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ORIGINAL ARTICLE

Psychometric properties of the *Escala de Autoeficacia para la Depresión en Adolescentes* (EADA) among Latino youth with type 1 diabetes

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Abstract
Type 1 Diabetes (T1D) adolescents have higher depression rates than controls. Self-efficacy has been proposed as a mediator of therapeutic changes. Few scales assess emotional self-efficacy in adolescents. None have been validated with T1D youth. We examined the psychometric properties of the *Escala de Autoeficacia para la Depresión en Adolescentes* (EADA) with 51 T1D youth (aged 12–17 years), enrolled in a depression treatment study. Adolescents and one parent each completed several measures. Youth completed the EADA. We used alpha coefficient to estimate its internal consistency and Pearson correlation to assess its concurrent and construct validity. We found an internal consistency of 0.93 for the EADA total score, with alpha values ranging from 0.71 to 0.85 for its subscales. EADA scores significantly ($p \leq 0.05$) diverged from self-reports of depression, hopelessness/helplessness, suicidal ideation, self-esteem/guilt problems, depression-related cognitive alterations, hypoglycemic symptoms, and problems in quality of life. Its scores converged with youth's life satisfaction, self-efficacy for diabetes, self-care behaviors, and perceptions about the quality of group therapy climate and family social support. Our findings document EADA's reliability and validity when used with T1D youth and extend the supporting evidence on its psychometric properties to a clinical sample of Latino adolescents.

Keywords Adolescents · Depression · Emotional self-efficacy · Diabetes · Psychometric properties

Introduction

Depression among youths is a major health concern around the world [1]. Within a representative sample of adolescents from Puerto Rico, 13.4% had symptoms indicative of a probable depressive disorder [2]. Having type 1 diabetes (T1D) increases adolescents' risk for emotional problems such as depression [3]. In Puerto Rico, the rates of these symptoms among T1D youth range from 36.7 [4] to 45.5% [5]. Emotional problems are the most common mental health comorbidity in this population [6]. They may hinder youth's ability and confidence to adapt to this illness and adhere to treatment, affecting health and quality of life [7]. A higher self-efficacy may reduce the effect of depression on adherence, improving well-being [8].

Self-efficacy (SE) is the confidence in our ability to perform actions [9]. SE has a role in regulating emotions because it allows us to interpret potentially threatening situations as feasible challenges. This concept relates to the maintenance of depression and could be a mediator of therapeutic change [10]. In Social Cognitive Theory (SCT), *emotional/affective self-efficacy* was defined as the perceived ability to cope with situations that may produce emotional reactions [11]. Adolescence is a critical period for executing emotional SE, but few scales to assess it within the SCT framework have been tested in middle or high schoolers. Next, we review scales with at least three publications on its psychometric properties among this population.

The Emotional Self-efficacy (ESE) subscale of the Self-Efficacy Questionnaire for Children (SEQ-C), developed in the Netherlands by Muris [12], assesses perceived ability to cope with negative emotions. It has shown reliability (α = alpha) values from 0.54 [13] to 0.90 [14]. Its scores diverge from depression, anxiety, and panic/somatic problems [12, 15], but converge with prosocial behavior [13],

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quality of family climate [16], life satisfaction [17], cognitive flexibility [18] hope, effort, and positive mood [19]. Lower ESE scores are also linked to suicide behavior [20] and negative self-perceptions [21]. While testing the SEQ-C among ethno-cultural groups in the US (Latinos included), this subscale was excluded [22]. Yet, a Spanish version was tested with Puerto Rican youth [23], showing an α of 0.75 and diverging from depression scores.

The 43-item School Health Efficacy Questionnaire (SHEQ) was developed in the USA by Froman and Owen [24] to assess high schoolers' SE for physical (PH; 21 items) and emotional health (EH; 22 items). Two factors were obtained among EH items ($\alpha = 0.90$): interpersonal concerns (Factor 1; $\alpha = 0.90$) and anxiety (Factor 2; $\alpha = 0.86$). Higher EH scores were found for those with greater academic average. Yet, only the 4-item Factor 2 is a pure indicator of SE for EH. The 17-item Factor 1 is mostly composed by items linked to social SE, which includes items on emotions (i.e. "Maintaining a positive attitude toward school", "Being happy") but also some quite less related to EH (e.g. "Wearing seatbelts", "Driving safely"). A Korean version of the EH scale ($\alpha = 0.82$) showed similar properties as the original ($\alpha = 0.89$) when used in the same study [25]. A 19-item version ($\alpha = 0.83$) was used among Australian girls aged 10–16 years [26].

