



# Development of Respiratory Infection Prevention and Control Self-Efficacy Scale for Adults

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**Purpose:** This study aimed to develop a scale for respiratory infection prevention and control self-efficacy (R-PACS) to measure self-efficacy in the prevention and control of the spread of respiratory infections among adults and to confirm the applicability of the developed scale by testing its validity and reliability.

**Methods:** This methodological study was conducted in two phases. During the first phase, the R-PACS scale was developed after conducting a thorough literature review, content validity, and a pilot test. In the second phase, its validity and reliability were verified against 210 university students in Korea. The criterion validity of the developed R-PACS scale was tested using the correlation with resilience scale. Item analysis, explanatory factor analysis, and convergent and discriminant validity analyses were conducted in order to verify construct validity. Furthermore, Cronbach's  $\alpha$  was used to verify internal consistency reliability.

**Results:** The final version of the R-PACS scale comprises 4 factors and 16 items rated on a 5-point Likert scale. Higher scores are interpreted as higher levels of self-efficacy in the prevention and control of respiratory infection. The R-PACS scale exhibited good content validity, construct validity, criterion validity, and reliability. The correlation coefficient of the four factors was  $\geq .4$ , confirming the validity of item convergence; meanwhile, the Cronbach's  $\alpha$  coefficient for the final 16 items of the developed scale was 0.923, verifying reliability. This scale consists of four factors: "environmental management", "contact restrictions", "general infection prevention and control", and "early detection".

**Conclusion:** The applicability of the R-PACS scale exhibited acceptable validity and reliability. This scale can be utilized to assess and evaluate the degree of self-efficacy in the prevention and control of respiratory infections among adults. Data obtained using this scale can be utilized for preparing health behavior change and health promotion programs, and practical policies for preventing respiratory infections.

**Keywords:** health behavior, infection control, instrument development, respiratory tract infections, self efficacy

## Introduction

Respiratory infections are caused by various bacteria, viruses, and other pathogenic microorganisms in the upper and lower respiratory tract.<sup>1,2</sup> Respiratory infections comprehensively refer to frequent respiratory infectious diseases such as influenza, and novel respiratory infectious diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome, and coronavirus disease 2019 (COVID-19).<sup>2,3</sup> Specifically, COVID-19, which is caused by SARS-CoV-2, was declared a pandemic by the World Health Organization (WHO) in March 2020.<sup>4</sup> In addition, the importance of respiratory infection control has been emphasized because there is a possibility of a future occurrence of novel and variant respiratory infectious diseases.<sup>4</sup> Therefore, the prevention and control of the spread of novel respiratory infections is a challenge faced worldwide.

Self-efficacy is the most powerful concept for explaining human behavior, and it is described as a major determinant of behavioral change.<sup>5</sup> Perceived self-efficacy can determine whether the behavioral process necessary for coping with an upcoming situation is executed.<sup>5</sup> Additionally, judgments of self-efficacy determine an individual's likelihood of engaging in such behavior, how much effort they put into this behavior, how long they can resist when faced with obstacles or adverse experiences, and whether they maintain the particular behavior on a long-term basis.<sup>5,6</sup> The

improvement of self-efficacy is an important concept that directly or indirectly affects health behavior and outcomes for the prevention and control of diseases.<sup>7</sup> Self-efficacy, which explains health behavior, was found to predict adherence to infection prevention behavior significantly.<sup>8</sup> In prior studies, self-efficacy has been associated with taking preventive behaviors during the SARS and influenza A pandemics. This included hand washing, respiratory hygiene, and wearing masks when symptomatic.<sup>9,10</sup> Although numerous tools exist to assess behavioral responses during infectious diseases, there are no validated scales that can validly and reliably assess an individual's self-efficacy in preventing respiratory infectious diseases, recognizing symptoms, and managing them at home.<sup>11</sup>

