A Path Model Analysis of the Causal Relationship between Self-care Agency and Healthy Behavior in Community-dwelling Older People from the GAINA Study

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ABSTRACT

Background Self-care agency is an important determinant of self-care behavior. The purpose of this study was to identify the causal relationship between self-care agency and healthy behavior, and to construct a conceptual model of healthy behavior among older people living in a rural community.

Methods This study was conducted as a cross-sectional survey at the Hino, a town in western Tottori Prefecture, Japan. Participants who were enrolled in the Good Ageing and Intervention against Nursing Care and Activity Decline (GAINA) study from 2014 to 2018 (467 new participants) were initially investigated. Of 398 participants aged ≥ 65 years, 5 were excluded due to missing data, and thus 393 were analyzed. Nurse researchers conducted face-to-face interviews with participants to check the accuracy of data obtained from a self-administered questionnaire, which included demographic information, physical condition (comorbidities, knee pain, low back pain, and locomotive syndrome), healthy behavior, and self-care agency. Correlations among variables were investigated by Pearson's correlation coefficient analysis, and path analysis was performed to assess causal relationships.

Results A total of 393 persons (160 men and 233 women) were investigated, ranging in age from 65 to 92 years, with a mean age of 75.1 years (SD: 6.9 years). Path analysis revealed poor fit of a model in which pain and locomotive syndrome were factors inhibiting healthy behavior. When the model included only self-care agency, the indices of model fit were almost satisfactory (Goodness-of-fit index = 0.967, Adjusted goodness-of-fit index = 0.900, Comparative fit index = 0.951, and Root mean square error of approximation = 0.088), and the coefficient of determination (R^2) was 0.38. The self-care agency items with the greatest influence on healthy behavior were the ability to "grasp the techniques/tips needed to maintain health," and the ability to "persist with healthy behavior."

Conclusion Self-care agency can promote healthy behavior among community-dwelling older people. Regardless of physical problems such as pain and locomotive syndrome, older people have the potential to adopt positive healthy behavior if they acquire self-care agency.

Key words community-dwelling older people; healthy behavior; self-care agency; path analysis

The concept of self-care agency was introduced by Orem as one of the components of self-care nursing theory.[1] According to this theory, self-care agency is defined as one's ability and willingness to engage in self-care behaviors, which help maintain well-being, functioning, and health, even in individuals with chronic illness.[1] Additionally, self-care activities alleviate symptoms and complications of diseases, shorten recovery, and reduce hospital stay durations and rehospitalization rates.[2] Since anxiety and depression are negatively associated with a healthy diet and the frequency of exercise,[3] enhancing self-care agency to initiate and continue positive self-care healthy behaviors, such as those regarding diet or exercise, could help improve one's psychological state.

While self-care agency has been shown to be a factor promoting healthy behavior, other studies have investigated the factors that interfere with the acquisition of healthy behavior. Several studies have found that physical factors such as pain and fatigue inhibit the

performance of regular exercise by middle-aged and older people.[4, 5] In particular, many older people have musculoskeletal and other diseases. Thus, despite a desire to engage in exercise and physical activities, these conditions might make it difficult to continue healthy activities due to pain or fatigue.

In consideration of the above mentioned background, we hypothesized that pain and locomotive disabilities or comorbidities are factors that inhibit healthy behavior among community-dwelling older people; however, we also hypothesized that individuals with high self-care agency might learn and engage in healthy behaviors. Finally, we surmised that each component of self-care agency might synergistically influence healthy behavior in a sequential manner, rather than each component affecting healthy behavior in parallel. Accordingly, we aimed to develop a comprehensive sequential model of the associations between pain, locomotive syndrome (LS) as an indicator of physical frailty, comorbidities, and components of self-care agency. Many of the previous studies on factors associated with healthy behavior were based on qualitative approaches and/or univariate and multiple regression analyses. While it is possible to identify a causal relationship by multiple regression analysis, the assumed relationship is simplistic because a number of independent variables are identified as the predictors of a single dependent variable. Moreover, no previous study has investigated which components of self-care agency specifically influence healthy behavior, or how and to what degree. Determining the detailed process by which components of self-care agency affect healthy behaviors may reveal how health education should be conducted. Therefore, this study was performed using path analysis to identify the causal relationship between self-care agency and healthy behavior, and to develop a conceptual model of healthy behavior among older people living in a rural community.

