



EMPIRICAL STUDIES

Self-Care Dependency Evaluation Form: Psychometric properties of the revised version with 27 items

Paulo Parente PhD MSc RN, Professor¹ | Andreia Costa PhD MSc RN, Professor² |
Soraia Pereira MSc RN, Nurse³ | Paulo Machado PhD MSc RN, Professor^{1,4}  |
Teresa Martins PhD MSc RN, Professor^{1,4}  | Filipe Pereira PhD MSc RN, Professor¹ |
Abel Silva PhD MSc RN, Professor¹

¹Escola Superior de Enfermagem do Porto (ESEP), Porto, Portugal

²Escola Superior de Enfermagem de Lisboa, Lisboa, Portugal

³ACES Entre Douro e Vouga I – Feira/Arouca, Santa Maria da Feira, Portugal

⁴CINTESIS (Center for Research in Health Technologies and Services), Porto, Portugal

Correspondence

Teresa Martins, Escola Superior de Enfermagem do Porto, Rua António Bernardino de Almeida; 4200-072 Porto-Portugal.

Abstract

Introduction: The Self-Care Dependency Evaluation Form assesses dependency in performing self-care activities, but its original version is extensive and provides redundant information. The present study aims to scrutinise the items of the scale with the purpose of creating a revised version and to evaluate its psychometric properties.

Methods: The study was conducted in two phases. In the first phase, an exploratory and correctional analysis of the items of the original form was performed from a database with 282 participants, followed by a review by a panel of experts who analysed the discriminatory ability and the contribution and relevance of each item, which resulted in the revised version. In the second phase, a new study with a sample comprising 150 participants was conducted to test the psychometric properties of the revised version. All ethical aspects and matters of confidentiality and privacy were assured.

Results: The scale with 27 items shows good internal consistency, ranging from 0.67 (taking medication) to 0.96 (walking). It was moderately correlated with the Barthel Index and the Lawton and Brody Scale, proven to be a discriminatory measurement instrument.

Discussion/Conclusion: This measure will enable health professionals to better evaluate self-care activities and provide more efficient, simple and effective prescriptions.

KEYWORDS

quantitative approaches, instrument development, disability, gerontology

INTRODUCTION

Growing socio-demographic changes, along with the significant increase in the ageing population and prevalent chronic diseases (1), highlight the need for more knowledge of dependency in self-care.

Assessing patients' self-care abilities through the use of measurement tools and the assessment of type and level of dependency allows nurses to perform rigorous and systematic work in the promotion and evaluation of patients' autonomy,

as well as in the evaluation of health gains, which greatly contributes to the increased visibility of nursing therapeutics (2–5).

Despite the existence of some measures that assess autonomy/functionality, they present some constraints on their clinical use. Most of these measures fail to provide information on the limitations of actions allowing the performance of the activities of daily living, or are essentially adapted to certain pathologies (such as dementia, stroke), or because the results of their application often lead to

effects of ceiling, with little discriminatory value. This explains the need to use a measure that identifies the activities that comprehend a self-care action, thus facilitating the diagnosis and therapeutic orientation of patients' recovery/adaptation. The Self-Care Dependency Evaluation Form (SCDEF) was developed based on the Nursing Outcomes Classification (6) to determine the self-care abilities of patients with dependencies on. Each self-care was operationalised through a set of activities that contribute to an action/task. As an example, the ability in self-bathing requires the capacity to gather the necessary bathing materials (towel, shower gel...), open the tap and controlling the water temperature and be able to perform the movements to wash the body. The evaluation of these activities allows the health professional to identify aspects that need to be carefully addressed with the person to achieve greater autonomy in this particular self-care.

In its original version, part of an academic study, the author (7) attested to its clinical validity, ease of use and internal consistency. The SCDEF has been used in a set of academic studies designed to characterise the prevalence of families with dependent persons and to characterise patients with impaired self-care, describing the health condition (degree of dependency and complications), attributes and care needs.

The original SCDEF presents 9 domains (Table 1), in which each item is measured on an ordinal scale scored between one and four: 1 – dependent unable to perform, even with another person's help; 2 – dependent needs help from another person; 3 – needs assistive devices; and 4 – completely independent. Scores are calculated for each domain. Higher scores indicate greater autonomy. Although the instrument shows good psychometric properties and is useful for research, its 67 items were revealed to be excessive and very likely to provide redundant information, thus hindering the instrument's applicability in a clinical context (8–10).

There are no hard-and-fast rules guiding the minimum number of items that a measure should contain in each domain, but keeping a measure concise is an effective means of minimising response biases caused by boredom or fatigue (11). However, some authors suggest three to six items for each construct (11,12).

The present study aims to scrutinise the SCDEF with the purpose of creating a short form and evaluating its psychometric properties. This investigation was divided into two steps. The first step used data from the studies conducted in the doctoral programme of two authors to create a revised version. In the second step was conducted a new study that aimed to analyse the psychometric properties of the revised version and propose a short form.

MATERIALS AND METHODS

Step 1: Analysis of the contribution and relevance of each item of the SCDEF long version

With the purpose of analysing the best items of the SCDEF with 67 items to create a revised version, a secondary study based on data from two Portuguese population-based exploratory studies (using random spatial sampling calculated with ArcGIS® software) was conducted. One of the studies was conducted in the district of Porto (9), and the other was conducted in the district of Lisbon (10). These studies aimed to determine the prevalence of households with persons with dependences in self-care and to characterise these families. The questionnaires were applied to the dependent person or a close relative at home by a nurse.

