**Title:**
**The Prevalence and Stability of Challenging Behaviors**
**and Concurrent Early Literacy Growth among**
**Kindergarteners at Reading Risk**

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Abstract

The purpose of the study was to assess early literacy skills and examine the presence and stability of challenging behaviors across the critical threshold of the kindergarten school year. Students' ($n = 337$) literacy performance (letter sound fluency, word attack, and phonological awareness) and challenging behaviors (teacher ratings of inattention/hyperactivity, mood/affect, and defiance/aggression) were measured in the fall and spring. Changes in student behaviors were classified as (a) *Elevated Stable*, (b) *Average Stable*, (c) *Increased*, or (d) *Decreased*, based on the relation of scores to normative and clinical cutpoints, and to changes observed from fall to spring. Students' literacy growth patterns varied by type of behavior. In terms of defiance/aggression, students classified as *Decreased* demonstrated the strongest growth. By contrast, the level of challenging behavior was most relevant for inattention/hyperactivity, and behavioral stability was most relevant for mood/affect. After describing major implications, limitations and directions for future research are discussed.

*Keywords*: challenging behavior, reading, literacy, kindergarten, progress monitoring, inattention, problem behavior, defiance, aggression, mood, affect

The Prevalence and Stability of Challenging Behaviors and Concurrent Early Literacy Growth

among Kindergarteners at Reading Risk

Converging evidence from studies of elementary-aged students suggests that reading difficulties are associated with behavior problems (e.g., Morgan, Farkas, Tufis, & Sperling, 2008; Spira, Bracken, & Fischel, 2005). In fact, a majority of children identified as having an emotional and behavioral disorder also read below grade level (e.g., Nelson, Benner, Lane & Smith, 2004) and the proportion of those reading below grade level increases throughout their school careers (e.g., Greenbaum et al., 1996; Wanzek, Al Otaiba, & Petscher, 2014; Wei, Blackorby, & Schiller, 2011). In general, reading difficulties become more difficult to remediate (e.g., Juel, 1988; Torgesen et al.,1999) as students progress through the primary grades.

Research syntheses have reported that problem behaviors are associated with weaker responses to generally effective early literacy intervention (Al Otaiba & Fuchs, 2002; Lam & McMaster, 2014; Nelson, Benner & Gonzalez, 2003). For example, Al Otaiba and Fuchs (2006) reported a large effect size difference (*ES* = 1.20) in problem behavior scores between students who failed to adequately respond to peer assisted literacy intervention conducted across kindergarten and first grade relative to those who responded well. Similarly, Torgesen and colleagues (1999) reported that teacher-rated problem behaviors were one of the most reliable predictors of students' inadequate response to early literacy intervention (*r* = .51 of growth on word attack, and *r* = .11 on word identification). More details about the behavioral differences observed between responders and non-responders were reported by Greulich et al. (2014), who analyzed videos of first grade reading interventions. These authors compared the behaviors of first graders who did not reach reading standard scores of at least 90 after intervention to the behaviors of peers in the same intervention groups who responded well. They observed more

physical and verbal avoidance and noted these children exhibited more hopelessness and shame in relation to their more successful peers.

Explanations for behavioral differences among non-responders vary; nonetheless, findings from research reveal bi-directional or reciprocal interactions between behavior and reading (Caemmerer & Keith, 2015; Hinshaw, 1992; Miles & Stipek, 2006; Morgan et al., 2008; Prochnow, Tunmer, & Chapman, 2013; Wang & Fredricks, 2014). On the one hand, as Morgan and colleagues (2008) noted, reading problems can make reading tasks boring, frustrating, and embarrassing, which may lead to anxiety, off-task behavior, a lack of persistence, and disruptive behavior or aggression (c.f., Lane, Beebe-Frankenberger, Lambros, & Pierson, 2001; Wehby, Falk, Barton-Arwood, Lane, & Cooley, 2003). On the other hand, behavior problems could result in reading problems if the behaviors disrupt or impede learning (e.g., Lane, 1999; Metsäpelto et al., 2017; Reid, Eddy, Fetrow, & Stoolmiller, 1999). It is also possible that reading and behavior problems are reciprocally linked or could be explained by other causal factors (e.g., poor attention or classroom emotional support) that lead to problems in both domains (Lee & Bierman, 2015).

Researchers have explored the longitudinal nature of reading – behavior relations. For example, Morgan et al. (2008) used data from the Early Childhood Longitudinal Study-Kindergarten Class (ECLS-K) to examine relations between first and third grade reading and behavior. Their findings corroborate that first grade reading difficulties strongly predicted later reading difficulty and moderately predicted later problem behavior. In turn, first grade problem behavior strongly predicted later problem behavior, and poor task-engagement in particular strongly predicted later reading difficulties. In addition, there is some evidence that students with both problem behavior and reading problems in kindergarten are likely to demonstrate the least

reading growth across time. For example, Kamps et al. (2004) described kindergartners using four risk classifications: both reading and behavioral risk, reading risk, behavioral risk, and no risk. Nearly a third (30.46%) of students at risk for reading problems were also at behavioral risk with either internalizing or externalizing symptoms. Reading skills were assessed again in third grade. The authors found that by third grade, students who had been classified at-risk for both reading and behavior problems in kindergarten scored lowest on oral reading fluency relative to their peers.

**Relations Among Behaviors and Reading in Kindergarten**

Kindergarten represents an optimal developmental threshold to examine the stability of problem behaviors for students experiencing their first exposure to reading instruction. To date, converging findings have demonstrated small to moderate negative correlations in kindergarten between a variety of early literacy skills and problem behaviors (including inattention, task avoidance, hyperactivity, and aggression; Ball, Finch, Gettinger, & K-3 Reading and Behavior Intervention Project, 2004; Bulotsky-Shearer & Fantuzzo, 2011; Hagan-Burke et al., 2011; Matthews, Kizzie, Rowley, & Cortina, 2010; Ponitz, Rimm-Kauffman, Grimm, & Curby, 2009; Saez, Folsom, Al Otaiba, & Schatschneider, 2012; Stipek, Newton, & Chudgar, 2010). Conversely, positive correlations between literacy and positive behaviors (prosocial, learning related behavior, task engagement, inhibitory control) have been observed (Miles & Stipek, 2006; Ponitz et al., 2009; Saez et al., 2012; Stipek et al., 2010). Results from longitudinal studies indicate that these relations persist, as studies have shown that early literacy performance during kindergarten predicts behavioral discipline referrals in fifth grade (McIntosh, Horner, Chard, Boland, & Good, 2006; McIntosh, Sadler, & Brown, 2012), while challenging behaviors in

kindergarten predict reading skills through first, fourth, and fifth grades (Bulotsky-Shearer & Fantuzzo, 2011; Miles & Stipek, 2006; Spira et al., 2005).

**Longitudinal Relations between Behavioral Stability and Reading Skills**

There is evidence that initial status in behavior may have a more important influence on reading development than behavioral changes. Bub, McCartney, and Willett (2007) modeled both internalizing and externalizing behavioral change from 24 months through first grade to explore problem behaviors as predictors of first grade achievement (reading, plus applied problems) and cognitive ability. Relations across ratings from 54 months, kindergarten, and first grade indicated behaviors during the transition to elementary school were stable within student (correlations ranged .62 to .77), but varied significantly student to student. Latent growth analyses revealed externalizing behaviors were more stable than internalizing behaviors, however, behavioral change across years was not a significant predictor of achievement controlling for race/ethnicity and gender. Prevalence of clinically elevated levels of challenging behavior in kindergarten were of 8% for internalizing and 14% for externalizing. Students identified at 24 months of age with high internalizing behaviors demonstrated an effect size difference on first grade achievement of .66 lower relative to peers, while those identified with high externalizing behaviors demonstrated a smaller effect size (.30). Bub and colleagues reported that initial status in behavior was more important in predicting subsequent performance than was the rate of change in challenging behaviors.

