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## Workforce Agility during the COVID-19 Pandemic: Validation of the Workforce Agility Scale in Care Workers for Frail Elderly

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### Abstract

*This research aimed to validate the Korean version of the Workforce Agility Scale (K-WAS) among care workers for community-dwelling frail elderly. The study involved 192 care workers from Gyeongsangnam-do, who completed a structured questionnaire between May 31 and July 15, 2023. The K-WAS, a 13-item instrument measured on a 5-point Likert scale, captures three key aspects of workforce agility: proactivity, adaptability, and resilience. Confirmatory factor analysis was employed to ascertain the scale's construct validity. The K-WAS demonstrated a significant positive correlation with psychological empowerment ( $r=.560$ ,  $p<.001$ ), thereby establishing its criterion validity. Although the results suggest that the K-WAS is a valid and reliable tool for assessing workforce agility among care workers, further refinement is recommended. The K-WAS is anticipated to aid in the implementation and evaluation of interventions focused on enhancing workforce agility among care workers for frail elderly. By providing a valid and reliable measure of workforce agility, the K-WAS can facilitate the evaluation of these interventions' effectiveness in improving outcomes for the frail elderly and enhancing the overall quality of care delivery.*

**Keywords:** Care Workers, Reliability, Validity, Workforce Agility.

## 1. INTRODUCTION

In the dynamic landscape of the contemporary healthcare environment, agility has emerged as a crucial competency for employees [1-3]. Agility encapsulates an individual's capacity to respond to changes promptly and appropriately, leveraging them to their organization's advantage [4]. Employees exhibiting high agility are comfortable with change, receptive to novel ideas, and readily adopt innovative technologies, underpinned by a commitment to continuous learning and assimilation [5].

Agility performance is conceptualized through three primary dimensions: proactivity, adaptability, and resilience [6]. Proactivity entails employees taking the initiative to engage in activities that positively impact the changing environment. Adaptability signifies the willingness to modify oneself or one's behavior

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to align with new circumstances, while resilience describes the ability to operate efficiently under stressful conditions [4,7]. These dimensions necessitate employees to continuously challenge themselves, expand their capabilities, and engage in ongoing learning and exploration [4,8,9].

These studies commonly emphasize employees' intrinsic motivations in acquiring agility. Notably, Alavi and his colleague [4] investigated the role of a flexible organizational structure in stimulating employee learning and enhancing agility. Sumukadas and Sawhney [8] underscored the influence of different psychological incentives that encourage employees to actively observe their external environments and proactively seek opportunities. Sherehiy and Karwowski [10] discussed autonomy and collaboration as strategies that foster employee agility. Khanna, Singh, and Alam [11] revealed the significant impact of psychological factors, such as self-awareness, self-control, and self-motivation, in enhancing agility performance. Consequently, investigating employees' psychological conditions holds great significance in understanding and advancing this research domain, as psychologically motivated individuals exhibit improved agility performance [4,11].

In the context of caregiving, agility is a competency that empowers care workers to be flexible and adaptive, significantly enhancing connectivity with caretakers [12]. Care workers demonstrating agility can quickly respond to the changing needs and preferences of the elderly patients they are caring for, leading to a more personalized and meaningful caregiving experience [13]. Furthermore, agility enables care workers to efficiently address unexpected challenges and crises that may arise in caregiving settings, maintaining a sense of stability and assurance for both the caretakers and the elderly patients [14]. By being agile, care workers can foster open communication and collaboration with caretakers, strengthening the partnership between care workers and caretakers [15]. In addition, agility allows care workers to stay up-to-date with the latest advancements in caregiving practices and medical knowledge, building confidence and trust with caretakers in the quality of care provided [16].

The COVID-19 pandemic has underscored the critical importance of agility in healthcare settings. The ability to rapidly respond to unanticipated requirements, adapt to new circumstances, and leverage existing capacities and infrastructure has been instrumental in managing the crisis [17]. In this context, the agility of care workers has proven to be essential, enabling them to swiftly adapt to the evolving needs of patients and the healthcare system at large.