Self-efficacy comprises general and task-specific levels of self-efficacy.<sup>6</sup> General levels of self-efficacy refer to an individual's perception of their ability to perform the behaviors required in various personal situations successfully.<sup>6</sup> Task-specific levels of self-efficacy refer to an individual's perception of their ability to perform a particular behavior required in a certain situation.<sup>6</sup> To predict task-specific levels of self-efficacy that change according to specific situations and behaviors, the measurement should comprise measurement indicators that can specifically reflect particular situations and behaviors.<sup>12</sup> In a study of American college students, the likelihood of consistently using condoms to prevent sexually transmitted diseases was highest among students who reported high self-efficacy in communicating about condom use and obtaining sexual consent.<sup>13</sup> As such, self-efficacy has been considered a major predictor of prevention and control of sexually transmitted diseases. According to the results of a systematic literature review that measured the self-efficacy of hand hygiene practices for infection prevention and control,<sup>14</sup> the lack of a validated measurement tool for evaluating self-efficacy levels is considered a problem. To the best of our knowledge, there are no measurement tools for self-efficacy in the area of infection prevention and control. The reliable respiratory infection prevention and control self-efficacy (R-PACS) effectively measures self-efficacy and is expected to be used by health policy makers, researchers, and healthcare providers to screen risk groups for infection prevention and control, and sometimes even to check the effectiveness of education on the subject.

This study aimed to develop a R-PACS scale to measure self-efficacy in the prevention and control of the spread of respiratory infections among adults. It also aimed to confirm the applicability of the scale developed by testing its validity and reliability.

## Methods

### Study Design

This methodological study was conducted in two phases. In the first phase, the R-PACS scale for adults was developed. In the second phase, its validity and reliability were tested and verified.

### First Phase: Development of R-PACS

#### Literature Review

The R-PACS scale developed in this study measures the expectations and beliefs that an individual can successfully implement the health behaviors necessary for the prevention and control of respiratory infections. Related previous studies and existing measurements were investigated using MEDLINE, CINAHL, Embase, Research Information Sharing Service, National Digital Science Library, and Google Scholar. Additionally, the websites of the Center for Disease Control (CDC), Korea Disease Control and Prevention Agency, and WHO were searched to locate relevant guidelines, articles, and additional related references. Searches were conducted for the period between 2010 and 2020, and they were not limited to language, type of literature, or study design. The search strategy terms comprised "respiratory infection", "influenza", "tuberculosis", "COVID-19", "prevention", "control", "self-efficacy", "scale", "tool", "measurement", "guidelines", "validity", and "reliability." Initially, 909 studies were searched in total. After excluding duplicate studies, 857 studies remained. After reviewing the title and abstract, 43 studies remained. Finally, 15 studies for which the original text was available were reviewed.

#### Derivation of Preliminary Items

In the case of respiratory infection control in Korea, related guidelines were divided into monitoring systems, epidemiological investigation, patient and contact management, environmental management, examination and

reporting by disease, and prevention and management.<sup>15,16</sup> The 12 main concepts of prevention and control of respiratory infections derived from the literature review were general infection control, isolation, symptom management, vaccination, compliance with prevention rules, implementation of rules of conduct when symptoms are present, medication management, environmental management, nutrition management, emotional management, activities, and exercise. The initial 54 items were developed based on these concepts. However, for this study, it was determined suitable to reduce the number of items to only those closely related to the prevention and control of respiratory infections. Therefore, general concepts, such as nutrition management, emotional management, activities, and exercise, were excluded. Finally, we derived 35 preliminary items from 8 concepts.

### Selection of a Response Format

The R-PACS is a 5-point Likert scale ranging from 1 = “strongly disagree” to 5 = “strongly agree.” The higher the total score, the higher the individual’s self-efficacy in the prevention and control of respiratory infections would be.

