

Anxiety, depression and coping strategies in adolescence: psychometric issues and proposal of a reduced version

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ABSTRACT

This study used depression (CDI – Kovacs, 1981), anxiety (MASC – March, 1997) and coping strategy (CRI-Y – Moos, 1993) scales and studied the fitness of reduced versions. The sample consisted of 916 Portuguese pupils, 54.3% female, aged 10 to 21 years old. The participants were randomly selected from public schools nation-wide. Two classes were chosen from the 5th to the 12th grade.

A set of principal component analyses was carried out in a randomly chosen sample ($n = 394$) and three reduced measures were found to be strongly correlated with the previous. Confirmatory factor analyses (CFA) using the other part of the sample ($n = 522$) revealed adjustment indexes suggesting a good fit for both the whole model and gender and age groups separately. All scales revealed a good internal consistency. According to our results, girls were more anxious and developed more coping strategies than boys. Older students tended to be less depressed, while younger adolescents present higher scores in CDI-R (depression) and CRI-R (coping) scales.

Keywords: Depression, Anxiety, Coping, Reduced version, School-based interventions.

Literature Review

Several studies are unanimous in considering depression as a very common pathology in childhood and adolescence. The heterogeneity of depressive symptoms is related to different periods of childhood/ adolescence - that is, when they begin co morbidity (Harrington, Rutter, & Trombone, 1996; Mash & Wolfe, 2002).

In general, studies suggest that depression symptoms appear by the age of 12 and boys present higher values of depression (McGee, Feehan, Williams, & Anderson, 1992). As age increases, there is a substantial increase of the number of depression symptoms. According to some researchers, the differences can be verified at a deeper level between the ages of 13 and 15 years, which drastically increases between the ages of 15 and 18, where there's a bigger prevalence among the female gender (Duggal, Carlson, Srouf, & Egeland, 2001; Schraedly, Gotlib, & Hayward, 1999).

Anxiety appears as a common, functional and transitory experience and its nature and intensity can vary to a large extent, depending on the individuals' period of development, allowing in this sense, children and adolescents to engage in new, unexpected or dangerous situations (Rosen & Schulkin, 1998). However, the intensity of anxiety can increase and often become chronic and dysfunctional from a social and emotional point of view (Fonseca, 1998).

From a sample of adolescents between the ages of 12 and 17, Essau, Conradt and Petermann (2000) found that females presented more anxiety symptoms than males and that these symptoms tend to increase with age - generally between the ages of 12 and 15.

Some studies have demonstrated the existence of a relation between anxiety and depression in adolescents and adults (Kovacs & Devlin, 1998; Pine, Cohen, Gurley, Brookm, & Yuju Me, 1998). In order to analyse this association, Matos, Barrett, Dadds and Short (2003) carried out a cross-sectional study with Portuguese children and adolescents, aged 10 to 17 attending 6th, 8th and 10th grade in public schools. The subjects were also evenly distributed in terms of gender. These researchers confirmed a significant association between depression and anxiety and superior frequency levels of anxiety and/or depression symptoms in females.

Children and adolescents use a great diversity of coping answers in different domains (in their school performance, family-life and social environment). They differ nonetheless, in stress situation evaluation and in coping strategy assessment. The effects and type of answer in any given situation that causes stress, depend on personal characteristics and abilities (Wenger, Sharrer, & Wynd, 2000).

Some researchers reported the existence of a positive relation between maladaptive coping strategies and different disorders (Endler & Parker, 1990; Holahan, Moos, & Schaefer, 1996). Selffge-Krenke (2000) stated that children and adolescents with pathological behaviours use maladaptive coping strategies, which in the future can increase their pathological behaviours, resulting in a vicious cycle.

Depressed adolescents showed a higher number of stressful life events and a higher use of maladaptive coping strategies before the onset of these events (Selffge-Krenke, 2000).