Claessens and Dowsett (2014) also explored the importance of behavioral and academic performance changes over time. Using ratings of both attention problems and disruptive behavior in the fall and spring of kindergarten, the authors predicted reading achievement gains through fifth grade. Increases in attention problems were associated with less kindergarten reading

growth from fall to spring relative to peers; disruptive behaviors included in the same model were not. Longitudinally, kindergarten changes in attention continued to be a significant predictor of reading growth between kindergarten and first grade, and between first grade and third grade, even after accounting for changes in behavior during each of those measurement intervals. More focused studies of change within kindergarten with a more narrow examination of early literacy skills are needed given the importance of kindergarten in children's transition into formal reading instruction. Information about comorbid reading and behavior difficulties could be especially important for identifying students and for informing intensive early interventions. Better understanding concurrent response to literacy instruction within a context of classroom management for behavior could guide decisions about the relevance of combined behavioral and reading interventions during kindergarten. Such integrated interventions could mitigate outcomes early and potentially prevent long-term problems.

Researchers have also provided some evidence regarding the stability of relations between literacy and social behaviors across time. As is common in longitudinal research, Miles and Stipek (2006) found that the associations between reading and prosocial behavior (e.g., helps other children, shows recognition of others' feelings, offers comfort when others are upset) weakened across time. However, they found that the relations between aggression and reading problems actually strengthened.

There are some limitations to this research base that warrant further research. It is not clear to what extent the studies have included participants who were at-risk for reading difficulties. It is also unclear how less stable patterns of, or steeper, behavioral change might relate to early literacy performance. Further, only a few studies have examined behavioral

changes across the critical kindergarten year, which is when most children begin reading instruction and formal education.

**Purpose and Guiding Questions**

The purpose of the study was to describe early literacy growth in relation to levels and changes in challenging behaviors across the kindergarten year among a sample of children at-risk for reading disability. Three research questions were posed for the current study: (a) What is the prevalence of challenging behaviors in the areas of inattention/hyperactivity, defiance/aggression, and mood/affect among kindergarteners identified as at-risk for early reading problems? (b) What proportion of kindergarteners exhibit stable, increased, or decreased levels of challenging behavior from the fall to spring of kindergarten? (c) Are there differences in children's early literacy skills growth associated with behavioral stability or change patterns across the kindergarten school year?

## Method

Data used in the present analyses were gathered as part of a longitudinal study funded by the *Institute for Education Sciences* (Clemens, Hagan-Burke, Kwok, & Al Otaiba, Grant R324A130214), which aimed at establishing the technical properties of published instruments for monitoring the reading progress of kindergarten students at-risk for reading difficulties. The samples, settings, recruitment procedures, and assessments described below were part of the larger study.

**Settings and Participants**

**Setting.** Across a two-year period we recruited Kindergarten students from 10 schools and five school districts in central and south-central Texas. Six schools were situated in urban communities, one was in a suburban area, and three were in rural communities. Across all

schools the average percentage of students that qualified for free or reduced-price lunch was 77%.

**Students.** Students at-risk for reading disability were recruited through a two- step screening process. First, teachers completed an adapted version of the *Teacher Rating of Reading Problems* (Speece & Case, 2001; Speece et al., 2011) to survey each student's alphabetic knowledge, phonological awareness, oral language, and overall reading skills. Teachers' ratings were then used to identify a range of five to eight of the lowest performing readers within each classroom. The team obtained parent consent for these students to participate in the second phase of screening. Next, the research team individually administered the phonological awareness and letter identification subtests of the Woodcock Reading Mastery Test, Third Edition (WRMT-III, Woodcock, 2011) to each student, and students had to score below the 40th percentile on one or more subtests to be enrolled. Students identified by their schools as English learners (31.7%) were included if they received at least 50% of their reading instruction in English.

This process identified a total of 428 students. Two students with developmental disabilities were ultimately excluded because their literacy performance could not be accurately assessed. The present analyses were conducted with 337 students with non-missing behavior scores from both the fall and spring semesters. The mean standard score on letter identification was 82.68 (SD = 15.67) and on phonological awareness was 79.34 (SD = 8.88).

We conducted separate analyses comparing the literacy scores of the 89 students with missing data (omitted from our main analyses) and the 337 students with complete data. T-tests indicated that average scores in the beginning of the year for omitted students were statistically significantly lower on letter sound fluency ($p = .03$) and phonological awareness ($p = .03$), but not on word attack ($p = .69$). Year-end scores did not differ statistically on any test (letter sound

fluency $p = .71$, word attack $p = .58$, and phonological awareness $p = .17$. Additionally, a chi-square test revealed no significant difference between groups in the proportion of English learners (34.8% for the omitted sample vs. 30.9% for the analysis sample; $p = 0.47$). In summary, the analyses indicated that the omitted students did not differ from the analysis sample on the majority of the variables.

Demographic information is provided in Table 1, which shows that a majority (54.0%) of student participants were male and that the ethnic diversity of our sample was similar to state demographics. About four percent of the students received special education services. The mean age at the start of the study was 5.71 (SD = .37).

**Teachers.** A total of 52 kindergarten teachers participated; 25 teachers participated during both study years. Forty-six teachers taught students with complete data and were included in the current analyses. Ninety-four percent of these teachers were female ($n = 43$). Fifty-four percent were white ($n = 25$), 30% were Hispanic or Latino ($n = 14$), and 11% were African American (n = 5). All participating teachers had at least a bachelor's degree and 11 also held a graduate degree. Total years of teaching experience ranged from 0 (i.e., beginning teacher) to 41 years. Teachers had an average 10.52 (SD = 9.53) years of teaching experience, and an average of 6.52 (SD = 7.67) years of experience teaching kindergarten students. The project did not have resources to conduct formal observations of classroom instruction; anecdotally research staff noted a variety of curricular materials were used to deliver reading-related instruction within participating classrooms.

**Measures**

In the following we describe measures of behaviors and early literacy utilized in the analyses for this paper, all of which were administered as part of the larger project. Trained

research staff individually administered a large range of literacy growth measures. For the present analyses we selected three tests that are representative of skills commonly targeted in kindergarten literacy instruction.

**Letter Sound Fluency (LSF).** LSF is a one minute, individually-administered assessment that measures fluency in identifying letter-sound relationships. We used LSF probes from the AIMSweb system (Pearson, 2012). Each probe contains a list of randomly ordered lower case letters. Students provide the most common letter sound associated with each letter, and receive a point for each correct response provided within one minute. The average two-week alternate-form reliability for LSF was .86 for our sample.

**Word Attack (WAT).** The WRMT-III Word Attack subtest was used to measure decoding skills (Woodcock, 2011). Participants read a list of phonologically regular pseudowords that increase in difficulty; developer-suggested basal and ceiling rules restrict the total number of items administered during this untimed assessment. Students receive one point for each pseudoword read correctly as a whole unit (segmented or partially blended words do not receive credit). The measure demonstrated an adequate Kuder-Richardson 20 internal consistency coefficient of .79 (Kuder & Richardson, 1937).

**Phonological Awareness (PA).** The Phonological Awareness composite from the WRMT-III was used to measure awareness of the phonological components of language (Woodcock, 2011). The sum of items correct from five sections comprise a student's final score: First-Sound Matching; Last-Sound Matching; Rhyme Production; Blending; Deletion. In First- and Last-Sound Matching, students selected from three images the picture beginning or ending with the same sound as a stimulus image. In Rhyme Production, students generate a word that rhymes with an orally-presented stimulus word, while in Blending and Deletion students

combine or removing a syllable or phoneme from orally-presented stimulus. Per the WRMT-III manual, the Phonological Awareness composite average split-half reliability is .92.

