Journal of School Psychology 65 (2017) 69–82

Contents lists available at ScienceDirect

Journal of School Psychology

journal homepage: www.elsevier.com/locate/jschpsyc

Latent national subpopulations of early education classroom disengagement of children from underresourced families☆

Paul A. McDermott[a], Michael J. Rovine[a], Marley W. Watkins[b], Jessica L. Chao[a,*], Clare W. Irwin[c], Roland Reyes[a]

[a] *University of Pennsylvania, United States*
[b] *Baylor University, United States*
[c] *Education Development Center, Inc., Waltham, MA, United States*

ARTICLE INFO

Action Editor: Jochem Thijs

Keywords:
Disengagement
Reticence/Withdrawal
Growth mixture modeling
Early childhood education
Social-behavioral adjustment

ABSTRACT

This research examined the latent developmental patterns for early classroom disengagement among children from some of the most underresourced families in the nation. Based on standardized teacher observations from the Head Start Impact Study, a nationally representative sample of children (N = 1377) was assessed for manifestations of reticent/withdrawn and low energy behavior over four years spanning prekindergarten through first grade. For each form of disengagement, latent growth mixture modeling revealed three distinct subpopulations of change patterns featuring a dominant class associated with generally good classroom adjustment, a medial class that varied close to the population average over time, and a more extreme class (about 10% of the population) whose adjustment was relatively marginal and sometimes reached problematic levels. Whereas reticent/withdrawn behavior ordinarily subsided over time, low energy behavior increased. More extreme low energy behaviors tended to dissipate through schooling and extreme reticence/withdrawal became more accentuated, with both types associated with later academic and social problems. Attendant risk and protective factors are identified and mitigating assessment and prevention measures are discussed.

1. Introduction

Successful early schooling is dependent on the positive participation of children with teachers, classmates, and the learning activities that surround them. This positive participation is often called classroom engagement and the interactions that flow from it are deemed formative for eventual cognitive and social-emotional development (Mashburn et al., 2008; McWilliam & Casey, 2008; McWilliam, Scarborugh, & Kim, 2003; Willford, Vick Whittaker, Vitiello, & Downer, 2013) because they show the child how to encounter novelty and risk, seek assistance where needed, master new learning challenges, interact appropriately with teachers and peers, and respond reflectively and resiliently to failure and opposition (Fredricks, Blumenfeld, & Paris, 2004; McDermott et al., 2011).

The nature of classroom engagement and the relative structure of the classroom environs change as children transition from preschool to school (Fredricks et al., 2004; Powell, Burchinal, File, & Kontos, 2008; Searle, Sawyer, Miller-Lewis, & Baghurst, 2014),

☆ This research was conducted with the cooperation of the U.S. Department of Health and Human Services, Administration for Children and Families.
Correspondence concerning this article should be addressed to Paul A. McDermott, Graduate School of Education, University of Pennsylvania, 3700 Walnut Street, Philadelphia, PA 19104-6216.

* Corresponding author.
E-mail address: jec@gse.upenn.edu (J.L. Chao).

http://dx.doi.org/10.1016/j.jsp.2017.07.002
Received 26 August 2016; Received in revised form 31 March 2017; Accepted 9 July 2017
0022-4405/

but the residual effects of these early experiences have lasting influence for subsequent encounters with formal learning and life in general. Ample research literature supports that the quality of early school engagement connects predicatively to later educational achievement (Chien et al., 2010; Fredricks et al., 2004; Greenwood, Horton, & Utley, 2002), to social and emotional outcomes (McDermott, Rikoon, & Fantuzzo, 2016), and to school retention, absenteeism, delayed graduation, and accelerated dropout (Alexander, Entwisle, & Horsey, 1997; Buhs & Ladd, 2001; Ladd, Birch, & Buhs, 1999; Searle et al., 2014).

1.1. Forms of disengagement

Although classroom engagement is always active, it is not always positive. Negative classroom engagement is illustrated by aggressive, hyperactive, impulsive, or defiant behavior; commonly referred to as externalizing or overactive behavior problems (Noone-Lutz, Fantuzzo, & McDermott, 2002; Willford et al., 2013). Alternatively, when children can't or won't engage either positively or negatively, the behavioral state is more properly termed disengagement. Disengagement is marked by behavioral detachment or disconnection that could be described as pervasive shyness, diffidence, unassertiveness, reticence, withdrawal, inattention, sluggishness, or chronic lethargy. As is true for active engagement, classroom disengagement also foreshadows distal outcomes, but they are almost uniformly undesirable, including academic nonproficiency and social-emotional disturbances (Barghaus et al., 2017; Drogalis et al., 2017; Fantuzzo, Bulotsky, McDermott, Mosca, & Noone Lutz, 2003; Fantuzzo et al., 2007; Noone-Lutz et al., 2002). The current study focused selectively on the kinds of classroom disengagement that are manifest among that segment of the early education population that is at relative greatest risk for subsequent undesirable outcomes—children from some of the nation's most economically underresourced households (per the Head Start Impact Study [HSIS];U.S. Department of Health and Human Services [DHHS], 2010). Specifically, the investigation followed the developmental transitions in the forms of disengagement that have established construct validity as well as continuity from the earliest year of prekindergarten through first grade. These forms of classroom disengagement are known as low energy behavior and reticence/withdrawal (McDermott, Watkins, Rovine, & Rikoon, 2013).

Low energy and reticent/withdrawn forms of classroom disengagement were first identified in a study of a large sample of Head Start children from the nation's 5th largest and most economically impoverished city (Noone-Lutz et al., 2002). These dimensions correlated below or near zero with all identified forms of negative classroom engagement (aggression, oppositionality, hyperactivity) but produced very strong positive multivariate associations with social disconnection during classroom play, as assessed through the Penn Interactive Peer Play Scale (Fantuzzo, Coolahan, Mendez, McDermott, & Sutton-Smith, 1998). Similar strong associations were observed with the classroom Inattention scale of the Conners Teacher Rating Scale (Conners, 1990). In an extension of this work, Fantuzzo et al. (2003) jointly referred to low energy and reticence/withdrawal as forms of Head Start classroom disengagement and showed their strong inverse relationships to teacher assessments of children's physical movement and coordination and propensity to engage in social contexts with classmates and teachers. Based on a still larger and independent sample of Head Start children from the same urban locale, Fantuzzo et al. (2007) later confirmed the strong positive association between classroom disengagement and disconnected social interactions during play periods and also showed that the reticent form of disengagement is more likely to manifest in situations with teachers than with classmates.

The specific behaviors that define low energy and reticence/withdrawal were incorporated as items in the Adjustment Scales for Early Transition in Schooling (ASETS; McDermott et al., 2013). ASETS was chosen by the Head Start Bureau and DHHS (2010) to represent the social-emotional domain of child functioning within the national HSIS. The HSIS drew a large nationwide random sample of children who were eligible for Head Start entry and randomly permitted a portion to enter Head Start and the remaining portion to enter comparable non-Head Start preschool settings. Thus, the sample was designed to proportionately represent both Head Start enrollees and enrollees in alternative non-Head Start preschools. It further assessed participant children (both initial Head Start and non-Head Start enrollees) through two years of prekindergarten, kindergarten, and first grade, each year applying ASETS toward the close of the spring semester.

McDermott et al. (2013) used exploratory and confirmatory longitudinal factor analyses to establish the structural integrity and continuity of the ASETS low energy and reticence/withdrawal measures across time and, through IRT vertical equating and Bayesian scoring, established reliable scales that would reflect changes in performance while holding stable the integrity of the underlying disengagement constructs. The researchers demonstrated through multilevel individual growth-curve modeling that the low energy and Reticence/Withdrawal scales were sensitive to both linear change and to higher-order quadratic and cubic change. Moreover, they established that it was possible to isolate distinctly different change patterns as associated with children known to have later succeeded versus failed academically and to have appeared adjusted versus maladjusted by the close of first grade. Further, across the four years of HSIS, low energy and Reticence/Withdrawal assessments were significantly related to direct assessments of academic functioning, to teacher assessments of academic functioning, and to independent teacher and parent assessments of classroom and home social and emotional adjustment.

Whereas the prior work is fundamental and supportive of the prospect that low energy and reticence/withdrawal measures detect even complex curvilinear change over the early education years and furthermore can discover in retrospect the unique change patterns associated with children who eventually manifest desirable versus undesirable outcomes, it is unknown whether the measures can identify important latent subpopulations of children (developmental trajectories) that distinguish themselves in terms of growth patterns and levels of adjustment. It is also not known whether such distinct developmental trajectories are more or less likely related to eventual academic and social outcomes. Nor is there an understanding as to how such latent subpopulations of children might be unique in terms of antecedent child and family explanatory factors.

From a practical standpoint, school psychologists and other educators who are provided early warning of a child's likely membership in a given latent growth subpopulation and the prospects for more distant outcomes and possible explanatory factors are likely to be in a much better position when considering interventions or the need for them. In response, the current investigation was designed to identify latent subpopulations of each form of disengagement, how these subpopulations transition over the early school years, and how they relate to important outcomes and to precursor child and family characteristics.

