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Construct Validity of the Learning Behaviors Scale and the Academic Competence Evaluation Scales

Taryn L. Smith
Eastern Illinois University

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Taryn L. Smith

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Construct Validity of the Learning Behaviors Scale and the Academic Competence Evaluation Scales

Taryn L. Smith

Eastern Illinois University

Abstract

This research examined the convergent and discriminant validity of the Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2000) and the Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 2001). The Adjustment Scales for Children and Adolescents (ASCA; McDermott, Stott, & Marston, 1993) was compared with the ACES and LBS to examine discriminant validity. Pearson product moment correlations were obtained to examine convergent and discriminant validity. Paired samples *t*-tests were conducted on the ACES and LBS total and subscale scores to compare the mean scores. The ACES Academic Enabler (ACES-AE) total score was significantly, positively correlated with the LBS total score ($r = 0.88$) and shared 77% variance. Paired samples *t*-test analyses indicated that the ACES-AE Total *T* score ($M = 46.83$, $SD = 10.63$) was significantly higher than the LBS Total *T* score ($M = 42.18$, $SD = 13.81$), $t(97) = 5.47$, $p < .001$, $d = .38$. However, although teacher ratings on the ACES-AE were significantly higher than the LBS, the effect size was small and likely not meaningful. Both the ACES-AE and the LBS Total score were moderately, negatively correlated with the ASCA Overactivity score ($r = -0.43$ and $r = -0.55$, respectively) with 18% and 30% shared variance and the ASCA Underactivity score ($r = -0.42$ and $r = -0.32$, respectively), with 18% and 10% shared variance. The ACES and LBS demonstrated convergence (they measured similar constructs) while they each demonstrated discriminant validity when compared with the ASCA (these correlations were mostly lower than ACES/LBS correlations). Thus, the current study found construct validity support for the ACES and LBS.

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Introduction

Academic achievement is a construct that has been the focus of research for many years. As defined by Green, Forehand, Beck and Vosk (1980) academic achievement scores provide, "as assessment of the child's academic competency in the classroom" (p. 1150). Thus, achievement tests attempt to measure what and how much an individual has learned through explicit classroom instruction.

Much of the reliable variance in achievement test scores is accounted for by intelligence. Intelligence is conceptualized as representing the internal cognitive abilities of an individual. Measures of intelligence such as the Wechsler Intelligence Scale for Children – Third Edition (WISC-III; Wechsler, 1991) and the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV; Wechsler, 2003) have demonstrated good longitudinal stability (Canivez & Watkins, 1998; Canivez & Watkins, 1999; Canivez & Watkins, 2001; Watkins & Smith, 2013). In fact, the margin of error of the Full Scale Intelligence Quotient (FSIQ) is smaller than that of such medical assessments as blood pressure readings, and the diagnostic specificity and sensitivity of the FSIQ surpasses that of many physical measurements (Gottfredson, 2008). Criterion-related validity studies consistently show that intelligence accounts for about 50% of the variance in achievement scores (Gottfredson, 2008; Naglieri & Bornstein, 2003; Neisser et al., 1996; Sattler, 2008). Although this is a substantial amount of the variance, that still leaves 50% of the variance to be accounted for by other factors.

Research has suggested that learning behaviors or academic enablers also greatly affect learning and may influence the development of achievement beyond that of intelligence (DiPerna, Volpe, & Elliott, 2001; Malecki & Elliott, 2002; Schaefer & McDermott, 1999). Exploring these learning behaviors and academic enablers was the focus of the current study.

Literature Review

What Else Affects Achievement?

The connection between academic achievement and intelligence has been thoroughly established through previous research (Gottfredson, 2008; Naglieri & Bornstein, 2003; Neisser et al., 1996; Sattler, 2008). However, the investigation of variables in addition to intelligence that affect achievement scores is warranted for several reasons. First, IQ scores have been shown to be relatively stable over time and interventions designed to raise low IQ scores have shown poor results (Locurto, 1991; Neisser et al., 1996; Spitz, 1986). Second, while about 50% of achievement variance is accounted for by IQ, 50% of the variance in achievement test scores is, therefore, not accounted for by IQ scores (Gottfredson, 2008; Naglieri & Bornstein, 2003; Neisser et al., 1996; Sattler, 2008). Third, intelligence tests do not regularly produce educational and cognitive interventions that are effective (Brown & Campione, 1982; Ceci, 1990, 1991; Glutting & McDermott, 1990a, 1990b; Macmann & Barnett, 1994; Neisworth & Bagnato, 1992; Reschly, 1988, 1997; Scarr, 1981; Schaefer & McDermott, 1999; Spitz, 1986; Ysseldyke & Christenson, 1988). Cooper, Heron, and Heward (2007) stated, "Results from standardized tests...might indicate that a fourth-grader is performing at the third-grade level in mathematics and at the first-grade level in reading...but it...[does

not] provide sufficient direct context with which to launch an enrichment or remedial program" (p. 53).

Therefore, although intelligence is important in understanding an individual's achievement, there are other factors that influence achievement that are important as well. Research has suggested that additional student and environmental variables are also important in the acquisition of academic skills.

Carroll (1963) was one of the first researchers to examine student and environmental variables and he developed a model of school learning that could assist practitioners desiring to address variables that influence students' learning. He hypothesized that school learning consisted of five dimensions (see Figure 1). The first, Aptitude, was defined as the time a student requires in order to master a given learning task. Students who do not need much time in order to grasp a concept would be said to have higher aptitude, whereas students requiring more time would have lower aptitude. The second dimension was Ability to Understand Instruction. This could be viewed as a combination of general intelligence and verbal ability. Students high in Ability to Understand Instruction would be able to figure out what a learning task is and how to learn it. They are also more capable of overcoming poor teaching. However, students low in this area would be unable to do so. The third dimension was Opportunity to Learn, or time allowed for learning. This dimension refers to the pace of instruction and allowing the student enough time to master concepts. The fourth of Carroll's dimensions was Quality of Instruction, which includes the performance of the teacher and characteristics of the curricula (textbooks, workbooks, and other materials). The final dimension was Perseverance, or the time the student is willing to spend in order to learn.

This dimension was related to both motivation and active engagement. Carroll explained that students may not be sufficiently motivated to spend time learning a concept or may

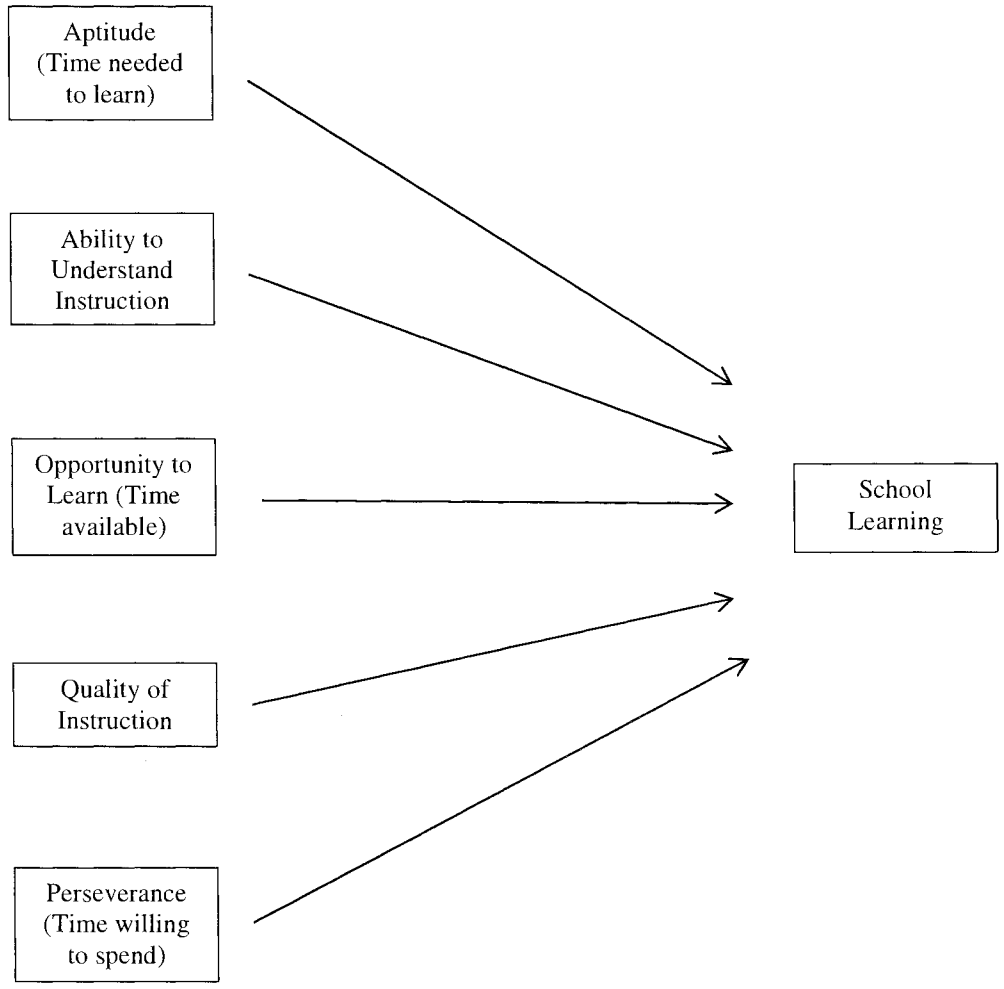

Figure 1. John Carroll's Model of School Learning (Carroll, 1963).

Anderson and Messick (1974) also examined the importance of variables besides intelligence. They reported results from an expert panel discussion that identified 29 facets that influence the social competency of young children. They defined social

competency as "just one of the many phrases that might have been used to mobilize attention to the broad range of cognitive and personal-social dimensions of the developing child" (Anderson & Messick, 1974, p. 286-287). The 29 facets were drawn from multiple theories mainly within the domains of cognitive-perceptual areas, personal-social areas, and areas of interface between cognition and personality. The conceptualizations of Piaget, Binet, Rogers, Bandura, Thurstone, and Kohlberg were among the most influential in determining the 29 facets of social competency. Appendix A lists and defines the 29 facets in Anderson and Messick's model. Included in this model were the facets of sensitivity and understanding in social relationships, appropriate regulation of antisocial behavior, control of attention, memory skills, flexibility in the application of information-processing strategies, competence motivation, and some positive attitudes toward learning and school experiences.

The works of both Carroll (1963) and Anderson and Messick (1974) emerged out of the need to identify the variables that affect achievement, including the effects of student and environmental variables. Although successful student learning is greatly affected by cognitive abilities, or intelligence, it is also aided by such student behaviors as active participation, accepting correction and feedback, appreciation of novelty, attention to tasks, reflective responding, and generating and using effective strategies (Carter & Swanson, 1995; Finn & Cox, 1992; Jussim, 1989; Schuck, Oehler-Stinnett, & Stinnett, 1995). Achievement is not solely determined by one's cognitive abilities, but is also influenced by a host of individual variables such as motivation, attitude, persistence, strategy, study skills, and academic engagement; as well as by external factors such as teacher skills and curricula. Carroll's (1963) model posited that both internal dimensions

such as aptitude and perseverance and external dimensions like quality of instruction and opportunity to learn affect student learning. Later, Anderson and Messick (1974) looked specifically at variables internal to the student and hypothesized facets that affect social competency. Both of these early works helped to provide the foundation for later researchers such as McDermott, Green, Francis, and Stott, and DiPerna and Elliott to examine student variables more closely and were the ground from which the constructs of leaning behaviors and academic enablers grew.

Why Learning Behaviors and Academic Enablers are Beneficial

The benefit of research dedicated to learning behaviors and academic enablers is that behaviors directly involved in the achievement process and behaviors that support learning are more amenable to change than the constructs that are measured by intelligence tests (which are generally stable over time). Academic enablers and learning behaviors may be affected by teaching or interventions, thereby affecting the acquisition of academic skills. The assessment of learning behaviors may offer supplementary insights into learning problems and benefit in the remediation of learning difficulties (McDermott, Goldberg, Watkins, Stanley, & Glutting, 2006).

Scales to Measure Learning Behaviors and Academic Enablers

Some of the first researchers to investigate the concept of learning behaviors were Reynolds, DeSetto, and Bentley (1977), who developed the Classroom Behavior Rating Scale (CBRS) to measure learning-related behaviors in the classroom. Reynolds (1979) reported on the development and validation of this early scale. Initially, the CBRS consisted of 100 behavioral statements that described a myriad of classroom behaviors such as persistence, response to directions, and attention. The behaviors were

then delineated within the contexts of homework, small group instruction, large group instruction, projects, test situations, and seat work.

