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Authors

Stadnick, Nicole A
Meza, Rosemary D
Suhrheinrich, Jessica
et al.

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Leadership profiles associated with the implementation of behavioral health evidence-based practices for autism spectrum disorder in schools

Nicole A Stadnick[1,2], Rosemary D Meza[3], Jessica Suhrheinrich[2,4], Gregory A Aarons[1,2], Lauren Brookman-Frazee[1,2], Aaron R Lyon[3], David S Mandell[5] and Jill Locke[3]

Abstract

Implementation of evidence-based practice (EBP) for autism spectrum disorder (ASD) in the education system is a public health priority. Leadership is a critical driver of EBP implementation but little is known about the types of leadership behaviors exhibited by school leaders and how this influences the context of EBP implementation, particularly for students with ASD. The objectives of this study were to determine (1) the leadership profiles of principals involved in EBP implementation for students with ASD and (2) how these leadership profiles related to school characteristics and implementation climate. The Exploration, Preparation, Implementation, Sustainment (EPIS) framework was used to guide the design and analysis of this study. Participants (n = 296) included principals, teachers, and classroom support staff. They provided demographic information and completed the Multifactor Leadership Questionnaire and Implementation Climate Scale. Using latent profile analysis, a three-pattern solution was identified: *Disengaged* (6% of sample), *Undifferentiated* (23% of sample), and *Optimal* (71% of sample). Principals in schools with higher proportions of students with an individualized education program were more likely to be classified as *Undifferentiated* than *Optimal*. The *Optimal* group was associated with more positive implementation climate than the *Undifferentiated* or *Disengaged* groups. Findings suggest that leadership behaviors rated by principals and their staff involved in implementation of common autism EBPs can be meaningfully clustered into three discernible profiles that are shaped by organizational context and linked to strategic implementation climate. Our study findings have implications for leadership training and service delivery in schools by underscoring the critical nature of school leadership during implementation of EBPs for children with autism and the interplay between specific leadership behaviors and strategic implementation climate.

Keywords

autism spectrum disorder, EPIS framework, evidence-based practices, implementation science, leadership, principal, schools

Introduction

Galvanized by the need to improve access to and availability of effective services for behavioral and mental health treatment and support, increased implementation of evidence-based practices (EBPs) has been recognized as a public health priority (Hoagwood et al., 2014; McHugh & Barlow, 2010; Nakamura et al., 2014; Starin et al., 2014; Trupin & Kerns, 2015). The critical need to promote large-scale EBP implementation is particularly salient for school systems that increasingly serve children with autism spectrum disorder (ASD). Children with ASD represent a clinically complex and high priority population due to the rising prevalence and substantial healthcare expenditures

[1]University of California, San Diego, USA
[2]Child and Adolescent Services Research Center, USA
[3]University of Washington, USA
[4]San Diego State University, USA
[5]University of Pennsylvania, USA

Corresponding author:
Nicole Stadnick, Child and Adolescent Services Research Center, 3020 Children's Way, MC 5033, San Diego, CA 92123, USA.
Email: nstadnick@ucsd.edu

(Christensen et al., 2014; Leigh & Du, 2015). Children with ASD often require more healthcare and educational services than children with other special healthcare needs (Bitterman, Daley, Misra, Carlson, & Markowitz, 2008; Gurney, McPheeters, & Davis, 2006; Montes, Halterman, & Magyar, 2009). The education system is the primary service sector in which children with ASD are involved (Brookman-Frazee et al., 2009; Kang-Yi, Locke, Marcus, Hadley, & Mandell, 2016; Mandell, Cao, Ittenbach, & Pinto-Martin, 2006). A necessary ingredient to support successful EBP implementation in community service settings is effective leadership (Aarons, Ehrhart, Farahnak, & Sklar, 2014; Aarons, Ehrhart, Torres, Finn, & Beidas, 2017). The primary focus of this study was to determine the leadership profiles of principals overseeing EBP implementation for children with ASD and the association of these leadership profiles with school characteristics and EBP implementation climate. In the following sections, we summarize the literature on EBP implementation in schools and describe the application of the selected implementation science framework to inform our study design and explicit focus on leadership and implementation climate.

There are formal recommendations for and current initiatives to implement EBPs in schools (California Autism Professional Training and Information Network [CAPTAIN], 2017; Howard, Ladew, & Pollack, 2009; National Professional Development Center on ASD, 2017). However, EBP implementation in schools is fraught with challenges, such as the heterogeneous needs of children with ASD, resource-intensive interventions, limited teacher training in EBPs, and variation in the school context to adopt, implement, and sustain EBPs (Chasson, Harris, & Neely, 2007; Dingfelder & Mandell, 2011; Iovannone, Dunlap, Huber, & Kincaid, 2003; Locke et al., 2015; Proctor et al., 2009; Stahmer et al., 2015).

