



An Outpatient-based Survey on the Recognition of Locomotive Syndrome in Japan: The Results of three Years of Surveys

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Authors' contributions

This work was carried out in collaboration between all authors. Authors YT, TO, YK and MI designed the study, wrote the protocol and wrote the first draft of the manuscript. Author YS designed the study, managed the study and literature searches, wrote the first draft of the manuscript. Authors TK and Kiyoshi Matsuoka analyses of the study performed the spectroscopy analysis. Authors YT, TO, MI, YK, KA, Kenta Mukaiharu, DK and NO collected the data. Authors YM, TS and KK supervised the study and the data. All authors read and approved the final manuscript.

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ABSTRACT

Background: In 2007, the Japanese Orthopaedic Association (JOA) proposed the term locomotive syndrome (LS) and the Japan Locomo Challenge Promotion Conference (JLCPC) began to carry out continuous campaigns to increase the LS recognition.

LS awareness and prevention activities have been considered to be critical health promotion activities in the orthopedic field. The JLCPC surveyed the LS recognition rate with an Internet-based

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questionnaire since 2012. However, there have not been any outpatient cohort studies. Thus, since 2014, we have surveyed the outpatients who were treated at Juntendo University Hospital, Tokyo.

Methods: To investigate LS recognition, we conducted an annual questionnaire survey of the approximately 1000 orthopedic outpatients who were treated each year at Juntendo University Hospital (Tokyo, Japan) from March to June (a 3-month period) in the 3 years from 2013 to 2015.

Results: We created three classifications of LS recognition: "Known", "Heard of" and "Unknown." The results of the survey revealed that the LS recognition rate was 24.6% in 2013, 26.4% in 2014 and 27.9% in 2015. The outpatient survey results indicated that there has been a stable increase in the LS recognition rate over the past 3 years.

Conclusion: This study demonstrated that the LS recognition rate in 2015 was 27.9%, which amounts to a 3.3% increase in comparison to the in 2013 survey. We therefore consider that our outpatient-based survey has been a health promotion activity that has helped to promote a better understanding of the effects of the promotion of LS awareness and trends in awareness promotion activities.

Keywords: Locomotive syndrome; orthopaedics; recognition.

1. INTRODUCTION

Based on the health promotion policies of the World Health Organization, the Ministry of Health, Labour and Welfare in Japan has promoted the "National Health Promotion Movement in the 21st Century (Health Japan 21)" since 2000. "Health Japan 21" aims to reduce the number of deaths of people in the prime of their life, prolong the healthy years of life, and to improve people's quality of life (QOL) in facilitate the establishment of a vigorous society in which all citizens can live in good physical and mental health [1].

In 2007, the Japanese Orthopaedic Association (JOA) proposed the term locomotive syndrome (LS) to describe a condition in high-risk patients with musculoskeletal diseases who are highly likely to require nursing care [2-4]. LS is caused by the weakening of the musculoskeletal organs, such as the bones, joints and muscles and LS is related to several diseases [5-10]. Disorders of these organs lead to self-transportation disabilities. These conditions force people who suffer from LS to require outside care and support. To prevent a decline into disability, such patients need to maintain their health, especially their locomotor function [2-4].

The concept of LS is still unfamiliar among the Japanese population. In the 2nd edition of Health Japan 21, the government-led health policy aimed to increase the LS recognition rate to 80% by 2022 [1,11]. As such, the health promotion activities of the orthopedics field play an important role in promoting awareness on the topic of LS. The proposal of LS and its prevention is among the original health promotion activities from Japan, which is facing the first super-aging society in the world, and could be a valid

reference for other countries facing an aging society in the future.

The Japan Locomo Challenge Promotion Conference (JLCPC) has surveyed the LS recognition rate with an Internet-based questionnaire since 2012. They reported that the recognition rates in 2012, 2013, 2014, and 2015 were 17.3%, 26.6%, 36.1% and 44.4%, respectively (Fig. 1) [11-13]. However, surveys on the LS recognition rate among outpatients who are expected to be at risk of developing LS have not yet been conducted. We have therefore annually investigated the LS recognition rate among new orthopedic patients, who were treated on an outpatient basis at Juntendo University Hospital, Tokyo, Japan. Since 2013, approximately 1,000 patients have completed the survey.