**Challenging Behaviors.** To assess the extent of children's challenging behaviors, their classroom teachers completed the *Conners Early Childhood Teacher/Childcare Provider* (Short Version) behavior rating scale (Conners-EC; Conners, 2009). Teachers were asked to rate challenging behaviors during October of the fall semester (i.e., after at least a month and a half of instruction to allow time for them to become familiar with their students) and again at the end of kindergarten spring semester (May). The Conners-EC utilizes classroom teacher ratings to measure internalizing and externalizing student behaviors. The short form consists of 46 items that teachers use to rate individual students using a 4-point scale. Scores are provided on six subscales. For the purposes of these analyses we focused on the following three subscales: inattention/ hyperactivity (i.e., difficulty controlling attention and behavior, easily distracted, impulsive), defiant/aggressive behaviors (i.e., argumentative, destructive, difficulty controlling temper, physical or verbal aggression), and mood/affect (i.e., irritability, sadness, negativity). The form demonstrates Cronbach's alpha internal consistency of .87 and mean 2- to 4-week test-retest reliability of .90 (Sparrow, 2010).

**Assessment Procedures**

As part of the larger study, test administrators included senior research staff, graduate students, and advanced undergraduate students. Training sessions included an explanation of general assessment procedures accompanied by systematic description and modeling of protocol-specific administration requirements. In addition, test administrators practiced in pairs comprised of one novice and one senior data collector. Inter-rater reliability via mock test administrations included feedback and modeled administration by senior project staff. Finally, demonstrations

were conducted with student participants. Test administrators were permitted to collect data independently after demonstrating 100% fidelity to assessment procedures and at least 95% inter-rater agreement with a senior staff member in observed sessions with students.

Test administrators conducted individual testing according to publishers' standardized procedures. Testing locations were selected to minimize distractions and included unused offices or classrooms, libraries, and quiet sections of hallways. All test protocols were double-scored by project staff and double-entry was used when entering raw data into electronic databases.

**Data Analytic Approach**

Preliminary analyses include descriptive statistics for variables of interest, correlations for reading (LSF, WAT, and PA) and behavior measures, and chi-square analyses to determine whether there were statistically significant differences in the proportion of students in each behavior stability classification by ethnicity, LEP status, or gender. Additionally, fall and spring LSF, WAT, and PA descriptive statistics were calculated for each challenging behavior (inattention/hyperactivity, defiance/aggression, and mood/affect) by behavior stability classification (*Elevated Stable, Average Stable*, *Increase*, or *Decrease*).

To address questions about the prevalence of challenging behaviors, we classified students' behavior based on Conners-EC (2009) ratings and then computed the percent of students with elevated levels of each type of challenging behavior. First, we converted students' scores on the Connors-EC to age-based standard scores using the publishers' norm-referenced score conversions. Next, research staff consulted the Conners-EC (2009) user's manual to establish the clinical significance of challenging behavior ratings. Table 2 provides the developers' cut off scores for criterion levels of undesirable behavior ranging from "low" to

"very elevated". We examined students' scores for each type of behavior to determine prevalence of low to very elevated levels.

We next used students' behavioral stability classifications to describe the proportion of students with *Elevated Stable, Average Stable, Increased,* or *Decreased* levels of each type of behavior across the kindergarten year. Specifically, we used clinical and statistical criteria to create behavioral stability classifications (Table 3), which indicate whether each students' challenging behaviors changed or remained stable from fall to spring. First we determined whether fall and spring ratings of a given behavior reflected a clinically significantly change. According to the publisher, T-Scores at or above 65 (i.e., "elevated", 1.5 standard deviations above the mean) are considered high and clinically significant. T-Scores below 65 are considered within the average range for a given behavior based on student age. Next, we confirmed whether those differences were also statistically significant based on T-score difference scores specified by the publisher (i.e., difference scores of 7.84, 6.82, and 6.01 for inattention/hyperactivity, defiance/aggression, and mood/affect, respectively). Behavior rating scores at or above the clinical cutoff of 65 at both measurement time points were classified as *Elevated Stable*, while ratings below the cutoff at both time points were classified as *Average Stable*. Behavior ratings that changed across the year were classified as *Increased* (i.e., problem behaviors worsened across the school year), or *Decreased* (problem behaviors improved across the school year). We computed the percent of students whose ratings fell under each behavioral stability classification for each type of behavior.

Finally, we investigated literacy skills change across kindergarten by estimating the effect sizes of LSF, WAT, and PA change scores from fall to spring for each behavior and each stability classification. Given that students' literacy scores were nested within teachers ($n = 46$), we fit a

two-level random-intercept model to the literacy change scores treating teachers as clusters. Specifically,

$$Level\ 1: Y_{ij} = \beta_{0j} + e_{ij},$$

$$Level\ 2: \beta_{0j} = \gamma_{00} + U_j$$

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where in level 1, $Y_{ij}$ denotes the literacy change scores of student $i$ under teacher $j$, $\beta_{0j}$ represents the mean literacy change scores in teacher $j$'s class, and $e_{ij}$ is the random error term that is specific to student $i$. In level 2, $\gamma_{00}$ is modeled as the mean literacy change score of the entire sample and $U_j$ is a random effect specific to teacher $j$.

Both the between-cluster variance ($\sigma_B^2$) and the within-cluster variance ($\sigma_W^2$) can be estimated by fitting the above two-level random-intercept model. The cluster mean of $\beta_{0j}$ across all the teachers is denoted by $\overline{\beta}_{0j}$. The standardized effect size of the literacy change scores while accounting for the teacher effects is of the form (Hedges, 2007):

$$\delta_T = \frac{\overline{\beta}_{0j}}{\sqrt{\sigma_B^2 + \sigma_W^2}}.$$

**Results**

The purpose of the current study was to examine relations between early literacy and challenging behavior in a sample of kindergarteners at-risk for reading problems. Research questions addressed the prevalence of challenging behavior, behavior stability from fall to spring, and literacy growth associated with behavioral stability classifications.

The concurrent and predictive correlations among reading scores were low to moderate (ranging from .05 to .39, and from .05 to .43, respectively). Correlations were somewhat higher for our behavioral ratings, with correlates at fall ranging from .46 to .75 and at spring ranging from .56 to .76, with the largest correlations at both time points for defiant/aggression and mood/affect behaviors.

**Prevalence of Challenging Behaviors**

Among children in this sample—kindergarteners selected based on their at-risk status for reading difficulties—the majority (65% - 77%) were rated by their teachers as exhibiting behaviors within the average range (i.e., clinically non-significant levels of challenging behaviors) for all three behavioral subscales at the fall and spring assessment points. Figure 1 reports prevalence for each of the five behavior classifications. The percentages of children who met criteria for elevated or very elevated (hereafter, elevated) levels (i.e., T-score $\geq$ 65) of challenging behavior in the fall were 33.00%, 22.60% and 24.90% for inattention/hyperactivity, defiance/aggression, and mood/affect, respectively. By spring of kindergarten the percentages of students with elevated levels across these types of problem behavior were 34.70%, 31.50%, and 30.50%, respectively.

**Behavior Stability from Fall to Spring**

Figure 2 illustrates the percentage of students in the *Increased* (i.e., behavior worsened), *Decreased* (i.e., behavior improved), *Average Stable*, and *Elevated Stable* (i.e., clinically significant level of problem behavior did not change) classifications. Across the three types of behavior, 8.9% to 11% of students *Increased;* they developed high and clinically significant levels of challenging behavior during the course of their kindergarten year. The type of behavior

with highest percentage of students who *Decreased* was inattention/hyperactivity (6.8%),

followed by mood/affect (4.7%), and defiance/aggression (2.1%).

