Research Article

Validation of the Stress in Children (SiC) Questionnaire in a Sample of Greek Pupils

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Abstract

Aim: The purpose of this study was to validate a Greek version of the Stress in Children (SiC) Questionnaire and assess its psychometric qualities in a Greek pediatric sample. Materials and Methods: Healthy children aged 8-12 years, attending schools of various areas of Attica, the largest region in Greece, were eligible to participate in the study. Data were collected from May 2016 until June 2017, anonymously, though three self-reported questionnaires, a simple demographic questionnaire, the SiC Questionnaire and the State and Trait Anxiety in Children Questionnaire. Results: Questionnaires were completed by 100 pupils (54 boys, 46 girls) aged (mean ± SD) 10.6 ± 1.26 years. A three-factor structure ("Distress", "Presence of well-being", and "Presence of social support") accounted for 41.33% of variance. Reliability Cronbach's alpha of "Distress", "Presence of well-being" and "Presence of social support" factors was equal to 0.75, 0.75 and 0.61, respectively. Regarding concurrent validity, positive correlations were found between "Distress" and both trait anxiety (rho=0.59, p<0.0001) and state anxiety (rho=0.61, p<0.0001). Correlations were also found between "Presence of Wellbeing" and age (rho=-0.24, p=0.019), state (rho=-0.36, p=0.006) and trait anxiety (rho=-0.45, p<0.0001). Conclusions: The Greek version of SiC Questionnaire demonstrated satisfactory psychometric properties (content validity, internal reliability) that support its use in Greek children.

Introduction

Stress is a state in which homeostasis is disturbed by a stressor i.e. a real or perceived threat (Chrousos & Gold 1992). Increased vulnerability to stressors is observed during periods of continuous growth and great brain plasticity such as the prenatal period, infancy, childhood and adolescence. Extreme activation of the stress system during these critical periods of life has been related to adverse endocrine and metabolic sequel as well as negative effects on brain development and behavior (Charmandari *et al*. 2012, Pervanidou & Chrousos 2011).

A well-known study measuring the impact of stress on child health is the World Health Organization survey on Health Behaviour of School-aged Children (King *et al*. 1996).Widely used instruments measuring childhood and adolescent internalizing and externalizing disorders are the Achenbach's Child Behavior Checklist (CBCL), which is a caregiver report measure, and the Achenbach's Youth Self-Report (YSR), which is an adolescent (11-18 years) report meas-

ure (Achenbach 2001). The State-Trait Anxiety Inventory for Children (STAIC) is another self-report valid instrument of 40 items, measuring anxiety in children, which has been translated into the Greek language (Psychountaki *et al*. 2003, Spielberger & Edwards 1973).

Childhood is a period of increased vulnerability to stressors, therefore brief, self-reported and easily scored screening measures of stress are of particular value in young children. The Stress in Children (SiC) is a short, easily administered, self-reported questionnaire, constructed to assess stress in younger children up to the age of 12 years (Osika *et al*. 2007). Since SiC has not been validated in Greece, the purpose of this study was to validate a Greek version of the SiC Questionnaire and to assess its psychometric qualities in a Greek sample of healthy pupils of 3rd to 6th grade of elementary school.

Materials & Methods

Linguistic validation

Permission to validate the SiC Questionnaire in Greek was obtained by its authors (Osika *et al*. 2007). Translation was performed by two independent native bilingual Greek translators with the use of the forward/backward translation method. The translated version was initially administered to five persons in order to identify any unclear sections and to define the final Greek version.

Participants

The study was conducted in various areas of Attica, the largest and main urban region of Greece, from May 2016 until June 2017. Healthy children aged 8-12 years attending the 3rd to 6th grade of two private and one public elementary schools of of Pallini, Aigaleo and Glyfada, respectively, were asked to participate in the study.

The study protocol was approved by the scientific and ethics committee of the Postgraduate Course "Stress Management and Health Promotion", School of Medicine, National and Kapodistrian University of Athens. Children's parents were thoroughly informed about the purpose of the research and provided written consent prior to their children's participation.

Questionnaires

Data were collected from participating children in an anonymous manner through three self-reported questionnaires, a simple demographic questionnaire, the SiC Questionnaire and the State and Trait Anxiety in Children Questionnaire.

The demographic questionnaire included questions regarding children's age, gender, family status (two or single parent family), presence of siblings and the type of attending school (public or private).

The SiC Questionnaire comprises of 21 questions that address physical and emotional aspects of stress. Questions are answered using a 4-point Likert-type scale (from 1=never to 4=very often), while 13 of them are positively worded, to minimize potential biased responses (Osika *et al*. 2007).