Across both studies, the database included information on 282 persons identified to have impairments in self-care. These participants were assessed using the SCDEF with 67 items. A descriptive and exploratory analysis item to item was performed. This information was presented to a panel of experts comprised of seven researchers from a research department in the area of self-care. If an item showed a correlation of ≥ 0.95 with another item in the same domain, the exclusion of one of the items was suggested. The researchers analysed the relevance and clinical contribution of each item for the self-care domain under analysis and decided which items to delete.

Step 2: Analysis of the psychometric properties of the revised version

A new study was outlined to evaluate the psychometric properties of the revised version of the SCDEF, initially with 29 items selected in the previous phase by the panel of experts. A cross-sectional study was conducted, and a non-probabilistic random sample was used. The sample size must be set according to the extension of the instrument, with 5–10 participants deemed acceptable for each item (13). In accordance with the number of items of the version under analysis, the sample was composed of 150 persons dependent on self-care. From these participants, 57 were recruited through Home Support Services and 93 persons from two day care centre institutions, which provided assistance to dependent residents of a city in the northern region of Portugal. The eligibility criterion was that the person had to be dependent on at least one basic activity of daily living, meaning that the dependent person needed assistance from another person to perform that activity. The questionnaires were applied to the dependent person or a close relative in the institutional context by a nurse.

TABLE 1 Original SCDEF-67 items: Items analysis per domain in the first study.

Item	Dependent but not participating	Needs help from another person	Needs assistive devices	Completely independent
Feeding $\alpha = 0.97$				
1 prepares food to ingest*	140 (52.0%)	39 (14.5%)		90 (33.5%)
2 opens recipients*	84 (31.1%)	34 (12.6%)	1 (0.4%)	151 (55.9%)
3 uses utensils	55 (20.3%)	20 (7.4%)	1 (0.4%)	195 (72.0%)
4 places food in the utensils	48 (17.7%)	26 (9.6%)	2 (0.7%)	195 (72.0%)
5 holds glass or cup*	43 (15.8%)	18 (6.6%)	2 (0.7%)	209 (76.8%)
6 takes food to the mouth using the hand or fingers	43 (15.9%)	15 (5.6%)	1 (0.4%)	211 (78.1%)
7 takes food to the mouth using a recipient	44 (16.2%)	15 (5.5%)	1 (0.4%)	212 (77.9%)
8 takes food to the mouth using the utensils*	45 (16.5%)	16 (5.9%)	2 (0.7%)	209 (76.8%)
9 drinks from glass or cup	41 (15.1%)	16 (5.9%)	3 (1.1%)	212 (77.9%)
10 places food in the mouth	44 (16.2%)	16 (5.9%)	1 (0.4%)	211 (77.6%)
11 finishes a meal	43 (15.8%)	24 (8.8%)	2 (0.7%)	203 (74.6%)
Walking $\alpha = 0.96$				
1 holds the body in the upright position*	38 (14.3%)	26 (9.8%)	103 (38.9%)	98 (37.0%)
2 ambulates with firm steps, different rhythm	45 (17.0%)	31 (11.7%)	125 (47.2%)	64 (24.2%)
3 goes up and down stairs*	56 (21.2%)	51 (19.3%)	113 (42.8%)	44 (16.7%)
4 ambulates ascending and descending steep slopes	50 (19.2%)	41 (15.8%)	117 (45.0%)	52 (20.0%)
5 walks short distances (<100 m)	48 (18.4%)	23 (8.8%)	125 (47.9%)	65 (24.9%)
6 walks average distances (>100 m < 500 m)*	67 (25.9%)	43 (16.6%)	102 (39.4%)	47 (18.1%)
7 walks long distances (>500 m)	94 (36.9%)	44 (17.3%)	82 (32.2%)	35 (13.7%)
Getting ready $\alpha = 0.99$				
1 combs the hair*	75 (27.2%)	34 (12.3%)		167 (60.5%)
2 maintains oral hygiene*	45 (31.0%)	26 (17.9%)		74 (51.0%)
3 shaves	35 (31.8%)	11 (10.0%)		64 (58.2%)
4 puts on makeup	99 (36.4%)	90 (33.1%)		83 (30.5%)
5 cares for nails*	58 (23.0%)	25 (9.9%)		169 (67.1%)
6 uses a mirror	63 (27.2%)	28 (12.1%)		141 (60.8%)
7 puts deodorant*	74 (27.3%)	53 (19.6%)		144 (53.1%)
8 cleans area around perineum	74 (27.0%)	40 (14.6%)		160 (58.4%)
9 cleans ears	63 (23.0%)	22 (8.0%)		189 (69.0%)
10 keeps nose clean and clear	66 (24.7%)	38 (14.2%)		163 (61.0%)
Bathing $\alpha = 0.98$				
1 provides objects for bathing*	93 (33.1%)	75 (26.7%)	2 (0.7%)	111 (39.5%)
2 manages to get water	87 (31.1%)	67 (23.9%)	1 (0.4%)	125 (44.6%)
3 opens the water tap*	85 (30.4%)	63 (22.5%)	1 (0.4%)	131 (46.8%)
4 regulates water temperature	87 (31.3%)	70 (25.2%)	1 (0.4%)	120 (43.2%)
5 regulates water flow	86 (30.7%)	74 (26.4%)	1 (0.4%)	119 (42.5%)
6 bathes in shower	81 (29.2%)	99 (35.7%)	1 (0.4%)	93 (33.6%)
7 washes the body*	82 (29.2%)	106 (37.7%)	1 (0.7%)	91 (32.4%)
8 dries the body	81 (29.0%)	108 (38.7%)		90 (32.3%)
Using a wheelchair $\alpha = 0.87$				
1 moves the body from one side to the other in a wheelchair*	23 (59.0%)	8 (20.5%)	1 (2.6%)	7 (17.9%)
2 safely transfers from and to the wheelchair	24 (63.2%)	10 (26.3%)	1 (2.6%)	3 (7.9%)

