Validity and Reliability of the Scale, Role Taking in Caregivers of People with Chronic Disease, ROL

ORIGINAL

Abstract

Background: To determine face, content, and construct validity, and internal consistency of ROL scale.

Methods and Findings: A three-phase study was conducted. First, content analysis of the scale was carried out consulting 10 professional experts. Then, face validity was analyzed with 60 caregivers. Finally, construct validity was evaluated by performing an exploratory factor analysis (EFA) with 110 participants. Internal consistency of ROL scale was also assessed. Face validity of ROL scale reached a high acceptance index in three dimensions: role performance (0.97), role organization (0.98), and response to the role (0.98). Content validity showed coherence, clarity, and relevance of the scale. From factor analysis, three components emerged and were grouped in the same manner for varimax, quartimax, and equimax rotations. Cronbach's alpha was 0.816, which is an acceptable overall value.

Conclusion: ROL scale makes objective the concept of role taking in family caregivers of people with chronic disease. It demonstrated to have acceptable reliability, and construct, face, and content validity to be used in the Colombian context.

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Introduction

Chronic non-communicable diseases (CNCDs) represent the main cause of morbidity and mortality in the world. In developing countries, 75% of deaths are due to CNCDs [1], which shows an increasing trend owing to the epidemiological profile of these countries, especially in Latin America where this phenomenon has become a major public health issue [2-4].

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People with CNCDs have progressive loss of functional ability, which leads to become partly or fully dependent for performing basic living activities [5, 6]. It entails direct and ongoing supervision in clinical and home settings, and family caregivers' involvement. Usually, these caregivers are people with family bonds who, out of a sense of responsibility and commitment to the other, take over care-related tasks [7].

Family caregivers must carry out a series of instrumental activities for which they are not prepared. It involves new challenges to take on, which bring about changes in their personal, professional, economic and social lives [8, 9]. These changes comprise a transition as the family member moves from being husband, mother, father, son, or brother of a healthy person to being caregiver of a person with CNCD. For caregivers, this transition brings about stressors, relationship changes, expectations about care tasks, and new knowledge [10, 11].

A person's transition into family caregiver affects the balance of the live they have normally led, because they are faced to respond with undeveloped skills and factors that upsets a new role taking. Caregivers can adapt themselves to role shifting [12], but during transition, they might experience bewilderment, desires of leaving their caregiving tasks, loss of sense of purpose, disorientation, and disintegration of support systems, until they find a positive perspective of their tasks [13]. This eventually leads caregivers to adaptation, turning the new situation into an opportunity for continuous learning and personal satisfaction [11].

Transitions are cognitive, behavioral and interpersonal processes that must be periodically assessed. They can be based on interventions that allow role clarification, role modeling, and role rehearsal, permitting adaptation to patient and caregiver needs [11].

Each transition may or may not be healthful and is determined by outcome indicators. These indicators are related to caregiver's coping, self-confidence, learning, and satisfaction acquired by exercising their caregiving role. Having healthy practices allows development of process indicators: optimum role performance (task), role organization, and making sense of the exercise of the role [14].

In order to make objective the role-taking construct in family caregivers of people with CNCD, and using Afaf Meleis's Transitions Theory as conceptual framework [11], the authors of this study proposed an instrument called Role taking in Family Caregivers of People with Chronic Disease –ROL Scale–, which is an indicator for caregiver's role-taking process.

An indicator for caregiver's role taking process is proposed based on three aspects: 1) *Response to the role.* Caregiver's reactions to the experience of role taking. They represent caregivers' capacity to transcend or, on the contrary, if they express negative feelings about their task, they may lose the course of it. 2) *Role Organization.* It indicates the distribution of caregiving tasks, activity allocation, and social support to take breaks to rest and reduce mental and physical burden. 3) *Role performance.* It comprises caregivers' encounter with the shock of disease diagnosis, and their capacity to adapt themselves to caregiving tasks. It includes, among other aspects, performing caregiving activities, and adjusting things at home to meet patient's needs [11, 14].

