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Validity and reliability of the Brazilian version of the Caregiver Reaction Assessment

Validade e confiabilidade da versão brasileira do Caregiver Reaction Assessment

Validez y confiabilidad de la versión brasileña del Caregiver Reaction Assessment

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ABSTRACT

Objective: To analyze the validity based on the internal structure and reliability of the Brazilian version of the Caregiver Reaction Assessment (CRA) applied to informal caregivers of dependent elderly. **Method:** A methodological study with 120 informal caregivers of the elderly. Validity based on the internal structure evaluated by exploratory factorial analysis, with extraction of main factorial axes, varimax orthogonal rotation and retention of factors by parallel analysis. Reliability assessed by Cronbach's alpha. **Results:** The instrument revealed a factorial structure different from the original version: three factors were identified, equivalent to subscales, self-esteem, daily activities and family support, with explained variance of 42%. The values of the Cronbach alpha for the items belonging to each subscale were, respectively: 0.71, 0.81 and 0.83. **Conclusion:** The Brazilian version of CRA presents good evidence of validity based on internal structure and is reliable, and can be used to assess the overload of informal caregivers of dependent elderly.
Descriptors: Elderly Man; Caregivers; Validation Studies; Geriatrics; Nursing.

RESUMO

Objetivo: Analisar a validade baseada na estrutura interna e a confiabilidade da versão brasileira do *Caregiver Reaction Assessment* (*CRA*) aplicado a cuidadores informais de idosos dependentes. **Método:** Estudo metodológico, realizado com 120 cuidadores informais de idosos. Validade baseada na estrutura interna avaliada por análise fatorial exploratória, com extração de principais eixos fatoriais, rotação ortogonal *varimax* e retenção de fatores por análises paralelas. Confiabilidade aferida pelo *alpha* de *Cronbach*. **Resultados:** O instrumento revelou estrutura fatorial diferente da versão original: três fatores foram identificados, equivalentes às subescalas, autoestima, programação das atividades diárias e suporte familiar, com variância explicada de 42%. Os valores do *alpha* de *Cronbach* para os itens integrantes de cada subescala foram, respectivamente: 0,71, 0,81 e 0,83. **Conclusão:** A versão brasileira do *CRA* apresenta boas evidências de validade baseada na estrutura interna e é confiável, podendo ser empregada na avaliação da sobrecarga de cuidadores informais de idosos dependentes.
Descritores: Idoso; Cuidadores; Estudos de Validação; Geriatria; Enfermagem.

RESUMEN

Objetivo: Analizar la validez basada en la estructura interna y la confiabilidad de la versión brasileña del Caregiver Reaction Assessment (CRA) aplicado a cuidadores informales de ancianos dependientes. **Método:** Estudio metodológico, realizado con 120 cuidadores informales de ancianos. Validez basada en la estructura interna evaluada por análisis factorial exploratorio, con extracción de principales ejes factoriales, rotación ortogonal varimax y retención de factores por análisis paralelos. Confiabilidad examinada por el alpha de Cronbach. **Resultados:** El instrumento reveló una estructura factorial diferente de la versión original: tres factores fueron identificados, equivalentes a las subescalas autoestima, programación de las actividades diarias y soporte familiar, con varianza explicada de 42%. Los valores del alpha de Cronbach para los elementos integrantes de cada subescala fueron, respectivamente:

0,71, 0,81 y 0,83. **Conclusión:** La versión brasileña del CRA presenta buenas evidencias de validez basadas en la estructura interna y es confiable, pudiendo ser empleada en la evaluación de la sobrecarga de cuidadores informales de ancianos dependientes.
Descriptores: Anciano; Cuidadores; Estudios de Validación; Geriatría; Enfermería.

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INTRODUCTION

Population aging, on a global level has been the subject of numerous discussions, with emphasis on its effects on societies, which include social security, health care and other services. This requires adequate and urgent planning for the years to come[1]. In this scenario, research aimed at improving understanding about the experiences and results of providing informal care for the elderly is considered to be increasingly relevant[2].

Functional dependent elderly people (who present physical or mental limitations that are restrictive of the independent performance of their daily activities, suggesting the need of a caregiver) are predominantly assisted by informal caregivers, both in the international context[3] and in Brazil, where the percentage of informal care for the elderly is estimated at 81.8%[4].