SUBJECTS AND METHODS
Setting and participants
This study analyzed participants enrolled in the Good Ageing and Intervention against Nursing Care and Activity Decline (GAINA) study.[6–9] The GAINA study, which began in 2014, is a population-based prospective study of the residents of Hino, a rural town in western Tottori Prefecture, Japan. In 2016, Hino had 3,352 residents and an aging rate of 45.0%. Inclusion criteria included the ability to (i) walk at the time of the survey and (ii) understand and sign an informed consent form. Individuals who were receiving nursing care insurance were excluded from the study. We recruited community-dwelling individuals who underwent a local government medical check-up between May 2014 and May 2018, and 467 consented to participate in the GAINA study (new participants for 2014–18). Of these, 398 individuals aged ≥ 65 years were investigated in this cross-sectional study and 393 persons were analyzed after 5 with missing data were excluded.

Data collection
Nurse researchers conducted face-to-face interviews with the participants to verify the accuracy of data from the self-administered questionnaire, which covered the following four areas. Participants were asked to fill out a self-administered questionnaire covering four topics (demographic information, healthy behavior, self-care agency, and locomotive syndrome) and to bring it with them to a local government medical check-up. Unclear or blank answers were corrected during a 10-minute interview with a nurse researcher on the day of the medical check-up, and the completed questionnaire was used for the analysis.

Background information
Information on age, gender, current employment, family structure, medications, and physical condition (comorbidities, knee pain, and low back pain) was provided by the participants using a specified form. Knee pain and low back pain were assessed on a 100-mm horizontal visual analogue scale (VAS).

Healthy behavior
To assess ongoing healthy behavior, we asked the participants whether they incorporated health-maintenance activities into their daily lives. They responded using a 5-point Likert scale: (i) disagree, (ii) somewhat disagree, (iii) neither agree nor disagree, (iv) somewhat agree, or (v) agree. Thus, higher scores meant that participants were better at incorporating healthy behaviors into their daily lives.

Self-care agency
Self-care agency is the ability to engage in self-care, which is assessed based on aspects of behavior and cognition. To develop a scale appropriate for assessing self-care agency in community-dwelling older individuals in a rural area, we conducted a literature review regarding self-care agency in patients with chronic illness.[6, 10] We constructed a self-care agency scale based on the results of a confirmatory factor analysis that comprised three factors consisting of a total of 15 items. The factors were "acquisition and maintenance of health management methods," "avoiding overwork," and "reinforcement of one's support system." These factors had high Cronbach's

alpha coefficients and the indices of fit were satisfactory for this scale; therefore, this scale has a certain level of reliability and the construct validity. Participants were asked to rate each item on the following 5-point Likert scale: (i) disagree, (ii) somewhat disagree, (iii) neither agree nor disagree, (iv) somewhat agree, or (v) agree. Higher scores on the scale corresponded to higher self-care agency.

Locomotive syndrome

The evaluation of LS was performed using the five-question Geriatric Locomotive Function Scale.[11] This is a validated, self-administered, written questionnaire in Japanese that is considered to be a reliable, evidence-based method for identifying older adults at risk of developing increased dependency on others and adults who require nursing care due to locomotive dysfunction associated with musculoskeletal disorders. It is relatively comprehensive, consisting of five items graded on a 5-point scale ranging from no impairment (0 points) to severe impairment (4 points). In this study, a score of more than 6 out of 20 was grounds for diagnosing LS. A score of 5 points or less indicated no LS.

