

Research Article

Psychometric properties and validation of the index of Emotional Regulation in Children and Adolescents (ERICA) in mexican schoolchildren

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ABSTRACT

Introduction: Emotional regulation is responsible for monitoring, evaluating and modifying emotional reactions to meet a specific goal. Different types of mental disorders have difficulties in this process. The self-applied scale ERICA is an instrument with reliable psychometric properties for this purpose.

Method: An observational, descriptive and transversal study was carried out. The translation-retranslation of the ERICA was carried out. The data was analyzed with the Statistical Package SPSS v. 19 and the IBM SPSS AMOS V. 23 program.

Results: 202 participants with 9-16 years old, with an average age of 11.77 (SD=1.91). KMO index of 0.75, significant Bartlett test. With an acceptable Cronbach's alpha of 0.74 and explained variance greater than 40%. Confirmatory Factor Analysis, yielded an index χ^2 / df of 1.671, and an acceptable RMSEA of 0.058.

Discussion: the three main components of the original scale were identified, however the grouping of the items was different. The evaluation of a construct as the emotional regulation that from the neuropsychological view is associated with executive functions and in turn influenced by contextual aspects such as parenting styles, psychopathological antecedents and sociocultural level of the caregivers, is complicated even with the help of an instrument such as the ERICA scale.

Conclusion: in the population shown in this study, there are important differences in the grouping of the different reagents. This may be due to the different stages of the emotional development of the sample, in addition to the neurophysiological aspects that intervene in emotional regulation.

Key words: Emotion regulation; ERICA; Validation; Confirmatory factorial analysis

Introduction

Emotions allow to organize thought, learning and action; this being crucial for other processes, for example to facilitate social interaction and social-emotional development [1]. Emotional regulation was described by Thompson as the extrinsic and intrinsic processes responsible for monitoring, evaluating and altering emotional reactions, which are designed to accomplish a specific goal for example a mother (extrinsic factor) tries to calm her child when he is crying, then the school-age child will try to self contain by the learning generated on the containment that the mother exercised in previous stages of the development [2,3]. According to the emotional response that has generated the same either pleasant or unpleasant, the individual will have the tendency to choose situations and respond to them with strategies that allow him to obtain a result in his opinion favorable, it is important to point out that the strategies used will change according to individual development stage, and will depend on external and internal factors [3-7]. Interest in this process has focused mainly on periods of childhood and early childhood, and has recently spread to adolescence, stage in which the ability to transmit emotional experiences to others is developed, in addition to learning the external expression of emotions and internal feelings. The acquisition of the necessary skills for a satisfactory emotional regulation constitutes an outstanding achievement in the development, it is a sign of adaptive psychosocial functioning, that is to say, insofar as the emotional regulation is more stable, this will allow to perceive in a greater degree the positive effect of the skills that allow pleasing results for the individual and to be replicated in different situations throughout life [8-11].

The model with greater acceptance on this issue is the one proposed by Gross and Thompson, which is used to guide the operationalization and evaluation in the research of emotional regulation [12]. From this model derive emotional control that is characterized by the way in which the individual regulates negative affect, as well as expressions and socially inappropriate emotional responses; self - awareness which is the recognition and emotional flexibility that aims to enhance positive emotions and decrease negative emotions as well as the situational response involving social awareness and socially appropriate emotional responses, including expression of empathy [13].

The study of this construct is relevant before the multiple processes that surround it, as the psychological and cognitive, the modification of the emotional response from the cognitive change generated by previous experience, and the neurophysiology that manifests itself in the development of the individual which is regulated according to the environment in which it develops [11,12,14]. During childhood and adolescence, the acquisition of skills to modulate emotional responses depends of maturation factors of neurophysiological systems that allow individuals to reach different levels of organization in the psychological, cognitive and behavioral dimensions.

Currently, several scales of self-report for adolescents and adults can be accessed, with appropriate index of reliability and validity.; Children's Emotions Management Scales (anger, sadness and worry), by Zeman and colleagues (2001);

Difficulties in Emotion Regulation Scale, by Gratz and Roemer [15]. Among others, however the first one only focuses on specific emotions (anger, sadness and concern) and the second is only applicable in adolescents over 13 years of age which was originally designed for adult population.

