Behavioral Intention Analysis Regarding Exercise After Provision of Health Information

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Abstract Japan will be the first country to face a super-aging society with a declining birthrate. This is an unprecedented situation in history. To ensure a sustainable medical and nursing-care system, the population of the country must live long, healthy lives. In this context, exercise is essential for living long, healthy lives. Therefore, this study conducted an author-developed questionnaire survey to understand the processes whereby people decide to exercise for the sake of their health and take action. We asked for cooperation to questionary survey to 1706 participants, and we received an answer from 315 participants. 159 participants who answered that they had no exercise habits at the time of the survey were asked to watch a video about locomotive syndromes. When they were then surveyed about their behavioral intentions regarding exercise, approximately 60% indicated that they would be willing to proactively exercise in the future. Therefore, we made behavioral intention formation model using 159 participant data. Furthermore, this behavioral intention to exercise was found to be related to the participants' self-efficacy, their ability to anticipate the consequences of not exercising, the impact of exercise on their lives, and structural factors such as exercise facilities.

1. Introduction

Japan is the first country in the world to face a super-aging society with a declining birthrate. This is an unprecedented situation in human experience. Japan's population is aging rapidly, with the elderly population aged over 65 years rising from 17.4% in 2000 to 28.4% in 2019; it is predicted that by 2035, more than one-third of the population will be elderly [1]. With the population aging, the financial burden of illness and nursing care will steadily rise. Therefore, in the 21st century, Japan is expected to become a society where the population faces an extremely high financial burden stemming from disease. To ensure that the medical and nursing-care systems are sustainable, one of the most important issues is to ensure that the population lives long, healthy lives.

Exercise is essential for a long, healthy life. Those who are more physically active and exercise more often have lower morbidity and mortality rates, ischemic heart disease, hypertension, and diabetes [2]. The amount of physical activity is a factor in many diseases, suggesting that promoting physical activity is important in regard to preventing diseases, including lifestyle diseases. Although few long-term time-series studies have been conducted on physical activity and exercise in Japan, it is clear that physical activity has declined due to the automation of housework and work and the development of transportation, which, along with changes in diet, has contributed to an increase in lifestyle diseases in recent years. In Japan, the proportion of those who have an exercise habit (exercise for 30 minutes or more for two days a week for one year or more) is not high with 32.2% men and 27.0% women.

Locomotive syndrome is a newly proposed concept by the Japanese Orthopaedic Association in 2007, and refers to "a condition in which mobility is impaired due to musculoskeletal disorders." The Ministry of Health, Labour and Welfare has identified that increasing awareness of locomotive syndrome is an effective measure to extend healthy life expectancy. Frailty is a disorder that, like locomotive syndrome, involves the concept of decline in physical functions. However, while frailty

includes a decline in various systemic functions, including organs and the brain, locomotive syndrome refers to a decline in physical function due to the decline in organs involved in motor skills. It is expected that recognizing the importance of locomotive syndrome prevention will lead to individual behavioral changes that will serve to maintain the health of the locomotor system of the population and consequently reduce the proportion of the population that requires nursing care. Therefore, increasing awareness of "locomotive syndrome" is an important measure in this regard.

2. Research Objectives

To promote healthy behavior, understanding the process whereby people decide to exercise for the sake of their health and then take action is important. Behavioral intention plays a major role in health behavior changes. It refers to the intensity of a desire to take a certain action. The theory of planned behavior (TPB) proposed by Ajzen et al. states that when a person intends to perform some action, their "intention" to act is activated before the desired action is performed [3]. Hausenblas et al. reported that behavioral intention has a direct effect on motor behavior [4].

Therefore, this study focuses on measures to extend healthy life expectancy in Japan, and clarifies how providing information on locomotive syndrome can develop people's behavioral intentions regarding exercise via a questionnaire survey. The study's purpose is to clarify the process whereby behavioral intentions are developed; doing so would lead to developing effective measures to extend healthy life expectancy.

3. Health Behavior Change Model

A representative model of the process of engaging in health behaviors is the Health Action Process Approach (HAPA) proposed by Ralf Schwarzer.

