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Psychometric properties of the Hospital Anxiety and Depression Scale in Romanian adolescents

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The present study explored the psychometric properties, validity and factorial structure of the Hospital Anxiety and Depression Scale (HADS) in healthy and chronically ill Romanian adolescents. The sample consisted of 500 adolescents aged 12 to 16 years (M = 14.2; SD = 1.39) recruited from schools and medical settings. Two additional screening tools were used to test the validity of the measured construct. Results indicated that the structure of HADS is represented in both healthy and chronically ill Romanian adolescents by a similar two-factor structure corresponding to anxiety and depression symptoms. With some exceptions, all items loaded on their original scale. Both HADS-Anxiety and HADS-Depression subscales showed good stability over one week and adequate positive correlations with scores on similar screening tools. Still, reliability problems of HADS-Depression scale were identified in healthy adolescents. The findings provide preliminary evidence of the adequacy of using HADS in chronically ill adolescents. The problems connected with the use of HADS-Depression scale in healthy adolescents are discussed.

Keywords: HADS; psychometrics; validity; adolescents

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Introduction

The Hospital Anxiety and Depression Scale (HADS) is a short self-assessment tool developed to identify anxiety (HADS-A subscale) or depression (HADS-D subscale) symptoms in non-psychiatric patients aged between 16 and 65 years (Zigmond & Snaith, 1983). Since its development HADS was extensively used in non-psychiatric medical settings, especially in oncology hospitals (Mitchell, Meader, & Symonds, 2010). The ease in application and the good ability to identify the presence and severity of anxiety and depression symptoms (Bjelland, Dahl, Haug, & Neckelmann, 2002) encouraged the use of HADS in community settings and in younger population. Thus, HADS was found to perform well in children as young as 10 years old (Chan, Leung, Fong, Leung, & Lee, 2010).

In Romania, the psychometric properties of HADS were tested in medical and clinical adult samples, showing a two-factor structure, good reliability, and adequate validity (De Smedt et al., 2013; Ladea, 2005). Still, no previous study was concerned with the adequacy of using HADS in Romanian adolescents. Moreover, previous worldwide validation studies on adolescents (Chan et al., 2010; Dunbar, Ford, Hunt, & Der, 2000; White, Leach, Sims, Atkinson, & Cottrell, 1999) included mainly participants from community samples, not controlled for the presence or absence of medical conditions. A separate analysis of the psychometric properties by health status is recommended, considering that previous findings indicated a possible structure invariance between non-medical and medical adult samples (Cosco, Doyle, Ward, & McGee, 2012). Therefore, the aim of the present study was to extend the research on the adequacy of using HADS in adolescents by analyzing separately in healthy and chronically ill samples the psychometric properties and factorial structure of the Romanian adolescent version.

Development of the HADS

HADS was developed in non-psychiatric medical settings in response to the need for a screening instrument able to identify patients at risk for emotional disorders (Zigmond & Snaith, 1983). This need appeared as a consequence of the frequent occurrence of anxiety or depression symptoms in patients with chronic somatic

diseases. A chronic disease is one in which symptoms manifest actively for more than three months per year or which requires at least one month of continuous hospitalization (Pless & Pinkerton, 1975). It usually interferes with the normal functioning through the limitations consequent to the symptoms (e.g., joint pain in arthritis) or the medical treatment (e.g., nausea following chemotherapy in cancer). Therefore, patients must undergo an adjustment process during which they may experience anxiety or depression symptoms.

Similar to the majority of screening instruments, HADS was not based on a well-established theory of anxiety or mood disorders (Straat, van der Ark, & Sijtsma, 2013). Instead, the authors decided on which aspects of anxiety or depression symptoms to focus. To avoid false positive identification in somatic patients, the authors deliberately avoided items referring to somatic complaints such as sleep disorders or tiredness (Zigmond & Snaith, 1983). In the HADS-D scale, depression is conceptualized mainly through anhedonia, authors considering it the main aspect which responds to antidepressants (Zigmond & Snaith, 1983). Consequently, anhedonia is measured through five items (items 2, 4, 10, 12, 14) while depressive disposition (item 6) and psychomotor retardation (item 8) are each measured by a single item. In the HADS-A scale, anxiety is conceptualized in a more complex way, including panic feelings (items 3, 9, 13), tension (items 1, 7, 11) and worries (item 5).