Based on the Gross and Thompson model, the self-report Emotion Regulation Questionnaire (ERQ) [16] was carried out translated and validated in different countries as Germany, Spain, Portugal and Italy, however this is for adult population, by having an acceptable internal consistency, later a specific report was made for children and adolescents (Emotion Regulation Questionnaire for Children and Adolescents ERQ-CA), which was applied in a sample of 827 participants with an age range of 10 to 18 years of age, which showed an adequate adjustment in the confirmatory factor analysis with a CFI .942, RMSEA .073 [17-22]. These two instruments (ERQ and ERQ-CA) include two specific strategies of the Gross model: expressive suppression and cognitive reappraisal; derived from this instrument, Biesecker and Easterbrooks, made the list of emotional regulation for teens (ERCA), which consists of 27 items for teenagers over 16 years, the authors reported appropriate psychometric properties [13]. Subsequently, MacDermott in 2010, made a review of it, applicable to children and adolescents, creating the scale ERICA (Emotion Regulation Index In Children and Adolescents), consisting of 16 items, in a Likert type format, which evaluates 3 components of emotional regulation according to the Gross and Thompson model: emotional control, emotional self- consciousness and situational response. And consider it useful to apply in children from 9 to 16 years of age. Reporting an internal consistency with a Cronbach alpha of 0.75. For its usefulness, this scale has been translated and validated in several countries. Machado and Reverendo [23] in 2013, in a sample of 268 subjects, with an age range of 12 to 15 years, carried out the translation and validation into Portuguese of the ERICA; finding as well as MacDermott 3 factors, by means of varimax rotation, however reactivities 3 and 4 were grouped in the factor I (emotional control) unlike MacDermott that found them in factor II (self-consciousness). Pimentel [24] and Arellano [25] in 2013, used this instrument in children from 9-11 years and 12 to 16 years respectively, to compare emotional regulation between healthy subjects and subjects with attention deficit disorder and hyperactivity (ADDH), while performing validation of the scale discrepancies in the factors that make it up were found. Pimentel, scored three main factors, and Arellano reported 4 factors besides grouping each one of the reactivities in different factors, e.g. reactive 9 "sometimes I can be very troublesome" not joined any of the factors originally proposed and the reactivities "when I get upset I calm down quickly" and "when things change or I have to try something different, my reaction is adequate", they were grouped into factor one, unlike what was found by Mac Dermot that originally were grouped in factor two of self-consciousness. To count with an instrument that evaluates the characteristics of emotional regulation in the development of children and adolescents and also help to know the manifestations of emotional regulation in the various psychopathological disorders. International epidemiological studies have estimated that anxiety disorders are the most

frequent psychiatric condition in children and adolescents, followed by behavioral disorders, mood disorders and substance use disorders [26-33]. Studies carried out in Mexico estimated a prevalence of 4-12% of children with attention deficit disorder and hyperactivity, approximate started at 5 years, and within the mexican survey of mental health in adolescents, it was identified that 7.2% of young people of Mexico City, suffered a depressive disorder and that 54.7% of the cases were qualified as serious, with approximate onset between 11 and 12 years old [34]. It is also reported in this same study the appearance of anxiety disorders at early age as a specific phobia at 5 years of age, separation anxiety disorder at 6 years of age, in 50% of the surveyed young people and the generalized anxiety disorder generalized with and average onset at 12 years of age [35].

Evidence of poor emotional regulation, has been linked to different types of mental disorders in children and adolescents, such as anxiety and major depression [4,14,36]. It has been observed that even individuals with neurodevelopmental disorders such as attention deficit disorder and hyperactivity have difficulties in emotional regulation and therefore difficulties in cognitive functions [37]. To evaluate each of these processes there have been used different strategies, ranging from behavioral approach to cognitive, going through physiological measurements in biological approach [38]. For the above it is considered necessary to evaluate the psychometric properties of the self - administered scale ERICA in mexican children over 9 years of age, that allow to show know the process of emotional regulation thereof to timely propose interventions to favor an emotional regulation that allows to preserve the function of the individual. In México investigations have been carried out that used the instrument ERICA, where substantial differences between them were found therefore to contrast those results will serve to corroborate the usefulness of the instrument [24,25]. So that the purpose of this study was to observe the psychometric properties of the scale ERICA in mexican children and adolescents.

Method

An observational, descriptive and transversal study was carried out.