1.2. The focal population

It is evident from the foregoing research that some communities of children are far more vulnerable than others as it pertains to potential educational disengagement. Most affected are those who arrive in prekindergarten from economically underresourced homes and socially stressed communities (DHHS, 2010; Isenberg et al., 2016). The challenges facing such children are daunting from the outset, considering that the average Head Start enrollee is functioning at the 15th to 20th percentile in areas of literacy, language, and mathematics (DHHS, 2003; Kopack Klein, Aikens, West, Lukashanets, & Tarullo, 2013). Further, these children, partly related to a dearth of strong social support networks (related to impoverishment, large proportions of new immigrants, English-language limitations, etc.), face high risk for continued academic and socioemotional stress (DHHS, 2010; Isenberg et al., 2016). The discovery that the dominant forms of classroom disengagement among Head Start children are low energy and reticent/withdrawn behavior and confirmation that these same forms of disturbance maintain construct stability, measurement reliability, and sensitivity to simple and complex change throughout the early education period, offer substantial promise for understanding the mechanisms that yield different transition pathways, precursors, and outcomes for children at relative risk.

1.3. The research questions

Within this context, we address three questions. First, are there latent and longitudinal subpopulations (developmental trajectories) of emergent low energy and reticent/withdrawn behavior as children transition through prekindergarten, kindergarten, and first grade? Second, do these subpopulations forecast scholastic nonproficiency and classroom adjustment problems (distal outcomes) at the close of prekindergarten and first grade? Third, to what extent do child personal and familial factors (gender, ethnicity, primary language, special needs, family structure, maternal age at childbirth, education, immigration) serve to affect the risk of child membership in the most problematic subpopulations of emergent classroom disengagement? Whereas prior research has highlighted the predictive agency of early classroom disengagement (Barghaus et al., 2017; Fantuzzo et al., 2003, 2007; Noone-Lutz et al., 2002), it has never done so by capturing a large and nationally representative probability sample that tracks disengagement throughout the early education years, nor has research identified important variations of developmental change, their related distal outcomes, and potentially explanatory precursors.

2. Method

2.1. Participants

The national Head Start Impact Study (HSIS; DHHS, 2010) was a randomized control trial designed to measure the relative effectiveness of Head Start and comparable prekindergarten programs. Our study centers exclusively on that portion of the sample deemed the 3-year-old cohort because only that cohort was tracked through two years of prekindergarten and then kindergarten and first grade. Participants were drawn at random from 223 prekindergarten agencies across all geographic regions of the United States, provided that each child was eligible for Head Start entry (essentially a family income below or close to the federal poverty level). Children were enrolled in prekindergarten in academic year 2002–2003 (AY0203) and followed through AY0506. This study focuses on those children for whom assessments of classroom low energy and reticent/withdrawn behavior were obtained. Assessments were completed by each child's classroom teacher at the end of the first year of prekindergarten (PreK 1), second prekindergarten year (PreK 2), kindergarten year (K), and first-grade year (1st grade).

Because some families migrated and some children transferred outside of accessible sampling regions over the period of the study, modest attrition resulted, with the national sample size varying as children moved from PreK 1 to 1st grade (i.e., PreK 1 $N = 1377$, PreK 2 $N = 1123$, K $N = 1080$, 1st grade $N = 1106$). Attrition was not related to performance on the longitudinal variables, effectively supporting the assumption that the children in the full sample were observed at random with some data missing at random (Little & Rubin, 2002).

Considering the full sample ($N = 1377$), M age at entry to the study was 3.64 years ($SD = 0.51$), with 49.0% of children being female, 38.8% Hispanic, 30.6% African American, 30.6% White or other race/ethnicity (this category as used by DHHS to properly frame the largest minority populations in Head Start), 19.5% primarily Spanish-speaking at entry, 13.4% identified with special needs, and 82.2% residing in urban areas. During PreK 1, children attended 541 preschool centers (867 classrooms) and during PreK 2581 centers (822 classrooms); while during K, children attended 715 schools (926 classrooms) and during 1st grade, 756 schools (999 classrooms). Through PreK years, as much as 80% of classrooms were not associated with conventional schools (approximately 60% being part-day environs such as day care or other non-school centers), with about 90% of post-PreK classrooms affiliated with public schools. Detailed sample characteristics are reported by DHHS (2010).

Certain demographic variables inform the risk status for the participant child sample and served as explanatory covariates in subsequent analyses. As determined by trained research technicians at the opening of AY0203, 48.4% of children lived with both biological parents, with 43.3% of mothers currently married, 42.9% never married, and 13.8% currently separated or divorced.

Additionally, 14.7% of mothers were teenagers (aged < 18 years) at the time of their child's birth, with 15.4% being recent immigrants and 32.5% unable to complete high school. Based on the overall demographic picture, the participant child sample was regarded at relative risk for serious social and academic problems (Federal Interagency Forum on Child and Family Statistics, 2008; Huston & Bentley, 2010).

2.2. Measures

2.2.1. Classroom disengagement

The Adjustment Scales for Early Transition in Schooling (ASETS; McDermott et al., 2013) is a standardized teacher rating scale designed especially for longitudinal assessment of classroom behavior. Each item is dichotomous indicating the presence or absence of a given behavior over the past month. Two of the scales pertain specifically to underactive or disengaged behavior; Low Energy features 12 items and Reticence/Withdrawal 24 items. Moreover, the items are presented in particular classroom situations (involving teacher, classmates, learning situations, organized play, group activities) in order to provide context and motivational clues about observed problem behavior. In addition to items that reflect either low energy or reticent/withdrawn behavior, each situation presents items that would alternatively describe aggressive or attention-seeking behaviors (viz., negative engagement), and in order to diminish negative response sets, at least one item that describes normal or commonplace behavior (none of these items contribute to the Low Energy or Reticence/Withdrawal scales). Example Low Energy items include, "Cannot work up energy to face anything new," "Too lethargic to ask for help," "Lacks interest, just sits," "Sluggish, apathetic in games," "Lacks physical energy when working with hands," and "Appears to live in a dream world." Sample Reticence/Withdrawal items include, "Freezes up and doesn't answer questions," "Is too timid to join in during free play," "Too withdrawn to come forward for jobs," "Afraid to budge during teacher directed time," and "Ignores all other children."

Each scale is based on longitudinal exploratory and confirmatory structural analyses across the four academic years, with item response theory (IRT) calibration under the two-parameter logistic model, vertical equating using nonbiased linking items (i.e., no differential item functioning), and scaled scores (*SS*s) via ex a posteriori (EAP) Bayesian estimation where the population $SS\ M = 50$ and $SD = 10$ at PreK 1, the reference year. Score increments for each scale are indicative of the observed presence of a given phenotype behavior (viz., Low Energy or Reticence/Withdrawal) across multiple different classroom contexts. Internal consistency as derived directly from the IRT EAP scores and their standard errors was 0.77 for Low Energy and 0.92 for Reticence/Withdrawal. Over the four years, the average correlation between Low Energy and Reticence/Withdrawal scores = 0.49 (range = 0.47–0.53), where canonical redundancy indicates that 25.5% of variability in Low Energy is predictable from Reticence/Withdrawal scores and 25.9% of variability in Reticence/Withdrawal is predictable from Low Energy scores. Thus ≈ 74.3% of the variability in the two scales is unique and independent. (Note: Just as the statistic known as the coefficient of determination [r^2] indicates the overlap in variance between two variables, canonical redundancy indicates the overlap between one multivariate set of variables [e.g., Low Energy scores at each of 4 time points] and another multivariate set of variables [e.g., Reticence/Withdrawal scores at those same 4 time points].) Substantial evidence for concurrent and predictive criterion validity, as well as sensitivity to linear and higher-order growth detection, was provided by McDermott et al. (2013).

2.2.2. Distal outcome measures

Direct assessments of achievement and teacher ratings of relationships with children, all measures collected toward the close of PreK 2 (culminating the two-year PreK period) and 1st grade (culminating the two-year post-PreK period) served as outcome measures to assess the validity of any latent subpopulations of classroom disengagement growth trajectories. As direct assessments, the Pre-Academic Skills cluster of the Woodcock-Johnson III Tests of Achievement (WJ; Woodcock, McGrew, & Mather, 2002) was administered. This cluster assesses letter and word identification and writing skills as well as practical mathematics problem solving by recognition of processes, counting, and calculating. HSIS PreK 2 and 1st-grade population α coefficients for the cluster range 0.76–0.78 (DHHS, 2010). Ample validity support has been reported for the WJ achievement cluster (Dumont & Willis, 2006; McGrew, Schrank, & Woodcock, 2007; Salvia, Ysseldyke, & Witmer, 2017).

Independent teacher ratings were obtained from the Positive Teacher Relationships subscale of the Pianta Student-Teacher Relationships Scale (Pianta, 1996). Items such as, "I share an affectionate, warm relationship with this child," are rated on a 5-point scale ranging from 1 = "Does not apply" to 5 = "Definitely applies." Positive Relationships contains 15 items and α coefficients range 0.88–0.89 (DHHS, 2010). Substantial concurrent and predictive validity evidence was provided by Pianta (2001) and Pianta and Stuhlman (2004).

2.3. Procedure

The three research questions respectively motivated the applications of latent growth mixture modeling (Duncan, Duncan, & Strycker, 2006; Ram & Grimm, 2009) to identify any unobserved subpopulations of longitudinal change in Low Energy and Reticence/Withdrawal, the regression of distal outcomes on resultant latent classes, and the regression of those latent classes on explanatory covariates representing available child and family demography.

