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Psychometric Validation of the Revised Child Anxiety and Depression Scales – Parent Version (RCADS-P) in Children Evaluated For ADHD

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Abstract

Children with attention-deficit/hyperactivity disorder (ADHD) frequently experience comorbid internalizing symptoms. The Revised Child Anxiety and Depression Scales–Parent Version (RCADS-P) is a frequently-used measure of anxiety and depression in children, though its psychometric properties remain unexamined in children referred for ADHD specifically. The present study evaluated the RCADS-P in 372 children (ages 7-12; 68% male) referred for evaluation at an ADHD specialty clinic (89% met criteria for ADHD). In addition to the RCADS-P, parents completed the Vanderbilt ADHD Diagnostic Rating Scale (VADRS) and Child Behavior Checklist (CBCL) and were administered the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS) semi-structured diagnostic interview. Teacher ratings were available for approximately half of the sample. Factor structure, reliability, convergent/discriminant validity, and sensitivity/specificity were examined. Results supported the six-factor structure of the RCADS-P. The RCADS-P demonstrated adequate internal consistency as well as convergent and discriminant validity with other parent ratings and, to a somewhat lesser extent, teacher ratings. Children with an internalizing diagnosis had higher RCADS-P scores than children without an internalizing diagnosis. Finally, the RCADS-P had good-to-excellent diagnostic efficiency, and a total sum score of 25 had excellent sensitivity and fair specificity. Findings provide psychometric support for the RCADS-P in children with ADHD.

Keywords

anxiety; assessment; comorbidity; depression; factor structure; internalizing

Children with attention-deficit/hyperactivity disorder (ADHD) frequently experience comorbid mental health problems, including both externalizing comorbidities such as

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oppositional defiant disorder (ODD) and conduct disorder (CD) as well as internalizing comorbidities such as anxiety and depression (Pliszka, 2015; Tung et al., 2016). In a seminal review of community-based studies, Angold and colleagues (Angold, Costello, & Erkanli, 1999) found that individuals with ADHD had higher than expected prevalence rates of anxiety (odds ratio: 3.0) and depression (odds ratio: 5.5). More recent reviews have similarly found children with ADHD to have higher-than-expected rates of internalizing disorders (Pliszka, 2015; Tung et al., 2016). Although rates across individual studies vary widely, it is estimated that up to half of children with ADHD have comorbid anxiety and up to a third of children with ADHD have comorbid depression (Pliszka, 2015). In addition, subthreshold symptoms of psychopathology are common among youth (Lewinsohn, Shankman, Gau, & Klein, 2004) and frequently develop into full syndrome disorders in adulthood (Shankman et al., 2009). It is therefore important to both evaluate for the presence of internalizing problems among youth with ADHD, as well as monitor the progression of internalizing problems as children transition to adolescence and adulthood.

Not only are comorbid internalizing problems common among children with ADHD, they are also associated with increased impairment and clinical complexity. Comorbid anxiety and depression are associated with poorer family and peer functioning, higher rates of suicidality and other mental health problems, increased sleep difficulties, and, potentially, more academic problems (Becker, Luebke, & Langberg, 2012; Daviss, 2008; Hvolby, 2015; Schatz & Rostain, 2006). Furthermore, although controlled trials have provided mixed evidence in terms of whether or not comorbid internalizing problems (and anxiety specifically) impacts medication response among children with ADHD (Diamond, Tannock, & Schachar, 1999; MTA Cooperative Group, 1999; Pliszka, 1989; Ter-Stepanian, Grizenko, Zappitelli, & Joobar, 2010), recent evidence demonstrates that internalizing symptoms are associated with a less robust response to medication in children treated for ADHD in naturalistic community settings (Al Ghriwati et al., 2017). It is thus perhaps unsurprising that having a comorbid internalizing problem is associated with increased treatment costs among children with ADHD as compared to children with ADHD who have a comorbid externalizing problem (Guevara, Lozano, Wickizer, Mell, & Gephart, 2001).

Given the prevalence, impact, and clinical implications of comorbidity among children with ADHD, practice guidelines from both the American Academy of Pediatrics (AAP; American Academy of Pediatrics, 2011) and American Academy of Child and Adolescent Psychiatry (AACAP; American Academy of Child and Adolescent Psychiatry, 2007) emphasize the need to assess for these comorbid conditions when assessing a child for ADHD. What is less clear from these guidelines are the specific evidence-based measurement tools that can, or should, be used to assess these common comorbidities. In particular, whereas a number of measures used in clinical and research settings for ADHD assessments include items that assess for ODD and CD symptoms based on the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), this is not the case for internalizing symptoms of anxiety and depression. In addition, researchers frequently assess internalizing symptoms in studies of children with ADHD; therefore, it is important to establish the reliability and validity of assessment measures in samples of children with ADHD.

The *Revised Child Anxiety and Depression Scales – Parent Version* (RCADS-P) (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Ebesutani et al., 2011) is a frequently used measure that has been validated in school (Ebesutani et al., 2011) and general clinic samples (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Gormez et al., 2017; Park, Ebesutani, Bose, & Chorpita, 2016). Comprised of 47 items, the RCADS-P has several notable strengths. First, the RCADS-P maps onto current DSM-based diagnoses and includes symptoms of five specific anxiety disorders (i.e., generalized anxiety disorder, separation anxiety disorder, social phobia, panic disorder, and obsessive-compulsive disorder) as well as major depressive disorder. Second and relatedly, the RCADS-P includes both anxiety and depression in a single measure, whereas a number of other measures assess for only anxiety (e.g., *Revised Children's Manifest Anxiety Scale*, *Multidimensional Anxiety Scale for Children*) or depression (e.g., *Children's Depression Inventory*, *Reynolds Adolescent Depression Scale*). Using separate scales to assess for anxiety and depression reduces efficiency, and these measures have different response options and anchors which can make it difficult to compare findings for anxiety and depression. Third, while copyrighted, the RCADS-P is free to use and readily available (<http://www.childfirst.ucla.edu/Resources.html>), which makes it a cost-efficient tool for clinical practice as well as large-scale research studies. The RCADS-P web-site also includes Excel scoring programs and SPSS syntax to aid in the scoring of single or multiple forms. Fourth, the original English version of the RCADS-P has been translated into multiple languages (e.g., Dutch, Greek, Korean, Spanish, Swedish).