In 2013, the LS recognition rate in our outpatient-based survey was 24.6%, which was similar to that in the JLCPC's Internet-based survey (26.6%) from the same year (Fig. 1) [11,14]. However, in 2014, there was a marked difference in the LS recognition of our outpatients (26.4%) and the patients who completed the JLCPC's Internet-based survey (36.1%) (Fig. 1) [12,15]. Based on these results, we hypothesized that Internet use was an important factor in this discrepancy. Thus, to understand the reasons for the differences in LS recognition between the two cohorts, we investigated both the LS recognition rate and the Internet usage of our 2015 outpatient cohort.

In this study, to clarify health promotion activities in Japan, including the LS recognition rate in our outpatient-based cohort, we conducted a

questionnaire survey in a study population of approximately 1000 orthopedic outpatient clinic patients who were treated from the April to June (the same season) of each year from 2013 to 2015. In the present year (2015), we also surveyed the of LS recognition using an outpatient-based cohort. Furthermore, to understand the differences in the LS recognition rate of the patients who completed the JLCPC's web-based survey and our own outpatient cohort, we also examined the population of the Internet usage habits of our cohort.

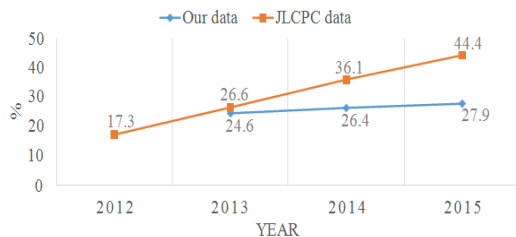


Fig. 1. The LS recognition rates in our outpatient survey and the JLCPC's Internet based survey. In our survey, the LS recognition rate in 2015 was 27.9%, this represented an increase of 3.3% from 2013 (24.6%) and 1.5% from 2014 (26.4%). The JLCPC's surveys showed that the recognition rates in 2012, 2013, 2014, and 2015 were 17.3%, 26.6%, 36.1% and 44.4%, respectively. In 2013, our results were similar to those of the JLCPC's Internet-based survey (26.6%). However, there was a major discrepancy between the results of the two surveys in 2014 and 2015

2. MATERIALS AND METHODS

2.1 Outpatient Cohort

To investigate LS recognition, we conducted a questionnaire survey of orthopedic outpatients who visited Juntendo University Hospital (Tokyo, Japan) from 2013 to 2015. We surveyed new patients had visited our department for the first time or who had new diseases, even if they had previously visited our department. We collected the data of 3,159 orthopedic patients (1,367 males and 1,792 females; age, 5-95 years; mean age,

54.3 years) over the 3-year period of the survey. The total number of patients that were treated each year is shown in Table 1. Partial answers were used for those who did not complete the entire questionnaire. This project was approved by the institutional review board of Juntendo University.

2.2 The Questionnaire Survey of the Recognition of LS

With respect to the recognition of LS, we asked the 7 questions (see Table 2).

2.3 The Questionnaire Survey on LS Recognition and the Frequency of Internet Use

The LS recognition level of the subjects was classified as "known", "heard of", or "unknown". The LS recognition rate LS was calculated based on total number of respondents who were classified into the "know" and "heard of" categories. We also investigated the frequency of Internet usage in our cohort. The frequency was divided into four levels: "always", "often", "occasionally" and "never".

2.4 The Diagnoses of LS and the 25-Question Geriatric Locomotive Function Scale (GLFS-25) Questionnaire

We could use the LS risk tests including the stand-up test, the two-step test and GLFS-25 to diagnose the LS. With respect to GLFS-25, GLFS-25 consisted of 25 items, including four questions regarding pain during the last month, 16 questions regarding pain during activities of daily living during the last month, three questions regarding social functions, and two questions regarding the mental status during the last month (Table 3). These 25 items were graded on five-point scales from no impairment (0) to severe impairment (4), and then the scores were added to produce a total score (minimum 0, maximum 100). These scores were classified as LS (Stage II): over 16 points, Stage I: 7-15 points, and Normal: less than 6 points 7.