Byrne (2000) analysed the relations between anxiety, fear, self-esteem and coping strategies, in a sample of 224 adolescents attending 7th, 9th and 12th grade. Results suggested that males present a significant decrease of anxiety and fear in the 12th grade and that by this time, both, males and females use different coping strategies in order to deal with their fear and anxiety.

These studies suggested the need to simultaneously take and analyse the three measures. However, in school-based interventions, if it was possible to focus in the most relevant features of these measures for non-clinical adolescent populations, a reduced version of those scales would avoid a time consuming assessment.

The aim of this study is thus to check for redundant (or not so relevant) items, considering three classical scales, commonly used to evaluate depression, anxiety and coping strategies, and then try to propose a reduced version of the three scales that could be used for screening procedures, in school settings.

It is also our intent to analyse the relationship between both the total scales and the respective reduced scales, in a school population of adolescents, as well as check the effects of age, gender and family type.

Method

Procedures

The study followed strict international ethical and privacy norms, namely, the faculty's scientific board approval, school authorizations, parental consent, anonymity guidelines and voluntary-based participation.

Researchers were chartered psychologists. Questionnaires were administered in the classroom and took an average of 50 minutes to fill in.

SPSS 16.0 software was used in order to carry out a set of principal component analyses (PCA) aiming at getting the more representative factor from the anxiety (MASC), depression (CDI) and coping (CRI-Y) scales.

Participants

The sample consisted of 916 Portuguese adolescents, 54.3% of which were female, aged 10 to 21 ($M = 14.4$; $SD = 2.62$). As for family type, 72.5% of the subjects were found to have been living in a nuclear family. The participants were selected from public schools nationwide, and two classes were randomly chosen from each of the 8 grades chosen, that is, from the 5th to the 12th grade. By using SPSS, we randomly chose two different samples. A first sample consisted of 394 individuals (217 of which were female) between the ages of 10 and 21 ($M = 14.4$ years and $SD = 2.58$). The second sample included 522 subjects (289 of which were female) between the ages of 10 and 21 ($M = 14.3$ years and $SD = 2.66$).

Measures

Children's Depression Inventory - CDI (Kovacs, 1981), the Multidimensional Anxiety Scale for Children - MASC (March, 1997) and the Coping Responses Inventory - Youth Form - CRI-Y (Moos, 1993) were used. Portuguese versions of these scales were available from the Psychology Laboratory of Lusofona University (Lisbon-Portugal), where international rules for independent translation, independent back translation and consensus procedure are systematically carried out.

The CDI consists of a self-report inventory of 27 items with a three point scale (1. Absence of symptoms; 2. Moderate symptoms; 3. Severe symptoms). The total result varies between 27 and 81 points. A higher classification corresponds to a more depressive situation. Kovacs (1981) referred satisfactory levels of internal consistency, with alpha coefficients varying between .71 and .89 for the total scale.

The original scale included several sub-scales that were not taken in consideration for this study, once specific factorial analysis procedures were aimed.

The MASC encloses a self-report scale consisting of 39 items with a four point scale (1- Never or almost never true; 2 - Rarely true; 3 - Sometimes true; 4 -Frequently true). The total result varies between 39 and 156. A higher classification corresponds to more anxiety. March (1997) referred satisfactory levels of internal consistency, with alpha coefficients varying between .88 and .89 for the total scale.

The original scale included several sub-scales that were not taken in consideration for this study, once specific factorial analysis procedures were aimed.

The CRI-Y is a self-report inventory consisting of two parts. In the first section, participants are asked to describe a problem or stressful situation and answers are grouped in different categories. In the present study for example, the stressful events were recoded in five groups: physical health, family, school, friends and "others".

The second part of the CRI includes 48 items, which evaluate coping strategies. Participants select how they usually deal with the situation described in the first part, in a four points scale (1 - No, never; 2 - One or two times; 3 - Yes, sometimes; 4 -Frequent).