In order to have a valid and reliable empirical indicator for role taking in family caregivers of people with CNCD in Colombia, the present study was conducted with the objective of determining internal consistency and face, content and construct validity of ROL Scale.

Method

Design
It was a validation study conducted in three phases between February and December 2017.

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Data collection instruments

ROL Scale. This instrument was previously developed by the researchers in an earlier study [15] that involved a literature review and aimed to measure the phenomenon of role taking in family caregivers of people with CNCD. ROL Scale is a process indicator with three dimensions that correspond to role taking attributes: role performance (7 items), role organization (8 items), and response to the role (7 items). It is a Likert-type scale that consists of 22 items with five response options ranging from 1 (Never) to 5 (Always). Response scores range from 22 to 110: the higher the score, the greater the caregiver's role taking.

Phases

Content Validity

To validate content, eleven health professionals from Colombia, Chile, Mexico, Peru, and Argentina, with master's degrees and expertise in care of patients with CNCD and family participated in the study. They evaluated items' clarity, relevance, and coherence, using a three-point Likert scale. First, agreement index was established by calculating Fleiss' kappa index. Then, content validity ratio (CVR) was calculated for each item. Finally, content validity index (CVI) was calculated using Lawshe's Index modified by Tristan [16] for clarity, relevance, and coherence aspects.

Face Validity

It was assessed with 60 caregivers enrolled in the supportive outreach program "*Cuidando a cuidadores*" (Caring for caregivers) held by the School of Nursing. These caregivers rated the items as comprehensible, barely comprehensible, and incomprehensible. A comprehensibility index was established, ranging from 0 (utterly incomprehensible) to 1 (utterly comprehensible). Comprehensibility was assessed for each item, for the overall scale and for its dimensions.

Construct Validity and Reliability

Taking a rate of five informants per item, as recommended by Gorsuch cited by Lloret Segura [17], a sample of 110 family caregivers of people with CNCD from Bogotá city was used to assess construct validity and reliability of the scale. Inclusion criteria for participants at this stage were being family caregiver of a person with CNCD, being 18 years old or older, and having been playing a caregiving role for six months or more. The sample was drawn from family caregivers enrolled in the outreach program above mentioned in 2017. Once participants were identified and inclusion criteria was checked, research assistants explained the aims of the study, and the caregivers signed the informed consent forms. ROL scale was filled out by the participants with the help of research assistants.

Sampling adequacy was measured by Kaiser-Meyer-Olkin (KMO) test, which was 0.835; Bartlett's test of sphericity was significant p=(0.000), and the measure of sampling adequacy showed values above 0.8 for all items. Once the previous tests had been conducted, it was determined that performing an exploratory factor analysis (EFA) was feasible. EFA was performed using principal components analysis method, extracting three factors, and using three rotation methods: varimax, quartimax, and equimax. Additionally, reliability was analyzed by estimating Cronbach's alpha internal consistency coefficient, with the same caregivers who participated in the construct validity process.

Ethical considerations

This study was framed within the ethical principles for conducting research involving human subjects. Participants in this study signed an informed consent form. Furthermore, approval was obtained from people in charge of the outreach program from which participants were recruited.

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Results

Phase 1. Content Validity

Fleiss' kappa index showed a strength of agreement between almost perfect agreement and substantial agreement on the three aspects the expert judges had to evaluate: almost perfect for coherence (0.85), substantial for clarity (0.67), and almost perfect for relevance (0.93).

Table 1 presents Content Validity Ratio (CVR) for each item and aspect of interest: coherence, clarity and relevance. An acceptable assessment from CVR is observed for all 22 items.

Table 2 presents Content Validity Index (CVI) for each aspect of interest. An acceptable assessment from CVI is observed in all three aspects.

