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# Development and Validation of Resilience Scale in Patients with Cardiovascular and Respiratory Diseases

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## Abstract

**Background:** Resilience is defined as skills, abilities, knowledge, and insight that people gain over time to overcome problems and hardships and cope with challenges.
**Objectives:** Due to the lack of a gold standard to measure resilience, the current study aimed at designing and validating a resilience scale in Patients with cardiovascular and respiratory diseases.
**Methods:** The current methodological study was conducted in 2016 in 3 consequential phases. In the first phase, the concept of resilience was defined and analyzed in patients with chronic physical diseases using hybrid concept analysis. In the second phase, based on the findings obtained in the phase 1, the item pool was generated. In the third phase, in order to evaluate the psychometric properties of the tools, 375 patients in public places of Tehran, Iran, were selected using the multistage cluster sampling method to complete the scales.
**Results:** Based on the results of the content analysis, the primary item pool included 142 items, which was reduced to 57 items by excluding the repetitive and combining the overlapping ones. After administering face validity, content validity, and item analysis, a total of 30 items remained. The exploratory factor analysis, by eliminating 1 item, indicated five 5, explaining 65% of the total variance, and the Kaiser - Meyer - Olkin (KMO) index was 0.949, showing a significant difference (P = 0.0001). Discriminant validity showed that patients with higher education were more resilient. Cronbach's alpha coefficient of the final version of the 29 - item scale was 0.943.
**Conclusions:** The 29 - item resilience scale was a simple, valid, and reliable tool to measure resilience in patients with cardiovascular and respiratory diseases.

*Keywords:* Resilience, Validity, Reliability, Cardiovascular Disease, Respiratory Disease

## 1. Background

Chronic diseases have adverse effects on patients' lives and exert too much stress on them due to loss of health, pain, reduced performance and longevity, feeling of loneliness and isolation, loss of self - confidence, and altered social roles (1). It is shown that 20.7% of Iranians have chronic diseases, and cardiovascular complications are the most prevalent ones (2). Disease, as a new life situation, challenges the common coping strategies of patients, and patients turn to new coping strategies to modulate this new situation (3, 4). Hence, different people adopt diverse methods to respond to problems and stresses. Although people respond to stresses purposefully, they do not necessarily choose the best response (4). Resilience means skills, abilities, knowledge, and insight that people gain over time to overcome problems and hardships and deal with challenges (5).

Resilience has a long history in psychological research, but it is a rather new concept in nursing discipline, which explains why some people can adapt to problems and adversities better than others and live longer lives (6, 7). Dubey considered resilience in nursing as resistance, improvement or return to the primary state of physical and mental health after facing challenges (8). The studies conducted on resilience concentrate on why some people, despite experiencing stressful conditions of life, still maintain their positive adaptability (9). Resilience is a concept that depends on context, culture, beliefs, attitudes, and worldview of people (10). Culture can even function as a type of stressor that people most probably experience (11).

A review of the literature showed a total of 15 scales to measure resilience, and their developers advised not to use

7 of these tools for clinical purposes. The target population of 8 tools is children and adolescents, no factor analysis is also reported for 4 tools and the Cronbach's alpha coefficient of 4 - tool is less than 0.70. Resilience scale for adults (RSA) and the Connor - Davidson resilience scale (CD - RISC) have some of the above deficiencies (adolescent target population and lack of clinical application and factor analysis), but the RSA tool, owing to low responding rate, nonrandom sampling, and administration on Norwegian patients has limited psychiatric generalizability. CD - RISC is the most widely used tool to evaluate resilience in national and international studies. Also, this tool neither evaluates resilience nor covers resilience properties (12).

## 2. Objectives

Since the data of the mentioned psychometric studies and designing resilience scales concentrated on the western culture and most of them were performed on resilience of children and people with psychological problems, the current study aimed at developing a psychometric scale of resilience for patients with cardiovascular and respiratory diseases.