### Content Validity

To validate the content of the 35 preliminary items, we assembled a panel of 7 experts. The panel comprised two nursing professors, two nurses in charge of infection control, one infection physician, and two nursing managers. The content validity questionnaire we devised required items to be rated on a 4-point Likert scale ranging and also included open-ended questions relating to content the experts believed to be missing from the questionnaire or items that required amendment. Of the 35 preliminary items, 24 had an item content validity index (I-CVI) of 0.8 or higher. Eleven preliminary items with an I-CVI less than 0.8 were deleted, and 24 items were selected to be included as final items of the preliminary scale.

### Pilot Test

To determine whether the 24 items contained in the preliminary scale were easily understandable and the time required to complete the scale, a pilot test was conducted. Convenience sampling was utilized to select a sample of 10 students from one university in D-city, Korea. The ages of the participants ranged from 21 to 25 years. The results of the pilot test showed that the items were not difficult to understand, and it took the participants approximately 12 to 15 minutes to complete the scale.

## Second Phase: Verification of Validity and Reliability

### Participants

Data collection was conducted to select the items and test the validity and reliability of the scale. A verification test was conducted using convenience sampling of 240 students from one university in D-city, Korea. The minimum number of participants required to verify construct validity using factor analysis was five to seven times the number of items (35 preliminary items x five to seven times = 175–245).<sup>17</sup> The questionnaire was distributed to 240 participants after the researchers considered the total number of items and the estimated dropout rate of approximately 20%. The questionnaires of 227 participants (95%) were collected, excluding 13 participants (5.4%) who refused to respond. After excluding 17 participants (7.1%) who responded insincerely, data from the questionnaires of 210 participants (87.5%) without any missing responses were finally analyzed.

### Measurement Scale for Criterion Validity

The criterion validity of the developed R-PACS scale was tested using the correlation with “resilience”, which has a significant correlation with self-efficacy. The 22 items of the Korean version of the Connor-Davidson Resilience Scale (K-CD-RISC), developed by Connor and Davidson,<sup>18</sup> were translated into Korean by Baek et al<sup>19</sup> and modified by Lee.<sup>20</sup> This scale comprises five factors: hardiness (7 items), persistence (8 items), optimism (4 items), control (2 items), and spiritual nature (1 item).<sup>20</sup> The items are rated on a 5-point Likert scale ranging, with a higher score indicating a higher level of resilience. The original CD-RISC,<sup>18</sup> which was translated to the K-CD-RISC<sup>19</sup> and modified to the K-CD-RISC<sup>20</sup> had Cronbach’s  $\alpha$  values of 0.89, 0.93, and 0.94, respectively.

## Data Collection

This study was reviewed by the Institutional Review Board (IRB) of Daejeon University (1,040,647–202,006-HR-021-01) and adhered to the Declaration of Helsinki. Data were collected after receiving approval from the IRB. One researcher and two trained research assistants collected the data during the period between September 21 and November 20, 2020. To ensure consistency in the data collection process, the research director conducted pre-educational training with the research assistants. The research assistants visited the classrooms of the two colleges and explained the purpose of the study and confidentiality. Written informed consent was obtained from the participants who voluntarily agreed to participate in the study, and a self-report questionnaire was distributed to the participants for completion.

## Data Analysis

Data analysis was performed using SPSS 28.0 (IBM Corp., Armonk, NY, USA). First, descriptive statistics were presented for the general characteristics of the participants, and the results were presented as frequency, percentage, mean, and standard deviation (SD). Second, the I-CVI was used to evaluate the content validity of the developed scale. Third, to verify construct validity, item analysis, explanatory factor analysis (EFA), and convergent and discriminant validity analyses were performed. For item analysis, a normal distribution was confirmed using the mean, SD, skewness, and kurtosis for each item. The inter-item correlation and corrected item-total correlation of the developed scale were measured. EFA was conducted to verify construct validity using the Kaiser–Meyer–Olkin (KMO) and Bartlett’s sphericity tests. The number of factors was determined by calculating eigenvalues, factor loading, and explained and accumulative variance using the principal component extraction method analysis and varimax rotation. A multi-trait-multi-method matrix was used to assess the convergent and discriminant validity of the items. Fourth, Pearson’s correlation coefficient with the K-CD-RISC was used for criterion validity analysis. Finally, the internal consistency reliability was analyzed using Cronbach’s  $\alpha$ .