In light of the above, this study was conducted to validate the Korean version of the Workforce Agility scale among care workers for frail elderly.

## **2. MATERIAL AND METHODS**

### **2.1 Study Design**

This study is a methodological study to test the reliability and validity of the Korean version of the Workforce Agility Scale developed by Alavi et al. [4] among the certified care workers caring for the frail elderly at home.

### **2.2 Participants and Data Collection**

The subjects of this study were 192 certified care workers with at least one year of experience who provide home-based care to the elderly in Gyeongnam. The survey was conducted from May 31 to July 15, 2023, using a structured questionnaire, and it took 10 to 15 minutes to complete.

Based on the evidence that confirmatory factor analysis to verify the construct validity of the Workforce Agility Scale requires at least 10 times the number of items [18], the minimum number of subjects required was 150, and considering a dropout rate of 20%, 200 subjects were selected for the study, and 192 data were used for analysis after excluding 8 copies with insufficient responses.

### **2.3 Instruments**

### 2.3.1 Workforce Agility

The Workforce Agility Scale, developed by Sherehiy and modified by Alavi et al. [4], is a 15-item instrument that measures three dimensions of workforce agility: proactivity, adaptability, and resilience. Proactivity encompasses feelings of readiness and the initiative to engage in activities that lead to improvements, effective task approaches, responsibility management, and innovative resource acquisition and utilization. Adaptability refers to the capacity to adjust to new environments, accept critical feedback, adapt to new work procedures, use new equipment, and modify oneself to fit new circumstances. Resilience pertains to the ability to function efficiently under stress, adapt to environmental changes, and recover from unsuccessful attempts to adopt new strategies and solutions [4]. Each item is rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability of the scale at the time of its development was reported as Cronbach's  $\alpha = .839$ ,  $.868$ , and  $.830$  for proactivity, adaptability, and resilience, respectively [4].

### 2.3.2 Psychological Empowerment

Psychological empowerment refers to an intrinsic motivation reflecting a sense of self-control, competence, and impact at work. Empowered employees are more likely to exhibit proactive behavior, adaptability, and resilience – the core dimensions of workforce agility [13,19,20]. This relationship between psychological empowerment and workforce agility has been substantiated by several studies. For instance, Alavi and colleagues [4] found that a flexible organizational structure, which can foster a sense of empowerment among employees, enhances workforce agility. Similarly, Hosein and Yousefi [20] highlighted the significant impact of psychological factors, such as self-awareness, self-control, and self-motivation, on enhancing agility performance.

In the context of care work, psychological empowerment enhances care workers' adaptability, proactivity, and resilience [14]. Consequently, the Psychological Empowerment scale, which captures these dimensions, was an appropriate criterion measure for the K-WAS. The significant correlation between the two scales further confirms the criterion validity of the K-WAS.

Psychological empowerment was measured using Spreitzer's 12-item questionnaire, which assesses four dimensions: meaningfulness, competence, self-determination, and influence [19]. Each dimension is evaluated with three items rated on a 5-point Likert-type scale, ranging from 1 (not at all true) to 5 (very true). The reliability of the scale at the time of its development was reported as Cronbach's  $\alpha = .87$ ,  $.81$ ,  $.81$ , and  $.88$  for meaningfulness, competence, self-determination, and influence, respectively [19]