(Continues)

Table 1 (Continued)

Item	Dependent but not participating	Needs help from another person	Needs assistive devices	Completely independent
3 handles the wheelchair in curves, access ramps and other obstacles, in slow, moderate and fast motion	25 (65.8%)	9 (23.7%)	1 (2.6%)	3 (7.9%)
Using the toilet $\alpha = 0.98$				
1 occupies and leaves the toilet	49 (18.0%)	46 (16.9%)	18 (6.6%)	159 (58.5%)
2 undresses	48 (18.2%)	54 (20.5%)	3 (1.1%)	159 (60.2%)
3 positions in toilet or bedpan*	51 (19.1%)	38 (14.2%)	5 (1.9%)	173 (64.8%)
4 performs personal hygiene after urinating or defecating	61 (22.5%)	60 (22.1%)	3 (1.1%)	147 (54.2%)
5 lifts from toilet*	49 (18.4%)	43 (16.1%)	20 (7.5%)	155 (58.1%)
6 arranges clothes after personal hygiene*	54 (19.9%)	55 (20.2%)	2 (0.7%)	161 (59.2%)
Taking medication $\alpha = 0.90$				
1 provides for medication	119 (43.8%)	58 (21.3%)		95 (34.9%)
2 prepares medication*	114 (41.6%)	52 (19.0%)	2 (0.7%)	106 (38.7%)
3 takes medication*	68 (24.8%)	47 (17.2%)	3 (1.1%)	156 (56.9%)
Dressing $\alpha = 0.96$				
1 chooses clothes*	88 (31.7%)	43 (15.5%)	1 (0.4%)	146 (52.5%)
2 ties with laces*	91 (32.7%)	51 (18.3%)	3 (1.1%)	133 (47.8%)
3 uses zippers	69 (24.9%)	39 (14.1%)	1 (0.4%)	168 (60.6%)
4 puts on socks*	73 (26.3%)	56 (20.1%)	1 (0.4%)	148 (53.2%)
5 takes off socks	76 (27.4%)	65 (23.5%)		136 (49.1%)
6 puts on shoes	73 (26.3%)	56 (20.1%)		149 (53.6%)
7 takes off shoes	76 (27.5%)	64 (23.2%)		136 (49.3%)
8 removes clothes from drawer or closet	77 (27.8%)	54 (19.5%)	1 (0.4%)	145 (52.3%)
9 holds clothes	76 (27.4%)	53 (19.1%)	1 (0.4%)	147 (53.1%)
10 able to dress upper part of the body	84 (32.6%)	43 (16.7%)		131 (50.8%)
11 able to dress lower part of the body*	76 (28.1%)	36 (13.3%)		158 (58.5%)
12 able to undress upper part of the body	86 (31.0%)	82 (29.6%)	3 (1.1%)	106 (38.3%)
13 able to undress lower part of the body	86 (31.0%)	78 (28.2%)	3 (1.1%)	110 (39.7%)
14 buttons the clothes*	83 (30.4%)	69 (25.3%)	7 (2.6%)	114 (41.8%)
15 unbuttons the clothes	83 (30.4%)	64 (23.4%)	4 (1.5%)	122 (44.7%)
Transferring/turning and lifting oneself $\alpha = 0.96$				
1 transfers oneself from bed to the chair/sofa*	43 (16.0%)	40 (14.9%)	40 (14.9%)	145 (54.1%)
2 transfers oneself from chair/sofa to the bed*	43 (16.0%)	41 (16.1%)	40 (15.7%)	131 (51.4%)
3 moves the body, shifting from one side to the other*	40 (14.6%)	23 (8.4%)	5 (1.8%)	206 (75.2%)
4 lifts part of the body*	43 (15.5%)	42 (15.2%)	42 (15.2%)	150 (54.2%)
SCDEF Global $\alpha = 0.99$				

*Items integrating the revised version to be examined in step 2.

Measures

In the first step, the long version of the SCDEF was used. In the second step, in addition to the SCDEF revised experimental version (29 items), Portuguese versions of the Barthel index (BI) (14), Lawton and Brody Scale (LBS) (15) and Appraisal of Self-Care Agency Scale (ASA-A) (16) were also used to verify the convergent validity (in step 2). A test has convergent validity if it shows a significant correlation

with another test that measures a theoretically related trait (17).

The BI evaluates the person's activities of daily living (feeding, grooming, bathing, dressing, bowel and bladder care, toilet use, ambulation, transfers and stair climbing) using a 10-question test. The BI measures the degree of independence of a person by means of a total score that ranges from zero to 20. High scores mean more independence in the assessed dimensions (14).