Mplus version 7.3 (Muthen & Muthen, 2015) was used for all analyses, with imputation of missing data under full-information maximum-likelihood estimation. Models were estimated separately for Low Energy and Reticence/Withdrawal, through a series of both fixed (linear and polynomial) and latent basis approaches across the four academic years. Preferable models produced: (a) lower values for Akaike's Information Criterion (AIC), Schwarz's Bayesian Information Criterion (BIC) and Adjusted BIC (ABIC) than found for less complex models (Nylund, Asparouhov, & Muthen, 2007); (b) minimal values for the Integrated Classification Likelihood with Bayesian-type Approximation (ICL-BIC; McLachlan & Peel, 2000); (c) maximal values for entropy and average posterior classification accuracy (Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Nagin, 1999); (d) statistical significance for contrast with the model featuring one less latent class as per the Vuong-Lo-Mendell-Rubin, Lo-Mendell-Rubin, and parametric bootstrap (using 100 draws) likelihood ratio tests (Nylund et al., 2007); and (e) theoretically meaningful results (Ram & Grimm, 2009). Children's cross-membership in Low Energy and Reticence/Withdrawal latent growth classes was assessed through cross-tabulations and estimation of weighted coefficient κ (Fleiss, Levin, & Paik, 2003) for ordinal classes.

Given the preferred growth model for Low Energy and Reticence/Withdrawal, respectively, binary distal outcomes were generated and regressed on the latent class variables formed by the most likely posterior classifications. Binary outcomes were appropriate because: (a) the alternative WJ normal-curve equivalent scores and Pianta raw scores were significantly abnormally distributed and differentially skewed; (b) the WJ item-domain representation was relatively sparse below the 25th percentile with punctuated rather than graduated changes in item difficulty (a problem common to commercial tests; see McDermott et al., 2009); and (c) they would yield relative probabilities of desirable versus undesirable outcomes in late PreK 2 and 1st grade as a function of membership in each derived latent growth class. Thus, an outcome reflecting Academic Proficiency versus Nonproficiency was formed from WJ Pre-Academic Skills scores where Proficiency comprised performance in the upper three quartiles (scored 0) and Nonproficiency the lowest quartile (scored 1). Conversely, a Positive Relationships with Teacher indicator was formed from the Pianta subscale (upper quartile = 1). Quartiles were preferred because they provided the necessary statistical power for reliable point separation in logistic modeling (Stokes, Davis, & Koch, 1995). Probabilities of better versus poorer outcomes associated with each latent growth class were obtained using the M*plus* DCAT function.

The 3-step method (Asparouhov & Muthen, 2014) was applied to regress resultant latent classes on the explanatory demographic covariates while accounting for measurement error in posterior classifications. Each model held the covariates as simultaneous binary explanatory variables, including child personal indicators (child sex, ethnicity [Latino, African American, with White and others as reference group], English as a secondary language [ESL], and provision of special needs services) and family indicators (child resides with both biological parents vs. not, family resides in an urban area vs. not, mother is married vs. not, mother was an adult vs. teenager at child's birth, mother is a recent immigrant vs. not, mother completed high school vs. not) in a multinomial logistic regression model using the general logit link function. Final models were constructed through sequential series of pilot models examining collinearity, simple, interactive, and additive effects for smaller sets of covariates (per Hosmer & Lemeshow, 2000) as guided to the extent possible by prior research (McDermott et al., 2013). Variables such as child's age at preschool entry and full day versus part-day preschool attendance were not included because they showed no significant relationship to Low Energy or Reticence/Withdrawal scores. The objective was to ascertain the relative risk increment or reduction for latent growth class membership (estimated through the odds ratio) associated with each demographic variable.

3. Results

3.1. Latent growth models

The longitudinal variable observations were nested within teachers who may have observed more than one child. Latent growth mixture modeling provides no practical mechanism for estimating parameters that are nested longitudinally. Rather, we calculated the harmonic mean number of children assessed by teachers for each dependent variable during each year and the associated design effect (Snijders, 2005). The grand harmonic mean number of children assessed per teacher = 1.13 (range 1.05–1.24), yielding a trivial grand mean design effect = 1.02 (range 1.00–1.06) for Low Energy and 1.02 (range 1.00–1.03) for Reticence/Withdrawal, where 1.00 indicates absence of variation between teachers. Thus, any nesting effects are regarded as essentially inconsequential.

Models derived through polynomial growth estimates were uniformly better fitting than those through latent basis estimation. Table 1 presents properties, fit statistics, and parameter estimates for the best alternative models pertaining to Low Energy behavior and Table 2 to Reticence/Withdrawal. In all instances, models estimating quadratic curvature provided best fit, with linear slopes variability consistently nonsignificant statistically (and thus fixed to 0.0) and significant quadratic slopes variability. The latter indicates that, whereas changes in children's trajectories of classroom disengagement within the various latent classes did not vary linearly, change trajectories did vary quadratically among children within classes. Moreover, estimates of residual variance were allowed to vary across academic years, producing better model fit as partly related to the differing amounts of available data over time. For both Low Energy and Reticence/Withdrawal, the 3-class model was preferable. The 3-class Low Energy solution met all of the stated criteria (except minimum ABIC) including minimal ICL-BIC and maximal entropy and posterior classification accuracy. Whereas the 2-class Reticence/Withdrawal model produced minimal ICL-BIC and maximal classification accuracy and the 4-class model featured minimal AIC, BIC and ABIC and maximal entropy, the 4-class model failed in two likelihood-ratio tests to show statistically significant improvement over the 3-class model, whereas the 3-class model did evidence general statistical improvement and greater entropy over the 2-class alternative, and quite good fit on all other grounds.

The estimated mean subpopulation trajectories for Low Energy and Reticence/Withdrawal are displayed in Figs. 1 and 2, respectively. For convenience, the lowest classes (in terms of *SS*s) are named Well Adjusted where mean *SS*s generally range from the population mean (50) downward, the middle classes are titled Adequately Adjusted with *SS* means rallying around the population mean, and the highest classes called Marginally Adjusted, reflecting the *SS* mean levels reaching a maximum of 1½ *SD*s above the population mean. (Refer to Supplementary Table A for report of estimated and observed means.) Based on posterior membership estimates, 66.6% of change trajectories for Low Energy and 65.9% for Reticence/Withdrawal were classified Well Adjusted,

Table 1
Properties, fit statistics, and parameter estimates for latent growth mixture models of early childhood low energy.

	1-Class model	2-Class model	3-Class model	4-Class model
Sample size				
Class 1, N_{C1}	1377.00	1151.14	917.46	946.88
Class 2, N_{C2}		225.86	327.77	152.85
Class 3, N_{C3}			131.77	199.28
Class 4, N_{C4}				78.00
Fit statistics				
# Free parameters	10	14	18	19
Akaike's Information Criterion (AIC)	31,212	30,539	29,817	29,607
Schwarz's Bayesian Information Criterion (BIC)	31,264	30,612	29,911	29,707
Sample size adjusted BIC (ABIC)	31,232	30,568	29,854	29,646
Integrated Classification Likelihood (ICL-BIC)		30,712	29,935	30,222
Entropy		0.948	0.992	0.865
Average class membership posterior probability		0.983	0.996	0.928
Vuong-Lo-Mendell-Rubin LRT, p		< 0.0001	0.0001	0.0022
Lo-Mendell-Ribin adjusted LRT, p		< 0.0001	0.0002	0.0026
Parametric bootstrap LRT (via 100 draws), p		< 0.0001	< 0.0001	< 0.0001
Latent variable means				
Class 1 intercept, γ_{01}	49.79 (0.17)	47.40 (0.10)	45.88 (0.00)	48.35 (0.18)
Class 1 linear slope, γ_{11}	− 0.79 (0.29)	1.51 (0.26)	3.13 (0.25)	− 2.90 (0.25)
Class 1 quadratic slope, γ_{21}	0.45 (0.10)	− 0.10 (0.09)†	− 0.50 (0.10)	1.01 (0.07)
Class 2 intercept, γ_{02}		62.90 (0.41)	55.02 (0.16)	50.86 (0.79)
Class 2 linear slope, γ_{12}		− 13.32 (0.92) †	− 6.00 (0.55)	− 8.92 (1.11)
Class 2 quadratic slope, γ_{22}		3.41 (0.32)	1.67 (0.20)	4.91 (0.32)
Class 3 intercept, γ_{03}			66.12 (0.40)	52.74 (0.68)
Class 3 linear slope, γ_{13}			− 17.04 (1.05)	4.06 (0.99)
Class 3 quadratic slope, γ_{33}			4.42 (0.39)	− 1.52 (0.29)
Class 4 intercept, γ_{04}				56.15 (1.27)
Class 4 linear slope, γ_{14}				16.56 (1.85)
Class 4 quadratic slope, γ_{24}				− 5.88 (0.55)
Latent variable variances and covariances				
Intercept, $\sigma^2\gamma_0$	8.31 (1.48)	1.48 (0.74)	0.86 (0.40)	0.00 [fixed]
Linear slope, $\sigma^2\gamma_1$	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]
Quadratic slope, $\sigma^2\gamma_2$	0.25 (0.08)	0.28 (0.07)	0.35 (0.06)	0.00 [fixed]
Intercept by linear slope, $\sigma^2\gamma_0\sigma^2\gamma_1$	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]
Intercept by quadratic slope, $\sigma^2\gamma_0\sigma^2\gamma_2$	− 1.30 (0.24)	0.15 (0.15)	0.08 (0.08)	0.00 [fixed]
Linear slope by quadratic slope, $\sigma^2\gamma_1\sigma^2\gamma_2$	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]
Residual variances				
Academic year 1, σ^2_{e1}	37.31 (2.36)	10.51 (0.93)	2.18 (0.46)	42.70 (2.22)
Academic year 2, σ^2_{e2}	25.62 (2.48)	30.30 (2.67)	31.16 (2.63)	2.76 (0.36)
Academic year 3, σ^2_{e3}	44.37 (3.50)	47.37 (3.57)	47.99 (3.57)	56.80 (4.03)
Academic year 4, σ^2_{e4}	37.73 (5.38)	33.93 (5.08)	30.70 (4.80)	24.02 (2.48)

Note. LRT = Likelihood Ratio Test. All parameter estimates are significant statistically unless indicated by the † symbol. Parenthetical values are estimated standard errors.