Table 1. Proportion of expert judges who evaluated an item "positively" (CVR).

| Item | Aspect of interest | | | CVR Interpretation |
| | Coherence | Clarity | Relevance | |
	%	%	%	
1	100	100	100	
2	100	100	100	
3	100	100	100	
4	80	60	90	
5	100	90	100	
6	90	70	100	
7	90	70	100	
8	100	90	100	
9	90	80	100	
10	80	70	100	
11	100	90	90	Acceptable
12	90	90	80	
13	100	90	100	
14	100	90	100	
15	100	70	100	
16	100	70	100	
17	90	100	100	
18	90	80	100	
19	100	90	100	
20	100	90	100	
21	80	100	90	
22	100	100	100	
Source: study data.				

Table 2. Content Validity Index (CVI).

| Aspect of interest | CVI | Interpretation |
	%	
Coherence	94.55	
Clarity	85.91	Acceptable
Relevance	97.73	
Source: study data.		

Phase 2. Face

Validity

The following are demographic characteristics of caregivers who participated in the face validation process. **(Table 3)**

The participants for this stage were 60 family caregivers of people with CNCD. From the results ob-

Table 3. Sample characteristics Phase 2.

| Variable | % |
	n=60
Age	
Standard deviation	8.34
Min	39
Max	67
Mean	47.56
Gender	
Male	23.33
Female	76.66
Educational Attainment	
Elementary School diploma	30
Incomplete Elementary School	18.33
High School diploma	21.66
Incomplete High School	30
Place of Origin	
Bogotá	38.33
Boyacá	10
Cundinamarca	51.66

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Variable	%
	n=60
Marital Status	
Single	20
Married	60
Non-marital cohabitation	20
Occupation	
Homemaker	63.33
Employee	23.33
Free-lancer	13.33
Socioeconomic Status	
1	20
2	26.66
3	53.33
	Source: Research data

Variable	%
	n=110
Educational Attainment	
Elementary School diploma	3.33
Incomplete Elementary School	1.67
High School diploma	20.00
Incomplete High School	8.33
Complete Technical Training	21.67
Technician	1.67
Bachelor's degree	28.33
Postgraduate degree	15.00
Place of Origin	
Bogotá	10
Bolívar	1.67
Boyacá	13.33
Cúcuta	1.67
Cundinamarca	65
Magdalena	1.67
Sucre	1.67
Tolima	5.00
Marital Status	
Single	21.67
Married	36.67
Divorced	15
Widowed	13.33
Non-marital cohabitation	13.33
Occupation	
Homemaker	36.67
Employee	15.00
Free-lancer	16.67
Other	31.67
Socioeconomic Status	
1	3.33
2	5.00
3	48.33
4	30.00
5	10.00
6	3.33
	Source: Research data

tained, a high comprehensibility index was evident in each dimension of the instrument: role performance (0.978), role organization (0.970), and response to the role (0.983). Overall acceptance index for the instrument was 0.977. Comprehensibility of each item was above 0.9, in all cases.

The participants had no observations or suggestions about the items in terms of comprehensibility, redundancy or missing content. The average time to fill out the scale was 10 minutes.

Phase 3. Construct Validity and Reliability

Table 4 presents demographic characteristics of the caregivers who participated in this phase.

Table 4. Sample characteristics Phase 3.

Variable	%
	n=110
Age	
Standard deviation	10.419
Min.	31
Max.	75
Mean	58.98
Gender	
Male	15.00
Female	85.00

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Table 5. Factor Analysis Rotations.

Rotated component matrix[a]			
ROL	**Component**		
	1	**2**	**3**
Varimax			
1	-,022	-,238	,574
2	,047	,040	,593
3	,160	-,177	,499
4	,297	,248	,426
5	-,129	-,004	,780
6	-,160	,005	,664
7	-,171	-,137	,723
8	,429	,573	-,006
9	,193	,615	-,241
10	,405	,682	,031
11	,537	,546	,038
12	,089	,713	-,012
13	,197	,542	,218
14	-,107	,606	,101
15	,137	,260	,119
16	,569	,302	,009
17	,584	,340	-,047
18	,743	,250	-,117
19	,710	,056	-,087
20	,667	,011	-,026
21	,734	,234	-,089
22	,832	,117	,015
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. [a]: Rotation converged in five iterations.			