Psychometric properties of the HADS

Reliability

HADS-A (Cronbach's α ranging between .68 and .93) and HADS-D (Cronbach's α ranging between .67 and .90) scales showed acceptable to excellent internal reliabilities in both chronically ill and community adults worldwide (Bjelland et al., 2002). Similar results were obtained in Romanian adult patients with coronary heart diseases (De Smedt et al., 2013). Still, in a controlled study on healthy adults from UK (Caci et al., 2003), HADS-D scale had unacceptable reliability (Cronbach's α = .49). Problems with the reliability of HADS-D were also found in community adolescent samples from Poland and Hong Kong (Cronbach's α ranged between .63 and .77), while HADS-A (Cronbach's α ranged between.75 and .80) seemed to perform better (Borawska-Kowalczyk & Sands, 2014; Chan et al., 2010). Therefore, it was expected for HADS-D to show some inadequacy in healthy Romanian adolescents as well.

Validity

HADS showed adequate validity in relation with other tools measuring anxiety and depression symptoms in both adult (Bjelland et al., 2002) and adolescent (Borawska-Kowalczyk & Sands, 2014; Chan et al., 2010) samples. Also, a study performed on chronically ill patients confirmed the discriminant validity of HADS in relation with somatic complaints (Johnston, Pollard, & Hennessey, 2000). In Romania the validity of HADS was confirmed in both psychiatric (Ladea, 2005) and medical (De Smedt et al., 2013) adult patients. Similar good results were expected for HADS in Romanian adolescents.

Factor structure

There is a continuous debate on the structure of HADS consequent to the failure of many studies to confirm the two-factor model proposed by scale's authors (Bjelland et al., 2002). The original model (Zigmond & Snaith, 1983) represented by an anxiety (HADS-A) and a depression factor (HADS-D), each composed of seven items, was confirmed in adult patients from 22 countries, including Romania (De Smedt et al., 2013). Still, a different two-factor model was more often identified (Bjelland et al., 2002), consisting in six anxiety and eight depression items, following the transference of item 7 (feeling relaxed) from HADS-A into HADS-D (Moorey et al., 1991). This transfer was theoretically justified through the content of the item which could refer to psychomotor retardation/agitation symptom of depression (Moorey et al., 1991).

Conceptual overlap was identified in other HADS-A items consequent to the presence of tension or worries in both anxiety and depression disorders. Therefore, different three-factor structures were also proposed over time resulting from the split of HADS-A items into those specific to anxiety and those common to both emotional disorders (Caci et al., 2003; Dunbar et al., 2000; Friedman, Samuelian, Lancrenon, Even, & Chiarelli, 2001). Among the three-factor structures, Dunbar et al.'s (2000) model was most often replicated (Cosco et al., 2012). This model is based on the tripartite theory of depression and anxiety, which assumes the existence of both distinct and common features between the symptoms (Clark & Watson, 1991). As such, HADS-A items were split into a Negative Affectivity factor (items 3, 5, 9, 13) representing generalized distress common to both disorders. The remaining HADS-A items and the entire HADS-D scale were kept to represent Autonomic Anxiety and Anhedonic Depression, respectively.

Similar findings were obtained in studies on adolescents. The original two-factor structure proposed by the scale's authors was not confirmed in any study. Instead, Moorey et al.'s (1991) two-factor model containing the transference of item 7 was replicated in all adolescent samples (Chan et al., 2010; Dunbar et al., 2000; White et al., 1999). Additionally, Dunbar et al.'s (2000) three-factor model was also proven to be a good fit (Dunbar et al., 2000). Still it is worth noticing that the factorial structure of HADS was analyzed only in community adolescents, not controlled for the presence of somatic conditions. This is of particular importance considering that in adults, the three-factor structures were most frequently identified in medical samples, while the two-factor models were rather identified in community samples (Cosco et al., 2012). Moreover, in a controlled study on healthy adults, a different factor structure was observed following the split of HADS-D items while the HADS-A scale remained intact (Andersson, 1993). The split of depression items is not surprising considering the reliability problems of HADS-D in healthy samples (Caci et al., 2003). Reliability problems are identified in healthy adolescents as well, consequent to low loadings of depression items, hardly exceeding the cut-off point of .40 for an acceptable correlation (Borawska-Kowalczyk & Sands, 2014; Chan et al., 2010; Dunbar et al., 2000; White et al., 1999).