The formal caregiver is defined as a person who has been trained in the care of the elderly and who has the function of caring for the elderly as a paid activity[5]. The informal caregiver, the focus of this study, is defined as the person who assumes, without compensation and in general, without specific training, care for the elderly, with whom they commonly have family bonds[5].

The provision of care to a dependent elderly person can generate overload in the caregivers and especially in informal caregivers[6]. Such overload can be understood as the result of the caregivers' self-assessment of their social roles, functions performed, perception and evolution of the health problems that affect the person cared for, as well as the influence of these factors on the different domains of their lives[7].

Caring for a family member with functional limitations can lead to overload due to the possibility of psychosocial disorganization, innumerable negative feelings, such as fear, guilt and anxiety, causing a generalized state of malaise and tension, which commonly affects physical health and of the informal caregiver[8]. In this sense, the evaluation of the overload of informal caregivers of dependent elderly is indispensable, and valid and reliable instruments should be used[9].

The Caregiver Reaction Assessment (CRA) is an instrument originally developed in the United States to assess the consequences of providing informal care to dependents[10]. CRA was adapted for use in Brazilian culture, demonstrating content valid for the evaluation of the overload of informal caregivers of dependent elderly[11]. However, for greater scientific support regarding its use in clinical practice, it is prudent to proceed with the analysis of evidence of validity based on the internal structure and the reliability assessment of the Brazilian version.

It should be noted that the CRA has already been validated by different target audiences for several countries, such as: Germany[12], the Netherlands[13], Sweden[14], Norway[15], Portugal[16], Korea[17], Japan[18], China[19], and Singapore[20], suggesting their psychometric quality in different cultural contexts.

Thus, it was proposed to analyze the validity and reliability of the Brazilian version of the Caregiver Reaction Assessment (CRA) instrument with informal caregivers of dependent elderly.

OBJECTIVE

To analyze the evidence of validity based on the internal structure and reliability of the Brazilian version of the Caregiver Reaction Assessment (CRA) instrument with informal caregivers of dependent elderly people.

METHOD

Ethical aspects

The research project was previously submitted and approved by the Research Ethics Committee of the Universidade Federal do Ceará. The study was conducted in accordance with all ethical standards required for research involving human subjects, pursuant to Resolution 466/2012 of the National Health Council/Ministry of Health. It is also worth mentioning the prior authorization of the authors of the original version of CRA[10] for the accomplishment of cross-cultural adaptation studies and analysis of the psychometric properties of the instrument for use in Brazil.

Study design, place of and period

It is a methodological study, to analyze the validity based on the internal structure and the reliability of the Brazilian version of the CRA[11]. The investigation took place in the city of Fortaleza, Ceará State, between January and March 2014.

CRA was developed in the United States of America and presents 24 items, distributed in five dimensions (or subscales): scheduling of daily activities (five items that assess the extent to which care provision prevents the daily activities of the caregiver) , family support (five items that assess the extent to which the caregiver perceives lack of support and abandonment of family members), financial issues (three items that measure financial stress on the caregiver), physical health (four items that assess the caregiver in relation to the deterioration of their physical health), self-esteem (seven items that evaluate positive experiences from care)[10].

The format of responses to the instrument is categorical level ordered in a five-point Likert scale, which varies from totally disagree (1) to fully agree (5). Each subscale is independent and generates an own score to evaluate the different aspects of the caregiver's overload[10]. Among the 24 items in the instrument, five are scored with reverse scores[10].

Sample and inclusion and exclusion criteria

The non-probabilistic convenience sample consisted of 120 informal caregivers of dependent elderly people living in three

Mota FRN, Victor JF, Silva MJ, Soares ES, Oriá MOB, Marques MB, et al.

Validity and reliability of the Brazilian version of the Caregiver Reaction Assessment

Primary Health Care Units (PHCU) in the city of Fortaleza, accessed through home visits, through the guidance of professionals from the Strategy teams Family Health. The choice of sample and sample recruitment (through PHCU) was due to the difficulty of identification and contact with informal caregivers of dependent elderly people, who usually remain most of the time in the home environment, elderly care.

The sample size was equivalent to five respondents for each item of the instrument, followed by a recommendation in the literature for performing multivariate data analysis procedures[21] (number of CRA items = 24). However, it should be emphasized that this numerical relationship is not a determining factor for the analysis of instruments of psychological measures, since other aspects of analytical quality may be more relevant[22].