Despite its strengths and clear applicability to the clinical and research assessment of internalizing symptoms in children with ADHD, no study to date has examined the RCADS-P in children with ADHD specifically. The present study examined the psychometric properties of the RCADS-P in a large sample of children referred to a specialty clinic for possible ADHD. It was our goal to examine both the utility and validity as well as the sensitivity and specificity of the parent RCADS within a sample of children who have ADHD. We hypothesized that the six-factor structure of the RCADS-P would be supported in children with ADHD. We also hypothesized the RCADS-P to demonstrate adequate reliability, convergent validity, and discriminant validity. We expected children with an internalizing disorder diagnosis, children with ADHD, and girls to have higher scores on the RCADS-P than children without an internalizing diagnosis, children without ADHD, and boys. Finally, we examined the sensitivity and specificity of the RCADS-P in relation to the presence of an internalizing disorder diagnosis using a semi-structured diagnostic interview.

Methods

Participants

Families with children ages 7-12 years were recruited for an ongoing study through the standard clinical intake flow at an outpatient clinic specializing in pediatric ADHD. All participants were being evaluated in the clinic for possible ADHD, and 372 children contributed data for the current study (89% of which met full criteria for ADHD). All children had an IQ ≥ 70 ($Range = 71-142$) based on the *Kaufman Brief Intelligence Scale, Second Edition* (KBIT-2) (Kaufman & Kaufman, 2004). Sample characteristics, including

ADHD and comorbid diagnoses based on the *Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children* (K-SADS) (Kaufman et al., 1997) interview conducted with the child's caregiver, are provided in Table 1. Among children with ADHD, 34 (10.2%) met criteria for an internalizing disorder diagnosis; among children without ADHD, 3 (7.5%) met criteria for an internalizing diagnosis. Internalizing disorders were similarly prevalent across the ADHD subtypes/presentations: 9.4% ($n = 18$) of children with ADHD Combined Presentation, 11.2% ($n = 15$) of children with ADHD Predominantly Inattentive Presentation, and 9.1% ($n = 1$) of children with ADHD Predominantly Hyperactive-Impulsive Presentation met criteria for an internalizing disorder on the K-SADS.

Procedures

This study was reviewed and approved by the Institutional Review Board. Families were recruited through the standard clinical intake flow at an outpatient clinic specializing in the diagnosis and treatment of ADHD. Families seeking an evaluation for ADHD who had children ages 7-12 years were invited to participate. Parents provided informed consent and children provided assent. For a separate project within the broader study, teacher ratings were also collected for a period of time (see Missing Data section below).

Measures

Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS).—The K-SADS (Kaufman et al., 1997) is a semi-structured diagnostic interview with good reliability and validity. The ADHD, ODD, anxiety disorders, and mood disorders modules were administered and used in the current study. The K-SADS was administered by doctoral students in clinical psychology, postdoctoral fellows, and licensed clinical psychologists. All interviewers were trained by experienced interviewers, including scoring a previously recorded interview, observation of interviews, and being observed before interviewing independently. In addition, one interview per interviewer was randomly selected to be scored by another interviewer. We achieved 100% reliability between interviewers on this reliability check.

Revised Child Anxiety and Depression Scales – Parent Version (RCADS-P).—As described above, the RCADS-P (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Ebesutani et al., 2011) is a 47-item caregiver-report measure that assesses anxiety and depression disorder symptoms on a four-point scale (0 = *never*, 3 = *always*). In addition to a depression scale (10 items; e.g., “My child feels sad or empty”), the RCADS-P has five anxiety scales: separation anxiety (7 items; “My child worries about being away from me”), generalized anxiety (6 items; e.g., “My child worries about things”), panic disorder (9 items; e.g., “All of a sudden my child will feel really scared for no reason at all”), social phobia (9 items; e.g., “My child worries what other people think of him/her”), and obsessive-compulsive (6 items; e.g., “My child has to do some things just the right way to stop bad things from happening”). The RCADS-P has good psychometric properties and has demonstrated excellent reliability and validity in clinical and nonclinical samples (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000; Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Ebesutani et al., 2011).

Vanderbilt ADHD Diagnostic Rating Scale (VADRS).—ADHD, ODD, and internalizing (anxiety/depression) symptoms were assessed using the *Vanderbilt ADHD Diagnostic Parent Rating Scale* and *Vanderbilt ADHD Diagnostic Teacher Rating Scale* (Wolraich, Lambert, Baumgaertel, et al., 2003; Wolraich, Lambert, Doffing, et al., 2003). The Vanderbilt scales include all 9 inattentive and 9 hyperactive-impulsive *DSM* ADHD symptoms and also assess ODD (8 and 4 items for parent- and teacher-report, respectively) and internalizing symptoms (7 items for both raters). Each item is rated on a four-point scale (0 = *never*; 3 = *very often*). As in previous research (Becker, Langberg, Vaughn, & Epstein, 2012), separate anxiety (3 items for both parent- and teacher-report) and depression (4 items for both parent- and teacher-report) subscales were used in this study to increase specificity in internalizing problems and to also allow us to examine whether RCADS-P anxiety and depression scales demonstrated convergent and discriminant validity with anxiety and depression as assessed using the Vanderbilt scales. In the present study, mean scale scores were calculated and internal consistencies for parents (teachers) were: ADHD inattention $\alpha = .89$ (.93), ADHD hyperactivity impulsivity $\alpha = .90$ (.94), ODD $\alpha = .91$ (.89), anxiety $\alpha = .77$ (.82), and depression $\alpha = .84$ (.80).

Child Behavior Checklist (CBCL) and Teacher's Report Form (TRF).—The CBCL and TRF are caregiver- and teacher-report measures, respectively, of children's emotional and behavioral problems (Achenbach & Rescorla, 2001). Items are rated on a three-point scale (0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very true or often true*). In the present study, the *DSM*-oriented ADHD (Attention Deficit Hyperactivity Problems [ADHP]; 7 and 13 items for CBCL and TRF, respectively), ODD (5 items for both CBCL and TRF), anxiety (6 items for both CBCL and TRF), and depression (Affective Problems; 13 and 10 items for CBCL and TRF, respectively) scales were used. The *DSM*-oriented scales have demonstrated good internal consistency as well as convergent and discriminant validity with other parent- and self-report symptom scales and with *DSM* diagnoses as determined by clinical interviews (Achenbach & Rescorla, 2001; Ebesutani, Bernstein, Nakamura, Chorpita, Higa-McMillan, et al., 2010; Nakamura, Ebesutani, Bernstein, & Chorpita, 2009).