HAPA is an open framework to describe, predict, and explain the process of health behavior changes. In HAPA, health behavior largely comprises the "motivational phase," in which intentions are formed from motivation, and the "volitional phase," in which intentions lead to planning and implementation. The behavioral intention during the motivational stage is affected by self-efficacy (confidence in being able to engage in a behavior), expectation of effectiveness, and risk perception (disadvantage of not engaging in a behavior) [5]. HAPA was developed to explain a variety of health-altering behaviors, such as smoking cessation, alcohol consumption, and dietary behavior.

Several studies have attempted to model health behavior using HAPA. For example, Barg et al. distributed booklets describing the health-improving effects of exercise and physical activity to women aged 40–65 who had no exercise habits and observed subsequent changes in their behavior. These observations were then used to model the changes in health behavior due to HAPA [6].

Luszczynska et al. report the usefulness of the HAPA model about a self-examination action of the breast cancer [7]. Barling et al. report the usefulness of the HAPA model about a self-examination action of the testis cancer [8].

The HAPA model has a good reputation for the many kinds of the healthy action to intend for. And It is shown for various actions Dental Flossing, Seat Belt Use, Dietary Behavior, and Physical Activity in conjunction with the health to be a model with the versatility [9], [10], [11].

In Japan, Amagasaki et al. applied HAPA to predict physical activity among university students [12]. In HAPA, behavioral intentions are posited to form through the influence of risk perception, outcome expectancy, and self-efficacy; however, according to these studies, not all these factors influence behavioral intentions and opinions differ.

Moreover, health beliefs and the environment in which the subject is placed may be involved in the formation of behavioral intentions regarding exercise. In particular, there has been much discussion about the development of parks and exercise facilities aimed at health promotion [13], [14].

4. Research Methods

This study took up the provision of health information as a health promotion measure, and conducted an author-developed questionnaire survey to find how providing health information can develop people's behavioral intentions regarding exercise. Health information was provided to the participants by means of a two-minute video on locomotive syndrome; the video was created for the purpose of this study. The video consists of four sessions. In addition to a general description of locomotive syndrome, four other factors are present: life expectancy and healthy life expectancy, major causes of need for support and nursing care, and age-related changes in muscle mass. These are the key pieces of information found in pamphlets and other publications on locomotive syndrome. The participants were asked to watch the video, and their attitudes and behavior regarding health and exercise were surveyed using questionnaire administered before and after watching the video.

The survey targets were persons aged 20 or older living in a specific regional city in Japan and registered with a research firm. Considering that the environment in which the subjects were placed, such as exercise facilities, may be involved in the formation of exercise intentions, we limited the survey to a specific area. A survey request was sent to all subjects (1,706 participants) registered with the research company who met the above conditions, and the survey was completed when the responses of 315 participants were received.

5. Exercise status and health awareness of subjects before providing information

Fig.1 shows the participants' normal exercise situation. Before providing health and other information, the respondents were asked about their exercise status during the previous week.

This question was formulated with reference to the question regarding the implementation status of exercise situations proposed by Harada et al [15]. The question proposed by them specifies a period of time and simply asks whether or not you exercised during that period. On the other hand, Kato et al reports that there are two types of activities: compulsory activities such as work, and free activities that allow people to choose whether or not to engage in them of their own volition. This idea seems to be common to exercise. The purpose of this question was to understand the proportion of people who exercised voluntarily and those who exercised compulsory, using four options. Fig.1 shows 19.7% participants Exercise Frequency. Additionally, Fig.1 shows that 29.8% of the subjects were not aggressive but ended up moving their bodies. In the subsequent analysis, Fig.1 spits to two groups (exercise and not exercise) 49.5% (156 participants) Exercise Frequency (19.7% Actively Exercised and 29.8% Not Aggressive, but physical) 50.5% (159 participants) Exercise Frequency (32.7% I don't move much and 17.8% Not moving at all).