Data analysis

Summary statistics were calculated for all parameters. Correlations among variables were investigated by Pearson's correlation coefficient analysis. Path analysis, which allows for indirect and integrated effect evaluation, was conducted to assess causal relationships. We decided to use path analysis because constructing a model with path coefficients allows for simultaneous analysis of causal relations among all variables as well as examination of the goodness-of-fit of the model.[12] In order to assess the fit of the model, the goodness-of-fit index (GFI) was used to assess its explanatory power, and the adjusted goodness-of-fit index (AGFI) was used to delineate its stability. In addition, the comparative fit index (CFI) and root mean square error of approximation (RMSEA) were used as indicators of comparative fitness. Values indicating the acceptability of a model were previously specified as ≥ 0.9 for GFI and AGFI, ≤ 0.1 for RMSEA,[13] and ≥ 0.95 for CFI.[14] The significance of parameter estimates (path coefficients, corresponding to t-values) was assessed by dividing the values of non-standardized coefficients by the value of the standardized error. If a t-value is over 1.96, the path can be judged as statistically significant ($P < 0.05$). Model fit and loading path coefficients were calculated with a maximum likelihood estimator.[15] When the model provided inadequate fit indices, we examined the modification indices (MIs) for each parameter to improve the model fit. Another means of improving the model fit is to use test statistics. Smaller test statistic values indicate weaker influence, and thus represent paths and correlations that can be ignored. Using these indices and values, researchers discussed and made model revisions to construct a reasonable and realistic model. All data were analyzed using SPSS statistical software (version 22 for Windows; IBM, Tokyo, Japan) and Amos (version 20 for Windows; IBM, Tokyo, Japan).

Ethical considerations

This study was approved by the ethics committee of the Faculty of Medicine, Tottori University, Tottori, Japan (No. 2354). The objectives, potential impact, methods, risks, and benefits of the study were included in the document used to help explain the study to potential participants. All participants gave written informed consent.

RESULTS
Characteristics of the participants

The characteristics of the participants are summarized in Table 1. A total of 393 persons were enrolled in this study, including 160 men and 233 women aged 65–92 years (mean age: 75.1 years; SD: 6.9 years). Compared to male participants, a significantly higher proportion of female participants were taking hypnotics and osteoporosis medications ($P < 0.001$), while compared to female participants, a higher proportion of male participants were taking diuretics ($P < 0.001$). Among comorbidities, the prevalences of knee osteoarthritis and osteoporosis were significantly higher among female participants than male participants ($P < 0.001$). Moreover, a significantly higher proportion of female participants had LS compared to male participants ($P = 0.021$). When healthy behavior was assessed, we found that a significantly higher proportion of female participants had acquired healthy behavior ($P = 0.004$).

Self-care agency

Answers to the questions about self-care agency are listed in Table 2. The majority of the participants answered either "agree" or "somewhat agree" to each question. The top five self-care agency items with a high percentage of "agree" and "somewhat agree" answers were as follows: "I do not want to do anything that might damage my health" (93.3%), "I pay attention to my age-related decline in physical strength" (91.6%), "I take a rest if I notice something different [about my health]" (90.6%), "I keep my health in mind when I do things" (88.0%), and "I try to notice deterioration of my condition as soon as possible" (87.3%). On the other hand, "I grasp the techniques/tips needed to maintain my health" achieved