The most problematic items in both adolescent (Chan et al., 2010; Dunbar et al., 2000) and adult (Caci et al., 2003; Johnston et al., 2000; Straat et al., 2013) samples are

items 7 and 11 from HADS-A, and items 8, 10 and 14 from HADS-D. Items 7 (feeling relaxed) and 11 (feeling restless) frequently cross-loaded on HADS-D (Bjelland et al., 2002) as their content can refer to the psychomotor retardation/ agitation aspect of depression. Item 8 (feeling slowed down) cross-loaded on HADS-A (Dagnan et al., 2008), since anxiety can be somatically experienced as both tension and inability to react (Bracha, 2004). Additionally, in medical patients items 8 (feeling slowed down), 10 (losing interest in one's own appearance), and 14 (enjoying passive activities such as watching TV) are considered inadequate since the answer to these items may be influenced by the functional limitations or disfigurement associated with the disease rather than by the presence of depression symptoms (Coyne & van Sonderen, 2012; Schönberger & Ponsford, 2010). In the current samples, similar cross-loadings were expected.

Clinical utility

Despite the issues related to items loadings and factorial structure, HADS was consistently proven to have good sensitivity and specificity in identifying clinical cases of generalized anxiety or major depression disorders, performing as well as or even better than other screening instruments (Brennan, Worrall-Davies, McMillan, Gilbody, & House, 2010; Mitchell et al., 2010; Vodermaier, Linden, & Siu, 2009). Similar promising results were identified in adolescents, where HADS adequately discriminated between clinically healthy adolescents and those diagnosed with depression or anxiety disorders (White et al., 1999). Still, various cut-off points were recommended for distinct populations, ranging between scores of 5 to 11 (Mitchell et al., 2010; Vodermaier et al., 2009). In Romanian adults, scores above 8 / 10 are indicators for the presence of clinically relevant problems (Ladea, 2005). The calculation of cut-off points for identifying clinical problems in adolescents falls beyond the scope of the current research.

The present study

The aim of the present study was to analyze the psychometric properties, validity and factorial structure of the Romanian adolescent version of HADS. The analyses were performed separately on healthy and chronically ill adolescents, considering the possible structure invariance by health status indicated by previous studies on adults. The concurrent validity of HADS scales was tested in relation to two other self-assessment screening instruments measuring similar constructs, for which positive correlations between scores were expected. Also, the test-retest reliability was considered for a one-week follow-up, corresponding with the time at which the participants had to think while answering the items.

Method

Participants

The sample consisted of 500 adolescents (45.8% girls) aged 12 to 16 years-old (M = 14.2; SD = 1.39) from which 227 (48% girls; age M = 14.00; SD = 1.41) were diagnosed with a chronic disease and 273 (44% girls; age M = 14.38; SD = 1.36) were healthy. The chronic diseases included were asthma (N = 39), cancer (N = 57), diabetes type I (N = 59), chronic renal failure (N = 39), and cystic fibrosis (N = 33). The one-week test-retest reliability was tested in a subsample of 60 healthy adolescents (39.3% girls; age M = 13.87, SD = 1.7). The validity of HADS in relation to other measures of anxiety or depression symptoms was tested in a subsample of 111 healthy adolescents (34.2% girls; age M = 14.26, SD = 1.53).

According to the demographic characteristics, 46.8% of the total participants were from urban environment, 46% were from rural environment, and 7.2% did not report the place of living. Twenty-seven percent of total participants were from families with low income, 22.8% from average income, 12% from high income, and 38.2% did not report family income. There was no significant difference between groups based on gender, $\chi 2 = .82$, $p = .369$ or place of living, $\chi 2 = 1.14$, $p = .301$. Still, the groups were significantly different based on age $\chi 2 = 11.89$, $p = .036$ and family income, $\chi 2 = 14.69$, $p = .001$. Chronically ill adolescents were significantly younger and originated from families with lower income than healthy adolescents.