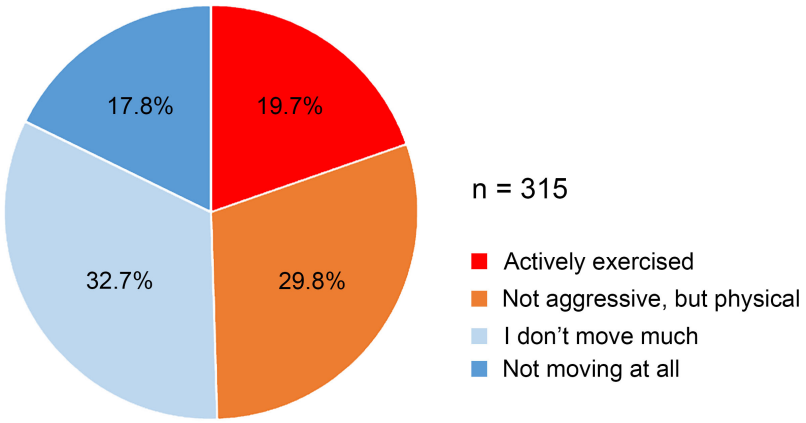

Fig. 1. Exercise Frequency.

Fig. 2 shows the participants' awareness of locomotive syndrome before viewing the video. Fig. 2 spits to two groups (awareness and not awareness) 27.6% awareness of locomotive syndrome Consisting of 8.6% answered know much, and 19.0% answered know some, 72.4% not awareness of locomotive syndrome Consisting of 19.7% don't know much, and 52.7% answered I don't know. As this study aimed to extend healthy life expectancy by promoting exercise, participants who were currently exercising on a daily basis were excluded; the 159 participants who answered that they were "not very physically active" or "not at all physically active" to the question in Fig. 1 were included in subsequent analyses.

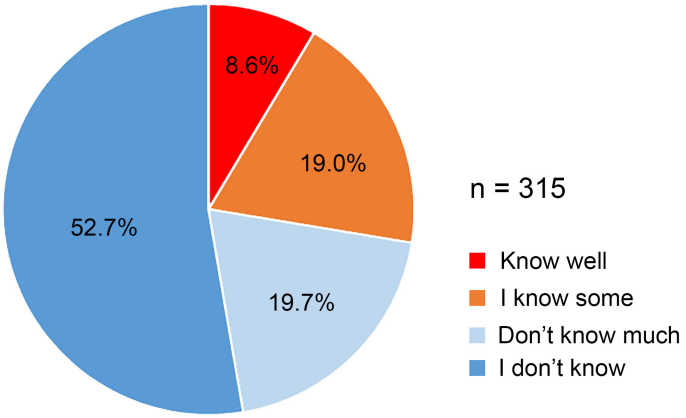

Fig. 2. Recognition of locomotive syndrome.

6. Behavioral intention formation regarding exercise after the provision of health information

After watching the video about locomotive syndrome, behavioral intentions regarding exercise were surveyed. Questions of health behavioral intentions was formulated in reference to the action intention standard of the exercise action that Harada and others suggested [16]. Harada et al. defined the health behavioral intentions scale of five items in reference to the existing exercise action intention standard in foreign countries [17], [18], [19] and the action intention standard of other domains in our country and inspected the validity of the standard. In their report, they state that these items are the same factors. However, the applicable item to our study was only one, because their defined items are not assumed the measurement of the action intention after the intervention. In this study, we formulated the answer of "are you going to exercise positively." of health behavioral intentions.

Fig. 3 shows behavioral intentions regarding exercise after watching the video among the 159 participants. After watching the video, 59.8% of the subjects answered that they were very much or somewhat willing to exercise proactively during the coming week.

Therefore, we compared participants who answered that they were going to exercise proactively during the coming week after watching the video with those who answered otherwise, and analyzed the background to the differences in responses despite the subjects having been provided the same information. According to HAPA, behavioral intentions regarding health can be explained by three factors—self-efficacy, outcome expectancy, and risk perception. We analyzed the relationship between these three factors and the subjects' behavioral intentions regarding exercise by adding structural factors such as impact on life and the availability of exercise facilities. The questionnaire items for the factors of self-efficacy, outcome expectancy, and risk perception were developed with reference to previous studies on HAPA.