Table 1. Participant characteristics, *n* = 393

	Total (*n* = 393)		Male (*n* = 160)		Female (*n* = 233)		*P* value
Age (years)	75.1	(6.9)	75.2	(6.8)	75.0	(7.0)	0.812
Family structure (%)							
Living alone	73	(18.6)	23	(14.4)	50	(21.5)	0.087
Living with family	320	(81.4)	137	(85.6)	183	(78.5)	
Jobs (%)							
Yes	164	(41.7)	77	(48.1)	87	(37.3)	0.037*
No	224	(57.0)	81	(50.6)	143	(61.4)	
No response	5	(1.3)	2	(1.3)	3	(1.3)	
Medication use (multiple answers possible) (%)							
Analgesics	97	(24.7)	33	(20.6)	64	(27.5)	0.153
Hypnotics	56	(14.2)	9	(5.6)	47	(20.2)	0 < 001**
Diuretics	32	(8.1)	24	(15.0)	8	(3.4)	0 < 001**
Steroids	13	(3.3)	6	(3.8)	7	(3.0)	0.777
Osteoporosis medications	50	(12.7)	5	(3.1)	45	(19.3)	0 < 001**
Comorbidities (multiple answers possible) (%)							
Visual problems	93	(23.7)	34	(21.3)	59	(25.3)	0.398
Hearing problems	87	(22.1)	41	(25.6)	46	(19.7)	0.176
Meniere's disease	31	(7.9)	9	(5.6)	22	(9.4)	0.187
Knee osteoarthritis	77	(19.6)	18	(11.3)	59	(25.3)	0 < 001**
Hip osteoarthritis	18	(4.6)	4	(2.5)	14	(6.0)	0.140
Osteoporosis	51	(13.0)	2	(1.3)	49	(21.0)	0 < 001**
Spinal canal stenosis	73	(18.6)	33	(20.6)	40	(17.2)	0.313
Rheumatoid arthritis	11	(2.8)	5	(3.1)	6	(2.6)	0.764
Previous surgery for musculoskeletal disease	69	(17.6)	23	(14.4)	46	(19.7)	0.180
Previous fractures	79	(20.1)	26	(16.3)	53	(22.7)	0.125
Fall during the past 1 year	81	(20.6)	35	(21.9)	46	(19.7)	0.614
LS ≥ 6(%)	93	(23.7)	28	(17.5)	65	(27.9)	0.021*
Knee and low back pain (VAS; mm/100 mm)	22.3	(26.9)	20.6	(25.6)	23.5	(27.8)	0.240
Healthy behavior (%)	289	(73.5)	105	(65.6)	184	(79.0)	0.004**

Values are means (± SD) for continuous variables and number (%) for categorical data. Significance of differences was evaluated by the chi-square test or unpaired Student's *t*-test. *$P < 0.05$, **$P < 0.01$. LS, locomotive syndrome; VAS, visual analogue scale.

the lowest percentage of "agree" and "somewhat agree" responses (62.4%).

The mean (and SD) score divided by each item number for the "acquisition and maintenance of health management methods," "avoiding overwork," and "reinforcement of one's support system" subscales were 4.26 (SD 0.64), 4.35 (SD 0.68), and 3.97 (SD 1.04), respectively.

Healthy behavior model for community-dwelling older people

We performed path analysis to investigate our initial hypothesis that knee pain, back pain, LS, and comorbidities were factors that inhibited healthy behavior among community-dwelling older people, while self-care agency promoted healthy behavior. The results are summarized in the initial path diagram shown in Fig. 1. The fit indices of this model were unacceptable (GFI = 0.769, AGFI = 0.629, CFI = 0.273, and RMSEA = 0.209). Since the path coefficient between healthy behavior and physical issues such as pain and LS was low, we concluded that physical issues did not directly affect healthy behavior. Therefore, in the next step we verified only the relationship between self-care agency and healthy behavior, but this model was also unacceptable (Fig. 2).