Method

All participants filled in the Hospital Anxiety and Depression Scale – Teen version (Zigmond & Snaith, 1983). This version was created with the kind permission of HADS publisher, GL Assessment Limited (UK), by simplifying the complex vocabulary used in the Romanian adult translation distributed by Mapi Research Institute on behalf of the publisher. For example, item 13 ("I get sudden feelings of panic") translated by Mapi Research Institute as "Mă simt deodată cuprins(ă) de panică" was adapted into "Mă simt deodată cuprins(ă) de o frică puternică". This simplification was performed to ensure adequate items understanding of young adolescents. Except for the simplified language, HADS-Teen is identical with the original adult version (Zigmond & Snaith, 1983), being as such composed by 14 items measuring the presence of anxiety and depression symptoms (7 items/ subscale). For each item, participants chose one of four possible answers describing the presence of the symptoms in the past week. The answers are coded from 0 to 3; higher scores indicating higher presence of the symptoms. HADS performed well in Romanian adult medical patients (De Smedt et al., 2013), showing good internal consistency (Cronbach's α was .85 for HADS-A and .76 for HADS-D) and validity (Pearson's r ranged from .34 to .59 for HADS-A and from .41 to .57 for HADS-D) in relation with instruments measuring similar constructs. The psychometric properties of HADS-Teen in the current samples are explored in the Results section.

To test the validity of HADS-A scale, the Spence Children's Anxiety Scale – Generalized Anxiety subscale (SCAS-GA; Spence, 1998) was used. The SCAS-GA is composed of six items measuring on a four point Likert scale (0 = never; 3 = always) the frequency of generalized anxiety symptoms experienced in the past week. In the present sample, SCAS-GA had good internal reliability (α = .79), similar to the one reported (α = .73) by the scale's author (Spence, 1998).

The validity of the construct measured by HADS-D scale was tested in relation to the Center for Epidemiological Studies Depression Scale for Children (CES-DC; Weissman, Orvaschel, & Padian, 1980). The

CES-DC is composed of 20 items measuring on a four point Likert scale (0 = never; 3 = always) the presence of depression symptoms as experienced in the past week. In the present sample, CES-DC had good internal reliability (α = .78), similar to the one (α = .76) reported in a validation study of the Romanian adult version of CES-D (Butucescu et al., 2013).

The SCAS-GA and the CES-DC were translated into Romanian following the forward-backward translation design (Hambleton, Yu, & Slater, 1999). Namely, each instrument was translated by two distinct translating teams. The two versions were compared, forming a single version which was next back-translated into English by a person not previously involved in the translation. The back-translated version was then compared with the original English version. Divergences were solved leading to the final Romanian version.

Procedure

The healthy sample was recruited from schools from Maramureş and Cluj counties, while the chronically ill sample was recruited from medical hospitals and centers from Bucureşti, Buşteni, Cluj-Napoca and Iaşi. To ensure a clear healthy sample, the participants recruited from schools who declared having a chronic disease were analyzed together with the chronically ill sample. Prior to the participants' recruitment, parents signed an informed consent. Adolescents aged 16 years were also required to sign an adapted consent form. The participation in the study was voluntary; no incentives where given. The research procedure was approved by the Research Ethics Comitee of the Institute of Psychology, Jagiellonian University in Krakow. Additionally, ethical approvals were obtained from Romanian hospitals where the research was conducted.

Results

Psychometric properties

HADS-A had good internal consistency in both the healthy and chronically ill samples; Cronbach's α was .80 and .79, respectively. Still, HADS-D had unacceptable consistency in the healthy sample, while having acceptable consistency in the chronically ill group; Cronbach's α was .49 and .68, respectively. The inter-scale Spearman's ρ correlation was .30 in the healthy sample and .50 in the chronically ill sample. Both scales showed adequate stability over one-week (see Table 2).

Factor structure

The adequacy of the inter-item correlation matrix for factorial analysis (Labăr, 2008, p.308-309) was indicated in both samples by the significance of Bartlett's test of sphericity, the Kaiser–Meyer–Olkin measure of sampling adequacy higher than .80, and the low percentage of elements of the off-diagonal anti-image covariance matrix greater than .09. For deciding the number of factors to be extracted five criteria were considered: the Kaiser–Guttmann criterion of eigenvalue greater than one, the Cattell's scree plot test, the Velicer's minimum average partial (MAP) test, the parallel analysis computed on 1,000 random samples, and the interpretability of the resulting factors (Zwick & Velicer, 1986). Among these, higher reliability was given to the statistical procedures, namely the MAP test and the parallel analysis, which are more accurate than the criteria based on rules of thumb (Zwick & Velicer, 1986). If different solutions were suggested, the parallel analysis was preferred considering that it was proven to be the most accurate one in simulation studies (Zwick & Velicer, 1986). Next, the factors were rotated through Direct Oblimin rotation in view of the possible correlation between anxiety and depression symptoms (Clark & Watson, 1991; Moorey et al., 1991).