The 39-item Middle School Self-Efficacy (MISSE) Questionnaire [27] is an adaptation of the SHEQ to assess SE perceptions in middle schoolers (11–14 years old). No pure EH factor was found on it but an interpersonal concerns one ($\alpha = 0.89$) similar to what From and Owen [24] reported. Some items with emotional content (e.g. related to worries and avoiding getting one's feelings hurt) loaded on the preventive health factor, along with items on physical health, raising concerns about the scale content and construct validity. Still, the interpersonal concern factor correlated with self-reports of anger and academic grades. Using a Turkish version, SE scores converged with perceived social support [28, 29]. Its structure was similar to the original and neither showed a pure EH factor. The interpersonal concern factor had an α of 0.81.

The 28-item Self-Rated Abilities for Health Practices (SRAHP) Scale was created in the USA to assess adults' perceived abilities to perform health-promoting behaviors [30]. Emotional SE indicators, such as the confidence to manage stress, boredom and loneliness, communicate emotions, and do things to make one feel good about oneself, comprise its 7-item Psychological Well-being (PWB) subscale. Using an adapted version with adolescents, the PWB has shown α values from 0.76 [31] to 0.81 [32]. SRAHP scores converged with those in a general SE scale [33].

The Regulatory Emotional Self-Efficacy (RESE) scale developed in Italy assesses SE for expressing positive emotions (e.g. joy, enthusiasm, pride) and regulating negative ones (e.g. anger, discouragement, distress) [34]. In youth samples, its α values has ranged from 0.58 [35] to 0.85 [36] for the negative and from 0.68 [37] to 0.86 [38] for the positive emotion scales. Its scores converge with behavioral/social SE, life satisfaction, self-esteem, and optimism [10, 39], diverge with anxiety/depression [34, 36] and non-suicidal self-injuries [37], and predict self-esteem [40] and depression [10]. Although used with Spaniard (B. Mesurado, personal communication, Nov 2, 2017) and Hispanic youth from Colombia and USA [41], psychometric data are still unpublished.

The Coping Self-Efficacy Scale (CSES) assesses the confidence for healthy coping if faced with adversity [42]. Designed for HIV-positive adults, it has subscales on problem-focused coping (subscale 1), getting support from friends and family (subscale 2), and stopping unpleasant emotions and thoughts (subscale 3). Its total score α value for non-HIV youth from South Africa, Malaysia, and the USA has ranged from 0.81 [43] to 0.96 [44] for its 13- or 26-item versions. Values from 0.80 (subscale 2) to 0.92 (subscale 3) were found for the 13-item version [45]. Its scores converge with parent–youth attachment [46], school self-regulatory SE [45], and with hope, PWB, and positive affect [43]. CSES scores diverge from antisocial behavior [46] and negative affect [43]. Only subscale 1 has correlated with mindfulness [45]. Latinos were under-represented in these samples. The CSES was tested in adults with diabetes [47] but not in youths.

Finally, the Self-Efficacy Questionnaire for Depression in Adolescents (SEQ-DA) was created in Australia [48], with a sample of 12–18-year-old depressed youth ($\alpha = 0.73$), to measure perceived ability to cope with depression. Its baseline scores diverged from depression reports and predicted better outcome at post-treatment and 6 months later [48, 49]. A low SEQ-DA score at post was linked with recurrence by 2 and 4 years' follow-up [50]. SEQ-DA's publications use the same sample: 92% Australian, no Hispanics. Youth with chronic illnesses were excluded.

SE scales reviewed have several limitations. Some (i.e. RESE, SRAHP, and CSES) were based on adults' conceptions of affective SE. Also, some scales were validated for limited age ranges (i.e. SHAQ and MISSE) or presented broad ranges of reliability across studies (i.e. RESE and ESE subscale). When testing concurrent validity, mostly depression scores or behavioral (not emotional) SE scales were used as gold standard. Beyond the RESE and the SEQ-C ESE, most scales have limited evidence of construct validity among youth (see Table 1), via convergent or divergent correlations. Only one scale reviewed (SEQ-DA) was aimed for assessing SE for depression and was tested in clinically depressed youth. Although the RESE and the ESE subscales have Spanish versions, none of the scales was developed for a Spanish-speaking population, so they did not consider

Table 1 Summary of validity criteria and other significant features for emotional self-efficacy measures used with adolescents

