Child Psychiatry & Human Development (2021) 52:579–585
https://doi.org/10.1007/s10578-020-01050-0

ORIGINAL ARTICLE

Convergent Validity and Preliminary Cut-Off Scores for the Anxiety and Depression Subscales of the DASS-21 in US Adolescents

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Received: 14 March 2020 / Revised: 11 July 2020 / Accepted: 16 August 2020 / Published online: 20 August 2020

Abstract

Although the depression and anxiety subscales (DASS-D and DASS-A) of the 21-item Depression, Anxiety, and Stress Scales are commonly used in adolescents, few studies have investigated the convergent validity of/potential cutoff scores for these subscales in U.S. adolescents. To address these gaps, 306 U.S. adolescents completed the DASS-21, Generalized Anxiety Disorder-7 scale (GAD7), and Center for Epidemiological Studies-Depression Scale (CESD). The DASS-D and CESD were strongly correlated, while the DASS-A and GAD7 were strongly correlated in males and more moderately correlated in females. Using the CESD as reference, DASS-D cutoff scores of four for males and five for females provided the best balance of sensitivity and specificity. When using the GAD7 as reference, DASS-A cutoffs of six for females and five for males appeared best. These findings suggest the DASS-A and DASS-D demonstrate good convergent validity and may be suitable for identifying adolescents who are significantly anxious and/or depressed.

Keywords DASS-21 · CES-D · GAD-7 · Depression · Anxiety · Assessment

Introduction

Given the widespread prevalence of depression and anxiety, it is important that researchers and clinicians have measures that are reliable and valid for the assessment of such phenomena [1]. The 21-item version of the Depression, Anxiety, and Stress Scales (DASS-21) is one such measure that is commonly used to measure symptoms of depression, anxiety, and stress in adults [2–6]. The DASS-21's widespread use is likely due to its public accessibility, array of symptom domains (depression, anxiety, and stress), and brief format (using only 21 items). The DASS-21 has also been found to have high levels of internal consistency, test-retest reliability, construct validity, convergent validity, and discriminant validity in adult populations [2, 4–7]. Due to this substantial psychometric support in adult populations, it is not surprising that the DASS-21 is also commonly used to assess symptoms of depression, anxiety, and stress in adolescents [8–12].

The use of the DASS-21 in adolescents is supported by numerous studies supporting this measure's reliability in adolescents. Indeed, the DASS-21 has been shown to have fairly high internal consistencies in (Depression $\alpha = 0.88$; Anxiety $\alpha = 0.79$, Stress $\alpha = 0.82$; [12]) and has evidenced good 1-week test-retest reliability in adolescents (intraclass correlation coefficients = 0.80 for the Anxiety subscale, 0.86 for the Depression subscale, and 0.82 for the Stress subscale; [10]). Further, the DASS-21 has demonstrated construct validity in adolescent populations, with many studies supporting a three-factor structure of the DASS-21(depression, anxiety, and stress) across a variety of cultures [12–14]. Such factor-analytic findings support the DASS-21's construct validity and suggest that it may indeed be used as a measure of depression, anxiety, and stress in adolescents.

Despite the DASS-21's widespread use and reported reliability and factor analytic results, one substantial weakness of the DASS-21 is the lack of research investigating the convergent validity of this measure's depression and anxiety subscales in US adolescents. While numerous studies support the convergent validity of the DASS-21's subscales such studies were primarily conducted with adults or adolescents from outside the USA [2, 4, 6, 15–17]

The first aim of the present study was to address this gap in the literature by examining the convergent validity of the depression and anxiety subscales of the DASS-21 in a sample of US adolescents. To achieve this goal, the present study

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investigated how the DASS-21's subscales related to other established measures of adolescent depression (the Center for Epidemiological Studies-Depression Scale or CESD; [18]) and anxiety (the Generalized Anxiety Disorder-7 scale or GAD7; [19]) in a sample of US high school students. By testing the convergent validity, the study hoped to further elucidate whether the DASS-21's subscales are appropriate for measuring depression and anxiety in US adolescents.