Analytic Approach

Missing data.—Teacher ratings were available for 172 participants in the current study. There were no differences in demographic characteristics or RCADS-P scores between children with and without teacher data (all p s > .05). In addition, the CBCL was available for 273 children; there were no differences in demographic characteristics or RCADS-P scores between children with and without CBCL data (all p s > .05).

Factor structure.—Confirmatory factor analyses (CFAs) were calculated using Mplus v. 7.0 (Muthén & Muthén, 1998-2017). Four competing models were calculated in line with Ebesutani et al. (2011): the original six-factor model, a five-factor model in which GAD and depression items were combined to form a general factor (see Lahey et al., 2008, for rationale for this approach), a two-factor depression and anxiety model (with all five anxiety disorder subscales on a single factor), and a one-factor model thought to reflect general negative affect. We considered the Likert-scale items as ordered categorical data and

therefore used the weighted least squares with mean and variance adjustment (WLSMV) estimator. Missing data were handled via pairwise correlation with available data. Model fit was assessed with multiple indices, with the following indicating acceptable fit: comparative fit index (CFI) >0.90, and root mean square error of approximation (RMSEA) <0.08 (Hu & Bentler, 1999; Yu, 2002). Simulations testing performance of these indices of fit have assumed continuous data, rather than ordered categorical data. To compare models, chi-square difference tests were conducted using the DIFFTEST option in Mplus (see Asparouhov & Muthén, 2006) for technical details regarding DIFFTEST). It was decided a priori that if another model had similar overall fit to the six-factor model, the six-factor model would be selected as the optimal model since this factor structure has strong empirical support in previous studies examining the RCADS-P (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Ebesutani et al., 2011; Gormez et al., 2017; Park et al., 2016) and aligns with current diagnostic nosology.

Reliability.—As in previous RCADS-P validation studies (Ebesutani et al., 2011; Park et al., 2016), we assessed the reliability of the RCADS-P scores using Cronbach alpha coefficients, item-total correlations, and alpha-if-item-deleted values. In behavioral research, coefficients 0.70 are generally considered acceptable (Nunnally, 1978).

Subgroup invariance and mean differences.—To demonstrate validity of the RCADS-P between pertinent groups, multiple indicator, multiple cause (MIMIC) models were conducted to examine whether RCADS-P scores differed in three subgroups: (1) girls vs. boys, (2) children with ADHD vs. children without ADHD, and (3) children with an internalizing disorder diagnosis vs. children with no internalizing diagnosis. MIMIC models were used rather than multigroup comparisons given the relatively small *N*s in certain subgroups (Morin, Arens, & Marsh, 2016). We expected girls and children with an internalizing disorder diagnosis to have more internalizing symptoms on the RCADS-P than boys or children without an internalizing disorder diagnosis (with sex differences expected to be clearer for anxiety than for depression in our sample of school-aged children). We also expected children with an ADHD diagnosis to have higher RCADS-P internalizing scores than children without an ADHD diagnosis, though we expected the group difference effect to be more consistent and pronounced in the internalizing disorder group comparison. In our MIMIC models, latent factors were regressed on covariates coded for group membership (e.g., girls = 0, boys = 1). Subsequent regression coefficients represent the difference between groups expressed in standardized latent scores, and thus directly interpretable as a Cohen's *d* (Brown, 2006), with 0.2 considered a small effect, 0.5 a medium effect, and 0.8 a large effect (Cohen, 1988).

Convergent and discriminant validity.—The VADPRS/VADTRS and CBCL/TRF were used to examine convergent and discriminant validity. As in previous studies (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Ebesutani et al., 2011; Ebesutani, Korathu-Larson, Nakamura, Higa-McMillan, & Chorpita, 2016), correlations were conducted to evaluate whether RCADS-P scores were positively associated in expected ways with internalizing symptoms on the VADPRS/VADTRS and CBCL/TRF as well as less positively associated with ADHD and externalizing behaviors on these measures. A

correlation of 0.10 is considered a small effect, a correlation of 0.30 is considered a medium effect, and a correlation of 0.50 is considered a large effect (Cohen, Cohen, West, & Aiken, 2003). In addition, Steiger's *z*-tests for dependent correlations were conducted to examine whether RCADS-P scores were significantly more strongly associated with the convergent validity variables than the discriminant validity variables. While correlations were conducted for all of the RCADS-P subscales, the depression, total anxiety, and total internalizing scores on the RCADS were the focus of the *z*-test analyses.

Sensitivity and specificity.—Receiving operating characteristic (ROC) analysis was conducted to examine the sensitivity (identification of true positives) and specificity (identification of true negatives) of the RCADS-P. Since only five children in our sample received a depression diagnosis on the K-SADS (and all but one of those with a depression diagnosis also had an anxiety diagnosis), we conducted the ROC analysis using the total internalizing sum score on the RCADS-P in relation to receiving any internalizing disorder diagnosis on the K-SADS. Area under the curve (AUC) of the ROC was examined to evaluate the diagnostic efficiency of the RCADS-P total internalizing score. The following benchmarks were used to assess AUC: 0.90 is excellent, 0.80 is good, 0.70 is fair, and <0.70 is poor (Swets, 1988). In addition, while it is optimal for a measure to have both high sensitivity and high specificity, a tradeoff between sensitivity and specificity is usually required (Frick et al., 1994). Given the importance of screening for internalizing problems in children referred for possible ADHD (American Academy of Pediatrics, 2011), as well as the clinical and cost implications of not identifying a child with a mental health problem (Costello et al., 1988; Foster et al., 2007; Guevara et al., 2001), we prioritized sensitivity over specificity. Specifically, we selected the cut-off that yielded a sensitivity 0.90 while also having the highest level of specificity possible.

