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Original Article

Development of an empowerment scale for inpatients in the Kaifukuki Rehabilitation Ward: validation of the validity and reliability of the scale and difference between the empowerment scale and the FIM

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ABSTRACT

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Objective: The Kaifukuki Rehabilitation Ward (KRW) provides patients with support for improving the ability to perform activities of daily living and acquiring autonomy. The ability to solve problems independently, defined as empowerment, is crucial for life after hospital discharge. The purpose of this study was to develop a new empowerment scale for KRWs and verify its validity and reliability.

Methods: This new scale was created by selecting items suitable for KRWs from previous work on developing empowerment scales. The assessment of the validity and reliability of the scale and a comparison of this scale with the Functional Independence Measure (FIM) were performed based on 159 responses.

Results: Although three of the 18 items showed response biases, the factor structure of the scale showed moderate validity (RMSEA = 0.083, correlation coefficient between subscale and total score = 0.61 – 0.83). The concurrent validity and internal consistency were generally good, and the test-retest reliability of the total score was 0.93 in the intraclass correlation coefficients. There was no correlation between the FIM and the new scale.

Conclusion: The developed empowerment scale has certain validity and reliability and may provide a different outcome than the FIM.

Key words: empowerment, autonomy, problem-solving ability, kaifukuki rehabilitation ward, daily life after discharge

Introduction

The Kaifukuki Rehabilitation Ward (KRW) is a specialized recovery ward in Japan that provides services focusing on improving the patients' ability to perform activities of daily living [1]. In recent years, KRWs have been focusing on facilitating a smooth return to life in the community and ensuring long-term continued community life [2]. Patients who are discharged home are required to actively identify and resolve various life issues spontaneously. However, hospitalized patients tend to fall into a passive mind of "treatment target," and the safety rules in hospital tend to undermine patient autonomy [3].

For rehabilitation during the chronic phase, it is necessary to set up specific goals adjusted to the patient's situation, and achievement of autonomy is important for attaining these goals [4]. The autonomous state becomes apparent when the patient voluntarily selects and resolves his or her problems during hospital care or in preparation for hospital discharge. In order to restore the patient's autonomy, collaborative interventions by a multi-professional team with due respect to the patient's will are effective [5]. This kind of support is termed "empowerment" [6–11].

In medical care, empowerment is "the process by which a patient who has become powerless regains power by regaining a sense of control over his or her

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own body and life" [7]. Small and colleagues identified the following five concepts for measuring the empowerment of long-term care subjects: ① Identity, ② Knowledge and understanding, ③ Personal control, ④ Decision making, and ⑤ Enabling others [6]. Similar articles also suggest that although the number of dimensions differs, there are generally dimensions of "self-identity and self-control," "decision making," and "enabling others" [7–11].

Medical workers in KRWs usually provide empowerment interventions consciously or unconsciously. However, to our knowledge, currently there are no suitable empowerment scales for inpatients in KRWs that can measure the outcome of the interventions. The standardized outcome scale can help to evaluate and improve the intervention process and encourage the achievement of autonomy following discharge. Combined use with the Functional Independence Measure (FIM), an index of activities of daily living, and the empowerment scale may contribute to a more smooth transition to home life.

We have developed a prototype empowerment scale (prototype scale) suitable for use in KRWs [12]. The items of the prototype scale were selected from a list of items identified from several empowerment measurement reports [13–15], including that by Small. The listed items were carefully selected by deleting similar items and modifying or deleting items that were unsuitable for KRWs by the authors and auxiliary researchers. The prototype scale, consisting of 17 items rated using a 5-point Likert scale with five subscales defined by Small and co-workers, had a certain degree of validity and reliability. In contrast, the prototype scale showed response biases in a majority of the items, indicating a need to improve its factorial validity. This study aimed to modify the prototype scale and to confirm its validity and reliability. Furthermore, we clarified the difference in the construct concept between the modified prototype scale and FIM [16–18], regarded as the clinical outcome in KRWs.

