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Ecobehavioral Assessment of Paraeducator Behaviors That Support Engagement of Students With Disabilities

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Abstract

Due to a shortage of special education teachers and an increase in the number of students with disabilities, the use of paraeducators is common. Paraeducators frequently provide instruction, under the direction of a teacher, to support elementary students with disabilities in elementary school classrooms. However, if and how paraeducators implement foundational instructional strategies is largely unknown (e.g., opportunities to respond [OTR], praise). Likewise, how students with disabilities respond to paraeducators' instructional behaviors is also unknown. With decades of evidence indicating that contextual factors (e.g., group size, activity type) influence interactions between educators and students, we relied on ecobehavioral assessment to measure paraeducators' use of core instructional strategies and students' response in the natural context. Our results indicated a correlation between higher rates of paraeducator-delivered OTRs and praise statements and increased student engagement. Of concern, paraeducators infrequently used core, evidence-based instructional approaches, and students often were not engaged. Findings suggest increased student engagement may depend on professional development efforts aimed at improving paraeducators' implementation of these essential core strategies.

Recent data indicate the number of paraeducators employed in public schools exceeds the number of special educators by nearly 100,000 (U.S. Department of Education, 2018). Further, the U.S. Bureau of Labor Statistics (2017) forecasts nearly a 10% increase in the number of paraeducators employed by our schools in the next decade. This increase is largely due to an increase in the number of students with disabilities coupled with a shortage of special education teachers (Robinson, 2011). The responsibilities of these paraeducators may include (a) engaging individual and small groups of learners in instructional activities in classrooms and community-based settings, (b) conducting behavior management and positive support plans developed by teachers, (c) assisting teachers with data collection and other assessment activities, and (d) assisting nurses, physical and occupational therapists, and speech language pathologists with provision of related services. However, the primary duty of paraeducators is often provision of supplemental instruction and behavior support for students with disabilities, particularly those with more intensive support needs (Carter et al., 2009; Walker & Smith, 2015).

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Concerns have been raised regarding paraeducators' extended responsibilities despite ineffective or nonexistent training (Carter et al., 2009) as well as the absence of guidelines or uniformity in practice standards (Giangreco et al., 2013). A primary concern is that paraeducators are inadequately trained and supervised to do the jobs they are asked to do (Suter & Giangreco, 2009) and typically receive "on-the-job training" rather than preservice training (Fisher & Pleasants, 2012). Researchers report that paraeducators may be asked to provide instruction for which they are not qualified or compensated (Walker & Smith, 2015). In many cases, for example, paraeducators are assigned to support students with extensive needs for one-to-one assistance. This may result in those individuals with the least amount of training on effective instructional strategies teaching students with the most complex learning characteristics (Giangreco et al., 2013). Yet, local educational agencies (LEAs) and state educational agencies (SEAs) lack guidance in constructing efficient, ongoing learning and supervision for paraeducators to support high-quality instructional practices (Carter et al., 2009; Giangreco et al., 2001, 2002).

Although the instruction provided by paraeducators is intended only to augment the instruction provided by highly qualified educators, it is imperative that this instruction be provided utilizing evidence-based practices (EBPs) to ensure opportunities for learning are maximized. A variety of EBPs have been identified, all of which include key foundational attributes (Pennington & Courtade, 2015). For instance, research supports the importance of prompts that elicit frequent opportunities to respond (OTRs; Lewis et al., 2004; Simonsen et al., 2008; Sutherland & Wehby, 2001), with recommendations of approximately 3.5 OTRs per minute (Stichter et al., 2009; Sutherland et al., 2003), and inclusion of hierarchical prompting systems to support errorless learning. Additionally, frequent feedback regarding student performance is essential, with higher rates of positive teacher attention than redirections and corrections (Lewis et al., 2004; Simonsen et al., 2008). Previous research has suggested that at a minimum, students should receive three praise statements per redirection or correction (Shores et al., 1993). Research indicates that when teachers implement these practices, student engagement and responding is higher. However, less is known regarding the extent to which paraeducators implement these strategies and the relationship between the quantity and quality of paraeducator-delivered OTRs, the quantity and quality of praise given, and students' responding and engagement behavior.