The LBS is an instrument to assess independent living skills through instrumental activities of daily living. The scale has eight domains (use the phone, shop, prepare food, homemaking, do laundry, use transports, medication management and managing finance). Scores range from 0 to 23 points, with the lowest values indicating greater dependence on instrumental activities of daily living (15).

The ASA-A is a 24-item to measure the awareness of health needs and the patient's accountability for self-care behaviours. A five-point Likert type scale ranging from totally disagree to totally agree is applied. Total scores range from 24 to 120, with higher scores meaning better understanding of the capabilities of self-care. According to the authors, the scale is a one-dimension measure (16). The ASA-A was used only when the dependent person was able to understand and respond to questions.

Ethical considerations

All ethical aspects and matters of confidentiality and privacy were assured. The research protocol was approved by the ethics committees of all institutions where the study was conducted or by the chief of the executive board in case the institution had no ethics committee. Participants who freely agreed to participate in the study were asked to sign an informed consent form. Alphabetical codes were used to identify the transcribed data. The authors of the scale under analysis gave permission for the creation of a reduced version.

During the completion of questionnaires, participants were informed that they could decide not to answer a question if they did not fully understand it. This was most evident in the application of ASA-A, that required agreement or disagreement with possible causal relationships about past health behaviours.

Data analysis

Data analysis was performed using IBM SPSS, version 24. The statistical procedures were based on descriptive and univariate exploratory data analysis and the exploration of the association between continuous variables using Pearson's correlation coefficient. Cronbach's alpha was calculated for the internal consistency coefficient analysis. A Cronbach alpha coefficient was calculated for each domain, as well as the inter-item correlation matrix, the corrected item-total correlation and the alpha value if the item were deleted. Concerning the suggestions of Tavakol and Dennick (18) a very high alpha values to lead to redundancies, evidencing the need to develop a shorter version of the test.

The confirmatory factor analysis was conducted through AMOS to evaluate the factorial structure of SCDEF. The squared Mahalanobis distance (D2) was used to evaluate the presence of outliers, and the univariate and multivariate coefficients of asymmetry (Sk) and kurtosis (Ku) were applied to measure the normal distribution of variables. The covariance matrix was inputted, and the method of maximum likelihood estimates was used. The quality of the global fit of the factorial model was assessed according to the indices and respective reference values (19,20).

The local fit was assessed by factor loading and the items' reliability. The chi-square test (χ^2/df), the comparative fit index (CFI), the parsimony comparative fit index (PCFI), root mean square error of approximation (RMSEA, $p[\text{rm-sea} \leq 0.05]$), the akaike information criterion (AIC) and the modified expected cross-validation index (MECVI) were all used. In model fit, the chi-square value (CMIN/DF) is recommended to be lower than 3. The GFI, AGFI and CFI need to be close to 0.90. The PCFI must show values above 0.50, while the recommended RMSEA is up to 0.08 (19,20). Despite having no reference values, the AIC and the MECVI show better fit when values are lower (19). The final model was refined taking into account the modification indices and the theoretical considerations of the constructs.

RESULTS

Development of a revised version of the SCDEF

The participants from the population-based exploratory studies were mostly female (83%). More than half (55%) of the participants were over 80 years old and 12% were 65 years or younger. They already have a pre-existing dependence condition for an average of 5 years, and for the vast majority (71%), this condition was gradually installed. They took an average of five different medicines a day.

A descriptive and exploratory analysis item to item was performed from step 1 (Table 1).

This information was presented to the panel of experts. The internal consistency for the self-care dimension of the long version showed very high alpha values (ranging from 0.87 to 0.99), which were likely to lead to redundancies, evidencing the need to develop a shorter version of the test.

The panel of experts selected the items considered most relevant for each dimension, ensuring the instrument's content validity.

Equal patterns of responses were found for the majority of the items reflecting the opposite action for the same activity. For example, individuals' level of autonomy/difficulty in dressing the upper part of the body was very similar to that found in removing clothes from the upper part of the body. Similarities were also found for the action 'putting on socks'

and 'taking off socks'. In these cases, the panel of experts decided to consider only one related activity. Additionally, some overlapping activities, such as putting on socks or shoes, showed identical results, and the decision was made to consider the less complex action.

Some items presented semantic content that also included more specific items. For example, the person who was able to autonomously use devices for feeding also responded to being able to place food in utensils or use a glass. Moreover, the specification of the domain 'walking' short, moderate or long distances was highly discriminatory, since only a reduced number of participants were able to walk for more than 0.5 km on descending steep slopes. The decision was to consider items that could better fit the functionality profile of the majority of participants. Activities showing a high number of missing responses, such as 'put on makeup' or 'shaving', were also excluded. After reaching a consensus, the panel of experts decided to exclude 38 items and submit the short version (to the second phase of the study) with a total of 29 items (items marked with * in Table 1).

Validation of the SCDEF revised version

The results of the cross-sectional study are shown in Table 2.

The majority of the participants (76%) were female, with an average age of 78.45 years. Many of the participants had a clinical history of hypertension (67%), diabetes (28%), stroke sequels (10%) or cancer (3%), but none reported suffering from acute illness.