Participants

A sample by convenience was settled where 268 children and adolescents aged 9-16 years, who were enrolled in schools of basic education of which 104 were women and 164 men, with average evaluated age of 11.69 years ($DS=1.93$), who could read and write, and speak mexican language, previous signing of informed consent by parents and/or guardians; and informed consent of the participants. This research was carried out together with the psychopathology screening project and referral to attention of schoolchildren in public elementary schools.

For the purpose of this study the group of participants who had no psychiatric diagnosis was taken, so there were eliminated 66 participants that through the interview MINI KID was confirmed that they had psychiatric diagnosis. The total number of participants without a psychiatric diagnosis was 202 subjects.

Instrument

Emotion Regulation Index of Children and Adolescents "ERICA" (Emotion Regulation Index for Children and Adolescents): It is a self-applicable instrument that consists of 16 reactives, of which 10 are inverse reactives (5, 7, 8, 9, 10, 11, 12, 13, 14 and 16). The reactives are designed to evaluate 3 main components of emotional regulation according to the model of Gross and Thompson. 1. Emotional control: evaluated by reactives 5, 7, 9, 10, 12, 14 and 16; 2. Emotional self-consciousness: includes elements that reflect the self-consciousness and emotional modulation valued by reactives 1, 3, 4, 11 and 13; and 3. Situational response: which is assessed by means of reactives 2, 6, 8 and 15.

The original instrument by Mac Dermott and colleagues 13 is a Likert scale, which goes from 1 totally disagree to 5 totally agree. The 3 main components explain the 43.18% of the total variance explained and reports a reliability with Cronbach's alpha of 0.75, in the exploratory factor analysis (EFA) reported that the emotional control factor contributed in 16.98% to the variance, self-conciuousness in 13.29% and situational response in 12.91%. The reactive "I am quiet and shy, I don't show my feelings" with the lowest factorial load of 0.48 was reported; with an RMSEA of 0.04 and a CFI of 0.95. In Mexico, Pimentel²⁴ in 2013, used this instrument in mexican children aged 9 -11 years without psychiatric diagnosis and with a diagnosis of attention deficit disorder and hyperactivity to compare the emotional regulation between both groups; he analyzed it the scale by means of varimax rotation, and obtained a Kaiser Meyer Olkin index 0.71; and described 3 main factors: emotional control with 8 items (3, 4, 5, 9, 10, 12 and 14), second factor self-conciuousness with 5 items (1,8, 11, 13 and 16) and the third situational response factor with 3 items (2,6, 15), however the total variance was 45.80%, but with higher values compared with the original version. Arellano²⁵ in 2013, evaluated with the same instrument teenagers of 12-16 years, who also had a diagnostic of attention deficit disorder and the emotional regulation was compared with adolescents without psychiatric diagnosis and he found a Cronbach 's alpha of 0.80 for the adaptation of the instrument, however while performing the factorial analysis (varimax rotation), it showed 4 major factors, grouping most of items of the scale in the three main (self-conciuousness, emotional control and situational response), however, item 9 was the fourth factor; associating this to the translation of the instrument. The reactives were grouped as follows: Self-consciousness grouped items 1, 11, 13 and 14, emotional control grouped items 3, 4, 5, 7, 10, 12, 16 and situational response items 2, 6, 8, 15. Prior to the application of this instrument, the translation and adaptation process was carried out.

Procedure

The translation-retranslation of the ERICA was carried out by a bilingual person (english-spanish) whose native language was english, upon request to the Foreign Languages Center of the National Autonomous University of Mexico (CELE). Subsequently, a pilot study of this version of ERICA in children

and adolescents of similar characteristics was carried out to identify problems in the comprehension of instrument questions [39-41].

Later it was applied in three primary schools and a secondary school in Mexico City during the period from March 2013 to March 2014 ; previously an informative lecture for parents and teachers of schools, to explain the risks and benefits of involvement of the students was given. This project was approved by the Ethics and Research Committee of the Dr. Juan N. Navarro Children's Psychiatric Hospital.

Finally instruments MINI KID, ERICA and the sociodemographic card were applied.