## 2.4 Research Process

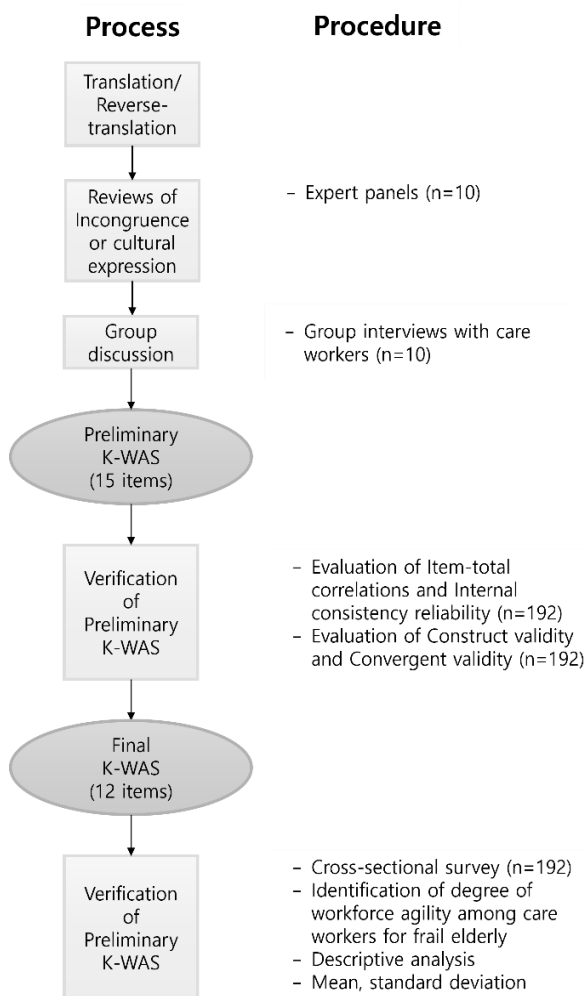
### 2.4.1 Tool back-translation and translation

Formal approval for the use of the Workforce Agility Scale (WAS) was obtained from the developer of the tool, and the overall study procedure is depicted in Figure 1. The cultural adaptation of the tool was conducted in accordance with guidelines provided by the Beaton et al. [21].

The translation process of the WAS included primary translation, expert review, and back-translation to finalize the items in the instrument. Initially, the WAS, originally in English, was translated into Korean by two nurses, a nursing professor, and a researcher, all fluent in both languages. The focus was on conveying the original meaning of the sentences rather than a word-for-word translation [21].

In the expert review process, three translators reviewed and discussed the questions in the first version of the tool and drafted Korean questions. The back-translation process was performed by a professor of English literature, proficient in both Korean and English, without any prior knowledge of the existing tool. This approach was taken to prevent bias and lead to unexpected and meaningful interpretations [21].

Finally, a native English speaker from America compared the original and back-translated instruments for semantic equivalence. For items that were not rated as completely identical, the translators of the original



**Figure 1. Research Process**

needed to conduct factor analysis, Nunnally [18] suggests that at least 10 times the number of items is required. Since the sample size for securing the reliability and validity of the preliminary tool derived from translation and back-translation was 150, the data collection for this study was conducted from May 31 to July 15, 2023, considering the dropout rate, and a total of 200 copies were collected. A total of 192 questionnaires were used in the final analysis, excluding 8 questionnaires with insufficient responses. To check the reliability of the preliminary instrument, internal consistency was calculated through item analysis, and validity was checked through content validity, construct validity, convergent validity, and convergent validity. For content validity, four nursing professors who majored in nursing at a nursing school and six experienced nurses with more than five years of experience at a senior general hospital were selected as the expert group to calculate the Content Validity Index (CVI). For the construct validity test, a confirmatory factor analysis was conducted using the Korean version of the WAS for home-based elderly visiting caregivers, and convergent validity was further checked. Concurrent validity was measured and calculated using the Psychological Empowerment Tool, and Cronbach's  $\alpha$  was measured for each factor and the overall Cronbach's  $\alpha$  was checked.

**2.5 Ethical Considerations**

In this study, the certified care workers were provided with an explanation of the study, a consent form, and a questionnaire before data collection. The informed consent letter explained the purpose and content of the study, the procedures and methods, the freedom to participate in the study, the guarantee of anonymity,

instrument reviewed and revised the translated Korean items. The back-translated and translated English items were compared with the original instrument to finalize the Korean version of the WAS [21]. There were no significant cultural differences in the translation process, and passive voice, words, etc. were modified to fit the Korean nursing culture.