**Overlap in stability classification.** There was relatively little overlap in the *Increased* or

*Decreased* classifications. For example, of the 32 students that *Increased* in

inattention/hyperactivity scores across the year, only five (16%) *Increased* in mood/affect, and 11

(34%) *Increased* in defiance/aggression. Of the 37 students that *Increased* in defiance/aggression

scores across the year, 12 (32%) were also *Increased* in mood/affect. Similarly, of the 23 students

that *Decreased* on inattention/hyperactivity, only one student *Decreased* in mood/affect and

another in defiance/aggression. Of the seven students that *Decreased* in defiance/aggression, no

students demonstrated a concurrent *Decrease* in mood/affect.

In contrast to the low overlap in the *Increased* and *Decreased* categories, greater overlap

was observed among students classified with *Elevated Stable* and *Average Stable* behaviors. Of

the 88 students with *Elevated Stable* inattention/hyperactivity across the year, 37 (42%) were

also *Elevated Stable* in mood/affect and 49 (56%) were *Elevated Stable* in defiance/aggression.

Of the 69 students in the *Elevated Stable* group for defiance/aggression, 45 (75%) were classified

as *Elevated Stable* in mood/affect. Of the 194 students with *Average Stable*

inattention/hyperactivity, 157 (81%) and 167 (86%) students were also classified as *Average*

*Stable* in mood/affect and defiance/aggression, respectively, across the same period of time.

Finally, of the 224 students with *Average Stable* levels of defiance/aggression across

kindergarten, 193 (86%) were classified as *Average Stable* in mood/affect. Because *Average*

*Stable* was the largest category, and that students that are typically functioning (i.e., "average"

ratings) in one behavioral area are more likely than not to be average functioning in other

behavioral areas, the high overlap among the *Average Stable* classification was not surprising.

**Stability classifications and demographic characteristics.** Chi-square test results indicated that the distribution of kindergarteners in our sample across inattention/hyperactivity stability classifications did not significantly vary by ethnicity, $\chi^2(9) = 7.799$, *ns*, LEP status, $\chi^2(3) = 1.687$, *ns*, or gender, $\chi^2(3) = 7.554$, *ns* Defiance/aggression stability classifications did not differ by LEP status, $\chi^2(3) = 2.845$, *ns* or gender, $\chi^2(3) = 2.727$, *ns* Similarly, mood/affect stability classifications did not differ by LEP status, $\chi^2(3) = 0.416$, *ns*, or gender, $\chi^2(3) = 0.732$, *ns* However, both defiance/aggression and mood/affect stability classifications varied significantly by ethnicity, $\chi^2(9) = 21.184$, *p* < .05 and $\chi^2(9) = 21.042$. *p* < .05 respectively. Specifically, the post-hoc analysis indicated that, compared to expected values, ratings for African American/Black students in the sample were more likely to be classified *Elevated Stable* for defiance/aggression (adjusted residual = 3.8) and mood/affect (adjusted residual = 2.7), and less likely to be classified *Average Stable* on the same problem behavior (adjusted residual = -4.4 for defiance/aggression and -2.2 for mood/affect). On the other hand, teacher ratings of Hispanic/Latino student were less likely to be classified as *Elevated Stable* for defiant / aggressive behaviors (adjusted residual = -2.2) and more likely to be classified as *Average Stable* for these same behaviors (adjusted residual = 2.5). Furthermore, ratings for White students were more likely to fall in the *Decreased* classification of mood/affect (adjusted residual = 2.9) compared to expected representation.

**Early Literacy Change Associated with Behavior Stability Patterns**

See Table 4 for descriptives for each of the early literacy test scores for the entire sample; Table 5 breaks out statistics by behavior type and stability classification. We describe next the most salient stability classification(s)—those corresponding with concurrent literacy growth patterns—which varied depending on the type of challenging behavior.

**Inattention/Hyperactivity.** In the fall, we observed little variation in LSF, WAT, or PA scores across the four inattention/hyperactivity stability classifications. Figure 3 describes growth on these three measures for students in each of the four stability classifications for inattention/hyperactivity. Of the three literacy measures, students' growth in LSF was most similar across all classifications. Growth on the other two measures was more variable. Notably, students in the *Elevated Stable* behavior stability classification demonstrated consistently lower amounts of growth when compared to the other three groups, with average effects ranging from $\delta_T = 0.63$ to 1.37. As for the other three behavior stability classifications, the pattern of results were mixed depending on the literacy measure.

**Defiance/Aggression.** Similar to the pattern of findings for inattention/hyperactivity, only minimal differences were observed in the three fall early literacy scores among students across the four defiance/aggression stability classifications. However, as illustrated in Figure 4, two fairly consistent growth patterns emerged. The first related to students with *Decreased* defiance/aggression; they demonstrated the most growth on the literacy measures ($\delta_T = 1.57$ to 2.66) compared to the other behavior stability classifications. Conversely, students with significantly *Increased* defiance/aggression across the year generally demonstrated lower growth on early literacy measures ($\delta = 0.59$ to 1.45).

**Mood/Affect.** We observed very few differences in fall LSF, WAT, and PA scores among students within the different mood/affect stability classifications. As illustrated in Figure 5, for at least two measures, we notice that students in the *Average* and *Elevated Stable* behavior classifications had stronger growth (WAT $\delta_T = .62$ and .78, respectively; LSF $\delta_T = 1.81$ and 1.51, respectively) compared to students in the *Increased* or *Decreased* classifications (WAT $\delta_T = 0.53$ and 0.55, respectively; LSF $\delta_T = 1.34$ and 1.30, respectively).

**Patterns by early literacy skill.** For word attack and letter sound fluency growth, there was no consistent pattern across inattention/hyperactivity, defiance/aggression, and mood/affect classifications. By contrast, in terms of phonological awareness growth, students classified with *Average Stable* or *Decreased* behavior showed relatively stronger growth than students with *Elevated Stable* or *Increased* behavior classifications.

## Discussion

The purpose of the current study was to add to the existing research by describing concurrent changes in early literacy and behavior across the school year for a sample of kindergarteners at-risk for reading disorders. Our study was unique in that it examined whether *changes* in challenging behavior (rather than absolute levels) were associated with early literacy growth during kindergarten, a critical window of child development. The following research questions were investigated: (a) What is the prevalence of challenging behaviors in the areas of inattention/hyperactivity, defiance/aggression, and mood/affect among kindergarteners identified as at-risk for early reading problems? (b) What proportion of kindergarteners exhibit *Stable*, *Increased*, or *Decreased* levels of challenging behavior from the fall to spring of kindergarten? (c) Are there differences in children's early literacy skills growth associated with behavioral stability or change patterns across the kindergarten school year?

**Prevalence and Stability of Challenging Behaviors**

Our first two research questions addressed the beginning and end of year prevalence of inattention/hyperactivity, defiance/aggression, mood/affect and the proportion of kindergarteners whose teachers reported exhibited *Stable*, *Increased*, or *Decreased* levels of challenging behavior from fall to spring. Depending on the type of challenging behavior, we found that 65 to 77 percent of the students' behaviors were rated by their teachers as normatively average in fall and

again in spring. These prevalence percentages are consistent with those reported by Kamps et al. (2004), as 30.46% of their sample of students at risk for reading problems were also at behavioral risk. Our findings add uniquely to the literature by showing that the proportion of students with elevated and clinically significant levels of problem behaviors increased by 8.9 to 11 percent between the fall and spring.

**Behavior Stability and Early Literacy Growth**

Our third research question explored whether students' growth in letter sound fluency, decoding, and phonological awareness skills differed based upon the stability of their challenging behaviors across the kindergarten school year. We observed a variable pattern of results when we examined the magnitude of change in early literacy scores from the fall to spring (as shown in Figures 3-5). With respect to inattentive/hyperactive behaviors described in Figure 3, students in the *Elevated Stable* behavior classification—those whose behaviors remained high and clinically significant—had the lowest growth across on WAT and PA, and also showed among the lowest growth on LSF.