Ethical considerations

This research was carried out in accordance with the General Health Law on Health Research [42], in its article 17, according to which it was considered a risk-free research since it consisted in the application of clinical instruments without performing any physiological, psychological or social intervention in the participants. In accordance with the ethical principles of human research and what is described in Article 18, 19 and 20 of the aforementioned law, which allows the subject of research may withdraw its participation at any time of the research, respecting the autonomy of it; in such a way that the parents or guardians signed an informed consent in which all the procedure and risks of the research were clarified; and information management was reported anonymously, to avoid exposure or stigmatization of the participant. Also, the minors gave their assent.

Respecting the principle of beneficence, a meeting was established with the participant and tutors to receive feedback on the instruments applied, and if necessary, was guided about the need for psychological or medical attention.

Statistical analysis

The internal consistency of ERICA was evaluated by means of Cronbach's alpha. The validity of the construct was evaluated by exploratory factorial analysis of principal components (PCA) with varimax rotation. The Kaiser Meyer Olkin index was determined. The data was analyzed with the Statistical Package SPSS v.19 The confirmatory factorial analysis (CFA) was carried out through the IBM SPSS AMOS V.23 program; initially, the same was done with the complete sample of subjects of 9-15 years of age, after which it was decided to separate the sample by age group, the first of them of 9-11 years old and the second of 12-15 years; both groups were subjected to internal consistency analysis through Cronbach's alpha and factorial exploratory and confirmatory analysis.

It is important to mention that to carry out the statistical analyzes it was necessary to recode the reactives "When things don't go my way, I get upset easily", "I can be disruptive at the wrong times", "I get angry when adults tell me what I can and cannot do", "I have trouble waiting for something I want", "I do things without thinking about them first", "I annoy others by not minding my own business", "I have angry outbursts", "I am a sad person", "I am quiet and shy, and I don't show my

feelings" and "I enjoy seeing others hurt or upset" because they are inverse reactives.

Results

A sample of 202 participants was obtained, of which 91 were women and 111 men, with an average age of 11.77 (DS=1.91). The average age for women was 11.61 (DS=1.948) and for men 11.77 (DS=1.886). In this group there was no subject of 16 years of age so the age range of the participants was left from 9 to 15 years.

A KMO index of 0.75 was found with significant Barlett test; with an acceptable internal consistency according to Cronbach's alpha (0.74) and an explained variance greater than 40%. In the principal component analysis (PCA) a lower load of .4 was found for the reactive 10 It bothers me when an adult tells me what I can do and what I can not do (0.38); the other reactives were distributed as follows: Emotional control found reactives 4, 5, 9, 10, 12, 14 and 16, self-consciousness grouped reactives 1, 7, 11 and 13 and in situational response were charged their reactives 2, 3, 6, 8, 15; differences were found in the group of reactives 3, 4 and 7 with those reported in the original scale, since the first two correspond to the self-consciousness factor and the last to the emotional control factor (Table 1).

The CFA was carried out based on the analysis of main components; that when analyzing the 16 reactives in the sample of 202 participants the CFA showed an index χ^2/df of 1.671, the goodness index, to verify the adjustment of the model, showed an adequate adjustment of the model according to the goodness index (GFI), with a value of 0.907 and a mean square approximation error (RMSEA) acceptable of 0.058 (Figure 1, Table 2).

Discussion

The clinical instruments that evaluate emotional regulation in children and adolescents are necessary for the investigation of this construct, so it was considered useful to evaluate the psychometric properties of the scale designed by MacDermott, who reported acceptable psychometric properties in 2010, for the evaluation of this construct in mexican population.

Initially, the three component factors of the scale were identified, corresponding to the factors described in the original instrument: emotional control, self-consciousness and situational response; however, the grouping of the reactives was different in the analyzed group of 9-15 years of age. The reactive "I handle it well when things change or I have to try something new." as described by MacDermott as part of the factor of self-consciousness, however in the model evaluated in this study were grouped in the factor of situational response, this may be due to the fact that, according to the emotional regulation scheme of Gross and Thompson, the situational response will always be modified in a negative or positive way by means of cognitive reassessment, being necessary for this the self-consciousness of the individual, it being evident that this reactive can evaluate these two aspects of emotional regulation [4,8,10].