After teacher evaluations, field testing, and data analysis, Reynolds et al. retained 40 items. A principal components analysis produced a strong one-factor solution that accounted for 76.8% of the variance. Item factor coefficients ranged from .77 to .94 and produced an internal consistency estimate of .98. They examined convergent validity using measures of intelligence (California Test of Mental Maturity [CTMM]; Sullivan, Clark, & Tiegs, 1963), academic achievement (Metropolitan Achievement Test [MAT]; Durost, Bixler, Wrightstone, Prescott, & Balow, 1970), and an overall teacher estimated academic rating (from 1-5). The CBRS demonstrated convergence with these three measures (correlations ranging from .65-.87 with the MAT, .62 with the CTMM, and .80 with the teacher academic rating). The CBRS showed divergence from teacher ratings of the following classroom behavior problems: hyperactive, withdrawn, acting out, and instability. One problem behavior (inattentive) however, *was* correlated with the CBRS although this would be expected since attention is a learning-related behavior the CBRS was attempting to measure. In sum, the CBRS provides a historical look into the concept of learning behaviors and demonstrates that learning-related behaviors converge with intelligence and achievement and diverge with most problem behaviors.

A major precursor of the Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 2001), was the Guide to the Child's Learning Skills (GCLS; Stott, Green, & Francis, 1982). Stott et al. developed the guide in the Centre for Educational Disabilities at the University of Guelph, where Stott observed the general styles of coping in children's play and learning. Participants were 50 five-year-olds who were chosen by

teachers over four successive years as being likely to develop learning problems. Parents brought children to the Centre for two half-day sessions per week across 6 months where they participated in individual and small-group activities. At the end of each session, Stott met with the teachers to determine what was causing the child's poor performance on the tasks. From these sessions, 14 categories of faulty learning behaviors emerged and subsequently rated on a 3-point scale of severity.

However, this version was too cumbersome for use with entire classes and only described poor learning styles. Therefore, Stott et al. developed a shorter checklist and hypothesized that the opposites of the learning behavior problems would likely be associated with good academic attainment. They then modified the statements according to the recommendations of teachers in Coventry Infants' school and others enrolled in courses at the North East London Polytechnic. At that time, the GCLS included seven statements that centered around attention, concentration, confidence, participation, self-reliance, flexibility, and alertness.

Stott, Green, and Francis (1983) then examined the relation between learning style, as assessed by the GCLS, and academic attainment. Academic attainment was assessed by ratings of Reading, Number, and Spoken Language on a scale of A (very good) to E (exceedingly poor) by teachers who did not provide ratings on the GCLS. This is important because if the same teacher rated learning style and academic attainment, this could confound the results due to method effect. The Pearson product-moment correlations were statistically significant ($p < .001$) and were .50, .50, and .47, for Reading, Number, and Spoken Language, respectively. Based on these correlations, Stott et al. (1983) concluded that when a child is found to have learning difficulties,

diagnostic priority should be given to an assessment of learning style rather than an intelligence test. Their reasoning was that an assessment of learning style could pinpoint what required remediation and provide a means by which to evaluate the remediation. However, it should be noted that measures of intelligence and measures of learning styles are not completely independent. In fact, Stott et al. (1983) mentioned that there was good reason to suppose that learning style was a significant determinant of IQ, and therefore they are not exclusive concepts. Because of this, some amount of the above variance is likely shared with intelligence.

These early studies of learning styles and learning-related behaviors validated the hypothesis that variables other than intelligence relate to academic outcomes, and because these variables are observable, there is merit in the research and validation of the constructs. Revision and extension of the GCLS led to the creation of the Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 2001).

Learning Behaviors Scale (LBS)

The Learning Behaviors Scale (LBS; McDermott et al., 2001) is a teacher-report questionnaire consisting of 29 positively and negatively worded items specific to learning-related behaviors. The items are rated on a three-point scale (2 = Most Often Applies, 1 = Sometimes Applies, or 0 = Does Not Apply). Of the 29 items, 25 combine to produce a total score and four factors: Competence Motivation (CM; motivation to attempt and complete tasks), Attitude Toward Learning (AL; interest in learning), Attention/Persistence (AP; attention to and completion of tasks), and Strategy/Flexibility (SF; flexible thinking in the completion of tasks). Four items (10, 12, 19, and 22) are not used to score the LBS because they failed to produce salient factor loadings in the factor

analysis with the standardization sample. Five items (items 6, 11, 15, 18, and 26) cross loaded and are included on multiple (two) factors. CM and AP, AL and AP, and AP and SF each share one item, while CM and AL share two items. The total and subscale raw scores are then converted to normalized *T* scores ($M = 50$, $SD = 10$).

McDermott (1999) reported on the development and standardization of the LBS. Participants were 1,500 5-17-year-old school children representative of the 1992 U.S. population census. A model with 4 equamax rotated orthogonal factors that satisfied 5 criteria was found. The criteria were: 1) satisfied the scree test, 2) retained five or more items with loadings $\geq .40$, 3) yielded internal consistency $\geq .70$ for salient items, 4) was invariant across models, and 5) made psychological sense. To ensure that the model was generalizable to subgroups within the population, McDermott tested invariance and generalizability. Invariance analyses were conducted on six random subsamples of 250 participants and coefficients for hypothesized complimentary dimensions averaged .95 while coefficients for noncomplimentary dimensions averaged .63. McDermott tested generality by repeating the analyses for demographic subsamples: male students (.99), female students (.99), preadolescents (5-11 years; .99), adolescents (12-17 years; .93), White youths (.99), Hispanic youths (.94), African American youths (.90), and all non-White youths (.98; McDermott, 1999).

McDermott (1999) also summarized reliability and validity estimates for the LBS standardization sample. Average internal consistency estimates for the four subscales ranged from .75 to .85 ($M_r = .82$) across various demographic subgroups. The test-retest stability was substantial, with coefficients ranging from .91 to .93 ($M_r = .92$). McDermott (1999) summarized results where incremental validity was demonstrated

with the LBS predicting significant portions of grade variation and achievement variation as measured by teacher-assigned grades beyond that of the Differential Ability Scales (DAS; Elliott, 1990) (increments of 16.3% and 2.7%, respectively).

In examining the convergent and discriminant validity support for the LBS, McDermott (1999) used the Campbell and Fiske (1959) model of discriminant validity. In this model, discriminant validity is supported by examining a multitrait-multimethod matrix consisting of intercorrelations among multiple methods and multiple traits. Discriminant validity is supported when the relationship between two constructs is weaker compared to other relationships in the matrix. Negative correlations demonstrate inverse relationships and are also important in examining the pattern of relative relationships within the matrix. McDermott (1999) also examined convergent and discriminant validity with comparisons to the Differential Ability Scales (DAS; Elliott, 1990) and the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Stott, & Marston, 1993). The DAS was administered to 1,366 of the total LBS sample to assess cognitive functioning and the ASCA was administered to 1,242 of the total LBS sample to evaluate psychopathology. The ASCA yields scores on syndromes of Attention-Deficit/Hyperactive (ADH; restless and unfocused), Solitary Aggressive (Provocative; SA[P]; provoking others to anger), Solitary Aggressive (Impulsive; SA[I]; impulsively making bad choices), Oppositional Defiant (OpD; oppositional toward authority), Delinquent (Del; participating in illicit activities), Diffident (Dif; too timid to join peers), Avoidant (Avo; aloof and lacking interest), and Lethargic-Hypoactive (Leh; apathetic toward peers and learning). The correlations between the LBS and the ASCA were significant, moderate, and negative (where expected), as well as some small,

negative correlations, suggesting evidence for discriminant validity (ranged from *Rc* = .17 to .80). McDermott (1999) concluded from this pattern of correlations that problem behaviors decrease as learning behaviors increase. However, there was a 30% overlap between learning behaviors (LBS) and psychopathology (ASCA) based on canonical redundancy analysis and composite scores. Four bimultivariate interactions emerged: 1) overall, good learning behavior was related to an absence of hyperactive behavior and low levels of other pathology excluding diffident behavior, 2) low competence motivation, strategy/flexibility, and attention/persistence were related to diffident and avoidant behaviors, 3) low competence motivation coupled with low attitude toward learning was related to high avoidant and oppositional behaviors, and 4) low strategy/flexibility and competence motivation were associated with high oppositional and diffident behaviors. Convergent validity of the LBS was suggested in that the LBS was able to account for 12.1% of the variability in DAS verbal, nonverbal, and spatial ability (canonical correlation [*Rc*] = .43) and 13.2% of the variability in DAS achievement (*Rc* = .45).

Buchanan, McDermott, and Schaefer (1998) conducted one of the first studies on the LBS. They examined the interobserver agreement of the LBS by using linear and intraclass correlation methods with 72 students (aged 7-16 years) observed by 16 educators in self-contained special education programs (briefly summarized in McDermott, 1999). The students were previously diagnosed with conduct disorders, physical disabilities, learning disabilities, or attention deficit disorders. Buchanan et al. (1998) found that intra- and interclass correlation values were almost identical, suggesting that LBS observations were essentially comparable across independent

observers in level, pattern, and rank ordering (intraclass correlations ranged from .68-.88 with a mean of .82 for the subscales and .91 for the total). Buchanan et al. (1998) also noted that the mean *T* scores fell nearly one *SD* below the population average of 50. This finding supports the expectation that students with disabilities may demonstrate problematic learning behaviors.

Schaefer and McDermott (1999) examined the relationships among learning behaviors, grades, achievement, and intelligence. They collected LBS ratings, teacher-assigned grades, academic achievement (using the DAS achievement battery) and intellectual ability (using the DAS cognitive ability battery) on a representative sample of 1,100 students ages 6-17. They conducted hierarchical regression analyses and learning behaviors accounted for an average 27.1% of variability in grades and 12% in achievement scores. They computed zero-order correlations between the intelligence and LBS dimensions and approximately 85% of their variance was unique. This finding supports the idea that learning behaviors and intelligence are separate and distinct constructs.

Worrell, Vandiver, and Watkins (2001) examined the construct validity of the LBS with a sample of 257 American students in grades 1-5. They examined both a three-factor and a four-factor solution and found support for three of the four factors (Competence Motivation, Attitude Toward Learning, and Strategy/Flexibility). Factor analyses extracted factors similar to the above three factors originally reported and accounted for 51.1% of the variance in LBS scores. The results of factor analyses indicated that the Attention/Persistence factor might benefit from additional study. Worrell et al. (2001) also reported internal consistency estimates from the total sample

ranging from .76 to .91. They reported the internal consistency of the Total LBS score (.91) and the scores on Attitude Toward Learning (.89) and Competence Motivation (.86) were high enough for individual decision making. Internal consistency estimates for scores on Strategy/Flexibility (.79) and Attention/Persistence (.76) were slightly lower.

Canivez, Willenborg, and Kearney (2006) also examined the LBS factor structure with a sample of 241 first-seventh graders. They examined both three- and four-factor models and found support for the four-factor model with the four-factor solution accounting for 50.9% of the variability of LBS scores. Coefficients of congruence indicated "good" to "excellent" matches with the results found with the standardization sample and were higher for the four-factor model than for the three-factor model. Internal consistency estimates (coefficient alpha) ranged from .77 to .93 (*Mdn* = .88) which were all acceptable and were as high or higher than those obtained in the standardization of the LBS.

Canivez and Beran (2011) examined the four-factor structure of the LBS with a sample of 393 Canadian 5-17 year-olds. Based on exploratory factor analyses (EFA) with equamax rotations, factor structure coefficients were produced that were very similar to those from the standardization sample. Also, factor invariance estimates corresponded to estimates from the standardization of the LBS. The SE_{Scree} criteria and eigenvalue > 1 suggested retaining five factors; however, the visual scree, minimum average partials (MAP), Horn's parallel analysis (HPA), and theoretical consideration suggested retaining four factors. Extracting 5 factors created small alpha coefficients and smaller rotated structure coefficients, therefore four factors were retained. The four factors accounted for 11.47% (Competence Motivation), 13.31% (Attention/Persistence),

14.19% (Attitude Toward Learning), and 10.48% (Strategy/Flexibility) of the variability in LBS scores. Also, most of the items were associated with the expected theoretical factor and the items that cross-loaded in the standardization sample also cross-loaded on the same two factors in the Canadian sample. Lastly, a one-way ANOVA for differences between the Canadian sample and the American standardization sample revealed small effect sizes for the total score and across subscales (Cohen's *d*'s ranging from .28-.35; Cohen, 1988).

Rikoon, McDermott, and Fantuzzo (2012) examined the external validity and factor structure of the LBS with a sample of 450 children in Kindergarten who were previously enrolled in Head Start. Minimum average partial analysis suggested up to four LBS factors be extracted and a four-factor promax structure was found superior and satisfied all criteria. The four factors were named Competence Motivation, Discipline/Persistence, Cooperation, and Emotional Control. Confirmatory Factor Analysis also supported the four-factor structure and three of the four factors demonstrated acceptable levels of internal consistency (ranging from .67-.90). LBS factor scores exhibited moderate, statistically significant correlations with future assessments of academic achievement (as measured by the TerraNova, Second Edition [CTB/McGraw-Hill, 1997] and report card grades) both within the same year and up to 2 years later (overall average correlation of .34). Lastly, all factors demonstrated significant associations with reduced risk for future negative outcomes and risk reduction averaged 75.6% across ASCA behavioral contexts.