The second aim of this study was to investigate potential cutoff scores for the DASS-21's anxiety and depression subscales by comparing the depression and anxiety subscales to more established measures of depression (the CESD) and anxiety (the GAD7) that have clinically validated cut-off scores. Although descriptive cutoff score categories for the DASS-21's subscales were provided by the creators of the scale for adult populations (e.g., Mild, Moderate, etc.,) it is unclear how these categories translate to whether an adolescent is experiencing clinically significant symptoms of depression and/or anxiety [2]. While the DASS-21 may be able to measure symptoms of depression and anxiety it is not currently suited to evaluate whether an individual is experiencing clinically significant levels of depressive or anxious symptoms. The current study's aim of determining preliminary cut-off scores for the DASS-21's depression and anxiety subscales in US adolescents will therefore prove useful in allowing future researchers to potentially use the DASS-21 as a means of categorizing individuals as significantly depressed or not depressed and/or significantly anxious or not anxious, rather than just measuring the relative amount of depressive and anxious symptoms that an adolescent might be experiencing.

Methods

Participants

Participants consisted of 306 high school students (140 female, 166 male) from public and private Midwestern high schools between the ages of 13 and 18 ($M = 15.35$, $SD = 1.26$). These students primarily identified as White/European American (73.5%), followed by Asian/Asian American (7.8%), and Black/African American (4.6%). Participants were primarily freshman (49%), with 20.3% juniors, 17.0% seniors, and 13.7% sophomores. This sample also likely came from a highly educated background, as 20.5% of the sample had at least one parent/guardian with a bachelor's degree, 50.3.% had at least one parent/guardian with a master's degree, and 21.9% had at least one parent/guardian with a doctoral degree.

In terms of mental health, 57.5% of the sample indicated that they had never used psychological or psychiatric services, while 21.6% indicated that they had previously used such services, 14.4% reported they were currently using such services, and 6.5% of the sample chose to skip this question.

Measures

DASS-21

The DASS-21 utilizes four-point item responses that range from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). Scores range from 0 to 21 for each subscale and are obtained by summing the 7 depression, 7 anxiety, and 7 stress items, with higher scores indicating higher depression (DASS-D), anxiety (DASS-A), or stress (DASS-S; [8]). The idea that the DASS-21's subscales indeed measure symptoms of depression, anxiety, and stress is supported by numerous factor-analytic findings across adolescents from a variety of cultures [12–14]. The DASS-21's three subscales have also demonstrated fairly high internal consistencies (Depression $\alpha = 0.88$; Anxiety $\alpha = 0.79$, Stress $\alpha = 0.82$; [12]) and 1-week test-retest reliability in adolescents (intraclass correlation coefficients = 0.80 for the Anxiety subscale, 0.86 for the Depression subscale, and 0.82 for the Stress subscale; [10]). All three scales also demonstrated high internal consistency in the present sample (Depression $\alpha = 0.92$, Anxiety $\alpha = 0.81$, Stress $\alpha = 0.81$).

GAD7

The Generalized Anxiety Disorder-7 scale (GAD7) is a 7-item scale that asks respondents how often they have been bothered by various symptoms of anxiety over the past two weeks on a scale ranging from 0 ("Not at all") to 3 ("Nearly every day;" [19]). The items on the GAD7 were originally designed to measure symptoms of general anxiety (e.g., "Worrying too much about different things"). However, since the symptoms measured by the GAD7 can also apply to other anxiety disorders (e.g., "Feeling afraid as if something awful might happen"), the GAD7 has been shown to be related to other anxiety disorders—including Panic Disorder, Social Anxiety Disorder, and PTSD—and is often used to assess overall levels of anxiety [20]. Summing the 7 items gives the total score for this scale, which ranges from 0 to 21 (with higher scores indicating greater levels of anxiety). In a sample of US adults, the GAD7 showed high internal consistency ($\alpha = 0.92$ and test-retest reliability; intraclass correlation = 0.83), and was related to other measures of anxiety such as the Beck Anxiety Inventory ($r = 0.72$) and the anxiety subscale of the Symptom Checklist-90 ($r = 0.74$; [19]). In samples of US children and adolescents, the GAD7 has demonstrated excellent internal consistency (*Cronbach*'s $\alpha = 0.90$; [21]) and was strongly correlated with the Pediatric Anxiety Rating Scale ($r = 0.65$; [22]). The internal

consistency of the GAD7 in the present study was excellent as well ($\alpha = 0.90$).