## 3. Methods

### 3.1. Study Design

The current study aimed at developing and validating a resilience scale for patients with cardiovascular and respiratory diseases. The current study procedures included defining resilience concept, formulating the items of scale, developing the scale, and analyzing its validity and reliability.

### 3.2. Settings, Sampling, and Procedure

The current methodological study was carried out in 2016 in 3 consequent phases as follows:

First phase: Resilience in patients with cardiovascular and respiratory diseases was defined by the hybrid model approach. First, a systematic review of the literature from 2000 to 2015 was conducted. To search for studies conducted on resilience in physical patients, Scientific Information Database (SID), MagIran, and IranMedex databases at national level, and Google Scholar, ScienceDirect, PubMed, and Scopus databases at international level were used, and finally based on PRISMA guidelines, 23 articles were entered the final analysis.

Second, field work was performed, which overlapped with the first phase in terms of time. In this phase, 12 patients with cardiovascular and respiratory diseases were purposefully selected for in - depth, semi - structured, personal interviews. Since such patients are available everywhere, there was no need for a specific place in order to collect information; however, clinics and parks were given priority. Data collection was continued until data saturation. Based on the hybrid model approach, 3 to 6 persons were sufficient (13). Interviews lasted 45 - 60 minutes. The interviews were recorded, transcribed, and analyzed through qualitative content analysis. Third, the results of the theoretical phase and field work were combined, and the final definition of resilience in patients with cardiovascular and respiratory diseases was presented.

Second phase: Based on the results of the first phase, an item pool was generated. The items were formulated deductively (from experimental data) and inductively (from the existing literature).

Third phase: The psychometric properties of resilience scale, including face validity, content validity, construct validity, and reliability were evaluated. The psychometric process involved face validity, content validity, and construct validity. The minimum sample size for factor analysis was 5 to 10 individuals per item and totally 374 persons were enrolled in the study (14). The multistage cluster sampling method was used and accordingly of 22 municipal districts of Tehran, 3 districts were randomly selected and later in each district 1 municipal area was also selected randomly. A list of public places in each municipal area was prepared and based on which sampling was conducted.

### 3.3. Face Validity

Face validity was assessed both qualitatively and quantitatively. In the qualitative face validity, face - to - face interviews were conducted with 10 patients with cardiovascular and respiratory diseases and they were asked to read aloud the items, explain what each item means, and determine the problematic or ambiguous words for revision (15). The items were revised and rewritten according to their views. Quantitative face validity was performed to determine the importance of each item. The item impact $\geq$ 1.5 indicated the appropriateness of the item (16).

### 3.4. Content Validity

To analyze the content validity, 17 psychologists, psychiatrists, psychiatric nurses, and authors of studies on resilience in patients with physical ailments were invited to evaluate the items qualitatively in terms of grammatical rules, spelling, and scoring (17). Also, they were asked to determine the content validity ratio (CVR) of each item by selecting 1 of the 3 following phrases: "It is necessary", "It is necessary, but not useful", or "It is not necessary". Based on the Lawshe table, if there are 17 experts, score $\geq$ 0.52

is appropriate for the item. Thus, the items with scores < 0.52 were excluded (18). Then, content validity index (CVI) was calculated for each item using the Waltz and Bussel criteria. To this end, 10 other experts were asked to determine the relevance rate of each item according to the 4 responses "Item is irrelevant", "Item needs some modifications", "Item is relevant, but needs revision", or "Item is completely relevant and appropriate". To compute the CVI, the number of experts that selected the last 2 responses was divided by all experts. The items with scores < 0.79 were excluded. Finally, the mean CVI of all items was used for scale - level CVI/averaging calculation (S - CVI/Ave). Polit and Beck suggested that S - CVI/Ave $\geq$ 0.9 indicates the excellent content validity (19). Eventually, a pilot study was conducted on patients with cardiovascular and respiratory diseases (n = 50) to perform item analysis.