Table 1. Factor loadings for HADS-Teen in Romanian adolescents by health status

	Healthy sample		Chronically ill sample	
Item (original scale)	Anx	Depr	Anx	Depr
Item 1 (HADS-A)	.73		.61	
Item 3 (HADS-A)	.80		.81	
Item 5 (HADS-A)	.75		.73	
Item 7 (HADS-A)	.42	(.39)		.57
Item 9 (HADS-A)	.57		.55	
Item 11 (HADS-A)	.58		.62	
Item 13 (HADS-A)	.70		.64	
Item 2 (HADS-D)		.46		.54
Item 4 (HADS-D)		.61		.67
Item 6 (HADS-D)		.60		.65
Item 8 (HADS-D)	.49		.57	
Item 10 (HADS-D)		.44		(.32)
Item 12 (HADS-D)		.64		.58
Item 14 (HADS-D)		.43		.70
% of variance explained	26.13 %	12.65 %	32.15 %	11.65 %

Note. Anx = Anxiety factor; Depr = Depression factor; HADS-A = Anxiety scale; HADS-D = Depression scale.Only loadings higher than .40 are presented. Items are arranged based on their order in the original HADS subscales.

In the healthy sample, the criteria based on rules of thumb, namely the Kaiser–Guttmann criterion and the scree plot test, indicated the extraction of three factors. Still, the parallel analysis indicated a two-factor solution, while the MAP test indicated a one-factor solution. The MAP test can underestimate the number of factors (Zwick & Velicer, 1986). Therefore, the solution indicated by the parallel analysis was considered to be more accurate. The two-factor solution (see Table 1) is similar to the one proposed by scale's authors, except for the transference of item 8 from HADS-D into HADS-A and the marginal cross-loading of item 7. Still, these adjustments did not modify substantially the internal reliabilities of the scales (see Table 2). The inter-scale Spearman's ρ correlation between the newly obtained two factors was .22, not significantly different than the correlation of .30 between the original HADS scales, $z = 0.99$, $p = .31$.

In the chronically ill sample, the Kaiser–Guttmann criterion suggested a four-factor solution, the scree plot test a three-factor solution, while the parallel analysis and the MAP test indicated a two-factor solution. Considering the higher accuracy of statistical procedures compared to the ones based on rules of thumb (Zwick & Velicer, 1986), for this sample also two factors were extracted. This solution

was similar with the original one proposed by the scale's authors, except for the transference of item 7 into HADS-D, the transference of item 8 into HADS-A, and the exclusion of item 10 from HADS-D (see Table 1). The newly obtained Anxiety factor had similarly good internal consistency (α = .79) as the original HADS-A scale, while the newly obtained Depression factor had a slightly improved internal consistency (α = .72) compared with the original HADS-D scale. The inter-scale Spearman's ρ correlation between the newly obtained two factors was .45, not significantly different than the correlation of .50 between the original HADS scales, $z = 0.68$, $p = .49$. Therefore, in the chronically ill sample the adjusted two-factor structure also did not improve significantly the psychometric properties of the scale.

Table 2. Internal consistencies (Cronbach's α), test-retest reliabilities (Spearman's ρ), and validity (Spearman's ρ) of the HADS-Teen in the healthy sample

	Original structure		Two-factor structure	
	HADS-A	HADS-D	Anxiety	Depression
α	.80	.49	.80	.51
ρT (one-week)	.76***	.68***	.79***	.68***
SCAS-GA	.51***	.18†	.52***	.18†
CES-DC	.46***	.45***	.43***	.50***

Note. Test-retest reliabilities (ρT) were based on $N = 60$. The validity of HADS-Teen was based on $N = 111$. HADS-A = Anxiety scale; HADS-D = Depression scale; SCAS-GA = Spence Children's Anxiety Scale – Generalized Anxiety subscale; CES-DC = Center for Epidemiological Studies Depression Scale for Children; ** $p < .01$; *** $p < .001$; † $p < .10$.

