

## A Concept Analysis of Self-Management of Physical Frailty

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### ABSTRACT

This review aimed to clarify the concept of self-management in the context of physical frailty and to provide insights that support the development of interventions to prevent physical frailty. A concept analysis using thirty-three studies was performed, six attributes of the concept “self-management of physical frailty” were identified: {Cooperating with healthcare professionals or familiar persons}, {Investing and managing in resources}, {Acquisition and maintenance of individualized self-management strategies}, {Self-directed process}, {Goal setting and personalized action planning} and {Living with one’s own health condition with a positive attitude}. Self-management of physical frailty can be defined as a process in which an individual independently sets goals and action plans, engages in strategies such as exercise and nutritional management, and lives with one’s own health condition with a positive attitude by collaborating with healthcare professionals and others, in addition to utilizing resources. To support the process in which an individual independently sets goals and action plans, engages in strategies, self-management support based on learning theories that lead to cognitive, emotional, and behavioral changes is necessary.

**Key words** concept analysis, physical frailty, self-management

Frailty is defined in various ways, but many geriatricians perceive it as a “biologic syndrome of decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, and causing vulnerability to adverse outcomes.”<sup>1</sup> Moreover, the term “frailty” represents a combination of aging, disease, and other factors (e.g., fitness and nutritional status).<sup>2</sup> Frailty can also be assessed as a frailty index that evaluates health deficits and reflects the

accumulation of deficits in the categories of symptoms, signs, disabilities, and diseases.<sup>3,4</sup> A study that created a frailty index from these deficits evaluated restricted activity, disability in Activities of Daily Living (ADL) and Instrumental ADL, impairments in general cognition and physical performance (e.g., impaired grip strength, impaired walking), comorbidity, self-rated health, and depression/mood.<sup>4</sup> This model of frailty is often described as the deficit accumulation model. Clinically, it is straightforward to numerically assess the cumulative degree of frailty as an index by simply adding up the deficits—including symptoms, signs, disabilities, and diseases—without weighting them. This approach provides a practical assessment of frailty in older adults that is not based on the binary presence or absence of a deficit but rather on the rating of deficits on a continuous scale.

Fried et al.<sup>1</sup> posit that when individuals become frail, five elements become evident: shrinking (weight loss), weakness, exhaustion, low activity, and slowness. In their model, widely known as the phenotype model, they define frailty as the presence of three or more of the five items.

The Cardiovascular Health Study (CHS) frailty index is a method that measures each element of frailty by using alternative indicators (unintentional weight loss, fatigue, physical activity level, walking speed, and grip strength). The CHS criteria do not include standard values for each of the five items, and various values have been used. In recent years, a research group of the Ministry of Health, Labour and Welfare created the Japanese version of the CHS (J-CHS) scale.<sup>5</sup> The revised J-CHS criteria, which included a revised cut-off value for grip strength, were published in 2020 to improve the consistency of diagnoses of frailty and sarcopenia,<sup>6</sup> and these revised criteria have since been used in Japan.

Frailty encompasses three domains: the physical, psychological, and social domains.<sup>7</sup> Furthermore, each of these domains is believed to mutually influence the other two, leading to adverse health outcomes. Since around 2012, there has been a movement to define and gain consensus on each domain of frailty. In this context, Morley et al.<sup>8</sup> proposed that physical frailty is a “medical syndrome with multiple causes

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Abbreviations: ADL, activities of daily living; BMI: body mass index; CHS, Cardiovascular Health Study; CINAHL: Cumulative Index of Nursing and Allied Health Literature; QOL, quality of life

and contributors that is characterized by diminished strength, endurance, and reduced physiologic function that increases an individual's vulnerability for developing increased dependency and/or death." The above-mentioned CHS criteria<sup>5</sup> and J-CHS criteria<sup>6</sup> require gait speed and grip strength to be measured and physical activity to be quantified; recently, they have been positioned as representative diagnostic methods for physical frailty. In short, physical frailty is understood as a state in which vulnerability to health impairments increases because of a decline in various physical and mental functions and reserves associated with aging and illness. It is seen as a crucial concept for estimating older adults' life and functional prognosis and providing comprehensive healthcare and care for older adults.

Japan has the highest aging population in the world, and as the population ages, the number of older adults exhibiting physical frailty increases. Factors contributing to the development of physical frailty include loss of muscle mass due to aging or illness (sarcopenia) and chronic undernutrition. Frailty is considered to confer a high risk for adverse health outcomes, including mortality, institutionalization, falls, and hospitalization.<sup>1</sup> In Japan, older adults identified as frail have been reported to face a higher risk of dependency and mortality.<sup>9</sup> Thus, frail older adults are at an elevated risk of various health issues in the future, making physical frailty a pressing health challenge that the healthcare professionals should address.