Canivez and McDermott (2015) re-examined the factor structure of the LBS using the LBS standardization sample (N = 1,500). They examined one- through five-factor

models using exploratory factor analysis (EFA) with oblique rotation and confirmatory factor analysis (CFA). Schmid-Leiman transformations (Schmid & Leiman, 1957) of the higher-order EFA found that most of the item variance was accounted for by a dominant higher-order factor. Most of the item variance was associated with the hierarchical general factor and very little unique variance was associated with the specific subscales. CFA found that a bifactor solution with one general dimension (and three group factors) was superior to other models. Thus, the LBS Total score is most reliable for interpretation as the subscales do not capture enough unique variance to support interpretation. The LBS, overall, has demonstrated substantial evidence that suggests adequate reliability and validity.

Academic Competence Evaluation Scales (ACES)

An instrument designed to measure academic competence is the Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2000). DiPerna and Elliott defined academic competence as being composed of academic enablers (a construct similar to learning behaviors) and academic skills. The ACES purports to measure both of these factors. First, Academic Skills are measured by teacher ratings or student self-ratings in the areas of Reading/Language Arts, Mathematics, and Critical Thinking. Second, Academic Enablers are measured by four scales based on teacher ratings: Study Skills, Interpersonal Skills, Classroom Engagement, and Academic Motivation.

Precursors to the ACES Academic Enablers. DiPerna and Elliott (2000) defined the first Academic Enabler, Study Skills, as "behaviors that facilitate the processing of new material" (p. 6-7) and are generally viewed as prerequisites for learning (Gettinger & Knopik, 1987; Smith Harvey, 1995). Good study habits can affect

active engagement in learning and scores on tests. Reutzel and Cooter (1992) evaluated the use of SQ3R (Survey-Question-Read-Recite-Review), a technique designed to enhance studying and found that SQ3R resulted in more active engagement in learning and improved scores on classroom tests. Olson (1995) examined 3rd graders who followed a study-buddy and self-evaluation process and found that they correctly spelled significantly more words. Lastly, the use of study skills at home has been demonstrated to have a meaningful impact on academic performance of middle and high school students (Cooper, 1989).

The second academic enabler is Interpersonal Skills, which are "cooperative learning behaviors necessary to interact with other people" (DiPerna & Elliott, 2000, p. 6). Prosocial behaviors have been found to be related to student's grades and scores on standardized achievement tests (Green, Forehand, Beck, & Vosk, 1980; Malecki & Elliott, 2002; Wentzel, 1993). Green et al. (1980) found that children with high academic achievement (as measured by the Metropolitan Achievement Test) were liked by peers (as measured by peer ratings, $r = .33$) and interacted positively with peers (as measured by observations, $r = .41$). Similarly, Wentzel (1993) found that prosocial behaviors (as determined from student nominations of prosocial classmates) were significantly correlated with grade point average ($r = .54$) and standardized achievement scores (as measured by the Stanford Test of Basic Skills, $r = .38$). Finally, Malecki and Elliott (2002) found that students' social skills (as measured by the Social Skills Rating System - Teacher Form social skills subscale) were moderately correlated with Iowa Test of Basic Skills Total Reading, Math, and Language scores (correlations ranged from .40 to .54).

Engagement is the third academic enabler and is defined as "behaviors that reflect attentive, active participation in classroom instruction" (DiPerna & Elliott, 2000, p. 6). The concept of engagement came out of research on academic survival skills (Hoge, 1983), academic learning time (Berliner, 1988), and academic responding (Greenwood, Delquadri, & Hall, 1984). Greenwood (1996) described engagement in academic responding as a profound sign of the effects of instruction and has used engagement as the main component of his performance-based instructional model.

The last academic enabler is Motivation which is the "approach, persistence, and level of interest regarding academic subjects" (DiPerna & Elliott, 2000, p.6). Stinnett, Oehler-Stinnett, and Stout (1991) found small to moderate correlations between teacher ratings of academic achievement motivation (as measured by the Teacher Rating of Academic Achievement Motivation, or TRAAM) and student scores on the math, reading, and spelling subtests of the Wide Range Achievement Test-Revised. Correlations ranged from .26 - .42 for reading, .29 - .38 for spelling, and .24 - .42 for math across the five factors of the TRAAM. Also, TRAAM motivation ratings were significant predictors of student grades in reading (R^2 total TRAAM score = .61), math (R^2 total TRAAM score = .44), language arts (R^2 TRAAM factor 4 = .56), science (R^2 TRAAM factor 4 = .60), and social studies (R^2 TRAAM factor 4 = .59; Stinnett & Oehler-Stinnett, 1992). Stinnett et al. (1991) conducted stepwise multiple regressions on averaged report card grades in the above areas as criterion variables. TRAAM factor 4 was a better predictor of student grades in language arts, science, and social studies. Factor 4 of the TRAAM attempts to measure the student's capacity to keep up with the speed of instruction and past success in school. Example items are "Has had little

success in school," and "Demonstrates mastery of work that has been previously studied" (Stinnett & Oehler-Stinnett, 1992, p. 279). One caveat of this study is that teachers completed the TRAAM and also issued grades to the students. Because teachers provided both scores, a possible method effect should be noted. However, from these studies it can be concluded that motivation is connected to academic performance whether measured by student grades or by standardized achievement test scores.

Structure of the ACES. The ACES Academic Skills scale consists of Reading/Language Arts, Mathematics, and Critical Thinking. The Reading/Language Arts subscale contains ratings of writing, verbal communication skills, and reading; and consists of items such as oral communication quality and written text processing. The Mathematics subscale includes ratings of using and applying numbers and mathematical concepts and it encompasses computation, problem-solving, and measurement. Lastly, the Critical Thinking subscale provides ratings of higher-order thinking and is composed of items measuring synthesis, investigation, and analysis. On the *ACES-Teacher* form, teachers use a 5-point rating of proficiency of the skill (1 = Far Below Grade-level Expectations to 5 = Far Above Grade-level Expectations) to rate Academic Skills. Teachers also rate on a 3-point rating scale, the Importance or how important a particular skill is (1 = Not Important to 3 = Critical). However, the *ACES-Student* record form uses a 5-point Frequency rating for Academic Skills that describes how often a skill is used (1 = Never to 5 = Almost Always). The Frequency scale is used on the *ACES-Student* record form because students have difficulty judging their academic skills in relation to grade-level expectations. The student form also does not have an Importance rating because this type of rating was difficult for students as well (DiPerna & Elliott, 2000).

The ACES Academic Enablers scale (Study Skills, Interpersonal Skills, Engagement, and Motivation) was previously discussed in detail. On the *ACES-Teacher* form, teachers rate the Academic Enabler items on a 5-point Frequency scale for how often the behavior is observed (1 = Never to 5 = Almost Always). Teachers also give an Importance rating on how important they view a behavior from 1 = Not Important to 3 = Critical. The *ACES-Student* record form only uses the 5-point Frequency scale for how often a behavior is used. The ACES has three forms: teacher, student, and college student. The teacher rating form can be used for students grades K-12. The student form, however, is only suitable for students in grades 6-12 because it requires self-analysis, which is not appropriate for younger children. The last form is the college student self-rating form, which is used for students at 2- and 4-year-post-secondary institutions.

Validation of the ACES. DiPerna and Elliott (1999) reported on the development and validation of the ACES with the original 95-item form and examined reliability, item analyses, and factor analyses. DiPerna and Elliott (1999) also examined the validity of the ACES with correlations between the ACES and Social Skills Rating System-Teacher (SSRS-T; Gresham & Elliott, 1990) and the Iowa Test of Basic Skills (ITBS; Hoover, Hieronymus, Frisbie, & Dunbar, 1993). They eliminated items through item analysis and the final selection retained 60 items for the final version. Items were eliminated through teacher responses, low importance ratings, low item-ITBS correlations, and low ranking through Principal Axis Factoring (PAF). Using PAF, 9 factors with eigenvalues greater than one emerged; however, an inspection of the scree plot indicated two "elbows." They selected the five factor model because 1) this model

accounted for 70.7% of the total variance in the scale, 2) it provided greater clarity of interpretation than other models, and 3) the 5-factor model was theoretically consistent with research. Therefore, a 5-factor model was retained (Academic Skills, Interpersonal Skills, Academic Motivation, Participation, and Study Skills). Internal consistency coefficients ranged from .92-.98 across the scales (.98 for Academic Skills, .97 for Academic Motivation, .95 for Interpersonal Skills, .94 for Study Skills, and .92 for Participation). DiPerna and Elliott calculated test-retest coefficients for 20 students between the scores from two ACES administrations 6 weeks apart. These stability coefficients ranged from .70-.92 across the scales (.92 for Academic Skills, .85 for Interpersonal Skills, .81 for Participation, .80 for Study Skills, and .70 for Academic Motivation). Item-total correlations ranged from .69-.91 across scales (.76-.89 for Academic Skills, .79-.85 for Interpersonal Skills, .83-.91 for Academic Motivation, .69-.82 for Participation, and .69-.84 for Study Skills).

DiPerna and Elliott (1999) reported that the validity of the ACES was supported in that the majority of correlations between the ACES and ITBS were moderate. The Academic Skills scale of the ACES had the highest correlations with the ITBS test scores (ranging from .71-.84), while the Interpersonal Skills scale had the lowest correlations with the ITBS scores (ranging from .31-.56). DiPerna and Elliott compared the ACES with the Academic Competence scale from the SSRS-T and obtained moderate ($r = 0.43$ with Interpersonal Skills) to high ($r = 0.87$ with Academic Skills) correlations. DiPerna and Elliott also examined correlations between the ACES and the Social Skills subscale of the SSRS-T and correlations ranged from .49-.74. Lastly, they examined correlations between the ACES and the Problem Behaviors subscale of the Social Skills Rating Scale-

Teacher (SSRS-T) and correlations ranged from -.03 to -.70 (-.03 [Academic Skills], -.20 [Participation], -.34 [Motivation], -.36 [Study Skills], and -.70 [Interpersonal Skills]).

DiPerna and Elliott (2000) extensively reviewed the entire ACES system. However, because the focus of the current study is on the Academic Enablers portion of the ACES and not the Academic Skills, only the reliability and validity of the Academic Enablers portion of the ACES is discussed in detail. Also, because the *ACES-Teacher* form is of specific focus, the *ACES-Student* will not be discussed in detail.

DiPerna and Elliott (2000) reported the internal consistency estimates for the Academic Enablers Scale Total scores across four grade groups (K – 2nd grade, 3rd – 5th grade, 6th – 8th grade, and 9th – 12th grade). Internal consistency estimates were .98, .98, .99, and .99, respectively. The subscale internal consistency estimates for the *ACES-Teacher* were .97 for Interpersonal Skills, .94 to .95 for Classroom Engagement, .97 to .98 for Academic Motivation, and .94 to .97 for Study Skills across the age groups. DiPerna and Elliott examined test-retest reliability of the Academic Enablers Total of the *ACES-Teacher* for 188 students with a 2-3 week retest interval and found it was high (r = 0.96). The subscale test-retest reliability estimates for teacher report were .92 for Interpersonal Skills, .92 for Classroom Engagement, .96 for Academic Motivation, and .96 for Study Skills. The differences in raw score means were less than 1 point from Time 1 to Time 2. DiPerna and Elliott also examined interrater agreement of the Academic Enablers Scale Total of the *ACES-Teacher* form for 122 students and it was reported to be .61. The Academic Enabler interrater agreement for teacher report was .31 for Interpersonal Skills, .42 for Classroom Engagement, .62 for Academic Motivation, and .42 for Study Skills. However, the different raters often observed the student in a

different class and/or at a different time. Thus, these interrater agreement scores may not be an adequate measurement of *ACES-Teacher* agreement between raters.

DiPerna and Elliott (2000) also conducted Principal Components Analysis (PCA) using all items from the ACES and reported that this analysis identified 2 broad factors (Academic Skills and Academic Enablers). Next, they conducted separate PCAs on the items that contributed to each of the factors and they separated the teacher sample into two groups (K-5 and 6-12) to minimize developmental influences. The criteria to determine the number of factors to retain were eigenvalues > 1, visual analysis of the scree plot, and theoretical fit. Four factors were thus retained and were obliquely (Promax) and orthogonally (Varimax) rotated. If an item loaded > .40 on a factor, they considered it to have loaded strongly on that factor. They considered items with loadings < .20 between two factors to be dually loaded and assigned them to the factor that was most consistent with the item content. PCA for the Academic Enablers yielded a 4-factor solution and 80% of items loaded exclusively on one factor for the K-5 group and 74% loaded exclusively for the teacher-report 6-12 group. The subscale factor loadings for teacher report ranged from .74 to .85 for Interpersonal Skills, .63 to .88 for Classroom Engagement, .41 to .75 for Academic Motivation, and .31 to .76 for Study Skills across age groups.