Many factors influence EBP implementation in schools (Domitrovich et al., 2008; Owens et al., 2014). Several implementation science frameworks delineate the multilevel and multifactor determinants of EBP implementation in various service settings (e.g. Damschroder et al., 2009; Glasgow, Vogt, & Boles, 1999). The Exploration, Preparation, Implementation, Sustainment (EPIS) framework (Aarons, Hurlburt, & Horwitz, 2011; Moullin, Dickson, Stadnick, Rabin, & Aarons, 2019) was developed to delineate key domains and factors, and processes likely to affect EBP implementation and sustainment in public service sectors such as behavioral health, child welfare, and schools. The EPIS framework was selected to guide the study objectives and interpretation of results as it addresses key domains and processes of interest in this study. In particular, inner context factors (individual and organizational characteristics), such as leadership and implementation climate, influence EBP implementation, and we focus our examination on these contextual factors (Aarons, Cafri, Lugo, & Sawitzky, 2012; Beidas et al., 2014; Beidas et al., 2016; Bonham, Sommerfeld, Willging, & Aarons, 2014).

A growing body of literature suggests that leadership is one of the most, if not the most important inner setting factor in supporting successful implementation of EBPs in community service settings (Aarons, Ehrhart, et al., 2014; Aarons, Ehrhart, Torres, et al., 2017). EBP implementation in schools necessitates coordinated efforts from multiple leaders (e.g. school principals and district special education directors) who direct decision-making and provide oversight to school personnel (e.g. teachers) who ultimately deliver EBPs (Camburn, Rowan, & Taylor, 2003). In this study, we examine school-level leadership, represented by principals, given principals' potential importance as organizational supporters and drivers of change to instructional practices, including EBP implementation (Forman & Barakat, 2011; Lyon et al., 2018). Beyond specific EBP implementation efforts, principals' leadership has demonstrated important impacts on student academic outcomes and classroom effects (Bowers, Blitz, Modeste, Salisbury, & Halverson, 2017; Leithwood & Jantzi, 2006). For example, a study of school-specific transformational leadership (TL) (i.e. setting direction, developing people, organizational redesign) influenced classroom practices including identified classroom level motivation, capacity, and work setting effects (Leithwood & Jantzi, 2006). A meta-analysis found that overall TL (with varying definitions) had a small but significant effect on students' achievement and that leader behaviors of building collaboration and providing individualized support accounted for significant proportions of variance in outcomes (Sun & Leithwood, 2012). Thus, school leaders, namely principals play a key role in driving changes to instructional practices, including but not limited to EBP implementation efforts.

For this study, we rely on the full-range model of leadership, the most studied taxonomy of leadership (Avolio, 1999, 2011; Barling, Christie, & Hoption, 2011). This model delineates five leadership categories: TL, contingent reward (CR), management by exception active (MEA), management by exception passive (MBEP), and laissez-faire/avoidant (LF/A). Briefly, TL is characterized by inspiring staff to achieve optimal outcomes; CR, (or transactional leadership), occurs when leaders provide support by means of incentives and rewards contingent on task performance; MEA is characterized by proactive identification of staff performance concerns and resolving them; MBEP occurs when leaders reactively address performance concerns; LF/A is characterized by a "hands off" approach (Bass & Riggio, 2006). Individuals may exhibit behaviors consistent with varying degrees of these categories across the full-range model.

Building upon (Arnold, Connelly, Gellatly, Walsh, & Withey, 2017), we used a person-oriented approach to

examine leadership profiles of school principals directing oversight of EBP implementation for students with ASD. This approach offers the advantages of comprehensively examining leadership behaviors coupled with a more nuanced examination of intra-individual variation (Bergman & Lundh, 2015; Foti, Thompson, & Allgood, 2011). Previous person-oriented approaches to study leadership have consistently identified an "optimal" pattern of leadership (Arnold et al., 2017; Doucet, Fredette, Simard, & Tremblay, 2015; Foti, Bray, Thompson, & Allgood, 2012). However, distinctive patterns have emerged (Arnold et al., 2017; Doucet et al., 2015) and would be expected for principals, a unique type of leader whose roles do not fully reflect that of corporate management (Hallinger, 1992).