One of the critical goals of next-generation healthcare is to extend healthy life expectancy. A crucial step to achieve this goal and thus improve individuals' quality of life (QOL) could be to establish self-management as a strategy to prevent physical frailty and enable people to live authentically. Fortunately, identifying frailty does not mean that a patient necessarily faces a continuous path of deterioration, and frailty can be reversible with appropriate interventions. Research has shown that proper interventions can improve physical performance, gait speed, and mobility.<sup>10, 11</sup> Therefore, it is desirable that healthcare professionals actively intervene at an early stage and promote understanding among the community about the significance of frailty prevention. These actions involve encouraging continuous self-management for frailty prevention and ensuring that individuals in the community understand the importance of these measures and actively engage in them.

The term self-management suggests that patients actively participate in treatment.<sup>12</sup> Furthermore, the term also conveys meanings such as making an effort to do things as well as continuously and systematically

carrying out activities. In short, self-management involves taking authority and responsibility for oneself and continuously addressing issues to maintain a favorable state. Lorig et al.<sup>12</sup> developed a self-management program that addresses three areas of medical management (medication, role, and emotional management) and six self-management skills (problem-solving, decision-making, resource utilization, the formation of a patient-provider partnership, action planning, and self-tailoring). A self-management program developed for arthritis patients had positive effects, including improved patient self-efficacy, reduced pain and fatigue, and alleviated anxiety.<sup>13</sup> The concept of frailty includes reversibility, meaning that individuals can return to a robust state with appropriate intervention.<sup>14</sup> Therefore, older adults living with the effects of aging must acquire specific and comprehensive self-management skills to maintain and improve functional abilities, not just the skills specific to chronic diseases.

In Japan, healthcare decisions, such as treatment choice, have traditionally been entrusted to providers, who make decisions based on their goodwill and professional judgment. However, patients' awareness of their rights has recently increased, leading to a shift toward patient-centered care that emphasizes self-determination. It is crucial that the concept of self-management, which developed in contexts where individuals are expected to take personal responsibility, is integrated into the current health challenges of preventing physical frailty in Japan. To prevent frailty, healthcare providers must pay attention to the recent circumstances and common usage of self-management in the context of physical frailty and accurately understand the structure of this concept. Therefore, this review aims to clarify the concept of self-management in the context of physical frailty, foster a shared understanding of self-management, and provide insights that support the development of interventions to prevent physical frailty.

## METHODS

For this review, we used Rodgers' evolutionary model of concept analysis, which identifies the characteristics of a concept by comparing it with its relevant concepts.<sup>15</sup> In Rodgers' model, the characteristics of a concept are shown in attributes, antecedents (factors preceding the concept), and consequences (factors subsequent to the concept). Specifically, the process involves identifying the target domain for the literature search, analyzing information extracted from the literature, and presenting directions for concept development and hypotheses.

## Definition of terms

On the basis of the literature search performed in the context of the current review,<sup>1–8</sup> we adopted the definition of physical frailty as a “medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance, and reduced physiologic function that increases an individual’s vulnerability for developing increased dependency and/or death.”<sup>8</sup> Specifically, physical frailty is a state in which the interconnected influences of chronic diseases and aging, including chronic undernutrition, lead to loss of muscle mass, thereby resulting in various conditions such as reduced maximum oxygen intake due to sarcopenia, decreased muscle strength, decreased gait speed, and fatigue.

## Method of literature search

The search was performed in PubMed database, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Japan Medical Abstracts Society website. We included studies published after 2012 because the understanding of the definition of physical frailty has generally been consistent since then. We performed the search on October 26, 2023, and included studies from 2013 until the date of the search.

In the PubMed database, our search focused on studies with the main topics of physical frailty and self-management. Related terms for physical frailty included frailty, frail, frailties, frailness, and frailty syndrome. Additionally, in Japan, there is a concept known as “locomotive syndrome,” which is almost synonymous with physical frailty (at times, locomotive syndrome is regarded as a cause of physical frailty). According to the Japanese Orthopaedic Association, locomotive syndrome means being restricted in one’s ability to walk or lead a normal life because of a dysfunction in one or more of the parts of the musculoskeletal system, i.e., muscles, bones, joints, cartilage, or intervertebral discs, and it is mainly used within Japan. Because the prevention methods for locomotive syndrome and physical frailty overlap, the self-management strategies for both conditions may have common elements. Therefore, we performed a search in PubMed with the terms “frailty or frail\*” and “locomotive syndrome” and (“self-management” or “self management”) and identified 175 studies, of which 102 were available. After reading all the titles and main texts, we selected those that focused on self-management for frailty prevention. We excluded studies that were not in a scholarly format, were duplicates, did not target adults or older adults, or discussed only oral frailty or prevention of cognitive or social frailty, and ultimately selected 23 studies. A

search on CINAHL with the same terms resulted in 112 hits, nine of which were included as additional studies after we had excluded duplicates. In the Japan Medical Abstracts Society website, the search results were limited to original studies and yielded 26 items. However, upon close examination of the complete texts, we found that although studies verified specific exercises and rehabilitation effects for preventing physical frailty, only one study explicitly described the self-management activities necessary for preventing physical frailty. Thus, we selected a total of 33 studies for analysis. Generally, sampling guides for concept analysis suggest a minimum of 30 literature sources. Therefore, the sample size of 33 studies was considered reasonable for a concept analysis (references number;<sup>16–48</sup>).