The CRI-Y scale is composed of four approach coping subscales including: Logical Analysis, Positive Reappraisal, Seeking Guidance and Support, and Problem Solving. It includes four avoidance coping subscales as well, namely, Cognitive Avoidance, Resignation or Acceptance, Seeking Alternative Rewards, and Emotional Discharge. This instrument measures different types of behavioral and cognitive efforts directed at handling stressful situations and/or their aftermath. Each individual subscale yields a score ranging from 6 to 24. Additionally, there is a general summary score measuring approach strategies and one that measures avoidance strategies.

In the original version, the author considered two dimensions (*active/confronting* coping and *passive/avoidance* coping). In the present study, data did not allow the assumption of two separate factors and therefore, only one coping dimension (CRI) was considered. Accordingly, results vary between 48 and 192 for each dimension and a higher classification corresponds to a more frequent use of coping strategies.

The CRI-Y has been used with over 400 adolescents (masculine and fiinine) in various contexts (health, depression, and chronic illness). The author of the scale (Moos, 1993) referred satisfactory levels of internal consistency alpha coefficients, with alpha coefficients between .68 and .79 for *active/confronting* coping and between .59 and .72 for the *passive/avoidance* coping. No alpha coefficients were available for the total CRI scale.

In the present study, as said, only the scale totals of the CDI, the MASC and the CRI have been studied.

Results

As previously mentioned the main objective of this study was to obtain three independent measures to evaluate the depression, anxiety and coping.

The PCA was developed on the total of itis, which integrate each of the scales used and a first random sample of 394 adolescents was used.

The PCA with Kaiser Criteria was then conducted to extract the higher component (in each separable scale) with eigenvalues greater than one. To interpret the factors a varimax orthogonal rotation was used. As a rule of thumb, only itis with loadings of .32 and above were interpreted (Tabacknick & Fidell, 2001). Some factors loaded only one or two itis, which were hereafter eliminated, taking into account Hakstian, Rogers and Cattell (1982) considerations. According to Ford, MacCallum and Tait (1986), we also deleted itis with loadings greater than .40 in two or more factors. This statistical procedure allowed us to develop three uni-factorial scales that measure depression, anxiety and coping strategy constructs. Those scales represent those itis that have higher loadings in the first PCA component (Table 1).

The PCA's allowed us to analyze 12 itis ($KMO = .894$; $\chi^2=3787.247$, $df = 351$) associated with the first component, which as a consequence, became integrated components of the new reduced version of the depression scale (CDI-R). The reduced version of the anxiety scale (MASC-R) resulted from a first factor with 9 itis ($KMO = .842$; $\chi^2=3603, 495$ $df = 741$). Lastly, an instrument used to evaluate coping strategies ie rged with six itis, which were an integrated part of the first component of the PCA ($KMO = .852$; $\chi^2=3748.561$, $df = 1128$).