## Results

### General Characteristics of the Participants

The mean (SD) age of the participants was 20.69 ( $\pm 1.25$ ) years. Of the participants, 82.4% were female, 61.4% had received infection control education, and 54 (25.7%) had previously tested positive for a respiratory infection (Table 1).

### Construct Validity

#### Item Analysis

To assess the normal distribution of the 24 items, the absolute value of skewness of each item should not exceed 2, and the absolute value of kurtosis should not exceed 10. Following the analysis, the absolute value of skewness of one item (“I can rest at home if I have symptoms of a respiratory infection.”) was 2.19, and the absolute value of kurtosis was 6.92. Therefore, this item was excluded. The range of skewness values for the remaining items was from  $-1.79$  to  $-0.40$ , and kurtosis values ranged from  $-0.84$  to 2.36. Inter-item and corrected item-total correlations were checked to confirm the contribution of the items. The correlation coefficient between each of the remaining 23 items and all items ranged

**Table 1** General Characteristics of the Participants (N=210)

Characteristics	Categories	N	%	Mean $\pm$ SD (Range)
Age				20.69 $\pm$ 1.25 (19–25)
Gender	Female	173	82.4	
	Male	37	17.6	
Experience in infection control education	Yes	129	61.4	
	No	81	38.6	
Experience of being positive for respiratory infection	Yes	54	25.7	
	No	156	74.3	

from 0.51 to 0.79 in this study. It was confirmed that the correlation coefficient of all items was 0.30 or higher, and this was evaluated as having a high contribution within the scale.

### Explanatory Factor Analysis

EFA was conducted on the 23 items. The KMO value was 0.92 and the result of Bartlett's sphericity test was  $\chi^2 = 3367.87$  ( $df = 253, p < 0.001$ ), thereby suggesting excellent sampling adequacy. Factor extraction was performed through principal component analysis. An eigenvalue of 1 or more, commonality of 0.40 or more, factor loading of 0.40 or more, and cross-loading of 0.20 or more were used as the criteria. In addition, the items and factors were determined based on an accumulative variance of 60% or more of the variance explained by the extracted factors.

In the first EFA, 7 items were deleted because they had a factor loading value of 0.40 or more but a cross-loading value of less than 0.20. It was determined that these seven items had mixed concepts and did not represent each factor. In the final EFA, 4 factors and 16 items were derived. The cumulative explanatory value of all factors was 71.01%. Factor 1 had an eigenvalue of 4.20, an explained variance of 26.23%, and the factor loading of 6 items included was more than 0.66. Factor 2 had an eigenvalue of 2.62, an explained variance of 16.39%, and the factor loading of the 4 items included was more than 0.60. Factor 3 had an eigenvalue of 2.34, an explained variance of 14.62%, and the factor loading of the 3 items included was more than 0.67. Factor 4 had an eigenvalue of 2.21, an explained variance of 13.82%, and the factor