A clear and consistent pattern emerged within the defiance/aggression behavior type, as seen in Figure 3. Students whose behavior worsened across the year (i.e., the *Increased* behavior pattern) demonstrated consistently low growth in reading compared to the other behavior stability classifications ($\delta_T$ of .59, 1.12, and 1.45 on WAT, PA, and LSF, respectively). By contrast, students whose behavior improved (i.e., the *Decreased* behavior pattern) showed the strongest literacy growth ($\delta_T$ of 1.57, 2.59 and 2.66 on WAT, PA, LSF, respectively). In terms of mood/affect behaviors shown in Figure 5, for both WAT and LSF, the strongest growth was in the *Elevated Stable* and *Average Stable* behavior stability classifications, but this pattern was not consistent for PA.

Thus, our sample's growth patterns indicate the most salient stability classifications may be unique to each type of behavior: when considering inattention/hyperactivity, problematic and persistent *levels* were most relevant. In particular students in the *Elevated Stable* classification demonstrated low growth on LSF, and the lowest growth on WAT and PA. For defiance/aggression, *instability* may be most important. Recall a reduction in this behavior was associated with stronger growth and increased problems were associated with low growth on WAT, and the least growth on both PA and LSF. Whereas for mood/affect *stability versus instability* may be most important because the *Elevated* and *Average Stable* classifications were associated with stronger growth than the *Increased* and *Decreased* classifications on both WAT and LSF.

Another interesting finding was that students who showed the most desirable pattern (i.e., their behavior was average and stable or improved significantly) demonstrated stronger growth on PA; this finding was consistent across all behavior types. Thus, further research is needed to replicate whether certain amounts of literacy growth best identify comorbid reading-behavior challenges, or whether PA could be especially sensitive to resilience.

Because of our specific classification scheme and measures used, it is challenging to directly compare our findings about behavior change and early literacy growth with other studies we reviewed. Through a different analytic method we replicate findings that initial levels (Bub et al., 2007) and kindergarten changes (Claessens & Dowsett, 2014) in challenging behaviors are especially important in predicting subsequent performance, as most students' behaviors among our sample were also stable when held to statistical and clinical thresholds. From a general perspective, Bub et al. (2007) reported young children's behavior (assessed at 24 months) was more important in predicting their reading performance at first grade than was the rate of change

of problem behaviors. Notably, however, behavior trajectories were relatively stable from both internalizing and externalizing behavior. Our findings contribute to an understanding of literacy growth in the presence of meaningful improvements in defiance/aggression.

Our findings on the relation between elevated levels of inattention and poor literacy growth are consistent with prior research. Poor self-regulation and low task-engagement early in a child's schooling have been consistently observed as predictors of long-term, persistent academic difficulties (e.g., Morgan et al., 2008; Spira, Bracken, & Fischel, 2005; Stipek, Newton, & Chudgar, 2010). Our study contributes to this knowledge base by demonstrating that inattention and difficulties in behavior regulation that remain elevated across kindergarten are associated with consistently low growth relative to other behavior change categories examined in this study. Kindergarten often represents a child's first experience with formal reading instruction, and the extent to which a child benefits from that instruction depends in part on their ability to engage with the teacher and assigned tasks.

Further, our findings extend those of Miles and Stipek (2006), who demonstrated that the associations between aggression and reading strengthened across time. Skill difficulties can make literacy instruction and activities frustrating and embarrassing, which may increase the likelihood of inattention or disruptive behavior (Metsapelto et al., 2015), and difficulties sustaining attention are a particularly strong predictor of long-term academic difficulties (Rabiner, Coie, & Conduct Problems Prevention Research Group, 2000; Sayal, Washbrook, & Propper, 2015). Thus, it makes theoretical sense that students that demonstrated stable and/or worsening problems in defiant, aggressive, inattentive, or hyperactive behaviors demonstrated among the least growth in early literacy skills across kindergarten. Our study adds uniquely to

the literature by demonstrating these relations as students begin formal schooling and formal literacy instruction.

An important implication of this study is that teachers rated a third of the students with reading problems as having challenging behaviors, and that early literacy growth was weak and similar in level among students who became more defiant and aggressive across the year, had more inattentive and hyperactive behaviors than average throughout the year, or had significant changes in mood affect across the year. Literacy growth was strongest among students whose elevated levels of defiance and aggression resolved between fall and spring. Thus, important implications of these findings are that (a) consideration of reading and behavior data across kindergarten may aid the identification of children at increased risk for significant academic difficulties, and (b) kindergarten teachers can identify children who may benefit from early intervention that combines behavioral and literacy interventions. Another important implication is that students with comorbid reading and challenging behaviors might benefit from interventions that embed social-emotional learning competencies such as task engagement, persistence, grit, and goal setting within evidence based literacy interventions such as shared book reading (e.g., Al Otaiba, 2004; Daunic et al., 2013; Lake, Al Otaiba, & Guidry, 2010).

It is notable that change in internalizing types of behaviors (as measured by the mood/affect scale in this study) were associated with less growth in early literacy skills. Of the three types of behavior we assessed, mood/affect includes behaviors more consistent with internalizing problems (i.e., depression, anxiety). Prior research indicates a weaker relation among internalizing problems and reading development (Rabiner et al., 2000), however evidence also suggests that early reading difficulties are predictors of depression in later grades (Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003). Our focus within a kindergarten sample indicates

clinically-relevant changes in mood/affect across one school year may be more important to early literacy than improvement or high levels, as was the case with the other behaviors we measured. However, further research is needed to investigate mood and affective instability among kindergarteners.

**Limitations and Directions for Future Research**

There are several limitations of our study; we believe these limitations can provide directions for future research. The first limitation relates to our sample. By design, we focused a sample of students who were at risk for reading difficulties who are frequently the subject of resource-intensive assessment and intervention efforts in schools. However, our findings may not generalize to other students who are typically achieving in early literacy, including those who might display problem behaviors. Future research with larger samples could involve a broader range of students, which would allow an examination of the relations of student characteristics to behavioral stability. In addition, our sample was diverse and its size appropriate for our questions, but having a larger sample size would allow us to examine whether the pattern of our findings remain relevant regardless of student ethnicity or English language proficiency.

A second limitation was that we were not able to report student-level data regarding socio-economic status. In some of the school districts we recruited, all students were economically disadvantaged, and policies in other school districts restricted the collection of student-level data on economic disadvantage. Thus we were unable to investigate behavior and literacy change patterns as a function of socio-economic status. Future research could replicate our findings in schools with a wider range of socioeconomic status.

A third limitation was that we did not have direct observation data to complement the teachers' behavior ratings. Although teacher ratings of behavior have long been considered a

valid source of information in educational and psychological research, direct observations would strengthen conclusions about the changes or stability in student behavior. Future research could also incorporate direct observations of both literacy instruction and teachers' behavior management, which are related to reading outcomes.

A fourth limitation involved our use of change scores on the early literacy measures, which can be problematic given the aggregation of error from two time points. Subsequent work might investigate change using latent growth or latent change score models that better account for measurement error. Finally, future research is warranted that includes additional follow-up study to examine changes in relations across a longer period of time, including students' elementary school years.