### 3.5. Construct Validity

Exploratory factor analysis, convergent validity, and known-groups comparison were applied to determine the construct validity of the scale (20). Sampling was performed through convenience sampling at public places and clinics of Tehran and Saqqez, Iran. Finally, 375 questionnaires were completed and analyzed. As the first step to construct validity, the latent factors were identified using explanatory factor analysis, the sampling sufficiency index (the Kaiser - Meyer - Olkin (KMO) was calculated, and the Bartlett test was conducted. A KMO of 0.7 to 0.8 was considered good, while a KMO of 0.8 to 0.9 was regarded as big (21). The extraction of hidden factors was conducted with the help of principal component analysis and varimax rotation using PASW software.

The individuals with a history of cardiovascular or respiratory diseases for 1 year or more were enrolled in the study. The research objectives were explained to the participants and they were assured of the confidentiality of data. For the sake of ethical considerations, the questionnaires were distributed anonymously. To perform item analysis, a pilot study was conducted on 50 patients with cardiovascular and respiratory diseases. Item analysis aimed at calculating Cronbach's alpha for the primary reliability and identifying the items affecting reliability and analyzing the correlation of items with each other; if an item had no minimum correlation (2-3%) with other items, it was excluded; if an item had a correlation of > 0.8, it was eliminated and if an item had a correlation of < 0.5 with total score, it was excluded.

### 3.6. Convergent Validity

Convergent validity was assessed by CD - RISC. Using the Spearman correlation coefficient, the correlation between the scores of questionnaires was computed. CD - RISC consists of 25 items, and a higher score indicates more resilience (22). The known-groups comparison is another method to estimate validity. In the current study, the samples were divided into 4 groups: illiterate, with elementary to high school education, with a high school diploma, and with university education. The scores of resilience obtained in these groups were compared by one - way ANOVA and the follow - up Tukey test.

### 3.7. Reliability

Internal consistency and stability measures were used to determine the reliability of the scale. The results of internal consistency were reported by Cronbach's alpha. A Cronbach's alpha $\geq$ 0.8 was considered good and $\geq$ 0.7 satisfactory (23). Stability was determined by the test - retest technique. To this end, the questionnaires were given to patients in 2 stages, with an interval of 10 days, and the correlation between scores obtained from the 2 tests was calculated by the intraclass correlation coefficient (ICC). An ICC $\geq$ 0.8 indicated an acceptable stability index (24). The floor - ceiling effect was calculated as well.

### 3.8. Data Analysis

To evaluate the normality of data distribution, the Kolmogorov - Smirnov test was applied. Descriptive statistics, exploratory factor analysis, ANOVA, independent t - test, intraclass correlation coefficient, Cronbach's alpha, and the Spearman correlation coefficient were used to analyze the collected data. Data analysis was conducted by PASW software.

### 3.9. Ethical Considerations

The study was approved by the ethical committee of the research council of University of Social Welfare and Rehabilitation Sciences (IR.USWR.REC.1394 - 289), Tehran, Iran in December 2015. Study participants were personally informed regarding the objectives of the study, anonymity and confidentiality of their information, and their ability to either participate in or withdraw from the study.

## 4. Results

First phase: The concept of resilience was defined by the hybrid model. Resilience in patients with cardiovascular and respiratory diseases was a context - dependent concept in which patients tried to protect themselves through positive thinking, information - seeking, and overcome the initial reactions of the illness through developing capabilities, self-efficacy and stress management by getting help from psychological - spiritual support networks, adapting successfully and actively to various aspects of the disease,

and gaining new insight into disease and life while integrating with the existing conditions.

Second phase: The findings of the first phase were used to generate the item pool. The primary item pool comprised of 142 items. After the analysis of items by the research team, the repetitive items were excluded and overlapping ones were combined. Finally, a pool of 53 items was obtained.

Third phase:

A) Face validity: Six items were excluded due to their impact score of less than 1.5; thus, 47 items remained eventually. Four items were revised based on the patients' opinions.