Methods

1. Composition and modifications of the empowerment scale in KRWs

In this study, the prototype scale was modified as follows. The level of measurement in the 5-point scale that included the responses of "Agree" to "Disagree" was expanded from "Strongly Agree" (5 point) to "Strongly Disagree" (1 point). The structure of the subscales was the same as that of the prototype scale because the prototype scale demonstrated a certain degree of validity and reliability. However, one of the subscales consisted of two items; therefore, one item was added to the subscale, and each subscale was created to include three to five items. Twelve items that were identified by the measures to cause fluctuations in the interpretation of item sentences were modified. The difference between the modified sentences and the original sentences was assessed by an English teacher at the author's university. Table 1 shows the structure of the 18 items and five subscales of the modified empowerment scale in the KRWs (modified scale).

2. Subjects

We asked 271 inpatients with cerebrovascular disease, musculoskeletal disease, respiratory disease, and disuse syndrome who were admitted to the KRWs of hospital A to answer the modified scale. As per the exclusion criteria, patients with a diagnosis of dementia, those with a Mini Mental State Examination (MMSE) score of ≤23 points, and those with difficulty in communicating due to aphasia or anosognosia were excluded from the study. The purpose and content of the research were explained to the subjects, and written consent was obtained from all the subjects.

3. Data collection procedure

Answers to the modified scale were collected via face-to-face interviews. The timing of answering was within two weeks before the subjects were scheduled to be discharged, and those who provided consent were asked to respond again three to five days later. In order to confirm the concurrent validity, we also administered the General Self-Efficacy Scale (GSES, KOKORO NET Co., Ltd.) by Sakano and Tohjoh [19]. Self-efficacy is considered a component of empowerment [6, 8, 10], and the GSES is commonly used in similar previous studies [8, 20]. Furthermore, clinical information regarding age, sex, disease name, FIM score, duration of hospital stay, and MMSE score were collected from the medical records.

This study was approved by the Ethics Committee of Shin-Yokohama Rehabilitation Hospital (Approval No.0061) and the Ethics Committee of the School of Nursing and Rehabilitation Sciences, Showa University (Approval No.406).

4. Statistical analyses

The results of each item were analyzed as interval scales as per several previous studies [8, 21–24]. After confirming the ceiling effect (mean +1 standard deviation) and floor effect (mean −1 standard deviation), the good–poor (G–P) analysis and item–total (I–T) correlation analyses were performed.

Thereafter, factorial validity was verified using confirmatory factor analysis of a second-order factor model with "empowerment" placed at the top of the assumed factor structure and correlation analysis between item scores and subscale scores, and between subscale scores and total scores. The subscale score was the sum of the scores of each item score belonging to the subscale. Moreover, we verified the concurrent validity by performing correlation analysis between

Table 1. Questionnaire items and assumed factor structure of the modified empowerment scale in KRWs.

Subscale	Item		Questionnaire item
Factor 1 (Identity)	1	Understanding one's condition	I know enough what I can and can not do.
	8	Role after discharge	I think that I can have a role at home, in community, at work,or at facility after dischage despite my current condition.
	9	Good outlook	I think that I will be able to live well after discharge despite my current condition.
	10	Life outlook	I think that I can spend my daily life even if my condition deteriorates after discharge.
Factor 2 (Control)	2	Motivation for rehabilitation	I am actively willing to do at rehabilitation.
	3	Sense of control	I have the ability to maintain or improve my condition.
	4	Face myself	I am able to face my physical condition voluntarily.
	11	Problem-solving	If other patients can overcome the same difficulties as myself, I can too.
	12	Surrounding support	My family and friends are taking good care of me in every way.
Factor 3 (Knowledge)	5	Necessity of knowledge	Knowing more about my condition helps me to maintain or improve it.
	6	Knowledge of control (plus)	I know what I need to do to improve my condition.
	7	Knowledge of control (minus)	I know what to do when I am no feeling well.
Factor 4 (Decision making)	13	Self willingness	I try to communicate my wishes about the treatment to the doctor or therapist.
	14	Self willingness (reply)	If I do not agree with the treatment policy the doctor or therapist, I may not do what they say.
	15	Future plan	If I change my mind about the treatment policy, I can talk about my feelings with the doctor or therapist.
Factor 5 (Enabling others)	16	Sharing with others	I have shared my condition with other patients.
	17	Support for others	I have helped other patients are in trouble to solve their problems.
	18	Achievement of aid	I feel when I could be of service to others, despite my current condition.