Results

Factor Structure

The original six-factor structure of the RCADS-P was tested against three other models representing various competing conceptualizations of the relations among internalizing symptoms. The six-factor model fit the data adequately and, compared to all other models, the six-factor model best fit the data as demonstrated by the significant chi-square difference tests. Fit statistics for competing models are shown in Table 2. In the six-factor model, all items loaded significantly ($p < .05$) on their respective factors: Separation Anxiety ($\lambda_s = .64$ to $.91$), Social Anxiety ($\lambda_s = .65$ to $.85$), Generalized Anxiety ($\lambda_s = .68$ to $.95$), Panic ($\lambda_s = .65$ to $.91$), Obsessive-Compulsive ($\lambda_s = .64$ to $.91$), Depression ($\lambda_s = .49$ to $.80$). See Table 3 for each item's factor loading. As summarized in Table 4, factor correlations ranged from $.46$ to $.75$.

Reliability

Cronbach's alpha coefficients, in addition to alpha-if-item-deleted and item-total correlation values, as well as omega reliabilities are reported in Table 3. All of the alpha coefficients were >0.75 with the exception of the obsessive-compulsive scale ($\alpha = 0.65$). Of note, the internal consistency for the obsessive-compulsive scale would not be improved by removing

any single item from this scale. All omega coefficients were >0.85 . The total anxiety and total internalizing scales demonstrated excellent internal consistency (>0.90).

Invariance across Subgroups and Latent Mean Differences

MIMIC models assume metric invariance (i.e., factor loadings are equivalent across groups). Strong measurement invariance (i.e., absence of monotonic differential item functioning) can be demonstrated by comparing three nested models: a null model in which the covariate or grouping variable of interest (e.g., sex) predicts neither latent factors nor item intercepts, a saturated model in which the grouping variable is allowed to predict item intercepts but not the latent means, and an invariant model in which the grouping variable is allowed to predict the latent means but not item intercepts (Morin et al., 2016). If the saturated and invariant models fit better than the null model, an effect of the grouping variable is suggested. If the invariant model does not fit worse than the saturated model, this is interpreted as evidence of strong measurement invariance (Morin et al., 2016). That is, the grouping variable may have an effect on the latent means suggesting differences between groups, but not evidence of differential item functioning at the level of individual item intercepts. Improvement in fit was defined as $> .01$ for CFI and TLI, and $> .015$ for RMSEA (Chen, 2007).

As shown in Table 5 (top panel), neither the saturated nor invariant models improved fit meaningfully when child sex was used as the grouping variable in MIMIC models. The MIMIC model comparing children with ADHD and those without ADHD failed to converge given a lack of variability on one item (RCADS item 40 “I feel like I don’t want to move”) for those without ADHD. When this item was removed, the null model did not fit worse than either the saturated or invariant models. Taken together, data suggest not only strong measurement invariance across these groups (i.e., sex and ADHD status), but also no differences in latent mean scores across groups.

For the models with internalizing diagnosis as the grouping variable, the saturated and invariant models fit better than the null model. Further, the invariant model did not fit worse than the saturated model, suggesting measurement invariance (i.e., absence of differential item functioning; Table 5, top panel). Examining regression coefficients, children with an internalizing disorder diagnosis on the K-SADS had significantly higher latent mean scores than children without an internalizing disorder diagnosis on all RCADS-P latent factors, with small to moderate effect size differences across all domains (see Table 5, bottom panel). To facilitate the comparison of mean scores using the RCADS-P in future studies, Table 6 shows the descriptive information on the RCADS-P manifest variables for children referred for an ADHD evaluation who did and did not meet criteria for an internalizing disorder diagnosis.

Convergent and Discriminant Validity

Convergent and discriminant validity correlations with parent- and teacher-report measures are reported in Tables 7 and 8, respectively.

Convergent/discriminant validity with parent-report measures.

As summarized in Table 7, RCADS-P ratings were moderately-to-strongly correlated with parent-rated internalizing symptoms on both the VADPRS and CBCL ($r_s = 0.22$ to 0.70), with all but five correlations > 0.30 . In contrast, RCADS-P ratings were small-to-moderately associated with ADHD and externalizing behaviors on the VADPRS and CBCL ($r_s = -0.06$ to 0.38), with all but seven correlations < 0.30 .

Steiger's z -tests supported the specificity of the RCADS-P anxiety and depression scales in relation to the VADPRS and CBCL anxiety and depression measures. Specifically, RCADS-P total anxiety was more strongly associated with VADPRS and CBCL anxiety ($r_s = 0.69$ and 0.62 , respectively) than with VADPRS and CBCL depression ($r_s = 0.53$ and 0.38 , respectively; $z_s = 4.92$ and 5.11 , respectively, both $p_s < .001$). Likewise, RCADS-P depression was more strongly associated with VADPRS and CBCL depression ($r_s = 0.60$ and 0.61 , respectively) than with VADPRS and CBCL anxiety ($r_s = 0.53$ and 0.45 , respectively; $z_s = 2.01$ and 3.39 , $p_s = 0.04$ and $< .001$, respectively).

Steiger's z -tests also indicated that the RCADS-P total internalizing score was more strongly associated with total internalizing on the VADPRS ($r = 0.70$) than with ADHD or ODD symptoms on the VADPRS ($r_s = 0.12$ to 0.38 ; $z_s = 7.74$ to 10.18 , all $p_s < .001$). The RCADS-P total internalizing score was also more strongly associated with total internalizing problems on the CBCL ($r = 0.60$) than with total externalizing problems on the CBCL ($r = 0.23$; $z = 7.10$, $p < .001$).

Convergent/discriminant validity with teacher-report measures.

As summarized in Table 8, RCADS-P ratings were negligibly-to-moderately correlated with teacher-rated internalizing symptoms on both the VADTRS and TRF ($r_s = -.02$ to 0.25). In contrast, RCADS-P ratings were rarely significantly positively associated with ADHD and externalizing behaviors on the VADTRS and TRF (obsessive-compulsive was significantly associated with higher teacher-rated ODD and total externalizing problems). Further, multiple RCADS-P variables were significantly *negatively* associated with teacher-rated ADHD-HI symptoms.