Rotated component matrix[a]			
ROL	**Component**		
	1	**2**	**3**
Quartimax			
1	-,243	-,080	,567
2	,035	-,016	,595
3	-,180	,108	,512
4	,282	,265	,426
5	-,011	-,136	,779
6	-,006	-,166	,662
7	-,149	-,162	,723
8	,614	,367	-,008
9	,630	,129	-,245
10	,721	,331	,029
11	,600	,476	,038
12	,714	,082	,003
13	,561	,136	,215
14	,592	-,171	,095
15	,274	,107	,118
16	,240	,598	,006
17	,399	,546	-,045
18	,325	,713	-,113
19	,130	,701	-,081
20	,081	,662	-,020
21	,309	,707	-,084
22	,204	,815	,021
Extraction Method: Principal Component Analysis Rotation Method: Quartimax with Kaiser Normalization [a]: Rotation converged in five iterations.			

Rotated component matrix[a]			
ROL	**Component**		
	1	**2**	**3**
Equimax			
1	-,012	-,237	,575
2	,059	,041	,592
3	,168	-,177	,496
4	,425	,242	,304
5	-,126	-,003	,781
6	-,156	,007	,664
7	-,170	-,135	,724
8	,440	,564	-,007
9	,203	,611	-,241
10	,419	,674	,031
11		,548	,036
12		,092	,713
13	,208	,538	,218
14	-,094	,608	,103
15	,142	,257	,119
16	,313	,563	,008
17	,591	,329	-,049
18	,747	,235	-,120
19	,710	,043	-,090
20	,667	-,002	-,029
21	,738	,220	-,092
22	,834	,101	,011
Extraction Method: Principal Component Analysis Rotation Method: Equimax with Kaiser Normalization [a]: Rotation converged in five iterations.			
Source: study dada.			

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Construct Validity

Table 5 shows the data grouped into the three components and for each rotation method used for this study.

Component 1: items from 1 to 7.
Component 2: items from 8 to 15.
Component 3: items from 16 to 22.

In equimax rotation, the items are grouped in the same manner, except for item 16, which was included into Component 2.

Reliability

Internal consistency reliability, as measured by Cronbach's alpha, was 0.816, which is an acceptable overall value. Item-by-item reliability showed from acceptable to reliable indices for the three components: role performance (0.767), role organization (0.835), and response to the role (0.801).

Discussion

This study describes the process of designing and validating an instrument to measure role taking in family caregivers of people with CNCD, which is conceptually and psychometrically appropriate. The results of item clustering in this study are coherent with the three dimensions conceptually proposed. Furthermore, this study established that psychometric properties for each item, each dimension, and the overall scale were acceptable to Colombian context.

Regarding conceptual development of ROL scale proposed by the researchers in a previous study [15], it was observed that the experts supported such conceptual development during the content validation phase, as their opinions were considerably high. Most of them evaluated each of the items positively; this with regard to what was proposed by Lawshe and later modified by Tristan [16, 18].

The results from the exploratory factor analysis of the instrument showed three components for varimax, quartimax and equimax rotations, in which the item clustering is distributed in the same manner for the three components. This confirms the role taking dimensions theoretically proposed by the researchers in their previous study [15]. These dimensions are related to the three aspects of a process indicator for caregiver's role taking proposed by the instrument: 1) response to the role, 2) role organization, and 3) role performance.