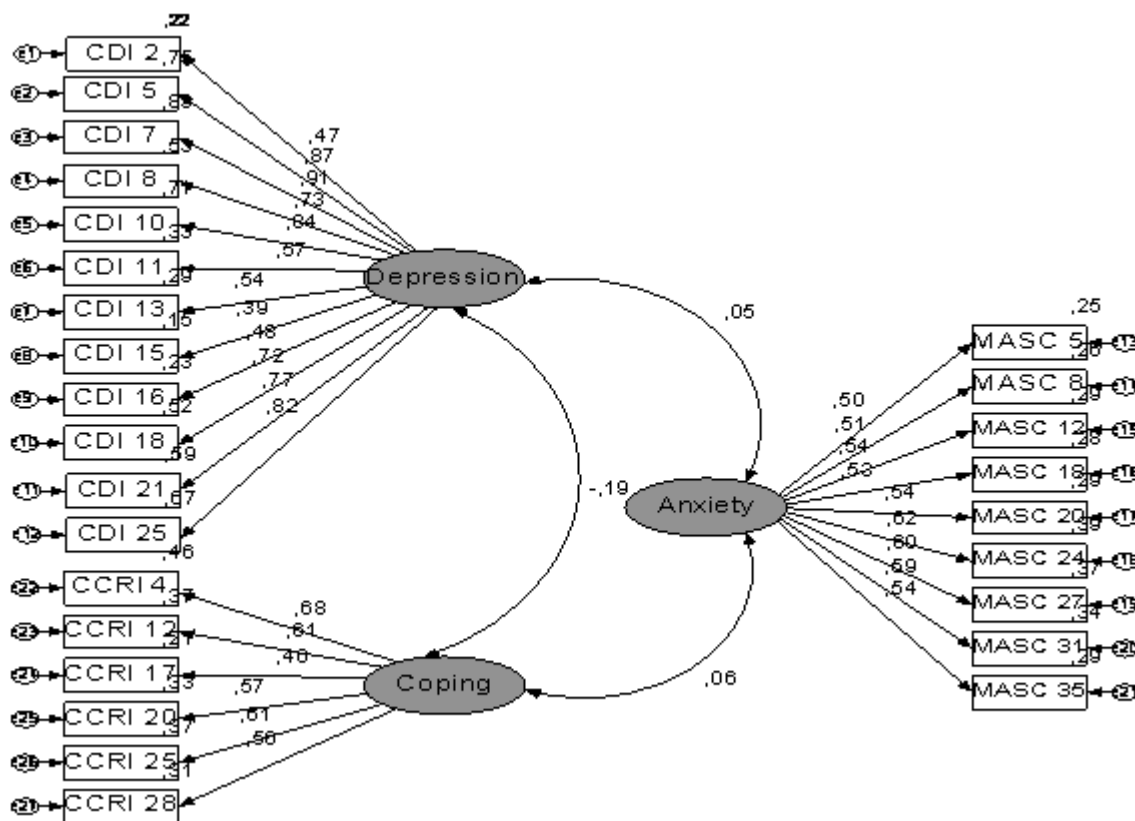
Table 1. Rotated first components loadings, eigenvalues and explained variance after PCA

Reduced Scales	Items	Description	Loadings	
CDI-R (Depression)	CDI 7	I hate myself	.887	
	CDI 10	I feel like crying every day	.865	
	CDI 25	Nobody really loves me	.842	
	CDI 5	I am bad all the time	.842	
	CDI 18	Most days I do not feel like eating	.800	
	CDI 21	I never have fun at school	.782	
	CDI 8	All bad things are my fault	.720	
	CDI 11	Things bother me all the time	.633	
	CDI 16	I have troubles sleeping	.633	
	CDI 13	I cannot make up my mind about things	.550	
	CDI 2	Nothing will ever work out of me	.502	
	CDI 15	I have to push myself to do homework	.456	
	Explained Variance			23.978
	Eigenvalues			6.474
MASC-R (Anxiety)	MASC 24	My heart races or skips beats	.692	
	MASC 27	I feel restless and on edge	.634	
	MASC 18	I have pains in my chest	.633	
	MASC 5	I have trouble getting my breath	.592	
	MASC 35	My hands shake	.549	
	MASC 20	I feel strange, weird, or unreal	.547	
	MASC 12	I get dizzy or faint feelings	.541	
	MASC 31	I feel sick to my stomach	.531	
	MASC 8	I get shaky or jittery	.481	
Explained Variance			9.364	
Eigenvalues			3.652	
CRI-R (Coping)	CCRI 28	Did you try at least two different ways to solve the problem?	.722	
	CCRI 25	Did you think about how things might turn out?	.658	
	CCRI 12	Did you know what had to be done and try hard to make things work?	.625	
	CCRI 4	Did you decide on one way to deal with the problem and do it?	.527	
	CCRI 17	Did you go over in your mind what you say or do?	.514	
	CCRI 20	Did you decide what you wanted and try to get it?	.512	
Explained Variance			7.268	
Eigenvalues			3.489	