DiPerna, Volpe, and Elliott (2001) examined the four ACES Academic Enablers in relation to prior and current reading achievement (as measured by the ACES Reading/Language Arts subscale) with 192 students in grades K-2 and 202 students in grades 3-6. The goal was to explore the fit of a proposed model for reading/language arts achievement. Teachers completed the ACES Interpersonal Skills and Reading/Language

Arts subscales at Time 1 for each student 6-8 weeks into the school year. In the final month of the school year teachers completed the ACES Academic Motivation, Study Skills, Classroom Engagement, and Reading/Language Arts subscales. The correlations of prior reading achievement for the K-2 students were as follows: .33 with Interpersonal Skills, .58 with Academic Motivation, .38 with Study Skills, and .61 with Classroom Engagement. Similarly, their current reading achievement correlated .31 with Interpersonal Skills, .62 with Academic Motivation, .40 with Study Skills, and .63 with Classroom Engagement. They found similar results in the 3rd-6th grade sample. Correlations of prior reading achievement were .46 with Interpersonal Skills, .65 with Academic Motivation, .56 with Study Skills, and .43 with Classroom Engagement. Lastly, current reading achievement correlated .43 with Interpersonal Skills, .66 with Academic Motivation, .60 with Study Skills, and .52 with Classroom Engagement. All of these correlations were statistically significant ($p < .01$). DiPerna et al. (2002) reported that their model fit fairly well for the K-2 sample (χ^2 (7) = 36.34, p = .00, GFI = .94, CFI = .95, NNFI = .90, and RMSEA = .15) and quite well for the 3rd-6th grade sample (χ^2 (7) = 13.74, p = .06, GFI = .98, CFI = .99, NNFI = .98, and RMSEA = .07). Based on their results, DiPerna et al. (2002) concluded that prior achievement and interpersonal skills impacted motivation, which then affected engagement and study skills to stimulate current academic achievement.

Elliott, DiPerna, Mroch, and Lang (2004) reported further validity evidence for the ACES in their study of teacher and student ratings of academic enablers in a sample of 2,060 students who differed according to their educational status (learning disability, at-risk, or general education) and sex. Results from teacher reports showed that general

education students and female students tended to have higher ratings of academic enablers than the other groups. The overall effect size (Cohen's *d*) of general education vs. learning disability was 1.18 (large), general education vs. at-risk was 1.62 (large), and female students vs. male students was .44 (medium). Results from the student reports showed that general education students tended to have higher ratings than the learning disability group (Cohen's $d = 0.93$ [large]) and that female students tended to have higher ratings than male students (Cohen's $d = 0.51$ [medium]). This study demonstrated further support for validity evidence in that students of differing educational status (whether by teacher or self-report) also differed in their ACES scores in the expected directions (distinct group differences).

Zegadlo (2015) examined the factor structure of the ACES Teacher form using higher-order exploratory factor analyses (EFA) with a sample of 433 students for the Academic Skills (AS) scale and 466 students for the Academic Enablers (AE) scale. EFA identified a three-factor model for the AS subscales (Reading/Language Arts, Mathematics, and Critical Thinking) and found that the majority of the variance was apportioned to a general Academic Skills dimension. EFA identified a four-factor model for the AE subscales (Interpersonal Skills, Engagement, Motivation, and Study Skills) and found that, once again, the majority of the variance was apportioned to a general dimension (in this case, the AE dimension). Thus, the AS and AE Total scores were deemed the most reliable and valid when interpreting the ACES while the subscales did not capture enough true score variance to be individually interpretable.

Logic for the Current Study

Some of the factors of the ACES are theoretically similar to the four factors of the LBS. While the ACES has Academic Motivation, the LBS has Competence Motivation. While the ACES has Classroom Engagement, the LBS has Attention/Persistence. Although the LBS and the ACES do differ, they also measure somewhat similar constructs. Because of this, the ACES Academic Enabler Total score and the LBS Total score should show convergent validity. However, some factors should correlate more highly than others such as the ACES Classroom Engagement subscale (with items like "Pays attention in class") and the LBS Attention/Persistence subscale (with items like "Responds in a manner that shows attention"). Table 1 summarizes LBS and ACES item similarities by subscale. However, both the LBS and the ACES should be primarily interpreted based on the Total scores (Canivez & McDermott, 2015; Zegadlo, 2015) due to low portions of true score variance uniquely associated with the LBS and ACES subscales. Therefore, examinations of the ACES Academic Enabler Total and the LBS Total are most important.

Table 1
LBS and ACES Item Similarities by Subscale

LBS	ACES
Competence Motivation	**Academic Motivation**
Tentative about answering	Offers answers
	Offers to read out loud
	Communicates when asked
	Classroom Engagement
Does not resist or fear new tasks	Favors tasks that challenge
	Is driven to learn
Puts forth good effort but performance declines and concentration disappears	Perseveres with challenging tasks
	Remains on task
Does not appear determined to complete a task, gives up quickly	Perseveres with challenging tasks
	Is driven to learn
	Is focused on the goal
Attitude Toward Learning	**Interpersonal Skills**
Does not demonstrate a need to please teachers	When asked, will correct wrong behavior
	Will take suggestions from teachers
Even when a task is too challenging, will not receive help	Will listen to what others say
	Will take suggestions from teachers
	Cooperates with adults properly
	Cooperates with peers properly
Will accept help when a task is too challenging	Will listen to what others say
	Will take suggestions from teachers
	Academic Motivation
Will accept help when a task is too challenging	Perseveres with challenging tasks
Does not make much effort or is not interested in most things	Is driven to learn
	Capitalizes on learning experiences
Is interested in learning activities	Is driven to learn
	Is responsible for own learning
	Is focused on the goal
Attention/Persistence	**Academic Motivation**
Stays on task with minimal distractions	Sticks with a task
	Is focused on the goal
Answers without taking the time to examine the problem or come up with a solution	Turns in excellent work
Cries easily when pressed for a response	Perseveres with challenging tasks
Is distracted easily by the environment or looks for distractions	Sticks with a task
	Classroom Engagement
Interacts in class activities appropriately	Contributes in class
	Speaks when asked

Table 1 Continues

Table 1 (Continued)

LBS	ACES
Attention/Persistence	**Classroom Engagement**
Cries easily when pressed for a response	Will answer questions
	Accepts leadership in group situations
Displays attention	Attends in class
Is out of seat needlessly	Takes notes
Is distracted easily by the environment or looks for distractions	Attends in class
Strategy/Flexibility	**Interpersonal Skills**
Will become belligerent or aggressive when work is modified or when upset	Will alter problematic behavior if asked
	Articulates frustration properly
Will not work well if in a bad mood	Articulates frustration properly
Does not complete tasks in the conventional manner	Will take suggestions from teachers
	Study Skills
Comes up with strange ways of doing tasks	Does assignments according to directions
Carries out tasks according to own ideas rather than in the accepted way	Does assignments according to directions

Note. LBS = Learning Behaviors Scale. ACES = Academic Competence Evaluation Scales

Research Questions

Convergent Validity

The first main research question was related to the convergence of the ACES Academic Enabler Total score and the LBS Total score. The two Total scores were expected to be at least moderately, positively correlated. The two Total score means were also expected to not differ significantly. Based on an examination of the item content, the following predictions were made between the subscales:

1. The LBS Competence Motivation subscale will be at least moderately, positively correlated with the ACES Academic Motivation and Classroom Engagement subscales.

2. The LBS Attitude Toward Learning subscale will be at least moderately, positively correlated with the ACES Interpersonal Skills and Academic Motivation subscales.
3. The LBS Attention/Persistence subscale will be at least moderately, positively correlated with the ACES Academic Motivation, Classroom Engagement, and Study Skills subscales.
4. The LBS Strategy/Flexibility subscale will be at least moderately, positively correlated with the ACES Interpersonal Skills and Study Skills subscales.

Discriminant Validity

In order to provide additional support that the LBS and ACES are truly measuring what they purport to measure, discriminant validity was also examined. A common finding that has been observed in the research literature shows divergent or discriminant validity of learning behaviors or academic enablers with problem behaviors (DiPerna & Elliott, 1999; McDermott, 1999; Rikoon, McDermott, & Fantuzzo, 2012). Most teachers who have worked with children for any length of time would most likely state that the children who exhibit the most problem behaviors are more than likely not the highest achieving students in the class. Also, as DiPerna and Elliott (1999), McDermott (1999), and Rikoon et al. (2012) discussed, academic enablers and learning behaviors show some divergence with most problem behaviors. Specifically, DiPerna and Elliott (1999) used the Problem Behaviors of the Social Skills Rating System as a measure of discriminant validity with the ACES. Correlations between problem behaviors and ACES academic enablers were low: -.20 with Participation, -.34 with Academic Motivation, and -.36 with Study Skills. The Interpersonal Skills subscale was the exception with a high negative

correlation (-.70). Therefore, interpersonal skills were not found to be divergent from problem behaviors because a high (rather than low) correlation was found. McDermott (1999) found discriminant validity support for the LBS with the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Stott, & Marston, 1993), which is a measure of psychopathology (as previously discussed).

Similarly, in the current study, it was hypothesized that LBS subscales would be divergent from theoretically dissimilar ASCA syndromes (have low/near-zero correlations). However, some relationships were expected to be lower than convergent but not quite divergent either (as also found in McDermott, 1999). Thus, Campbell and Fiske's (1959) model of discriminant validity was also used in the current study to examine the relative pattern of relationships (expecting some near-zero relationships, some small relationships, and some large, negative relationships). Similarly, the ACES Academic Enabler scores were also hypothesized to be divergent from theoretically dissimilar ASCA scores (although again, the relative pattern of relationships will be examined). Divergent validity support would be expected, for example, between the ASCA Diffident syndrome and the LBS Attitude Toward Learning subscale and the ASCA Diffident syndrome and the ACES Academic Motivation and Study Skills subscales. These comparisons were expected to produce near-zero correlations because the item content is related to theoretically unrelated constructs (see Appendix B for ASCA subscale content information). However, some inverse relationships were also expected. For example, it was expected that if one scores low in Attention/Persistence on the LBS or low in Classroom Engagement on the ACES, that one's score on the ASCA's Attention-Deficit/Hyperactive subscale would be higher. Thus, a significant negative

correlation would indicate an inverse relationship. The second main research question then, was related to discriminant validity (expecting lower than convergent relationships) of LBS scores and ASCA scores (providing a replication of McDermott, 1999) and also of ACES Academic Enabler scores and ASCA scores. It was expected that these correlations would be mostly lower (with some inverse relationships) than the LBS-ACES correlations.

LBS and ASCA predictions. The LBS Total score was expected to be at least moderately, negatively correlated with the ASCA Overactivity and Underactivity global adjustment syndromes. Based on the findings of McDermott (1999) and examination of item content, the following predictions were made:

1. The LBS Competence Motivation subscale (LBS-CM) will have a near-zero correlation with the ASCA Solitary Aggressive (Provocative) syndrome. The LBS-CM will be at least moderately, negatively correlated with the ASCA Oppositional Defiant, Diffident, Avoidant, and Lethargic syndromes.
2. The LBS Attitude Toward Learning subscale (LBS-AL) will have a near-zero correlation with the ASCA Diffident syndrome. The LBS-AL will be at least moderately, negatively correlated with the ASCA Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), Oppositional Defiant, Avoidant, Delinquent and Lethargic syndromes.
3. The LBS Attention/Persistence will be at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive, Solitary Aggressive (Impulsive), Oppositional Defiant, and Lethargic syndromes.

4. The LBS Strategy/Flexibility subscale (LBS-SF) will have near-zero correlations with the ASCA Avoidant and Lethargic syndromes. The LBS-SF will be at least moderately, negatively correlated with the ASCA Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), Oppositional Defiant, and Delinquent syndromes.

ACES and ASCA predictions. The ACES-AE Total score was expected to be at least moderately, negatively correlated with the ASCA Overactivity and Underactivity global adjustment syndromes. Based on an examination of item content the following predictions were expected:

1. The ACES Interpersonal Skills subscale will be at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), Oppositional Defiant, Diffident, and Delinquent syndromes.
2. The ACES Classroom Engagement subscale (ACES-CE) will have near-zero correlations with the ASCA Solitary Aggressive (Impulsive) and Delinquent syndromes. The ACES-CE will be at least moderately, negatively correlated with the ASCA Solitary Aggressive (Provocative), Oppositional Defiant, Diffident, Avoidant, and Lethargic syndromes.
3. The ACES Academic Motivation subscale (ACES-AM) will have a near-zero correlation with the ASCA Diffident syndrome. The ACES-AM will be at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive, Solitary Aggressive (Provocative), and Lethargic syndromes.