The effect of leadership on EBP implementation is likely mediated by its influence on EBP implementation climate, defined as shared perceptions of staff that the adoption and use of an innovation are expected, supported, and rewarded by their organization (Ehrhart, Aarons, & Farahnak, 2014; Klein, Conn, Smith, & Sorra, 2001; Klein, Conn, & Sorra, 2001; Weiner, Belden, Bergmire, & Johnston, 2011). Thus, this study also examines the influence of leadership patterns on EBP implementation climate within the context of school-based implementation of EBPs for children with ASD. Better understanding of leadership, particularly within the context of EBP implementation in public schools, may inform the best ways in which to address challenging implementation barriers. The participating schools in this study had policies to implement best practices for students with ASD. Data for this study were extracted from a larger study examining the impact of EBP implementation specifically for students with ASD following school staff EBP training (Locke et al., 2016). To this end, we had two objectives: (1) to identify profiles of leadership styles in a sample of principals and staff involved in implementation of EBPs for students with ASD, and (2) to evaluate the association between observed leadership styles, school characteristics, and EBP implementation climate.

Method

Participants

Participants included 61 principals, 96 teachers, and 139 classroom support staff members (1:1 assistant or classroom assistant) across elementary schools (kindergarten through third-grade) in the northeastern and northwestern USA. Ninety-two schools were invited to participate based on the eligibility criteria that the school had a kindergarten through third-grade special education classroom for students with ASD. Of the invited schools, 18 declined to participate and 7 more were not included because they had fewer than three staff working in their autism support classrooms or they were missing more than 30% of data elements. At least three respondents are needed for data aggregation of organizational-level variables. Thus, 67 schools (73%) participated. School districts in these regions selected three EBPs specific for students with ASD (discrete trial training, pivotal response training, and visual supports) to implement. These EBPs are based on the principles of applied behavior analysis to address academic, behavioral, and social outcomes for children with ASD (Arick, Loos, Falco, & Krug, 2004; Arick et al., 2003). Data for the current study were collected from a subsample of schools in these regions that had received training in these three EBPs. Principals were not directly involved in the delivery of the EBPs. Rather, they provided administrative and fiscal oversight of teacher and staff delivery of the EBPs. University institutional review boards and each school district approved the study.

School personnel were predominantly women (62% principals; 97% teachers; 93% support staff), and varied in whether they had specialized ASD training (17% principals; 70% teachers; 49% support staff). Additional sociodemographic and professional characteristics for each participant group are displayed in Table 1.

Schools had an average of 584 enrolled students (SD = 196; Range: 290–1125) and served a racially/ethnically diverse student population. The average number of students per classroom was 8.2. The racial/ethnic distribution was: 24% White, 43% African American, 16% Hispanic/Latino, 8% Asian, < 1% Pacific Islander, < 1% American Indian, and 9% Other. On average, 80% of students were enrolled in free/reduced price lunch (as a proxy for socioeconomic status) and 14% of students had individualized education programs (IEPs) with a special education designation. The average number of students receiving an EBP per school was 8.1.

There were statistically significant differences by regions ($p < 0.05$) in the following proportion: students with free/reduced lunch (northwestern USA: M = 33% vs northeastern USA: M = 94%), African American students (northwestern USA: M = 7% vs northeastern USA: M = 53%), Asian American/Pacific Islander students (northwestern USA: M = 14% vs northeastern USA: M = 6%), and White students (northwestern USA: M = 54% vs northeastern USA: M = 16%). These differences were accounted for in all analyses.

Procedure

The research team met with school district officials to obtain a list of special education classrooms (kindergarten through third-grade) and subsequently met with the principal at each prospective school to discuss the research and obtain a letter of agreement. Recruitment materials were distributed to the school, and the research team met with interested participants to inform them about the study and their role as a study participant. Once informed consent

Table 1. Participant characteristics.

M (SD); Range or n (%)	Principals (n = 61)	Autism support teachers (n = 96)	Classroom support staff (n = 139)
Sociodemographic characteristics			
Age (years)	47.56 (7.77); 32–68	37.54 (11.21); 23–63	42.74 (12.78); 19–68
Gender (female)	38 (62%)	91 (97%)	126 (93%)
Ethnicity (Hispanic/Latino)	5 (8%)	2 (2%)	7 (5%)
Race (not mutually exclusive)			
White	37 (61%)	81 (84%)	71 (51%)
African American	22 (36%)	11 (12%)	55 (40%)
American Indian/Alaska Native	1 (2%)	2 (2%)	1 (1%)
Asian/Pacific Islander	2 (3%)	2 (2%)	10 (8%)
Multiracial and other	1 (2%)	0 (0%)	2 (1%)
Professional characteristic			
Highest level of education			
High School	0 (0%)	0 (0%)	27 (19%)
Some College	0 (0%)	0 (0%)	44 (32%)
College Degree	3 (5%)	14 (15%)	50 (36%)
Graduate/Professional	56 (92%)	81 (84%)	17 (12%)
Other	2 (3%)	1 (1%)	1 (1%)
Tenure in current position (months)	62.88 (50.56); 0.63–244	3.64 (4.89); 0–33	4.46 (5.11); 0–29
Tenure in position as principal (months)	112.90 (88.90); 3–360	—	—
Specialized ASD training	10 (17%)	66 (70%)	65 (49%)
Special education certification	—	94 (98%)	17 (12%)

Note.— indicates that data were not available.

was obtained, the research team asked the principals, teachers, and classroom staff to complete study measures. For the measures used in this study (described below), respondents were asked to complete them within the context of the ASD-specific EBP implementation efforts occurring at their school. Participants received $50 for their time.