## Analysis

A coding sheet was created, and descriptions related to the concept’s attributes, antecedents, and consequences were extracted. The extracted content was summarized, and categories were created while considering commonalities and differences. In the categorization process, to ensure the analysis’s reliability and validity, the content refinement was achieved through repeated discussions among co-researchers.

## RESULTS

As a result of the analysis, six attributes, six antecedents, and six consequences were elucidated. Categories are shown in { }, while subcategories are shown in [ ].

### Attributes

{Acquisition and maintenance of individualized self-management strategies} is derived from many studies and was considered as the core of self-management. This category illustrates the individual’s attitudes and abilities in addressing the prevention of physical frailty and health challenges associated with frailty. This category describes an individual’s attitude and ability to prevent physical frailty and cope with the health challenges of frailty, as well as the regimen that is translated into action (e.g., exercise management, dietary management, symptom management). Moreover, the {acquisition and maintenance of individualized self-management strategies} is a part of the {self-directed process}, incorporating the concept of [decision-making] and [going through the process of taking responsibility]. It involves individuals setting their own goals and action plans for health practices, considering a balance with fulfilling their own lives, and making thoughtful adjustments. Additionally, for the continued implementation of self-management strategies, possessing the ability to

get help from familiar persons, valuing social networks and communication with others, as seen in {cooperating with healthcare professionals or familiar persons}, and having the skills of {investing and managing in resources} were identified as crucial. Moreover, {living with one's own health condition with a positive attitude} is a positive mindset in accepting the inevitable aging process for frail older adults and involves efforts to maintain and improve the frailty state. At times, it requires developing abilities such as [modifying daily life to reduce the load on the body], [accepting one's health condition and positive frame of mind], [dealing with emotion]. This involves the capacity for reconstructing and reinterpreting one's life (Table 1).

### Antecedents and Consequences

In the antecedents, {individual cognitive factors to support self-management strategies} and {sustained support by healthcare professionals} were identified from many studies (Table 2). In the consequences, many studies highlighted {improvement or prevention of deterioration of health status} and {maintenance or improvement of QOL} (Table 3).

### Theoretical definition

The model diagram is shown in Fig. 1. On the basis of the attributes, antecedents, and consequences found in this study, self-management of physical frailty can be defined as “a process in which an individual independently sets goals and action plans, engages in strategies such as exercise and nutritional management, and lives with one's own health condition with a positive attitude by collaborating with healthcare professionals and others, in addition to utilizing resources.” Moreover, frailty is greatly affected by the decline in physiological function associated with chronic diseases and aging. Therefore, accepting one's health condition and modifying daily life is essential.

### Model case

The following is a fictitious model case that illustrates the self-management of physical frailty.

Ms. Tani is a 73-year-old woman living in the countryside, engaged in farming with her husband. With a slender physique and a body mass index (BMI) of 19, she started experiencing knee and lower back pain in her 60s. Consulting her primary care doctor and a physical therapist, she learned about methods to reduce stress on the knee joint and effective exercise techniques. Taking matters into her own hands, Ms. Tani decided to engage in resistance training and stretching at home every night before bedtime, exercises that were easy to incorporate

into her routine. Additionally, she gathered tips on walking from health magazines for older adults and made it a habit to walk for around 20 minutes every day. Recently, through a friend's recommendation, Ms. Tani has been using Nordic poles to avoid putting excessive strain on her joints. During the busy farming season, tasks such as mowing and harvesting increase, and there are times when weight loss and worsening pain in the legs and back occur. In such situations, she takes breaks without overexerting herself. She sets a limit of 1–2 hours for mowing, typically performed early in the morning. When fatigue sets in, she seeks assistance from her son and daughter-in-law, who live nearby. During pain, Ms. Tani promptly seeks medical attention and manages discomfort with prescribed medications from her primary care doctor. She also consults with her doctor, who guides her in maintaining appropriate weight and muscle mass, holding a strong desire to avoid decline as a motivating factor. She was aware of the importance of maintaining muscle mass through dietary adjustments. After consulting with her doctor and learning about the optimal weight, she gained knowledge from pamphlets provided by a nurse. This information emphasized the importance of a balanced diet, protein intake, and calcium consumption. By combining this nutritional knowledge with regular exercise, she experienced a reduction in pain and subjectively felt that her body “became easier to move.” These successful experiences contributed to increased confidence and motivation for further health-related actions. Support from her family—such as compliments for her consistent efforts and engaging in physical activities together—encourages her. In her 70s, Ms. Tani began to feel more easily fatigued. Although initially attributed it to aging, she was determined to maintain her vitality and live a healthy life. Upon discovering announcements for health workshops and screenings in her community, she actively invited friends and family to join her. The social interactions during these events became a stress-relief outlet for Ms. Tani and served as a source of strength or energy for her well-being. Engaging in conversations with friends made Ms. Tani realize that she was not “alone in facing challenges.” Learning about the health behaviors practiced by her friends, she felt motivated to incorporate similar strategies into her own routine, adopting an attitude of determination and effort.