Table 2. Answers to the self-care agency questionnaire

| Self-care agency		Agree/ Somewhat agree		Neither agree nor disagree		Disagree/ Somewhat disagree	
Acquisition and maintenance of health management methods	1. I want to follow through with my goals for maintaining my health	303	(77.1)	70	(17.8)	20	(5.0)
	2. I maintain a good relationship with my illness to best manage my health	309	(78.8)	61	(15.5)	23	(5.8)
	3. I keep my health in mind when I do things	346	(88.0)	30	(7.6)	17	(4.3)
	4. I do not want to do anything that might damage my health	369	(93.9)	15	(3.8)	9	(2.3)
	5. I realize the need to perform specific actions to be in better condition	337	(85.8)	41	(10.4)	15	(3.8)
	6. I grasp the techniques/tips needed to maintain my health	245	(62.4)	98	(24.9)	50	(12.7)
	7. I try to notice deterioration of my condition as soon as possible	343	(87.3)	32	(8.1)	18	(4.6)
Avoiding overwork	8. I avoid places that are unhealthy	297	(75.6)	69	(17.6)	27	(6.8)
	9. I pay attention to my age-related decline in physical strength	360	(91.6)	19	(4.8)	14	(3.6)
	10. I take a rest if I notice something different about my health	356	(90.6)	15	(3.8)	22	(5.6)
	11. If I don't feel well, I ease up on my work or housework as appropriate	327	(83.3)	32	(8.1)	34	(8.6)
	12. I try not to force myself	334	(85.0)	36	(9.2)	23	(5.8)
Reinforcement of one's support system	13. There is someone who stops me when I am about to do something bad for my health	285	(72.5)	44	(11.2)	64	(16.3)
	14. People around me provide cooperation and encouragement	299	(76.1)	57	(14.5)	37	(9.4)
	15. I have someone who understands my needs and gives me a boost	276	(70.2)	68	(17.3)	49	(12.5)

Data show the number of responders (%).

Only the path coefficient for one of the three subscales of self-care agency, "acquisition and maintenance of health management methods," was significant (Fig. 2). We had previously analyzed the correlations between the three subscales; therefore, our next step was to conduct another path analysis, this time using the factor relationships of the self-care agency subscales. The fit indices were almost satisfactory (GFI = 0.999, AGFI = 0.995, CFI = 1.000, and RMSEA = 0.000), and the coefficient of determination (R^2) was 0.37 (Fig. 3). Of the self-care agency subscales, only the "acquisition and maintenance of health management methods" directly affected healthy behavior (path coefficient 0.61, $P < 0.01$). The other two domains did not directly affect healthy behavior. Therefore, it was considered that there was an association between each observed variable (item) of this domain and healthy behavior. Pearson's correlation analysis was used in the preliminary path analysis of self-care, and items showing a significant correlation with healthy behavior (correlation coefficient ≥ 0.3) were selected for the model. The results are summarized in the path diagram shown in Fig. 4. The indices of fit were not satisfactory for this model (GFI = 0.676, AGFI = 0.553, CFI = 0.203, and RMSEA = 0.175). Path coefficients for the influence of knee pain, back pain, LS, and comorbidities on healthy behavior also showed no significant differences, with low values ranging from 0.01 to 0.09. In the final step, with reference to the MIs and path coefficient values, we repeated the analysis by systematically removing paths and variables with large MI values. Additionally, we created new paths and referenced the previously determined theoretical basis of the causal model for self-care and healthy behaviors, which posited that knowledge and techniques increase self-efficacy, for example the awareness of the importance of healthy behaviors and confidence and the promotion of behavioral change.[16, 17] We improved the model while focusing on correlations among each of the self-care items, and constructed the model shown in Figure 5. With this final model, the indices of fit were almost satisfactory (GFI = 0.967, AGFI = 0.900, CFI = 0.951, and RMSEA = 0.088). In addition, all of the path coefficients were significant (Fig. 5). Among the self-care agency subscales, the ability to "do what is needed to maintain health" (0.30) and the will to "persist with healthy behavior" (0.28) had the strongest influence on the adoption of healthy behavior. In addition, the path from "realize the need for healthy behavior" to the ability to "do what is needed to
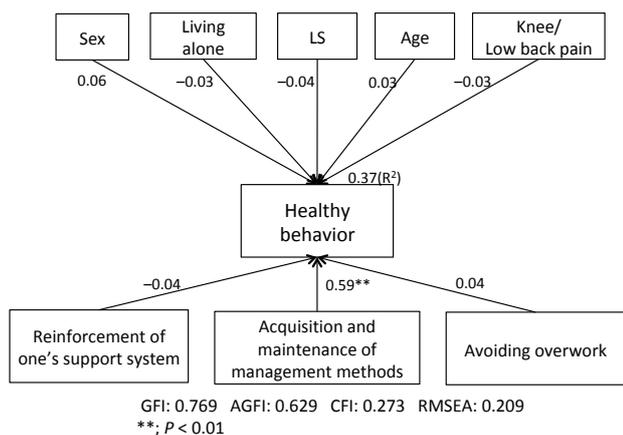
Fig. 1. Initial model of healthy behavior among community-dwelling older people. R^2 is the proportion of the variance in the dependent variable that is predictable from the independent variables. Numerical values are path coefficients (standardized). Error variables are omitted. This model was not acceptable. AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; LS, locomotive syndrome; RMSEA, root-mean-square error of approximation.
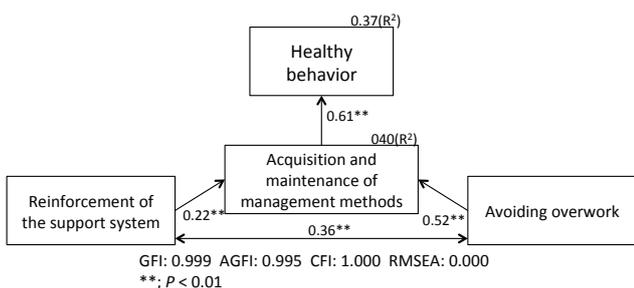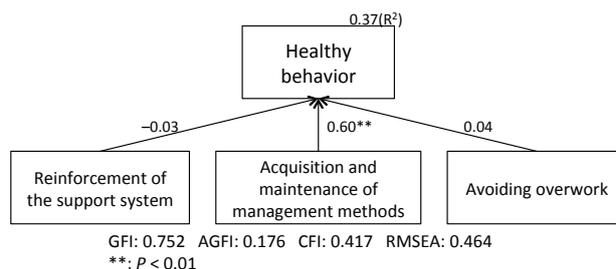