**Table 2** Analysis of Item Appropriateness for the Items and Factors of the Scale (N=210)

Factor	Item <sup>a</sup>	Item and Total Correlation	Commonality	Factor Loading	Eigen Value	Explained Variance (%)
1. Environmental management	I can dispose of infected waste in a separate rubbish bin.	0.746	0.770	0.819	4.197	26.234
	If I have symptoms, I can use a designated bathroom.	0.758	0.787	0.818		
	I can seal the infected waste and dispose of it in an automated rubbish bin.	0.757	0.730	0.789		
	If I have symptoms, I can close the door of my room.	0.762	0.720	0.762		
	I can dispose of infected waste by following expert recommendations.	0.742	0.616	0.663		
	If I have symptoms, I can limit my activities at home.	0.779	0.702	0.659		
2. Contact restrictions	I can avoid contact with many people to prevent infection.	0.506	0.759	0.851	2.622	16.388
	I can maintain distance of one meter between myself and others to prevent infection.	0.682	0.701	0.721		
	I can avoid touching my eyes, nose, and mouth to prevent infection.	0.654	0.650	0.715		
	I can adhere to government instructions and go out when permitted.	0.670	0.573	0.601		
3. General infection prevention and control	Whenever I cough or sneeze, I can cover my mouth and nose.	0.548	0.738	0.827	2.339	14.617
	I can wash my hands with hand hygiene products wherever I go.	0.576	0.671	0.758		
	If having infected symptoms, I can wear a mask and gloves when leaving the room.	0.672	0.646	0.666		

(Continued)

**Table 2** (Continued).

Factor	Item <sup>a</sup>	Item and Total Correlation	Commonality	Factor Loading	Eigen Value	Explained Variance (%)
4. Early detection	I can recognize infected symptoms.	0.569	0.769	0.841	2.211	13.818
	As recommended by health authorities, I can seek a help.	0.703	0.782	0.770		
	As recommended by health authorities, I can decide either maintain daily life or make a call.	0.786	0.755	0.642		

**Note:** <sup>a</sup>This is a summary of the R-PACS Scale items.

loading of the 3 items included was more than 0.64. In each conceptualized factor, the name of the factor was determined by referring to the highly loaded items (Table 2).

### Convergent and Discriminant Validity

The results of a multi-trait-multi-method matrix showed that the correlation coefficient for Factor 1 was 0.795–.886, 0.739–.834 for Factor 2, 0.772–.851 for Factor 3, and 0.847–.898 for Factor 4. For all four factors, the correlation coefficient was  $\geq 0.40$ , thereby verifying the validity of item convergence. Additionally, the correlation coefficient between each item and other sub-factors to which it did not belong was 0.414–.587 for Factor 1, 0.297–.548 for Factor 2, 0.352–.568 for Factor 3, and 0.338–.644 for Factor 4. Discriminant validity was verified as all items had a value smaller than the correlation coefficient with the factor to which each item belonged.

### Criterion Validity

Pearson's correlation analysis using K-CD-RISC<sup>20</sup> was performed to confirm the criterion validity of the developed scale (Table 3). The correlation between the total score of the scale developed in this study and K-CD-RISC<sup>20</sup> was  $r = 0.424$  ( $p < 0.001$ ). The correlation coefficient between the four factors of the developed scale and K-CD-RISC ranged from 0.299 to 0.385 (all  $p < 0.001$ ).

### Reliability

The reliability verification of the developed scale confirmed Cronbach's  $\alpha$  coefficient, which measures internal consistency (Table 3). The final 16 items were found to have a Cronbach's  $\alpha$  coefficient of 0.923. The Cronbach's coefficient  $\alpha$  was 0.913 for Factor 1, 0.810 for Factor 2, 0.763 for Factor 3, and 0.824 for Factor 4. Internal consistency was confirmed.

### Confirmation of R-PACS

The R-PACS scale developed in this study comprised 4 factors and 16 items (Supplementary Tables 1, 2). The R-PACS scale uses the average score for each factor by dividing the total score for each factor by the number of items present in

**Table 3** Criterion Validity and Reliability of the Scale (N=210)

Respiratory Infection Prevention and Control Self-efficacy (R-PACS) Scale	K-CD-RISC $r$ ( $p$ )	Cronbach's $\alpha$
Total	0.424 (<.001)	0.923
Environmental management	0.385 (<.001)	0.913
Contact restrictions	0.328 (<.001)	0.810
General infection prevention and control	0.299 (<.001)	0.763
Early detection	0.374 (<.001)	0.824

**Abbreviation:** K-CD-RISC, Korean version of the Connor-Davidson Resilience Scale.

the scale. The R-PACS scale can assess and measure the level of self-efficacy among adults relating to the prevention and control of respiratory infections for each factor. The items contained in the R-PACS scale are rated on a 5-point Likert scale ranging from 1 = “strongly disagree” to 5 = “strongly agree”, and the total score ranges from 16 to 80. The higher the total score, the higher the individual’s self-efficacy in the prevention and control of respiratory infections.