Consequently, Ms. Tani transformed a positive frame of mind, recognizing the importance of “accepting her condition and living her life accordingly.” During health measurement events, which included assessments of grip strength, ability to walk, and self-checks for frailty, Ms. Tani consciously monitored her physical



**Table 1. Attributes**

Category	Subcategory	Code	References
Acquisition and maintenance of individualized self-management strategies	Regularly practicing evidence-based, individualized exercise	Taking regular exercise	17, 19, 20, 21, 23, 25, 28,42,
		Continuing individualized exercise programs tailored to one's condition	17, 47, 48
		Continuing self-selected exercise	38
		Practicing a multi-component physical activity programme of evidence-based exercises designed by healthcare professionals	30, 32
	Continuing physical activity in daily life in accordance with one's capabilities	Enhancing moderate intensity physical activity	32
		Continuing physical activity in accordance with one's capabilities	17, 19, 21, 23, 24, 25, 28, 38, 42, 48
		Keeping a regular lifestyle	17
	Managing healthy nutrition status and body weight	Managing a healthy diet and healthy nutrition	42, 17, 19, 21, 23, 25, 28, 48
		Performing individualized nutrition management	47
		Performing management of appropriate body weight	17, 30, 48
		Performing management of sarcopenia	18, 48
	Increasing medication and treatment adherence	Increasing medication adherence	21, 22, 25, 41
		Performing medication management	27, 30
		Increasing adherence to treatment	24, 25, 39
	Managing symptoms	Controlling pain and discomfort	21, 38
		Recognizing symptoms and dealing with them	24, 38, 41
		Reinterpreting symptoms	26, 28
		Performing fatigue/exhaustion management	21, 30, 48
	Participating in various social activities	Participating in various social activities	20, 23, 25
	Acquisition of self-monitoring skills and recognition of frailty status	Early recognition of frailty status	18, 26, 33
Self-monitoring		25, 33	
Log-keeping		29	
Cooperating with healthcare professionals or familiar persons	Getting help from familiar persons	Getting help from family and friends' companionship	25
		Seeking support in social network	29, 39
		Communicating with others	21, 28
	Cooperating with healthcare professionals	Communicating with with healthcare professionals	21, 28
Cooperating with healthcare professionals	Cooperating with healthcare professionals	22, 25, 26, 30	
Investing and managing in resources	Investing and managing in resources	16,22	
Goal setting and personalized action planning	Goal setting and undergoing a personalized problem-solving process	Personalized problem-solving	21, 24, 25, 28, 29, 37,44
		Personalized goal setting	24, 29, 31, 32,37
		Personalized action plan	21, 23, 24, 29, 32, 37
Self-directed process	Decision-making	Individual decision-making	21, 28, 48
		Autonomy and self-determination	43
	Maintaining and promoting independence	Taking initiative	22, 24, 45
		Maintaining and promoting independence	25, 40
		Effort of self-help	24, 42
	Going through the process of taking responsibility	Taking responsibility for self-management	24, 28
Taking responsibility for one's own health		32, 41	
Living with one's own health condition with a positive attitude	Modifying daily life to reduce load on the body	Not overdoing things to reduce load on the body	25, 39,46
		Accepting one's own health condition and positive frame of mind	Attempting to live with frailty or illness/Adaptation to living conditions
	Having a positive frame of mind	22, 45	
	Dealing with emotion	Controlling one's emotions	21, 25, 28
		Calming the mind	25
Avoidance coping		25	