The State and Trait Anxiety in Children Questionnaire, is a "how-I-feel" questionnaire that includes two scales of 20 items with each question answered with the use of a 3-point Likert-type scale. The State-Anxiety scale considers children's feelings at a particular moment in time, with half of the items assessing the presence of anxiety, and the other half the absence of anxiety. The Trait-Anxiety scale evaluates how children feel generally (usually) with all its items assessing the presence of anxiety (Psychountaki *et al*. 2003, Spielberger & Edwards 1973).

During questionnaire completion, no clarity issues arose. Children were informed to leave blank any questions in case they didn't wish to answer.

Results

From a total of 110 questionnaires, 10 were excluded because of incomplete answers. Questionnaires from 100 children (54 boys, 46 girls) aged 8 to 12 years (mean ± SD, 10.6 ± 1.26 years) were finally included in the analysis.

Analysis indicated absence of very high correlation of variables as the determinant was 0.001 (≥0.00001). The Barlett's test of Sphericity was statistically significant (χ^2=615.886, p<0.0001), showing satisfactory correlation among variables. Sample adequacy was confirmed by a Kaiser-Meyer-Olkin test value of 0.713 (>0.5). Similarly, sample adequacy for each variable individually was confirmed by Kaiser-Meyer-Olkin test value >0.5 for each variable.

The three factors eigenvalues of ≥1, combined accounted for 41.33% of the variance. The scree plot indicated that three factors should be retained (Figure 1).

The items of factor 1, labelled as "Distress", refer to the physical, emotional and

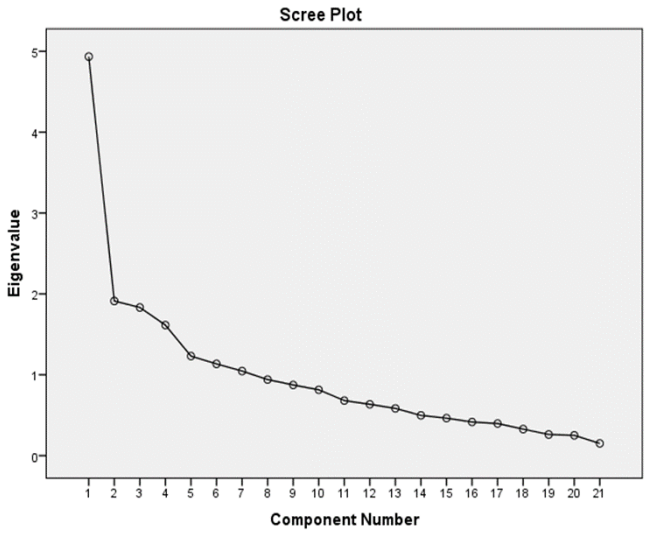

Figure 1. Scree plot of the factors' eigenvalues regarding the SiC Questionnaire.

behavioral aspects of psychological stress. Items of factor 2, labelled as "Presence of well-being", refer to the child's general feeling of life satisfaction. The items of factor 3, labeled as "Presence of social support", refer to the expression of feelings and presence of supportive social environment. The final results of factor analysis are displayed in Table 1. The subscales' basic descriptive measures are presented in Table 2. The subscales' correlations are shown in Table 3.

Higher levels of distress were associated with lack of social support and absence of well-being. On the contrary, well-being was significantly related to the presence of social support and lower levels of distress. Regarding concurrent validity, a significant positive correlation was found between "Distress" and both trait anxiety (rho=0.59, $p<0.0001$) and state anxiety (rho=0.61, $p<0.0001$). Significant correlations were also found between "Presence of Wellbeing" and age (rho=-0.24, p=0.019), state (rho=-0.36, p=0.006) and trait anxiety (rho=-0.45, $p<0.0001$). Finally, "Distress" and "Presence of Social Support" were significantly higher in girls (p=0.049 and p=0.03, respectively), while "Presence of Wellbeing" was significantly higher in children without siblings (p=0.026). No other significant associations were noted.

Discussion

During the past decades, special emphasis has been attributed to the relationship of psychological distress with the physical and psychological health of children. (Charmandari *et al*. 2003, Chrousos & Gold 1992, Nicolaides *et al*. 2015, Stavrou *et al*. 2017).

Results support the reliability and validity of the Greek version of the SiC Questionnaire, used in this study. The adaptation was performed with the use of common component analysis of data collected from 100 pupils residing in urban regions. The three-component structure, also used elsewhere (Osika *et al*. 2007), in the present study accounted for 41.33% of the tool's variance. Most questions' loadings onto the factors were satisfactory, including four negative loadings which had to be reversed during score calculation. Two questions of the original questionnaire ("The other kids tease me" and "When I have a hard time it helps being with my friends") were excluded due to low loading onto the three factors. This result could be justified by both the relatively small study population and some social-cultural factors, e.g. different structure of interpersonal relationships. The internal reliability of the three factors was satisfactory too.

