Implementation of Knee Motivative Exercise Corresponding to Category of the Japanese Care Insurance

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Abstract
We hope this study would lead to protecting independent living for aged people in the aging society progressing in the world. Japanese life expectancy is 83.7 years old and the longest in the world. An aging rate is the highest at 26.0% in the world in 2014. The elderly ratio which was 12.1% in 1990 and increased to 26% in 2014. It is also the earliest pace of expansion in the world. There is the Long-Term Care Insurance System (Care Insurance) under the Long-Term Care Insurance Act (Insurance Act) to support this aged society. We investigated the situation of the English translation of the Care Insurance under the Insurance Act of Japan. We try to translate the untranslated part of it, “Care Degree” and introduced. We examined the Care Degree and the result of enforcement of the knee motivative exercise, which the outpatients are performing by themselves. We performed an evaluation of exercise with setting 15 subjects with their consent subjects at the medical facility by the therapist and rehabilitation collaborators. We analyzed the exercise value when they performed the motivative exercise individually. There was a big difference in the maximum range, the minimum range, time, and the average speed per second of the exercise under exercise for 300 seconds for every individual. We examined the correlation between exercise range and average speed, and the digitalized care degree. There were significant correlation as the maximum movement range (r = .702, p < .01), the minimum movement range (r = .608, p < .05), an average movement range (r = .745, p < .01), and average speed (r = .664, p < .01). We showed that the autonomous knee motivative exercise is an accommodated kinetic rehabilitation to the patient’s physical strength due to correlating with the exercise value of the degree of care. We showed that they could implement under the therapist direction to do for 300 seconds without touching.

1. Introduction
Japanese life expectancy is 83.7 years old and the longest in the world[1]. An aging rate is the highest at 26.0% in the world in 2014. The elderly ratio was 12.1% in 1990 and increased to 26% in 2014. It is also the earliest pace of expansion in the world[2]. There is the Long-Term Care Insurance System (Care Insurance) under the Long-Term Care Insurance Act (Insurance Act) to support this aged society. We called disabled elderly who were recognized as the person requiring long-term care or Support level in the Care Insurance. The disabled elderly increased 2,580,000 people from 2001 and became 5,457,000 people at the end of 2012 fiscal year. People living in Japan can receive the benefits according to the degree of needed care by the Category of Condition of Need for Long-Term Care (Category) by the Care Insurance. People do not use the evaluation method by the category of it except Japan. People seem to perform the motivative exercise without enforcement leader or anywhere[5][6]. We also clarified the functional recovery effect[7][8]. We reported the effect to the cerebral function until now[9][10]. We designed the study to find out the practice standard by investigating the relation of the Category and the articulatio genus motivative exercise.

2. Subject
This research obtained the consent of the Tachibana orthopedics outpatient rehabilitation center (Center) and its outpatient and passed through ethics examination of the Japanese Biophilia Rehabilitation Academy. Firstly, we made the investigation target the English notation of the insurance law and Category. Secondly, we set 15 persons who have evaluated among 21 users who got the consent from of the Center subjects. Their age was 92 the oldest, 79.2 the youngest and 67 average age. They had dangerous factors other than dementia, diabetes, and a bone and joint disease including 11 cerebrovascular disorders, such as high blood pressure. We showed them in Table 1.
Table 1 Status of 16 subject

| No. | Sex | age | care degree | Substituted main disorder | onset year paralysis side |
|-----|-----|-----|-------------|---------------------------|---------------------------|
| 1   | f   | 75  | 2           | Cerebral infarction       | 2003 Right Upper limb    |
| 2   | f   | 84  | Y1          | Lumbar spinal stenosis    |                           |
| 5   | m   | 84  | Y2          | Lumbar spinal stenosis, DM| 1989                      |
| 6   | m   | 87  | Y1          | Cerebral infarction       | Left Paresis             |
| 7   | f   | 67  | 5           | Cerebral aneurysm         | Right hemiplegia         |
| 8   | f   | 74  | 2           | Cerebral infarction       | 2008 Left hemiplegia     |
| 9   | m   | 73  | 2           | Cerebral infarction       | 2000 Right hemiplegia    |
| 12  | m   | 80  | 3           | cerebral hemorrhage       |                           |
| 13  | m   | 87  | Y2          | deformans lumbar, DM      |                           |
| 14  | f   | 85  | 2           | Third lumbar compression fracture, Osteoporosis | |
| 16  | f   | 75  | 3           | Cerebral infarction       | 2003 Right hemiplegia    |
| 18  | f   | 68  | 2           | Brain tumor               | 2004 Right hemiplegia    |
| 19  | m   | 75  | 2           | Cerebral infarction       | 2001 Right hemiplegia    |
| 20  | f   | 85  | 2           | Cerebral infarction, Right femur fracture | 2004 Right hemiplegia |
| 21  | f   | 92  | 5           | Cerebral infarction, Left femur fracture | 2007 Right Paresis |