Validity

As expected, there was a moderate positive correlation between HADS-A and SCAS-GA scores and between HADS-D and CES-DC scores (see Table 2). These results confirm the concurrent validity of the construct measured by HADS. Also, the weak correlation between HADS-D and SCAS-GA scores confirms the discriminant validity of the depression construct. Still, the moderate correlation between HADS-A and CES-DC scores indicate a conceptual overlap between the anxiety items and depression symptoms. This overlap decreased with the transference of item 7 into HADS-D and of item 8 into HADS-A in the newly obtained two-factor structure. Nevertheless, the difference between the correlation values was not significant for neither the association between CES-D and HADS-D or Depression scores, $z = 0.47$, $p = .64$, nor between SCAS-GA and HADS-A or Anxiety scores, $z = 0.28$, $p = .78$.

Discussion

The present study explored the psychometric properties, validity and factorial structure of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) in healthy and chronically ill Romanian adolescents aged between 12 and 16 years. To ensure the adequate understanding of the items by younger adolescents, the wording was simplified into a HADS-Teen version. The results obtained with this version are consistent with the ones reported in worldwide studies on adolescents (Chan et al., 2010; Dunbar et al., 2000; White et al., 1999).

As such, the two-factor structure proposed by the scale's authors (Zigmond & Snaith, 1983) was not confirmed. Instead, a slightly different two-factor structure was identified consisting in the transference of items 7 and 8 between HADS-A and HADS-D scales. In Romanian adolescents, regardless of the health status, feeling slowed down (item 8) seems rather an indicator of anxiety than of depression symptoms, associated to the fight-or-flight anxiety response (Bracha, 2004). Also, sitting at ease and feeling relaxed (item 7) seems rather an indicator of depression than of anxiety symptoms. While both these cross-loadings were identified in previous studies on adults (Coyne & van Sonderen, 2012; Dagnan et al., 2008; Schönberger & Ponsford, 2010), the transference of item 7 between scales was the most consistently observed modification of HADS (Bjelland et al., 2002; Caci et al., 2003; Johnston et al., 2000; Straat et al., 2013), being replicated in all the studies on adolescent samples (Chan et al., 2010; Dunbar et al., 2000; White et al., 1999). This cross-loading results from the presence of psychomotor retardation/agitation in both depression and anxiety symptoms (Clark & Watson, 1991).

Still, in chronically ill Romanian adolescents, psychosomatic retardation/agitation seems to be rather a sign of depression than of anxiety symptoms, as indicated by the higher cross-loading of item 7 into HADS-D scale. This would explain the stronger overlap between HADS scales found in the current medical versus non-medical sample (Pearson's r inter-scale correlation was .50, respectively .30). Additionally, in the medical sample, item 10 had a low loading into HADS-D, the scale for which it was developed. This finding is consistent with the previous ones obtained from medical samples and strengthens earlier assumptions according to which losing interest in one's own appearance (item 10) is not a relevant indicator for depression symptoms in somatic patients (Coyne & van Sonderen, 2012).

The modifications identified in the original factorial structure of HADS did not impact significantly the reliability, stability or validity of the scales. Both the original and the currently identified two-factor structures provided similar psychometric properties with the ones previously obtained for HADS in Romanian adult samples (De Smedt et al., 2013; Ladea, 2005). HADS-A had similar good internal reliability in both medical and non-medical adolescents, good stability over one-week, and adequate moderate correlation with another measure of generalized anxiety regardless of the removal of item 7 or addition of item 8. The moderate correlation with CES-DC reinforces earlier observation regarding the conceptual overlap between HADS-A items and depression symptoms (Caci et al., 2003; Dunbar et al., 2000; Friedman et al., 2001). As such, it is not surprising that HADS-A was previously found to identify equally well patients with clinical depression as HADS-D scale (Mitchell et al., 2010).

HASD-D scale also seems to measure a stable and valid construct in adolescents, regardless of the removal of items 8 and 10 or the addition of item 7. Nevertheless, HASD-D appears more reliable in chronically ill than in healthy adolescents. The results are consistent with the ones on a controlled healthy adult sample (Caci et al., 2003), thus suggesting that HADS-D is not a reliable depression measure in non-clinical individuals.