Measures

Demographic questionnaire. Participants completed a brief questionnaire about their age, sex, race/ethnicity, educational attainment, teaching experience (years), ASD experience (yes/no), and special education certification (teachers and classroom support staff only).

Leadership. Participants completed the multifactor leadership questionnaire (MLQ; Bass & Avolio, 1995), a psychometrically validated measure, which includes statements that assess behaviors representative of the full-range leadership model. Participants rated each statement on a five-point Likert-type scale indicating the frequency of specific leader behaviors from "0" (Not at all) to "4" (Frequently). Principals self-rated each statement while teachers and classroom staff rated each statement about their principal. Example items on the leader form include: "I provide others with assistance in exchange for their efforts." "I specify the importance of having a strong sense of purpose." "I keep track of all mistakes." "I help others develop their strengths." We list the following subscales that we used along with the scale reliabilities calculated with our sample: TL (20 items; $\alpha = 0.96$; correlations (r) between four combined subscales ranged from 0.72 to 0.85), *Contingent Reward* (four items; $\alpha = 0.85$), MEA (four items, $\alpha = 0.68$) MBEP (four items, $\alpha = 0.76$) and LF/A (four items, $\alpha = 0.81$). We combined *intellectual stimulation, inspirational motivation, individual consideration*, and *idealized influence* into one TL subscale because of theoretical justifications and to maintain consistency with previous EBP implementation research (e.g. Aarons & Sommerfeld, 2012).

Implementation climate. The implementation climate scale (ICS) is an 18-item scale rated from (0) "not at all" to (4) "very great extent" that measures strategic implementation climate (Ehrhart et al., 2014). We used the school-based version of the ICS (Lyon et al., 2018). Example items include, "Using EBP is a top priority in this team/agency." "Provides EBP trainings or in-services." "More likely to get a bonus or raise." "Selects staff who value EBP." The ICS is a psychometrically validated and reliable instrument ($\alpha = 0.81$–0.91; Ehrhart et al., 2014). We used the ICS Total Score, which is a mean of the six subscales (focus on EBPs, educational support for EBPs, recognition for EBPs, rewards for EBPs, selection for EBPs, and selection for openness). This approach was used because the individual

subscales were highly correlated (average correlation = 0.47; all correlations $p < 0.05$). The internal consistency was strong in our sample ($\alpha = 0.93$). Scores were aggregated to the school-level for each participant type. Each school had two ICS Total Scores: (1) the principal's ICS Total Score; and (2) the aggregated teacher and staff ICS Total Score.

Data analyses

For our first objective, we estimated a series of two-level latent profile analysis (LPA) models using maximum likelihood estimation with robust standard errors (SEs; MLR) in Mplus (Muthén & Muthén, 1998–2017) to test six patterns of principals' leadership styles (TYPE = TWOLEVEL MIXTURE). Level 1 was the individual nested within their school (level 2). Due to modeling restrictions in Mplus, we were unable to model the region of the school (northwestern USA vs northeastern USA) as a third level. We therefore included this dichotomous variable as a level 2 (school) covariate to account for the school differences by regions (described earlier). A total of five continuous indicators representing the five subscales on the MLQ were included in each class solution tested. To maximize the sample size, non-aggregated MLQ data from principals, teachers, and staff were included in the LPA models. Participant type (principal vs teacher/staff) was included as a dichotomous within-level covariate. We evaluated each pattern solution by comparing model fit indices (log likelihood (lower limit, LL), Akaike information criterion (AIC), Bayesian information criterion (BIC), sample-size-adjusted BIC (SSA-BIC), Lo–Mendell–Rubin likelihood ratio test (LMR; Lo, Mendell, & Rubin, 2001), bootstrap likelihood ratio test (BLRT; Nylund, Asparouhov, & Muthén, 2007; entropy) until an optimal number of patterns was determined with respect to empirical and theoretical interpretations. The optimal class solution was determined based on the following parameters: (1) the lowest LL, AIC, BIC, and SSA-BIC values compared with other model solutions; (2) significant LMR and BLRT *p*-values, which indicate that a model with *k* classes is a better fitting model than one with *k*–1 classes; (3) sufficiently populated classes (i.e. no less than 5% of the sample in a given class); (4) high probability of correct classification and low probability of belonging to other classes; (5) alignment with previous research and theoretical considerations to produce meaningfully interpretable classes (Foti et al., 2012; Morin, Morizot, Boudrias, & Madore, 2011).