B) Content validity: Fifteen items were eliminated due to possessing a CVR of less than 0.52. Since the CVI of all items was above 0.71, no item was removed. Also, the S - CVI for all questionnaires was 0.91. Responses were rated based on a 5 - point Likert scale, from "completely agree" (score 5) to "completely disagree" (score 1). None of the items had reversed scoring. Higher scores in this scale meant more resilience in patients with cardiovascular and respiratory diseases. Then, item analysis was performed with a sample size of 50 participants. Finally, 2 items were eliminated due to very low and very high correlation with the total score of the scale.

C) Construct validity: Exploratory factor analyses along with principal component analysis were conducted on the 30 - item resilience scale of patients with cardiovascular and respiratory diseases. The result of KMO test was 0.949, indicating sampling adequacy. The findings of the Bartlett test showed a significant correlation between items to perform factor analysis (P = 0.0001). Items with a factor load of 0.40 were excluded. After calculating the correlation between variables, the extraction of factors from the main factor was performed by varimax rotation (Eigenvalues > 1). In this stage, variables with high correlation with each other were categorized into 1 class or factor. Item 28 was excluded as it did not fit into any factors. The scree plot showed that 5 factors had the required adequacy to explain the factorial construct validity of resilience scale in patients with cardiovascular and respiratory diseases.

The extracted factors explained 69.8% of the total variance. After the extraction of factors, each factor was named according to its items, and the consistency rate of these factors with resilience concepts and domains determined in the qualitative section was evaluated. The first factor (active compatibility) had 10 items, the second factor (self - management) and the third factor (logical empowerment) had 7 items each, the fourth factor (adherence to treatment) had 3 items, and the fifth factor (spirituality) had 2 items.

According to the results, participants with higher edu-

**Table 1.** Resilience Scores Based on Demographic Variables

| Variable | Number | Standard Deviation | Mean |
|---|---|---|---|
| **Gender** | | | |
| Male | 241 | 23.6 | 112.9 |
| Female | 134 | 21.9 | 114.8 |
| **Marital status** | | | |
| Single | 32 | 31 | 113.6 |
| Married | 260 | 21.3 | 115.7 |
| Deceased spouse | 83 | 23.9 | 108.6 |
| **Disease** | | | |
| Cardiovascular | 211 | 22.8 | 113.7 |
| Respiratory | 147 | 23.2 | 114.6 |
| Cardiorespiratory | 17 | 22.7 | 102.8 |
| **Income** | | | |
| Below 250 $US | 79 | 26.6 | 106.7 |
| 250 - 500 $UD | 122 | 21.7 | 112.9 |
| 500 - 750 $UD | 139 | 21.9 | 115.2 |
| Above 750 $UD | 35 | 18.3 | 124.8 |
| **Economic status** | | | |
| High | 22 | 23.1 | 125 |
| Moderate | 138 | 21.9 | 116.2 |
| Low | 122 | 22.3 | 113 |
| Never | 93 | 24.3 | 107.8 |
| **Education** | | | |
| Elementary to high school | 62 | 23.9 | 106.9 |
| High school to diploma | 84 | 23.8 | 109.5 |
| High school diploma | 112 | 22.6 | 114.8 |
| University | 117 | 21.1 | 118.8 |
| **Job** | | | |
| Unemployed and housewife | 69 | 23.9 | 108.6 |
| Employee | 120 | 22.8 | 113.7 |
| Self - employed | 100 | 21.8 | 117.3 |
| Other | 86 | 23.5 | 113 |
| **Duration of the disease (year)** | | | |
| < 2 | 64 | 22.7 | 112.4 |
| 2 - 5 | 124 | 22.2 | 116.2 |
| 5 - 10 | 114 | 23.3 | 112.2 |
| > 10 | 72 | 24.4 | 112.4 |