*2.4.2 Preliminary Survey*

After reviewing the translated and back-translated questionnaires for inconsistencies and expressions, a preliminary survey was conducted from May 1 to 12, 2023, with 10 care workers with more than 5 years of work experience at a nursing home. The pre-survey was conducted in a one-on-one meeting between the researcher and the participants, and the participants were first asked to respond to the questionnaire in a self-report format. The purpose of the preliminary survey was to determine the clarity of the Korean version of the questionnaire, the presence of unintelligible terms, and the time it took to respond. After the preliminary survey and responses were completed, an interview was conducted with the surveyor. As a result, pilot participants were added for questions where they were not mentioned, and the original instrument consisted of 15 questions, keeping the same 15 questions as the preliminary results.

*2.4.3 Validity and Reliability Checks*

As a basis for determining the number of samples needed to conduct factor analysis, Nunnally [18] suggests that at least 10 times the number of items is required. Since the sample size for securing the reliability and validity of the preliminary tool derived from translation and back-translation was 150, the data collection for this study was conducted from May 31 to July 15, 2023, considering the dropout rate, and a total of 200 copies were collected. A total of 192 questionnaires were used in the final analysis, excluding 8 questionnaires with insufficient responses. To check the reliability of the preliminary instrument, internal consistency was calculated through item analysis, and validity was checked through content validity, construct validity, convergent validity, and convergent validity. For content validity, four nursing professors who majored in nursing at a nursing school and six experienced nurses with more than five years of experience at a senior general hospital were selected as the expert group to calculate the Content Validity Index (CVI). For the construct validity test, a confirmatory factor analysis was conducted using the Korean version of the WAS for home-based elderly visiting caregivers, and convergent validity was further checked. Concurrent validity was measured and calculated using the Psychological Empowerment Tool, and Cronbach's  $\alpha$  was measured for each factor and the overall Cronbach's  $\alpha$  was checked.

the ability to withdraw consent at any time, and that the data will not be used for purposes other than the study. Data were collected using self-reported questionnaires, which were completed by the subjects themselves, and care workers who participated in the study were provided with small incentives.

## 2.6 Statistical Analysis

The collected data were analyzed in the following ways using SPSS/WIN 28.0 and AMOS 28.0 statistical programs, with two-tailed tests at a statistical significance level of .50. The general characteristics of the subjects were analyzed as frequencies and percentages, means, and standard deviations. To analyze the content validity of the initial items of the Korean Workforce Agility Scale (K-WAS) derived through the translation/back-translation process, the scale content validity index was calculated as the average of the item content validity indexes by a group of experts [21]. The validity and reliability of the K-WAS were verified in the following steps. First, for item analysis, the inter-item correlation coefficient and item-total score correlation coefficient were calculated, and the mean value, standard deviation, skewness, and kurtosis of each item were obtained. The skewness of each question ranged from  $-.72$  to  $.06$  and the kurtosis ranged from  $-.76$  to  $1.07$ , which did not violate the normal distribution, and the ceiling effect and floor effect were analyzed. The ceiling effect and floor effect were calculated as the frequency and percentage (%) of the highest and lowest scores for all 15 items. Second, a confirmatory factor analysis was conducted to check the construct validity of the tool. Varimax Rotation, a principal component analysis, was applied to the factor analysis, and convergent validity was further checked. Third, to check the concurrent validity of the tool, the psychological empowerment of the certified care workers was measured together to see if there was a significant correlation. Fourth, the reliability of the tool was calculated by Cronbach's  $\alpha$ , which is the internal consistency reliability.

## 3. RESULTS

### 3.1 Participants Characteristics

The study's participants were primarily female (95.8%,  $n=184$ ) with a mean age of 55.84 years ( $SD=7.55$ ). Most participants had a religious affiliation (76.0%,  $n=146$ ) and were employed full time (84.4%,  $n=162$ ). They had substantial experience in aged care work, averaging 88.19 months ( $SD=49.4$ ). The participants reported a moderate stress level ( $M=4.63$ ,  $SD=1.83$ ) and a relatively high job satisfaction level ( $M=6.46$ ,  $SD=1.82$ ). These characteristics provide a context for understanding the study's results (Table 1).