5-point Likert scale (5, Strongly Agree; 4, Agree; 3, Neither; 2, Disagree; 1, Strongly Disagree).
KRW, Kaifukuki Rehabilitation Ward.

the subscale scores and the total scores of the modified scale and the GSES.

We verified the internal consistency using Cronbach's alpha coefficients for the subscale scores and the total score. In the case of low alpha coefficients, we confirmed the values when the items were deleted. We verified the test-retest reliability based on the intraclass correlation coefficient (ICC).

Furthermore, we conducted correlation analysis between the subscale scores and the total scores of the modified scale and FIM scores.

We used Spearman's rank correlation coefficient for all the correlation analyses. We used IBM SPSS Statistics 23 (IBM Corp.) for the analyses, and IBM SPSS Amos 23 (IBM Corp.) for confirmatory factor analysis.

Results

1. Participant demographic characteristics

Of the 271 inpatients, 41.3% were excluded and 159 were included in the analysis. Table 2 shows the mean, standard deviation, frequency, and percentages for the following data: age, sex, primary disease, FIM score, duration of hospital stay, and MMSE score of the subjects.

2. Item analyses

Table 3 shows the results of the item analyses. The ceiling effect was observed in three out of 18 items; however, it was significantly improved in 16 out of 17 items of the prototype scale. In the G–P analysis, all the items were significantly different, and there were no items with a weak discriminating power. In the I–T correlation analysis, item 14 demonstrated no correlation; however, the other items demonstrated a moderate to strong correlation of 0.50 to 0.74 ($p < 0.001$).

3. Validity

Figure 1 shows the factor loading and goodness-of-fit index based on the confirmatory factor analysis with the assumed factor structure. The factor loading was as low as 0.26 from the subscale "decision making" to item 14; however, the others ranged from 0.59 to 1.00. The goodness-of-fit indices were 0.863 for GFI, 0.822 for AGFI, and 0.083 for RMSEA.

With respect to all the item scores of the modified scale, the correlation with the subscale scores to which the item belonged was higher than the correlation with the subscale scores to which the item did not belong. Moreover, there was a moderate to strong correlation between each subscale score and the total score, ranging from 0.61 to 0.83 ($p < 0.001$).

Table 4 shows the results of the concurrent validity. The total score of the modified scale and the GSES showed a weak correlation of 0.35 ($p < 0.001$). Furthermore, the total score of the modified scale and the GSES had a stronger correlation with each constituent subscale score.

Table 2. Demographic characteristics of the participants.

	Attribute	Mean±SD	Frequency (number)	Percentage (%)
Age (years)	Whole	73.7±14.0	159	
	20s		2	1.3
	30s		3	1.9
	40s		5	3.1
	50s		16	10.1
	60s		20	12.6
	70s		50	31.4
	80s		55	34.6
	90s		8	5.0
Sex	Male		60	37.7
	Female		99	62.3
Primary disease	Cerebrovascular		78	49.1
	Musculoskeletal		80	50.3
	Respiratory		0	0.0
	Disuse		1	0.6
FIM at admission (points)	Motor	53.5±11.9		
	Cognitive	30.5±4.2		
FIM at discharge (points)	Motor	85.3±4.5		
	Cognitive	33.0±2.4		
Difference of FIM at admission and discharge (points)	Motor	31.9±9.6		
Duration of hospital stay (days)	Whole	72.4±35.0		
MMSE (points)	Whole	28.3±1.8		

SD, standard deviation; FIM, Functional Independence Measure; MMSE, Mini Mental State Examination.