23.6%–23.8% were classified Adequately Adjusted for each type of classroom disengagement, and 9.6% of Low Energy trajectories and 10.5% of Reticence/Withdrawal trajectories were classified Marginally Adjusted.

The dominant Well Adjusted subpopulations (nearly ⅔ of the population) for Low Energy and Reticence/Withdrawal are distinctly different. Most children actually manifest increasing Low Energy behavior as time passes, with positive linear and negative quadratic growth (amounting to ≈½ *SD* increment in average scores). In stark contrast, the prevailing transitions in Reticence/Withdrawal show steady decreases in that type of disengagement, with both negative linear and quadratic trends (an ≈½ *SD* decrement in average scores).

The change trajectories for Adequately Adjusted Low Energy and Reticence/Withdrawal (≈ 25% of the population) both display negative linear and positive quadratic trends with scores tending to vary in the vicinity of the population mean. But remarkable differences are evident between the Marginally Adjusted subpopulations (≈ 10% of the population), where over time Low Energy behavior decreases precipitously (mostly linear) after initial assessment in PreK 1, culminating in a > 1 *SD* drop by the close of 1st grade, while Marginally Adjusted Reticence/Withdrawal increases 1 *SD* by the end of 1st grade. At their apogees, the mean *SS*s for Low Energy at first assessment and Reticence/Withdrawal at last assessment approach or exceed 1½ *SD*s above the population mean, clearly falling within a recognized subclinical zone for problem behavior (McDermott et al., 2016; Rikoon, McDermott, & Fantuzzo, 2012).

The low canonical redundancy between the Low Energy and Reticence/Withdrawal measures and the distinctly different latent growth classes produced in mixture modeling are echoed in the co-membership of children associated with the three growth classes

Table 2
Properties, fit statistics, and parameter estimates for latent growth mixture models of early childhood Reticence/Withdrawal.

	1-Class model	2-Class model	3-Class model	4-Class model
Sample size				
Class 1, N_{C1}	1377.00	1063.94	907.56	683.92
Class 2, N_{C2}		313.06	325.06	339.15
Class 3, N_{C3}			144.38	216.94
Class 4, N_{C4}				136.99
Fit statistics				
# Free parameters	10	14	18	20
Akaike's Information Criterion (AIC)	32,322	31,988	31,798	31,727
Schwarz's Bayesian Information Criterion (BIC)	32,374	32,062	31,892	31,832
Sample size adjusted BIC (ABIC)	32,343	32,017	31,835	31,768
Integrated Classification Likelihood (ICL-BIC)		32,545	32,576	32,616
Entropy		0.747	0.774	0.794
Average class membership posterior probability	0.912	0.905	0.898	
Vuong-Lo-Mendell-Rubin LRT, p		< 0.0001	< 0.0001	0.2590†
Lo-Mendell-Ribin adjusted LRT, p		< 0.0001	< 0.0001	0.2675 †
Parametric bootstrap LRT (via 100 draws), p		< 0.0001	< 0.0001	< 0.0001
Latent variable means				
Class 1 intercept, γ_{01}	49.79 (0.22)	49.07 (0.27)	48.68 (0.30)	47.94 (0.30)
Class 1 linear slope, γ_{11}	− 2.64 (0.31)	− 1.88 (0.38)	− 1.35 (0.40)	− 0.52 (0.38)
Class 1 quadratic slope, γ_{21}	0.69 (0.10)	0.12 (0.12)†	− 0.16 (0.12)†	− 0.51 (0.11)†
Class 2 intercept, γ_{02}		52.32 (0.63)	50.76 (0.56)	50.51 (0.56)
Class 2 linear slope, γ_{12}		− 5.29 (0.95)	− 3.92 (0.81)	− 3.24 (0.72)
Class 2 quadratic slope, γ_{22}		2.60 (0.30)	1.64 (0.24)	0.86 (0.21)
Class 3 intercept, γ_{03}			54.55 (1.03)	50.85 (0.67)
Class 3 linear slope, γ_{13}			− 7.73 (1.55)	− 4.13 (0.86)
Class 3 quadratic slope, γ_{33}			3.70 (0.47)	1.92 (0.27)
Class 4 intercept, γ_{04}				55.30 (0.98)
Class 4 linear slope, γ_{14}				− 8.18 (1.39)
Class 4 quadratic slope, γ_{24}				3.82 (0.42)
Latent variable variances and covariances				
Intercept, $\sigma^2\gamma_0$	20.81 (3.04)	22.47 (2.96)	17.74 (2.06)	1.05 (0.41)
Linear slope, $\sigma^2\gamma_1$	1.95 (0.71)	1.47 (0.59)	0.00 [fixed]	0.00 [fixed]
Quadratic slope, $\sigma^2\gamma_2$	0.00 [fixed]	0.00 [fixed]	0.19 (0.06)	0.00 [fixed]
Intercept by linear slope, $\sigma^2\gamma_0\sigma^2\gamma_1$	− 3.00 (1.26)	− 5.48 (1.14)	0.00 [fixed]	0.00 [fixed]
Intercept by quadratic slope, $\sigma^2\gamma_0\sigma^2\gamma_2$	0.00 [fixed]	0.00 [fixed]	− 1.72 (0.25)	0.00 [fixed]
Linear slope by quadratic slope, $\sigma^2\gamma_1\sigma^2\gamma_2$	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]	0.00 [fixed]
Residual variances				
Academic year 1, σ^2_{e1}	48.12 (3.36)	45.78 (3.30)	49.04 (2.67)	64.07 (2.45)
Academic year 2, σ^2_{e2}	39.23 (2.53)	40.29 (250)	38.45 (2.51)	51.12 (2.80)
Academic year 3, σ^2_{e3}	45.41 (2.80)	49.33 (2.82)	49.24 (2.77)	54.44 (2.96)
Academic year 4, σ^2_{e4}	39.49 (3.54)	19.94 (2.61)	6.55 (3.12)	2.25 (0.36)

Note. LRT = Likelihood Ratio Test. All parameter estimates are significant statistically unless indicated by the † symbol. Parenthetical values are estimated standard errors.

produced for each model. Fig. 3 illustrates the cross-membership results. Were children perfectly cross-classified, or relatively consistently cross-classified, to the same latent classes (e.g., Marginally Adjusted to Marginally Adjusted, etc.) across models, the values on the principal diagonal (shown in boldface) would be 100.0% or close to 100.0% and the values on the off-diagonals would be 0.0% or close thereto. Instead, the only noticeable degree of consistent cross-membership is found for children classified as Well Adjusted for both Low Energy and Reticence/Withdrawal (the upper left panel; i.e., ≈ 71.6% agreement). But there is no relative correspondence across Low Energy and Reticence/Withdrawal for those classified as Adequately Adjusted (the center panel; ≈ only 25.2% agreement, with most children classified Well Adjusted for the opposite form of disengagement) and Marginally Adjusted (the lower right panel; ≈ only 23.1% agreement, with most children again classified Well Adjusted for the opposite form of disengagement). Weighted $\kappa = 0.10$, indicating an absence of overall correspondence in membership across Low Energy and Reticence/Withdrawal latent classes, and reflecting the fact that the change patterns across disengagement forms tend to tell quite different stories.

3.2. External validity evidence

Figs. 4 and 5 illustrate the relative probabilities of each distal outcome associated with each latent growth class for Low Energy and Reticence/Withdrawal, respectively. Thus, Fig. 4(a) shows that the mean probability of Academic Nonproficiency (i.e., lack of sufficient achievement in literacy and mathematics) at the close of PreK 2 doubles significantly from 0.21 for members of the Well Adjusted class of Low Energy behavior to 0.42 for the Marginally Adjusted class, and again at the close of 1st grade the probability of

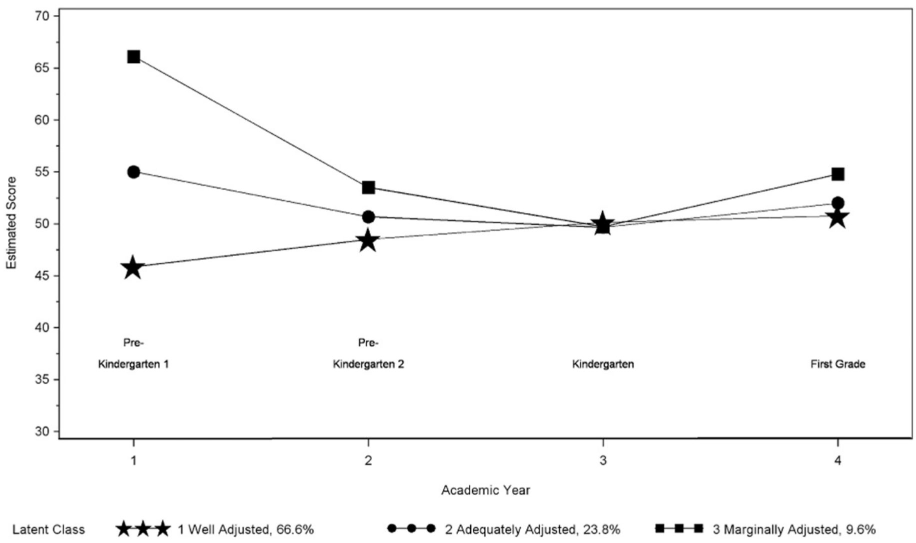

Fig. 1. Estimated mean latent growth trajectories for low energy.