In order to test the correlations between the three latent constructs obtained through the previous PCA, a confirmatory model was constructed (Figure 1) using the AMOS 6.0 (Arbuckle, 2005) program. With this aim, the second sample of the study was used ($n=522$), which corresponds to the subjects that didn't belong to the first sample. The CFA was conducted based on the covariance matrix while using maximum likelihood estimation. The overall fit was assessed through the following indices of fit: Chi-square, *root mean square residual* (RMR), *root mean square error of approximation* (RMSEA), *comparative fit index* (CFI), *incremental fit index* (IFI) and *Akaike's information criterion* (AIC). To clarify, the AIC is

used in the comparison of two or more models, with smaller values representing a better fit of the hypothesized model (Hu & Bentler, 1995). Also, RMR represents the average residual value derived from the fitting of the hypothesized model for the sample data variance-covariance matrix. In a well-fitting model, the value must be close or under .05 (Byrne, 2001). CFI and IFI values close to 1 indicate a very good fit (Bentler, 1990). Values of the RMSEA of about .05 or less would indicate a close fit of the model (Browne & Cudeck, 1993). Adjustment indexes thus suggest a good fit ($\chi^2=630.017$, $df=296$; $RMR=.032$; $RMSEA=.035$; $AIC=792.017$; $CFI=.961$, $IFI=.961$). All t values were significant ($p < .01$) and had completely standardized factor loadings higher than .392 and error variances with values ranging from .225 to .770.

Figure 1. Global confirmatory model of the relation between depression (CDI-R), anxiety (MASC-R) and coping strategies (CRI-R)



The three factors included in the present model explain 63.3% of the variance for the latent construct depression (CDI-L), 30.5% of the variance for the latent construct anxiety (MASC-L) and 31.0% of the variance for the latent construct coping strategies (CRI-L). As for covariances between latent constructs, there is a significant negative association between depression (CDI-L) and coping strategies (CRI-L) ($cov(CDI-L, CRI-L) = -.086$, $p < .01$). Association among the other latent constructs was not significant.

The invariance of the model according to gender and age was also tested. The model remains adjusted for girls ($\chi^2=501.125$, $df=321$; $RMR=.045$; $RMSEA=.044$; $AIC=615.125$; $CFI=.937$, $IFI=.938$) and closely fitted for boys ($\chi^2=569.606$, $df=321$; $RMR=.048$; $RMSEA$

= .058; AIC = 683.606; CFI = .896, IFI = .898). Lastly, if we consider the age factor, both the younger group ($N= 202$; 11 or less) ($c^2=440,939$, $df =321$; RMR= .050; RMSEA = .043; AIC = 554.939; CFI = .936, IFI = .937) and the intermediate age group ($N= 258$; ages between 12 and 15) ($c^2=489.630$, $df =321$; RMR= .036; RMSEA = .045; AIC = 603.630; CFI = .908, IFI = .910) generated adjusted models. We also verified that the model which integrates the sample including masculine subjects, presents worse fit indices, which may be acceptable if we consider the fit values mentioned in the literature. The AIC indices allowed us to confirm that of all the tested models, the younger group of adolescents presents the lowest values, which suggests a better adjustment of the model for populations with similar characteristics.

Descriptive analysis and alpha consistency of the reduced measures for the CDI, the MASC and the CRI for the two samples studied are shown on Table 2. According to Nunnally (1978) reliabilities of .70 or greater are sufficient. In both samples, the sub-scale shows good results for the measures of the CDI-R (.92 and .91, respectively), the MASC-R (.80 and .74, respectively) and the CRI-R (.82 and .80, respectively).