Table 1 compares the ration of subjects who positively responded with "strongly agree" or "agree" to each of the questions regarding self-efficacy, outcome expectancy, risk perception, impact on life, and structural factors, dividing the groups into those whose behavioral intentions regarding exercise were confirmed after viewing the video and those whose behavioral intentions were not confirmed. Z

values were the result of Test of Equal or Given Proportions. Z value highlight means the ration of positive responses ware 5% significant difference between groups. Table 1 shows that there were significant differences in the ration of positive responses for many questions. However, when self-efficacy was divided into three levels of exercise intensity: strong (carrying heavy loads, jogging, singles tennis, etc.), moderate (carrying light shopping, playing tag with children, swimming slowly, etc.), and weak (walking or strolling), and a question was asked whether each exercise intensity is easy to perform, the groups showed significant differences in the ration of positive responses for weak and moderate exercise intensity, but no significant differences in the ration of positive responses for strong exercise intensity. In outcome expectancy, "if I did not exercise, I would develop a lifestyle disease", and "If I did not exercise, I would become obese." Significant differences were observed between the two groups for the questions. These questions ask about the sense of crisis regarding the disease. But "If I did not exercise, my ability to think would be slowed down." and "If I did not exercise, I would not sleep well." No significant differences were found in the questions. These questions ask about quality of life. For the questions about risk perception, a significant difference was found for the rubric "I cannot imagine myself getting a lifestyle disease."

Table.1. Ration of positive responses to each question by behavioral intention formation regarding exercise.

Category	Variables	Question	Ration of subjects who positively responded to each of the questions		
			Behavioral Intentions not confirmed group	Behavioral Intentions confirmed group	Z value
self-efficacy	se01	Is it easy to perform strong exercise intensity.	0.063	0.074	-0.273
	se02	Is it easy to perform moderate exercise intensity.	0.141	0.295	-2.255
	se03	Is it easy to perform weak exercise intensity.	0.234	0.642	-5.048
outcome expectancy	re01	If I did not exercise, I would develop a lifestyle disease.	0.500	0.747	-3.202
	re02	If I did not exercise, I would become obese.	0.469	0.768	-3.880
	re03	If I did not exercise, my ability to think would be slowed down.	0.219	0.337	-1.610
	re04	If I did not exercise, I would not sleep well.	0.313	0.432	-1.514
risk perception	rp01	I cannot imagine myself getting a lifestyle disease	0.719	0.526	2.433
	rp02	I cannot imagine myself requiring nursing care.	0.719	0.611	1.407
impact on life	lf01	Active exercise makes me tired.	0.453	0.674	-2.768
	lf02	If I was active in exercise, I spend less time on non-exercise activities.	0.203	0.358	-2.097
structural factors	fa01	Parks, sports facilities, walking trails, and other facilities for walking and exercise are located nearby.	0.531	0.695	-2.093
	fa02	Parks, sports facilities, walking trails, etc. within easy reach of my daily activities are suitable for me to exercise.	0.063	0.347	-4.169

*z value highlight means the ration of positive responses ware 5% significant difference between Behavioral Intentions formation group and not formation group.

Based on these results, the relationship was confirmed by covariance structure analysis. Fig. 3 shows the covariance model of behavioral intentions regarding exercise in this study. Objective variable is behavioral intentions regarding exercise were confirmed or not. The squares in Fig.3 are description variables. In table 1, The question that the ration were significantly difference was chosen. Furthermore, I repeated trial and error and chose a variable so that the model conformity values are increased. The ellipses in Fig.3 are latent variable.

The Criterion of model fit is evaluated with values of GFI, AGFI and RMESA. GFI was 0.902 and AGFI was 0.824, indicating that the model was an appropriate fit. RMESA was 0.110 indication that the model was allowable. However, regarding the structural factors, as it was assumed that the factor analysis results for fa01 and fa02 differed, only fa02, which had a large difference in the ration of positive responses between groups, was used as an explanatory variable. Risk perception was excluded because its addition to the model significantly reduced the goodness of fit and the path coefficients were not significant.

The number written next to the arrows in Fig. 3 is the path coefficient. The 5% significant coefficients are marked with *, and 1% significant coefficients with **. Self-efficacy was estimated to be the largest path coefficient for the presence of behavioral intentions, and the path coefficient from outcome expectancy was also significant. Meanwhile, the path coefficients for life impact and structural factors, which were newly added in this study, were found to influence the presence or absence of behavioral intentions regarding exercise after the provision of information on locomotive syndrome, although the values were less significant than those for self-efficacy and outcome expectancy.