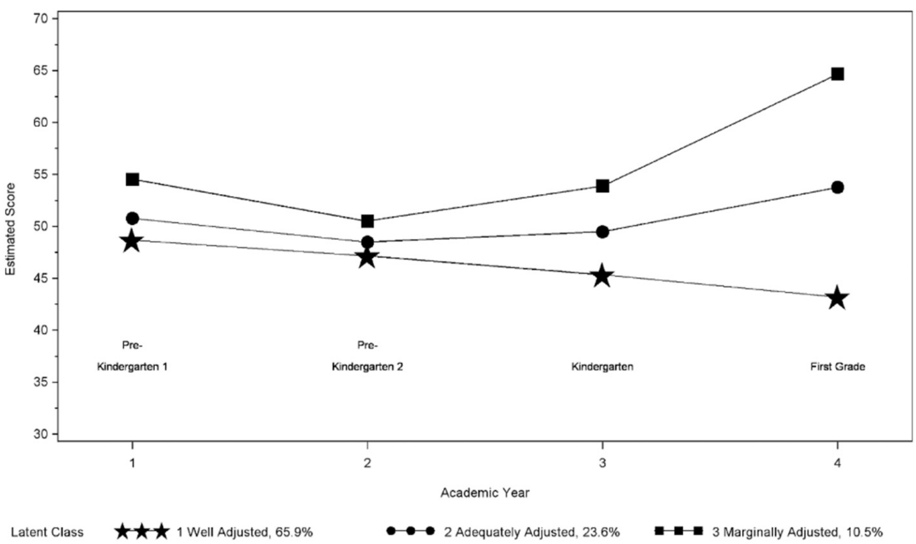

Fig. 2. Estimated mean latent growth trajectories for reticence/withdrawal.

		RETICENCE/WITHDRAWAL		
	Row % / *Column %*	Well Adjusted	Adequately Adjusted	Marginally Adjusted
LOW ENERGY	Well Adjusted	**74.4** / *68.8*	18.8 / *65.2*	6.9 / *51.6*
	Adequately Adjusted	68.5 / *22.8*	**22.4** / *28.0*	9.1 / *24.6*
	Marginally Adjusted	63.9 / *8.4*	13.9 / *6.8*	**22.3** / *23.8*

Fig. 3. Cross-membership in latent classes of low energy and reticent/withdrawn behavior ($N = 1377$). Values on the principal diagonal are boldface, where entries would be 100.0% if cross-membership was in total agreement.

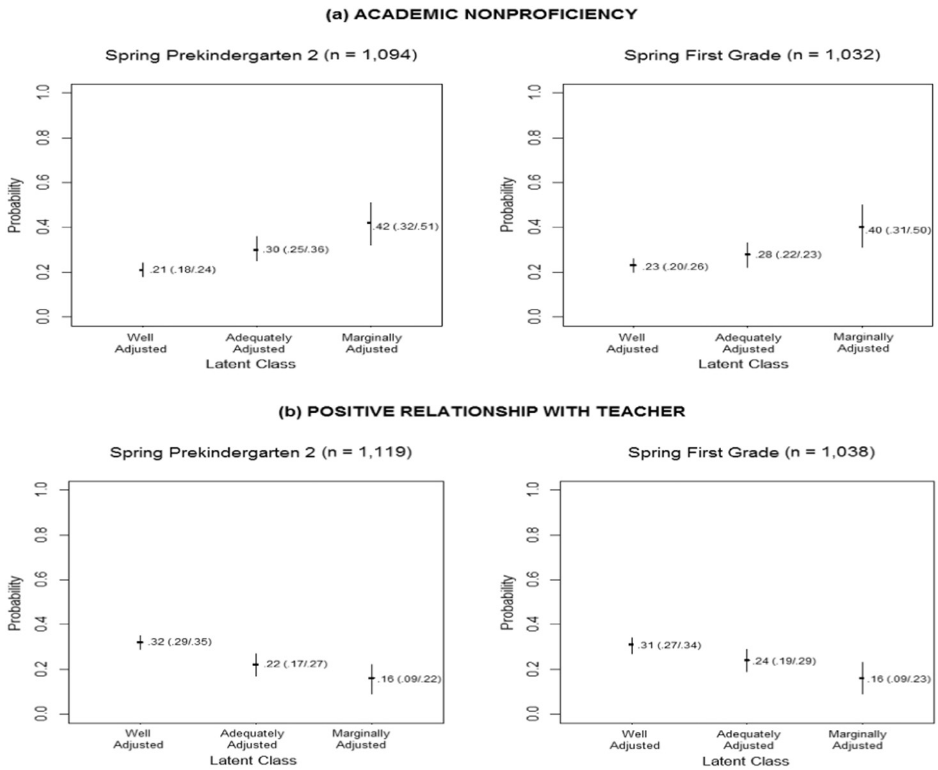

Fig. 4. Predicted probability (and 95% confidence bands) of indicator outcomes associated with membership in latent growth classes of low energy.

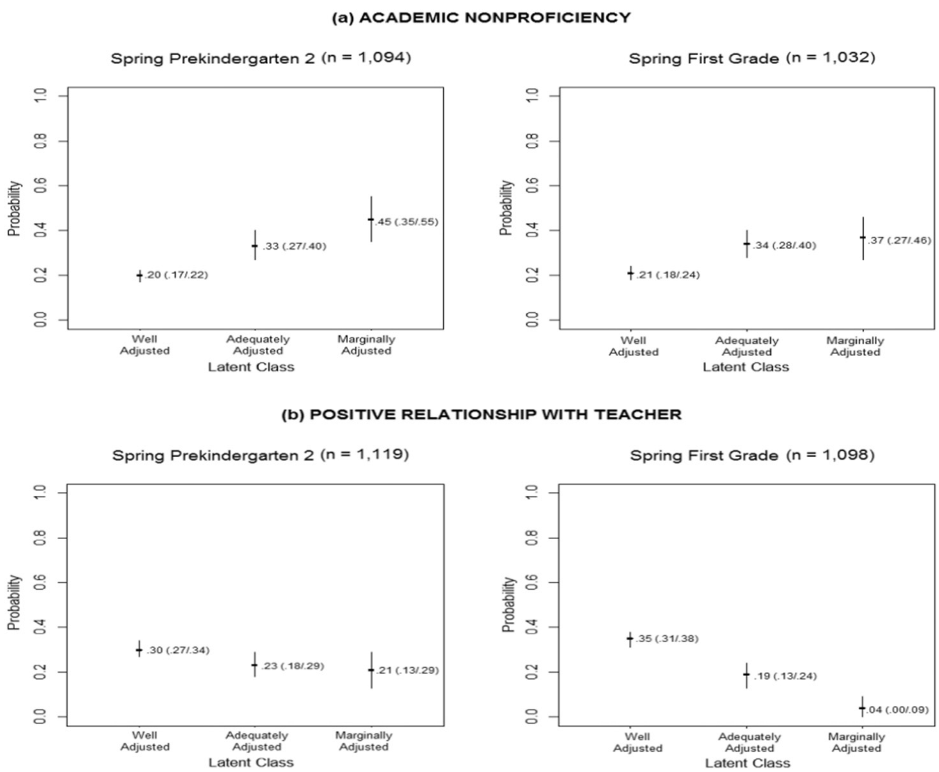

Fig. 5. Predicted probability (and 95% confidence bands) of indicator outcomes associated with membership in latent growth classes of reticence/withdrawal.

Table 3
Explanatory relationship between early explanatory variables and latent classes of change in low energy.

Explanatory variable	Odds ratio (95% confidence limits)	% Risk increment[a]
Odds for classification as marginally adjusted (latent class 3) vs. Well Adjusted (latent class 1)		
Child is male (vs. female)	2.09 (1.42/3.07)	109.0
Child uses English as a secondary language	1.78 (1.17/2.71)	78.1
Child is provided special needs services	1.64 (0.99/2.70)	
Odds for classification as adequately adjusted (latent class 2) vs. Well Adjusted (latent class 1)		
Child is male (vs. female)	1.53 (1.18/1.97)	52.7
Child uses English as a secondary language	1.02 (0.74/1.42)	
Child is provided special needs services	1.66 (1.16/2.36)	65.5

Note. Values are estimated through multimomial logistic regression applying the generalized logit link function where the latent growth classes are regressed simultaneously on explanatory variables and latent class 1 (Well Adjusted) is the reference group.
[a] Entries equal odds ratio - 1 (100).