Table 3. Items of the modified empowerment scale in KRWs and results of the item analysis.

Item	Mean±SD	Ceiling effect	Floor effect	Response distribution (%)					G–P analysis			I–T correlation analysis	
		Mean +SD	Mean −SD	1	2	3	4	5	Upper group Mean±SD	Lower group Mean±SD	*p*	ρ	*p*
1 Understanding one's condition	4.35±0.57	4.92	3.77	0.00	0.01	0.03	0.57	0.39	5.00±0.00	3.83±0.45	***	0.51	***
2 Motivation for rehabilitation	4.68±0.49	5.17	4.18	0.00	0.00	0.01	0.30	0.69	5.00±0.00	3.95±0.22	***	0.50	***
3 Sense of control	4.11±0.72	4.82	3.39	0.00	0.04	0.09	0.59	0.28	5.00±0.00	3.33±0.73	***	0.53	***
4 Face myself	4.36±0.59	4.95	3.78	0.00	0.01	0.04	0.54	0.42	5.00±0.00	3.80±0.46	***	0.64	***
5 Necessity of knowledge	4.46±0.56	5.03	3.91	0.00	0.01	0.01	0.49	0.49	5.00±0.00	3.90±0.38	***	0.63	***
6 Knowledge of control (plus)	4.25±0.60	4.85	3.64	0.00	0.00	0.09	0.58	0.33	5.00±0.00	3.65±0.48	***	0.63	***
7 Knowledge of control (minus)	3.98±0.69	4.67	3.29	0.01	0.01	0.17	0.62	0.19	4.78±0.42	3.15±0.62	***	0.56	***
8 Role after discharge	4.17±0.76	4.93	3.41	0.00	0.05	0.06	0.55	0.33	5.00±0.00	3.35±0.80	***	0.64	***
9 Good outlook	4.25±0.66	4.91	3.60	0.00	0.01	0.10	0.53	0.36	5.00±0.00	3.55±0.55	***	0.73	***
10 Life outlook	4.15±0.66	4.81	3.49	0.00	0.01	0.11	0.58	0.29	5.00±0.00	3.45±0.60	***	0.68	***
11 Problem-solving	4.35±0.64	4.99	3.71	0.00	0.01	0.07	0.49	0.43	5.00±0.00	3.68±0.53	***	0.65	***
12 Surrounding support	4.51±0.68	5.19	3.83	0.00	0.02	0.05	0.33	0.60	5.00±0.00	3.65±0.62	***	0.49	***
13 Self willingness	4.36±0.61	4.98	3.75	0.00	0.01	0.05	0.52	0.43	5.00±0.00	3.75±0.49	***	0.62	***
14 Self willingness (reply)	2.57±1.21	3.78	1.36	0.18	0.43	0.08	0.25	0.06	4.23±0.42	1.28±0.45	***	0.19	*
15 Future plan	4.18±0.73	4.90	3.45	0.00	0.03	0.11	0.52	0.34	5.00±0.00	3.35±0.66	***	0.67	***
16 Sharing with others	3.74±1.08	4.83	2.67	0.04	0.14	0.09	0.50	0.23	4.93±0.27	2.15±0.66	***	0.48	***
17 Support for others	3.28±1.11	4.39	2.16	0.04	0.25	0.24	0.33	0.14	4.55±0.50	1.83±0.38	***	0.57	***
18 Achievement of aid	3.47±1.05	4.53	2.42	0.02	0.20	0.24	0.37	0.17	4.68±0.47	2.05±0.45	***	0.68	***

* $p < 0.05$, *** $p < 0.001$.

KRW, Kaifukuki Rehabilitation Ward; SD, standard deviation; G–P analysis, good-poor analysis; I–T correlation analysis, item-total correlation analysis.