Limitations of the study

The study's limits must be considered. Firstly, the healthy sample was recruited from two counties, while the chronically ill sample was recruited from medical hospitals and centers located in four main cities, covering patients from 38 of 41 total counties in Romania. Therefore, the results obtained on the chronically ill sample have a higher generalizability than the ones from the healthy sample.

Secondly, the scale was filled in individually by chronically ill adolescents and in groups by healthy teens. The different administration results from the specificity of the medical settings where participants were recruited individually, at different times and were hospitalized in separate rooms. The administration would have been time consuming if the community sample would have been also recruited on individual basis. Still, the difference in administration may not have impacted significantly the results, considering the consistency of the current findings with the ones reported in previous studies.

Thirdly, the validity of the scale was tested in relation with other translated instruments, not previously validated in Romanian adolescents. Still, the internal reliabilities of the translated versions are consistent with the ones reported in earlier studies. Also, the correlation between the selected scales and HADS scores are in the expected direction, thus confirming the adequacy of the translated forms used in this research.

Fourthly, the validity of HADS was not tested in the chronically ill sample. This sample is a part of a larger project in which other instruments were used. Therefore, the administration of additional instruments to test the validity of the scale would have overloaded the chronically ill patients, leading to arbitrary responses.

Lastly, the sensitivity and specificity of HADS-Teen in identifying clinical cases was not analyzed, as this was beyond the scope of the present study. Considering the adequacy of using HADS in Romanian adolescents as suggested by the current findings, a normative study could be performed to establish the cut-off points for identifying adolescents at risk for emotional disorders.

Practical implications

The present findings indicate that HADS is a stable and valid measure of anxiety and depression symptoms in Romanian adolescents. The two-factor structure and the cross-loadings between items found in previous research are replicated. Thus, the structure of HADS is represented in both healthy and chronically ill Romanian adolescents by a similar two-factor structure corresponding to anxiety and depression symptoms. The differences between the medical and non-medical samples are connected with the structure and reliability of HADS-D scale, which results from the assessment of depression symptoms almost exclusively through anhedonia.

Unquestionably, anhedonia is an important aspect of depression disorders, often omitted from screening instruments. Nevertheless, its low variability in non-clinical samples results in low reliability of the scale (Caci et al., 2003), fact replicated also in Romanian healthy adolescents. In medical patients, the answer on anhedonia items may be influenced by the presence of the somatic disease rather than by depression symptoms (Coyne & van Sonderen, 2012; Schönberger & Ponsford, 2010). Furthermore, in chronically ill Romanian adolescents, losing interest in one's own appearance is an irrelevant sign of depression, and thus item 10 could be disregarded in this sample. Consequently, additional instruments should be considered for a comprehensive screening of depression symptoms in adolescents regardless of their health status.

For a more accurate measure of emotional disorders in Romanian adolescents, some adjustments to the originally proposed structure of HADS (Zigmond & Snaith, 1983) should be made. Namely, feeling slowed down (item 8) should be considered a sign of anxiety while sitting at ease and feeling relaxed (item 7) a sign of depression symptoms. These cross-loadings results from the reference of both HADS-A and HADS-D items to psychomotor retardation/agitation, a common aspect present in both emotional disorders (Clark & Watson, 1991). These adjustments increase the accuracy of HADS in Romanian adolescents without altering its psychometric qualities.

Note.

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Appendix

Table 1: Descriptive statistics, item-correlation and item-covariance matrix of HADS-Teen in Romanian adolescents