Our next step was to model school/principal (level 2) covariates to understand their influence on the observed leader profiles. Covariates were examined through multinomial logistic regression to examine the incremental value of each covariate on leadership classification. Level 2 covariates included the following: region, school size, proportion of racial/ethnic minority students, proportion of students receiving free/reduced lunch, proportion of students with an IEP, and principal demographics. Principal characteristics were conceptualized as level 2 (school) variables because there was a 1:1 principal to school ratio. All covariates were entered simultaneously into the model. Finally, we tested mean equality across the observed latent profile groups for the ICS Total Score using a one-way analysis of variance with post hoc Bonferroni group comparisons using SPSS v. 20.

Results

Descriptive data for the MLQ and ICS

The average ratings for principal-report on the MLQ were as follows: M = 3.26 (SD = 0.36) on the Transformation (TFL) subscale, M = 3.07 (SD = 0.61) on the CR subscale, M = 1.62 (SD = 0.89) on the MBE-A subscale, M = 0.84 (SD = 0.53) on the MBE-P subscale and M = 0.52 (SD = 0.51) on the LF/A subscale. For teachers and staff, their ratings on the MLQ were: M = 2.50 (SD = 0.89) on the TFL subscale, M = 2.43 (SD = 1.05) on the CR subscale, M = 1.75 (SD = 0.94) on the MBE-A subscale, M = 1.39 (SD = 1.02) on the MBE-P subscale and M = 1.03 (SD = 0.99) on the LF/A subscale. For the ICS, the descriptive data by reporter were M = 2.07 (SD = 0.66) for principals and M = 2.00 (SD = 0.58) for teachers and staff.

Latent profile analysis

Per recommended decision criteria for evaluation and selection of latent patterns (e.g. Foti et al., 2012; Lubke & Muthén, 2005), our data best supported a three-pattern solution (see Table 2). Specifically, the model fit indices for the three-pattern solution indicated lower LL, AIC, BIC, and SSA-BIC values than the two-pattern solution, a significant BLRT *p* value and a higher entropy value than the four-, five-, and six-pattern solutions. Each of the three profiles was adequately populated, which was not the case for the five- and six-profile solutions. The three-profile solution exhibited high probabilities of correct classification (0.90–0.97). Furthermore, the three-profile solution yielded conceptually meaningful configurations of leadership profiles. See Table 3 for descriptive information about the three-profile solution.

Based on each profile's characteristics and alignment with previous research (Arnold et al., 2017), we named Profile 1 (n = 18; 6.06% of the sample) *disengaged* because these leaders were rated very low on all MLQ subscales. Profile 2 (n = 67; 22.56% of the sample) was labeled *undifferentiated* because leaders were rated at moderate levels across all MLQ subscales. The largest and third profile, (n = 212; 71% of the sample) was labeled *optimal* because leaders were rated high on TL and CR

Table 2. Model fit statistics for pattern structures.

Models	LL	FP	AIC	BIC	SSA-BIC	LMR (*p*)	BLRT (*p*)	Entropy
Two-pattern	−1639.76	19	3317.53	3387.71	3240.48	<0.001	<0.001	0.86
Three-pattern	−1574.10	26	3200.19	3296.23	3213.77	0.24	<0.001	0.87
Four-pattern	−1524.99	33	3115.98	3237.87	3133.22	0.24	<0.001	0.84
Five-pattern	− 1469.83	40	3019.65	3167.40	3040.55	0.18	<0.001	0.85
Six-pattern	− 1427.73	47	2949.46	3123.07	2974.02	0.24	<0.001	0.83

Note. LL = log-likelihood; FP = free parameters; AIC = Akaike information criteria; BIC = Bayesian information criteria; BIC; SSA-BIC = sample-size-adjusted BIC; LMR = Lo–Mendell–Rubin test; BLRT = Bootstrap Likelihood Ratio Test.

Table 3. Three latent patterns of leadership styles: descriptive information.

Pattern	% of Sample	TFL		CR		MBE-A		MBE-P		LF/A	
		M	SE	M	SE	M	SE	M	SE	M	SE
Pattern 1	6.06	1.31	0.33	1.05	0.36	0.99	0.22	0.72	0.17	0.58	0.18
Pattern 2	22.56	1.88	0.11	1.74	0.14	2.15	0.13	2.52	.11	2.19	0.12
Pattern 3	71.38	3.10	0.05	3.02	0.07	1.63	0.07	0.87	0.05	0.50	0.05

Note. TFL = transformational leadership; CR = contingent reward; MBEA = management by exception active; MBEP = management by exception passive; LF/A = laissez-faire/avoidant; SE = standard error.

relative to lower scores on the MEA, MBEP, and LF/A subscales. Leadership behaviors pronounced within the *optimal* profile include the following: demonstrates moral and ethical integrity, inspires others by articulating shared values and goals, considers individual staff needs and goals to promote professional growth, and clearly states expectations and objectives to contingently reward (or punish). See Figure 1.