Informal and primary caregivers of dependent elderly were included in the sample in at least one Basic Activities of Daily Living (BADL) (feeding, bathing, dressing, roaming, going to the toilet and maintaining control over their eliminations)[23] or in two Instrumental Activities of Daily Living (IADL) (such as shopping, using transportation, preparing meals and caring for their own finances)[23], performing this function for a minimum period of 60 days. Caregivers with cognitive impairment were excluded.

Study protocol

Informal caregivers of dependent elderly people who were included in the study sample and voluntarily agreed to participate answered, in addition to the Brazilian version of the CRA, a form elaborated specifically for the present study, which contained questions about the socio-demographic characterization of caregivers and the elderly care, as well as questions about the clinical variables of the caregivers and about the care offered to the elderly. The Katz and Lawton and Brody scales were also applied to caregivers to evaluate the level of independence of the elderly care in the BADL and IADL[23].

Data were collected at the home of informal caregivers, through home visits in the morning. Four people, previously trained for this, participated in the data collection. It should be noted that although the professionals of the FHS (Family Health Strategies) teams were identified to identify the caregivers of the sample, these professionals did not participate in the interviews, which had an average duration of 30 minutes.

Analysis of results and statistics

The collected data were organized and analyzed using software R (Psych package). For the evaluation of evidence of validity based on the internal structure, an exploratory factorial analysis was performed, with the extraction of main factorial axes and orthogonal varimax rotation. It should be noted that this analytical method was also used in the validation study of the original version of the instrument[10], as well as in studies of adapted versions of CRA for use in other countries[12-20]. We opted for the use of the parallel analysis technique for factorial retention, since it is pointed out as the most accurate for this purpose[22].

Regarding the reliability of the Brazilian version of the CRA, an internal consistency analysis was performed by calculating the Cronbach alpha coefficient. The alpha value was calculated for the set of items belonging to each identified factor/subscale in the exploratory factorial analysis, as well as for the individual items of the instrument.

RESULTS

The characterization of the informal caregivers of the elderly revealed that the majority are female (90.8%), in the age group between 38 and 59 years (69.2%), with a significant percentage aged 60 or over (19.1%); with no schooling (13.4%); mostly married or in a consensual union (51.7%), with no gainful activity (70%), low schooling (with five to eight years of schooling: 30.8%; and without personal income (54.2%). The majority were children of the elderly care (63.3%), living in the same house as the elderly (88.3%).

Regarding the clinical and care-related variables offered: 40% of caregivers assessed their health as reasonable, 32.5% as good health; 52.5% reported having a disease; 58.3% never have leisure activities; 51.7% attend some social support network; 81.7% do not exercise regularly. The experience of caring for the elderly was generally long, for most caregivers (three to five years: 31.6%, more than ten years: 29.2%). In addition, 55.8% did not have help to care for the elderly; 69.2% did not receive financial aid.

Regarding the elderly recipients of care, the majority were women (70%), aged 80 years or more (69.8%), monthly income of a minimum wage (85%), coming from retirement (67.5%) and 25% had medical diagnosis of dementia. In relation to the BADL and IADL, there was a high degree of dependency for the BADL (26.7% dependent for all activities) and for the IADL (87.5% with a low score: between nine and 12 scores).

As regards the evaluation of evidence of validity based on the internal structure of the Brazilian version of the CRA by exploratory factorial analysis, the database was suitable for the Kaiser-Meyer-Olkin (KMO) measure, which resulted in 0.82, and Bartlett's sphericity test statistically significant (p = 0.001).

The execution of the parallel analysis method indicated the retention of three factors, whose explained variance percentage was 42%. Thus, the factorial structure of the Brazilian version of CRA differed from the original version.

The three factors corresponded to the subscales: self-esteem, daily activities and family support, but with a larger number of items (11, nine and five, respectively), since the items belonging to the physical health and financial issues subscales, in the original version of the CRA (non-existent subscales in the Brazilian version), self-esteem and daily activity schedules were incorporated into the subscales. Item 15 (I have sufficient physical strength to care for _____), originally belonging to the physical health subscale was incorporated into the self-esteem subscale.