**Table 2.** Internal and External Consistency Rates of Resilience Subscales in Patients with Cardiovascular and Respiratory Diseases

| Factor | Subscale | Number of Phrases | Cronbach's Alpha Coefficient | Correlation |
|---|---|---|---|---|
| **1** | Active compatibility | 17, 18, 19, 20, 21, 22, 23, 24, 29, 30 | 0.943 | r = 0.942 |
| **2** | Self - management | 5, 6, 7, 8, 9, 10, 11 | 0.919 | r = 0.882 |
| **3** | Logical empowerment | 1, 2, 3, 4, 15, 16, 25 | 0.883 | r = 0.892 |
| **4** | Adherence to treatment | 12, 13, 14 | 0.777 | r = 0.733 |
| **5** | Spirituality | 26, 27 | 0.908 | r = 0.491 |
| **Total scale** | | 29 items | 0.963 | r = 1 |

**Table 3.** Factors, Items, and Factor Loads

| Factors | Items | Factor Load |
|---|---|---|
| **Active compatibility** | In spite of the disease I have, I am not isolated. | 0.746 |
| | In spite of the disease I have, I perform daily activities as much as possible. | 0.742 |
| | In spite of the disease I have, I have a positive attitude toward life. | 0.739 |
| | My behavior is not influenced by the disease. | 0.725 |
| | I may have been weakened by the disease, but I have not broken down. | 0.705 |
| | I use all my abilities and means to control the complications of the disease. | 0.627 |
| | When I get disappointed by the disease, I try to engage myself in an activity. | 0.612 |
| | In spite of my illness, I am hopeful about my life. | 0.603 |
| | Despite the limitations imposed by my illness, I enjoy my life. | 0.575 |
| | I have accepted my illness, but I have not surrendered. | 0.551 |
| **Self - management** | I try to manage my stresses. | 0.766 |
| | I have control over my illness. | 0.761 |
| | I believe I will achieve whatever I have planned for my illness. | 0.730 |
| | With the passage of time, I feel I have had favorable changes in dealing with my illness. | 0.715 |
| | During my illness, I concentrate more on my capabilities than on my weaknesses. | 0.637 |
| | I believe in my abilities to confront my illness. | 0.579 |
| | I am self - confident. | 0.524 |
| **Logical empowerment** | Former experiences help me stand against my illness. | 0.692 |
| | I have a logical approach to my illness. | 0.651 |
| | My illness is a problem that has to be solved. | 0.634 |
| | My approach to dealing with my illness is better than the first days. | 0.629 |
| | I try to enhance my abilities in coping with my illness. | 0.594 |
| | Illness has made me appreciate my life. | 0.536 |
| | I feel powerful by controlling my illness. | 0.536 |
| **Adherence to treatment** | I do not adhere to non-pharmaceutical suggestions like diet and activities. | 0.797 |
| | I have changed my lifestyle according to my illness. | 0.718 |
| | I adhere to the therapeutic recommendations of doctors and nurses. | 0.641 |
| **Spirituality** | I remember God more at difficult times of my illness. | 0.928 |
| | My spiritual beliefs have helped me to tolerate my illness more. | 0.879 |

cation were more resilient. The resilience scores were compared among patients with the 4 educational levels of illiterate, elementary to high school education, high school diploma, and university education. The findings revealed a significant difference between the resilience scores of patients with university education and illiterate patients and patients with elementary to high school diploma education (P = 0.001). Further, the Spearman correlation coefficient between the resilience score of patients with cardiovascular and respiratory diseases and the resilience score

of CD - RISC was 76% (P = 0.0001), indicating the 2 scales were not exactly similar; and the convergent validity of the scale was also confirmed.

D) Reliability: Cronbach's alpha coefficient for the 29 - item resilience scale of patients with cardiovascular and respiratory diseases was 96.3, confirming the internal consistency of the scale. The intraclass correlation coefficient between the 2 tests, with a 2 - week interval, was 94.3 (P = 0.0001). In the whole 29 - item questionnaire, the floor effect was 0% and the ceiling effect was 2%.