Results from the two-level multinomial logistic regression using the largest group (*optimal*), as the reference category are displayed in Table 4. There was only one significant finding indicating that principals from schools with a higher proportion of students receiving special education services were 1.21 times more likely to belong to the *undifferentiated* profile than to the *optimal* profile.

The test of mean equality of the ICS Total score indicated significant group differences, $F(2, 286) = 13.72$, $p < .001$. A Bonferroni post hoc comparison revealed that the *optimal* leadership profile had a significantly greater ICS Total Score ($M = 2.12$; $SD = 0.56$) compared with the *undifferentiated* ($M = 1.73$; $SD = 0.63$, $p < 0.001$) and the *disengaged* profile ($M = 1.77$; $SD = 0.46$, $p = 0.04$).

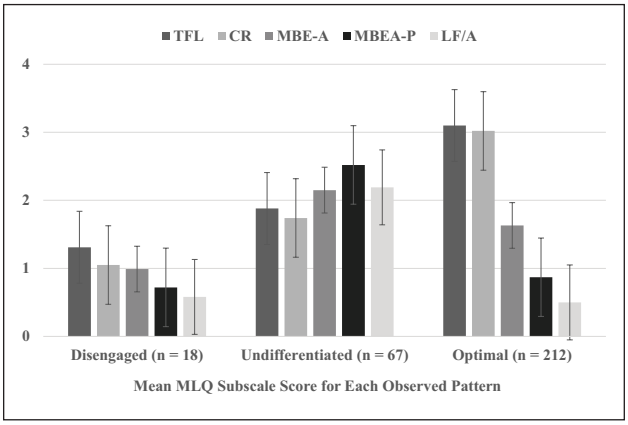

Figure 1. Latent profiles of leadership patterns.
TFL = transformational leadership; CR = contingent reward; MBEA = management by exception active; MBEP = management by exception passive; LF/A = laissez-faire/avoidant.

Discussion

We applied a person-oriented approach to obtain a nuanced understanding of leadership behaviors of principals involved in the implementation of EBPs for children with ASD in special education settings guided by the implementation science EPIS framework (Aarons et al., 2011; Moullin et al., 2019). Our secondary objective was to examine inner context implementation factors (principal and school characteristics) associated with identified leadership patterns and testing whether these patterns were associated with EBP implementation climate. From our sample of school principals, teachers, and staff, three interpretable leadership patterns (*optimal, undifferentiated, and disengaged*) emerged; one pattern (*optimal*) was associated with stronger EBP implementation climate than the other two. Overall, findings provide valuable insights into the types of leadership behaviors exhibited by school principals in the context of implementation of behavioral EBPs and suggest the need for targeted leadership training.

The most common pattern with the highest proportion of leaders was the *optimal* leadership group followed by

Table 4. Results of the multilevel latent class analysis: effects of level 2 latent class solution.

	Undifferentiated		Disengaged	
	logOR	SE	logOR	SE
Level 1 (Individual)				
MLQ Rater (Principal vs. Teacher/Staff)	47.99	0.0	43.03	0.00
Level 2 (School/Principal)				
School Region	0.02	1.27	1.77	1.35
School Size	0.002	0.002	0.001	0.003
% African American	5.88	4.61	5.42	4.50
% Caucasian	5.83	4.61	5.38	4.49
% API	5.90	4.59	5.38	4.49
% Hispanic/Latino	5.81	4.61	5.36	4.49
% Other Minority	5.77	4.62	5.35	4.48
% Reduced Lunch	–0.01	0.02	–0.003	0.03
% IEPs	0.19*	0.08	0.03	0.08
Principal age	0.04	0.06	0.08	0.06
Principal gender	0.73	0.67	0.51	0.74
Years as principal	–0.001	0.004	–0.004	0.01
Specialized ASD training	1.49	0.93	0.03	1.04

Note. Pattern 3 (*optimal*) is the reference category; logOR = multinomial logistic regression coefficient; SE = standard error; MLQ = multifactor leadership questionnaire.
*$p < .05$.