More than half of the participants needed assistive walking devices or were independently walking (63.3%). The use of a wheelchair registered a high percentage of missing data, explained by the fact that only 47 persons reported using this moving aid. For this reason, it was decided to eliminate this item and its respective domain in the final version. In the self-care domain of 'getting ready', the most impaired activity was nail care (90.7% of the participants needed help), which was an important indicator in evaluating the fine motor skills of the participants. Similar levels of dependency in activities related to getting dressed and undressed, as well as bathing, were found. More than half of the participants needed help in activities related to the use of the toilet.

The self-care activities 'transferring, turning and lifting' showed that a large percentage of participants were completely dependent on others for basic activities of daily living. The same distribution pattern was found in responses to two items of self-care transferring, meaning that the participants have the same level of difficulty in transferring from the bed to the chair/sofa or from the chair/sofa to the bed. Hence, it was decided to exclude the second item, and a final version of the SCDEF with 27 items was then presented.

The correlations between the SCDEF and the BI, LBS and ASA-A are shown in Table 3. Significant positive weak correlations were found; in fact, a highly significant correlation between the BI and the different domains of self-care were found, except for the domain 'taking medication'. Similarly, positive weak correlations were found between the self-care domains and the LBS. The ASA-A did not show significant correlations with the different domains of self-care.

The overall level of dependency, as evaluated by the SCDEF, was found to be moderately correlated with the BI and the LBS. These results indicate a non-overlapping convergence of the measures.

Cronbach's alpha of this reduced version containing 27 items reached a global value of $\alpha = 0.96$. An analysis by self-care domain showed values of Cronbach's alpha that were indicative of good internal consistency (Table 3).

Confirmatory factor analysis of the SCDEF revised version

The 27 observed variables were tested using confirmatory factor analysis to test the structural model fit. The model was completed with eight latent variables (the domain using wheelchair was omitted). The preliminary analysis revealed that no variable presented values of asymmetry and kurtosis indicative of severe deviation from the normal distribution ($|Sk| < 3$ and $|Kul| < 10$, according to Marôco, 2010). The octafactorial model was adjusted to the sample, having revealed poor fit ($c2/df = 2.37$; CFI = 0.91; PCFI = 0.77; RMSEA = 0.09; IC90% = 0.09-0.11; AIC = 919.64; and MECVI = 6.51).

To improve the fit of the model, five observations were excluded, since values of D2 suggested the presence of outliers ($p1$ and $p2 < 0.001$). Trajectories were also included in the model between the pairs of item residues: dress lower part of the body and button the clothes; choose clothes and put on socks; and prepare food to ingest and open recipients. As such, a reasonable fit was reached ($c2/df = 2.15$; CFI = 0.92; PCFI = 0.77; RMSEA = 0.08; IC90% = 0.08-0.09; AIC = 853.33; MECVI = 6.08).

DISCUSSION

Valid measurement tools used in the evaluation of older people provide important information that supports effective clinical interpretation and intervention by nurses and clinicians. Other measures are used to assess care dependence but underpin other theories and models of care (5,21-24). As opposed to other instruments, SCDEF allows to define the person's self-care deficit and clarify the nursing diagnosis and structure specific interventions in detail.

TABLE 2 Revised SCDEF: Items analysis for each domain in the second study.

	Dependent but not participating	Needs help from another person	Needs assistive devices	Completely independent
Feeding (n = 150)				
1 prepares food to ingest	116 (77.3%)	29 (19.3%)	1 (0.7%)	4 (2.7%)
2 opens recipients	33 (22.0%)	48 (32.0%)		69 (46.0%)
5 holds glass or cup	20 (13.3%)	10 (6.7%)	1 (0.7%)	119 (79.3%)
8 takes food to the mouth using the utensils	20 (13.3%)	11 (7.3%)	1 (0.7%)	118 (78.7%)
Walking (n = 150)				
1 holds the body in the upright position	32 (21.3%)	20 (13.3%)	44 (29.3%)	54 (36.0%)
3 goes up and down stairs	43 (28.7%)	33 (22.0%)	32 (21.3%)	42 (28.0%)
6 walks average distances (>100 m <500 m)*	34 (22.7%)	21 (14.0%)	45 (30.0%)	50 (33.3%)
Getting ready (n = 150)				
1 combs the hair	25 (16.7%)	54 (36.0%)	4 (2.7%)	67 (44.7%)
2 maintains oral hygiene	25 (16.7%)	43 (28.7%)		82 (54.7%)
5 cares for nails	40 (26.7%)	96 (64.0%)	1 (0.7%)	13 (8.7%)
7 puts deodorant	28 (18.7%)	49 (32.7%)		73 (48.7%)
Bathing (n = 150)				
1 provides objects for bathing	29 (19.3%)	65 (43.3%)		56 (37.3%)
3 opens the water tap	26 (17.3%)	37 (24.7%)		87 (58.0%)
7 washes the body	24 (16.0%)	116 (77.3%)	2 (1.3%)	8 (5.3%)
Using the Wheelchair (n = 47)				
1 moves the body from one side to the other in a wheelchair*	22 (14.7%)	15 (10.0%)	1 (0.7%)	9 (6.0%)
Using the toilet (n = 150)				
3 positions in toilet or bedpan*	23 (15.3%)	42 (28.0%)	23 (15.3%)	62 (41.3%)
5 lifts from toilet	24 (16.0%)	48 (32.0%)	31 (20.7%)	47 (31.3%)
6 arranges clothes after personal hygiene	23 (15.3%)	60 (40.0%)	2 (1.3%)	65 (43.3%)
Taking medication (n = 150)				
2 prepares medication	20 (13.3%)	67 (44.7%)		63 (42.0%)
3 takes medication	86 (57.3%)	46 (30.7%)		18 (12.0%)
Dressing (n = 150)				
1 chooses clothes	54 (36.0%)	28 (18.7%)		68 (45.3%)
2 ties with laces	35 (23.3%)	91 (60.7%)		24 (16.0%)
4 puts on socks	34 (22.7%)	91 (60.7%)	7 (4.7%)	18 (12.0%)
11 able to dress lower part of the body	31 (20.7%)	89 (59.3%)	2 (1.3%)	28 (18.7%)
14 buttons the clothes	30 (20.0%)	70 (46.7%)		50 (33.3%)
Transferring/turning and lifting oneself (n = 150)				
1 transfers oneself from bed to the chair/sofa	23 (15.3%)	45 (30.0%)	25 (16.7%)	57 (38.0%)
2 transfers oneself from chair/sofa to the bed*	23 (15.3%)	45 (30.0%)	25 (16.7%)	57 (38.0%)
3 moves the body, shifting from one side to the other	22 (14.7%)	24 (16.0%)	6 (4.0%)	98 (65.3%)
4 lifts part of the body	22 (14.7%)	50 (33.3%)	24 (16.0%)	54 (36.0%)

