and every country in the world " in 2010. “Overcome the disability” is realized as shown in Chapter 3. Research for solving the cause and mechanism of this fact is done. Biophilia was chosen as the research academy name as this term shows the representation of the following, “Independent living by overcoming the disability” and “the research from the soul and minds of human being to the technology and constitution of society”.

6.1 What we aim at: Methodological proposal of how to overcome the disability

The author claims "The restructuring (reconstruction) of rehabilitation medicine and a paradigm shift are required" in the above mentioned presentations. Dr. Kunihiko Fukui who was engaged in rehabilitation medicine as a pioneer of rehabilitative medical treatment for 50 years has stated that it is a lost labor even if the current rehabilitative medical treatment continued for the disabled elderly. The author considers that the following three points are the foundation of the restructuring of the rehabilitation medicine and of the paradigm shift, and they are advancing the studies to this end:

1. Interventions that are performed transiently by a third person, such as passive exercise, cannot affect part of the cerebrovascular disease.

2. Autonomous kinetic rehabilitation is just a means to overcome the functional disorder estimated as impairment.

3. Autonomous kinetic rehabilitation must be in the form of the Motivative Exercise named so for the following reason; it is the unaffected side that drives the training of both sides simultaneously of the upper or lower
extremities, and the supposition is that the unaffected side drive activates the affected extremity with the synergistic effect, which is a kind guiding function brought up by the autonomous act.

6-2 Our studies

The author enforced the following studies to show the above outlined and to further develop the issue: Listed fiscal year, grant organization, name, institution, title and Web address, if any (Research representative, signed name with the author’s collaboration: Unsigned, by the author).

- FY2006～FY2007, Japanese National Foundation, Association for Technical Aids, President Tetsuhiko Kimura, Biophilia Rehabilitation Academy, Actual research of the role and use of the welfare equipment in bedsore prevention
- FY 2006, Welfare And Medical Service Agency, Workshop for the motivative exercise which enables an independence life for the disabled elderly, [http://jiritu.org/wam2.html](http://jiritu.org/wam2.html)
- FY 2005, NEDO Grant, Prof. Hajime Takada, Yokohama National University, Improvement of look detection technology, and application to the industrial field
- FY 2005, Welfare And Medical Service Agency (Longevity), President Tetsuhiko Kimura, Biophilia Rehabilitation Academy, The study of local Rehab net construction by the elderly selves,
- FY2005-FY 2006, KAKEN (C) by MEXT, Prof. Tetsuhiko Kimura, International University of Health and Welfare, Research on the Bedsore after the Introduction of the Agenda for Reduction to the Non-provision for Bedsore
- FY 2004-FY 2005, KAKEN (C) by MEXT, Prof. Yoshiyasu Takefuji, Keio University, Database development and analysis for standardization of the degree evaluation data of recovery based on rehabilitation, [http://kaken.nii.ac.jp/ja/p/16500069](http://kaken.nii.ac.jp/ja/p/16500069)
- FY 2003, Japanese National Foundation, Association for Technical Aids, Surveillance study for independent living and improvement in ADL of the postoperative femoral neck fracture by welfare devices

![FIG.1 The first measurement devices](http://www.jiritu.org)

![FIG.2 The measurement devices for clinical trail](http://www.jiritu.org)
FY 2002- FY2003, KAKEN (C) by MEXT, Prof. Kenji Ushizawa Sanno University, Research of the reality and the future of the consumer education to the elderly, http://kaken.nii.ac.jp/en/p/14580493


FY 2001, New technology research FS, Japan Small Business Corporation, Development research of the upper-limbs training machine by motivative exercise combination lift apparatus

FY 2001, The Kanagawa Industrial Technology Research Institute, Co-study by the private-sector, (Akira Iemoto), Leg training systems development for Motivate Exercise

FY 2000, Japanese National Foundation, Association for Technical Aids, Prof. Tetsuhiko Kimura, Nippon Medical School, Surveillance Study of Improvement in ADL of advanced age bone fractures of patients and for their independence

FY 1999, Result expand research of the Kanagawa Industrial Technology Research Institute, the system development of the degree of functional recovery evaluation system by using gait training machine

FY 1998, Development support study of Kanagawa Industrial Technology Research Institute, (Akira Iemoto), Leg functional recovery training station

FY 1995-1999, Help by The legislation of Kanagawa small business creation activity promoting, Development of the Raku walker,

FY 1993-1995, NEDO Grant, Development of a walker with new four wheels with sledge