the *undifferentiated* and *disengaged* groups. The optimal leadership pattern is characterized by high levels of transformational and transactional leadership behaviors, moderately low levels of MEA and low levels of MBEP and avoidant leadership behaviors. The *undifferentiated* pattern is characterized by moderately low levels of all leadership behaviors contrasted with the *disengaged* leadership pattern that was characterized by low levels of all leadership behaviors. It is important to note that the *undifferentiated* and *disengaged* groups only represented approximately 25% and 7% of our sample, respectively, indicating that most principals demonstrated an *optimal* pattern of leadership. This is encouraging given the importance of strong leadership in EBP implementation and sustainment efforts (Aarons, Ehrhart, et al., 2014; Aarons, Farahnak, & Ehrhart, 2014; Aarons, Ehrhart, Torres, et al., 2017). It is also important to consider that the relatively high degree of *optimal* leadership in our sample may be unique to our school context and study sample, and shaped by key outer and inner context factors drawn from the EPIS framework (Aarons et al., 2011). Specifically, the participating school districts had existing policies (outer context influence) to implement best practices for students with ASD. It is also noteworthy that optimal leadership behaviors could have been demonstrated differently in this sample, potentially shaped by individual principals' characteristics (inner context factors), such as their attitudes toward EBPs and the extent of their ASD-specific training or experience. For example, optimal leadership could be shown through strong support of broad, school-wide implementation programming but not necessarily implementation of ASD-specific EBP programming. Finally, we were only able to create profiles based on principals who chose to participate in the larger study, which may impart a self-selection bias in that choosing to participate in the study is likely associated with factors that affect leadership and EBP implementation readiness.

Two of the patterns found in this study matched patterns found by Arnold and colleagues (2017): *disengaged* and *optimal*. In our sample, no evidence was found for the *passive* pattern, in which levels of LF/A and MBEP were high and levels of TL and contingent reward were low. There was some similarity between the comprehensive pattern from Arnold et al. (2017) and the *undifferentiated* pattern found in this study, in that the ratings across all five dimensions of leadership behaviors were relatively similar. However, the levels for the comprehensive pattern in Arnold et al. (2017) were all relatively high, whereas the levels for the *undifferentiated* pattern found in this study were all moderate (around the midpoint of the response scale). Thus, whereas the comprehensive style could be viewed as the leader adjusting his or her behavior in more extreme ways according to the situation, the *undifferentiated* style appears to be more of a "just enough" approach (i.e. doing the minimum required for any given situation, but no more).

The differences between Arnold et al. (2017) and the present study may be due, in part, to our sample composition. Arnold and colleagues (2017) used a sample of employees representing a range of industries and occupational responsibilities (e.g. manufacturing, retail trade,

construction). In contrast, our sample comprised a more homogeneous group of employees who were mostly housed in special education settings and involved, albeit in different roles, in the implementation of EBPs for children with ASD. In addition, principals have multiple and challenging role expectations ranging from implementing school-wide educational policy to overseeing curriculum delivery to acting as advocates for students and parents (Cobb, 2015). Because principals are responsible for navigating both outer context influences (e.g. school-wide policy decisions) and inner context influences (e.g. overseeing teacher training to delivery-specific educational practices), it is not surprising that distinct leadership patterns emerged in our sample of school principals.

Results from the multinomial logistic regression provided some contextual aid to understand our three leadership patterns and yielded some unanticipated findings about inner context factors associated with implementation efforts. Although the implementation literature has documented the association of several inner context factors at the individual and organizational levels with EBP implementation efforts (Aarons et al., 2012; Beidas et al., 2014; Beidas et al., 2016; Bonham et al., 2014; Locke et al., 2016), our results indicated that only one school characteristic was associated with the leadership profiles. Specifically, schools with a greater proportion of students with IEPs were more likely to have principals with an *undifferentiated* pattern of leadership. While this finding may be influenced by confounding variables (e.g. schools with fewer IEPs may be under-identifying students who require special programming), this finding is nonetheless concerning because schools with a greater proportion of students with IEPs may require stronger leadership to support special education practices and programs. However, school leaders often do not have formal training in special education services (DiPaola & Walther-Thomas, 2003). This was the case in our sample, given that only 17% of principals reported specialized ASD training. In addition, schools with a higher proportion of students with IEPs may represent high workplace stress settings that are less able to recruit effective leaders to manage these challenging school settings or less able to support principals in leading effectively. Principals with limited special education background who are in schools with a more clinically complex student population and more stressful work environment may exhibit an array of leadership behaviors to address the heterogeneous academic, behavioral or social needs of their school's student body (Locke et al., 2015; Locke et al., 2017).

We did not find that demographic or professional characteristics of principals were associated with leadership patterns. While these findings limit the explanatory capability of our leadership profiles, our findings suggest that immutable principal characteristics, such as gender and years of experience do not impact the likelihood of specific leadership behaviors in special education. Our findings also support future research that considers the role of potentially malleable leader characteristics (e.g. idiographic norms about principal leadership behaviors) in explaining a particular leadership profile.