**Table 1. General Characteristics of Participants (N=192)**

Characteristics	Categories	n(%) or M $\pm$ SD	Range
Gender	Female	184(95.8)	
	Male	8(4.2)	
Age (years)		55.84 $\pm$ 7.55	26-69
Religion	Yes	146(76.0)	
	None	46(24.0)	
Experience (month)	Aged care work	88.19 $\pm$ 49.4	12-234
	Current facility	61.72 $\pm$ 47.7	1-234
Employment state	Full time	162(84.4)	
	Part time	30(15.6)	
Stress scale		4.63 $\pm$ 1.83	0-10

Satisfied scale	6.46±1.82	0-10
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### 3.2 Content Validity

Ten expert groups were selected to assess the content validity of the Korean version of the WAS. These groups included two nursing department professors, four nurses with over five years of experience in a tertiary general hospital, and four caregivers with more than three years of experience in a long-term care facility. Using a 4-point Likert scale, the preliminary tools were evaluated, and the content validity index (CVI) was calculated based on experts' ratings. Notably, all items achieved a CVI of 0.8 or higher, indicating strong content validity. The overall CVI (S-CVI/Ave) for the entire measurement tool was 0.9, leading to the inclusion of all 15 questions in the final survey.

### 3.3 Construct Validity

To ascertain the construct validity of the K-WAS questionnaire (15 items), this investigation employed confirmatory factor analysis on three subdomains derived from the original instrument (Figure 2). The study revealed that item 3 had a factor load of .38, failing to meet the criterion, which resulted in its removal and necessitated a reevaluation of the model fit. The results of the initial confirmatory factor analysis indicated that the model fit did not meet the predefined criteria. Subsequently, a meticulous investigation of squared multiple correlations was undertaken, resulting in the exclusion of items 4 and 5 due to their estimates falling below .50. To address these identified issues, a new confirmatory factor analysis was subsequently performed. The  $\chi^2$  value resulted in 164.85 (df=51,  $p < .001$ ), with a  $\chi^2/df$  ratio of 3.232. Additionally, RMSEA (Root Mean Square Error of Approximation) was computed to be .102, NFI (Normed Fit Index) showed .886, CFI (Comparative Fit Index) displayed .917, and TLI (Tucker-Lewis Index) reflected .893 (Table 2).