Steiger's z -tests did not convincingly support the specificity of the RCADS-P anxiety and depression scales in relation to the VADTRS and TRF anxiety and depression measures. Specifically, RCADS-P total anxiety was not more strongly associated with VADTRS and TRF anxiety ($r_s = 0.25$ and 0.10 , respectively) than with VADTRS and TRF depression ($r_s = 0.22$ and 0.15 , respectively; $z_s = 0.54$ and 0.58 , respectively, both $p_s > .05$). Likewise, RCADS-P depression was not more strongly associated with VADTRS depression ($r = 0.06$) than with VADTRS anxiety ($r_s = 0.12$; $z = 1.06$, $p > .05$). However, RCADS-P depression was significantly more strongly associated with TRF depression ($r = 0.17$) than with TRF anxiety ($r = -0.02$; $z = 2.21$, $p = .03$).

Steiger's z -tests indicated that the RCADS-P total internalizing score was more strongly associated with total internalizing on the VADTRS ($r = 0.23$) than with ADHD or ODD symptoms on the VADTRS ($r_s = -0.23$ to 0.01 ; $z_s = 2.34$ to 4.34 , all $p_s < .02$). The RCADS-P total internalizing score was not more strongly associated with total internalizing problems

on the TRF ($r = 0.13$) than with total externalizing problems on the TRF ($r = 0.06$; $z = 0.86$, $p > .05$).

Sensitivity and Specificity

The ROC curve for the total internalizing score on the RCADS-P relative to an internalizing disorder diagnosis on the K-SADS is shown in Figure 1. The AUC was 0.89, indicating that the RCADS-P had good-to-excellent diagnostic efficiency in our sample. We also identified the total sum score that corresponded with sensitivity >0.90 while also maximizing specificity. We found that a total sum score on the RCADS-P of 25 yielded a sensitivity of 0.92 and a specificity of 0.75.

Discussion

The present study provides psychometric support for use of the RCADS-P in children with ADHD. Specifically, in our sample of children referred for possible ADHD, the RCADS-P six-factor structure was supported and the RCADS-P demonstrated good internal consistency and convergent/discriminant validity. Latent mean group differences on the RCADS-P were also found such that children with an internalizing disorder diagnosis had higher scores than children without an internalizing diagnosis. Moreover, the RCADS-P had good-to-excellent diagnostic efficiency and sensitivity/specificity in our sample. Considered together, our findings indicate that the RCADS-P may be a useful tool in both clinical and research settings where the assessment of internalizing problems in children with ADHD is necessary or desired.

The six-factor structure, reliability, and convergent/discriminant validity of the RCADS-P has now been replicated in a number of samples, including school samples (Ebesutani et al., 2011), general clinic samples (Ebesutani, Bernstein, Nakamura, Chorpita, Weisz, et al., 2010; Gormez et al., 2017; Park et al., 2016), and children who have experienced caregiver neglect in early childhood (Ebesutani, Tottenham, & Chorpita, 2015). We extend psychometric support of the RCADS-P to children referred for ADHD specifically. This is an important extension given the high rates of internalizing problems among children with ADHD (Pliszka, 2015; Tung et al., 2016) and the need to screen for, and monitor, internalizing symptoms among children diagnosed with ADHD (American Academy of Child and Adolescent Psychiatry, 2007; American Academy of Pediatrics, 2011). Although no group differences were found in our study comparing children with ADHD to those without ADHD, it is important to note that even the children without ADHD were referred to an ADHD clinic for evaluation. That is, the non-ADHD group was not a control group and likely had subthreshold ADHD, and children with subthreshold ADHD may have similar rates of internalizing symptoms to children meeting full diagnostic criteria for ADHD (see Balázs & Keresztény, 2014). Likewise, we found no group differences in internalizing symptoms between girls and boys, though sex differences in internalizing problems do not often become pronounced until adolescence (Costello, Egger, & Angold, 2005; Salk, Hyde, & Abramson, 2017).

In considering our convergent and discriminant findings, three findings are particularly important to note. First, the RCADS-P demonstrated convergent and discriminant validity

within internalizing dimensions. That is, the RCADS-P anxiety was more strongly correlated with anxiety than with depression on the VADPRS and CBCL, and vice versa. This provides compelling evidence for the specificity in which the RCADS-P can be used when assessing internalizing problems among children with ADHD, though this level of specificity did not generally emerge when examining teacher ratings on the VADTRS and TRF. Second, the RCADS-P demonstrated convergent and discriminant validity *across* internalizing and externalizing dimensions. Specifically, the RCADS-P total internalizing score was more strongly correlated with internalizing scores than with externalizing scores for both of the parent measures we examined (VADPRS and CBCL) as well as one of the teacher measures we examined (VADTRS). Third, and relatedly, we found much clearer evidence for convergent and discriminant validity, as well as stronger correlations in general, when examining the RCADS-P in relation to other parent-report measures than with teacher-report measures. This is not surprising, as it is well-documented that there is only moderate agreement between parent and teacher ratings of children's psychopathology symptoms, with lower cross-informant agreement for internalizing symptoms than externalizing symptoms (Achenbach, McConaughy, & Howell, 1987; De Los Reyes et al., 2015; Stanger & Lewis, 1993). Overall, findings provide compelling support for the convergent and discriminant validity of the RCADS-P in our sample of children referred for ADHD, particularly with other parent-report measures of psychopathology symptoms.