Criteria	SEQ-C ESE	SHEQ	MISSE	SRAHP-PWB	RESE	CSES	SEQ-DA	EADA
Concurrent validity								
Any depression-related construct	Yes	No	No	No	Yes	Yes	Yes	Yes
Any depressive symptoms scale	Yes	No	No	No	Yes	No	Yes	Yes
Another self-efficacy measure	Yes	No	No	Yes	Yes	Yes	No	Yes
Another ESE scale or subscale	No	No	No	No	No	No	No	Yes
Divergent (D) or Convergent (D) validity								
Self-esteem/self-concept (or problems)	Yes-C	No	No	No	Yes-C	No	No	Yes-D
Cognitive problems/flexibility	Yes-D,C	No	No	No	No	No	No	Yes-D
Anxiety or worries	Yes-D	No	No	No	Yes-D	No	No	Yes-D
Other mental health/functioning criteria	Yes-D	Yes-C	Yes-C	No	Yes-C	Yes-D,C	No	Yes-D,C
Quality of life (or problems in this area)	No	No	No	No	No	No	No	Yes-D
Satisfaction with life	No	No	No	No	Yes-C	No	No	Yes-C
Any social/emotional or family support	No	No	Yes-C	No	No	Yes-C	No	Yes-C
Self-care activities	No	No	No	No	No	No	No	Yes-C
Physical/Somatic symptoms	Yes-D	No	No	No	No	No	No	Yes-D
Other significant features								
Have meaningful subscales	No	Unclear	Unclear	No	Yes	Yes	No	Yes
Tested with depressed youth	No	No	No	No	No	No	Yes	Yes
Developed for adolescents	Yes	Yes	Yes	No	No	No	Yes	Yes
Used in youth with chronic illness	Yes	No	No	No	Yes	No	No	Yes
Available in Spanish and English	Yes	No	No	No	Yes	No	No	Yes
Alpha across samples (Main/Total scores)	0.54–0.90	0.82–0.90	0.81–0.89	0.76–0.81	0.58–0.86	0.81–0.96	0.73	0.90–0.94

SEQ-C Self-efficacy Questionnaire-Children, *ESE* Emotional Self-efficacy, *SHEQ* School Health Efficacy Questionnaire, *MISSE* Middle School Self-Efficacy Questionnaire, *SRAHP* Self-Rated Abilities for Health Practices scale, *PWB* Psychological Well-being subscale, *RESE* Regulatory Emotional Self-Efficacy scale, *CSES* Coping Self-Efficacy Scale, *SEQ-DA* Self-Efficacy Questionnaire for Depression in Adolescents, *EADA Escala de Autoeficacia para la Depresión en Adolescentes*

Latino culture and values when defining the construct to be assessed [51]. Although a Spanish-language emotional SE scale was created in Mexico [52], it has not been validated with Latino youth. Only the RESE [53] and the ESE subscales [54–56] were used in samples including youth with chronic illnesses, but few or no psychometric data for them were reported. As far as we know, none of the reviewed scales has been tested with T1D youth.

Compared to non-T1D youth, those with T1D face additional challenges, including a higher risk for depression, which may hinder youth's ability and confidence to adapt to T1D and adhere to treatment [7]. As SE may reduce the effect of depression on adherence and improve well-being [8], assessing and promoting emotional SE in T1D youth are a priority. To optimally examine and promote emotional SE in these youths, measuring tools consistent with the cultural values of the target population must be used [51]. Among Latino youth, this implies to consider interpersonal aspects and resources when assessing a construct related to depression, including SE [23]. We believe that is also the case for youth with chronic illness (Latinos or not).

Bandura's concept of SE informed the development of the manuals for the Cognitive-Behavioral Therapy (CBT) of depression [57]. One of them was culturally adapted for depressed Puerto Rican youth, with modules addressing thoughts, activities and interpersonal influences on mood problems and functionality [58]. The scale developed in Puerto Rico to assess SE for depression in youth, following this CBT model, is the *Escala de Autoeficacia para la Depresión en Adolescentes* (EADA) [23]. In this study, we assessed EADA's internal reliability as well as its concurrent and construct validity among depressed Latino youth with T1D. We expected an $\alpha \geq 0.80$ for total scores and ≥ 0.70 for subscales, and significant and mostly moderate correlations among EADA scores and measures on mental health or diabetes-related domains. As no scale reviewed has been tested for Latino depressed nor with T1D youth, our study will be the first to document the reliability and validity of an emotional SE scale among youth with these features.

Method

Participants

Participants were 51 T1D youth (29 women) aged 12–17 years ($M = 14.78$) recruited for a depression treatment study, which baseline data we analyzed. Youths attended public (66.67%) and private schools. About 43.14% lived in the metropolitan area. Their mean score in the Children's Depression Inventory (CDI) was 19.53. The mean family household size was 4.00 members ($SD = 0.98$; range 2–7). About 86.27% of caregivers (aged 32–58 years) were women. Most of their families (72.55%) were from low/medium to low socioeconomic status. Youths had to obtain a CDI score ≥ 13 or a score ≥ 44 in the Children's Depression Rating Scale-Revised for inclusion in the study. Psychotic symptoms, history of bipolar disorder, last-year substance dependence/abuse, and imminent suicide risk were among exclusion criteria [6].