The subscale programming of daily activities, in the Brazilian version, incorporated the other three items that were part of the subscale physical health (item 5 - Since I began caring for _____ I seem to be tired all the time, item 10 - My health has got worse since I started caring for _____; item 19 - I am healthy enough to care for _____. The three items that made up the subscale financial issues, in the original CRA version (item 3 - My financial resources are enough to pay for the care expenses; item 21 - Caring for _____ caused financial

Mota FRN, Victor JF, Silva MJ, Soares ES, Oriá MOB, Marques MB, et al.

Validity and reliability of the Brazilian version of the Caregiver Reaction Assessment

difficulties in the family; difficult to pay for health spending), were also incorporated into the subscale programming of daily activities, in the Brazilian version.

There was a large variation in factor loadings observed for the 24 items of the instrument: 0.27 (item 3, allocated in factor 2 - schedule of daily activities subscale) to 0.81 (item 23, belonging to factor 1 - subscale self-esteem). However, most of the items (14 items - approximately 60%) had a factorial loading higher than 0.60.

For the evaluation of the commonalities of items in association with retained factors, the variation was also significant, considering the same items mentioned above with border values of commonalities (0.19 - item 3 to 0.69 - item 23). However, it was observed that half of the items of the instrument presented commonalities with an approximate value equal to or greater than 0.50.

The following are the factorial loadings obtained for each of the 24 items of the Brazilian version of the CRA, with respective commonalities, referring to the solution with three factors, according to distribution in the equivalent subscales (by exploratory factorial analysis, with extraction method of main factorial axes, orthogonal varimax rotation and retention of factors by parallel analysis) (Table 1).

Regarding the reliability analysis of the Brazilian version of CRA, the value of the Cronbach alpha obtained for the set of items belonging to each of the three subscales identified was, respectively: self - esteem subscale - 0.71; subscale programming of daily activities - 0.83; subscale family support - 0.84. Considering the individual items, the coefficient value ranged from 0.63 (Item 23 - I like caring for _____) and 0.84 (Item 3 - My financial resources are enough to pay for expensive spending) (Table 2).

It should also be noted that, in relation to Hotelling's T2 test, it rejected the null hypothesis that all items of the instrument would present equal means (Hotelling's T2 = 0.001, for each of the three subscales identified in the exploratory factor analysis).

Table 1 – Factorial loading and commonalities obtained for the items of the Brazilian version of the Caregiver Reaction Assessment instrument, referring to the solution with three factors, according to distribution in the equivalent subscales, Fortaleza, Ceará State, Brazil, 2014

Subscales/ Items	Factorial loading	Comunality (h²)
Self-esteem		
Item 23 – I like caring for _____.	0.81	0.69
Item 9 – I want a lot caring for _____.	0.77	0.59
Item 20 – Caring for _____is important to me.	0.72	0.52
Item 17 – Caring for _____makes me feel good.	0.71	0.52
Item 1 – I feel pleased in caring for_____.	0.59	0.39
Item 7 – I feel upset in caring for _____.	0.52	0.31
Item 12 - Even though caring for _____ I could never recturn what he had done for me.	0.45	0.22
Item 15 - I have sufficient physical strength to care for _____.	0.41	0.29
Daily living activities schedule		
Item 18 - It is difficult to find time to rest because of the constant interruptions.	0.72	0.56
Item 5 - Since I began caring for _____I seem to be tired all the time.	0.63	0.51
Item 14 - I have failed to go to appointments since I started taking care of _____.	0.63	0.57
Item 8 - I have to stop in the middle of the activities you are doing for caring.	0.61	0.41
Item 11 - I have been visiting less family and friends since I started caring for _____.	0.60	0.40
Item 19 - I am healthy enough to care for _____.	0.58	0.44
Item 10 - My health has got worse since I started caring for _____.	0.51	0.37
Item 4 - My activities are all about caring for _____.	0.43	0.30
Item 24 - It is difficult to pay for the health care expenses of.	0.39	0.19
Item 21 - Caring for _____ caused financial difficulties in the family.	0.35	0.17
Item 3 - My financial resources are enough to pay for care expenses	0.27	0.15
Family support		
Item 2 - The other put the care of _____ in my hands.	0.74	0.60
Item 6 - It is very difficult to get help from my family to take care of _____.	0.69	0.58
Item 22 - My family (siblings, children) left me alone to care for _____.	0.65	0.49
Item 16 - Since I started caring for _____I feel abandoned by my family.	0.65	0.46
Item 13 - My family cooperates in the care of _____.	0.63	0.46

Mota FRN, Victor JF, Silva MJ, Soares ES, Oriá MOB, Marques MB, et al.