One particularly intriguing ancillary finding from our study also deserves attention: scores on the RCADS-P were significantly *negatively* correlated with teacher-rated ADHD symptoms, and hyperactive-impulsive symptoms particularly (see Table 8). There is long-standing interest in whether internalizing symptoms, and anxiety symptoms specifically, have an inhibitory effect on externalizing behaviors among children with ADHD (Quay, 1997), with most studies examining this issue in relation to aggression, delinquency, or conduct problems (Abikoff et al., 2002; Becker, Luebke, Stoppelbein, Greening, & Fite, 2012; Falk, Lee, & Chorpita, 2015). Several studies have found that the comorbid anxiety in children with ADHD is associated with less impulsivity on laboratory tasks (Pliszka, 1989, 1992; Schatz & Rostain, 2006), though this effect may be specific to physiological anxiety symptoms (Epstein, Goldberg, Conners, & March, 1997). We found that internalizing symptoms were associated with *less* hyperactivity-impulsivity, and that this buffering effect only emerged when examining internalizing symptoms in relation to teacher-rated hyperactivity-impulsivity and not parent-rated hyperactivity-impulsivity. In addition, parent-rated physiological symptoms (i.e., panic disorder subscale) were not significantly associated with lower teacher-rated hyperactive-impulsive symptoms; rather, social phobia, separation anxiety, and depressive dimensions were each significantly associated with lower teacher-rated hyperactivity-impulsivity. As might be expected, it was social phobia dimension was most clearly associated with lower teacher-rated ADHD symptoms, as RCADS-P social phobia scores were significantly negatively correlated with both hyperactive-impulsive symptoms on the VADTRS and ADHD symptoms on the TRF. This finding suggests that when parents observe social phobia symptoms (e.g., worrying about embarrassment/looking foolish, what others think, making mistakes), teachers observe fewer hyperactive-impulsive symptoms in the school setting. Children with ADHD who have co-occurring anxiety have more school fears than other children with ADHD (Bowen, Chavira,

Bailey, Stein, & Stein, 2008), and it is possible that these fears have a dampening effect on hyperactive-impulsive behaviors. However, Abikoff et al. (2002) did not find the presence of a comorbid anxiety disorder to have a dampening effect on any observed classroom behaviors, including motor and out-of-seat behaviors, though separate anxiety disorders/dimensions were not examined. Additional studies are needed to evaluate the buffering hypothesis regarding internalizing symptoms and externalizing behaviors among children with ADHD, with multi-informant ratings and anxiety dimension specificity important areas for investigation.

Findings should be interpreted in the context of this study's strengths and weaknesses. A particular strength is our use of a large sample of children referred to an ADHD specialty clinic for possible ADHD. Thus, the sample in this study is likely generalizable to settings where children are initially evaluated for suspected ADHD. In addition, we were able to evaluate convergent and discriminant validity across parent and teacher informants, as well as sensitivity and specificity with a well-validated semi-structured diagnostic interview. However, a smaller percentage of children in our study met criteria for an internalizing disorder diagnosis as compared to some other studies of children with ADHD (Pliszka, 2015; Tung et al., 2016). In particular, few children in our sample met criteria for a depression diagnosis, and as such we were not able to examine the sensitivity and specificity of the RCADS-P depression scale separately. In addition, the current study used a cross-sectional design, so while internal consistency reliability and concurrent convergent/discriminant validity were examined, we were unable to examine other important psychometrics such as test-retest reliability or predictive validity. Finally, our sample included school-aged children (ages 7-12 years) and results cannot be assumed to generalize to either younger children or adolescents with ADHD. All of these considerations are important areas for future research examining the RCADS-P. Nevertheless, findings from the present study provide important evidence for the factor structure, reliability, convergent/discriminant validity, and sensitivity/specificity of the RCADS-P in children with ADHD. As such, the RCADS-P is likely to be useful in a range of clinical and research settings.

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Figure 1.

Receiver operator characteristic (ROC) curve for the total internalizing scale of the RCADS-P relative to an internalizing diagnosis based on the K-SADS interview. Area under the curve (AUC) = 0.89.

Note. K-SADS = Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children. RCADS-P = Revised Child Anxiety and Depression Scales – Parent Version.

Table 1

Sample Characteristics (N = 372)

	M ± SD
Age	8.60 ± 1.53
Estimated IQ ^a	101.42 ± 13.84
	N (%)
Sex	
Male	252 (67.7%)
Female	120 (32.3%)
Taking Prescribed Psychotropic Medication ^b	43 (11.6%)
Stimulant	28 (7.5%)
Guanfacine	5 (1.3%)
Atomoxetine	5 (1.3%)
Antipsychotic	4 (1.1%)
Clonidine	2 (0.5%)
SSRI	2 (0.5%)
Valproic acid	2 (0.5%)
Fluoxetine	1 (0.3%)
Race/Ethnicity	
White	297 (79.8%)
Black	58 (15.6%)
Hispanic	12 (3.2%)
Asian	2 (0.5%)
Native American	1 (0.3%)
Other	2 (0.5%)
Family Income ^c	
\$20,000	43 (12.2%)
\$20,001 - \$40,000	75 (21.3%)
\$40,001 - \$60,000	43 (12.2%)
\$60,001 - \$80,000	54 (15.3%)
>\$80,000	137 (38.9%)
ADHD Diagnosis ^d	332 (89.2%)
Combined Type	160 (43.0%)
Inattentive Type	161 (43.3%)
Hyperactive-Impulsive Type	11 (3.0%)
Comorbid Internalizing Diagnoses ^d	
Depression/Dysthymia	5 (1.3%)
Generalized Anxiety Disorder	20 (5.4%)
Separation Anxiety Disorder	5 (1.3%)
Specific Phobia	7 (1.9%)
Social Phobia	7 (1.9%)

	M ± SD
Panic Disorder	2 (0.5%)
Obsessive-Compulsive Disorder	1 (0.3%)
Post-traumatic Stress Disorder	2 (0.5%)
Any Anxiety Disorder	36 (9.7%)
Any Internalizing Disorder	37 (9.9%)
Comorbid Externalizing Diagnosis ^d	
Oppositional Defiant Disorder	86 (23.1%)
Conduct Disorder	5 (1.3%)

Note. ADHD = attention-deficit/hyperactivity disorder.

^aEstimated intelligence quotient (IQ) determined using the *Kaufman Brief Intelligence Scale, Second Edition* (KBIT-2).

^bNumber of participants taking specific medications is greater than 43 since some participants were taking multiple prescribed medications.

^cFamily income not available for 20 participants.

^dDiagnoses established using the *Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children* (K-SADS).