4. The ACES Study Skills subscale (ACES-SS) will have near-zero correlations with the ASCA Diffident, Avoidant, and Lethargic syndromes. The ACES-SS will be at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive) and Delinquent syndromes.

Method

Participants

Participants included 98 general education, special education, and at-risk students referred for special education eligibility evaluations (51 boys, 47 girls). The sample consisted of students in grades K-8 and ages 5-14 (M = 9.6 years; SD = 2.5) from rural and small urban areas attending public or private school in Central Illinois. Fifty teachers (48 female, 2 male) completed the rating scales. Teachers were recruited by either being approached by the principal investigator (or supervisor) or through a presentation requesting participation. Both teachers and students were primarily Caucasian (students n = 80, teachers n = 49). The only ethnic diversity among teachers was one teacher who identified as Asian American. Among the students, 4 (4.1%) were identified as African American, 3 (3.1%) as Hispanic American, 10 (10.2%) as Multiple Races, and 1 (1.0%) as Other. Thirty students (30.6%) attended private school while 68 (69.4%) attended a public school. The majority of students were not disabled (n = 72, 73.5%). Only 25 students (25.5%) were disabled with Specific Learning Disability as the most common disability (n = 8, 8.2%). The majority of students were in 3rd grade (n = 17, 17.3%) while Kindergarten had the smallest sample size (n = 4, 4.1%). For further demographic information, see Table 2.

Table 2
Demographic Characteristics of Sample (n = 98)

Variable	*N*	Percent
School Region		
Rural	90	91.8
Small Urban	8	8.2
Student Age		
5	2	2.0
6	10	10.2
7	11	11.2
8	11	11.2
9	17	17.3
10	9	9.2
11	9	9.2
12	14	14.3
13	10	10.2
14	5	5.1
Disability		
Not Disabled	72	73.5
Disabled	25	25.5
Specific Learning Disability	8	8.2
Emotional Disability	5	5.1
Other Health Impairment	4	4.1
Speech/Lang. Impair.	3	3.1
Developmental Delay	2	2.0
Autism Spectrum Disorder	1	1.0
Intellectual Disability	1	1.0
Multiple Disabilities	1	1.0
Missing	1	1.0
Educational Status		
General Education	76	77.6
RtI	9	9.2
Special Education	13	13.3

Note. RtI = Response to Intervention. Some percentages may total over 100% due to rounding.

Instruments

Academic Competence Evaluation Scales (ACES). The Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2000) were designed to measure students' skills, attitudes, and behaviors that contribute to academic competence. The ACES consists of two separate scales: Academic Skills and Academic Enablers and can be

completed by teachers of grades K-12 and students in grades 6-12. Only the Academic Enablers scale was used in the present study and includes Interpersonal Skills, Academic Motivation, Study Skills, and Classroom Engagement subscales. The current study used the *ACES-Teacher* form in order to compare it to teacher ratings on the LBS and the ASCA. The final ACES standardization sample consisted of 1,000 students stratified to approximate the U.S. population (DiPerna & Elliott, 2000) and its reliability and validity evidence was presented previously. Generally, support has been found for a 5-factor model (Academic Skills, Interpersonal Skills, Academic Motivation, Participation, and Study Skills) with internal consistencies ranging from .92 to .98 (DiPerna & Elliott, 1999; DiPerna & Elliott, 2000). Test-retest stability coefficients ranged from .68 to .97 (DiPerna & Elliott, 1999; DiPerna & Elliott, 2000). The moderate correlations with the Iowa Test of Basic Skills (ITBS) and moderate to high correlations with the Social Skills Rating System-Teacher (SSRS-T) supported convergent validity (DiPerna & Elliott, 1999). Correlations with the SSRS-T Problem Behaviors scale mostly supported discriminant validity (-.03 [Academic Skills], -.20 [Participation], -.34 [Motivation], and -.36 [Study Skills]) with the exception of Interpersonal Skills (-.70). Interrater agreement for the *ACES-Teacher* form ranged from .31 to .62 across the scales with a total scale interrater agreement of .61 (DiPerna & Elliott, 2000). However, the different raters often observed studenst in a different class and/or at a different time. Thus, these interrater agreement scores may not be an adequate assessment of *ACES-Teacher* agreement between raters. Lastly, general education students tended to have higher ratings than students with learning disabilities (Cohen's $d = .93$) indicating further validity support through distinct group differences.

Hambleton (2010) reviewed the Academic Competence Evaluation Scales (ACES) and reported strengths and weaknesses. Strengths included criterion-referenced academic information (that could be useful in designing interventions), a full chapter of the manual dedicated to the correct interpretation of scores in the context of an example, straightforward scoring, and helpful ACES Scoring Assistant software for record keeping and monitoring. Criticisms included a small sample for norming the student form (302 students), no norms and limited validity data for use with college students, and norm-referenced (instead of criterion-referenced) academic enabler information.

Sabers and Bonner (2010) also reviewed the Academic Competence Evaluation Scales (ACES). They reported the following as criticisms: scoring instructions and summary on the same page where the student (on the student form) makes comments, the standardization data reported were prior to removing 25 items on the scale, and the overall inadequacy of the data for the student form. However, they reported strengths of the ACES including an in-depth discussion in the manual of the rationale for sampling, a detailed description of how to link assessment to intervention, the extensive norms of the teacher form, easy-to-use forms and scoring guidelines, and support for the ACES being related to standardized test scores.

Learning Behaviors Scale (LBS). The Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 2001) was designed to measure specific dimensions of classroom learning behaviors for students aged 5-17 based on teacher observations. LBS dimensions include Competence Motivation, Attitude Toward Learning, Attention/Persistence, and Strategy/Flexibility. The LBS includes a nationally representative standardization sample of 1,500 students (McDermott, 1999) and its

reliability and validity evidence was previously discussed. Generally, support has been found for the 4 factors described by McDermott (1999). Internal consistency ranged from .67-.93 (Canivez & Beran, 2011; Canivez, Willenborg, & Kearney, 2006; McDermott, 1999; Rikoon, McDermott, & Fantuzzo, 2012). Interrater agreement correlations ranged from .68-.88 for the subscales and .91 for the total (Buchanan, McDermott, & Schaefer, 1998). Test-retest stability coefficients ranged from .91 to .93 and convergent (with the DAS) and divergent (with the ASCA) validity evidence have been found (McDermott, 1999). LBS factors have demonstrated significant correlations with future assessments of academic achievement and have been found to be associated with reduced risk for future negative outcomes (Rikoon, McDermott, & Fantuzzo, 2012).

Adjustment Scales for Children and Adolescents (ASCA). The Adjustment Scales for Children and Adolescents (ASCA; McDermott, Stott, & Marston, 1993) contains 156 behavioral descriptions within the context of 29 specific social, learning, or play situations. The standardization sample consisted of 1,400 students aged 5-17 representing the population of all noninstitutionalized youths attending school between 1988-1990 in the U.S. McDermott (1993) reported on the development and standardization of the ASCA. Bartlett's chi-square criteria suggested as many as 11 dimensions to be extracted and McDermott et al. conducted Principal Components Analyses for 2 through 11 factor models. The 8-factor model met all criteria and they assigned items to respective hypothesized syndromes if they loaded $\geq .30$ on that scale. Twenty-six items failed to acquire salient loadings, so there were 103 items designated to syndromes. McDermott (1993) conducted confirmatory factor analyses with a separate sample of 1,034 participants and only 1 item migrated from its preliminary syndrome.

The 8 factors that emerged from these analyses were Attention-Deficit/Hyperactive (ADH), Solitary Aggressive (Provocative; SA[P]), Solitary Aggressive (Impulsive; SA[I]), Oppositional Defiant (OpD), Diffident (Dif), Avoidant (Avo), Delinquent (Del), and Lethargic-Hypoactive (Leh). However, the latter two syndromes did not have sufficient variability for all age groups. The Lethargic syndrome could not be generalized to students older than 11 and the Delinquent could not be applied to girls under 12. Therefore, these two syndromes are considered supplemental and are scored only when appropriate. The scores on Attention-Deficit/Hyperactive, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), and Oppositional Defiant are combined to form an Overactivity composite score, while the Diffident and Avoidant syndromes combine to yield an Underactivity composite score. McDermott (1993) concluded that the two-factor model accounted for a significant portion of the variability in syndrome scores (31.5% for Overactivity and 40.8% for Underactivity). However, a substantial portion of the variance was conveyed by each of the 6 core syndromes that was reliable and distinctive (syndrome specificity ranged from .29-.58 across core syndromes).

McDermott (1993) also reported on the internal consistency, interrater agreement and test-retest stability of the ASCA. Internal consistency for the core syndromes ranged from .70 (Solitary Aggressive [Impulsive]) to .86 (Attention-Deficit/Hyperactive). McDermott examined the interrater agreement for the core syndromes with 22 participants and it ranged from .67 (Attention-Deficit/Hyperactive) to .85 (Solitary Aggressive [Provocative]). Lastly, the test-rest stability was examined for 40 female students (aged 14-17) with a one-month retest interval and ranged from .66 (Solitary

Aggressive [Provocative]) to .91 (Oppositional Defiant). Convergent and divergent validity information was reported with 274 students from Kindergarten to 12th grade by also administering the revised Conners Teacher Rating Scale (CTRS; Trites, Blouin, & Laprade, 1982). Higher correlations were obtained between the 4 Overactive ASCA syndromes (ADH, SA[P], SA[I], and OpD) and the CTRS Hyperactive and Conduct Problem subscales (ranging from .56-.75). Also, near-zero correlations were obtained between ASCA's Underactive and Overactive syndromes and their opposite counterparts among CTRS factors. For example, the ASCA Underactivity syndrome correlated -.08 with the CTRS Hyperactive factor; and the ASCA Overactivity syndrome correlated .06 with the CTRS Anxious-passive factor. McDermott (1993) also reported a second analysis between the ASCA and parent ratings on the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983) with a sample of 48 students aged 7-11. The expected pattern of convergence and divergence was also obtained in those correlations. McDermott (1993) examined diagnostic utility by matching 150 students with Emotional Disturbance to 150 students without disorders and found a significant effect (Wilks' lambda = .68, multivariate $F[6, 293] = 22.7$, $p < .0001$) for separation of the groups based on ASCA core syndromes. Overall classification accuracy was 80.7%.

Similar results have been found in other studies. Canivez (2004), Canivez (2006), Canivez and Beran (2009), and Canivez and Sprouls (2009) replicated the two-factor structure of the ASCA. Canivez, Perry, and Weller (2001) obtained significant test-retest stability coefficients for both raw scores and *T* scores (median $r_s = .69$ and .61, respectively) and mean differences were less than .8 raw score points across the retest interval. Canivez, Watkins, and Schaefer (2002) reported significant interrater agreement

for the discriminant classifications ($\kappa = .51$, $z = 5.70$, $p < .00001$) which was considered moderate. Also, Canivez and Sprouls (2005) obtained statistically significant group differences between individuals with and without Attention-Deficit/Hyperactivity Disorder (ADHD) characteristics and found support for the diagnostic utility of the ASCA in that it correctly differentiated the ADHD group members from random normals.

Procedure

Prior to data collection, Eastern Illinois University's Institutional Review Board reviewed and approved this study's procedures. I asked teachers for their participation and each participating teacher randomly selected students for whom they completed the LBS, ACES-Teacher, and ASCA. Teachers completed the scales in randomized order and provided only student ID numbers for data tracking purposes. I collected data following the first 8 weeks of school in order for the teacher to become sufficiently familiar with the students they were rating. For each completed set of scales the teacher returned (LBS, ACES-Teacher, and ASCA scales), they were entered in a drawing for a $50 gift card in order to provide an incentive for teacher participation. I entered the data, including student ID, demographic information, and raw and *T* scores, into an Excel spreadsheet which was kept on a password protected personal computer.

Analyses

To address the first research question (convergent validity support), I conducted correlational analyses on the LBS and ACES-Academic Enabler (ACES-AE), raw scores using the IBM SPSS program version 23 for Windows 8. Pearson product moment correlations and descriptive statistics were obtained to examine convergent validity

(moderate to high correlations between LBS and ACES). Next, I converted the ACES-AE raw scores to *T* scores using Microsoft Excel and conducted paired samples *t*-tests in SPSS on theoretically similar LBS and ACES-AE subscales (and Totals) to compare the mean scores. To address the second research question (discriminant validity support), Pearson product moment correlations and descriptive statistics were obtained to examine the pattern of relationships between the LBS and ASCA and the ACES and ASCA.