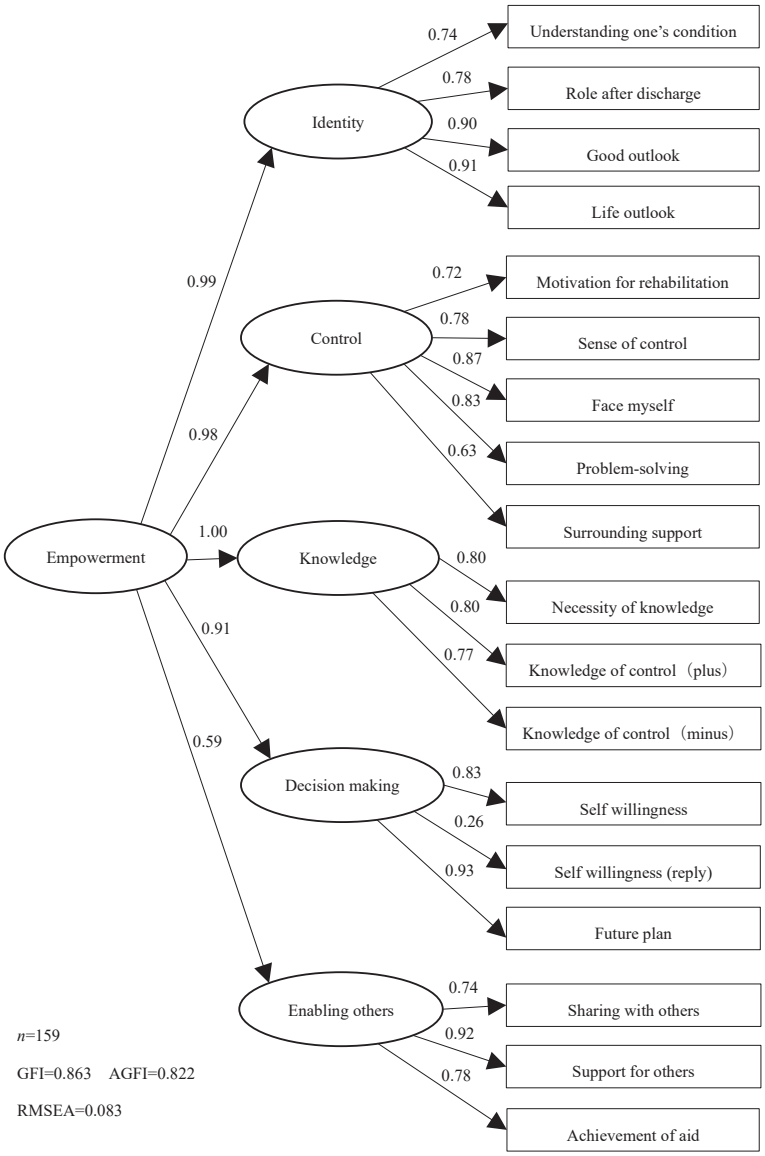

Figure 1. Results with the assumed factor structure (GFI, Goodness of Fit Index; AGFI, Adjusted Goodness of Fit Index; RMSEA, Root Mean Square Error of Approximation).

4. Reliability

Table 5 shows the results of the reliability assessment. Cronbach's alpha coefficients of the five subscales were as low as 0.41 for the subscale of "decision making" and 0.64 for that of "knowledge"; however, the coefficient for the subscale "decision making" improved to 0.70 with the deletion of item 14. The alpha coefficients of the other subscales and the total score ranged from 0.73 to 0.85.

We obtained the second response from 56 of the 159 subjects. The ICC (1,1) of each subscale score and the total score ranged from 0.83 to 0.93.

5. Correlation analyses of the modified scale scores and the FIM scores

Table 6 shows the results of the correlation analysis between the modified scale scores and the FIM scores. The total score and the subscale scores of the modified scale showed no correlation with the FIM scores at admission and those at discharge. There was no correlation between the difference in the FIM score (motor item) at admission and discharge, indicating the degree of improvement in the FIM, and the total score and the subscale scores of the modified scale.