In the initial validation study of the GAD7, the authors recommend using a cutoff score of 10 for identifying individuals with moderate levels of anxiety, as this cutoff score demonstrated good sensitivity (0.89) and specificity (0.82; [19]). A 2016 meta-analysis conducted also found that a score of 10 had relatively high pooled sensitivity (0.74) and specificity (0.83) for identifying GAD across various adult samples [20]. In light of these findings, a cut-off score of 10 was utilized in the present study to classify individuals as experiencing clinically significant levels of anxiety.

CES-D

The 20-item Center for Epidemiological Studies-Depression (CESD) scale [18] was used as an additional measure of depression. The CESD utilizes a 4-point Likert-type scale, ranging from 0 ("Rarely or none of the time…") to 3 ("Most or all of the time…") and provides a total score from 0 to 60, with higher scores indicating greater depression. This scale has demonstrated high internal consistency ($\alpha = 0.88$) in a sample of adolescents and young adults [23], as well as in the present study ($\alpha = 0.92$). In a sample of children and adolescents (ages 8–15), this scale was shown to be significantly and strongly correlated with other established measures of depression such as the Beck Depression Inventory, the Hospital Anxiety and Depression Scale, and the Zung Self-Rating Depression Scale [24]. The test-retest reliability of this scale in adolescents was fairly low across a 1 month period ($r = 0.49$ for males and $r = 0.60$ for females; [25]) and a 2 week period ($r = 0.55$; [24]). However, the CESD has been shown to have high sensitivity (0.40–0.91, with most studies reporting values between 0.72 and 0.84) and specificity (0.44–0.90, with most values between 0.59 and 0.75) when using a cut-off score of 16 in various adolescent samples [26]. In light of this, a cutoff score of 16 was used in the present study to classify participants as significantly depressed.

Demographics

Participants were asked various questions about their grade level, age, biological sex, race/ethnicity, parental education, and use of psychological/psychiatric services.

Procedures

The participants from this survey were recruited as part of a larger study investigating exercise and mental health in adolescents. After receiving approval from Saint Louis University's Institutional Review Board (IRB), a letter detailing the purpose and topic of the study and what participation entailed was emailed to the students' parents, giving them the opportunity to opt out from allowing their children to take the survey. If their parents did not opt out, students were later emailed a link by their teachers or academic supervisors to complete an online survey and were given time to complete the survey during the school day. Students were also able to access the survey link for up to one week after the initial data collection.

Data Analytic Strategy

First, the DASS-D and the CESD were correlated to investigate validity of the DASS-D. Then, to determine a potential cutoff score for the DASS-D, a linear model between the DASS total score and the CESD score was created. The cutoff score of 16 given by the CESD was then used to estimate a cutoff score for the DASS-D. To determine the effectiveness of these cutoff scores, area under the curve (AUC), and sensitivity and specificity statistics were run. ROC curves provided a visual representation for sensitivity and specificity data. The same analyses were then run for the DASS-A compared with the GAD7, using 10 as a cutoff score on the GAD7.

Results

Preliminary Analyses

A MANOVA was performed using sex, grade level, and school type as the predictor variables and the DASS-D, DASS-A, CESD, and GAD7 as the outcome variables. Results revealed no significant differences between public and private school samples ($F(4, 292) = 1.44$, Wilk's $\Lambda = 0.98$, $p = 0.22$), nor were there significant difference found between grade levels on any of the outcome variables ($F(12, 772.85) = 0.39$, Wilk's $\Lambda = 0.98$,, $p = 0.97$). However, significant results were found regarding sex ($F(4, 292) = 8.86$, Wilk's $\Lambda = 0.892$, $p = < 0.001$). Specifically, follow-up analyses revealed that male adolescents scored significantly lower than female adolescents on the CESD ($M = 13.20$ for male adolescents and 16.30 for female adolescents), GAD7 ($M = 4.83$ for male participants and 7.45 for female participants), and DASS-A ($M = 3.50$ for male participants and 4.89 for female participants; all p-values < 0.005), while no significant differences were found on the DASS-D ($M = 4.21$ for male participants and 4.73 for female participants; $p = 0.120$). Given these findings, the remaining analyses were run separately for male and female adolescents.