Academic Nonproficiency moves from 0.22 for the Well Adjusted to 0.40 for the Marginally Adjusted. The probabilistic separation of Adequately Adjusted Low Energy behavior from Well Adjusted is evident only at PreK 2. In Fig. 4(b) pertaining to likelihood of Positive Relationships with Teacher, the patterns are expectedly reversed where probability of a positive relationship is cut in half from 0.32 for members of the Well Adjusted class to 0.16 for the Marginally Adjusted class of Low Energy behavior, and the reversal is echoed again at 1st grade where the probability of positive relationships drops from 0.31 for the Well Adjusted to 0.16 for the Marginally Adjusted.

A very similar pattern is shown in Fig. 5(a) for the relationship between latent growth classes of Reticence/Withdrawal and PreK 2 and 1st-grade Academic Nonproficiency. At the PreK 2 assessment the probability of Nonproficiency more than doubles for Marginally Adjusted children (0.45) over Well Adjusted children (0.20), and with the Nonproficiency probability also higher for Adequately Adjusted children than Well Adjusted children. Viewing Fig. 5(b), which presents the probabilities for Positive Relationships with Teacher as related to children's subpopulations of Reticence/Withdrawal, a rather more remarkable pattern is observed. By PreK 2, the probability of positive relationships is significantly higher for Well Adjusted children than Marginally Adjusted children, but the distinctions become manifestly greater by the end of 1st grade. At that point the probability of positive relationships cascades precipitously from 0.35 for Well Adjusted to 0.19 for Adequately Adjusted to merely 0.04 for the Marginally Adjusted. Notice that this 1st-grade period is commensurate with the widest separation among the three Reticence/Withdrawal latent classes illustrated in Fig. 2. Overall it is clear that the Low Energy and Reticence/Withdrawal growth classes demonstrate significant and appropriately distinct associations with relevant late prekindergarten and post-prekindergarten outcomes.

3.3. Explanatory evidence

Table 3 presents results of the generalized multinomial logistic regression of the Low Energy latent growth classes on preexisting explanatory variables and Table 4 presents similar information for the Reticence/Withdrawal growth classes. Only statistically significant main effects remain in these final models (no interactions were significant) as reported in the tables and each explanatory variable appearing in a given table is controlled for all other variables appearing in that table. For Low Energy classes (Table 3), male children are found consistently at higher risk for membership in the Marginally and Adequately Adjusted classes (vs. the Well Adjusted reference group), whereas the risk for membership in the Marginally Adjusted Low Energy class is increased when children use English as a secondary language and risk for membership in the Adequately Adjusted Low Energy class is increased when children require services for special needs. A dramatically different phenomenon is evident for Reticence/Withdrawal (Table 4) where the significant explanatory variables function as protective rather than risk factors. Specifically, mothers' completion of high school operates as a universal agent to reduce the risk of Marginally or Adequately Adjusted (vs. Well Adjusted) Reticence/Withdrawal and mothers' more mature age at the time of childbirth operates to diminish the risk of Adequately versus Well Adjusted Reticence/

Table 4
Explanatory relationship between early explanatory variables and latent classes of change in reticence/withdrawal.

Explanatory variable	Odds ratio (95% confidence limits)	% Risk reduction[a]
Odds for classification as marginally adjusted (latent class 3) vs. Well Adjusted (latent class 1)		
Mother is an adult (vs. a teenager)	1.44 (0.70/2.95)	
Mother has completed high school	0.59 (0.38/0.91)	41.0
Odds for classification as adequately adjusted (latent class 2) vs. Well Adjusted (latent class 1)		
Mother is an adult (vs. a teenager)	0.59 (0.39/0.91)	40.8
Mother has completed high school	0.65 (0.46/0.93)	34.6

Note. Values are estimated through multimomial logistic regression applying the generalized logit link function, where the latent growth classes are regressed simultaneously on explanatory variables and latent class 1 (Well Adjusted) is the reference group.
[a] Entries equal 1 - odds ratio (100).

Withdrawal.

4. Discussion

This research sought to discover the latent developmental patterns for early classroom disengagement among children from the most underresourced families in the nation. The focus was on low energy and reticent/withdrawn behavior because those are the specific subtypes found nationwide in early education; that is, the subtypes of disengagement characteristic of broad community rather than clinical samples. McDermott et al. (2013) showed that both forms of disengagement were capable of detecting complex change across the early education years. That study used multilevel individual growth-curve modeling for a preliminary demonstration of growth detection sensitivity for newly designed measures, whereas the central focus of that work was the design, construct structure, scaling, and validation of the measures themselves. Given that earlier evidence for sensitivity to differential growth, the present study applied growth mixture modeling to identify the latent developmental patterns for classroom disengagement. This approach has the particular benefit of revealing unobserved, naturally occurring, and predominant groups (subpopulations) of developmental patterns in the national population, their relative frequencies, and adjusting for statistical uncertainty and measurement error, empirically assessing competing grouping models, and enabling the simultaneous estimation of linear and higher-order change patterns. These distinct groups of developmental patterns from the current study were thereafter simultaneously linked to distinct explanatory precursors and to multiple distal outcomes. Evidence of different subpopulations of developmental change patterns is important because it illustrates the basic nature of early transition in schooling and because it usually suggests the mead for different preventive and corrective interventions (Bornstein, Hahn, & Suwalsky, 2013; Trembley, 2010).

The present research revealed that each form of disengagement manifests three distinct subpopulations of change patterns, featuring a dominant class associated with generally good classroom adjustment (comprising nearly two-thirds of the population), a medial class whose performance levels and transitions are near the population average (about a quarter of the population), and a more extreme class whose adjustment is relatively marginal and sometimes reaches problematic levels (about 10% of the population). Beyond this, the manifest similarities between the developmental patterns of the two forms of disengagement disappear, with the most common change pattern for low energy behavior evincing a gradual increase in observable problems as children move out of prekindergarten and on into kindergarten and 1st grade, while the predominant trend for children's reticence and withdrawal shows a steady decrease in disengagement as time passes. Moreover, the developmental signatures for the more problematic latent classes of disengagement are dramatically unique. Marginally adjusted low energy behavior presents as quite prevalent when children are still in their first prekindergarten year but problem levels appear to subside greatly through early school transition, only to show some evidence of elevation by the close of 1st grade. On the other hand, marginal reticence and withdrawal is relatively elevated and a departure from other subpopulations even with the first assessments of children in prekindergarten and it remains visibly more problematic throughout early school transitions, eventually rising to more marked extremes as children leave prekindergarten and begin formal schooling.

Considering simultaneously the pathways of both forms of disengagement, it is clear that, except for some reasonable likelihood that a child regarded as well adjusted for low energy would be found well adjusted for reticence/withdrawal, there is little overlap in child membership across the two forms of classroom disengagement. Therefore, a given child's developmental pattern for one form of disengagement is separate and unique from the developmental pattern for the other form of disengagement.

The dominant increments in low energy behavior and decrements in reticence/withdrawal are important discoveries. As pertains to most at risk children, the early education increment in low energy behavior would appear to be practically inconsequential because at its most elevated period in 1st grade, children's performance is entirely consistent with the population average, except for the fact that children with the highest scores in prekindergarten are still more likely to incur academic and social problems at the close of 1st grade. Additionally, the emblematic decreases in reticence and withdrawal for most children is both good news and likely related to the socializing influences of schooling and developmental encounters with people and situations that progressively encourage or demand productive involvement with teachers, peers, and learning activities (Willford, Maier, Downer, Pianta, & Howes, 2013).

Further clues may be uncovered by studying the nature of the marginally adjusted classes of disengagement. First, the evidence is compelling that membership in a marginal class for either low energy or reticent/withdrawn behavior is associated with markedly higher probabilities of children experiencing undesirable academic and social outcomes. Second, any elevated subpopulations of low energy behavior are substantially more likely for male children and even adequate versus good adjustment is a greater risk for children requiring special needs assistance. This may suggest some biological or bioepigenetic (Trembley, 2010) factors undergirding more pronounced low energy behavior. Use of English as a secondary language also serves as a risk marker for marginal low energy behavior; this could have many explanations, including fatigue related to new language immersion (Sears, 2015; Vicars, Steinberg, McKenna, & Cacciattolo, 2015). As for explanatory markers for marginal reticence/withdrawal, whereas potentially biologic factors play no obvious role, social/maternal factors certainly do. More elevated and developmentally progressive Reticence/Withdrawal is far less likely for children born to adult mothers and both adult motherhood and higher maternal education function to reduce the risk of adequate versus well-adjusted levels of that form of disengagement. It may be that more mature and educated motherhood enables increased parental contact, investment, resources, modeling, stability, and literacy and language capacities (Arnold, Zeljo, Doctoroff, & Ortiz, 2008; Nord & West, 2001).

4.1. Limitations

Our research is limited by the depth and breadth of information collected for the national HSIS. We simply do not know the detailed classroom or family dynamics that substantially or comparatively earmark membership in different latent classes of disengagement for economically underresourced children. This would necessitate the more powerful lens afforded by a vastly more expansive and costly research design than the HSIS. We also are limited by an absence in the HSIS of a broader array of sociological/ecosystem information (e.g., religion and social support services, social stressors, neighborhood structural decline, crime; see Bronfenbrenner & Morris, 1998, and Gross & McDermott, 2008) that might serve as useful control agents in determining the unique explanatory factors associated with early classroom disengagement. Nor does the HSIS study design provide any data to inform the contributions of genetics to observed behavior patterns. Further, it is important to emphasize that our research is designed to reveal salient latent growth trajectories and associated precursors and outcomes; it is not designed to answer questions about actual causality.