Confirmatory Factor Analyses of the Revised Child Anxiety and Depression Scales – Parent Version (RCADS-P) in Children Evaluated for ADHD

Table 2

Model	Comparing to 6-factor model					
	χ^2	df	p	RMSEA (90% CI)	CFI	χ^2 (df) p
6-Factor	1736.75	1019	<.001	.04 (.04,.05)	.94	-- --
5-Factor (combine GAD and DEP)	1882.39	1024	<.001	.05 (.04,.05)	.93	86.17 (5) <.001
2-Factor (ANX and DEP)	2652.80	1033	<.001	.07 (.06,.07)	.87	528.54 (14) <.001
1-Factor (negative affect)	2810.03	1034	<.001	.07 (.06,.07)	.86	616.43 (15) <.001

Note. $N = 372$. ADHD = attention-deficit/hyperactivity disorder. ANX = anxiety. DEP = depression. GAD = generalized anxiety disorder. For chi-square difference testing, the DIFFTEST option in Mplus was used because models were estimated using weighted least squares with mean and variance adjustments.

Table 3

Reliability (Alpha/Omega), Cronbach Alpha if Item Deleted, Item-Total Correlations, and Factor Loadings of RCADS-P in Children Evaluated for ADHD

Scale	Alpha / Omega	Item	Alpha if Item Deleted	Item-Total Correlation	Factor Loading
Separation Anxiety (7 items)	0.81 / 0.90	5	0.76	0.65	0.79
		9	0.76	0.66	0.77
		17	0.77	0.62	0.73
		18	0.81	0.38	0.64
		33	0.82	0.28	0.73
		45	0.76	0.66	0.91
		46	0.78	0.57	0.72
Generalized Anxiety (6 items)	0.88 / 0.95	1	0.88	0.59	0.87
		13	0.85	0.72	0.82
		22	0.84	0.79	0.95
		27	0.85	0.76	0.94
		35	0.84	0.77	0.89
		37	0.88	0.54	0.68
Panic Disorder (9 items)	0.78 / 0.93	3	0.79	0.42	0.68
		14	0.76	0.52	0.91
		24	0.74	0.63	0.84
		26	0.78	0.37	0.65
		28	0.76	0.53	0.76
		34	0.76	0.51	0.75
		36	0.77	0.45	0.68
		39	0.76	0.53	0.78
		41	0.75	0.55	0.80
Social Phobia (9 items)	0.89 / 0.93	4	0.87	0.69	0.79
		7	0.88	0.66	0.80
		8	0.89	0.54	0.70
		12	0.88	0.64	0.73
		20	0.88	0.62	0.79
		30	0.87	0.73	0.85
		32	0.87	0.74	0.82
		38	0.89	0.50	0.65
		43	0.87	0.69	0.85
Obsessive-Compulsive (6 items)	0.65 / 0.91	10	0.55	0.51	0.83
		16	0.63	0.33	0.71
		23	0.54	0.54	0.91
		31	0.63	0.36	0.82
		42	0.63	0.31	0.64
Depression (10 items)	0.76 / 0.89	44	0.63	0.34	0.79
		2	0.74	0.49	0.70

Scale	Alpha / Omega	Item	Alpha if Item Deleted	Item-Total Correlation	Factor Loading
		6	0.74	0.50	0.66
		11	0.75	0.42	0.64
		15	0.75	0.37	0.49
		19	0.74	0.49	0.72
		21	0.73	0.53	0.66
		25	0.75	0.37	0.56
		29	0.74	0.49	0.79
		40	0.76	0.37	0.80
		47	0.74	0.46	0.58
Total Anxiety (37 items)	0.93	--	--	--	--
Total Internalizing (47 items)	0.94 / 0.99	--	--	--	--

Note. $N = 372$. ADHD = attention-deficit/hyperactivity disorder. RCADS-P = Revised Child Anxiety and Depression Scales – Parent Version. Omega cannot be computed for total anxiety as it is not a specific factor modeled in confirmatory factor analyses.

Table 4
Intercorrelations and Descriptive Statistics of the RCADS-P in Children Evaluated for ADHD

RCADS-P Subscale	1	2	3	4	5	6	Total Anxiety	RCADS-P Total
1. Separation Anxiety	--						0.81	0.80
2. GAD	0.64 (0.75)	--					0.83	0.82
3. Panic Disorder	0.57 (0.73)	0.61 (0.73)	--				0.76	0.77
4. Social Phobia	0.50 (0.57)	0.54 (0.64)	0.50 (0.62)	--			0.83	0.81
5. OCD	0.44 (0.63)	0.55 (0.71)	0.44 (0.65)	0.36 (0.46)	--		0.61	0.61
6. Depression	0.52 (0.68)	0.50 (0.65)	0.54 (0.74)	0.48 (0.58)	0.42 (0.60)	--	0.62	0.74
<i>Mean</i>	0.45	0.53	0.18	0.92	0.15	0.41	0.47	0.45
<i>SD</i>	0.53	0.54	0.27	0.62	0.27	0.36	0.37	0.34
<i>Range</i>	0 – 2.43	0 – 3.00	0 – 2.11	0 – 3.00	0 – 1.50	0 – 2.00	0 – 1.97	0 – 1.98

Note. $N = 372$. All correlations were significant at $p < .001$. Correlations outside parentheses and descriptive statistics are based on raw scores. Correlations based on factor scores are in parentheses. ADHD = attention-deficit/hyperactivity disorder. GAD = generalized anxiety disorder. OCD = obsessive-compulsive disorder. RCADS-P = Revised Child Anxiety and Depression Scales-Parent Version.

Table 5

MIMIC Model Fit and Latent Mean Differences between Boys and Girls, Children with and without ADHD, and Children with and without an Internalizing Disorder Diagnosis

Model	RMSEA	CFI	TLI
<u>Grouping Variable = Sex (girls = 0, boys = 1)</u>			
Null	.045	.936	.933
Saturated	.044	.942	.936
Invariant	.043	.942	.939
<u>Grouping Variable = ADHD status (not diagnosed = 0, diagnosed = 1)</u>			
Null	.043	.945	.941
Saturated	.044	.946	.940
Invariant	.043	.946	.942
<u>Grouping Variable = Internalizing disorder status (not diagnosed = 0, diagnosed = 1)</u>			
Null	.056	.874	.866
Saturated	.045	.919	.911
Invariant	.044	.921	.916
<u>Standardized Regression Coefficients for MIMIC Model (Internalizing disorder status)</u>			
RCADS-P Scale	β	p	
Separation Anxiety	.41	.00	
GAD	.38	.00	
Panic Disorder	.35	.00	
Social Phobia	.36	.00	
OCD	.24	.00	
Depression	.35	.00	

Note. ADHD = attention-deficit/hyperactivity disorder. GAD = generalized anxiety disorder. OCD = obsessive-compulsive disorder. RCADS-P = Revised Child Anxiety and Depression Scales-Parent Version.