Table 1 Sensitivity and specificity data for adolescent males and females using the DASS-D and CESD cutoffs

Cutoff	Males			Females		
	Sensitivity	Specificity	Accuracy	Sensitivity	Specificity	Accuracy
2	0.97	0.59	0.70	0.99	0.57	0.75
3	0.95	0.74	0.80	0.90	0.72	0.80
4	0.90	0.82	0.84	0.79	0.81	0.80
5	0.80	0.88	0.86	0.72	0.94	0.84
6	0.72	0.93	0.87	0.61	0.98	0.82
7	0.68	0.95	0.87	0.54	0.99	0.79

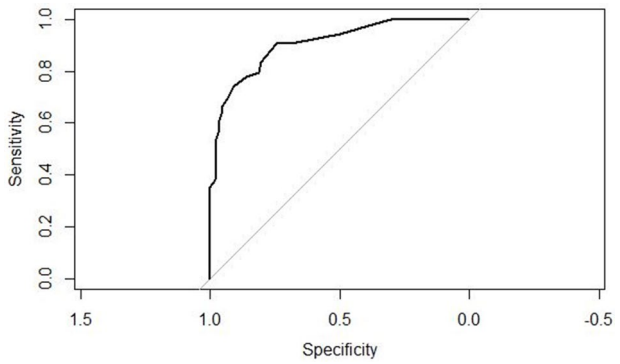

Fig. 1 ROC curve for adolescent males using the DASS-D and CESD cutoffs

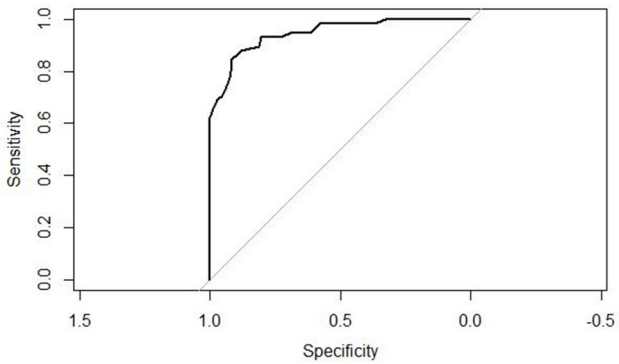

Fig. 2 ROC curve for adolescent females using the DASS-D and CESD cutoffs

Depression

A correlation was performed between the DASS-D subscale and the CESD to assess the convergent validity of the DASS-D as a standalone measure of depression. Strong, significant correlations were found between the two measures in both male adolescent ($r = 0.869$, $p < .001$) and female adolescent samples ($r = 0.864$, $p < .001$). As was recommended for use on the CESD by Vilagut et al. [26], a cutoff score of 16 was used in order to determine a preliminary cutoff score for the DASS-D to classify individuals as experiencing clinically significant levels of depression.

To ensure maximum accuracy, sensitivity and specificity data were taken for cutoff scores surrounding the predicted scores. As can be found in Table 1, for male participants a cutoff score of 4 yields the highest sensitivity (0.90), with a specificity of 0.82) and an overall accuracy of 0.84. For female adolescents, a cutoff score of 5 yields the highest overall accuracy (0.84), with a sensitivity of 0.72 and a specificity of 0.94 Also shown in Table 1, these preliminary cutoff scores for the DASS-D also yield high accuracy rates for both samples (84%). Furthermore, Figs. 1 and 2 display ROC plots for scores on the DASS-D and the CESD in male and female adolescent samples. As can be seen in Fig. 1, a cutoff score of four for male adolescents significantly deviates from a random test, with the AUC analysis above 0.80 (AUC = 0.906; 95% CI 0.856, 0.957). Similarly, in Fig. 2, a cutoff score of 5 for female adolescents also yields an AUC analysis above 0.80 (AUC = 0.946; 95% CI 0.911, 0.980), indicating high accuracy.