Discussion

This study focused on assessing the status of empowerment as an indicator of smoother transition to post-discharge life for patients in KRWs. The existing empowerment scales for long-term care subjects include many items that are specific to patients who

Table 4. Correlation coefficients between the modified empowerment scale scores in the KRWs and the GSES scores.

		Empowerment scale						GSES			
			Subscale						Subscale		
		Total score	Identity	Control	Knowledge	Decision making	Enabling others	Total score	Behavioral positiveness	Anxiety about failure	Social positioning of one's ability
Empowerment scale	Total score	1									
	Identity	0.83***	1								
	Control	0.80***	0.71***	1							
	Knowledge	0.78***	0.37***	0.68***	1						
	Decision making	0.61***	0.37***	0.35***	0.37***	1					
	Enabling others	0.66***	0.35***	0.30***	0.34***	0.27***	1				
GSES	Total score	0.35***	0.34***	0.35***	0.30***	0.19*	0.23**	1			
	Behavioral positiveness	0.32***	0.33***	0.31***	0.26***	0.14	0.22**	0.87***	1		
	Anxiety about failure	0.20*	0.25**	0.20*	0.25**	0.06	0.11	0.77***	0.58***	1	
	Social positioning of one's ability	0.31***	0.21**	0.32***	0.19*	0.27***	0.21**	0.68***	0.34***	0.34***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
KRW, Kaifukuki Rehabilitation Ward; GSES, General Self-Efficacy Scale.

Table 5. Cronbach's alpha coefficient and ICC (1,1).

	Cronbach's α	ICC (95% confidence interval lower limit–upper limit)
Total score	0.85	0.93 (0.88–0.96)
Identity	0.75	0.84 (0.73–0.90)
Control	0.73	0.83 (0.72–0.90)
Knowledge	0.64	0.90 (0.84–0.94)
Decision making	0.41	0.83 (0.73–0.90)
Enabling others	0.82	0.90 (0.84–0.94)

ICC, intraclass correlation coefficient.

Table 6. Correlation coefficient between the modified empowerment scale scores in the KRWs and the FIM scores.

	Empowerment scale					
		Subscale				
	Total score	Identity	Control	Knowledge	Decision making	Enabling others
FIM at admission (Motor)	0.09	0.08	0.15	0.00	−0.01	0.01
FIM at admission (Cognitive)	0.12	0.14	0.07	0.10	−0.05	0.12
FIM at discharge (Motor)	0.10	0.11	0.10	−0.02	−0.03	0.07
FIM at discharge (Cognitive)	0.12	0.14	0.06	0.06	0.03	0.07
Difference of FIM at admission and discharge (Motor)	−0.09	−0.07	−0.14	−0.03	−0.01	−0.01

KRW, Kaifukuki Rehabilitation Ward; FIM, Functional Independence Measure.

are receiving home-based care and many items specific to diseases, especially for those who have been living with chronic conditions. However, the functioning of patients in KRWs remarkably changes in the short term. Furthermore, it is crucial for patients to prepare for daily life at home by predicting their own functioning after hospital discharge. To our knowledge, there is no scale suitable for such a situation; therefore, we developed a scale for measuring empowerment suitable for patients in KRWs.

1. Validity and reliability of the modified scale

According to past research, the Likert scale should be regarded as an interval scale on condition that the responses are linearly related to the potential characteristic [21]. A study that compared the use of the Likert scale and a visual analog scale showed that even though each Likert scale score is not linear, the collective score of many individual results can be regarded as linear and can be treated as an interval scale [22]. Other studies have also showed that the Likert scale should be treated as an interval scale because the analytical results are generally consistent, irrespective of whether the interval scale or ordinal scale is considered; when treatment is given as per the ordinal scale, the statistical analysis is limited [23, 24]. Therefore, they were treated as interval scales in the present study.