7. Result of Studies

7.1 Study for the Devices (evaluation machine) 40), 41), 42), 43)

Usually, physiotherapists perform rehabilitation expecting to improve a person who cannot walk due to a cerebrovascular disorder, fracture, etc. Although usually 10 to 20 patients are trained per day by a rehabilitator, less than 5000 in the year in Japan, 15000 persons were trained by SPT with two aids following Takizawa method per year and it greatly appreciated by patients. There is a specialized bedridden elderly-disabled patients' hospital with 226 beds. When patients were hospitalized, all of them gait apraxia. Only10 people could walk in 1988. At the end of 1994, training was done in 193 in-patients and 59 reacquired walking ability as shown in Table 2. The method used training devices, and a rehabilitation program prepared by the planner’s instruction, in our case SPT did it and evaluated it, and the rehabilitation was performed. The leg functional training and the measurement devices shown in Fig. 1-2 were developed to examine the same patient or the data between patients were compared owing it to the database created. The quantified grade of functional recovery of patients was assessed, since the rehabilitation method is universal. Thus, the effective rehabilitation can be performed in various places.

7.2 System research 44), 45), 46), 47), 48), 49)

SPT, a physiotherapist, Kyoko Takizawa who is 84 years old now has believed and noted the cause of her excellent effects as having a “Magic or God’s hand to help people”, as one patient says "You are God" and as she says "Since I do, they are cured". The author continued to persuade for

FIG.3 Cerebral infarction (right MCA domain); brain activity of the Patients with left hemiplegia by the Motivative exercise (fMRI)

FIG.4 Brain activity of the Patients with left hemiplegia by the Passive exercise (fMRI) Presented by Morita, et. al. 63)
many years that it was not a "hand of a magician or God’s" but the system of rehabilitation. The author has sacrificed a lot of time to overcome her belief. The author cannot forget about the analysis of a round number of 10000 kinds of rehabilitations carried out by SPT. This system of rehabilitation is the discovery and invention by the author’s study based on the retrospective observations. Now, the system management method was admitted as the United States Patent. Several studies have been concerning the enforcement of the method. As a result of the study on “Construction of Community Biophilia Rehabilitation Network for the Disabled Elderly”, the Degree of independence has improved significantly (P=0.017). Evaluation of "2-3 sitting with both feet on Ground" has also improved significantly (P=0.044). From these research findings, it is thought that the possibility of enforcement of the autonomous rehabilitation and home implementation of it has been specified for the disabled elderly. And 1 person of independent living at the first time evaluation value increased to 6 persons at the last time evaluation value. The analysis shows that the rehabilitation training by the Takizawa Method can result in positive effects by enforcement approximately of 2-4 days training in a week rather than every day.

7-3 Other medical studies.

The walker development was carried out to aim at the innovation of a life stage. The Sphinx in Egypt has been asking travelers the question, "What animal walks on 4, 3 and 2 feet and is slower walking when the number of legs increases?" The old myth which the traveler could not answer is "It is a human being". Four feet walk is for a baby, and then walking with a cane as a third foot is like using a device. People certainly get older. The author has thought that it is "one evolution" to protect their walking ability using the developed walker. People's migration length all over the world tremendously increased by using the invented cars and airplanes. The developed walker is something of the same as it means living people's life in a richer way, since the elderly can move freely in the interior of a room, which they could not do otherwise. It is a great transformation of the way of thinking for people to "Walk with a walker by 6 feet" from "Walk with a cane by 3 feet" by the myth from the Greek era. A possibility of using the walker and living on 6 legs as a great transformation of the way of thinking was accepted. The clinical trial under support of NEDO grant joining many university hospitals, such as the University of Tokyo, Keio University, Kitasato University, Tokai University, Yokohama City University, and St. Marianna University School of Medicine, and some institutions had been enforced. It was supervised by the orthopedics department of University of Tokyo. The development of a walker with sled and the improvement of move capability by using device developed was reported.

About bedsore prevention, it was reported to prevent and to lose the bedsore in the Nagaoka Hospital where the Takizawa method rehabilitation was carried out. And also it was confirmed that the rehabilitation according to the degree of care was carried out there.

7-4 Social science research

Research on the dissemination of the method of rehabilitation (Takizawa Method) to reduce the number of the bedridden elderly was done and reported as a study of the business administration. The Rogers Model is famous in the study of business administration. The adoption person is classified into five categories which are the innovator and early adapter, etc. according to the adoption time. The result showed the rate of perceived knowledge of the Takizawa method is still only about 5%, it did not reach the level of the early adapter which the turning point to dissemination.

The enlargement of research contributed to the establishment of the non-profit organization Biophilia Rehabilitation Academy. We performed cross-industrial group establishment for the devices dissemination by admitting the necessity which includes change of a marketing target from the viewpoint of business administration. The social engineering study group, a non-profit organization for advanced age citizen to play an active part in the society was established from the research. Now it became the International Biophilia Rehabilitation Academy.
We also found in consumer education research that the advanced age disabled persons can perform independent shopping activities for desired economic goods.  