Results

Convergent Validity: ACES-AE and LBS Comparisons

Table 3 presents correlations between the ACES-AE and LBS subscales and total scores. Overall, the ACES Academic Enabler Total score was significantly, positively correlated with the LBS Total score ($r = 0.88$) and shared 77% variance. All subscale correlations were at least moderately, positively correlated (r's ranging from 0.32 to 0.81) and were statistically significant $p < .001$ (two-tailed). I made the following predictions and each demonstrated large correlations (r's ranging from 0.50 to 0.81) while the other subscale comparisons (those not hypothesized to be theoretically similar) demonstrated correlations ranging from .32 to .76.

1. The LBS Competence Motivation subscale was largely, positively correlated with the ACES Academic Motivation (.81) and Classroom Engagement subscales (.71), with 66% and 50% shared variance, respectively.
2. The LBS Attitude Toward Learning subscale was largely, positively correlated with the ACES Interpersonal Skills (.71) and Academic Motivation subscales (.79), with 50% and 62% shared variance, respectively.

3. The LBS Attention/Persistence subscale was largely, positively correlated with the ACES Academic Motivation (.76), Classroom Engagement (.52), and Study Skills subscales (.75), with 58%, 27%, and 56% shared variance, respectively.
4. The LBS Strategy/Flexibility subscale was largely, positively correlated with the ACES Interpersonal Skills (.75) and Study Skills subscales (.50), with 56% and 25% shared variance, respectively.

Table 3
Pearson Product Moment Correlations and Descriptive Statistics for the Learning Behaviors Scale Raw Scores and the Academic Competence Evaluation Scales Raw Scores (n = 98)

		Academic Competence Evaluation Scales (ACES)				
Learning Behaviors Scale (LBS)		Interpersonal Skills	Classroom Engagement	Academic Motivation	Study Skills	Total
Competence Motivation		.43	.71	.81	.62	.75
Attitude Toward Learning		.71	.66	.79	.76	.85
Attention/ Persistence		.76	.52	.76	.75	.81
Strategy/ Flexibility		.75	.32	.48	.50	.59
Total		.76	.67	.83	.76	.88
	M	39.54	26.05	32.88	37.39	135.86
	SD	9.22	8.23	12.29	11.09	35.62
	Sk	-.87	-.37	.08	-.46	-.47
	K	.06	-.74	-1.05	-.41	-.42

Note. *Sk* = Skewness, *K* = Kurtosis. All correlations were significant $p < .001$ (two-tailed). Subscale-Total correlations were not corrected.

ACES-AE and LBS Mean Differences

ACES-AE Total and LBS Total. Paired samples *t*-test analyses indicated that the ACES-AE Total *T* score ($M = 46.83$, $SD = 10.63$) was significantly higher than the LBS Total *T* score ($M = 42.18$, $SD = 13.81$), $t(97) = 5.47$, $p < .001$, $d = .38$. While teacher ratings on the ACES-AE were significantly higher than the LBS, the effect size

was small and likely not meaningful. I also conducted paired samples *t*-tests on theoretically similar ACES-AE and LBS subscales.

ACES Interpersonal Skills and LBS Attitude Toward Learning. Analyses showed that the ACES Interpersonal Skills (ACES-IS) *T* score ($M = 49.00$, $SD = 10.61$) was significantly higher than the LBS Attitude Toward Learning (LBS-AL) *T* score ($M = 44.14$, $SD = 14.49$); $t(97) = 4.47$, $p < .001$; $d = .38$. Even though teacher's ratings on the ACES-IS were higher than their ratings on the LBS-AL, the effect size was small and likely not important.

ACES Interpersonal Skills and LBS Strategy/Flexibility. A paired samples *t*-test indicated that the ACES Interpersonal Skills (ACES-IS) *T* score ($M = 49.00$, $SD = 10.61$) was significantly higher than the LBS Strategy/Flexibility (LBS-SF) *T* score ($M = 45.35$, $SD = 14.77$); $t(97) = 3.18$, $p < .01$; $d = .28$. While teacher ratings on the ACES-IS were significantly higher than the LBS-SF, the effect size was small and probably not meaningful.

ACES Classroom Engagement and LBS Competence Motivation. Analyses demonstrated that the ACES Classroom Engagement (ACES-CE) *T* score ($M = 45.71$, $SD = 11.19$) was significantly higher than the LBS Competence Motivation (LBS-CM) *T* score ($M = 43.27$, $SD = 12.21$); $t(97) = 2.60$, $p < .05$; $d = .21$. Despite the fact that teachers rated students higher on the ACES-CE than on the LBS-CM, this effect size was small and likely not important.

ACES Classroom Engagement and LBS Attention/Persistence. A paired samples *t*-test indicated that the ACES Classroom Engagement (ACES-CE) *T* score ($M = 45.71$, $SD = 11.19$) was not significantly different than the LBS Attention/Persistence

(LBS-AP) *T* score ($M = 43.85$, $SD = 13.06$); $t(97) = 1.42$, $p = .16$; $d = .15$. Teacher ratings on the ACES-CE were not significantly different than the LBS-AP.

ACES Academic Motivation and LBS Competence Motivation. Analyses revealed that the ACES Academic Motivation (ACES-AM) *T* score ($M = 46.38$, $SD = 10.79$) was significantly higher than the LBS Competence Motivation (LBS-CM) *T* score ($M = 43.27$, $SD = 12.21$); $t(97) = 3.79$, $p < .001$; $d = .27$. Although teacher's ratings on the ACES-AM were higher than their ratings on the LBS-CM, this effect size was small and most likely not important.

ACES Academic Motivation and LBS Attitude Toward Learning. A paired samples *t*-test indicated that the ACES Academic Motivation (ACES-AM) *T* score ($M = 46.38$, $SD = 10.79$) was significantly higher than LBS Attitude Toward Learning (LBS-AL) *T* score ($M = 44.14$, $SD = 14.49$); $t(97) = 2.21$, $p < .05$; $d = .18$. While teacher ratings on the ACES-AM were significantly higher than the LBS-AL, the effect size was trivial and probably not meaningful.

ACES Academic Motivation and LBS Attention/Persistence. Analyses showed that the ACES Academic Motivation (ACES-AM) *T* score ($M = 46.38$, $SD = 10.79$) was significantly higher than the LBS Attention/Persistence (LBS-AP) *T* score ($M = 43.85$, $SD = 13.06$); $t(97) = 2.53$, $p < .05$; $d = .21$. Though teachers rated students higher on the ACES-AM than on the LBS-AP, the effect size was small and thus likely not meaningful.

ACES Study Skills and LBS Attention/Persistence. Paired samples *t*-tests indicated that the ACES Study Skills (ACES-SS) *T* score ($M = 47.71$, $SD = 11.49$) was significantly higher than the LBS Attention/Persistence (LBS-AP) *T* score ($M = 43.85$,

SD = 13.06); $t(97) = 3.83$, $p < .001$; $d = .31$. While teacher ratings on the ACES-SS were significantly higher than the LBS-AP, this effect size was small and probably not meaningful.

ACES Study Skills and LBS Strategy/Flexibility. Analyses revealed that the ACES Study Skills (ACES-SS) *T* score (*M* = 47.71, *SD* = 11.49) was not significantly different than the LBS Strategy/Flexibility (LBS-SF) *T* score (*M* = 45.35, *SD* = 14.77); $t(97) = 1.62$, $p = .11$; $d = .18$. Teacher ratings on the ACES-SS were not significantly different than the LBS-SF.

Discriminant Validity: ACES-AE and ASCA Comparisons

ACES-AE Total and ASCA results. Table 4 presents correlations between ACES subscales and ASCA syndromes. As expected, the ACES Academic Enabler Total score was moderately, negatively correlated with both the ASCA Overactivity score (r = -0.43) and the ASCA Underactivity score (r = -0.42) with 18% shared variance. Interestingly, The ACES Academic Enabler Total score was at least moderately, negatively correlated with most of the ASCA syndromes. However, the ACES Academic Enabler Total score was only slightly correlated with the Oppositional Defiant syndrome (r = -0.28) and Diffident syndrome (r = -0.20) with only 8% and 4% shared variance, respectively.

Table 4

Pearson Product Moment Correlations and Descriptive Statistics for the Academic Competence Evaluation Scales Raw Scores and the Adjustment Scales for Children and Adolescents Raw Scores (n = 98)

	Adjustment Scales for Children and Adolescents (ASCA)									
	Global Adjustment		Core Syndromes						Supplemental Syndromes	
Academic Competence Evaluation Scales (ACES)	Ovr	Unr	ADH	SA(P)	SA(I)	OpD	Dif	Avo	Del[a]	Leh[b]
Interpersonal Skills	-.64***	-.08	-.57***	-.44***	-.46***	-.52***	.14	-.34**	-.39**	-.45***
Classroom Engagement	-.06	-.70***	-.00	-.06	-.17	-.05	-.52***	-.62***	-.22	-.63***
Academic Motivation	-.34**	-.43***	-.32**	-.23*	-.35***	-.18	-.23*	-.51***	-.35**	-.55***
Study Skills	-.41***	-.28**	-.39***	-.30**	-.38***	-.24*	-.11	-.40***	-.43***	-.63***
Total	-.43***	-.42***	-.38***	-.30**	-.40***	-.28**	-.20	-.53***	-.41**	-.64***
M	6.62	3.08	3.85	.98	.30	1.39	1.92	1.16	.34	.88
SD	6.92	3.28	3.97	1.80	.65	2.08	2.32	1.73	.76	1.38
Sk	1.26	1.04	1.08	2.29	2.21	1.73	1.24	2.17	2.48	2.09
K	1.45	.24	.74	4.93	4.24	2.58	.70	6.39	5.70	5.42

Note. *Sk* = Skewness, *K* = Kurtosis

Ovr = Overactivity, Unr = Underactivity, ADH = Attention-Deficit/Hyperactive, SA(P) = Solitary Aggressive (Provocative), SA(I) = Solitary Aggressive (Impulsive), OpD = Oppositional Defiant, Dif = Diffident, Avo = Avoidant, Del = Delinquent, and Leh = Lethargic

[a] $n = 65$ due to females under 12 not being scored. [b] $n = 69$ due to none 12 and over being scored

* $p < .05$ (2-tailed). ** $p < .01$ (2-tailed). *** $p < .001$ (2-tailed)

ACES-AE subscale and ASCA global adjustment results. The ACES-AE subscales were mostly at least moderately, negatively correlated with the ASCA global adjustment scales (Overactivity and Underactivity) with the exceptions of ACES Interpersonal Skills (IS) and ASCA Underactivity (Unr; r = -0.08), ACES Study Skills (SS) and ASCA Unr (r = -0.28), and ACES Classroom Engagement (CE) and ASCA Overactivity (Ovr; r = -0.06). Overall, correlations ranged from -.06 (ACES-CE and ASCA-Ovr) to -.70 (ACES-CE and ASCA-Unr) with shared variance from 0.4% to 50%.

ACES-AE subscale and ASCA syndrome results. The following subscale predictions were in the expected directions:

1. The ACES Interpersonal Skills subscale was at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive (-.57), Solitary Aggressive-Provocative (-.44), Solitary Aggressive-Impulsive (-.46), Oppositional Defiant (-.52), and Delinquent (-.39) syndromes with 32%, 19%, 21%, 27%, and 15% shared variance, respectively.
2. Near-zero correlations were found between the ACES Classroom Engagement (ACES-CE) subscale and the ASCA Solitary Aggressive-Impulsive (-.17) and Delinquent (-.22) syndromes with 3% and 5% shared variance, respectively. The ACES-CE was largely, negatively correlated with the ASCA Diffident (-.52), Avoidant (-.62), and Lethargic (-.63) syndromes with 27%, 38%, and 40% shared variance, respectively.
3. A near-zero correlation was found between the ACES Academic Motivation (ACES-AM) subscale and ASCA Diffident (-.23) syndrome with 5% shared variance. The ACES-AM was at least moderately, negatively correlated with

the ASCA Attention-Deficit/Hyperactive (-.32) and Lethargic (-.55) syndromes with 10% and 30% shared variance, respectively.

4. A near-zero correlation was found between the ACES Study Skills (ACES-SS) subscale and ASCA Diffident (-.11) syndrome with 1% shared variance. The ACES-SS was at least moderately, negatively correlated with the ASCA Attention-Deficit/Hyperactive (-.39), Solitary Aggressive-Provocative (-.30), Solitary Aggressive-Impulsive (-.38) and Delinquent (-.43) syndromes with 15%, 9%, 14%, and 18% shared variance, respectively.