Anxiety

A correlation was performed between the DASS-A subscale and the GAD7 to assess the convergent validity of the DASS-A as a standalone measure of anxiety. A strong, significant correlation was found between the two measures in adolescent males ($r = 0.720$, $p < .001$), while a more moderate, but significant, correlation was found in adolescent females ($r = 0.502$, $p < .001$). In order to determine potential cutoff scores for the DASS-A, a cutoff score of 10 was used to identify individuals as experiencing clinically significant levels of anxiety, as was recommended for the GAD7 [19].

Once again, sensitivity and specificity data were taken for cutoff scores surrounding the predicted scores. As can be seen in Table 2, a preliminary cutoff score of 6 for male adolescents yields the highest sensitivity (0.83) and specificity (0.87) data, with a high overall accuracy rate (0.86). In female adolescents, a preliminary cutoff score of 5 yields the highest sensitivity (0.70) and specificity (0.70) data, with an equally high accuracy rate (0.70). Furthermore, Figs. 3 and 4 display the ROC curves for both samples. As can be

Table 2 Sensitivity and specificity values for adolescent males and females using the DASS-A and GAD7 cutoffs

Cutoff	Males			Females		
	Sensitivity	Specificity	Accuracy	Sensitivity	Specificity	Accuracy
3	0.94	0.64	0.69	0.84	0.44	0.58
4	0.88	0.78	0.80	0.77	0.59	0.65
5	0.83	0.82	0.82	0.70	0.70	0.70
6	0.83	0.87	0.86	0.61	0.81	0.74
7	0.75	0.93	0.90	0.53	0.83	0.73
8	0.67	0.96	0.91	0.42	0.87	0.71
9	0.58	0.97	0.90	0.33	0.91	0.71

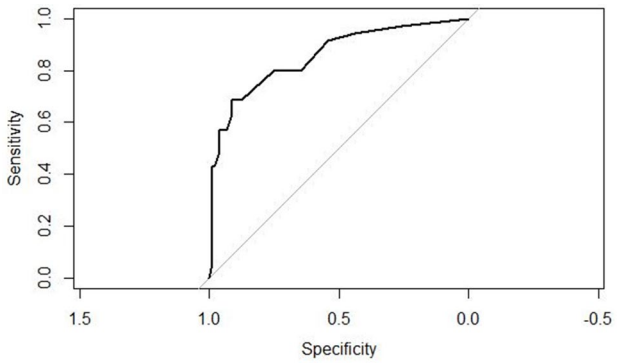

Fig. 3 ROC curve for adolescent males using the DASS-A and GAD7 cutoffs

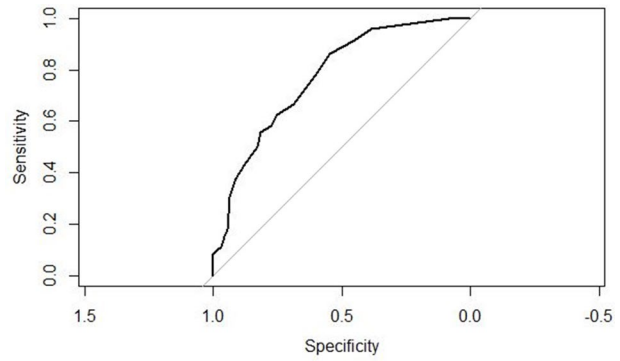

Fig. 4 ROC curve for adolescent females using the DASS-A and GAD7 cutoffs

seen in Figs. 3 and 6 for male adolescents significantly deviates from a random test, with the AUC analysis above 0.80 (AUC = 0.857, 95% CI (0.780, 0.933))). For female adolescents, Fig. 2 displays that a cutoff score of 5 yields an AUC analysis above 0.75 (AUC = 0.772, 95% CI (0.702, 0.843). While the female adolescent AUC analysis is somewhat weaker than with male adolescents, the cutoff scores used for each sex displayed relatively good sensitivity, specificity, and accuracy.