Fig. 3. Third model of healthy behavior among community-dwelling older people (acceptable model). R^2 is the proportion of the variance in the dependent variable that is predictable from the independent variables. Numerical values are path coefficients (standardized). Error variables are omitted. This model was acceptable. AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root-mean-square error of approximation.
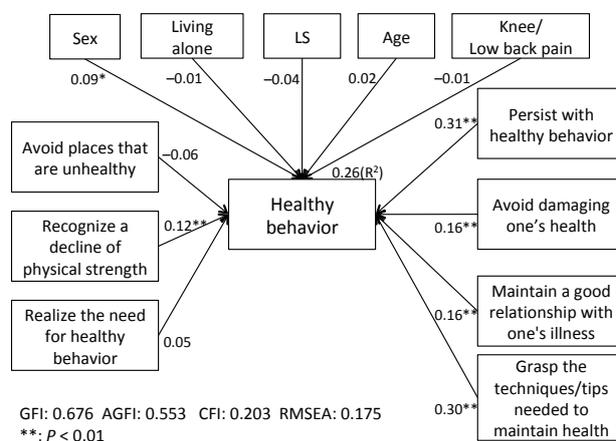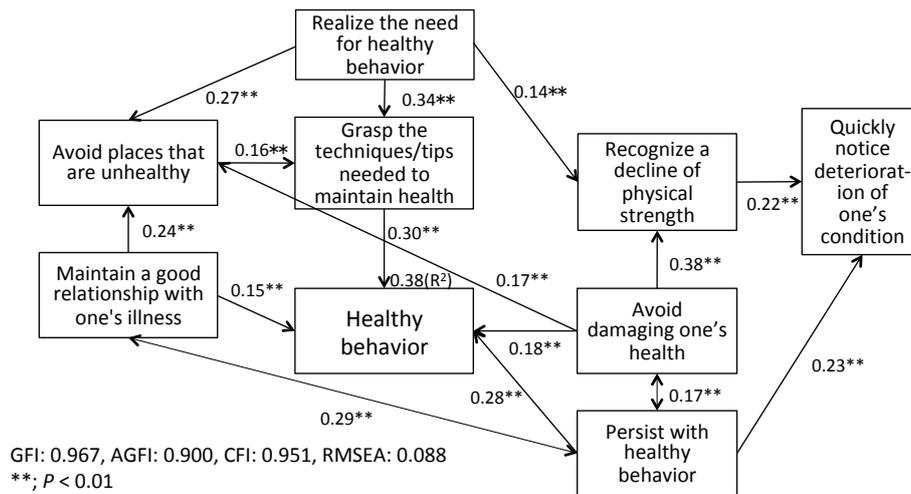