3. Method

We investigated the state of the motivative exercise using the developed evaluation device \(^{11}\) for articulatio-genus motivative exercise at the rehabilitation service center and analyzed it to the degree of needed care (Care Degree) \(^{12}\).

3-1. Care Degree

We read the English data about the care insurance extensively. The Japanese government prepared the translation system of law and published Long-Term Care Insurance Act \(^3\). The Japanese Ministry of Health, Labour and Welfare (Ministry) has announced the English summary sentence of the Care Insurance, which is the system supporting this aged society \(^4\). Moreover, there is the booklet, which was published by the city towards the foreigner who lives in Japan \(^5\). The classification is defined by the evaluation of the Care Insurance according to the grade of the necessity for support that the welfare labor ministerial ordinance defined. The evaluation basis of Care Insurance is based on the physical condition and activities of daily living of disabled elderly. Function Independence Measure, Barthel Index, Manual Muscle Test, and Joint Range of Motion Testing are well known in the world as evaluation standard of the physical function or daily activities. This Care Insurance evaluation is very rational because it evaluates the whole life situation including the physical condition and activities of daily living. Since it is used for calculation of a benefit as introduced to the Outline of Long-Term Care Insurance System \(^4\), it has been a standard, which can be evaluated impartially and practically. However, we found that there was no standard published in English.

3-2. Evaluation of the motivative exercise for knee

We analyzed data collected with the movement evaluation device, which the Biophilia Institute developed. We collected data for 300 seconds. We examined the maximum range, the minimum range, time, and the average speed per second of the exercise by the measurement data with using the device shown in Fig. 1. We analyzed the correlation of the degree of care to the result using SPSS (15.0J).
4. Result

4.1. Care Degree

The Ministry illustrated the outline of the standard\(^{12}\) as shown in Fig 2, but there was no translation. We translated the standard of care degree because there was no standard published in English. And we made it digitalization to investigate correlation as Support level 1 to 7 and Care level 5 to 1 as shown in Table 2. They defined Support level as Support required in the Insurance Act, but we use the name of Support level by an indication of Fig 2.

![Fig 2 Outline of the care level standard, the Long-term Care Insurance System in Japan\(^{12}\) by the Ministry, pp12.](image)

Table 2. Long-term care level (Care level)

| Classification of Care level | The details of cognitive and motor function |
|-----------------------------|------------------------------------------|
| Support level 1             | (1) One needs some care such as observation or physical support for cleaning own rooms or taking care of self-dressing. |
|                             | (2) One sometimes needs some support for complicated movements like stand up or keep standing on one leg, etc. |
|                             | (3) One can excrete and feed by oneself. |
| Substituted (7)             | |
| Support level 2             | (1) Own activities of daily living decline from support level 1, and they need additional assistance or support, etc. |
|                             | (4) One sometimes needs some support for locomotive movements, like walk or keep standing on both legs. |
| Substituted (6)             | |
| Care level 1                | (1) - (4) are the same as the support level 2. |
| Substituted (5)             | |
| Care level 2                | (1) One needs some care such as watch or help for cleaning own rooms or taking care of personal appearance over all. |
|                             | (2) One needs some assistance for complicated movements like stand up or keep standing on one leg, etc. |
|                             | (3) One needs some assistance for locomotive movements, like walk or keeps standing on both legs. |
|                             | (4) One needs some care such as watch and help to excrete or feed. |
| Substituted (4)             | |
| Care level 3                | (1) One cannot clean own rooms or take care of self-dressing over all. |
|                             | (2) One cannot do complicated movements like standing up or keep standing on one leg, etc. |
|                             | (3) One cannot sometimes walk or keep standing on both legs by oneself. |
|                             | (4) One cannot excrete or feed by oneself. |
| Substituted (3)             | |
| Care level 4                | (1) One can hardly clean own rooms or take care of personal appearance. |
|                             | (2) One can hardly do complicated movements like standing up or keep standing on one leg, etc. |
|                             | (3) One can hardly walk or keep standing on both legs by oneself. |
|                             | (4) One can hardly excrete or feed by oneself. |
| Substituted (2)             | |
| Care level 5                | (1) One can hardly clean own rooms or take care of personal appearance over all. |
|                             | (2) One can hardly do complicated movements like standing up or keep standing on one leg, etc. |
|                             | (3) One can hardly walk or keep standing on both legs. |
|                             | (4) One can hardly excrete or feed by oneself. |
| Substituted (1)             | (1) One suffers from a lot of cognitive problems or decrease comprehension in general. |