4.2. Assessing contexts for classroom disengagement

The observational measure that was employed for HSIS (ASETS; McDermott et al., 2013) was selected partly because each item is situated in a very specific classroom context. The factor scales covering disengagement function to compile the additive effect of each behavioral phenotype (low energy or reticence/withdrawal) as it becomes more pervasive across many contexts. The same instrument also yields scores that reflect, not the increments in the two phenotypes but rather the emergence of problem behaviors within specific, factorially-integral types of classroom contexts; i.e., problems that emerge within teacher contexts versus peer contexts versus learning contexts. The scales are called situtypes, as depicting the situations within which disengagement is manifest (McDermott, Watkins, Rovine, & Rikoon, 2014). Thus a given child can be dually assessed for relative low energy or reticent/withdrawn behavior (the forms of disengagement) as well as the specific contexts of observation (the where, when, and with whom of emergent problems). The latter information is applied to inform the differential circumstances and possible motivations for the disengaged behavior, both key issues for planning interventions.

In practice we would advise that the ASETS instrument be applied during the latter half of the first semester of a child's first year in prekindergarten. The school psychologist should look for Low Energy scores that exceed 60 or Reticence/Withdrawal scores that exceed 55. These are fairly good signals that a child is more likely to incur both academic and social problems while moving through prekindergarten and on into kindergarten and 1st grade. Such early elevation in Reticence/Withdrawal scores also tend to be associated with eventual increments in that type of behavior as children transition through early education. In turn, the psychologist should be vigilant for ASETS score elevations ($SS \geq 55$) among the situtypes for problems occurring specifically in contexts with the teacher or classmates or learning activities. This latter information will often reveal the when and where of disengagement behavior and suggest good starting places for forming interventions. Subsequent applications of ASETS can confirm changes in the direction of adjustment patterns.

5. Conclusion

Children's earliest transitions in schooling are formative, requiring reciprocal learning incentives and child participation. We have for the case of those children viewed at greatest risk, mapped out both the common developmental pathways of classroom disengagement and the rarer pathways that tend to signal undesirable and perhaps adverse outcomes. For any such children the most impactful deterrent is sustained and artful promotion of positive classroom engagement. One approach is to structure interactions among children, teachers, and the varied contexts available in the classroom (Bundick, Quaglia, Corso, & Haywood, 2014; Herman, Borden, Webster-Stratton, & Reinke, 2011; McHugh, Tingstrom, Radley, Barry, & Walker, 2016; Morgan, 2006; Weiss, Osborne, & Dean, 2015). Still another approach assesses and augments classroom learning behaviors (McDermott et al., 2011). Learning behaviors, or approaches to learning, describe how children are engaged in classroom learning, highlighting engagement with teachers, peers, and activities. They are taught through programmed instruction and modeling and integrated within standing curricula rather than featured as add-on components (refer to Fantuzzo, Gadsden, & McDermott, 2011, for an example framed in a randomized control trial). Thereby skills are built in areas such as effectiveness motivation, interpersonal responsiveness in learning, vocal engagement in learning, strategic planning, sustained focus in learning, acceptance of novelty and risk, and group learning.

Successful classroom engagement is also fostered by families who hold education in high regard. It tends to follow that parents who themselves engage in activities surrounding the early education experience are seen as models by children and other parents (Weiss, Lopez, & Rosenburg, 2010). Accordingly, student engagement might be enhanced by improved teacher-parent communications (Kraft & Dougherty, 2013), positive teacher-student relationships (Roorda, Koomen, Spilt, & Oort, 2011), and effective parenting (Hurlburt, Nguyen, Reid, Webster-Stratton, & Zhang, 2013; Sanders, Kirby, Tellegen, & Day, 2014). Degrees of family involvement are now empirically assessable (Fantuzzo et al., 2013) and fortified through nationwide policy initiatives under the U.S Department of Education's Dual Capacity-Building Framework for Family-School Partnerships (Mapp & Kuttner, 2013).

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jsp.2017.07.002.

References

Alexander, K. L., Entwisle, D. R., & Horsey, C. S. (1997). From first grade forward: Early foundations of high school dropout. *Sociology of Education*, *70*, 87–107.

Arnold, D. H., Zeljo, A., Doctoroff, G. L., & Ortiz, C. (2008). Parent involvement in preschool: Predictors and the relation of involvement to preliteracy development. *School Psychology Review*, *37*, 74–90.

Asparouhov, T., & Muthen, B. (2014). Approaches for auxiliary variables in mixture modeling: 3-step approaches using Mplus (ver. 8). *Mplus Web Notes, No. 15*.

Barghaus, K., Fantuzzo, J., LeBoeuf, W., Henderson, C., Li, F., & McDermott, P. (2017). Problems in classroom engagement: Validation of an assessment for district-wide use in the early primary grades. *Early Education and Development*, *28*, 154–166.

Bornstein, M. H., Hahn, C.-S., & Suwalsky, J. T. D. (2013). Developmental pathways among adaptive functioning and externalizing and internalizing behavioral problems: Cascades from childhood into adolescence. *Applied Developmental Science*, *17*, 76–87. http://dx.doi.org/10.1080/10888691.2013.774875.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 1: Theoretical models of human development* (pp. 993–1028). (5th ed.). New York, NY: Wiley.

Buhs, E. S., & Ladd, G. W. (2001). Peer rejection as an antecedent of young children's school adjustment: An examination of mediating processes. *Developmental Psychology*, *37*, 550–560.

Bundick, M. J., Quaglia, R. J., Corso, M. J., & Haywood, D. E. (2014). Prompting student engagement in the classroom. *Teachers College Record*, *116*, 1–34.

Chien, N. C., Howes, C., Burchinal, M., Pianta, R. C., Ritchie, S., Bryant, D. M., ... Barbarin, O. A. (2010). Children's classroom engagement and school readiness gains in prekindergarten. *Child Development*, *81*, 1534–1549. http://dx.doi.org/10.1111/j.1467-8624.2010.01490.x.

Conners, C. K. (1990). *Conners rating scales manual*. Toronto, Canada: Multi-Health Systems.

Drogalis, A. R., McDermott, P. A., Watkins, M. W., Chao, J. L., Worrell, F. C., & Hall, T. E. (2017). Parent and teacher perspectives on psychological adjustment: A national measurement study in Trinidad and Tobago. *International Journal of School and Educational Psychology*, *5*(2), 74–87.

Dumont, R., & Willis, J. O. (2006). Test descriptions and reviews. In E. Fletcher-Janzen, & C. R. Reynolds (Eds.), *The special education almanac* (pp. 39–146). Hoboken, NJ: Wiley.

Duncan, T. E., Duncan, S. C., & Strycker, L. A. (2006). *An introduction to latent variable growth curve modeling: Concepts, issues, and applications* (2nd ed). New York, NY: Psychology Press.

Fantuzzo, J., Bulotsky, R., McDermott, P. A., Mosca, S., & Noone Lutz, M. (2003). A multivariate analysis of emotional and behavioral adjustment and preschool educational outcomes. *School Psychology Review*, *32*, 185–203.

Fantuzzo, J., Coolahan, K., Mendez, J., McDermott, P. A., & Sutton-Smith, B. (1998). Contextually-relevant validation of peer play constructs with African American head start children: Penn interactive peer play scale. *Early Child Research Quarterly*, *3*, 411–431.

Fantuzzo, J., Gadsden, V., Li, F., Sproul, F., McDermott, P., Hightower, D., & Minney, A. (2013). Multiple dimensions of family engagement in early childhood education: Evidence for a short form of the Family Involvement Questionnaire. *Early Child Research Quarterly*, *28*, 734–742.

Fantuzzo, J. F., Bulotsky-Shearer, R., McDermott, P. A., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *School Psychology Review*, *36*, 44–62.

Fantuzzo, J. W., Gadsden, V. L., & McDermott, P. A. (2011). An integrated curriculum to improve mathematics, language, and literacy for head start children. *American Educational Research Journal*, *48*, 763–793.

Federal Interagency Forum on Child and Family Statistics (2008). *America's children in brief: Key national indicators of well-being, 2008*. Washington, DC: U.S. Government Printing Office.

Fleiss, J. L., Levin, B., & Paik, M. C. (2003). *Statistical methods for rates and proportions* (3rd ed). Hoboken, NJ: Wiley.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*, 59–109.

Greenbaum, P. E., Del Boca, F. K., Darkes, J., Wang, C., & Goldman, M. S. (2005). Variation in the drinking trajectories of freshman college students. *Journal of Consulting and Clinical Psychology*, *73*, 229–238.

Greenwood, C. R., Horton, B. T., & Utley, C. A. (2002). Academic engagement: Current perspectives on research and practice. *School Psychology Review*, *31*, 328–349.

Gross, K. S., & McDermott, P. A. (2008). Use of city archival data to inform dimensional structure of neighborhoods. *Journal of Urban Health*, *86*, 161–182.

Herman, K. C., Borden, L. A., Webster-Stratton, C., & Reinke, W. M. (2011). The impact of the incredible years parent, child, and teacher training programs on children's co-occurring internalizing symptoms. *School Psychology Quarterly*, *26*, 189–201.