Fig. 2. Second model of healthy behavior among community-dwelling older people. R^2 is the proportion of the variance in the dependent variable that is predictable from the independent variables. Numerical values are path coefficients (standardized). Error variables are omitted. This model was not acceptable. AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root-mean-square error of approximation.

Fig. 4. Fourth model of healthy behavior among community-dwelling older people. R^2 is the proportion of the variance in the dependent variable that is predictable from the independent variables. Numerical values are path coefficients (standardized). Error variables are omitted. This model was not acceptable. AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; LS, locomotive syndrome; RMSEA, root-mean-square error of approximation.

maintain health" had the highest path coefficient (0.34), with a coefficient of determination (R^2) of 0.38.

DISCUSSION

This study was performed to identify the causal relationship between self-care agency and healthy behavior, and to develop a conceptual model of healthy behavior among older people living in a rural community. While we initially suspected that pain and LS would inhibit healthy behavior among older individuals, the model based on the hypothesis that physical factors influence healthy behavior did not show sufficient fit indices.

Instead, we obtained better fit indices for a different model of the relationship between self-care agency and healthy behavior, indicating a good fit between our data and the alternate model. This result suggested that older people who have acquired self-care agency can adopt healthy behavior, including pain control and regulation of physical function, regardless of the presence or absence of physical problems. According to a previous qualitative study, people found it difficult to engage in healthy behavior in their daily lives for reasons such as "my back and hip hurts," "I feel pain when I walk," or "I don't have the strength to move due to fatigue.[5]"

Fig. 5. Final model of healthy behavior among community-dwelling older people (acceptable model). R^2 is the proportion of the variance in the dependent variable that is predictable from the independent variables. Numerical values are path coefficients (standardized). Error variables are omitted. "Persist with healthy behavior" and "Realize the need for healthy behavior" were correlated (0.28, path omitted). "Realize the need for healthy behavior" and "Maintain a good relationship with one's illness" were correlated (0.28, path omitted). Numerical values are path coefficients (standardized). Error variables are omitted. This model was acceptable. AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root-mean-square error of approximation.

However, those findings conflicted with those of the present study. This difference may be due to the fact that the qualitative study had a small number of participants; thus, the findings may not necessarily be universally applicable. However, the participants in this study attended a local government medical check-up and had a relatively higher level of health awareness. Thus, the participants had less severe pain and dysfunction, which could have resulted in the non-significant association between physical problems and healthy behaviors.