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Table 1

*Demographics of Student Participants*

| Student Characteristics | | Valid (N=337) | |
|---|---|---|---|
| | | N | % |
| Gender | Female | 155 | 46.0 |
| Ethnicity | | | |
| | Asian | 4 | 1.2 |
| | American Indian | 0 | 0.0 |
| | Black or African-American | 82 | 24.3 |
| | Hispanic or Latino | 172 | 51.0 |
| | White | 72 | 21.4 |
| | Other | 7 | 2.1 |
| Received Special Education Services | | 14 | 4.2 |
| Bilingual/English Language Learner | | 104 | 30.9 |

Table 2

*Conners-EC Clinical Cutoff Scores*

| Clinical Interpretation | T-Score | Percentile | Classification |
| --- | --- | --- | --- |
| High and clinically significant: | | | |
| | 70+ | 98+ | Very Elevated |
| | 65-69 | 93-97 | Elevated |
| Avergage and clinically non-significant: | | | |
| | 60-64 | 84-92 | High Average |
| | 40-59 | 16-83 | Average |
| | <40 | <16 | Low |

*Note*. Scores equal or above 65 are classified as High (i.e., clinically significant); scores below 65 are defined as Average (i.e., clinically non-significant). Conners-EC = Conners Early Childhood-Teacher/Childcare Provider Short (Conners, 2009).

Table 3

*Classification Definitions for Change in Challenging Behaviors*

| Stability Category | Definition |
|---|---|
| *Elevated Stable* | Behavior rating scores high and clinically significant for both fall and spring assessments. |
| *Average Stable* | Behavior rating scores average and clinically non-significant both fall and spring behavior assessments. |
| *Increased* | Average behavior rating score for the fall assessment and high and clinically significant for spring. |
| *Decreased* | High and clinically significant behavior rating score for the fall assessment and average for spring. |

*Note.* Increased indicates more of the challenging behavior and Decreased indicates improved behavior. High and average behavior designations based on scores criterion of 65 adopted from the Conners Early Childhood user's manual (Conners, 2009).

Table 4

*Reading Instruments: LSF, WAT, and PA Raw Score Descriptives*

|  | Fall | Spring |
|---|---|---|
|  | Mean (*SD*) | Mean (*SD*) |
| LSF | 6.25 (*6.95*) | 29.47 (*17.24*) |
| WAT | 0.07 (*0.42*) | 1.94 (*2.77*) |
| PA | 7.19 (*3.41*) | 15.69 (*6.55*) |

*Note*. Fall = beginning of the fall semester, spring = end of the spring semester. LSF = Letter Sound Fluency, AIMSweb (Pearson, 2012), WAT = Word Attack subtest, WRMT-III (Woodcock, 2011), PA = Phonological Awareness composite, WRMT-III (Woodcock, 2011).

Table 5

*Descriptive Statistics for LSF, WAT and PA by Behavior Type and Behavior Stability Classification*

| Measure | *Elevated Stable* | | *Average Stable* | | *Increased* | | *Decreased* | |
|---|---|---|---|---|---|---|---|---|
| | **Fall** *M* (*SD*) | **Spring** *M* (*SD*) | **Fall** *M* (*SD*) | **Spring** *M* (*SD*) | **Fall** *M* (*SD*) | **Spring** *M* (*SD*) | **Fall** *M* (*SD*) | **Spring** *M* (*SD*) |
| **LSF** | | | | | | | | |
| Inattention/ Hyperactivity | 5.67 (5.87) | 23.81 (15.38) | 8.34 (8.15) | 33.05 (17.57) | 7.03 (6.73) | 32.61 (16.83) | 4.83 (4.86) | 28.31 (18.82) |
| Defiance/ Aggression | 5.72 (5.06) | 27.42 (14.69) | 7.51 (7.88) | 30.87 (17.94) | 7.77 (7.53) | 30.07 (18.20) | 11.94 (7.77) | 39.75 (18.71) |
| Mood/Affect | 6.74 (6.50) | 28.28 (16.16) | 7.57 (7.89) | 30.87 (17.83) | 7.50 (7.05) | 31.66 (16.18) | 5.35 (4.29) | 28.35 (20.05) |
| **WAT** | | | | | | | | |
| Inattention/ Hyperactivity | 0.01 (0.11) | 1.29 (2.06) | 0.07 (0.47) | 2.20 (3.05) | 0.19 (0.59) | 1.84 (2.13) | 0.05 (0.21) | 2.48 (3.17) |
| Defiance/ Aggression | 0.05 (0.21) | 1.63 (3.01) | 0.07 (0.48) | 2.06 (2.73) | 0.05 (0.23) | 1.59 (2.71) | 0.13 (0.35) | 2.75 (2.25) |
| Mood/Affect | 0.05 (0.21) | 1.82 (3.05) | 0.08 (0.49) | 2.04 (2.57) | 0.06 (0.23) | 1.41 (2.80) | 0.00 (0.00) | 2.24 (4.02) |
| **PA** | | | | | | | | |
| Inattention/ Hyperactivity | 6.18 (2.88) | 12.78 (6.50) | 7.56 (3.56) | 16.82 (6.28) | 7.69 (3.75) | 16.25 (5.90) | 7.23 (6.88) | 16.43 (5.23) |
| Defiance/ Aggression | 6.29 (2.60) | 14.83 (6.39) | 7.42 (3.60) | 16.07 (6.59) | 7.49 (3.19) | 14.22 (6.63) | 7.14 (4.10) | 19.14 (4.81) |
| Mood/Affect | 6.03 (2.63) | 15.03 (6.94) | 7.60 (3.68) | 16.07 (6.43) | 6.40 (2.33) | 13.25 (5.86) | 8.00 (2.71) | 17.31 (6.95) |

*Note*. Fall = beginning of the fall semester, spring = the end of the spring semester.

LSF = Letter Sound Fluency, AIMSweb (Pearson, 2012), WAT = Word Attack subtest,

WRMT-III (Woodcock, 2011), PA = Phonological Awareness composite, WRMT-III
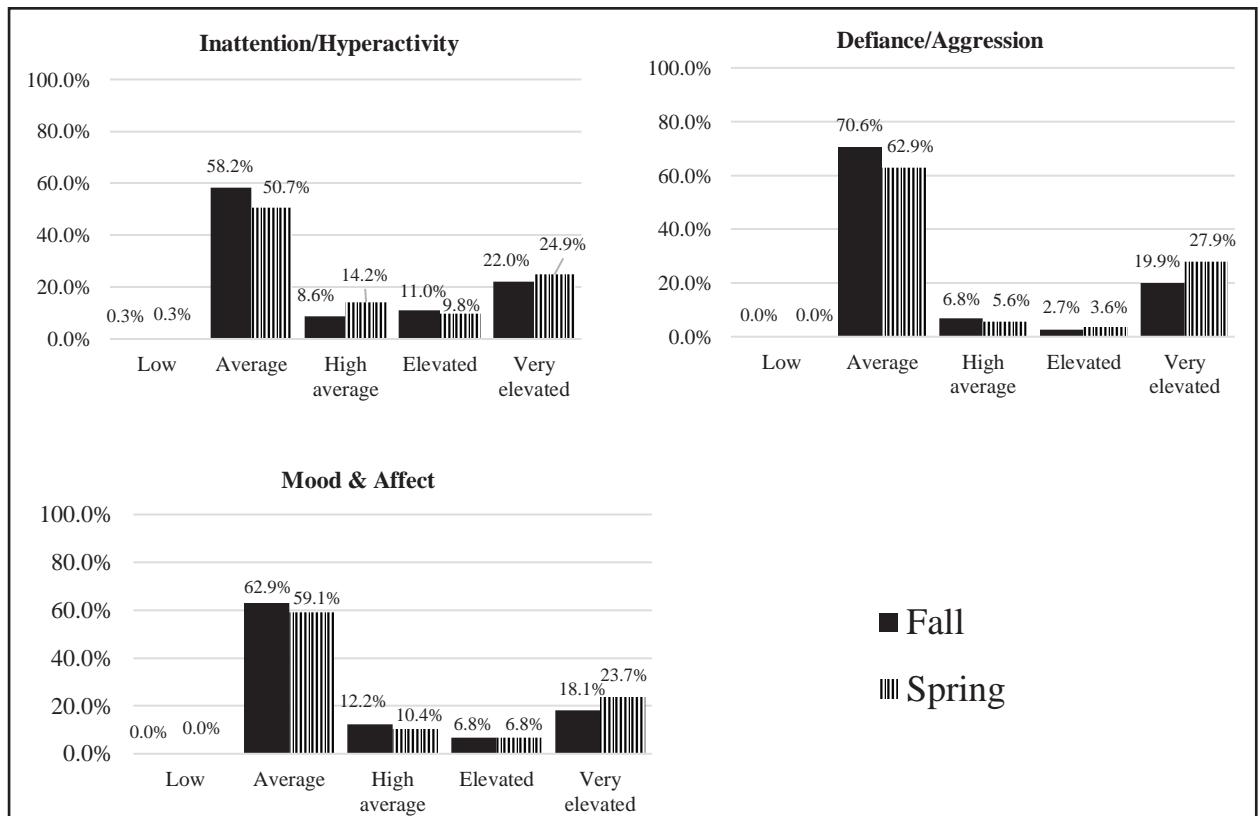
(Woodcock, 2011).