Table 2. Descriptive Statistics and internal consistency for the CDI- R, MASC-R, CRI-R total scores

	Sample 1 (N =394)					Sample 2 (N =522)				
	Min	Max	Mean	SD	Cronbach Alpha	Min	Max	Mean	SD	Cronbach Alpha
CDI-R	1	24	13.08	5.21	.92	5	36	21.50	6.91	.91
MASC-R	5	36	20.91	6.88	.80	7	36	15.22	5.04	.75
CRI-R	8	36	14.87	4.94	.81	1	24	13.34	4.69	.80

We tried to determine in sample 2 whether any of the remaining items in the three reduced versions were problematic. Correlations between the response to a particular item and the sum of the responses to all other items were obtained for each scale. Scale scores for each dimension were obtained for each participant by summing up the ratings of all items in each of the three scales (CDI-R, MASC-R, and CRI-R). The item/total correlation ranged from .482 to .877 for CDI-R, .580 to .668 for MASC-R, and .589 to .703 for CRI-R - as all the correlation coefficients were greater than .450. An application of the *Kolmogorov-Smirnov* test was then developed and showed that scale scores were normally distributed for each of the three reduced scales. Reduced measures were strongly, significantly and positively correlated with the respective total scale (CDI and CDI-R, $r = .888$, $p < .001$; MASC and MASC-R, $r = .697$, $p < .001$; CRI and CRI-R, $r = .704$, $p < .001$).

Differential analysis

Concerning gender variables, girls scored significantly higher than boys for the MASC-R [$t(519) = -2.841$, $p = .05$, $r = .12$] and CRI-R [$t(511) = -2.782$, $p = .006$, $r = .12$] subscales. Despite the significant test results, those size effect values are very lower. The Scheffé post hoc test indicated that students from the 5th and 6th grades reported higher CDI-R scores ($p < .001$) than all the other student grades. In accordance with this, the

younger group (n = 202; 11 years old or less) showed significantly higher values in the CDI-R and CRI-R scales when compared with different age groups, such as the intermediate age group (n = 258; ages between 12 and 15 years old) and the older group (n = 62; 16 years old or more).

Discussion

Reduced scales are proposed to assess depression (the CDI-R), anxiety (the MASC-R) and coping strategies (the CRI-R) in school settings, while targeting adolescent populations. Initially, the aimed age group for this study ranged from 10 to 18 years old. However, a small number of pupils attending 12th grade were older than 18 (5% from 19 to 21 years old), and were not excluded from the present analysis, in the sake of ecological validity in the instruments in school settings. Scales were reduced by means of the PCA while using half the sample extracted randomly, and therefore, confirmed by the CFA by using the other half.

The PCA with a varimax rotation allowed the extraction of one main component representative of each scale construct. This analysis allowed us to obtain three independent constructs destined to measure depression (the CDI-R), anxiety (the MASC-R) and coping strategies (the CRI-I). The internal consistencies of the reduced scales obtained for sample 1 and confirmed in sample 2 are higher for the CDI-R and the CRI-R than those found in the literature (Kovacks, 1981; Moos, 1993). However, the reduced anxiety scale (the MASC-R) revealed lower scores than those found with the original version (March, 1997). Despite this, the scale with the highest internal reliability is the CDI-R.

Those reduced scales are strongly correlated with the respective and original total scales, but besides being shorter, seem to be accurate for gender and age differentiation. Within a second different sample, the CFA revealed to be supportive of the model obtained in the PCA. By using the reduced form of the Anxiety, Coping strategies and Depression scales, the odd and unusual positive correlation between Anxiety and Coping strategies seems to fade and a new significantly negative covariance between Coping strategies and depression is highlighted. According to the literature, the negative covariance may be explained with the fact that a positive relation between maladaptive coping strategies and different disorders was found (Endler & Parker, 1990; Holahan et al., 1996), as well as a higher number of stressful life events and a higher use of maladaptive coping strategies before the onset of these events, which showed depressed adolescents (Selffge-Krenke, 2000). Also, besides the fact that significant values were attributed to the covariance, the results found are low and attest in some ways, the independence of the latent constructs that were analyzed.