Discussion

Results revealed significant correlations between the DASS-D and CESD and between the DASS-A and the GAD7. These correlations provide support for the use of these subscales as measures of depression and anxiety in adolescents. However, it is worth noting that correlations between the DASS-D and CESD were strong for both adolescent males ($r = 0.87$) and female adolescents ($r = 0.86$), while the relationship between the DASS-A and GAD7 was still relatively strong for adolescent males ($r = 0.72$) but was notably weaker for adolescent females ($r = 0.50$; [2]). One reason for this finding could be that the items on the GAD7 appear to assess both cognitive and physical symptoms of anxiety (e.g., worrying too much about different things and being so restless that it's hard to sit still), while the items that comprise the DASS-A appear to solely assess physical symptoms of anxiety (e.g., trembling). Since female adolescents only scored slightly higher than male adolescents on the DASS-A ($M = 4.89$ for females and 3.50 for males) and much higher than male adolescents on the GAD7 ($M = 7.45$ for females and 4.83 for males), it could be that adolescent females in the present sample experienced both cognitive and physical symptoms of anxiety, while male adolescents reported primarily only physical symptoms of anxiety. If this pattern of symptoms is truly the case, it would follow that the correlation between the GAD7 and DASS-A would be stronger for male adolescents than female adolescents.

Therefore, it appears that while the DASS-D can be used as a measure of overall depression with adolescents, the DASS-A may only be well-suited to assess physical symptoms of anxiety in adolescents. However, further studies need to replicate and extend the current findings by assessing how suitable the DASS-21 is for measuring various types of anxiety in adolescents.

Regarding preliminary cutoff scores for the DASS-D, scores of 4 for adolescent males and 5 for adolescent females were supported with sensitivity and specificity data above 0.70 and AUCs above 0.80 for both groups. However, it is worth noting that cutoff scores of 3–6 for male participants and 3–5 for female participants all had acceptable levels of

sensitivity and specificity (e.g., above 0.70; [27]), with sensitivity being the highest for lower cutoff scores and specificity being the highest for higher cutoff scores.

For the DASS-A, cutoff scores of 6 for adolescent males and 5 for adolescent females were found to provide the best balance of sensitivity and specificity (with both values above 0.70 in both groups). While 5 was the only cutoff score that met minimally acceptable levels of sensitivity and specificity for female participants, cutoff scores of 4–7 on the DASS-A all had acceptable sensitivity and specificity for male participants (with sensitivity being highest at 4 and specificity being the highest at 7). In light of these findings, the exact cutoff scores to be used on the DASS-D and DASS-A would largely depend upon whether it is most beneficial to maximize sensitivity or specificity.

These findings fill an important gap in the literature by examining the convergent validity of the DASS-21 in US adolescents and providing preliminary cutoff scores that could potentially be used with adolescents who are exhibiting signs of depression and anxiety. More specifically, the present findings provide notable support for the DASS-D subscale as a potential indicator of clinically meaningful symptoms of depression in male adolescents (using a preliminary cutoff score of 4) and female adolescents (using a preliminary cutoff score of 5). While the present findings also provide notable support for the DASS-A as a way to detect clinically meaningful levels of anxiety in male adolescents when using a preliminary cutoff score of 5, they provide only minimal support for this use of the DASS-A in female adolescents when using a cutoff score of 6 (sensitivity = 0.70; specificity = 0.70, and accuracy = 0.70; [27]). If these preliminary cutoff scores are further evaluated, they could allow future researchers to use the DASS-21 as a means of identifying individuals who are significantly depressed or anxious, opening the door for future avenues of research with this instrument. Further evaluating the present cutoff scores might also help clinicians efficiently screen for clinically significant levels of depression and/or anxiety in their clients, thereby providing faster and more effective mental healthcare for adolescents and their families.