Table 6

RCADS-P Descriptive Statistics for Children Evaluated for ADHD with and without an Internalizing Disorder Diagnosis

RCADS-P Scale	Internalizing Diagnosis	No Internalizing Diagnosis	Group Differences	
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>t</i>	<i>d</i>
Separation Anxiety	1.18 ± 0.65	0.37 ± 0.45	7.36 ***	1.49
GAD	1.24 ± 0.72	0.45 ± 0.46	6.54 ***	1.31
Panic Disorder	0.51 ± 0.48	0.15 ± 0.21	4.53 ***	0.97
Social Phobia	1.65 ± 0.68	0.84 ± 0.56	6.98 ***	1.30
OCD	0.36 ± 0.39	0.13 ± 0.24	3.56 **	0.71
Depression	0.80 ± 0.47	0.37 ± 0.32	5.49 ***	1.07
Total Anxiety	1.01 ± 0.39	0.41 ± 0.30	9.14 ***	1.72
RCADS-P Total	0.97 ± 0.37	0.40 ± 0.28	11.31 ***	1.74

Note. ADHD = attention-deficit/hyperactivity disorder. GAD = generalized anxiety disorder. OCD = obsessive-compulsive disorder. RCADS-P = Revised Child Anxiety and Depression Scales-Parent Version.

p < .001.

**
p < .01.

*
p < .05.

Table 7

Convergent and Discriminant Validity Correlations with Parent-Report Measures

RCADS-P Scale	Convergent Validity					
	VADPRS			CBCL		
	Anxiety	Depression	Internalizing	Anxiety	Depression	Internalizing
Separation Anxiety	.48 ***	.37 ***	.47 ***	.55 ***	.34 ***	.47 ***
GAD	.57 ***	.44 ***	.55 ***	.57 ***	.29 ***	.46 ***
Panic Disorder	.47 ***	.37 ***	.46 ***	.41 ***	.27 ***	.39 ***
Social Phobia	.70 ***	.52 ***	.67 ***	.48 ***	.29 ***	.46 ***
OCD	.32 ***	.22 ***	.30 ***	.36 ***	.28 ***	.33 ***
Depression	.53 ***	.60 ***	.63 ***	.45 ***	.61 ***	.56 ***
Total Anxiety	.69 ***	.53 ***	.67 ***	.62 ***	.38 ***	.56 ***
RCADS-P Total	.70 ***	.58 ***	.70 ***	.63 ***	.46 ***	.60 ***
	Discriminant Validity					
	VADPRS			CBCL		
	ADHD-IN	ADHD-HI	ODD	ADHD	ODD	Externalizing
Separation Anxiety	.23 ***	.16 **	.34 ***	.11	.19 **	.22 ***
GAD	.26 ***	.15 **	.35 ***	.12	.17 **	.18 **
Panic Disorder	.22 ***	.11 *	.29 ***	.04	.10	.14 *
Social Phobia	.19 ***	-.06	.23 ***	.002	.09	.10
OCD	.22 ***	.20 ***	.22 ***	.21 ***	.18 **	.18 **
Depression	.35 ***	.13 *	.37 ***	.16 *	.25 ***	.29 ***
Total Anxiety	.28 ***	.11 *	.36 ***	.09	.17 **	.20 **
RCADS-P Total	.31 ***	.12 *	.38 ***	.11	.20 **	.23 **

Note. $N = 372$ for the correlations with the VADPRS variables and $n = 273$ for the correlations with the CBCL variables. ADHD = attention-deficit/hyperactivity disorder. ANX = anxiety. CBCL = Child Behavior Checklist. DEP = depression. GAD = generalized anxiety disorder. ODD = oppositional defiant disorder. VADPRS = Vanderbilt ADHD Diagnostic Parent Rating Scale.

p < .001.

**
p < .01.

*
p < .05.

Table 8

Convergent and Discriminant Validity Correlations with Teacher-Report Measures

RCADS-P Scale	Convergent Validity					
	VADTRS			TRF		
	Anxiety	Depression	Internalizing	Anxiety	Depression	Internalizing
Separation Anxiety	.25 **	.16 *	.22 **	.16 *	.19 *	.17 *
GAD	.23 **	.18 *	.22 **	.07	.11	.10
Panic Disorder	.18 *	.15	.18 *	.08	.16 *	.09
Social Phobia	.16 *	.18 *	.18 *	.01	.04	.02
OCD	.19 *	.19 *	.20 *	.13	.19 *	.18 *
Depression	.12	.06	.09	-.02	.17 *	.11
Total Anxiety	.25 **	.22 **	.25 **	.10	.15	.12
RCADS-P Total	.24 **	.19 *	.23 **	.08	.17 *	.13
RCADS-P Scale	Discriminant Validity					
	VADTRS			TRF		
	ADHD-IN	ADHD-HI	ODD	ADHD	ODD	Externalizing
Separation Anxiety	-.02	-.18 *	-.06	-.01	.10	.15
GAD	.01	-.13	-.01	-.03	.04	.09
Panic Disorder	-.04	-.15	.07	-.01	.13	.11
Social Phobia	-.04	-.26 **	-.01	-.16 *	-.07	-.10
OCD	.07	.03	.20 *	.06	.19 *	.24 **
Depression	-.02	-.20 **	-.05	-.11	-.01	.02
Total Anxiety	-.02	-.21 **	.02	-.07	.06	.07
RCADS-P Total	-.02	-.23 **	.01	-.09	.05	.06

Note. $N = 162$. ADHD = attention-deficit/hyperactivity disorder. ANX = anxiety. DEP = depression. GAD = generalized anxiety disorder. ODD = oppositional defiant disorder. TRF = Teacher's Report Form. VADTRS = Vanderbilt ADHD Diagnostic Teacher Rating Scale.

p < .001.

**
p < .01.

*
p < .05.