*Items deleted in final version.

The ability to perform activities of daily living is traditionally evaluated. However, the concept of self-care needs a broader approach considering the self-care initiatives as a potential means of promoting health and well-being of

individuals and communities, while reducing financial burden and demand on scarce national healthcare resources (25). Thus, self-care should be viewed as a continuum and not as a result. In this process, the identification of difficulties

	No. of items	Alpha coefficient	Barthel	Lawton and Brody	ASA-A
Feeding	4	0.82	0.25**	0.21**	0.12
Walking	3	0.96	0.33**	0.22**	-0.07
Getting ready	4	0.88	0.32**	0.27**	0.07
Bathing	3	0.77	0.25**	0.25**	0.08
Using the toilet	3	0.91	0.35**	0.24**	-0.04
Medication	2	0.67	0.19*	0.21*	0.15
Dressing and undressing	5	0.89	0.30**	0.31**	-0.09
Transferring/turning/lifting	3	0.89	0.38**	0.29**	-0.06
SCDEF (global)	27	0.96	0.37**	0.30**	0.06

* $p < 0.05$.

** $p < 0.01$.

TABLE 3 Alpha values and correlations between the self-care domains on the revised version of the SCDEF and the Barthel Index, the Lawton and Brody Scale and the ASA-A.

in performing real activities in self-care is likely to guide nurses to improve basic interventions. Furthermore, many professionals use the NOC classification in the planning and evaluation of care. The NOC comprises a set of outcomes that describe the condition, behaviours, reactions and feelings of the patient in response to the care provided (6). The scales developed according to this classification facilitate the identification of changes in the patient's condition through different scores over time. In addition, many of the information systems are supported by databases developed with classifications and ontologies. NOC is a classification that underlies many of these computer systems, transversal to the Portuguese context.

The original version of the SCDEF with 67 items has been used in many studies, yet its application in the context of care has been sparse due to its length (10). In addition, Cronbach's alpha of 0.99 of the original version may suggest redundant information (26,27). Thus, a short version was hence recommended, which would facilitate the instrument's usability in clinical practice but would also ensure validity and reliability. To develop the short version, it was important to maintain the structure of self-care domains, since this structure show to explain the specific dependency type that affects the person and eases the monitoring of the evolution of the condition. A panel of experts was recruited to ensure the content validity of the SCDEF in its short version (first study). The second study was outlined with the purpose of contributing to the validation of the revised version.

From the version revised by the panel of experts to the final version, two items were deleted. In the revised version, the panel of experts considered it useful to include the two items related to transferring: transfer oneself from bed to chair/sofa and transfer oneself from chair/sofa to bed, since it implied the use of different equipment. However, in the

second study, the results overlapped, so we decided to exclude one of the items. We agreed that the transfer from bed to the chair was easier to accomplish than the transfer from chair to bed, but it would not be very coherent to just ask if the person could transfer from the chair to the bed. Given the missing data related to the reduced number of participants who used a wheelchair (47 of the 150 participants) and taking into account that the wheelchair can be an aid device, we decided that the item in this domain should not be included in the analysis of the SCDEF to calculate the dependency total value. Thus, a domain (using a wheelchair) was excluded from the SCDEF, which now integrated eight domains of self-care.

Without overvaluing the internal consistency over other metric criteria, which may contribute to structurally weak measures (26,28), the SCDEF-27 items, revealed good reliability, with total Cronbach's alpha values above 0.90. However, the values are not sufficiently high to suggest redundancy (18). The internal consistency for each domain ranges from 0.67 (taking medication) to 0.96 (walking).

The SCDEF-27 items integrate three to five items per domain, following the recommendations of Raubenheimer who suggested a minimum of three items per domain (12).