In considering these findings however, it is important to note the limitations of the current study. Because there was no data on how these cutoff scores mapped on to actual clinical diagnoses, the cutoff scores on both the DASS-D and DASS-A are only preliminary and should not be used as stand-alone ways of determining clinical diagnoses. To further evaluate the potential clinical utility of these cutoff scores, future studies comparing these cutoff scores to actual clinical diagnoses are needed.. It is also important to note that due to the somewhat skewed sample of adolescents (e.g., highly educated parents and Midwestern high schools), the results should not be generalized to adolescents from other parts of the country nor to adolescents from families with lower socioeconomic resources and less educated backgrounds. Additionally, since the sample consisted mostly of white participants, future studies should look at adolescents with various racial and ethnic backgrounds when examining the usefulness of the DASS-21 in non-white samples. Further, while it is not likely that common method variance significantly impacted the current study's findings, it would be helpful for future studies to replicate the current findings using alternative methods.

Overall, this study provided support for the validity of the DASS-D and DASS-A subscales (particularly among adolescent males) and identified preliminary cutoff scores that could be indicative of clinically significant levels of depression and anxiety. However, further validation of these cutoff scores in clinical samples is needed. More specifically, future studies are needed to extend the present findings by comparing these preliminary cutoff scores with more established methods of identifying clinically meaningful depressive and anxious symptoms (e.g., existing clinical diagnoses or clinical diagnoses derived from diagnostic interviews). Future studies could also benefit by examining the observed differences between adolescent males and females to help determine why the present findings were stronger in male samples and why the relationship between the DASS-A and GAD7 is weaker than expected.

Summary

Despite the widespread use of the DASS-21's depression and anxiety subscales, few studies have investigated the convergent validity of these subscales or cutoffs for these subscales in U.S. adolescents. The present study sought to address these gaps. After 306 students from midwestern USA high schools completed the DASS-21, GAD7, and CESD, a MANOVA revealed significant overall sex differences and remaining analyses were separated by sex. These analyses revealed that the DASS-D and CESD were strongly correlated in both sexes. While the DASS-A and GAD7 were also strongly correlated in male participants, they were more moderately correlated in female participants. Using classification on the CESD as a reference point (i.e., whether adolescents exceeded a CESD score of 16), a cutoff score of four for male and five for female adolescents on the DASS-D provided the best balance of sensitivity and specificity. Using classification on the GAD7 as a reference point, cutoff points of 6 for female and five for male adolescents on the DASS-A had the best support. These findings suggest the DASS-A and DASS-D demonstrate good convergent validity, although the convergent validity for the DASS-A in female adolescents was notably weaker. This finding might be attributed to the DASS-A measuring primarily only physical symptoms of anxiety. Future studies should therefore

investigate whether the DASS-A is suitable for capturing various forms of anxiety in adolescents. Results also provide preliminary evidence that the DASS-D and DASS-A may be suitable for identifying adolescents who are significantly anxious and/or depressed, which would allow researchers and clinicians to use these subscales as screening instruments. However, the evidence for the use of the DASS-A in female adolescents again received minimal support. Future studies should seek to investigate and replicate the current findings through the use of a more representative sample of U.S. adolescents and/or a multimethod approach.