8. Conclusion  
Our study was esteemed all over the world and the first IBRC 2002 was co-hosted by the Saipan government and received a congratulatory address of the President of the Republic of the Philippines at the 3rd IBRC 2004. In the BIOPHILIA 2011 workshop in Rumania, the author received a letter of Application from the honorable Rumania charge-d'affaires in Japan. Thus, high expectations were met. Many clinical studies were carried out in the 2010 fiscal year by KAKEN (A), The Network Study for Advancing Home Rehabilitation (subject number 21249036). The author reported that patients’ functional recovery was seen by the method of (1) to (4) when the doctor diagnosed the following impairments;  

(1) Unaffected side restricted treatment,  
(2) The purpose management autonomous rehabilitation  
(3) The simultaneous movement of upper limbs on both sides, and  
(4) Motivative Exercise which we are advancing the research on.  

Research of Motivative Exercise continues since 1987. We named it supposing the synergistic effect of an autonomous act by unaffected side driving the affected side training of leg simultaneously. The author presented that functional recovery was reported in multiple cases as compared with a reference. And change was seen in the brain activity during Motivative Exercise, but not during passive exercise as shown in Figs. 3-4. The author believes that the paradigm shift of rehabilitation medicine may become the foundation for prevention of the "ageing crisis". It is shown in "Innovation and establishment of rehabilitation medicine which can overcome the disability". It means that the core concept of the current rehabilitation medicine, "Acceptance of disabilities" is converted into "Overcome disabilities." The baby boomers that the author belongs to are still 2 million or more with each grades of school and twice of the new born babies in Japan. Now they are becoming the elderly. If the elderly increase in number, a lot of pensions and medical expenses will be needed, and also nursing care expenses will increase. Such expenses increase, a social security system and continuation of the society itself become impossible, and the ageing crisis comes out. Even if the baby boomers who become of advanced age and get disability can overcome disabilities it, they can live independently then. The independent life with little care may be attained. From a reverse viewpoint, the society can ask baby boomers for an independent life. As a result, the elderly come to perform a social contribution longer. The society can exploit the elderly manpower and prevent the ageing crisis. The paradigm shift of rehabilitation medicine enables the independent life of many of advanced age and disabled persons from the life of care reliance. Furthermore, continuation of the philanthropy for the elderly is drawn, and it becomes the foundation of the second paradigm shift that realizes conversion of social structure. It is sure that our research enables such a chain. It is possible to say that the insiders do not have primitive questions to the domain that is the foundation of their lives.  

It is a reason that continued efforts of an outsider are required. In addition, it is necessary to realize the dissemination of knowledge about the Biophilia Rehabilitation and its scientific mechanisms, which backs the efforts of clarification. Also, it is necessary to reflect it in the policy of the MHLW, therefore one more step study is needed. We expect as many as researchers, doctors, nurses, politicians, administration officials, therapists and persons in related business to participate in the research as possible. Let realize the revolution of hope with us.  

Reference  
(2) Kunihiko Fukui, Tetsuhiko Kimura, TAKIZAWA Shigeo, “Proposition for the innovation of the
rehabilitation medicine -Retrospection and reflection related to mechanism of Proprioceptive Neuromuscular Facilitation-”, Biophilia Rehabilitation Journal (BRJ), 3-1, p17-26, 2006 (Reviewed)

(3) Kunihiko Fukui, "Retrospection and reflection of the neuromuscular facilitation", The Jiji Press welfare, No.5362 (2006-3-28), and pp2-6.(JP)


(8) TAKIZAWA Shigeo, patent documents 3094139, "5 Drawing cushion", and 2002/6/3.(JP)


(10) Kyoko Takizawa, Shigeo Takizawa (primary author), "Related training devices of the rehabilitation centering on a walker with new four wheel with sleds", The Fujisawa medical association news (Fujisawa medical association), No212(1993. 4) 5-7.(JP)

(11) Kyoko Takizawa, "Rehabilitation in an elderly patients' hospital for intensive care", The Kanagawa PT association annual meeting lecture (1993. 11.6).(JP)

(12) (Taki) TAKIZAWA Shigeo, "Development of a new walker with four wheels with the sled", The 15th NEDO business reporting, 1995/09/15, Tokyo.(JP)


(14) Tetsuhiko Kimura, et al, "Care reliance to independence 1", Civil publication (2002).(JP)

(15) Nikkan Kogyo Shimbun “The load, every possible effort to the welfare”, 1997.11.5-8.(JP)

(16) (Taki) TAKIZAWA Shigeo, et al, "Re-acquirement of walking from bedridden" Civil publication (1996).(JP)