This same situation occurred with the reactives and "I have angry outbursts" and "When I get upset, I can get over it quickly"

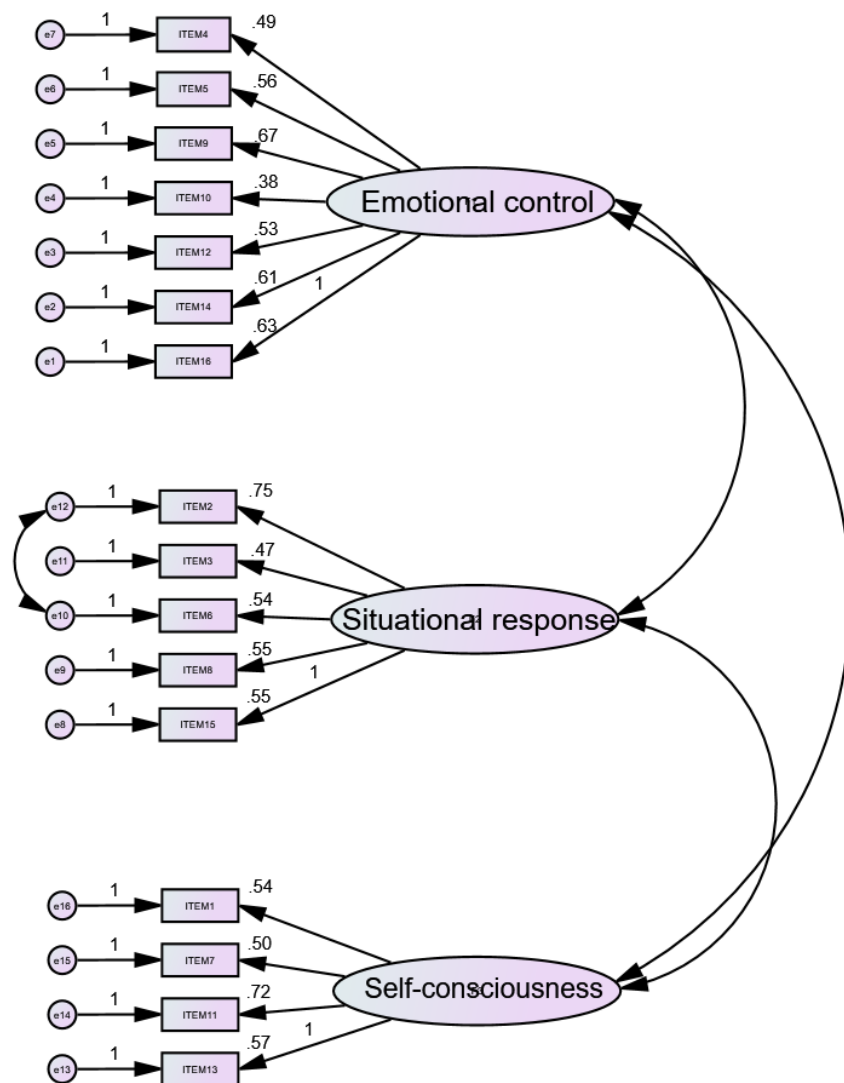


Figure 1. Factor loads per item for the ERICA.

this may indicate that the reactivates do not only measure one area of the emotional regulation, it is also important to remember that emotional regulation and processes involved are dynamic and inclusive, which has two basic strategies: cognitive reassessment and emotional suppression [8,12]. In the study by Pimentel, in children 9-11 years of age, this last reactive was grouped into factor 1 together with the reactive “I handle it well when things change or I have to try something new”, unlike our results that this last reactive was grouped in situational response, this may be due to the fact that in this age group the reflexive ability of the internal experience starts to developed, it is this stage when the emotional identification and situations that activate them begin to be valued by the individual [7]. A similar group was reported by Arellano in 2013 in adolescents 12-16 years of age, different from the one found in this project, which makes us think that the processes of emotional regulation in this last age group are characterized, such and as it is mentioned in the bibliography, in being more adaptive, due to greater abstraction and flexibility of the thought, however the same one depends in this stage of the development of the personality, being important not only the

temperament, but also the capacity of self-control, which can be reduced by the hormonal and neurophysiological changes inherent to development [43,44]. This can be evidenced in the reactive of “I do things without thinking” that in adolescents of 12-16 years of age groups in the factor of self-consciousness unlike the original instrument that marks it as part of the emotional control factor similar to that presented in the sample of this project, the difference could be explained from the fact that the adolescent is aware of his impulsiveness, but not that he manages to control it by the factors already set. Something important to stress is the result of Arellano as for the reactive “I can be disruptive at the wrong times” which did not manage to be grouped in any known factor of the known instrument, unlike Pimentel with children of 9 -11 years, study in which their group is part of the factor of self-consciousness, even so still different to the original study and presented in the present work that groups it in the emotional control factor, so it is considered that as to this reactive could be considered retranslation of such, for a better evaluation of the construct.