**Table 2. Antecedents**

Category	Subcategory	Code	References	
Stable physical and social environment	Stable social environment	Income	16, 19	
		Education level	16, 19, 30, 41	
		Low management costs	35	
	Stable physical environment	Number of comorbidities	19, 21	
		Complex health issues	26	
		Older adults' health deterioration	28	
		Deterioration of cognitive functioning	45	
Desire to avoid health problem that are considered severe	The self-perceived severity of health problem	Cognitive impairment level	21	
		Malnutrition level	21	
		The self-perceived severity of health condition	21, 38	
	Desire to avoid causing health issues	Strong desire to "avoid damaging one's health"	38	
		Valuation of life (VOL) to want to continue living	28	
Will to continue healthy behaviors	Will to continue healthy behaviors	Will to persist with healthy behavior	38	
Individual cognitive factors to support self-management strategies	Self-efficacy	Self-efficacy beliefs	22, 44	
		Confidence to manage one's health conditions	22, 30	
	Motivation	Active motivational abilities	22	
		Motivation to manage one's health conditions	22	
	Adequate knowledge/skills	Motivation or intrinsic motivation	23, 26, 27, 43	
		Adequate skills to manage one's health conditions	22	
		Adequate knowledge	24, 27	
		Health literacy	Health literacy	30
			Access to information	22, 27, 30,
			Information being provided	22
Ability to grasp the techniques or tips needed to maintain health	38, 44			
Resource combining abilities	22			
Sustained support by healthcare professionals	Professional knowledge/skills/attitude	Relational competence as a healthcare professional	27	
		Professional knowledge and skills	18, 27, 32, 35	
		Attitude to respect individual needs, priorities, and preferences as a healthcare professional	26, 27, 32	
	Sustained support from healthcare professional	Holistic approach from interdisciplinary team of specialist	24, 43	
		Sustained contact over time with a healthcare professional	29, 43	
Social support from familiar persons	Support from familiar individuals	Encouragement, guidance, and feedback from a healthcare professional	25, 27	
		Support from familiar individuals	19, 25, 43	

condition regularly, looking for early signs of physical discomfort. Motivated to minimize the burden on her family in the future, Ms. Tani remains committed to maintaining her ability to move independently. In particular, through consistent engagement in activities such

as exercise, nutrition management, stress reduction, symptom monitoring, and medication management. Further, she aims to continue her passion for farming within her capabilities and live life on her terms. However, when managing everything alone becomes

**Table 3. Consequences**

Category	Subcategory	Code	References
Improvement or prevention of deterioration of health status	Improvement of health status	Improvement of health status	16, 21
		Reduction or improvement of frailty	17, 19, 24, 32, 42, 47
	Reducing access to medical or nursing care	Minimizing unplanned hospital readmissions	41
		Reducing new acquisition of long-term care service requirements	20
	Prevention of sarcopenia	Prevention of malnutrition-sarcopenia syndrome	18
Maintenance or improvement of QOL	Maintenance or improvement of QOL	Maintenance or improvement of QOL	22, 43, 44
Maintenance or improvement of physical function	Maintenance or improvement of physical function	Maintenance or improvement of physical function	24, 35, 47
		Maintenance or improvement of ADL	27
Enhancement of individual cognitive factors to support self-management strategies	Enhancement of strengths	Improvement of self-efficacy	27
		More highly empowered	27
		Enhancing of adherence to physical activity	35
	Improvement of self-care competencies	Improvement of self-care competencies	27
		Improvement of sense of mastery	28
Reduction in cost to the health system	Reduction in cost to the health system	Reduction in cost to the health system	36
Reduction in caregiver burden	Reduction in caregiver burden	Reduction in caregiver burden	43

challenging, Ms. Tani ensures she does not push herself too hard and seeks support from her family and close friends.