Measures

Escala de Autoeficacia para la Depresión en Adolescentes (EADA)

The 28-item EADA (Self-Efficacy for Depression Scale—Youth) was the first Spanish-language emotional SE scale developed for youth. It assesses the frequency of youth's confidence in his/her ability to cope with feelings, cognitions, activities, and situations commonly faced when depressed, using a 1 (*Never*)–5 (*Always*) rating format. It showed an α of 0.90 in a school sample ($N = 116$) of youths from Puerto Rico, as well as good concurrent (0.71) and divergent validity (-0.66) when correlated with the SEQ-C ESE subscale and a short version of the CDI, respectively [23]. Mean total score in that sample was 113.75. Alpha values for the subscales were 0.79 (Thoughts), 0.80 (Activities), 0.73 (Interpersonal), and 0.69 (Functionality). Correlations between EADA subscales and depression ranged from -0.54 to -0.56, and from 0.50 to 0.60 with the SEQ-C ESE ($p \leq 0.001$). Preliminary data from a study in which the EADA was completed by 125 non-T1D Latino youth from Puerto Rico (aged 12–17) with depression yielded an alpha of 0.936 for the total score, as well as significant correlations with depressive symptoms, hopelessness, suicidal ideation, and self-concept, among other variables (Bernal, personal communication, April 24, 2018). Results were similar when dividing the sample in those with a chronic illness and those without illness.

Beck Anxiety Inventory (BAI)

This is a well-known anxiety measure [59] that has been used with adults and adolescents. In this sample its alpha was 0.86.

Children's Depression Inventory (CDI)

This 27-item scale measures depressive symptoms in youth aged 7–17 years [60]. Its internal reliability in our sample was 0.84.

Suicidal Ideation Questionnaire-Junior (SIQ-Jr)

This 15-item scale assesses the frequency of suicidal ideation [61]. In this study, its alpha was 0.90.

Youth Hopelessness and Helplessness Scale (EIDA by its Spanish Acronym)

This 17-item measure contains two subscales from the Depressive Symptom Spectrum Assessment Inventory (DSSAI), an indigenous depression scale validated with Puerto Rican youth [62]. In this sample, its alpha values were of 0.86 (Helplessness), 0.87 (Hopelessness), and 0.92 (Total) [63].

Undervaluing/Self-reproach and Cognitive Alterations Scale (IVARAC by its Spanish acronym)

This measure also contains two subscales from the DSSAI. Its internal consistency for T1D youth is 0.87 for the undervaluing/self-reproach (self-deprecation) and 0.90 for the cognitive alterations subscale [64].

Curative Climate Instrument (CCI)

It assesses group members' perception about the quality of therapy [65]. It is reliable ($\alpha = 0.94$) and valid when used with T1D Latino youth [66].

Diabetes Social Support Questionnaire Family (DSSQ-F)

It measures the frequency of family behavior and youth's perception about family social support related to five aspects: insulin use, blood tests, meal plan, exercise and emotions [67]. Its psychometric properties with T1D youth from Puerto Rico are good, with α values for its scores ranging from 0.70 to 0.96 [68].

Self-Care Inventory (SCI)

This is a valid and reliable measure of diabetes self-care [69]. When used with T1D Latino youths, a preliminary alpha value of 0.79 was obtained.

Hypoglycemia Scale (HS)

This 12-item scale assesses the severity of hypoglycemic symptoms, considering the worst episode in the past 7 days. Its psychometric properties with T1D youth ($\alpha = 0.85$) from Puerto Rico are excellent [70].

Self-Efficacy for Diabetes Scale (SED)

This 35-item scale assesses self-perceptions of competence, power and resources for successful management of diabetes [71]. Its internal reliability in this sample was of 0.91.

Barriers to Adherence Questionnaire (BAQ)

It assesses the frequency of cognitive and environmental obstacles to adherence (self-care) in people with diabetes [72]. We used a parent-rated Spanish version. In this sample, its α value was 0.80 [73].

Diabetes Quality of Life for Youth (DQOL-Y)

This questionnaire has three subscales: satisfaction with life, diabetes impact, and diabetes-related worries [74]. In this sample, alpha values for its subscales ranged from 0.81 (Impact) to 0.88 (Worries), with a reliability of 0.91 for the total score. Higher total scores indicate worse quality of life (more problems).

Kovacs Diabetes Management Information Schedule (K-DMIS)

Using this semi-structured interview schedule, we obtain T1D-related information from parents, including youth adherence [75]. We used an adapted version.

Children-Global Assessment Scale (C-GAS)

It consists of a single score that ranges from 1 (most impaired) to 100 (healthiest). It has shown good inter-rater reliability (0.83–0.91) as well as concurrent and discriminant validity in Puerto Rico [76].

Children's Depression Rating Scale-Revised (CDRS-R)

It consists of 17 clinician-rated items which measure diverse areas of depressive symptomatology in children and adolescents [77]. Its internal reliability for T1D youth from Puerto Rico is 0.80. Along with those obtained in the CDI, scores on the CDRS-R were used as inclusion criteria in the main study.