References

1. American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders, 5th edn. American Psychiatric Publishing, Washington, DC
2. Lovibond SH, Lovibond PF (1995) Manual for the depression anxiety & stress scales, 2nd edn. Psychology Foundation of Australia, Sydney
3. Antony MM, Bieling PJ, Cox BJ, Enns MW, Swinson RP (1998) Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. Psychol Assess 10:176
4. Crawford JR, Henry JD (2003) The Depression Anxiety Stress Scales (DASS) normative data and latent structure in a large non-clinical sample. Br J Clin Psychol 42:111–131
5. Henry JD, Crawford JR (2005) The short-form version of the Depression Anxiety Stress Scales (DASS-21): construct validity and normative data in a large non-clinical sample. Br J Clin Psychol 44:227–239
6. Sinclair SJ, Siefert CJ, Slavin-Mulford JM, Stein MB, Renna M, Blais MA (2012) Psychometric evaluation and normative data for the depression, anxiety, and stress scales-21 (DASS-21) in a nonclinical sample of US adults. Eval Health Prof 35:259–279
7. Brown TA, Chorpita BF, Korotitsch W, Barlow DH (1997) Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. Behav Res Ther 35:79–89
8. Moore SA, Dowdy E, Furlong MJ (2017) Using the Depression, Anxiety, Stress Scales–21 with US adolescents: an alternate models analysis. J Psychoeduc Assess 35:581–598
9. Patrick J, Dyck M, Bramston P (2010) Depression Anxiety Stress Scale: is it valid for children and adolescents? J Clin Psychol 66:996–1007
10. Silva HA, Passos MH, Oliveira VM, Palmeira AC, Pitangui AC, Araújo RC (2016) Short version of the Depression Anxiety Stress Scale-21: is it valid for Brazilian adolescents? Einstein (Sao Paulo) 14:486–493
11. Szabó M (2010) The short version of the Depression Anxiety Stress Scales (DASS-21): factor structure in a young adolescent sample. J Adolesc 33:1–8
12. Tully PJ, Zajac IT, Venning AJ (2009) The structure of anxiety and depression in a normative sample of younger and older Australian adolescents. J Abnorm Child Psychol 37:717
13. Mellor D, Vinet EV, Xu X, Mamat NHB, Richardson B, Román F (2015) Factorial invariance of the DASS-21 among adolescents in four countries. Eur J Psychol Assess 31:138–142
14. Willemsen J, Markey S, Declercq F, Vanheule S (2011) Negative emotionality in a large community sample of adolescents: the factor structure and measurement invariance of the short version of the Depression Anxiety Stress Scales (DASS-21). Stress Health 27:e120–e128
15. Tait RJ, French DJ, Hulse GK (2003) Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. Aust N Z J Psychiatry 37:374–381
16. Tan LB, Martin G (2016) Mind full or mindful: a report on mindfulness and psychological health in healthy adolescents. Int J Adolesc Youth 21:64–74
17. Le MTH, Tran TD, Holton S, Nguyen HT, Wolfe R, Fisher J (2017) Reliability, convergent validity and factor structure of the DASS-21 in a sample of Vietnamese adolescents. PLoS ONE 12:e0180557
18. Radloff LS (1977) The CES-D Scale: a Self-Report Depression Scale for research in the general population. Appl Psychol Meas 1:385–401
19. Spitzer RL, Kroenke K, Williams JW, Löwe B (2006) A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 166:1092–1097
20. Plummer F, Manea L, Trepel D, McMillan D (2016) Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. Gen Hosp Psych 39:24–31
21. Sachser C, Berliner L, Holt T, Jensen TK, Jungbluth N, Risch E et al (2017) International development and psychometric properties of the Child and Adolescent Trauma Screen (CATS). J Affect Disord 210:189–195
22. Mossman SA, Luft MJ, Schroeder HK, Varney ST, Fleck DE, Barzman DH et al (2017) The Generalized Anxiety Disorder 7-item scale in adolescents with generalized anxiety disorder: signal detection and validation. Ann Clin Psychiatry 29:227-234A
23. Siddaway AP, Wood AM, Taylor PJ (2017) The Center for Epidemiologic Studies-Depression (CES-D) scale measures a continuum from well-being to depression: testing two key predictions of positive clinical psychology. J Affect Disord 213:180–186
24. Tatar A, Kayiran SM, Saltukoglu G, Ozkut EŞZ, Emeksiz M (2013) Analysis of the Center for Epidemiologic Studies Depression Scale (CES-D) in children and adolescents from the perspective of the item response theory. J Clin PSychopharmacol 23:242–253
25. Roberts RE, Andrews JA, Lewinsohn PM, Hops H (1990) Assessment of depression in adolescents using the Center for Epidemiologic Studies Depression Scale. Psychol Assess 2:122
26. Vilagut G, Forero CG, Barbaglia G, Alonso J (2016) Screening for depression in the general population with the Center for Epidemiologic Studies Depression (CES-D): a systematic review with meta-analysis. PLoS ONE 11:e0155431
27. Bujang MA, Adnan TH (2016) Requirements for minimum sample size for sensitivity and specificity analysis. J Clin Diagn Res 10:YE01–YE06