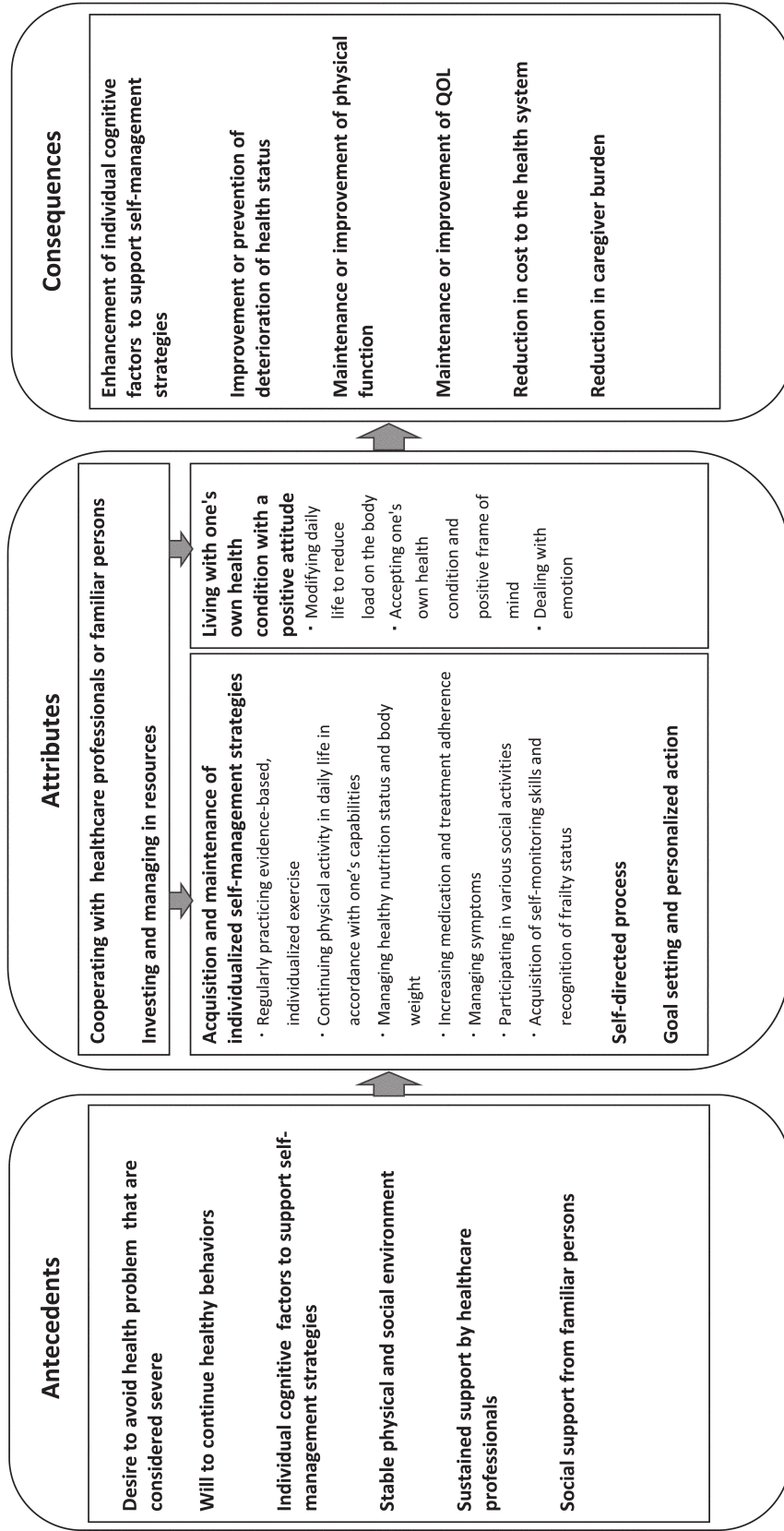
## DISCUSSION

The self-management model for physical frailty identified in this study appears to share similarities with the structure observed in patients with chronic illnesses. In their concept analysis of self-management in individuals with multiple chronic conditions, Garnett et al.<sup>49</sup> defined self-management as “a multidimensional construct that entails using financial resources to manage chronic disease, acquiring health- and disease-related education from health professionals, receiving a variety of ongoing social supports, responding in psychologically and emotionally positive ways to variations in health status, continuing engagement with the health system...and actively participating in sustained disease monitoring and management.” Concept analyses related to specific chronic illnesses, such as heart failure, cancer, diabetes, and motor disorders, have been reported.<sup>50–53</sup> Common aspects include processes and activities, problem-solving, and health-seeking. Individual decision-making is highly valued, and the importance of interactions with healthcare professionals is highlighted. Regarding consequences, there is an emphasis on improving the QOL. These findings are similar to the results of the

current study.

Frailty has been associated with hyperglycemia and systemic inflammation,<sup>54, 55</sup> and various diseases, such as chronic lung diseases, stroke, osteoarthritis, and previous cancer, have been identified as risk factors for the worsening of frailty.<sup>56</sup> These findings suggest that frailty is interconnected with various diseases. Specifically, effective disease management is important to prevent or mitigate the progression of frailty. When patients with chronic illnesses experience exacerbation and are hospitalized, they experience a decline in daily functioning abilities, including mobility, transfer, toileting, feeding, and grooming, during the hospital stay. Furthermore, older patients may experience a burden of new and worsened functional impairment during hospitalization,<sup>57</sup> and hospitalization in older adults has been identified as a factor leading to a decline in daily functioning.<sup>56</sup> Consequently, even after they have completed the acute phase of treatment, patients may be at risk of becoming frail. Therefore, individuals with chronic illnesses should aim to prevent disease exacerbation and avoid repeated hospitalizations. The above indicates that the self-management of physical frailty shares commonalities with the self-management of patients with chronic diseases.

The characteristics that distinguish “self-management of chronic diseases” from “self-management



**Fig. 1.** Conceptual diagram of self-management of physical frailty. Self-management of physical frailty was defined as “a process in which an individual independently sets goals and action plans, engages in strategies such as exercise and nutritional management, and living with frailty with a positive attitude through collaboration with healthcare professionals and others in addition to utilization of resources.” Moreover, frailty is greatly affected by the decline in physiological function associated with chronic diseases and aging, and therefore, accepting one’s health condition and modifying daily life are important.



of physical frailty” are evident in the content of the acquisition and maintenance of individualized self-management strategies. In particular, several studies found that regularly practicing evidence-based, individualized exercise and maintaining a healthy nutrition status and body weight can be considered the most critical aspects of self-management for preventing frailty. Managing exercise and diet is important in both robust individuals and those with illnesses. However, the evidence to date indicates that it is crucial to choose and sustain a personalized regimen tailored to one’s physical condition through collaborative decision-making with healthcare professionals. Thus, individuals in a frail state who have comorbidities should choose content validated by guidelines pertaining to each of their conditions. For example, before starting exercise therapy, older adults with diabetes should undergo a medical evaluation to check for diabetes complications, comorbidities, and motor abnormalities. Additionally, in patients with diabetes, it is generally recommended to assess the risk of falls and incorporate a combination of aerobic exercise, resistance training, balance exercises, and multi-component exercises.<sup>58</sup> In patients with diabetes undergoing treatment with insulin or insulin secretagogues, it is essential to be cautious about hypoglycemia during or after exercise, and in some instances, exercise might need to be restricted or prohibited. The example of diabetes shows how specific considerations and contraindications should be considered for each medical condition.