Procedures

We shared information about the main study via T1D clinics, local media, and printed materials. We recruited participants through summer camps, educational/recreational activities, and referrals from endocrinologists, school personnel, and other participants. Caregivers completed requests for participation forms. If initial eligibility criteria were met, youth and one parent each were invited to an in-person screening. After obtaining consent/assent, they completed measures at this visit and at a diagnostic evaluation scheduled within 2 weeks. The Institutional Committee for the Protection of Human Participants (CIPSHI by its Spanish acronym) of the University of Puerto Rico (UPR) Río Piedras Campus (Approval number 1112-005; initial approval date: August 30, 2011) and the Institutional Review Board (*Comité de Derechos Humanos* by its Spanish name) of the UPR Medical Sciences Campus (Approval number A9530112; initial approval date: September 19, 2012) approved the study.

Data analyses

We performed data analyses using SPSS 22.0. To assess internal consistency, we used Cronbach's alpha, corrected item-subscale (CISC) and corrected item-total correlations (CITC). To examine concurrent validity, we observed relationships between EADA scores and those on several depression-related variables, as well as on the SED. To support its construct validity, we looked for associations of EADA scores with measures of other constructs completed by youth, parents or evaluators to assess convergence/divergence among scores, using Pearson r ($p \leq 0.05$).

Results

The EADA total score showed an internal consistency of 0.93. Alpha values were of 0.81, 0.85, 0.80, and 0.71 for its thoughts, activities, interpersonal, and functionality subscales (Table 2). CITC ranged from 0.36 to 0.75; mean inter-item correlation was 0.34. Deleting any item did not increase alpha for the total score and for most subscales. Yet, if item 17 is removed from the functionality subscale, its alpha would slightly increase. Still, keeping the item produced an α above accepted standards (≥ 0.70). Examining subscales, we found CISC that varied among 0.34 (#14) and 0.64 (#2) in interpersonal, from 0.33 (#17) to 0.59 (#12) in functionality, among 0.44 (#8) and 0.69 (#13) in thoughts,

Table 2 Descriptive and internal consistency statistics for items of the EADA

EADA items	M	SD	CISC	ASID	CITC
Thoughts ($\alpha = 0.81$)					
1. Reduce or manage negative thoughts	3.22	1.40	0.49	0.81	0.54
8. Concentrate/pay attention in school	3.69	1.10	0.44	0.81	0.38
11. Take good decisions by myself	3.71	1.17	0.66	0.75	0.70
13. Maintain a positive attitude	3.55	1.01	0.69	0.76	0.73
18. Have pleasant thoughts	3.59	1.15	0.68	0.76	0.68
21. Imagine myself carrying out recreational activities	3.71	1.12	0.53	0.79	0.70
Activities ($\alpha = 0.85$)					
4. Continue with activities I like to do alone	4.00	1.10	0.57	0.83	0.66
5. Continue with activities I like to do with friends	4.20	0.94	0.43	0.85	0.42
6. Continue with activities I like to do with my family	4.12	0.84	0.64	0.83	0.63
16. Carry out new recreational activities	3.41	1.30	0.74	0.80	0.75
20. Carry out daily activities	4.00	1.08	0.64	0.82	0.67
23 Increase frequency of recreational activities	3.47	1.12	0.68	0.82	0.64
25. Plan recreational activities	3.18	1.31	0.58	0.83	0.61
Interpersonal ($\alpha = 0.80$)					
2. Ask for support or advice from my parents	3.71	1.45	0.64	0.77	0.45
3. Ask for support or advice from my friends	3.61	1.28	0.39	0.79	0.39
9. Get family to help me with activities	3.88	1.18	0.58	0.77	0.41
10. Get friends to help me with activities	3.67	1.26	0.49	0.78	0.39
14. Enjoy friends company	4.22	0.90	0.34	0.79	0.48
15. Enjoy family company	4.04	1.06	0.39	0.79	0.54
19. Ask for support/advice from other sources	3.65	1.32	0.53	0.77	0.56
22. Relate normally with others	3.84	1.12	0.41	0.78	0.63
26. Listen to advices from parents and friends	4.00	1.10	0.43	0.78	0.50
27. Express my feelings/thoughts to parents or friends	3.75	1.28	0.57	0.77	0.40
Functionality ($\alpha = 0.71$)					
7. Cope with feelings that affect activities i want to do	3.76	1.11	0.48	0.65	0.65
12. Eat normally (properly)	3.88	1.19	0.59	0.66	0.63
17. Sleep normally (properly)	3.76	1.35	0.33	0.72	0.36
24. Manage properly moments of agitation/sluggishness	3.41	1.19	0.40	0.68	0.50
28. Overcome fatigue or lack or energy	3.43	1.06	0.56	0.63	0.64