It was shown that the reduced version of the SCDEF ensures discriminant validity, since it can discriminate participants according to age, gender and health condition (10). The author stressed that women and the eldest adults were more dependent on self-care and that the condition of dependency was often gradual (10). A recent study that used the short form of the SCDEF to analyse the global levels of dependency in each domain of self-care in elderly people living in nursing homes found a profile of participants very similar to that of the present study (29). The significant but low correlations between SCDEF-27 items and the BI and the LBS suggest that the performance of basic and instrumental daily

activities was related to self-care activities. In other words, these items are measured different but linked parameters and ensured construct convergence. Thus, the authors consider that self-care activities comprehend a set of actions that require physical, cognitive and emotional skills and abilities likely to contribute to the activities of daily living. The lack of association between the short version of the SCDEF and the ASA-A can be explained by the small number of respondents who completed this questionnaire (only 55 participants answered all questions). The ASA-A assesses the self-care skills, which includes knowledge, skills and experience that the person needs to obtain to perform self-care activities, since many of the participants had cognitive decline, which impeded their ability to answer questions related to managing a healthy lifestyle. Knowing that the correlation values are very sensitive to the sample size, it would be important to continue to study this relationship.

Despite the reduced sample size, the confirmatory factor analysis enabled us to test the SCDEF-27 item structure against that of the theoretical base model, showing good fit indices of the model. The SCDEF-27 items showed to have factorial validity, confirming the eight domains of the scale. However, the small sample is a vulnerability in this investigation, which is why the adequacy to the model should also be analysed in future studies.

This study shows that the SCDEF-27 items are a valuable measurement tool, especially when we need to assess older adults with levels of impaired functional ability.

The SCDEF was developed based on the Nursing Outcomes Classification, which is considered an important contribution for those who use this classification. This measure will enable health professionals to better evaluate self-care activities and provide more efficient, simple and effective prescriptions.

Measuring the changes (decline or improvement) resulting from the action of psychosocial, behavioural factors, the ageing process, consequence of diseases or even therapeutic interventions is an essential aspect in the assessment of functionality and the need for care of the elderly. Future studies should be carried out, in different contexts and with different populations to examine whether the 27-item SCDEF shows similar outcomes to the present study.

CONCLUSION

The demographic changes and the escalating demands in health have a major impact on the preparation and planning of health policies. To reflect the multidimensionality of quality of life and to capture greater benefits within an economic evaluation framework, important dimensions related to older people, such as independence, must be assessed (2). Thus, the measurement and assessment of the dependent person and

caregiver become increasingly important, enabling a holistic approach that targets their needs. The studied instrument shows a specification level that facilitates a comprehensive understanding of dependency in the self-care domain. This instrument's characteristic provides a noteworthy contribution to the development and implementation of interventions that are more effective and tailored to individuals' real needs. The short version of SCDEF, composed of 27 items with eight domains, is thus a less time-consuming instrument while still showing good validity and reliability.

AUTHOR CONTRIBUTIONS

Paulo, Parente, Teresa Martins and Paulo Machado conceptualised and designed the study. Paulo Parente, Andreia Costa and Soraia Pereira collected the data. Teresa Martins and Paulo Machado analysed and interpreted the data. Teresa Martins and Soraia Pereira drafted the manuscript. Abel Paiva e Silva and Filipe Pereira involved in critical revision of the intellectual content. Paulo Parente and Teresa Martins supervised the study.

CONFLICT OF INTEREST

All authors declare no conflict of interests.

FUNDING INFORMATION

This research received no specific grant from any funding agency in the public, commercial, or non-profit sectors.

ORCID

Paulo Machado  <https://orcid.org/0000-0002-3187-6860>

Teresa Martins  <https://orcid.org/0000-0003-3395-7653>

REFERENCES

1. WHO. World report on Ageing and Health. Geneva: World Health Organization; 2015. ISBN 978 92 4 156504 2. https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf;jsessionid=305A57D413D78A2B8EE8C9032F55FB0D?sequence=1. Accessed 4 Feb 2020.
2. Bulamu N, Kaambwa B, Ratcliffe J. A systematic review of instruments for measuring outcomes in economic evaluation within aged care. *Health Qual Life Out*. 2015;13:179. <https://doi.org/10.1186/s12955-015-0372-8>.
3. Dale B, Sævareid H, Söderhamn O. Testing reliability and validity of Lorensen's Self-care Capability Scale (LSCS) among older home-living, care-dependent individuals in Norway. *Int J Older People Nurs*. 2013;8(2):166–73. <https://doi.org/10.1111/j.1748-3743.2012.00339.x>.
4. Darzins S, Imms C, Stefano M, Taylor N, Pallant J. Evaluation of the internal construct validity of the Personal Care Participation Assessment and Resource Tool (PC-PART) using Rasch analysis. *BMC Health Serv Res* 2014;14:543. <https://doi.org/10.1186/s12913-014-0543-z>.
5. Zhang S-Q, Wang H-M, Yang X-Y, Ye W-Q. The Care Dependency Scale: psychometric testing of the Chinese version. *Chin Nurs Res* 2016;3(2):62–5. <https://doi.org/10.1016/j.cnre.2016.06.005>.