The ceiling effect was demonstrated in three out of 18 items of the modified scale. A significant improvement was found from the ceiling effect in 16 of the 17 items in the prototype scale, potentially owing to the change in the item text and the expansion of the scale level. The ceiling effect of item 2 may be attributable to the fact that there were many positive efforts just before hospital discharge. The ceiling effect of items 5 and 12 may be attributed to the fact that the items reflected the characteristics of Japanese people who are highly considerate of others [25], and the items reflected the characteristics of being easily influenced by others, a characteristic observed during hospitalization. The responses in the early stage of hospitalization may not show a ceiling effect; therefore, data collection at various stages is necessary in the future. However, because all the items, including the three items demonstrating the ceiling effect, have appropriate discriminating power, it is not considered necessary to exclude them from the scale. In the I–T correlation analysis, only item 14 showed heterogeneity. This item showed a peculiar distribution in which there were few positive answers of 4 or 5 points and many of 1 or 2 points. The fact that many patients were obedient and followed the advice of the medical staff in line with the tendency of hospitalized patients may be the cause of this heterogeneity. Item 14 was not deleted because it is an important item related to the problem-solving ability and autonomy that are the essence of the empowerment scale.

The evaluation criteria for each goodness-of-fit measure of the confirmatory factor analysis were as follows: GFI ≥ 0.9 and RMSEA ≤ 0.05, which is a good fit, while a model wherein the AGFI is significantly lower than the GFI or RMSEA is ≥ 0.1 represented a poor fit [23, 26]. In the modified scale, the GFI was 0.863; however, the difference between the GFI and AGFI was small, and the RMSEA was 0.083, an improvement from 0.801 of the GFI and 0.091 of the RMSEA in the prototype scale; further, the goodness-of-fit of the factor model was improved. Furthermore, the correlation between the item scores and the subscale scores and that between the subscale scores and the total score was good; thus, the factorial validity of the modified scale was improved.

In the concurrent validity, the modified scale demonstrated a weak correlation with the GSES score. This result was similar to that reported previously for elderly people living in the community [8]. This result suggests that although the subscales of the modified scale include concepts similar to those of self-efficacy, they are only a part of the elements and are not the same as the measurement concept.

Internal consistency showed low alpha coefficients for the subscale of "decision making." In terms of internal consistency, the subscale of "decision making" showed a low alpha coefficient, presumably because this subscale includes item 14. The test-retest reliability was high for all the subscale scores and the total scores.

2. Relationship between the modified scale and the FIM

The modified scale scores did not correlate with the FIM scores. Moreover, there was no correlation between the improvement of FIM at admission and discharge and the scores of the modified scale. These results suggest that the modified scale in KRWs is an index of a measurement concept different from that of the FIM. For a smooth transition to home life after hospital discharge and resumption of life in the community, it is important for the patient to think about and engage in autonomy [2−5]. The presence of patients with a high FIM score and a low modified scale score suggests that the FIM status and empowerment status may not match.

Although the FIM is an important outcome scale for the patients currently in KRWs, it may be possible to assess the abilities necessary for a good quality of life after hospital discharge from a more diverse perspective by assessing the outcomes of psychological characteristics, such as empowerment. Moreover, as with FIM, it may be possible to understand whether the effects of interventions that enhance autonomy are obtained appropriately by assessing empowerment during hospitalization and tracking of changes over time. In addition, it is expected to help assess and improve the quality of intervention processes in the KRWs, such as providing support so that problems can be solved by assuming life after discharge from an earlier stage even when the empowerment state is low.

3. Limitations of the study and future issues

Most of the subjects in this study were patients with cerebrovascular and musculoskeletal disease, and there could be a bias in the responses. In the future, it will be necessary to understand the response tendency when taking other diseases into consideration.

In addition, only inpatients who were about to be discharged were analyzed; therefore, it is unclear whether the modified scale demonstrates validity and reliability during other periods. Analyses at different time points during hospitalization are required. To understand how the results of the FIM and empowerment scale affect life after discharge, it is necessary to examine the relationship with the course after hospital discharge. In other words, if we can identify the factors during hospitalization in KRWs and discharge that can accurately predict the functioning after hospital discharge, more effective process assessment in KRWs will be possible.

Thus, assessment of the empowerment status while in KRWs is important and requires further research.

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