Table 1. The populations in our three years of surveys

Year	Total	Male	Female	Average age
2013	1,010	429	581	54.2 (11 - 96)
2014	1,027	450	577	52.3 (5 - 94)
2015	1,122	488	634	56.2 (12 - 96)
Total	3,159	1,367	1,792	54.3 (5 - 95)

Table 2. The questionnaire survey of the recognition of LS

(1) Have you ever heard of LS?
(2) From which media sources did you learn about LS?
(3) Have you seen the brochure about LS?
(4) Where did you see the brochure about LS?
(5) Where should the brochure about LS be available?
(6) Could you understand the concept of LS based on the brochure?
(7) Were you motivated to perform daily exercise by the brochure about LS?
Closed questions: (1), (3), (6) and (7). Multi-choice questions: (2), (4) and (5) are allowed to select the multi-choice.
(6) and (7) were scored from 1 to 4 (1; poor or low, 2; slightly poor or slightly low, 3; good or high, 4; very good or very high).

Table 3. The 25-question geriatric locomotive function scale

	0 point	1 point	2 point	3 point	4 point
(1) Did you have any pain (including numbness) in your neck or upper limbs (shoulder, arm, or hand)?	No pain	Mild pain	Moderate pain	Considerable pain	Severe pain
(2) Did you have any pain in your back, lower back or buttocks?	No pain	Mild pain	Moderate pain	Considerable pain	Severe pain
(3) Did you have any pain (including numbness) in your lower limbs (hip, thigh, knee, calf, ankle, or foot)?	No pain	Mild pain	Moderate pain	Considerable pain	Severe pain
(4) To what extent has it been painful to move your body in daily life?	No pain	Mild pain	Moderate pain	Considerable pain	Severe pain
(5) To extent has it been difficult to get up from a bed or lie down?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(6) To what extent has it been difficult to stand up from a chair?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(7) To what extent has it been difficult to walk inside the house?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(8) To what extent has it been difficult to put on and take off shirts?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(9) To extent has it been difficult to put on and take off trousers and pants?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(10) To extent has it been difficult to use the toilet?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(11) To extent has it been difficult to wash your body in the bath?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(12) To extent has it been difficult to go up and down stairs?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult

	0 point	1 point	2 point	3 point	4 point
(13) To extent has it been difficult to walk briskly?	Not Difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(14) To extent has it been difficult to keep yourself neat?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(15) How far can you keep walking without rest?	More than 2-3 km	approximately 1 km	approximately 300m	approximately 100m	approximately 10m
(16) To extent has it been difficult to go out to visit neighbors?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(17) To extent has it been difficult to carry objects weighing approximately 2 kilograms (2 standard milk bottles or 2 PET bottle each containing 1-liter)?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(18) To extent has it been difficult to go out using public transportation?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(19) To extent have simple tasks and housework (preparing meals, cleaning up, etc.) been difficult?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(20) To what extent have load-bearing tasks and housework (cleaning the yard, carrying heavy bedding, etc.) been difficult?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(21) To extent has it been difficult to perform sports activity (jogging, swimming gate ball, dancing, etc.)?	Not difficult	Mildly difficult	Moderately difficult	Considerably difficult	Extremely difficult
(22) Have you been restricted from meeting your friends?	Not restricted	Slightly restricted	Restricted about half the time	Considerably restricted	Gave up all activities
(23) Have you been restricted from joining social activities (meeting friends, play sport, engaging in activities and hobbies, etc.)?	Not restricted	Slightly restricted	Restricted about half the time	Considerably restricted	Gave up all activities
(24) Have you ever felt anxious about falls in your house?	Have not felt anxious	Have occasionally felt anxious	Have sometimes felt anxious	Have often felt anxious	Have constantly felt anxious
(25) Have you ever felt anxious about being unable to walk in the future?	Have not felt anxious	Have occasionally felt anxious	Have sometimes felt anxious	Have often felt anxious	Have constantly felt anxious
All questions are closed questions.					

3. RESULTS

3.1 The LS Recognition Rate from 2013 to 2015

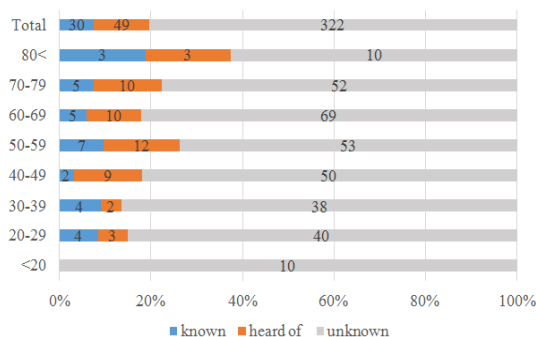
With respect to the LS recognition rate, the responses to the 2013-2015 surveys revealed that “known” ratios in 2013, 2014 and 2015 surveys were 10.8%, 9.8%, and 11.5%, respectively, while the “heard of” ratios were 13.8%, 16.6%, and 16.4%, respectively (Fig. 1). The total LS recognition rate in 2013, 2014, 2015 was 24.6%, 26.4% and 27.9%, respectively. In each of the years, the LS recognition rate tended to be higher in the female and elderly populations [14,15] (Table 4, Fig. 2).