SD Standard deviation, *CISC* Corrected item-subscale correlation, *ASID* Alpha of the subscale if item deleted, *CITC* Corrected item-total correlation

and from 0.43 (#5) and 0.74 (#16) for activity subscales. Mean inter-item correlation was 0.28 (interpersonal), 0.34 (functionality), 0.43 (thoughts), and 0.45 (activities). The highest means (≥ 4.00) were on items 14, 5, 6, 15, 4, 20 and 26. Two of the four activity items mentioned (items 4 and 5) evaluated interpersonal activities, while items 14, 15, and 26 were from the interpersonal subscale. Mean item scores were higher for the interpersonal (3.84) than for the activities (3.77), functionality (3.65), and thought (3.58) subscales. Items 25, 1, 16, 24, 28, and 23 had the lowest means (< 3.50).

As evidence of its concurrent validity, EADA total scores were negatively related with youths' depression, suicidal ideation, hopelessness, and helplessness. Also, these scores were positively related with youths' reports in the SED. This pattern of correlations was similar for subscales (Table 3). Functionality and thought subscales had mostly the highest correlations with these validity criteria. In relation to SED scores, functionality and activity subscales showed the highest concurrent validity indexes.

Supporting its convergent validity, all EADA scores showed a positive link with youths' initial reports on the quality of group therapy climate (in a range from 0.28 to 0.46). Total scores also converged with their life satisfaction (0.67), perceived family support to manage T1D (i.e. DSSQ-Total Feelings scores and its subscales), and self-care levels (0.36). EADA subscales showed mostly a similar pattern of associations with these variables. Yet, only interpersonal scores converged with all family support scores, and showed the strongest links with satisfaction with life and

Table 3 Concurrent, divergent, and convergent validity coefficients (*r*) for the EADA

Variable	TS	AS	IS	FS	Total
Concurrent validity					
CDI-total depression	− 0.45***	− 0.41**	− 0.36*	− 0.56***	− 0.48***
Suicide ideation	− 0.31*	− 0.34**	− 0.22[a]	− 0.35**	− 0.33**
Hopelessness	− 0.30*	− 0.31*	− 0.21[a]	− 0.39**	− 0.32**
Helplessness	− 0.39**	− 0.29*	− 0.35**	0.38**	− 0.40**
EIDA-total score	− 0.37**	− 0.31*	− 0.30*	− 0.40***	− 0.38**
Self-efficacy for diabetes	0.49***	0.58***	0.34**	0.60***	0.54***
Divergent validity					
Anxiety symptoms	− 0.21[a]	− 0.17	− 0.22[a]	− 0.22[a]	− 0.23*
Self-deprecation	− 0.37**	− 0.26*	− 0.41***	− 0.32**	− 0.39**
Cognitive alterations	− 0.42***	− 0.28*	− 0.25*	− 0.43***	− 0.37**
Hypoglycemic symptoms	− 0.39**	− 0.30*	− 0.42***	− 0.32*	− 0.41***
Quality of life-total problems	− 0.49***	− 0.44***	− 0.57***	− 0.48***	− 0.56***
Diabetes impact	− 0.37**	− 0.30*	− 0.41**	− 0.35**	− 0.40**
Diabetes worries	− 0.26*	− 0.15	− 0.34**	− 0.20[a]	− 0.28*
Barriers to glucose adherence	0.21[a]	− 0.23*	− 0.10	− 0.24*	0.21[a]
Convergent validity					
Satisfaction with life	0.55***	0.59***	0.62***	0.60***	0.67***
Social support (total feelings)	0.23*	0.24*	0.40**	0.24*	0.32**
Social support (Insulin)	0.27*	0.33**	0.41**	0.31*	0.38**
Social support (Glucose testing)	0.25*	0.26*	0.35**	0.25*	0.32**
Social support (Meal plan)	0.17	0.14	0.35**	0.17	0.25*
Social support (Exercises)	0.17	0.22	0.35**	0.21[a]	0.28*
Social support (Emotional)	0.26*	0.27*	0.44**	0.21[a]	0.35**
Diabetes self-care (Youth-rated)	0.26*	0.36**	0.33**	0.35**	0.36**
Diabetes self-care (Parent-rated)	0.21[a]	0.26*	0.12	0.22[a]	0.22[a]
Group curativeness	0.39**	0.28*	0.46***	0.39**	0.43***
Global functioning	0.14	0.10	− 0.04	0.31*	0.12

r Pearson Correlation, *CDI* Children's Depression Inventory, *EIDA* Spanish acronym for Youth Helplessness and Hopelessness Scale, *TS* Thought subscale, *AS* Activity subscale, *IS* Interpersonal subscale, *FS* Functionality subscale

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$ (one-tailed)

[a]$p \leq 0.10$

group curativeness. Only activities scores converged with parent-rated youth self-care.