This study revealed that several factors were important for maintaining health among community-dwelling older people, including the following: "acquisition and maintenance of health management methods," such as knowledge and skills to implement appropriate diet and exercise therapy despite physical problems; the "ability to grasp the techniques/tips needed to maintain health" in daily life; and the will to "persist with healthy behavior." We also found that the self-care agency items were correlated with each other, and thus mutually enhanced self-care agency. For example, the most important factor for increasing the "ability to grasp the techniques/tips needed to maintain health" in daily life was to "realize the need for healthy behavior." One useful model for promoting healthy behavior is the Health Belief Model (HBM), which was originally developed in the 1950s to predict whether individuals would remain engaged in programs to prevent and detect disease.[18, 19] The HBM consists of the following five constructs that are thought to influence the likelihood of an individual engaging

in a given health behavior so as to avoid an undesirable health outcome: perceived susceptibility (perception of the likelihood that one will experience the outcome in question), perceived severity (perception of the seriousness of consequences associated with the outcome), perceived benefits (potential advantages of engaging in healthy behavior, including the perceived efficacy for preventing the undesired outcome), and perceived barriers (perceived obstacles to engaging in the healthy behavior).[20] According to this model, recognizing the necessity for healthy behavior requires acknowledging both perceived severity ("If I continue this unhealthy habit, I might harm my health.") and perceived susceptibility ("If I continue this unhealthy habit, I might get sick..."), which suggests that education promoting a sense of threat or crisis ("This is scary, I must do something about it.") is important.

A positive response to statements on wanting to "maintain a good relationship with one's illness" and a strong desire to "avoid damaging one's health" were other factors that had a direct influence on healthy behavior, although the influence was not as strong. These results suggest that to increase people's interest in their health and their desire to manage it, healthcare professionals must implement interventions aimed at enhancing motivation and concern regarding healthy behavior.

Self-care agency is an operational concept that encompasses cognition, attitude, knowledge, and motivation. These variables can be directly manipulated by healthcare professionals and can be increased by nursing

support; thus, it is important to note that they were identified as variables associated with healthy behavior in this study. For healthcare support, it might be helpful to use Keller's ARCS Model of Motivational Design Theories, which proposes four factors that promote and sustain motivation in the learning process: attention, relevance, confidence, and satisfaction (ARCS).[21] We previously reported on the effects of a learner-focused health classroom setting based on an ARCS model of instructional design, and found that the setting improved self-efficacy, promoted the use of knowledge and skills related to health, and led to an improved understanding of the importance of health management.[22] These findings suggested that an ARCS model could be applied to a health classroom setting. Therefore, when providing health education for older people in the community, healthcare professionals first need to attract their attention when introducing the topic so that participants are engaged and interested. To encourage participants to meet the objectives specified by the action plan, healthcare professionals should aim to promote goal orientation and to enhance participants' feelings of confidence, significance, and relevance with regard to performing healthy behavior.

In conclusion, this study showed that self-care agency promoted healthy behaviors among community-dwelling older people. The first novel finding was that regardless of the presence or absence of physical issues such as pain and LS, older people have the potential to adopt healthy behaviors if they acquire self-care agency. Second, although the factor relationships of self-care agency and healthy behavior have been shown on their own, we demonstrated a synergistic association between the components of self-care agency, including the awareness of the importance of healthy behaviors and a strong desire to engage in these behaviors.

LIMITATIONS OF THIS STUDY

There were several limitations to this study. It used a cross-sectional design; therefore, a prospective longitudinal study will be needed in the future to obtain data for constructing a more accurate causal model. Furthermore, the coefficient of determination of the present model was 0.38, which is not particularly large; thus, it is likely that other factors also influence healthy behavior. In addition to self-care agency, a future study should examine the influence of a combination of other variables that stimulate behavioral changes, including self-efficacy. There is also a need to assess various categories of healthy behavior, such as those related to diet, motor activity, and medication, and to examine the factors that influence each of these behaviors.

Another limitation is the possibility of selection bias due to the fact that relative to individuals who did not attend medical check-ups, the participants were more aware of their health status and possessed a greater knowledge about healthy behaviors. This should be taken into account when generalizing our findings. To mitigate selection bias, a similar study in the future should enroll participants who have not attended a local government medical check-up.

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