Item (original scale)	*M*	*SD*	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	*Item 6*	*Item 7*	*Item 8*	*Item 9*	*Item 10*	*Item 11*	*Item 12*	*Item 13*	*Item 14*
								Healthy sample								
Item 1 (HADS-A)	1.06	.72	**.52**	-.05	.56	.15	.50	.26	.25	.35	.30	.01	.27	-.05	.41	.16
Item 2 (HADS-D)	0.84	.81	-.03	**.66**	-.08	.18	-.08	.05	.10	-.10	.02	.01	-.05	.19	.04	.13
Item 3 (HADS-A)	1.15	.93	.38	-.06	**.87**	.09	.51	.26	.29	.28	.36	.08	.34	-.10	.57	.10
Item 4 (HADS-D)	0.44	.75	.08	.11	.06	**.56**	.17	.27	.33	.04	.01	.05	.14	.20	.14	.17
Item 5 (HADS-A)	1.30	.87	.31	-.05	.42	.11	**.76**	.30	.39	.30	.33	.03	.36	-.06	.42	.11
Item 6 (HADS-D)	0.36	.64	.12	.02	.16	.13	.17	**.41**	.28	.09	.02	.27	.17	.21	.16	.22
Item 7 (HADS-A)	0.79	.64	.12	.05	.18	.16	.21	.12	**.41**	.19	.19	.05	.18	.02	.23	.20
Item 8 (HADS-D)	0.92	.65	.17	-.05	.17	.02	.17	.04	.08	**.42**	.12	.10	.27	.03	.23	.06
Item 9 (HADS-A)	0.93	.77	.17	.01	.26	.01	.22	.01	.09	.06	**.60**	-.07	.25	-.10	.35	.11
Item 10 (HADS-D)	0.45	.84	.00	.01	.06	.03	.02	.15	.03	.06	-.04	**.70**	.06	.22	.11	.07
Item 11 (HADS-A)	1.11	.83	.16	-.03	.27	.09	.26	.09	.09	.14	.16	.04	**.68**	-.10	.36	.16
Item 12 (HADS-D)	0.35	.74	-.03	.11	-.07	.11	-.04	.10	.01	.02	-.06	.13	-.06	**.55**	-.06	.09
Item 13 (HADS-A)	0.92	.82	.24	.03	.44	.09	.30	.08	.12	.12	.22	.08	.24	-.04	**.67**	.12
Item 14 (HADS-D)	0.42	.73	.08	.08	.07	.09	.07	.11	.09	.03	.06	.04	.10	.05	.07	**.54**
								Chronically ill sample								
Item 1 (HADS-A)	0.96	.78	**.60**	.07	.38	.23	.49	.42	.36	.34	.25	.11	.15	.06	.43	.12
Item 2 (HADS-D)	0.55	.79	.04	**.63**	.03	.22	.04	.23	.11	.06	.06	.09	-.06	.14	.18	.22
Item 3 (HADS-A)	1.03	.99	.30	.03	**.99**	.20	.57	.23	.24	.39	.38	.07	.29	.19	.56	.09
Item 4 (HADS-D)	0.54	.87	.15	.15	.17	**.75**	.28	.43	.51	.23	.28	.12	.07	.26	.39	.39
Item 5 (HADS-A)	1.15	.89	.34	.03	.50	.22	**.79**	.36	.39	.37	.35	.15	.23	.17	.49	.20
Item 6 (HADS-D)	0.41	.71	.23	.13	.16	.27	.23	**.51**	.51	.31	.29	.32	.06	.33	.41	.32
Item 7 (HADS-A)	0.80	.78	.22	.07	.19	.35	.27	.29	**.61**	.25	.28	.14	.12	.26	.36	.34
Item 8 (HADS-D)	1.04	.82	.21	.04	.31	.16	.27	.18	.16	**.67**	.35	.17	.25	.27	.42	.24
Item 9 (HADS-A)	0.86	.86	.17	.04	.33	.21	.27	.18	.19	.24	**.74**	.07	.29	.30	.45	.25
Item 10 (HADS-D)	0.59	.99	.09	.07	.07	.11	.13	.22	.11	.14	.06	**.99**	.09	.23	.17	.07
Item 11 (HADS-A)	1.24	.96	.12	-.05	.28	.06	.20	.04	.09	.19	.24	.09	**.93**	.00	.22	-.01
Item 12 (HADS-D)	0.53	.96	.04	.10	.18	.22	.14	.23	.19	.21	.25	.21	.00	**.91**	.26	.34
Item 13 (HADS-A)	0.90	.90	.30	.13	.50	.30	.39	.26	.25	.30	.35	.15	.19	.22	**.80**	.27
Item 14 (HADS-D)	0.58	.87	.08	.15	.08	.29	.15	.20	.23	.17	.19	.06	-.01	.28	.21	**.75**

Note. HADS-A = Hospital Anxiety and Depression Scale – Anxiety subscale; HADS-D = Hospital Anxiety and Depression Scale – Depression subscale. The item-correlation matrix is presented above the diagonal. The item-covariance matrix is presented under the diagonal. The diagonal presents the variance of each item.