Validity and reliability of the Brazilian version of the Caregiver Reaction Assessment

Table 2 – Cronbach alpha values of the Brazilian version of the Caregiver Reaction Assessment instrument, referring to the set of items from each of the three subscales identified and to the individual items, Fortaleza, Ceará State, Brazil, 2014

Subscales/ Items	Cronbach Alpha
Self-esteem subscale	0.71
Item 23 - I like caring for _____.	0.63
Item 9 - I want a lot caring for _____.	0.64
Item 20 - Caring for _____ is important to me.	0.65
Item 17 - Caring for _____ makes me feel good.	0.65
Item 1 - I feel pleased in caring for _____.	0.65
Item 7 - I feel upset in caring for _____.	0.65
Item 12 - Even though caring for _____ I could never return what he had done for me.	0.67
Item 15 - I have sufficient physical strength to care for _____.	0.83
Daily living activities schedule	0.83
Item 18 - It is difficult to find time to rest because of the constant interruptions.	0.81
Item 5 - Since I began caring for _____ I seem to be tired all the time	0.81
Item 14 - I have failed to go to appointments since I started taking care of _____.	0.81
Item 8 - I have to stop in the middle of the activities you are doing for caring.	0.82
Item 11 - I have been visiting less family and friends since I started caring for _____.	0.82
Item 19 - I am healthy enough to care for _____.	0.82
Item 10 - My health has got worse since I started caring for _____.	0.82
Item 4 - My activities are all about caring for _____.	0.83
Item 24 - It is difficult to pay for the health care expenses of.	0.83
Item 21 - Caring for _____ caused financial difficulties in the family.	0.83
Item 3 - My financial resources are enough to pay for care expenses.	0.84
Family support subscale	0.84
Item 2 - The other put the care of _____ in my hands.	0.81
Item 6 - It is very difficult to get help from my family to take care of _____.	0.82
Item 22 - My family (siblings, children) left me alone to care for _____.	0.81
Item 16 - Since I started caring for _____ I feel abandoned by my family.	0.80
Item 13 - My family cooperates in the care of _____.	0.81

DISCUSSION

The exploratory factorial analysis of the Brazilian version of CRA showed a prudent behavior, since it allowed for the replication and comparison of the analytical method, used both in the validation of the original version of the instrument[10] and in the validation studies for several other countries[12-20].

The measures of adequacy of the database to perform the analysis in question were satisfactory, indicating the feasibility of data matrix factorization (KMO = 0.82, Bartlett's sphericity test statistically significant, with p = 0.001). These measures confirmed that the exploratory factorial analysis was appropriate[22].

The option to perform the parallel analysis technique for factorial retention was due to its better accuracy, in an attempt to minimize the problems of overestimation or underestimation of the number of factors[22].

In addition, the Kaiser-Guttman criterion (eigenvalue greater than one) is not recommended for factor retention because of its tendency to overestimate the number of factors to be retained[24],

and the scree plot criterion is very confusing for an appropriate decision on that number[22]. Thus, parallel analyzes, whose mathematical principle takes into account the sample error, minimizing the probability of misunderstandings, are, in this context, the most appropriate method of choice for factorial retention[22].

The definition of only three factors in the Brazilian version of the CRA revealed a distinction of the factorial structure of the instrument compared to the original US version[10], as well as the versions adapted for other North American, European and Asian countries[12-20].

Although the CRA demonstrates notorious psychometric qualities as a tool for assessing the repercussions of the provision of informal care in various cultural contexts, there is no congruence of the results regarding its validity and reliability in the different application scenarios[20].

Other investigations in the international scenario also pointed out inadequacy of the original solution of the instrument, of five factors[16,20]. An analysis of the validity of CRA with informal caregivers of elderly people in Singapore indicated

four factors, equivalent to self-esteem subscales, daily activities, family support and financial issues[20]. Among caregivers of people dependent on Portuguese psychoactive substances, the CRA exploratory factor analysis revealed a solution, also, with three factors[20].

It should be emphasized that the factorial solution revealed by the Brazilian version of the CRA was obtained from consistent measures regarding the evaluation of evidence of validity based on the internal structure, among which are cited the use of software for coherent statistical analysis with the level of measurement of the scale of responses to the instrument and the choice of the technique of parallel analysis to decide the number of factors to be retained. This reinforces the quality of the results obtained in the exploratory factorial analysis undertaken.