(17) Hideo Kijima, Kenji Iizuka, Shigenobu Imai, Toshiaki Kato, Hitomi Watanabe, Shiro Kanai, Kyoko Takizawa, Shigeo Takizawa, "The rehabilitation and the related training devices which we have recommended", A clinical orthopedist meeting magazine, 23 (58) (1998), pp186-191.(JP)


(22) The 4th 21st century rehabilitation study meeting, 2000.8.5, Tokyo.(JP)


(25) TAKIZAWA Shigeo, "Creation of the Biophilia rehabilitation Academy, The Jiji Press welfare, No.4988
(2002.1.18), pp4-5.(JP)


(29) Naoichi Tsuyama, "The fundamental view of rehabilitation", "rehabilitation nursing" Medical friend company (1993), and 3.(JP)

(30) The Jikei University School of Medicine Rehabilitation medicine class, "What is the rehabilitation medicine", 2011.8.5. (JP) http://jikei-reha.com/about.shtml

(31) TAKIZAWA Shigeo, “Paradigm shift is asked to baby boomers", Civil publication (2008). (JP)


(33) TAKIZAWA Shigeo, "Biophilia Rehabilitation for you and your people who are waiting your return in your country", Proceedings of IBRC 2009, The 7th IBRC (2009). pp.15-16

(34) TAKIZAWA Shigeo, "Biophilia Rehabilitation for the Aged Society of China, Japan and All Other Developed Countries", Proceedings of IBRC 2010, The 8th IBRC (2010), pp.8-9


(36) TAKIZAWA Shigeo, "The social security measure concerning technology and aging", The Jiji Press, welfare, No.5689 (2009-12-08), pp 6-7.(JP)

(37) TAKIZAWA Shigeo, "Biophilia rehabilitation in an aged society, aging to China, Japan, and every country in the world", The Jiji Press, welfare No.5773 (2010-11-26), pp10-12.(JP)


(40) Akira Iemoto, Shigeo Takizawa, " implementation of devices which can evaluate quantitatively the degree of recovery of a motor function with a leg functional training device", Proc. 21 RSM, the Civil publication (2001. 08), pp14-18.(JP)


(44) Yoshiko Morita, Aoi Fujita, Tetsuhiko Kimura, Mitsuyo Makita, Hideo Kijima, Satoshi Endo, Yuzo Okamoto, Hiroshi Nagasawa, Kentaro Nagaoka, Koharu Miyamori, "the efficient physical therapy (occupational) treatment by Takizawa Method", Proc. of the 37th Japanese Association of Rehabilitation Medicine, 2000/06/24. (JP)


(46) Yoshiro Morita, Yuzo Okamoto, Takizawa Shigeo, Kyoko Takizawa, Tetsuhiko Kimura, "Evaluation of the
motivative exercise implementation based on Takizawa Rehab method”, BRJ, 1 (1), 51-54, 2002.(JP)
(47) Makita M, Nakadaira H and Yamamoto M, "Randomized Controlled Trial to Evaluate Effectiveness of Exercise Therapy (Takizawa Program) for Frail Elderly", Environmental Health and Preventive Medicine 11, 5: 221-227, (Sep. 2006)
(49) TAKIZAWA Shigeo, Yoshiyasu Takefuji, Tomoji Ishimaru, Rika Wada, Hajime Takada, Tetsuhiko Kimura, " Construction of Community Biophilia Rehabilitation Network for the Disabled Elderly ", BRJ, 6 (1), 2010, pp11-18.(JP)
(61) TAKIZAWA Shigeo, " Holding of International Convention and Establishment of the new civilization which does not make a negative factor of the increase in elderly people", the Jiji Press, welfare, 2003, No.5080, pp4-7.(JP)
(64) TAKIZAWA Shigeo, "Currently asked for the paradigm shift", The Jiji Press, welfare, (5795) 6-7, 2011-3-1 (JP)

(65) TAKIZAWA Shigeo, "Innovation and establishment of Rehab medicine which can overcome the disability", BRJ, No 4, pp17-20,2007.(JP)

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Background information, Patents;
TAKIZAWA Shigeo, et al, Lower limb function training device, US.No.7641591
TAKIZAWA Shigeo, et al, Lower limb function training device, US.No.7481739
TAKIZAWA Shigeo, et al, Lower limb function training device, US.No.7322904
TAKIZAWA Shigeo, et al, Method for managing exercise for function recovery and muscle strengthening, US.No.7153250
TAKIZAWA Shigeo, et al, Motivative exercise and lifting aid dual device, US.No.6978497
TAKIZAWA Shigeo, et al, Lower limb function training device, US.No.6780142
TAKIZAWA Shigeo, Caster for robot, US.No.6625846