According to the sarcopenia diagnostic guidelines, regular exercise and abundant physical activity can potentially prevent the onset of sarcopenia, and the guidelines strongly recommend an active lifestyle (evidence level: low; recommendation level: strong).<sup>59</sup> According to Arai,<sup>14</sup> moderate exercise can increase skeletal muscle mass, and improvements in muscle strength and walking speed can be expected. A comprehensive exercise program, including resistance exercises such as one-legged standing and half squats, in addition to aerobic exercise, is recommended to be performed 2 to 3 times a week, and it is desirable to continue such a program for at least three months. Sarcopenia is closely related to the frailty cycle, which involves decreased strength, walking speed, and resting metabolic rate.<sup>60</sup> Managing sarcopenia is considered a key factor in the prevention of physical frailty. The current recommended treatments for sarcopenia include nutritional and exercise therapies. In terms of nutrition, vitamin D supplementation and a high-protein diet are recommended, and a protein intake higher than the average in older Japanese individuals is deemed necessary in patients affected by sarcopenia.<sup>14</sup>

Sustainability is crucial in self-management because healthy behavior is not helpful if it cannot be sustained. Self-management involves a self-directed process in which it is essential to set personal goals and action plans and regularly incorporate them into daily life. To support this self-directed process, controlling antecedents becomes crucial.

Antecedents are those events or incidents that must occur or be in place before the occurrence of the concept. This review clarified that both internal and external antecedents exist. The three categories of {desire to avoid health problems that are considered severe}, {will to continue healthy behaviors}, and {individual cognitive factors to support self-management strategies} are perceived as internal antecedents that occur within an individual’s consciousness. The last of these internal antecedents encompasses self-efficacy beliefs, motivation or intrinsic motivation, and health literacy, all of which are related to the knowledge and skills an individual has acquired. The mechanisms by which human behavior is acquired and regulated are said to be formulated in terms of cognitive processes.<sup>61</sup> Important concepts of self-efficacy are outcome expectancy, which is defined as a person’s anticipation that a given behavior will lead to certain outcomes, and efficacy expectancy, which is the conviction that one can successfully execute the behavior required to produce the outcomes. Self-efficacy has also been identified as an antecedent of self-management in chronically ill patients.<sup>62</sup> In individuals with chronic illnesses, the awareness of the necessity for disease or symptom management is considered a crucial trigger for initiating self-management behaviors. Similarly, in the context of frailty self-management, avoiding health problems by perceiving the seriousness of one’s physical condition has been suggested to be important. However, it may be challenging to instill a preventive perspective in robust or pre-frail individuals who are not currently conscious of severe symptoms or impairments that significantly threaten their daily lives. Various theories, such as self-efficacy, motivation, and health literacy, have been applied to manipulate cognitive factors, and self-management programs based on these theories have been developed and implemented. These programs have shown positive outcomes, including improved self-management behaviors, knowledge, and self-efficacy beliefs.<sup>63, 64</sup> In the context of frailty prevention programs, it is essential to implement interventions that are based on motivation theories and self-efficacy theories and to address an individual’s emotions and cognitions rather than merely providing knowledge and skills. External antecedents such as a stable physical and social environment and support from familiar

persons are also crucial in these programs. This concept is consistent with the results of concept analyses of self-management in chronically ill patients, which identified factors that provide education and support, such as social support,<sup>62, 65</sup> economic resources, and the healthcare system.<sup>66</sup> In particular, much of the literature suggests that education may influence self-management abilities.

Exercise and dietary management are recommended as part of frailty prevention and require multidimensional interventions by a specialized team, including physicians, registered dietitians, physiotherapists, and nursing staff. However, it is also recognized that older adults and healthcare professionals can have different perspectives regarding frailty. The study by La Grouw et al.<sup>26</sup> is intriguing because it compiled interview results of frail older adults who could not sustain management efforts and revealed an interesting contrast; although the theoretical foundation of experts is future-oriented, older adults tend to be past-oriented. For older adults, valuing their established way of life and habits from the past takes precedence over future risk management. For instance, older patients expressed enjoyment in their meals and mentioned that abandoning their established dietary practices would signify a loss of identity and independence. Furthermore, one older adult who performed intensive physical therapy as part of her rehabilitation after a fall enjoyed the exercises. Nonetheless, she quit when she moved back home because she could not combine weekly sessions with the informal care she provided for her husband. Such discrepancies between the perspectives of healthcare professionals and those of older adults mean that professionals need to make an effort to accommodate older adults' individual needs, preferences, values, interests, and priorities. Relational competence, collaborative problem-solving approaches, and empathetic engagement with the values of the individuals involved are essential in addressing the challenges.