This tool was designed to assess the degree and symptoms of perceived distress, or lower levels of well-being and main aspects of coping and social support (Osika *et al*. 2007). Social skills were associated with greater well-being and lower degree of perceived stress. The lower perception of stress that accompanies enhanced social skills mediates the relationship of social skills with depression and life satisfaction (Segrin *et al*. 2007). According to our results, "Distress", "Presence of Well-being" and "Presence of Social support" were major parameters of perceived stress and therefore could be used in predicting the development of psychological and somatic symptoms in children.

The associations between female gender and elevated levels of distress as well as between "Distress" and state-anxiety are consistent with the results of previous studies (Pervanidou *et al*. 2013, Psychountaki *et al*. 2003) demonstrating higher levels of state-anxiety in girls. Sex differences in both neuroendocrine and behavioral stress responses do exist (Novais *et al*. 2017). Neuropsychiatric disorders are more prevalent in women than men (WHO 2012). Depression in particular, is twice more prevalent in females than in males. According to some researchers, this sex difference does not manifest in childhood, but emerges during puberty (Wade *et al*. 2002). However, a recent study from the U.S. demonstrated that this sex-related difference in depression has its origins in childhood and becomes significant in adolescence

Table 1. Results of Principal Component analysis.

Number	Questions	Factor 1 Distress	Factor 2 Presence of Wellbeing	Factor 3 Presence of Social Support
Item 2	I get headaches	0.704		
Item 4	I feel calm and happy	-0.436		
Item 5	I get stomach pains	0.462		
Item 6	I feel lonely	0.569		
Item 7	I get sad	0.705		
Item 12	Things work out as I have planned	-0.417		
Item 13	I feel happy	-0.520		
Item 15	Sometimes I do not reach the goal I have planned for	0.418		
Item 18	Sometimes I can't manage with the things I have to do	0.479		
Item 1	I get angry		-0.464	
Item 3	I like going to school		0.871	
Item 8	I like to be at school		0.867	
Item 10	I fall asleep easily at night		0.476	
Item 11	I feel calm		0.446	
Item 21	It is easy to concentrate during lessons at school		0.507	
Item 14	When I am happy I show it			0.667
Item 17	When I am sad I show it			0.591
Item 19	When I have a hard time there is an adult to talk to			0.736
Item 20	If anyone teases me I will react			0.531
Eigenvalues		3.16	2.9	2.62
%Variance		15.05	13.81	12.47
Cronbach's alpha		0.75	0.75	0.61

(Breslau *et al*. 2017). Social anxiety disorder and post-traumatic stress disorder are also more likely to develop in women during adolescence (Asher *et al*. 2017, Garza & Jovanovic 2017). Gender differences in the prevalence of stress-related psychiatric disorders seem to be mediated by differences in the function and regulation of the stress response system between men and women. Several clinical studies have identified gender differences in the stress response and at the same time many preclinical studies have revealed cellular and molecular sex differences in the stress response system (Bangasser & Valentino 2014). Furthermore, our finding of higher levels of social support among girls is consistent with previous studies suggesting that women compared to men, are more likely to use emotion-focused coping strategies and talk about their feelings (Tamres *et al*. 2002, Taylor *et al*. 2000).

Our study has some limitations. Although the study sample comprised of children in Attica, the most populated region in Greece, results cannot be generalized in the whole Greek pediatric population. Nevertheless, our results allow recom-

Table 2. SiC Questionnaire three factors' descriptive measures.

Factor	Number of items	Mean	SD	Min	Max
Distress	9	16.7	4.03	9	30
Presence of Well-being	6	16.8	3.7	8	24
Presence of Social Support	4	12	2.6	5	16

Table 3. Correlations of SiC Questionnaire's three factors.

	Distress	Presence of Well-being	Presence of Social Support
Distress	1	-	-
Presence of Well-being	-0.49*	1	-
Presence of Social Support	-0.26*	0.24*	1

mendation of this tool for use in future studies in the Greek territory. The lack of test-retest performance is another limitation of this study. Finally, there has been no prior study using SiC as a psychometric instrument in Greece, to allow better control of the validity criterion.

In conclusion, the Greek version of the SiC Questionnaire used in the present study, demonstrated satisfactory psychometric properties (content validity, internal reliability) that support its use as a valid screening measure for childhood stress. This easily administered tool could be used in future studies of childhood stress in Greece.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Authors' contributions

CE and FB designed the study protocol, collected, analyzed and interpreted the data, and were major contributors in writing the manuscript. DV supervised the data evaluation and the statistical analysis and contributed in drafting the manuscript. GPC supervised the validation procedure and contributed in drafting the manuscript. CD planned the data collection sites, supervised the collection of the questionnaires and the validation procedure and contributed in drafting the manuscript. All authors read and approved the final manuscript.

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