Another encouraging finding was that optimal leadership behaviors were associated with the most positive school climate for EBP implementation. This finding confirms theoretical and empirical literature in non-educational settings suggesting that leadership may precede and/or is a critical condition for EBP implementation climate (Aarons, Farahnak, & Ehrhart, 2014; Aarons & Sommerfeld, 2012). In particular, TL is an approach that is specifically focused on leading change efforts in organizations (Avolio, 1999; Bass & Riggio, 2006), and thus may be particularly useful in combination with implementation-specific leadership behaviors (Aarons, Ehrhart, Moullin, Torres, & Green, 2017). Our finding demonstrating that optimal leadership is associated with stronger EBP implementation climate is important because there is mounting pressure from policy-makers to implement EBPs in school settings (Fixsen, Blase, Metz, & Van Dyke, 2013). Strong implementation climate combined with strategic implementation strategies and supports has been associated with sustainment, child gains, lower staff burnout (Novins, Green, Legha, & Aarons, 2013), and EBP adherence (Dingfelder & Mandell, 2011). In addition, a recent school-based implementation study for students with ASD indicated that positive implementation climate moderated the effect of EBP adherence on student behavioral outcomes (Kratz et al., 2019).

Although the cross-sectional nature of our study design disallows temporal interpretations, our findings suggest that targeted leadership training in optimal leadership behaviors may facilitate a school climate most receptive to EBP implementation. Research conducted in urban schools has recommended targeted efforts directed at principals and teachers. For principals, there are specific recommendations to empower principals to foster a positive learning environment, characterized by favorable student attitudes toward learning and teacher job enthusiasm. For teachers, there are recommendations to engage teachers in shared decision-making regarding school policy (e.g. EBP implementation) to buffer teacher stress, boost satisfaction, and facilitate effective implementation (Locke et al., 2016; Mehta, Atkins, & Frazier, 2013).

Our findings suggest important implications for school administrators and stakeholders planning for and actively implementing EBPs in education settings for students with ASD or other complex clinical needs. In particular, our findings provide initial support for targeted leadership training for principals to support the special education needs of students with disabilities. Although specific leadership behaviors can be learned, little research has been conducted to identify, develop, and evaluate specific

strategies to support the implementation of EBPs in schools. Recently, the Leadership and Organizational Change for Implementation (LOCI) intervention was developed as an implementation strategy to train first-level leaders to improve the organizational context supportive of EBP implementation (Aarons, Ehrhart, Moullin, et al., 2017). LOCI involves multiple components including (1) assessment and feedback, (2) training, (3) coaching, and (4) organizational strategy development (Aarons, Ehrhart, Farahnak, & Hurlburt, 2015). These components may be critical in schools to foster optimal patterns of leadership. LOCI is currently being tested in school and community-based mental health settings within the context of EBP implementation for children with ASD (Brookman-Frazee & Stahmer, 2018).

Several limitations should be noted. First, because we were interested in determining leadership profiles of principals overseeing EBP implementation for children with ASD in public schools, data were collected from teachers and staff in self-contained autism support classrooms. Special education classrooms represent a small proportion of the overall education system. Related, all of these schools were implementing ASD-specific EBPs. It is possible that schools not implementing an ASD intervention may exhibit other patterns of associations. Second, most principals do not have a special education background or experience prior to assuming an administrative role, and often lack expertise and knowledge around special education (DiPaola & Walther-Thomas, 2003). Principals also have leadership responsibilities outside of the context of special education programming. As a result, findings may not fully represent the perspectives of general education staff and generalize to other school settings. Third, general education staff may differentially rate leadership behaviors compared with special education teachers and staff that coalesce into unique profiles. Fourth, we do not know if or what prior leadership training the principals in this study received. Fifth, this study is cross-sectional, precluding ability to examine temporal associations between leadership and inner context variables. Related, it was beyond the scope of this study to examine the association between the latent profiles of leadership and fidelity to the EBPs implemented in the schools. However, implementation research conducted in other service settings has documented the robust associations between leadership and intervention fidelity (e.g. Aarons et al., 2014; Aarons et al., 2016). An important next step in this line of research is to replicate and expand these findings within school settings by determining an explanatory pathway of the moderating role of implementation climate on school leadership profiles to impact EBP fidelity in schools for students with ASD.

Grounded within an implementation science framework (EPIS; Aarons et al., 2011), this study showcases the utility of a person-centered methodological approach to examine leadership behaviors and the influence of inner context factors associated with school-based EBP implementation for children with ASD. Findings suggest that the actions of school principals related to EBP implementation for ASD can be empirically and meaningfully clustered into discernible profiles (Disengaged, Undifferentiated, Optimal) that are shaped by elements of school organizational context and linked to strategic implementation climate. Future research should focus on identifying multilevel malleable factors that could be targets for implementation interventions aimed at promoting development of optimal leadership in school-based settings, especially for implementation of EBPs targeting students with ASD.

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

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

Declaration of conflicting interests

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ORCID iD

Jill Locke https://orcid.org/0000-0003-1445-8509

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