3.2 The Frequency of Internet Usage in Our Cohort

The results of our survey on Internet usage in 2015 demonstrated that that the frequency of Internet usage was “always,” “often,” “occasionally,” and “never” in 51% (419/822), 22% (180/822), 7% (59/822), and 20% (164/822) of the respondents, respectively (Fig. 3). With respect to the associations between the age of the respondents and the frequency of Internet use, younger patients were the most frequent Internet users, with the frequency rate decreasing with age (Fig. 3). The LS recognition rates, stratified by the levels of Internet usage were 24.4%, 39.1%, 37.9% and 34.0% in the “always,” “often,” “occasionally” and “never” groups, respectively (Fig. 4). The results of our survey indicate that the LS recognition rate of the outpatients who indicated that they “always” used the Internet was lower than that of the patients who indicated that they “never” used the Internet (Fig. 4). We also analyzed the relationships

between the LS recognition rate and the Internet usage frequency using Pearson’s chi-squared test (Table 5). We found no significant associations between the two rates (P=0.086) (Table 5).

The recognition rate among males in 2015



The recognition rate among females in 2015

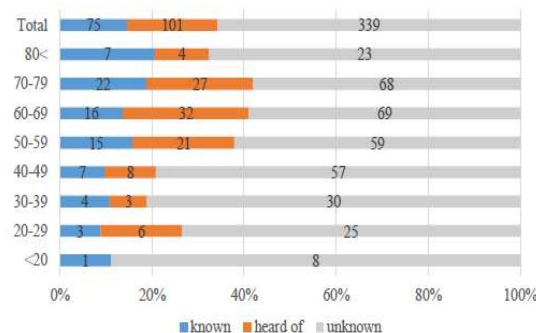


Fig. 2. The LS recognition rates; the bar plots show the population for each gender. These data indicate that the female and elderly populations tended to show higher LS recognition rates

Table 4. The recognition rates in our study and the JLCPC reports from 2013 to 2015

Year	Our study (male/female)	JLCPC report (male/female)
2013	24.6% (16.4% / 30.7%)	26.6% (23.7% / 29.6%)
2014	26.4% (19.3% / 32.0%)	36.1% (30.8% / 41.0%)
2015	27.9% (19.7% / 34.2%)	44.4% (39.1% / 49.3%)

Table 5. The statical association between the LS recognition rates and frequency of internet use

		Recognition		Total	p value
		Yes	No		
Frequency	High	170 (28.8%)	421 (71.2%)	591	0.086
	Low	77 (35.0%)	143 (65.0%)		
Total		247 (30.5%)	564 (69.5%)	811	

The frequency of Internet use was divided in two groups: "High" included "always" and "often"; "Low" included "occasionally" and "never"; The correlations between Internet use and the recognition rate were analyzed using the chi-squared test; There was no significant association between the frequency of Internet use and the recognition rate; (Significance was set at P < 0.05)

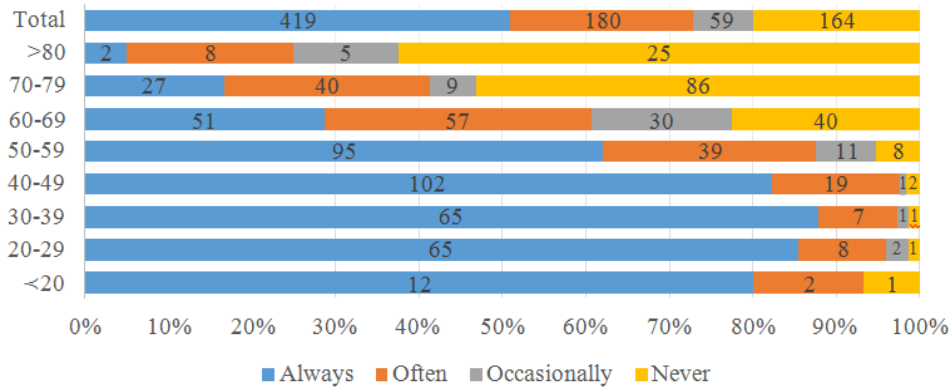


Fig. 3. The frequency of Internet use in 2015. We found that the frequency of Internet use was related to the age of the patients. These results indicated that younger patients used the Internet more frequently