Regarding its divergent validity, EADA total scores were inversely related to constructs such as quality of life total problems (− 0.56), T1D impact (− 0.40), diabetes-related worries (− 0.28), intensity of hypoglycemic symptoms (− 0.41), self-deprecation (− 0.39), anxiety symptoms (− 0.23), and cognitive functional problems (− 0.37). EADA subscales showed a similar pattern of correlations, except for youths' anxiety. With few exceptions, interpersonal scores showed the highest divergent validity indexes among subscales. Only scores on the interpersonal and thought subscales were significantly related to self-reports of diabetes-related worries. Similarly, only scores on the activities and functionality subscales were related with caregivers' reports on youth barriers to adherence regarding blood glucose testing. Finally, as expected, the functionality scores correlated with C-GAS scores as rated by clinical evaluators.

Discussion

Our findings suggest that the EADA has an excellent internal consistency and that it is a valid measure of SE for depression in clinically depressed youth with T1D. Results from this study converged with Díaz-Santos et al.'s [23] findings and with preliminary data from a study conducted in Puerto Rico with a sample of depressed adolescents, and provides additional evidence supporting its psychometric properties. Including a SE for DEP scale in protocols for T1D youth may be relevant, given their risk for negative emotions and its link with low SE [78].

The alpha values obtained for the total score (0.93) and the subscales (from 0.71 to 0.85) in our sample compared favorably with those from the original validation study [23], where values for the total score (0.90) and subscales (from 0.69 to 0.80) were similar. Also, preliminary data from an unpublished study by Bernal and colleagues, in which the EADA was completed by 125 non-T1D Latino youth (aged 12–17) with depression, yielded an alpha coefficient for the total score of 0.936, which is also very similar to the one observed in the current study. In that sample the validity of the EADA was supported by a significant correlation with the CDI and the SIQ-Jr, among other measures. When analyzing the reliability of the EADA only in depressed youth who reported having a chronic illness, an α of 0.93 was found, which was very similar to the one obtained with the whole sample and for those depressed youth who did not report having any chronic illness. Similarly, significant validity indexes were found in both subsamples. Those findings are also congruent with ours, suggesting that the EADA may be a valid measure for chronic illness young patients with depression and for non-depressed youth recruited in schools.

The reliability index of the EADA was comparable to or higher than indexes for other affective SE scales. Its total scale alpha (Table 1) was higher than the highest values reported for the ESE subscale of the SEQ-C or any other reviewed scale tested with adolescents, except for the CSES. Alpha values for its subscales compared favorably with those reported for the SHEQ, the MISSE, the RESE, and the CSES. Yet, 6 out of 7 reviewed scales have not been validated with community or clinical samples of Spanish-speaking youth. Although the RESE has Spanish versions, there is no published study of its psychometrics among Latino youth. When considering the available emotional SE scales, the EADA and the SEQ-C ESE subscales are the only measures validated for Latino youth. Still, only the EADA has been validated in community [23] and clinical samples (our study and the unpublished study by Bernal and colleagues) of Latinos adolescents, and tested among youth with T1D (Latinos or not).

Several remarks should be made about the EADA's validity. First, low levels of SE result in vulnerability to depression [10]. Our results further document the concurrent validity of the EADA through significant correlations not only with depression, but also with related constructs (e.g. suicidal ideation, hopelessness/helplessness), as summarized in the last column of Table 1. Besides, by reporting its association with SED scores, our study is the first to provide evidence of the concurrent validity of an affective SE scale in youths using as criterion a SE scale for managing a chronic illness. This study extends previous findings supporting EADA's concurrent validity using an emotional SE measure as criterion [23]. The higher concurrent validity indexes found for the thoughts and the functionality subscales harmonize with the cognitive and functional components prevailing in the scales used as validity criteria. Not surprisingly, these subscales also obtained the highest correlations with the cognitive functional alteration measure.

The pattern of associations with diabetes- and mental health-related constructs supports the construct validity of the EADA (Table 3). Its scores correlated more with depression-related variables than with anxiety, congruent with its specificity as a SE for depression measure, not just another emotional SE scale. Its scores were significantly related to all other constructs or domains used as validity criteria in studies in which other scales were used with adolescents (see Table 1), but also with diabetes-specific criteria. The latter extends the evidence of its validity to constructs particularly meaningful for chronic illness patients (e.g. self-care activities, somatic symptoms, satisfaction with life, quality of life, family emotional support), a characteristic that is rare for most scales. The accumulated evidence supporting EADA's construct validity was greater than the reported in any single study about other affective SE measures in youth. More evidence for EADA's construct validity was given by the lower mean scores of depressed youth in our study (104.43 vs. 113.75) than in Díaz-Santos et al.'s [23] sample ($t = 3.14$, $p = 0.002$). The difference was observed in all subscales. Mean total scores in our study resemble those reported by Ramos-Ortiz [79] in a small inpatient sample of depressed Puerto Rican youth (106.4).