Fig 2 Outline of the care level standard, the Long-term Care Insurance System in Japan\(^{12}\) by the Ministry, pp12.
4-2. Evaluation of the motivative exercise for knee

There was a big difference in the maximum range, the minimum range, time, and the average speed per second of the exercise under exercise for 300 seconds for every individual as shown in Table Fig 3. We examined the correlation between exercise range and average speed, and the digitalized care degree. There were significant correlation as the maximum movement range \(r = .702, p < .01\), the minimum movement range \(r = .608, p < .05\), an average movement range \(r = .745, p < .01\), and average speed \(r = .664, p < .01\).

Table 3. Evaluation of the motivative exercise for knee

| No  | Date      | Time | Average time for 1 drive /sec | Maximum movement range for 1 drive /cm | Minimum movement range for 1 drive /cm | Average movement range for 1 drive /cm | Average speed cm/sec |
|-----|-----------|------|------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|----------------------|
| 1   | 2011/8/30 | 272.2| 0.41                         | 181.0                                  | 4.0                                   | 117.0                                  | 287.2                |
| 2   | 2011/12/14| 276.2| 0.64                         | 261.0                                  | 155.0                                 | 229.9                                  | 359.2                |
| 5   | 2011/8/29 | 262.9| 0.46                         | 352.0                                  | 189.0                                 | 275.8                                  | 600.0                |
| 6   | 2011/12/12| 285.5| 0.55                         | 353.0                                  | 119.0                                 | 238.8                                  | 435.6                |
| 7   | 2011/10/20| 266.8| 10.02                        | 93.0                                   | 4.0                                   | 41.0                                   | 4.1                  |
| 8   | 2011/12/8 | 299.9| 0.79                         | 344.0                                  | 4.0                                   | 216.8                                  | 276.1                |
| 9   | 2011/8/29 | 282  | 0.45                         | 198.0                                  | 28.0                                  | 157.3                                  | 350.9                |
| 12  | 2011/8/29 | 281.3| 0.33                         | 171.0                                  | 3.0                                   | 130.5                                  | 398.6                |
| 13  | 2011/8/29 | 265.6| 0.50                         | 329.0                                  | 18.0                                  | 239.4                                  | 478.0                |
| 14  | 2011/12/16| 278.6| 0.84                         | 326.0                                  | 2.0                                   | 167.8                                  | 200.4                |
| 16  | 2011/8/29 | 268.5| 0.41                         | 225.0                                  | 90.0                                  | 169.1                                  | 410.8                |
| 18  | 2011/8/29 | 271.6| 0.59                         | 256.0                                  | 15.0                                  | 222.3                                  | 377.7                |
| 19  | 2011/10/20| 274.7| 0.33                         | 147.0                                  | 4.0                                   | 93.8                                   | 285.6                |
| 20  | 2011/8/29 | 300  | 0.44                         | 166.0                                  | 7.0                                   | 122.7                                  | 277.0                |
| 21  | 2011/12/16| 284.6| 0.58                         | 179.0                                  | 28.0                                  | 149.3                                  | 256.8                |

Max. value 10.0 353.0 189.0 275.8 600.0
Min. Value 0.3 93.0 2.0 41.0 4.1
Average 1.2 238.7 44.7 171.4 333.2