6. Moorhead S, Johnson M, Maas ML, Swanson E, editors. *Nursing Outcomes Classification (NOC)*, 5th edn. St. Louis: Mosby; 2008. 776 pp.
7. Duque H. *The patient dependent on self-care: A study on the evaluation and professional action of nurses* (Master Thesis). Instituto de Ciências da Saúde da Universidade Católica Portuguesa; 2009.
8. Gonçalves P. *Families that integrate dependent people in self-care, a population-based exploratory study in Porto* (Doctoral Thesis). Instituto de Ciências da Saúde da Universidade Católica Portuguesa; 2013.
9. Costa A. *Families that integrate dependent people in self-care, a population-based exploratory study in Lisboa* (Doctoral Thesis). Instituto de Ciências da Saúde da Universidade Católica Portuguesa; 2013.
10. Pereira S. *Self-Care Dependency Evaluation Form – Short form* (Master Thesis). Escola Superior de Enfermagem do Porto; 2014. 8 -9 – 10 references blinded for reviewers.
11. Hinkin T. A brief tutorial on the development of measures for use in survey questionnaires. 1998 [Electronic version]. Retrieved [2019 Nov], from Cornell University, School of Hotel Administration. Available from: <http://scholarship.sha.cornell.edu/articles/521>.
12. Raubenheimer J. An item selection procedure to maximise scale reliability and validity. *SAJIP* 2004;30(4):59–64. <https://doi.org/10.4102/sajip.v30i4.168>.
13. Hair JF, Black B, Babin B, Anderson RE, Tatham RL. *Multivariate Data Analysis: A Global Perspective*. New Jersey: Pearson Education Inc; 2010.
14. Araújo F, Pais Ribeiro J, Oliveira A, Pinto C. Validação do Índice de Barthel numa amostra de idosos não institucionalizados. *Rev Saude Publica*. 2007;25(2):59–66.
15. Araújo F, Pais Ribeiro J, Oliveira A, Pinto C, Martins T. Validação da Escala de Lawton e Brody numa amostra de idosos não institucionalizados. In: *Actas do 7º congresso nacional de psicologia da saúde*, (Leal I, Pais-Ribeiro J, Silva I, Marques S eds), 2008, Lisboa: ISPA, 217-20.
16. Silva J. Adaptação cultural e validação da escala para avaliar as capacidades de autocuidado - Appraisal of self-care agency scale (ASA-A). *Revista Eletrônica Acervo Saúde*. 2013;2(5):185–99.
17. Smith GT. On construct validity: issues of method and measurement. *Psychol Assess*. 2005;17(4):396–408.
18. Tavakol M, Dennick R. Making sense of Cronbach's Alpha. *Int J Med Educ*. 2011;2:53–5. <https://doi.org/10.5116/ijme.4dfb.8dfd>.
19. Marôco J. *Análise de equações estruturais: fundamentos teóricos, software & aplicações*. Pêro Pinheiro: ReportNumber; 2010.
20. Kline RB. *Principles and practice of structural equation modelling*. 4rd ed. New York: Guilford; 2016.
21. Dijkstra A, Buist G, Dassen T. Nursing-care dependency. Development of an assessment scale for demented and mentally handicapped patients. *Scand J Caring Sci*. 1996;10(3):137e143.
22. Dijkstra A, Yönt GH, Korhan EA, Muszalik M, Kędziora-Kornatowska K, Suzuki M. The care dependency scale for measuring basic human needs: an international comparison. *J Adv Nurs* 2012;68(10):2341–8. <https://doi.org/10.1111/j.1365-2648.2011.05939.x>.
23. Mlinac M, Feng M. Assessment of Activities of Daily Living, Self-Care, and Independence. *Arch Clin Neuropsychol* 2016;31(6):506–16. <https://doi.org/10.1093/arclin/acw049>.
24. Slade A, Fear J, Tennant A. Identifying patients at risk of nursing home admission: The Leeds Elderly Assessment Dependency Screening tool (LEADS). *BMC Health Serv Res* 2006;6(31). Published online 2006 Mar 13. <https://doi.org/10.1186/1472-6963-6-31>
25. El-Osta A, Webber D, Gnani S, Banarsee R, Mummery D, Majeed A, et al. The Self-Care Matrix: A unifying framework for self-care. *SelfCare*. 2019;10(3):38–56.
26. Stanton JM, Sinar EF, Balzer WK, Smith PC. Issues and strategies for reducing the length of self-report scales. *Pers Psychol* 2002;55(1):167–94. <https://doi.org/10.1111/j.1744-6570.2002.tb00108.x>.
27. Taber KS. The use of Cronbach's alpha when developing and reporting research instruments. *Res Sci Educ*. 2018;48(6):1273–96. <https://doi.org/10.1007/s11165-016-9602-2>.
28. Goetz C, Coste J, Lemetayer F, Rat AC, Montel S, Recchia S, et al. Item reduction based on rigorous methodological guidelines is necessary to maintain validity when shortening composite measurements. *J Clin Epidemiol* 2013;66(7):710–8. <https://doi.org/10.1016/j.jclinepi.2012.12.015>.
29. Imaginário C, Rocha M, Machado P, Antunes C, Martins T. Functional capacity and self-care profiles of older people in senior care homes. *Scand J Caring Sci*. 2020;34(1):69–77. <https://doi.org/10.1111/scs.12706>.

How to cite this article: Parente P, Costa A, Pereira S, et al. Self-Care Dependency Evaluation Form: Psychometric properties of the revised version with 27 items. *Scand J Caring Sci*. 2021;00:1–10. <https://doi.org/10.1111/scs.12966>