## Discussion

This study was conducted to attempt to change health behaviors and enhance infection prevention by confirming the self-efficacy of respiratory infection prevention and control. In this study, we developed the R-PACS scale for adults. By confirming its validity and reliability through content validity, construct validity, criterion validity, and reliability, 4 factors and 16 items were derived. The 4 factors are as follows: “environmental management”, “contact restrictions”, “general infection prevention and control”, and “early detection.”

Factor 1, “environmental management”, comprises 6 items and has the highest explained variance, accounting for 26.23% of the total variance. It comprises three items relating to the disposal of waste for individuals with respiratory infection symptoms and three items concerning the management of the quarantine environment and home isolation to protect others when an individual has symptoms of a respiratory infection. The Ministry of the Interior and Safety<sup>21</sup> recommends the “management of medical waste and laundry”, as well as “cleaning, disinfection, and ventilation” for environmental management. The Korea Disease Control and Prevention Agency (KDCA)<sup>21</sup> provides recommendations for “home treatment” and “home isolation.” This guide explains how to use the bathroom during home treatment and guidelines for those living with others, including how to disinfect the home environment, manage laundry and tableware, and dispose of waste.<sup>21</sup>

Factor 2, “contact restrictions”, comprises 4 items and explains 16.39% of the total variance. It comprises four items relating to avoiding contact with many people, social distancing, avoiding touching the eyes, nose, and mouth, and going out within the allowable range according to government guidelines to prevent the spread of respiratory infections. Infectious diseases can be transmitted through various methods, and respiratory infections, specifically, can spread through common routes, such as contact, droplets, and airborne transmission.<sup>21</sup> Factor 2 includes avoiding touching the eyes, nose, and mouth to prevent transmission through direct contact. Additionally, it includes maintaining an adequate distance from others and limiting contact with others to prevent droplet transmission. This means social distancing that minimizes contact with people based on social norms.<sup>21,22</sup>

Factor 3, “general infection prevention and control”, comprises 3 items. Factor 3 explains 14.62% of the total variance. It comprises three items relating to cough etiquette, washing hands, and wearing masks and gloves. In the context of the COVID-19 pandemic, most countries implemented policies on non-pharmacological interventions, especially cough etiquette, washing hands, and wearing masks.<sup>21</sup> Specifically, the Ministry of the Interior and Safety<sup>21</sup> recommends five important personal quarantine rules of “cough etiquette”, “washing hands”, “wearing a mask”, “social distancing”, and “environmental management” to prevent COVID-19 infection. The WHO has also prepared the “3W” standard precautions for the prevention and control of COVID-19.<sup>22</sup> The “3W” comprises washing hands, wearing masks, and watching distance.<sup>21</sup>

Factor 4, “early detection”, comprises 3 items and explains 13.82% of the total variance. It comprises three items concerning the early self-identification of respiratory infection symptoms, early self-severity prediction of symptoms, and action decisions based on the recommendations of health authorities. The WHO<sup>4</sup> and KDCA<sup>23</sup> have described the various symptoms of respiratory infections to the public through various media, such as news and videos. They also provide various recommended guidelines for the occurrence of respiratory infections, including health monitoring, health management, treatment, transmission prevention, and isolation. In particular, the CDC<sup>24</sup> has provided an online mobile-friendly tool called the COVID-19 self-checker. This assists an individual in deciding when to get tested or seek medical care if they suspect they or someone they know has contracted COVID-19 or has come in close contact with someone who has COVID-19.<sup>24</sup> The early and rapid diagnosis of respiratory infections will help reduce transmission rates and manage symptoms appropriately.<sup>4</sup>

Criterion validity was confirmed using the K-CD-RISC<sup>20</sup> related to resilience, which can be used as a gold standard for measuring self-efficacy in the prevention and control of respiratory infections among adults. Criterion validity was

verified by analyzing the correlation between the R-PACS scale developed in this study and the K-CD-RISC. As a result, a significant positive correlation was observed. Finally, 16 items were derived, and it was confirmed as a reliable scale for indicating internal consistency.