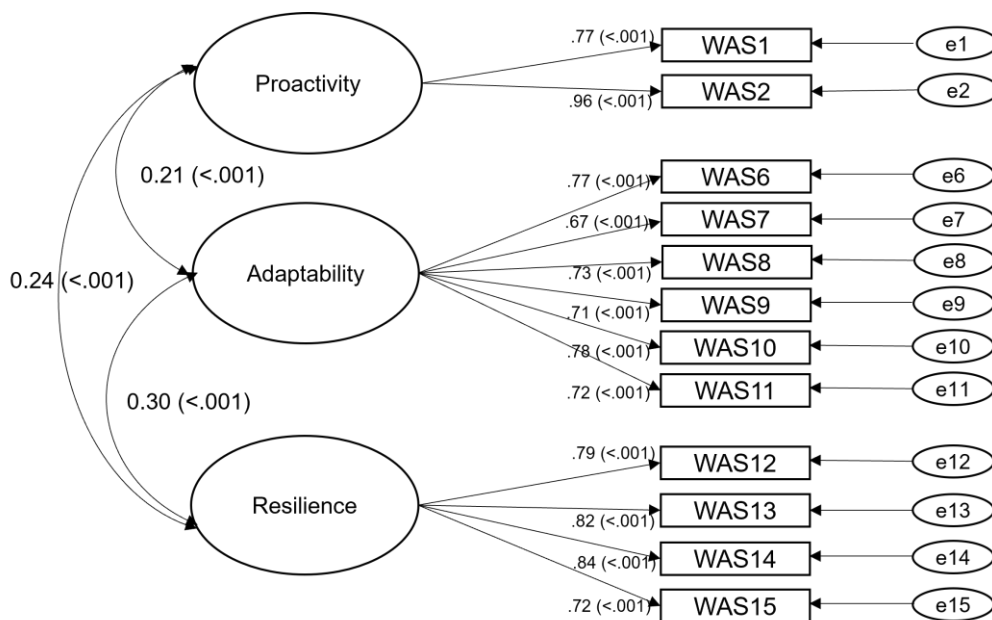


Figure 2. Confirmatory Factor Analysis

**Table 2. Model Fit of Confirmatory Factor Analysis of K-WAS (N=192)**

Model	$\chi^2$	df	$\rho$	$\chi^2/df$	RMSEA	SRMR	CFI	NFI	TLI
Research model	164.85	51	< .001	3.232	.102	.049	.917	.886	.893

**CFI=Comparative Fit Index; NFI=Normed Fit Index; TLI=Turker-Lewis Index; RMSEA=Root Means Square Error of Approximation**

### 3.4 Convergent Validity

The construct reliability (CR) in this study ranged from .86 to .87, and the average variance extracted (AVE) varied between .53 and .76. Achieving an average variance extracted of .50 or higher, along with construct reliability of .70 or higher, ensures the item's convergent validity. Consequently, the attainment of these values validates the item's convergent validity as they align with the accepted standard criteria (Table 3).

**Table 3. Analysis of Convergent Validity of WAS (N=192)**

Item	Standardized estimates	SE	CR	$\rho$	AVE	Construct reliability
<b>Proactivity</b>						
1 I look for the opportunities to make improvements at work.	.77	-	-	-	.76	.86
2 I am trying to find out more effective ways to perform my job.	.96	.12	11.18	<.001		
<b>Adaptability</b>						
6 In my work, I can change my behavior to work more effectively with other people.	.77	-	-	-	.53	.87
7 In my work, I can accept critical feedback.	.67	.11	9.35	<.001		
8 In my work, I can adjust to new work procedures.	.73	.09	10.21	<.001		
9 Use new equipment at work.	.71	.11	9.96	<.001		
10 Keep up-to-date at work.	.78	.10	11.10			
11 I can quickly adapt to switch from one project to another.	.72	.09	10.10	<.001		
<b>Resilience</b>						
12 I am able to perform my job efficiently in difficult or stressful situations.	.79	-	-	-	.63	.87
13 I am able to work well when faced with a demanding workload or schedule.	.82	.08	12.20	<.001		
14 When a different situation occurs, I react by trying to manage the problem.	.84	.07	12.46	<.001		
15 I drop everything and take an alternate course of action to deal with an urgent problem.	.72	.07	10.43	<.001		

### 3.5 Reliability

The internal consistency coefficients of all the factors were found acceptable [22,23]. The Cronbach's alpha coefficient for the whole scale was 0.916. The Cronbach's alpha coefficients were 0.742, 0.869, 0.865, for proactivity, adaptability, and resilience factors, respectively. The item correlation ranged between 0.674 to 0.937. Further, correlations between the factors were significant ( $p < .001$ ). The factors were related with each other as summarized in Table 4.

**Table 4. Model Fit of Confirmatory Factor Analysis of K-WAS (N=192)**

Factors	1	2	3	Mean	S.D.	Cronbach alpha
<b>1. Proactivity</b>	1			3.55	0.58	.742
<b>2. Adaptability</b>	.674*	1		3.69	.61	.869
<b>3. Resilience</b>	.837*	.937*	1	3.67	.53	.865

\* $p < 0.01$

### 3.6 Criterion Validity

The Korean version of the Workforce Agility Scale and Psychological Empowerment scale, which confirmed construct validity, were used to measure concurrent validity, and correlated, and the results showed a statistically significant net correlation ( $r = .560$ ,  $p < .001$ ).