## 5. Discussion

The current study aimed at developing and validating resilience scale in patients with cardiovascular and respiratory diseases. The final version of the scale consisted of 29 items and 5 domains, including active compatibility, self-management, logical empowerment, adherence to treatment, and spirituality. The obtained findings showed that this scale had acceptable validity and reliability. Due to the lack of a specific resilience scale for patients with cardiovascular and respiratory diseases, it is necessary to report the development and validation of this valid and reliable scale. The first domain (active compatibility), with 10 items, had maximum internal consistency ($\alpha = 0.943$). CD - RIS is theoretically based on adaptation and confrontation; hence, in this scale resilience means successful confrontation (12). The RS of Wagnild and Young aims to determine people's degree of resilience and positive personality traits to enhance adaptation (25).

The second domain was self - management with 7 items. People should at first identify the event causing stress, which is not always possible. Further, people may not know how to change the conditions directly. More interestingly, many studies and theories of resilience revolve around conditions that are hard to be changed such as an illness in its final stages (5).

The third domain of the scale was logical empowerment with 7 items. Youth resiliency- assessing developmental strengths (YR - ADS) considers empowerment as a factor causing resilience. However, the above scale cannot analyze the resilience changes over time (12). The fourth domain of the scale was adherence to treatment, which had the minimum internal consistency ($\alpha = 0.777$). None of the resilience scales had domains related to adherence to treatment, which indicated that this scale was especially designed for patients with cardiovascular and respiratory diseases. The patients' tendency toward adhere to treatment recommendations can be attributed to their consciousness. Consciousness is a personality trait related to resilience in the patients with chronic diseases who tend to get things done dutifully in order to achieve success (26). The last domain of the scale was spirituality with the minimum number of items. Religiousness is one of the eight domains of South African adult resilience indicator psychometrically assessed by Kotze et al. (27).

Resilient people believe in a supreme power that helps them to solve their problems. One of the domains of the widely used CD - RIS is spiritual influence. However, the developers of this scale suggested only the total score of scale be reported due to lack of validity and reliability of domains (22). The scale in the current study was specialized and covered larger domains of resilience in patients, compared with the existing resilience scales.

At present, there are fifteen resilience scales, only 8 of which have clinical applications. Windle believes that there is no gold standard to measure resilience (12). The target population of RS, YR - ADS, ego resiliency, and resilience scale for adolescents (READ) is adolescents, and no factor analysis is reported for situational resilience scales, California resilience scale and READ. RS and California resilience scale have not reported the reliability of their domains. The Cronbach's alpha level for each domain of RSA, READ, ego resilience, and situational resilience scale is less than 0.70. Moreover, the widely used CD - RISC lacks convergent validity and the type of ICC reported for it is also indefinite. Designing this tool, due to lack of a resilience tool specifically designed for patients with cardiovascular and respiratory (and even physical) diseases is of great importance. Data from 15 resilience tools, focused on orphan children and psychological patients in the West, was collected. Unlike previous studies, in the current study floor - ceiling effect was reported. The current study was new because of studied resilience only in Iranian patients with chronic cardiovascular and respiratory diseases and the collected data were all based on the culture and context of the samples. One of the most important limitations of the current study was lack of another tool to study resilience in patients with physical complications, due to which the concurrent validity could not be examined. It is recommended that this tool be used to examine resilience in patients with physical diseases.

The findings of the current study showed that the resilience scale of patients with cardiovascular and respiratory diseases developed based on the definition of resilience was a simple, valid, and reliable tool to measure resilience in such patients.

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## Footnotes

**Authors' Contribution:** Study concept and design: Reza Ghanei Gheshlagh and Abbas Ebadi; data acquisition: Abbas Ebadi; data analysis and interpretation: Abbas Ebadi and Asghar Dalvandi; manuscript drafting: Kian Nourozi Tabrizi; study supervision: Abbas Ebadi.

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