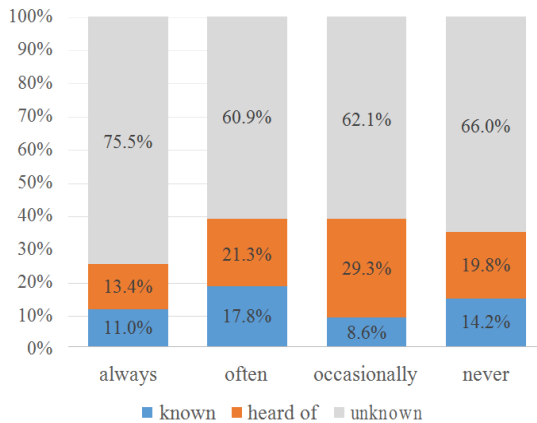


Fig. 4. The associations between the LS recognition rate and the frequency of internet use. The LS recognition rates which were divided by the levels of Internet usage were 24.4%, 39.1%, 37.9% and 34.0% in the “always,” “often,” “occasionally” and “never” groups, respectively. We found no significant associations between the LS recognition rate and the frequency of internet use

4. DISCUSSION

The JLCPC and The Bone and Joint Decade Japan conducted an Internet-based survey on LS recognition, which demonstrated that the recognition rate reached 44.4% in May 2015 [13]. This was a dramatic increase from the rates in their surveys from 2013 (26.6%) [11], and 2014 (36.1%) [12]. We hypothesize that the reasons for this is that LS has been featured in many health programs, as a current issue on television, in local government public relations news programs,

newspapers, weekly journals and in Internet-based news. Since the recognition of LS has been gradually increasing, the promotion of LS has been regarded as a successful Japanese health promotion activity.

In our study, the LS recognition rate in 2015 was 27.9%, which is a 3.3% from 2013 (24.6%) and a 1.5% from 2014 (26.4%) [14,15]. Our results were similar to those of the JLCPC’s Internet-based survey (26.6%) in 2013. However, there was a major difference in the recognition rate in our 2014 and 2015 surveys and rate in the JLCPC’s Internet-based survey. We therefore considered the possible reasons for this discrepancy. We first considered that the different study populations might have been responsible for the discrepancy. We hypothesized that the people who took part in the JLCPC’s Internet-based survey might have been more frequent Internet users, and considered that frequent Internet users may be exposed to more diverse information than infrequent Internet users. In this study, we examined the frequency of Internet use among our outpatient cohort and its relationship to the LS recognition rate. However, we could not identify a relationship between the recognition rate and the frequency of Internet use. Furthermore, the low-frequency Internet use group had a higher LS recognition rate than the high-frequency Internet use group. In the end, we were not able to identify the reasons for the discrepancy in the recognition rates of JLCPC’s web-based survey participants and our outpatient cohort in 2014 and 2015.

It is still critical to promote the recognition of LS. With respect to rational promotion regarding the

recognition of LS, we have researched and described our previous articles [14.15]. In these studies, when asked about the media sources from which they received information about LS in 2014, 178 (42.7%) of the 417 answers (263 patients provided 417 answers to this question) indicated that the patient had learned about the concept of LS from TV [14.15]. Ninety-five (22.8%) of the 417 answers were that the patient had received information about LS from newspapers and 47 (11.3%) of 417 responded that they had learned about LS from magazines [14.15]. Base on previous surveys, TV was the most common source of information about LS in patients of all ages. Therefore, we recommend to use TV to promote the recognition of LS efficiently.

LS recognition has gradually been increasing. We therefore suppose that the recognition LS rates may reach 80% by 2022, successfully achieving the goal of Health Japan 21 (2nd edition), which was set in 2012 [1]. We also believe that both the concept of LS and the LS prevention activities that are implemented in Japan may have critical effects in worldwide health promotion activities as forward-looking and successful model cases.

5. CONCLUSION

We investigated LS recognition among orthopedic outpatients. This study demonstrated that there was a slight increase in LS recognition. Our outpatient-based survey is therefore considered to be useful for understanding the effects and trends in the promotion of the concept of LS and represents one way that health promotion activities may promote LS awareness.

CONSENT

This study and project were approved by the institutional review board of Juntendo University.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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