Regarding the first dimension proposed for ROL scale, response to the role, which comprises aspects such as experience and positive contribution caregivers get when caring for a person with CNCD, several authors have pointed out the importance of finding meaning when providing care for a relative and its impact on variables such as caregiving overburden, stress, anxiety, and depression. In this dimension, item 4 showed low factorial load. This item states: "*I think that being a caregiver is just one of the roles I have*". A reasonable explanation for this behavior may be the relationship between caregivers' occupation, which for most of the participants was homemaking, and the fact that, in Colombia, in many cases, family caregivers take over this task exclusively, and without assistance, which leaves no room for performing other roles [19-21].

Regarding role organization dimension, which refers to the way caregivers arrange and plan patient's care, it was found that this dimension is related to tree of the dimensions of the scale Quality of Life in Life Threatening Illness – Family Carer Version QOLLTI-F [22]. This scale raises issues such as the importance of caregivers' health and the time to take care of themselves, their meaning of care, and their relationship with the patient and others. The relation between the dimensions of both scales supports what some authors have suggested: the possible implications a lack of role taking has for specific aspects in caregivers' quality of life, such as physical health, social relations, financial costs, and employment [23, 24]. With regard to the performance of the item 15 "*I have*

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allocated the financial resources to care for my relative", it scored low. We consider that the scores obtained are a result of caregivers' socioeconomic and family context, since organization of economic resources does not depend only on caregivers and their management abilities, but also on patient's decisions, consensus among family members, socioeconomic status, and other available financial support for patient care [25, 26].

Regarding the dimension "role performance", which refers to the knowledge and techniques that caregivers acquire to care for the patient, it was found that all items fit well into this dimension according to varimax rotation results. Different studies exploring the experience of caring for a patient with CNCD found that learning and acquiring skills to care for the patient were among the most important needs for caregivers, from skills such as feeding, to administering high-risk medications like opioids and anticoagulants [27, 28]. As to the importance of role performance dimension, it can be inferred from different studies that, in most of the cases, the gateway to caregiving role is hospitalization, because patients are later discharged with a long list of medical instructions, for which caregivers are not prepared, but they are responsible to follow them. Therefore, their priorities focus on that basic knowledge and those skills that will ensure proper care of the patient, and then move on to other aspects of care [24, 29]. The importance of this dimension is also present in different scales available to measure caregivers' ability to provide care to patients. For example, CUIDAR scale that measures home care competence in people with CNCD [30]; PBH-LIC: D scale that focuses on caregivers practical skills in caring for people with dementia [27], and PCS scale that measures preparedness for caregiving people with CNCD [31].

Some limitations of this study include the use of convenience sampling to get subjects enrolled as well as the homogeneity of the participants included. As shown in Table 3, most of them were people with average educational attainment and middle socioeconomic status. Future researches can measure preparedness for caregiving role taking in population with lower education and socioeconomic status and living in other parts of Colombia.

Regarding sample size, this study took into account Gorsuch's recommendations [17], which indicate that five participants per item may be enough to perform an EFA. However, statistical guidelines suggest that samples from five to twenty participants per observed variable (item) are necessary for confirmatory factor analysis [32, 33]. Therefore, future researches are needed using larger samples per item in order to confirm factors found in this study.

Among the strengths, it is important first to highlight the novelty of this type of scale, as it is the only instrument on caregivers of patients with CNCD that measure their caregiving role taking. Other instruments have been developed for measuring caregiving skills, preparedness for caregiving, caregivers overburden, but not for measuring role taking. Additionally, ROL scale is grounded in Meleis' Transitions Theory [14]. Following its theory principles, ROL scale measures role taking as a process that begins with role organization, passing through the performance of tasks and ending with the results achieved by being a caregiver of a patient with CNCD.

Conclusions

ROL scale makes objective the concept of role taking in family caregivers of people with CNCD in three aspects: response to the role, role organization, and role performance. According to psychometric measurements carried out for this study, ROL scale proved to have acceptable content, face, and construct validity, as well as acceptable reliability in a sample of family caregivers of people with CNCD in Colombia. ROL scale is a tool recommended for

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health professionals to measure how family caregivers have taken their role of caring a person with CNCD.

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