It should also be noted that although this analytical method has been replicated in several validation studies of CRA to other countries[12-20], the decisions adopted in its conduction are distinguished, affecting greatly the factorial solution obtained. In some cases, even the procedures are shown to be inconsistent from the psychometric point of view, considering the contemporary scientific literature of the area[12,15].

Regarding the factorial solution of the Brazilian version of CRA, it is emphasized that the denomination of factors/subscales (self-esteem, daily activities programming, family support) took into account both the theoretical structure underlying the original version of the instrument[10] to numerically higher factor loads in each factor[25].

It is worth pointing out that the reallocation of items originally belonging to physical health and financial issues subscales[10] in the subscales self-esteem and programming of daily activities, in the Brazilian version, revealed theoretical coherence regarding the content of the items and their relevance to the construct. The repercussion of the provision of care on finances, for example, is notoriously related to the scheduling of the daily activities of the caregiver. Thus, even items that presented factorial loadings considered low (less than 0.60), in the correlated factors, have a relevant theoretical relationship with them, which suggests their non-exclusion[26].

As to the variance explained by the three factors (42%), considering the seriousness and rigor of the procedures used to perform the exploratory factor analysis, it can be stated, according to the classical psychometry perspective, that it is prudent not to consider such percentage as a relevant indicator for interpreting the evaluation undertaken[27]. In addition, it is known that the fewer factors retained in a solution, the smaller the total amount of variance explained by the factors[27]. This is relevant, considering the reduction in the number of factors of the Brazilian version of the CRA in relation to the original version.

The reliability assessment in terms of internal consistency, as measured by the Cronbach alpha coefficient, was also performed in the CRA validation studies for other countries[12-20], allowing a relevant comparison of the results obtained for the Brazilian version, three identified subscales revealed satisfactory results.

The family support subscale presented the highest internal consistency (alpha = 0.84), similarly to that found in the validation study of the Chinese version of CRA, conducted with caregivers of cancer patients[19].

Regarding the coefficient values for the individual items of the Brazilian version of the CRA, a majority was greater than 0.80, considered good. As for values lower than 0.70, observed for seven of the 24 items of the instrument, its consistency in relation to the correlative subscale (self-esteem) is emphasized. This highlights the relevance of an interpretation of Cronbach's alpha coefficient values that considers the theoretical aspects underlying the measuring instrument under evaluation[22].

Limitations of study

It is pointed out as a limitation of the present investigation the fact that only the internal consistency was evaluated for reliability analysis of the Brazilian version of the CRA. It is therefore recommended that further analyzes of this psychometric property, such as the assessment of stability and equivalence of the instrument, be carried out in future research. In addition, although it was not the purpose of the study undertaken here, it is also suggested, as a continuation of the analysis already undertaken for evidence of validity of the Brazilian version of the CRA, the verification of its validity of criterion.

Contributions to the area of nursing and public health

The evidences of validity based on the internal structure and confirmation of the reliability of the Brazilian version of the CRA instrument, attested in this investigation, allow to recommend its administration to evaluate the overload experienced by informal caregivers of Brazilian dependent elderly. This suggests a relevant contribution to gerontological nursing, as well as to the other professional categories in the health area that assist the elderly with functional limitations and their caregivers. In their practice, these professionals will be able to use a scientifically supported, internationally recommended and proven valid and reliable instrument for the evaluation of the overload of informal caregivers of Brazilian dependent elderly people. In addition, the Brazilian version of the CRA may also be used, at a national level, in scientific investigations with this specific public.

CONCLUSION

The analyzes carried out in this investigation revealed that the Brazilian version of the CRA instrument presents good evidence of validity based on the internal structure, as well as a reliable instrument for the evaluation of the overload of informal caregivers of Brazilian dependent elderly. This allows the recommendation of its use in clinical practice on the national scene with this target audience.

The continuity of the evaluation of the psychometric properties of the instrument is encouraged, especially with regard to stability reliability, in order to increase the analyzes already performed. In addition, new validity and reliability evaluations of the Brazilian version of CRA are recommended when administered to informal caregivers of elderly people with different characteristics of the present investigation.

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Mota FRN, Victor JF, Silva MJ, Soares ES, Oriá MOB, Marques MB, et al.

Validity and reliability of the Brazilian version of the Caregiver Reaction Assessment

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