## 4. DISCUSSION

This study aimed to validate the Korean version of the Workforce Agility Scale (K-WAS) among care workers for the frail elderly. While the K-WAS showed promise as a potential measure of workforce agility, some challenges were encountered, particularly in the area of model fit in the confirmatory factor analysis.

The sample of participants in this study was primarily composed of experienced female care workers, which aligns with the typical demographic profile of care workers in Korea and other parts of the world [24]. This demographic homogeneity, while reflective of the current care workforce, may limit the diversity of responses and potentially influence the findings. The effect of demographic factors such as age, gender, and years of experience on workforce agility could be a rich area for future research, providing a more comprehensive understanding of how these factors interact with workforce agility.

The content validity of the K-WAS was established through a rigorous process involving expert reviews, resulting in high Content Validity Index (CVI) scores [22]. These scores suggest that the items in the K-WAS were perceived as relevant and clear in capturing the construct of workforce agility. However, establishing the construct validity of the K-WAS proved to be more complex. The removal of certain items from the original scale highlights the potential for cultural and contextual variations in the manifestations of workforce agility. This finding echoes the assertions of Suresh, Roobaswathiny, and Priyadarsini [16], who noted that the concept of agility may differ depending on the context. It underscores the importance of refining the K-WAS for use in the specific context of care work for the frail elderly, to ensure that it captures the unique aspects of agility in this setting.

The high Cronbach's alpha coefficients obtained in this study indicate good internal consistency for the K-WAS. This suggests that the items within the K-WAS are cohesive and measure the same underlying construct of workforce agility [18]. While the reliability of the K-WAS appears to be strong, establishing its validity requires further attention, especially in terms of its construct validity. Given the complexity of the construct of workforce agility, a more nuanced approach may be needed to fully capture its dimensions and manifestations among care workers for the frail elderly.



The criterion validity of the K-WAS was established by demonstrating a significant correlation with the Psychological Empowerment scale, supporting the theoretical link between psychological empowerment and workforce agility [4,19]. However, the relationship between these two constructs is complex and multifaceted. Given the intricacy of both psychological empowerment and workforce agility, further research is needed to delve deeper into their relationship, to understand how they interact and influence each other in the context of care work.

In conclusion, this study has made an initial attempt at validating the Korean version of the Workforce Agility Scale in the specific context of care work for the frail elderly. Although there were challenges encountered in the process, this study has opened the door for future research to refine and further validate the K-WAS. With more rigorous testing and refinement, the K-WAS has the potential to serve as a valuable tool for measuring workforce agility among care workers. It is hoped that this work will eventually contribute to enhancing the quality of care for the frail elderly, by enabling a more nuanced understanding and measurement of workforce agility in this critical area of care.

## 5. CONCLUSIONS AND IMPLICATIONS

Workforce agility is a pivotal concept in care work, fostering a vital connection between caregivers and their patients. To objectively gauge the degree of workforce agility among care workers, the development and validation of appropriate measurement tools is essential. In this regard, our study endeavored to validate and establish the reliability of the Korean version of a workforce agility tool, now known as the K-WAS. This tool comprises 13 items measured on a 5-point Likert scale, capturing three key aspects of workforce agility: proactivity, adaptability, and resilience.

The findings from this study are encouraging, suggesting that the K-WAS demonstrates high reliability. In terms of validity, the content, construct, convergent, and criterion validity were found to be relatively suitable, though further refinement is required. We recommend extending this research to include a broader range of healthcare workers as subjects in future studies, to further validate and refine the K-WAS.

The K-WAS is anticipated to make a significant contribution to the design of care interventions rooted in agility for care workers. By providing a valid and reliable measure of workforce agility, the K-WAS can facilitate the evaluation of these interventions' effectiveness in improving outcomes for the frail elderly and enhancing the overall quality of care delivery. This tool represents a significant stride towards a more comprehensive understanding and application of workforce agility in the care of the frail elderly.

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