Hosmer, D. W., & Lemeshow, S. L. (2000). *Applied logistic regression* (2nd ed). New York, NY: Wiley.

Hurlburt, M. S., Nguyen, K., Reid, J., Webster-Stratton, C., & Zhang, J. (2013). Efficacy of the incredible years group parent program with families in head start who self-reported a history of child maltreatment. *Child Abuse & Neglect*, *37*, 531–543.

Huston, A. C., & Bentley, A. C. (2010). Human development in social context. *Annual Review of Psychology*, *61*, 411–437.

Isenberg, E., Max, J., Gleason, J., Johnson, M., Deutsch, J., Hansen, M., & Angelo, L. (2016). Do low-income students have equal access to effective teachers? Evidence from 26 districts (Report No. NCEE 2017-4007). Retrieved from: https://ies.ed.gov/ncee/pubs/20174008/pdf/20174007.pdf.

Kopack Klein, A., Aikens, N., West, J., Lukashanets, S., & Tarullo, L. (2013). *Data tables for FACES 2009 report getting ready for kindergarten: Children's progress during Head Start (OPRE Report 2013-21b)*. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services. Retrieved from http://www.acf.hhs.gov/sites/default/files/opre/data_tables_for_faces_2009_child_outcomes_brief.pdf.

Kraft, M. A., & Dougherty, S. M. (2013). The effect of teacher-family communication on engagement: Evidence from a randomized field experiment. *Journal of Research on Educational Effectiveness*, *6*, 199–222.

Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence. *Child Development*, *70*, 1373–1400.

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed). New York, NY: Wiley.

Mapp, K. L., & Kuttner, P. J. (2013). *Partners in education: A dual capacity-building framework for family-school partnerships*. Austin, TX: SEDL. Retrieved from http://www.sedl.org/pubs/framework/FE-Cap-Building.pdf.

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O., Bryant, D., et al. (2008). Measures of classroom quality in pre-kindergarten and children's development of academic, language, and social skills. *Child Development*, *68*, 732–749.

McDermott, P. A., Fantuzzo, J. W., Warley, H. P., Waterman, C., Angelo, L. E., Sekino, S., & Gadsden, V. L. (2011). Multidimensionality of teachers' graded responses for preschoolers' stylistic learning behavior: The learning-to-learn scales. *Educational and Psychological Measurement*, *71*, 148–169.

McDermott, P. A., Fantuzzo, J. W., Waterman, C., Angelo, L. E., Warley, H. P., Gadsden, V. L., & Zhang, X. (2009). Measuring preschool cognitive growth while it's still happening: The learning express. *Journal of School Psychology*, *47*, 337–366.

McDermott, P. A., Rikoon, S. H., & Fantuzzo, J. (2016). Transition and protective agency of early childhood learning behaviors as portents of later school attendance and adjustment. *Journal of School Psychology*, *52*, 59–75.

McDermott, P. A., Watkins, M. W., Rovine, M. J., & Rikoon, S. H. (2013). Assessing changes in socioemotional adjustment across the early school transitions—new national scales for children at risk. *Journal of School Psychology*, *51*, 97–115.

McDermott, P. A., Watkins, M. W., Rovine, M. J., & Rikoon, S. H. (2014). Informing context and change in young children's sociobehavioral development —the national adjustment scales for early transition in schooling (ASETS). *Early Child Research Quarterly*, *29*, 255–267.

McGrew, K. S., Schrank, F. A., & Woodcock, R. W. (2007). *Woodcock-Johnson III normative update: Technical manual*. IL: Riverside: Rolling Meadows.

McHugh, M. B., Tingstrom, D. H., Radley, K. C., Barry, C. T., & Walker, K. M. (2016). Effects of tootling on class wide and individual disruptive and academically engaged behavior of lower-elementary students. *Behavioral Interventions*, *31*, 332–354.

McLachlan, G., & Peel, D. (2000). *Finite mixture modeling*. New York, NY: Wiley.

McWilliam, R. A., & Casey, A. M. (2008). *Engagement of every child in the preschool classroom*. Baltimore, MD: Brooks.

McWilliam, R. A., Scarborugh, A. A., & Kim, H. (2003). Adult interactions and child engagement. *Early Education and Development*, *14*, 7–27.

Morgan, P. L. (2006). Increasing task engagement using preference or choice-making. *Remedial and Special Education*, *27*, 176–187.

Muthen, L. K., & Muthen, B. O. (2015). *Mplus (Ver. 7.3). Los Angeles, CA*. (Authors).

Nagin, D. S. (1999). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods*, *4*, 139–156.

Noone-Lutz, M., Fantuzzo, J. F., & McDermott, P. A. (2002). Multidimensional assessment of emotional and behavioral adjustment of low-income preschool children: Development and initial validation. *Early Child Research Quarterly*, *17*(338–355), 396–601.

Nord, C. W., & West, J. (2001). *Fathers' and mothers' involvement in their children's schools by family type and resident status (NCES 2001-032)*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Nylund, K. L., Asparouhov, T., & Muthen, B. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, *14*, 535–569.

Pianta, R. C. (2001). *Student-teacher relationship scale professional manual*. Lutz, FL: Psychological Assessment Resources.
Pianta, R. C., & Stuhlman, M. W. (2004). Teacher-child relationships and children's success in the first years of school. *School Psychology Review*, *33*, 444–458.
Pianta, R. G. (1996). *Student-teacher relationship scale*. Charlottesville, VA: University of Virginia.
Powell, D. R., Burchinal, M. R., File, N., & Kontos, S. (2008). An eco-behavioral analysis of children's engagement in urban public school preschool classrooms. *Early Child Research Quarterly*, *23*, 108–123.
Ram, N., & Grimm, K. J. (2009). Growth mixture modeling: A method for identifying differences in longitudinal change among unobserved groups. *International Journal of Behavioral Development*, *33*, 565–576.
Rikoon, S. H., McDermott, P. A., & Fantuzzo, J. W. (2012). Approaches to learning among head start alumni: Structure and validity of the learning behaviors scale. *School Psychology Review*, *41*, 272–294.
Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*, 493–529.
Salvia, J., Ysseldyke, J. E., & Witmer, S. (2017). *Assessment in special and inclusive education* (13th ed). Boston, MA: Cengage Learning.
Sanders, M. R., Kirby, J. N., Tellegen, C. L., & Day, J. J. (2014). The triple p-positive parenting program: A systematic review and meta-analysis of a multi-level system of parenting support. *Clinical Psychology Review*, *34*, 337–357.
Searle, A. K., Sawyer, M. C., Miller-Lewis, L. R., & Baghurst, P. A. (2014). Prospective associations between children's preschool emotional and behavioral problems and kindergarten classroom engagement, and the role of gender. *The Elementary School Journal*, *114*, 380–405.
Sears, C. (2015). Enabling emergent bilingual students to access the language of the classroom. *Second language students in English-medium classrooms: A guide for teachers in international schools* (pp. 183–200). Buffalo, NY: Multilingual Matters.
Snijders, T. A. B. (2005). Power and sample size in multilevel linear models. In B. S. Everitt, & D. C. Howell (Vol. Eds.), *Encyclopedia of statistics in behavioral science*. *Vol. 3*. *Encyclopedia of statistics in behavioral science* (pp. 1570–1573). New York, NY: Wiley.
Stokes, M. E., Davis, C. S., & Koch, G. G. (1995). *Categorical data analysis using the SAS system*. Cary, NC: SAS Institute.
Trembley, R. B. (2010). Developmental origins of disruptive behaviour problems: The 'original sin' hypothesis, epigenetics and their consequence for prevention. *Journal of Child Psychology and Psychiatry*, *51*, 341–367.
U.S. Department of Health and Human Services (2003). Strengthening head start: What the evidence shows. Retrieved from http://aspe.hhs.gov/hsp/strengthenheadstart03/.
U.S. Department of Health and Human Services (2010). *Head start impact study technical report*. Washington, DC: Administration for Children and Families.
Vicars, M., Steinberg, S. R., McKenna, T., & Cacciattolo, M. (Eds.), (2015). *The praxis of English language teaching and learning (PELT): Beyond the binaries: Researching critically in EFL classrooms*. New York, NY: Springer.
Weiss, H. B., Lopez, M. E., & Rosenburg, H. (2010, December). Beyond random acts: Family, school, and community engagement as an integral part of education reform. *National Policy Forum for Family, School, and Community Engagement*Cambridge, MA: Harvard Family Research Project. Retrieved from http://eac.wested.org/wp-content/uploads/2013/07/beyond_random_acts.pdf.
Weiss, R., Osborne, K. J., & Dean, E. L. (2015). Effectiveness of a universal, interdependent group contingency program on children's academic achievement: A countywide evaluation. *Journal of Applied School Psychology*, *31*, 199–218.
Willford, A. P., Maier, M. F., Downer, J. T., Pianta, R. C., & Howes, C. (2013). Understanding how children's engagement and teachers' interactions combine to predict school readiness. *Journal of Applied Developmental Psychology*, *34*, 299–309.
Willford, A. P., Vick Whittaker, J. E., Vitiello, V. E., & Downer, J. T. (2013). Children's engagement within the preschool classroom and their development of self-regulation. *Early Education and Development*, *24*, 162–187.
Woodcock, R. W., McGrew, K. S., & Mather, N. (2002). *Woodcock-Johnson III tests of achievement*. Itasca, IL: Riverside.