We conducted other specific CFA analyses to test model invariance in relation to gender and different age groups. Although the results were adjusted to the different sub-samples studied, the AIC index highlights the highest adequacy of the data to the hypothesized model in the sub-sample, which refers to the younger group. We may conclude from this that these scales are more adequate in the evaluation of individuals with these characteristics.

Our results also revealed that girls presented significantly more anxious scores (MASC-R) and tended to develop more coping strategies (CRI-R) than boys. In accordance with our findings, Essau, Conradt and Petermann (2000) found that females presented more anxious

symptoms than males. Also, Matos et al. (2003) confirmed a significant association between depression and anxiety, and that anxiety and/or depression symptoms were more common in females.

According to our results, students from earlier school grades appeared to be significantly more depressed than the ones in the grades following. Adolescents in the younger group also presented significantly more frequent coping strategies use (CRI-R). We should, nevertheless, safeguard the low values associated with the effect size obtained and which raise precautions as to the statistical analysis retrieved. This may represent that the effect it measures is not meaningful or important.

All the instruments used, CDI, MASC and CRI-Y had originally sub-scales that were not here considered, because the purpose was exactly to propose an instrument putting together 3 unidimensional scales, assessing respectively the most relevant factors of depression, anxiety and coping, in this adolescent population. Furthermore, both EFA and CFA supported the unidimensional aspect of each of the 3 reduced dimensions.

It is very interesting to verify in Table 1 that from all the definitions presented in the literature, the depressive item retained in the PCA and associated to the CDI-R, is related to "negative thoughts about oneself and to the environment", supporting the idea that this is the most representative factor for depression in this adolescent population. Negative life events are relevant issues (Lau, 2002; Meyer, Chrousos, & Gold, 2001; Sandberg, Rutter, Pickles, McGuinness, & Angold, 2001), and one of their most relevant aspects is the number of negative life events, because they are described as having a cumulative effect (Kaplan, 1999; Masten, Garnezy, Tellegen, Pellegrini, Larkin, Larsen, 1988). This is an important cue to keep in mind in clinical and promotional interventions in school settings – that is, the importance of building positive self-esteem in adolescents and promoting an optimistic view of the world, even in the presence of negative life events.

Going further through this content analysis of items retained after the PCA, it is quite clear that all the anxiety items included in the MASC-R are related to "physical, emotional and biological related sensations", supporting the idea that this is the most representative factor for anxiety in this adolescent population. This is also an important issue in clinical and promotional intervention in school settings, namely when considering the importance of helping pupils understand, manage and control their bodies and their emotions. Unfortunately, this kind of curricula is too often forgotten.

As for the coping strategy items included in the reduced version of the CRI-R, it is also clear that all of the items are related to "problem analyses and resolution" - that is, to "active coping", supporting the idea that "active coping" is the most representative factor for coping in this adolescent population. This feature highlights and reinforces the importance of checking the adaptive/active strategies that adolescents use in order to deal with stress, considering that coping can be a key issue in understanding the success of performances under stressful events (Hussong & Chassin, 2004). Being able to manage one's own life and becoming autonomous, and simultaneously, using autonomous and positive coping skills successfully, is often related to the feeling of well-being – competencies which should be contemplated when considering school curricula.

Although the sample used in this study does not have national significance, it is a broad sample covering all school grades evenly (from 5th to 12th). Furthermore, classes were randomly chosen and selected from the schools, chosen to assure a broad national distribution. It is also important to underline that the CFA model, which corresponds to the

sub-sample of the masculine gender, presented some values close to adjustment, which allows us to suggest a new replica of the scales in future studies.

Besides the limitations found, this study managed to propose valid, reliable and sensitive reduced form enabling to assess in school settings with non-clinical populations, three important features of adolescents conditions: depression, anxiety and active coping, including their most relevant features, which were in the present study, the "negative thoughts about oneself and to the environment", the "physical, iotional and biological related sensations" and the "probli analyses and resolution".

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