Consequences can be predicted from the relationships between different categories and their changes over time. Consequences such as {improvement or prevention of deterioration of health status}, {maintenance or improvement of physical function}, and {maintenance or improvement of QOL} are related to individual health status. Moreover, changes in functioning are considered distal outcomes that indirectly evolve by enhancing individual cognitive factors to support self-management strategies, including self-efficacy, motivation, and health literacy. These distal outcomes are expected to manifest with a time lag because interventions that target individual cognitive factors often show their effects (e.g., improvement in knowledge, self-efficacy)

6 to 18 months later.<sup>63, 64</sup> Moreover, as these personal changes occur and lead to reduced caregiver burdens and cost savings, a longer duration may be required for these outcomes to become evident. Three publications identified the improvement of QOL as a consequence of personal changes, but the concept of QOL is broad. A cross-sectional study<sup>22</sup> concluded that in frail older adults, their self-management abilities and productive interaction with experts are related to their physical and social well-being. In the older adult phase, when losses become more prevalent, it is desirable to adjust goals and reconstruct life to approach a state of well-being and happiness. The older adult phase is a period of life integration, marked by the loss of physical functions, experiences of bereavement, retirement from social roles, and other factors that can lead to spiritual pain. It can become a crisis in which individuals must re-evaluate their sense of existence (i.e., their life purpose and meaning). Because of the prevalence of negative emotions in many older adults facing such challenges, the support provided by older adults' healthcare professionals and social connections is crucial in fostering acceptance of their health condition and maintaining a positive frame of mind.

Finally, we will discuss the implications of interventions by healthcare professionals. First, appropriate assessment is a crucial part of preventing physical frailty. As mentioned earlier, frailty can be diagnosed by different approaches, such as the deficit accumulation model<sup>3, 4</sup> and phenotype model.<sup>1, 5, 6</sup> The phenotype model<sup>1, 5, 6</sup> aims to return individuals to a healthy state through appropriate interventions and aligns with Japan's policy goal of extending healthy life expectancy. The J-CHS<sup>6</sup> assessment, which is straightforward and specific, can be used in outpatient care, preventative nursing care, and frailty prevention classes for older adults in the community. Additionally, screening for sarcopenia is an indispensable part of assessments of physical frailty. In contrast to the phenotype model, the deficit accumulation model<sup>3, 4</sup> may be suitable for evaluating older adults in various conditions. Evaluating comprehensive factors such as diseases, physical function impairments, and abnormal test results and calculating a frailty index provides a clinically understandable assessment of frailty in older adults. However, the process of calculating a frailty index can be complex. The Clinical Frailty Scale developed by Rockwood et al.<sup>67</sup> is widely used in many clinical settings, especially for assessing hospitalized patients.<sup>68</sup> Additionally, appropriate and comprehensive interventions by a multidisciplinary team are important. As revealed in this study, the core of self-management is the {acquisition and maintenance of individualized

self-management strategies}. It is essential that various professionals provide proper disease management, exercise guidance, nutrition counseling, and symptom and emotion management. Furthermore, to support the process in which an individual independently sets goals and action plans, engages in strategies, and lives with a positive attitude, self-management support based on learning theories that lead to cognitive, emotional, and behavioral changes is necessary. The involvement and empathetic approach of clinical psychologists or nursing professionals play a role in this process.

This study has several limitations. First, the literature used in this study varied in terms of the participant's age, sex, and severity of frailty. It included individuals with specific chronic illnesses, and their symptoms or complications were related to the frailty state. Stratifying the participants based on factors such as those already frail, those in a robust state needing frailty prevention, or those with specific diseases and conditions might lead to a more detailed and thorough concept analysis. Second, because there is a limited number of Japanese studies, evidence for self-management in preventing physical frailty is still underexplored in our country, which is facing the challenges of being the world's leading aging society. The conceptual diagram presented in this review is merely a hypothesis. Future research on self-management for physical frailty in Japan should build upon the extracted attributes, antecedents, and consequences. This can lead to the development of measurement indicators and intervention studies, ultimately verifying the validity of the analysis results obtained in this study.

## CONCLUSION

Thirty-three studies were reviewed, and a concept analysis was performed. Six attributes of the concept "self-management of physical frailty" were identified: {Cooperating with healthcare professionals or familiar persons}, {Investing and managing in resources}, {Acquisition and maintenance of individualized self-management strategies}, {Self-directed process}, {Goal setting and personalized action planning} and {Living with one's own health condition with a positive attitude}. Self-management of physical frailty can be defined as a process in which an individual independently sets goals and action plans, engages in strategies such as exercise and nutritional management, and lives with one's own health condition with a positive attitude by collaborating with healthcare professionals and others, in addition to utilizing resources.

*The authors declare no conflict of interest.*

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