As self-efficacy is a predictor of health-related behavior, a self-efficacy measurement scale should be developed according to specific health behavior goals.<sup>5,6</sup> To predict the implementation of various health behaviors, scales based on health behavior goals and the concept of self-efficacy have been developed.<sup>25–28</sup> However, a scale for measuring self-efficacy that can predict specific infection and control behaviors is yet to be developed. Therefore, the general self-efficacy scale<sup>28</sup> was used to predict an individual's specific behaviors related to infection control. The R-PACS scale developed in this study confirmed specific self-efficacy in the prevention and control of respiratory infections among adults affected by multidimensional factors. This scale is useful in the self-efficacy evaluation of health behavior changes for infection prevention and control. In addition, this scale is simple and easy to use. Various respiratory infectious diseases caused by bacteria and other pathogenic microorganisms, along with the emergence of new and mutant viruses, continue to threaten the world's healthcare systems as well as society.<sup>3</sup> In conclusion, we believe that the development of the R-PACS scale is timely and essential, particularly in the context of respiratory infection prevention and control. We anticipate that this scale will prove beneficial in future research and practice within public health fields.

## Suggestions for Future Research

Based on our findings, we suggest the following. First, as this study has limitations in that it targeted a single regional center and a small sample, we suggest future verification through re-evaluation of validity and reliability, including adults of different age groups in different regions and centers. Second, we suggest the re-verification of the results using various verification methods, such as confirmatory factor analysis and response-process validity evidence, to prove the construct validity of the scale we developed. Third, we recommend that this scale, which identifies the level of self-efficacy among adults regarding the prevention and control of respiratory infections, be used to develop educational programs and nursing interventions for infection prevention and control, and that follow-up studies be conducted to evaluate the effectiveness of the intervention.

## Conclusion

In this study, we developed the R-PACS scale, a self-efficacy measurement scale for the prevention and control of respiratory infections among adults and verified its validity and reliability. The R-PACS scale comprises 4 factors and 16 items rated on a 5-point Likert scale. The correlation coefficient of the four factors was  $\geq .4$ , confirming the validity of item convergence, and the Cronbach's  $\alpha$  coefficient for the final 16 items of the developed scale was 0.923, verifying reliability. The four factors include "environmental management", "contact restrictions", "general infection prevention and control", and "early detection." The total score ranges from 16 to 80, with higher scores indicating higher levels of self-efficacy in the prevention and control of respiratory infections. R-PACS, which has secured reliability and validity, is expected to be a powerful scale for predicting self-efficacy in the prevention and control of respiratory infections. With further validation through other centers and groups, this scale can be utilized to assess and evaluate the degree of self-efficacy in the prevention and control of respiratory infections among adults. Additionally, the results can be used as basic data for preparing health behavior change and developing health promotion programs and nursing intervention, as well as practical public policies aimed at preventing the spread of infections.

## Abbreviations

CDC, Centers for Disease Control; EFA, explanatory factor analysis; IRB, Institutional Review Board; I-CVI, item content validity index; KDCA, Korea Disease Control and Prevention Agency; KMO, Kaiser–Meyer–Olkin; K-CD-RISC, Korean version of Connor-Davidson Resilience Scale; R-PACS, Respiratory Infection Prevention and Control Self-efficacy; SARS, severe acute respiratory syndrome; SD, standard deviation; WHO, World Health Organization.



## Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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The authors declare that they have no competing interests in this work.

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