However, the following subscale predictions were not found:

1. The ACES Interpersonal Skills subscale was predicted to have at least a moderate, negative correlation with the ASCA Diffident syndrome. Instead, a small, non-significant positive correlation was found (.14) with only 2% shared variance.
2. The ACES Classroom Engagement subscale was predicted to have at least a moderate, negative correlation with the ASCA Solitary Aggressive (Provocative) and ASCA Oppositional Defiant syndromes. Instead, near-zero correlations were found (-.06 and -.05, respectively) with only 0.4% and 0.3% shared variance. These were both not significantly different from zero.
3. The ACES Academic Motivation subscale was predicted to have at least a moderate, negative correlation with the ASCA Solitary Aggressive (Provocative) syndrome. Instead, a small, negative correlation was found (-.23) with only 5% shared variance.

The ACES Study Skills ACES subscale was predicted to have near-zero correlations with the ASCA Avoidant and ASCA Lethargic syndromes. Instead, moderate, negative correlations were found (-.40 and -.63, respectively) with 16% and 40% shared variance.

Discriminant Validity: LBS and ASCA Comparisons

LBS Total and ASCA results. Table 5 summarizes the correlations between LBS Total and subscale scores and ASCA syndromes. As expected, the LBS Total score was at least moderately, negatively correlated with both the ASCA Overactivity score and the ASCA Underactivity score (r = -0.55 and r = -0.32, respectively) with 30% and 10% shared variance. The LBS Total score was at least moderately, negatively correlated with every ASCA composite scale, core syndrome, and supplemental syndrome with the exception of the Diffident syndrome (r = -0.08) with only 0.6% shared variance. LBS Total score correlations ranged from -.08 (with Diffident) to -.57 (with Lethargic) with shared variance ranging from 0.6% to 32%.

LBS subscale and ASCA global adjustment results. The LBS subscales were mostly at least moderately, negatively correlated with the ASCA global adjustment scales (Overactivity and Underactivity). However, the LBS Competence Motivation subscale was only slightly correlated with the ASCA Overactivity (Ovr; r = -0.24) syndrome, the LBS Attention/Persistence subscale had only a small, negative correlation with the ASCA Underactivity (Unr; r = -0.13) syndrome, and the LBS Strategy/Flexibility (SF) subscale had only a near-zero correlation with the ASCA-Unr syndrome (r = 0.06) with only 6%, 2%, and 0.4% shared variance, respectively. Overall, correlations ranged from .06 (LBS-SF and ASCA-Unr) to -.72 (LBS-SF and ASCA-Ovr) with shared variance from 0.4% to 52%.

LBS subscale and ASCA syndrome results. The following subscale predictions were in the expected directions:

1. A near-zero correlation was found between the LBS Competence Motivation (LBS-CM) subscale and the ASCA Solitary Aggressive (Provocative) syndrome (-.14) with only 2% shared variance. At least moderate, negative correlations were found between the LBS-CM and the ASCA Diffident (-.30), Avoidant (-.47) and Lethargic (-.56) syndromes with 9%, 22%, and 31% shared variance.
2. A near-zero correlation was found between the LBS Attitude Toward Learning (LBS-AL) subscale and the ASCA Diffident syndrome (-.12) with only 1% shared variance. At least moderate, negative correlations were found between the LBS-AL and the ASCA Solitary Aggressive-Provocative (-.31), Solitary Aggressive-Impulsive (-.45), Avoidant (-.59), Delinquent (-.33) and Lethargic (-.67) syndromes with 10%, 20%, 35%, 11%, and 45% shared variance, respectively.
3. At least moderate, negative correlations were found between the LBS Attention/Persistence and the ASCA Attention-Deficit/Hyperactive (-.60), Solitary Aggressive-Impulsive (-.48), Oppositional Defiant (-.33), and Lethargic (-.40) syndromes with 36%, 23%, 11%, and 16% shared variance, respectively.
4. Near-zero correlations were found between the LBS Strategy/Flexibility (LBS-SF) subscale and the ASCA Avoidant (-.17) and Lethargic (-.20) syndromes with only 3% and 4% shared variance, respectively. Large,

negative correlations were found between the LBS-SF and the ASCA Solitary Aggressive-Provocative (-.55), Solitary Aggressive-Impulsive (-.54) and Oppositional Defiant (-.59) syndromes with 30%, 29%, and 35% shared variance, respectively.

However, the following subscale predictions were not found:

1. The LBS Competence Motivation subscale was predicted to have at least a moderate, negative correlation with the ASCA Oppositional Defiant syndrome. Instead, only a small, non-significant negative correlation was found (-.18) with only 3% shared variance.
2. The LBS Attitude Toward Learning subscale was predicted to have at least a moderate, negative correlation with the ASCA Oppositional Defiant syndrome. Instead, only a small, negative correlation was found (-.29) with only 8% shared variance.
3. The LBS Strategy/Flexibility subscale was predicted to have at least a moderate, negative correlation with the ASCA Delinquent syndrome. Instead, only a small, negative correlation was found (-.28) with only 8% shared variance.

Table 5

Pearson Product Moment Correlations and Descriptive Statistics for the Learning Behaviors Scale Raw Scores and the Adjustment Scales for Children and Adolescents Raw Scores (n = 98)

	Learning Behaviors Scale (LBS)				
Adjustment Scales for Children and Adolescents (ASCA)	Competence Motivation	Attitude Toward Learning	Attention/ Persistence	Strategy/ Flexibility	Total
Global Adjustment					
Overactivity	-.24*	-.42***	-.60***	-.72***	-.55***
Underactivity	-.46***	-.40***	-.13	.06	-.32**
Core Syndromes					
Attention-Deficit/Hyperactive	-.15	-.33**	-.60***	-.62***	-.46***
Solitary Aggressive (Provocative)	-.14	-.31**	-.41***	-.55***	-.41***
Solitary Aggressive (Impulsive)	-.25*	-.45***	-.48***	-.54***	-.50***
Oppositional Defiant	-.18	-.29**	-.33**	-.59***	-.41***
Diffident	-.30**	-.12	.06	.22*	-.08
Avoidant	-.47***	-.59***	-.32**	-.17	-.49***
Supplemental Syndromes					
Delinquent[a]	-.21	-.33**	-.27*	-.28*	-.32**
Lethargic[b]	-.56***	-.67***	-.40**	-.20	-.57***
M	10.48	13.60	9.45	10.99	35.80
SD	3.89	4.36	3.73	3.22	10.22
Sk	-.42	-1.17	-.60	-1.15	-.73
K	-.79	.91	-.64	.83	-.08

Note. *Sk* = Skewness, *K* = Kurtosis

[a]*n* = 65 due to females under 12 not being scored. [b]*n* = 69 due to none 12 and over being scored

* $p < .05$ (2-tailed). ** $p < .01$ (2-tailed). *** $p < .001$ (2-tailed)

Discussion

The purpose of this study was to examine the construct validity of the Academic Competence Evaluation Scales (ACES) and the Learning Behaviors Scale (LBS). This research examined the convergent validity of the two by comparing them to each other. I expected to find high correlations between similar scales (supporting the hypothesis that the two measure similar constructs). The Adjustment Scales for Children and Adolescents (ASCA) was compared with the ACES and LBS. I expected to find discriminant validity support (through an examination of the pattern of correlations). I expected that the comparisons with the ASCA would mostly be lower than the LBS-ACES comparisons. The current study suggested that the ACES and LBS demonstrated convergence (they measured similar constructs). The ACES Academic Enabler Total score (ACES-AE) was significantly, positively correlated with the LBS Total score and shared 77% variance. Also, all ACES-AE and LBS predicted subscales were found to be largely, positively correlated. Thus, convergent validity was supported by these findings. However, as found in Canivez and McDermott (2015) and Zegadlo (2015), the LBS and ACES subscale scores primarily measure general variance (not unique variance). Thus, the high correlations with subscales may likely be the result of the general factor, not the specific subscale. Both the LBS and the ACES should be primarily interpreted from the Total scores produced as the subscales do not capture enough unique true score variance (Canivez & McDermott, 2015; Zegadlo, 2015). Thus, examinations of the ACES Academic Enabler Total and the LBS Total scores are most important and demonstrate the aforementioned validity support.

t-test Results Discussion

Most of the *t*-tests conducted on theoretically similar subscales (and Totals) found that ACES Academic Enabler (ACES-AE) subscale scores were significantly higher than LBS subscale scores. Two *t*-tests found no significant differences between the subscales (ACES Classroom Engagement and LBS Attention/Persistence comparison and ACES Study Skills and LBS Strategy/Flexibility comparison). However, most importantly, all effect sizes were either small or trivial so ACES and LBS differences were not meaningful. Thus, these significant differences are not likely to be replicated in future research. A likely reason that significant but not meaningful differences were found is due to the relatively large sample size. However, because the effect sizes were small or trivial, the means of the ACES-AE and LBS subscales were very likely similar.

Total Score Relationships with ASCA

The Learning Behaviors Scale (LBS) Total score was at least moderately, negatively correlated with both the Adjustment Scales for Children and Adolescents (ASCA) Overactivity and the ASCA Underactivity syndromes. Similarly, the Academic Competence Evaluation Scales (ACES) Academic Enabler Total score was moderately, negatively correlated with both the ASCA Overactivity and the ASCA Underactivity syndromes. However, both the LBS Total score and the ACES Total score had some interesting relationships with the ASCA syndromes. First the Total score relationships will be discussed followed by a discussion of the subscale relationships with the ASCA.

LBS Total score and ASCA relationships. The Learning Behaviors Scale (LBS) Total score was at least moderately, negatively correlated with every Adjustment Scales for Children and Adolescents (ASCA) syndrome (global, core, and supplemental)

with the exception of the ASCA Diffident syndrome. The LBS Total score was found to have a near-zero correlation with the ASCA Diffident syndrome (r = -0.08). This was expected based on results obtained by McDermott (1999). In his canonical redundancy analysis, four bimultivariate interactions emerged, one of which was that good learning behavior was related to low levels of pathology excluding diffident behavior. It should also be noted that the ASCA Diffident syndrome (ASCA-Dif) did not have significantly high negative correlations with most LBS subscales (not just the Total score). Correlations ranged from near-zero (r = 0.06) with Attention/Persistence to moderate (r = -0.30) with Competence Motivation. The ASCA-Dif syndrome describes shy and timid behaviors which is likely the reason that learning behaviors overall demonstrated a near-zero correlation with the ASCA-Dif.

ACES-AE Total score and ASCA relationships. The Academic Competence Evaluation Scales Academic Enabler Total (ACES-AE) score was at least moderately, negatively correlated with every Adjustment Scales for Children and Adolescents (ASCA) syndrome (global, core, and supplemental) with the exceptions of the ASCA Oppositional Defiant and the ASCA Diffident syndromes.

The ACES-AE Total score was only slightly, negatively correlated with the ASCA Oppositional Defiant syndrome (r = -0.28). This finding was surprising based on the results obtained in McDermott (1999) in which at least moderate correlations were found with the Learning Behaviors Scale (LBS) Total score with the exception of the ASCA Diffident syndrome. The ASCA Oppositional Defiant (ASCA-OpD) syndrome was found to have lower correlations with most of the ACES-AE subscales (with the only exception being Interpersonal Skills [r = -0.52]). Correlations ranged from -.05

(Classroom Engagement) to -.52 (Interpersonal Skills). A possible reason that the ASCA-OpD did not have many significant negative correlations could be the particular sample used in this study (see below limitations). Further research should explore why the ASCA-OpD correlated as expected with the Learning Behaviors Scale but not with the ACES-AE.

The ACES-AE Total score was only slightly, negatively correlated with the Diffident syndrome (r = -0.20). This is not surprising because the LBS Total score also did not show convergence with the ASCA Diffident (ASCA-Dif) syndrome in the current study or in McDermott (1999). Also like with the LBS, the ASCA-Dif did not have significantly high negative correlations with most ACES subscales. Correlations ranged from near-zero (r = -0.11) with Study Skills to large (r = -0.52) with Classroom Engagement. Classroom Engagement was the only ACES subscale that had even a moderate correlation. The item content of the ASCA-Dif presented above is once again the likely reason that academic enablers overall, demonstrated only a small, negative correlation with the ACES-AE score.

Overall, both the ACES-AE Total and the LBS Total had similar relationships with the ASCA. The only exception was the ASCA Oppositional Defiant syndrome not reaching a moderate correlation with the ACES, although it did with the LBS.