*Figure 1.* Percentages of at-risk Kindergarten students demonstrating behavior for each behavior classification in fall and spring, for each type of challenging behavior. Challenging behaviors for each behavior type and classification. *N* = 337 for both semesters. Percentages of at-risk Kindergarten students in each behavior stability classification for each type of challenging behavior
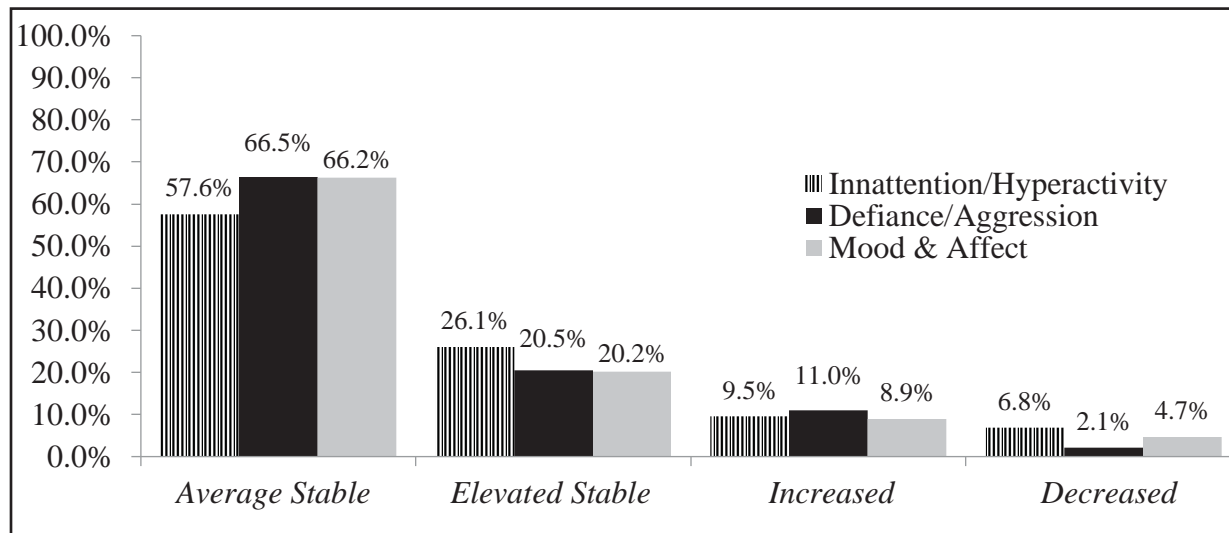
*Figure 2.* Percentages of at-risk Kindergarten students in each behavior stability classification for each type of challenging behavior. *N* = 337.