Table 1. Factorial loads through the analysis of main components with varimax rotation

ITEM	Mac Dermott y cols	
	LOAD	LOAD (factor)
EMOTIONAL CONTROL (I)		
4. When I get upset, I can get over it quickly.	0.493	0.64 (II)
5. When things don't go my way, I get upset easily.	0.566	0.50 (I)
9. I can be disruptive at the wrong times	0.679	0.64 (I)
10. I get angry when adults tell me what I can and cannot do	0.38	0.56 (I)
12. I have trouble waiting for something I want	0.531	0.68 (I)
14. I do things without thinking about them first.	0.611	0.56 (I)
16. I annoy others by not minding my own business	0.633	0.62 (I)
SELF-CONSCIOUSNESS (II)		
1. I am a happy person.	0.541	0.68 (II)
7. I have angry outbursts	0.504	0.61 (I)
11. I am a sad person.	0.727	0.69 (II)
13. I am quiet and shy, and I don't show my feelings.	0.572	0.48 (II)
SITUATIONAL RESPONSE (III)		
2. When adults are friendly with me, I am friendly to them.	0.757	0.65 (III)
3. I handle it well when things change, or I must try something new.	0.47	0.52 (II)
6. When other kids are friendly to me, I am friendly to them.	0.547	0.72 (III)
8. I enjoy seeing others hurt or upset	0.555	0.60 (III)
15. When others are upset, I become sad or concerned for them.	0.55	0.65 (III)
Original factor of the item is marked in roman number.		
Items in Italics (5, 7, 8, 9, 10, 11, 12, 13, 14, and 16) are reverse Scored.		

Table 2. Internal consistency and goodness of fit indices for the confirmatory factory analysis (cfa) of the Erica

MODEL	Cronbach's alpha	Total variance explained (%)	χ^2	df	χ^2/df	IFI	TLI	CFI	GFI	NFI	RMSEA
16 items covariance among error terms.	0.74	41.59	167.07	100	1.671	0.852	0.815	0.846	0.907	0.699	0.058
df: Freedom Degrees; IFI: Incremental Fit Index; TLI: Tucker Lewis Index; CFI: Comparative Fit Index; GFI: Goodness Index; NFI: Normed Fix Index; RMSEA: Mean Square Approximation Error											

The reactive "I have angry outbursts", in the analysis of main components showed low loads close to .4, showing a slightly higher value for the self-conciousness factor so it was decided to leave it in this factor, in addition to giving greater validity to the construct; this can again be explained by the overinvolvement of the components of emotional self-regulation, since this reactive shows the self-conciousness of the intensity of the individual's emotional control [11,45].

The evaluation of a construct as the emotional regulation that from the neuropsychological view is associated with executive functions and in turn influenced by contextual aspects such as parenting styles, psychopathological backgrounds and sociocultural level of caregivers, it becomes complicated even with the help of an instrument such as the ERICA scale ; example of this is the form in which it impacts and it is shown that each process involved in the emotional regulation according to the stage of development of the individual [8,9].

Conclusions

As it could be observed, the grouping of the reactives was different from that of the original instrument, in the same way as other works carried out in Mexico, and it shows that the strategies for emotional adjustment valued by each of the factors, are different according to the stages of development, so this instrument, although it has shown acceptable psychometric properties, in the population shown in this study, there are

important differences in the grouping of the different reactives; in addition the results should be treated with caution since during the different stages of emotional development there are not only psychological processes involved but also environmental and of course neurophysiological which will be intervene in emotional regulation presented in the individual.

However, it is noteworthy that during the statistical analysis the AFC showed an χ^2 significant, indicating that the sample of this study is not heterogeneous by the above results can not be generalized, this limitation may be due to how the sample was integrated.

It is considered that due to the values obtained, reactives that showed similar factorial loadings similar in one or more factors can be reevaluated, in order to improve the reliability of the instrument. Those that must be reevaluated initially, are reactives 3, 4 and 8, since they are the ones that show a different grouping in each of the works reviewed.

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