The higher mean item score, and higher individual item means, obtained for EADA items linked to interpersonal issues, correspond with the importance attributed to relational factors among Latinos, especially depressed adolescents [80]. Furthermore, the interpersonal subscale generally obtained higher indexes of convergent/divergent validity. Good family relationships and the importance attributed to the family by Hispanics may have a buffering effect for the development of mental disorders [81]. It is, thus, relevant to assess such dimension of SE in the EADA. Except for the CSES, the other six affective SE scales reviewed either do not systematically incorporate interpersonal aspects, deal with those aspects without framing them in the context of emotional problems (e.g. SHAQ and MISSE), and/or do not specifically assess the perceived confidence of youth in asking help to manage those problems. Among T1D youth, higher interpersonal scores are crucial to cope with the stigma related to mental health symptoms and increase their willingness of seeking support not only from family members, but also from peers and healthcare professionals [82]. Conversely, the lowest means (suggestive of difficulties in SE) were observed in a cluster of items that resemble an anhedonic (24, 16, and 23) and anergic (24 and 28) profile. Such profile, along with problems managing negative

thoughts (item 1), is congruent with the burden of living with T1D and depression.

This study provides some advance on the development of psychological measures. Our findings further support research linking SE and depression [10]. We also offer an initial answer to the call from Usher and Pajares [83] and from Tsang et al. [84] for more culturally diverse and better refined measures of SE in youth. As Tsang et al. [84] noted, processes of SE, and its assessment, are not static. Usher and Pajares [83] suggested paying attention to SE measures to fine-tune the theory and conceptualization of their processes. As the EADA was developed integrating SCT, concepts from CBT, and diagnostic criteria for depression [23], our findings portray this scale as a theoretically sound and psychometrically strong alternative for assessing SE for depression in Spanish-speaking adolescents, including T1D youth. As far as we know, this is the first study that documents the psychometric properties of a SE for depression or affective SE scale among T1D youth. Scales for these youths focus on T1D self-management, psychosocial or general SE [85]. Yet, a few SE scales for youths or adults with chronic diseases include subscales on the emotional aspects of illness [86]. Also, an emotional SE scale has been used with adult cancer patients [87].

Some emotional SE scales were not included in our literature review. The Depression Coping Self-Efficacy Scale (DCSES), developed in the USA [88], assesses the confidence in the ability to perform tasks specific to coping with depression, but we found only one study using the DCSES with youths [89]. Authors did not provide data on its reliability but did report a significant low correlation (− 0.19) between DCSES and depression scores. A novel vignette-based measure that assesses emotion-regulation (ER) and SE beliefs about ER was developed, but has been tested only in one study with 10–14-year-old youths [41]. Finally, some SE scales are based on a trait emotional intelligence model. An example is the 27-item Youth-Emotional Self-Efficacy Scale, adapted for adolescents in the United Kingdom from a 32-item adult scale developed in Australia [90]. Although reliable and valid, its structure and content diverge from the SCT framework.

This study has some limitations. Our sample fell short from a rate of five cases per item in the total scale, but not at the subscale level. Our study complied with criteria suggested by Yurdugül to establish reliable estimation of alpha with small sample sizes [91]. Besides, our findings are similar to those obtained in two samples that doubled its size. The non-probabilistic nature of our sample is also a limitation. Further studies should examine the properties of the scale using bigger samples and sampling methods that increase the ability to generalize results. As with most affective SE scales (particularly English versions), the EADA needs a study on its temporal reliability. Research should examine its utility for longitudinal studies and sensitivity to changes after interventions. Only preliminary support for this aspect has been provided [79].

As SE has been related to depression and proposed as a mediator of changes, scales as the EADA could help to identify people more prone to struggle while coping with these symptoms, allowing to adjust treatment accordingly. Using this or similar scales, professionals could assess pre-treatment levels of SE for depression to obtain a more accurate prognosis [48] and tailor treatment to the strengths and weaknesses of patients. This study provides initial evidence on the EADA's applicability with Latino youths from clinical populations and may help to reduce the knowledge gap on the emotional aspects of SE among young patients with chronic illnesses, particularly T1D. Further studies may examine its reliability and validity in non-T1D Latino youth with depression and among youth with other chronic illnesses in which depression or negative emotions may co-occur.

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Compliance with ethical standards

Ethics approval All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions.

Informed consent Informed consent was obtained from all participants included in the study.

Conflict of interest The authors have no conflict of interest to disclose.

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