Subscale Relationships with ASCA

LBS subscale and ASCA syndrome relationships. The Learning Behaviors Scale (LBS) was found to demonstrate inverse and small/near-zero relationships when compared with the Adjustment Scales for Children and Adolescents (ASCA). This was similar to the results from Rikoon, McDermott, and Fantuzzo (2012), who found that all

LBS factors demonstrated significant associations with reduced risk for future negative outcomes and the risk reduction averaged 75.6% across ASCA behavioral contexts. The current study also found significant negative correlations in LBS and ASCA global adjustment comparisons (for example, 52% shared variance between LBS Strategy/Flexibility subscale and ASCA Overactivity syndrome). McDermott (1999) also found significant, moderate, negative correlations between the LBS and ASCA. He found that problem behaviors generally decreased as learning behaviors increased. The current study also found many inverse relationships that demonstrated problem behaviors are generally inversely related to learning behaviors (for example, 45% shared variance between LBS Attitude Toward Learning subscale and ASCA Lethargic syndrome). McDermott (1999). The current study also found some of the highest negative correlations in comparisons with the ASCA Attention-Deficit/Hyperactive syndrome (for example, 38% shared variance with the LBS-SF subscale). However, as found in Canivez and McDermott (2015), the LBS subscale scores conflate general and specific group variance; thus these correlations may be driven by the general LBS factor.

ACES-AE subscale and ASCA syndrome relationships. The Academic Competence Evaluation Scales Academic Enabler (ACES-AE) scale was found to demonstrate inverse and small/near-zero relationships with the Adjustment Scales for Children and Adolescents (ASCA). This paralleled the results from DiPerna and Elliott (1999) where they examined correlations between the ACES and the Social Skills subscale of the Social Skills Rating Scale-Teacher (SSRS-T) and shared variance ranged from 24%-55%. In the current study, the ACES-AE subscales were mostly inversely related to the ASCA global adjustment scales (for example 49% shared variance between

the ACES Classroom Engagement subscale and ASCA Underactivity syndrome). DiPerna and Elliott also examined correlations between the ACES and the Problem Behaviors subscale of the SSRS-T. Shared variance ranged from 0.09% to 49% (0.09% [Academic Skills], 4% [Participation], 12% [Motivation], 13% [Study Skills], and 49% [Interpersonal Skills]). In the current study, the ACES-AE subscales were inversely related to the ASCA global adjustment scales, with the exceptions of the ASCA Overactivity syndrome and the ACES Classroom Engagement subscale and the ASCA Underactivity syndrome and the ACES Interpersonal Skills and Social Skills subscales. Thus, many of the relationships DiPerna and Elliott found were also found in the current study. Lastly, because the ACES-AE and Learning Behaviors Scale (LBS) were highly correlated, it would be expected that the ACES-AE would demonstrate the same pattern of correlations with the ASCA that the LBS did. This was also found across the different comparisons. For example, the ACES Interpersonal Skills subscale was largely, negatively correlated with the ASCA Overactivity syndrome but had a near-zero correlation with the Underactivity syndrome, and the LBS Attention/Persistence subscale (which had 58% shared variance) had the same pattern. However, as found in Zegadlo (2015), the ACES-AE subscale scores conflate general and specific group variance, thus these correlations may be driven by the general ACES-AE factor.

Summary

Overall, the ACES-AE subscales and LBS subscales showed very similar patterns of correlations with the ASCA in the expected directions. Of the 60 predictions mentioned, only 9 were unexpected based on the analysis of item content presented above. The ACES-AE and LBS correlations were mostly much higher than their separate

correlations with the ASCA. Thus, these correlational analyses show good support of convergent validity between the ACES-AE and LBS and good support of discriminant validity in comparison with the ASCA. Also, both the LBS and the ACES should be interpreted from the Total scores produced (Canivez & McDermott, 2015; Zegadlo, 2015), and examinations of the ACES-AE Total and the LBS Total demonstrate this construct validity support.

Limitations

A significant limitation of the current study relates to the sample and generalizability of the results. Data were collected from a very restricted geographical region with limited racial diversity. Almost all data were collected from rural Illinois (8 of the 98 were from a small urban area). Similarly, most of the teacher participants were white females (3 participants were rated by male teachers and 1 by an Asian American teacher) and a majority of students were white ($n = 80$). It is unknown how the racial and geographical restrictions affected the results. Thus, a more diverse sample would be preferable.

Another limitation is due to data being collected via teacher volunteers. Data from volunteers may differ in unknown ways from data collected from teachers who are not willing or able to participate. Because the teachers in this study volunteered to complete the scales (and were not randomly selected), the scores could be impacted in unidentified ways.

Conclusion

This current study's aim was to examine the construct validity of the Academic Competence Evaluation Scales (ACES) and Learning Behaviors Scale (LBS) and show

support that the two measure what they purport to measure. This study adds to the research base of the ACES and LBS through convergent and discriminant validity support. As more research is conducted on the ACES and LBS, their potential application in the schools will look even brighter. Future research should examine the link between academic enablers/learning behaviors and academic achievement following the work of DiPerna, Volpe, and Elliott (2001), Malecki and Elliott (2002), McDermott (1999) and Schaefer and McDermott (1999), for example. Another direction for research in this area is to design interventions that target academic enablers/learning behaviors and determine if the scales measure the behavioral changes. However, currently, the subscales of the ACES and LBS cannot be used for decision-making purposes (because the ACES and LBS subscale capture too little true score variance), so targeted interventions may be difficult to recommend or measure effectiveness. Thus future research should fine-tune the ACES and LBS (by perhaps revising the item content or adding items) so that individual subscales could be interpreted making targeted interventions more likely. If academic achievement can be increased by interventions targeted at academic enablers/learning behaviors, then the benefits of assessing, monitoring, and intervening with them might be fruitful. Academic enablers/learning behaviors are certainly more amenable to change than the constructs measured by intelligence tests and if improving academic enablers/learning behaviors could improve academic achievement, then the use of the ACES and LBS in schools could ultimately prove very beneficial to the identification and remediation of school learning problems.

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Appendices

Appendix A	
1. Differentiated self-concept & consolidation of identity (p. 289)	Child recognizes that he has different levels and kinds of skills in different areas of cognitive and interpersonal functioning and that he has different interests in different areas; ...there should be an integration of these differentiated subsystems...
2. Concept of self as an initiating and controlling agent (p. 289)	Child tends to initiate action and direct his own behavior within realistic environmental constraints
3. Habits of personal maintenance and care (p. 289)	Child meets common standards for his peer group in cleanliness, grooming, hygiene, eating habits, bladder and bowel control, sleeping habits, and safety practices
4. Realistic appraisal of self, accompanied by feelings of personal worth (p. 289)	Child's appraisal of his abilities and interests is not at substantial variance with his performance and behavior...there must be some feeling of worth as an individual
5. Differentiation of feelings and appreciation of their manifestations and implications (p. 289)	Child knows about and experiences different types of negative and positive feelings, recognizes their expression in himself and others, and takes this recognition into account in his actions and judgments
6. Sensitivity and understanding in social relationships (p. 289-290)	Child perceives and accepts differences between himself and others, and appreciates perspectives and viewpoints of others
7. Positive and affectionate personal relationships (p. 290)	Child does not hesitate to display affection to adults and other children and forms relatively stable friendships and personal associations
8. Role perception and appreciation (p. 290)	Child recognizes that children and adults take somewhat different roles in different situational and interpersonal contexts,...knows what is expected of others and of himself in these different contexts, and...takes role expectations into account in his own behavior
9. Appropriate regulation of antisocial behavior (p. 290)	Child does not exhibit a recurring pattern of extremely disruptive, violent, aggressive, hostile, or other types of antisocial behavior;... [and] does [not] avoid them through...primitive defenses that repress or deny the underlying impulses
10. Morality and prosocial tendencies (p. 290)	When there is an opportunity or situational expectation for prosocial behavior, the child engages in such behavior more often than not...as he

	matures he becomes increasingly aware of the reasons and principles...for it
11. Curiosity and exploratory behavior (p. 290)	Child evinces curiosity about his environment and actively explores it...without external inducement...particularly in areas of personal interest
12. Control of attention (p. 290)	As a function of situational or task requirements, the child attends to relevant cues for an appropriate length of time and at an appropriate level of concentration
13. Perceptual skills (p. 290)	Child perceives a unit or form as separate from its background, discriminates between similar units..., analyzes forms into their constituent units..., and synthesizes units...into an organized form
14. Fine motor dexterity (p. 290)	Child manipulates small objects and uses tools within his limits of physical development
15. Gross motor skills (p. 290)	Child walks, runs, jumps, and reaches without excessive clumsiness and within the limits of his physical development
16. Perceptual-motor skills (p. 290)	Child coordinates visual, auditory, and motor behavior at an age-appropriate level or within the limits of sensory acuity and other aspects of his physical development
17. Language skills (p. 290-291)	Child recognizes the meaning of words he hears, and recalls, comprehends, and interprets spoken words and sentences...later...he exhibits the same skills with printed words and sentences and also extracts information from a body of text or tabular material
18. Categorizing skills (p. 291)	Child recognizes whether objects (or events) are similar or different; apprehends the nature of the similarities and differences; categorizes objects or events on the basis of attributes, generic classes, or relationships..., dealing with exclusions as well as inclusions; labels categories; and verbalizes the principles underlying categories
19. Memory skills (p. 291)	Child has adequate memory skills to retrieve information on the basis of relevant cues...
20. Critical thinking skills (p. 291)	Child perceives and identifies problems, analyzes and appraises the elements of situations...and judges and evaluates conceptions, processes, and products...
21. Creative thinking skills (p. 291)	Child generates multiple responses...and conceptions...to situations...child moves flexibly across contents and forms
22. Problem-solving skills (p. 291)	Child applies memory skills and skills of critical and creative thinking to

	identification, analysis, and solution of problems and to evaluation of his own responses and products in the process
23. Flexibility in the application of information-processing strategies (p. 291-292)	Child recognizes that there are different approaches to exploring the environment and to obtaining and processing information from it, he recognizes that these approaches are differentially effective in different situations, and he applies these approaches flexibly and appropriately...
24. Quantitative and relational concepts, understandings, and skills (p. 292)	Child exhibits increasing evidence of concept attainment, understanding, and skills...in...number..., number properties...,seriation and ordinality, conservation, relation and comparison..., causality, measurement and estimation; and enumeration, counting, and simple arithmetic and other formal operations
25. General knowledge (p. 292)	Child has a reasonable amount of knowledge in areas important to functioning in and out of school: health and safety, social environment..., physical environment, practical arts..., consumer behavior, sports and games, art and music, literature, etc.
26. Competence motivation (p. 292)	Child wants to improve his skills, exhibits satisfaction with improvement or mastery, and seeks learning experiences in the absence of external pressure or reward
27. Facility in the use of resources for learning and problem solving (p. 292)	Child knows that he can obtain help and information from various external sources, knows what...these sources are..., and uses these resources appropriately and effectively
28. Some positive attitudes toward learning and school experiences (p. 292)	Child does not have a generalized negative attitude toward learning and school experiences
29. Enjoyment of humor, play, and fantasy (p. 292)	Child enjoys situations involving humor, play, and fantasy and participates in them within the limits of opportunity and ability. With...age, his sense of humor broadens, even to encompass himself

Appendix B	
Overactivity-Ovr	A composite scale comprised of scores on the Attention-Deficit/Hyperactive, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), and Oppositional Defiant subscales
Underactivity-Unr	A composite scale comprised of scores on the Diffident and Avoidant subscales
Attention-Deficit/Hyperactive-ADH	Loud, does not finish jobs/do them properly, answers before thinking, asks when help is not needed, talkative, attention-seeking, gazes around/plays with things, out of seat/restless, forgetful, clowns around
Solitary Aggressive (Provocative)-SA(P)	Lies, cheats, fights, has ruined work purposely, throws things, destroys books, unkind to weaker students, provokes others, tries to push in front of/take things from others
Solitary Aggressive (Impulsive)-SA(I)	Rough with weaker students, steals, destroys other's property, uses bad language, makes sexually offensive gestures/remarks/inappropriate noises
Oppositional Defiant-OpD	Responds with an angry look or turns away, moody, seems to seek disapproval, takes correction badly (sulks, mutters), poor loser, wants to dominate/have own way, loses temper if cannot get own way
Diffident-Dif	Waits for others to greet first, too withdrawn to come forward, freezes up, too timid to ask or be trouble, shy but not unfriendly, sits so quietly do not know if attending or not, needs encouragement to join in
Avoidant-Avo	Too unconcerned about people to greet, not shy but rarely offers answer/seeks help, unconcerned about attention, distant, rarely smiles, lacks interest, listless, seems unmotivated, sits lifelessly
Delinquent-Del	A supplemental syndrome: Associates with troublesome students, involved in pranks, damages property, is a leader or follower in illicit activities, uses or supplies drugs, drinks alcohol, has brought a deadly weapon to school, occasionally truant
Lethargic (Hypoactive)-Leh	A supplemental syndrome: Too lethargic to ask, has a dejected look, appears to live in a dream world, will not attempt if sensing a difficulty, lacks energy, seems afraid to try, slow/does not finish on time, sluggish/apathetic, will not get involved, wanders off