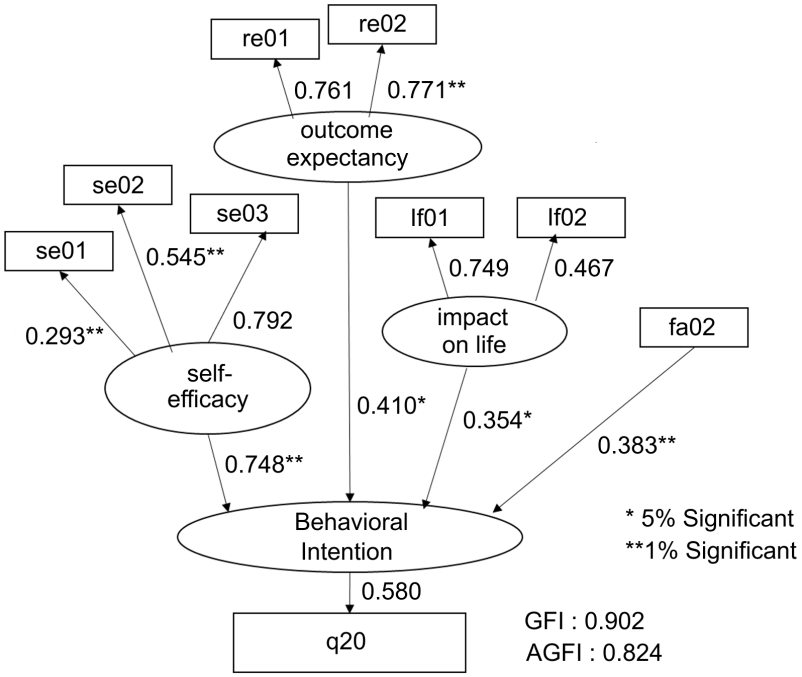

Fig. 3. Covariance structure analysis for behavioral intentions regarding exercise.

7. Discussion

Although risk perception has been shown to significantly affect behavioral intentions according to HAPA, it was not found to be a valid path for behavioral intention regarding exercise in this study. As this study considered exercise intentions stemming from the provision of health information, it is

assumed that the information did not motivate the subjects to make changes, given that the risk perception was the same for all participants.

The results for the questions related to structural factors, fa01 (Are there any exercise facilities nearby?), and fa02 (Are there parks and other facilities suitable for me?) showed that behavioral intentions regarding exercise did not depend on the existence of a facility; rather, it is necessary that individuals feel that the facility is suitable for their exercise. Table 1 shows that among those who answered that they did not intend to exercise, the number of participants who answered that they had suitable facilities was 0.063, suggesting that exercise facilities are a major factor.

However, these results do not indicate that simply preparing physical facilities is sufficient. According to studies of cognitive psychology, people tend to believe that the cause of other people's inability to do things lies with people themselves, while one's own inability to do things is caused by other factors. Although the possibility that such self-serving bias is involved in these results cannot be denied, it is clear that to effectively link the provision of information on locomotive syndrome to changes in health behavior, considering including environmental improvements such as exercise facilities is effective.

8. Conclusion

In this study, we asked subjects who did not usually exercise to watch a video about locomotive syndrome and investigated the changes in their behavioral intentions regarding exercise after watching the video. The results of the survey revealed that after watching the video, approximately 60% of the subjects responded that they would exercise in the future.

The results for behavioral intentions regarding exercise include self-efficacy ("Can I exercise easily?"), outcome expectancy ("Will I get lifestyle diseases or become obese if I do not exercise?"), and impact on quality of life ("Active exercise makes one tired; less time is spent on non-exercise activities") revealed that structural factors (e.g., proximity to parks suitable for the subject) had an influence on the results.

In Japan, as the importance of preventing locomotive syndrome is recognized, increasing public awareness of the term "locomotive syndrome" has been posited as a measure in encouraging behavioral changes in individuals. However, the study could clarify that awareness alone does not lead to behavioral changes; an effective introduction of this measure combined with other measures (for example, Development of suitable athletic facilities. Planning exercises according to the subject's motor abilities. etc.) are necessary to promote behavioral changes.

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