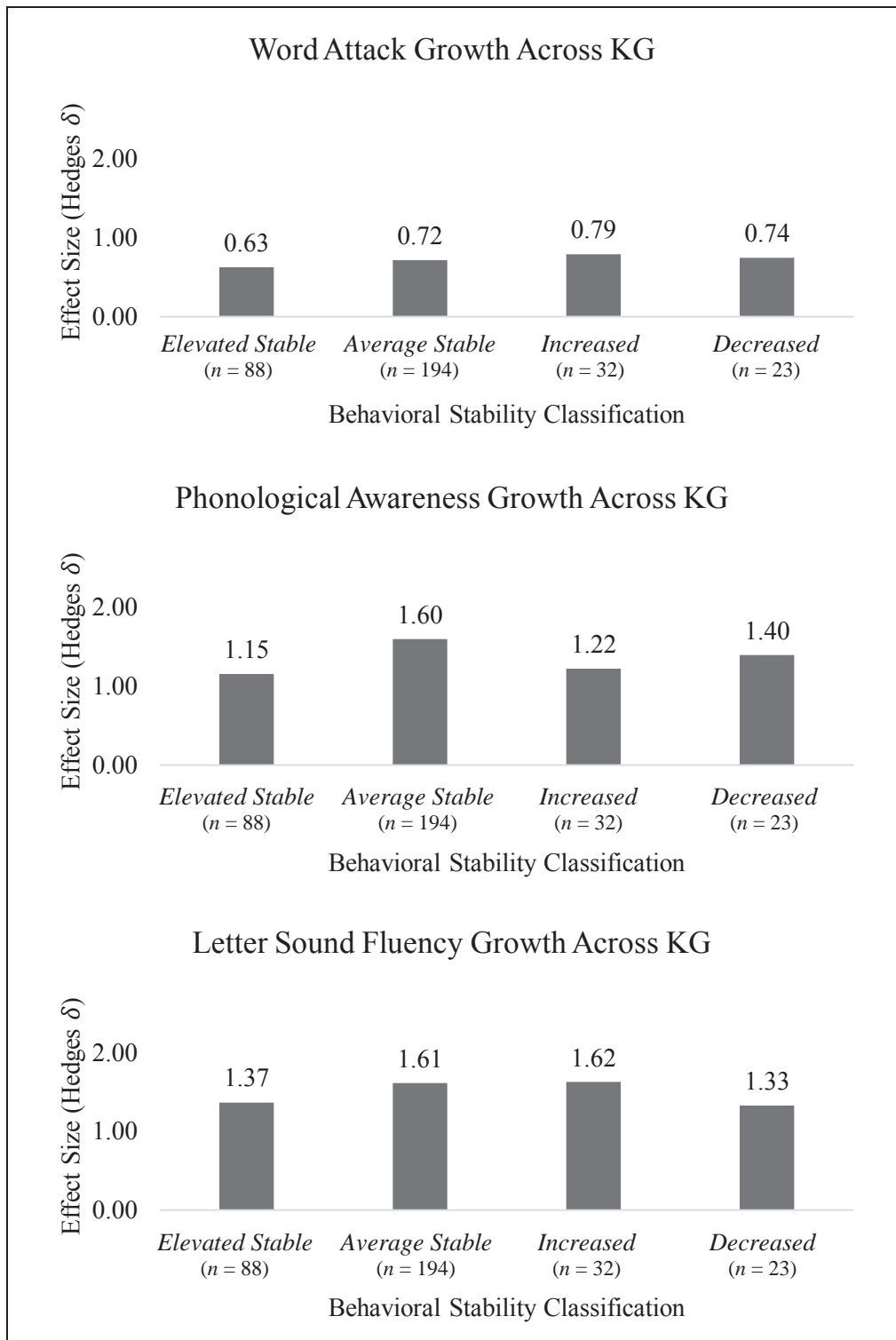
*Figure 3*. Students' early literacy growth effect sizes (Hedges $\delta_T$) from fall to spring for each hyperactivity/inattention stability classification.
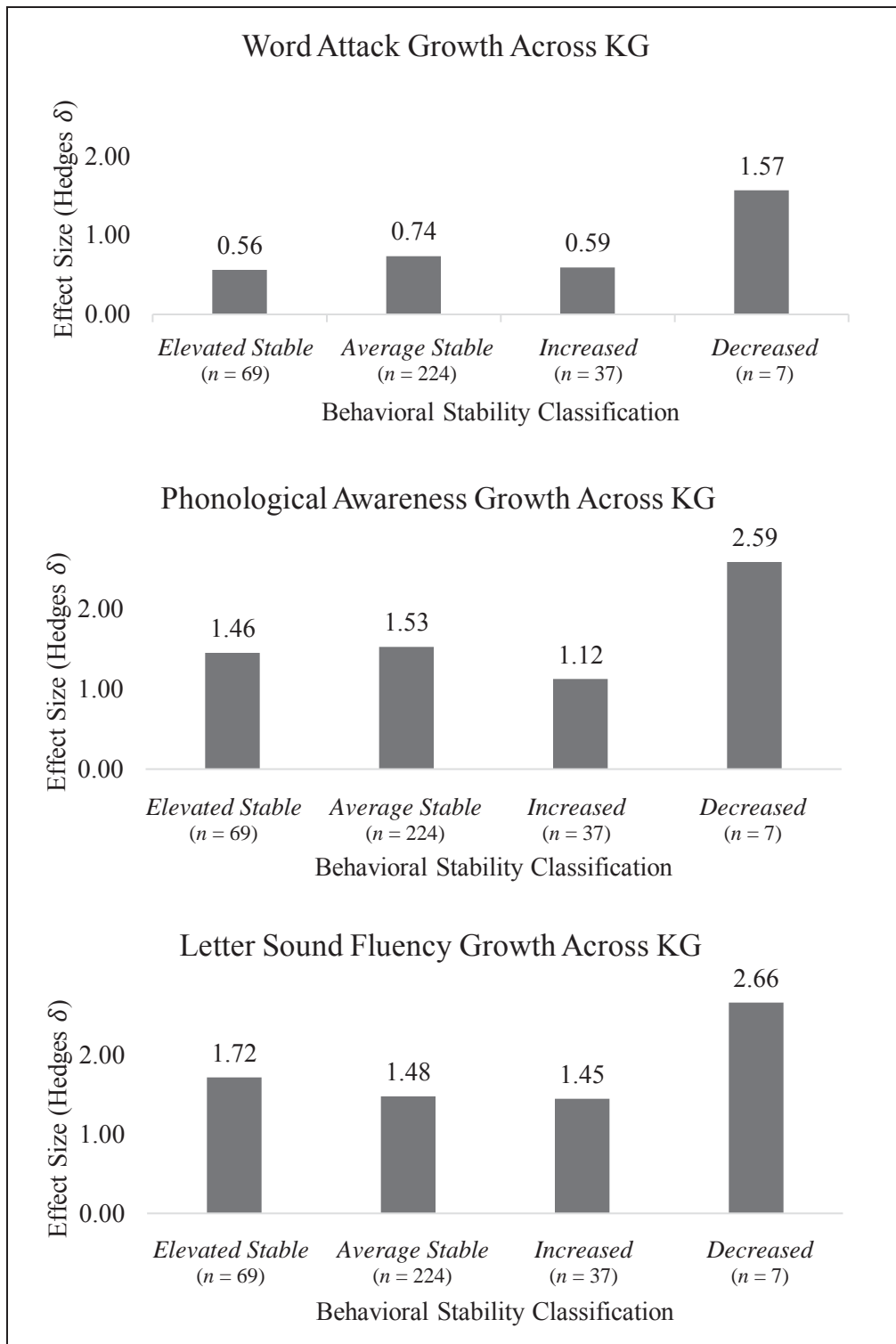
*Figure 4*. Students' early literacy growth effect sizes (Hedges $\delta_T$) from fall to spring for each defiance/aggression stability classification.
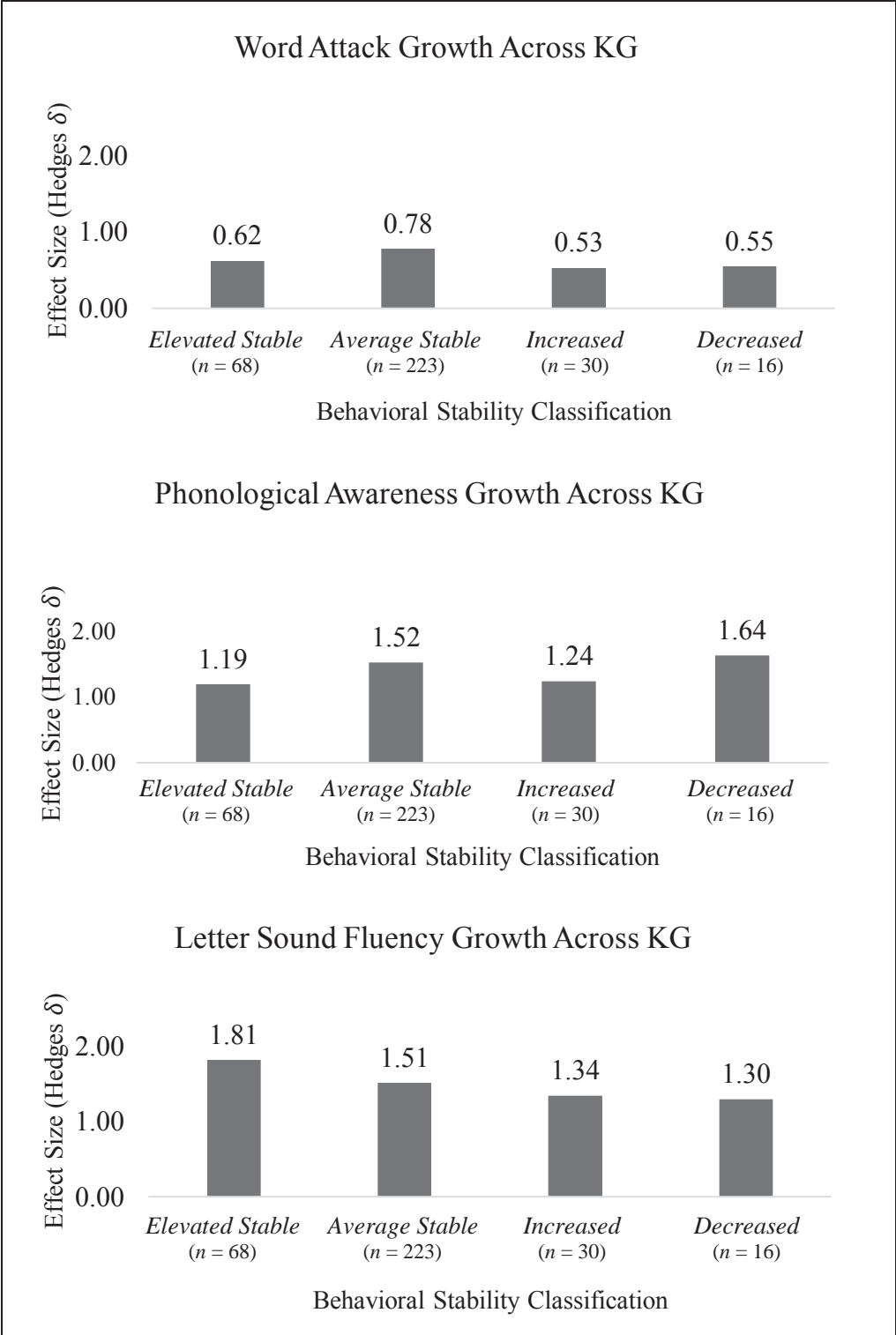
*Figure 5*. Students' early literacy growth effect sizes (Hedges $\delta_T$) from fall to spring for each mood/affect stability classification.