5. Discussion

The present age in which an age pyramid reverses is a society unprecedented for the human beings. The Ministry predicts that the number of the Japanese elderly aged 65 and over will be 36,570,000 people (120 million population estimation) in 2025 and 38,780,000 people (106 million population estimation) as a peak in 2042. The Ministry declared the aging society is progressing quickly, and expected it to be severe, "one young man supports one elderly." There were the doctors who asked themselves whether they would continue the previous rehabilitation medicine for the elderly whose function declined and became disabled in this situation noticed. We enumerate the valuable studies in (A) No.1 care level 2. Times 334, Sec0.41, Max. range 181.0, Min. range 4.0/par 1Drive (B) No.2 Support level 1. Times 285, Sec0.46, Max. range 352.0, Min. range 189.0/par 1Drive (C) No.16 care level 3. Times 325, Sec0.41, Max. range 225.0, Min. range 90.0/par 1Drive (D) No.21 care level 5. Times 245, Sec0.58, Max. range 179.0, Min. range 28.0/par 1Drive Fig 3. Individual implementation of the knee extension motivative exercise of (A) No.1, (B) No.2, (C) No.16, (D) No.21
Japan, which examined the previous rehabilitation medicine as following. (i) The joint guideline committee which consists of 3 research groups of the Ministry and five academies, such as the Japanese Cerebrovascular Disease Society and the Japanese Association of Rehabilitation Medicine announced the medical treatment guideline for the stroke in 2004\(^4\). They described following in the first edition; The ability rating measuring methods are under review on validity since a curative effect is judged by a function and ability rating for the rehabilitation medicine. Many domains such as the cure of the apoplexy rehabilitation medicine and medical treatment, training method or intervention, and else have been performed based on clinical experience. They are not enough validity from the field of evidence. Therefore we must wait for the further research to improve it in the future. (ii) Dr. Kunihiko Fukui, a prominent medical doctor as a pioneer of the rehabilitation medicine from its initial stage in Japan, Dr. Tetsuhiko Kimura, the past director of the Japanese National Rehabilitation Center for Persons with Disabilities and I published the related article\(^{15}\). Rehabilitation medicine progressed in the functional recovery of recent years since the above fact manifestation as following; (1) unaffected side unfree therapy\(^6\), (2) autonomous rehabilitation for aiming result\(^7\), (3) simultaneous upper-limbs exercise with both sides\(^8\), (4) rehabilitation treatment with robot using\(^9\), and (5) Takizawa method with motivative exercise\(^10\). The change of the rehabilitation medical specialists in Japan doubled from 810 to 1787 in about ten years by 2012, and the physiotherapist increased to 100,000 or more by 470%. The national medical insurances cover whole Japanese. People have received the medical rehabilitation treatment needed. Though we could expect a reduction of the disabled elderly by their increase, the increase of disabled elderly needing care under the care Insurance is remarkable. They doubled to 5,540,000 people in 2012 from 2,180,000 in 2000. We would like to innovate this present condition. The disabled elderly reacquires their independence living by overcoming their disability not “Accept disability” as the previous rehabilitation medicine said. We have reported many about re-acquisition of a walking\(^5\)\(^6\)\(^7\). It is our desire that this paper becomes a cause to introduce the motivative exercise, which anyone can implement easily and anywhere to innovate the rehabilitation medicine. Also, we want for the people to know the Japanese measure for the disabled elderly, which is a front-runner of an aged society.

6. Conclusion
We investigated the situation of the English translation of the Care Insurance under the Insurance Act of Japan. We translated the untranslated part of it, “Care Degree” and introduced. We examined the Care Degree and the result of enforcement of the knee motivative exercise, which the outpatients are performing by themselves. We performed an evaluation of exercise with setting 15 subjects with their consent at the medical facility by the therapist and rehabilitation collaborators. Their age were 92 the oldest, 79.2 the youngest and 67 average age. I analyzed the exercise value when they performed the motivative exercise by each them. There was a big difference in the maximum range, the minimum range, time, and the average speed per second of the exercise under exercise for 300 seconds for every individual as shown in Table Fig 3. We examined the correlation between exercise range and average speed, and the digitalized care degree. There were significant correlation as the maximum movement range \((r = .702, p < .01)\), the minimum movement range \((r = .608, p < .05)\), an average movement range \((r = .745, p < .01)\), and average speed \((r = .664, p < .01)\). We showed that the knee motivative exercise is an accommodated kinetic rehabilitation to the patient’s physical strength due to correlating with the exercise value of the degree of care. We showed that they could implement under the therapist direction to do for 300 seconds without touching. They had dangerous factors other than dementia, diabetes, and a bone and joint disease including 11 cerebrovascular disorders, such as high blood pressure. We could show that the outpatients implement the autonomous and effective kinetic rehabilitation safely to the prevention of the disuse syndrome, care required and functional degradation. We hope this would lead to protecting elderly life in the aging society progressing in the world.

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