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Another factor to consider is the variability in the types of job assignments and how this may impact the use of instructional strategies. Paraeducators may be assigned to work with students with mild disabilities or moderate-to-severe developmental disabilities, categorized by the intensity of instructional services necessitated due to the educational needs of the students. For instance, students with mild disabilities typically require less intense services, such as curricular modification, resource support, behavioral interventions, and differentiated instruction. Students with mild disabilities are typically served in special education under the Individuals With Disabilities Education Improvement Act (IDEA) categories of specific learning disability, emotional disturbance, and speech or language impairment; however, students who qualify under other categories (e.g., autism, intellectual disability, etc.) may also fall into this category. Students with moderate-to-severe disabilities (MSD) typically require more intensive supports, such as assistance with activities of daily living, augmentative and alternative communication, medical support, mobility assistance, and significant curricular modifications. Students with MSD are typically served in special education under the IDEA categories of intellectual disability, autism, and multiple disabilities; however, students who qualify under other categories

(e.g., severe learning disability) may also fall into this category if more intense services are required for educational progress. It is not known if paraeducator instructional behavior differs based on the learning characteristics of the students with whom they are working (i.e., mild disabilities or MSD) and further if the paraeducator–student interactions differ.

Ecobehavioral Assessment

The use of ecobehavioral assessment for analyzing observational data provides a useful method for analysis of a broad range of educators' behaviors and how these behaviors may impact students' behaviors and outcomes. This approach operationalizes the interaction between environment and individuals' behaviors (Watson et al., 2011); specifically, "in ecobehavioral assessment, as compared to traditional behavioral assessment, student behavior is assessed in relationship to events such as the classroom setting, the subject of instruction, the materials being used, and the teacher's behavior directed toward the student" (Greenwood et al., 1991, p. 62).

This method has been used in a number of studies over the past three decades to (a) describe classrooms and the relationship of teacher behavior to student performance for students with autism and developmental disabilities (e.g., Kamps, Leonard, Dugan, Boland, & Greenwood, 1991; Kamps, Barbetta, et al., 1994; Lee et al., 2009), students with learning and behavior problems (Knutson et al., 2004; Tankersley et al., 1996; Wills et al., 2010), and English language learners (Arreaga-Mayer et al., 2003) and (b) to guide training and instructional practices. However, few studies have used ecobehavioral assessment to measure paraeducators' behaviors and interactions with students. Devlin (2005) used ecobehavioral assessment to demonstrate paraeducators' teaching skills and increased social interaction with students. In a study by Bessette and Wills (2007), ecobehavioral assessment demonstrated increased teaching opportunities and attention to appropriate behaviors of students by paraeducators, resulting in reduced aggressive behaviors by students. Implementation of an ecobehavioral assessment has the potential to reveal relationships between the quality of strategies utilized by paraeducators, such as OTRs and praise, and student responding and engagement during instruction, subsequently informing administrators, policy makers, and researchers as they strive to develop targeted professional development aimed at positively impacting student outcomes.

To this end, we conducted an ecobehavioral assessment of paraeducators during math and reading instruction of students with disabilities. We began with descriptively examining natural classroom conditions during which paraeducators supported students with disabilities based on the paraprofessional's job placement—mild disabilities or MSD. Multilevel logistic regression analysis was used to determine the likelihood of given paraeducator behaviors (e.g., teaching, praise, prompting) and a subsequent student behavior. The purpose of this study was to identify strategies (a) used by paraeducators with students during academic instruction and (b) that do and do not correlate with higher rates of student engagement. Our specific research questions include the following:

1. What are the observed paraeducator and student behaviors during classroom observations of instructional times, and are these different based on severity of the disability (mild disabilities vs. MSD)?
2. What are observer impression ratings of paraeducators' interactions to support students with disabilities for supporting learning and engagement and appropriate behavior, and are these different based on severity of the student's disability (mild disabilities vs. MSD)?
3. What are the odds that an OTR delivered by a paraeducator will elicit a student response, and are these odds impacted by setting, quality of the OTR, paraeducator education and years of experience, or disability type (mild disabilities vs. MSD)?
4. How does paraeducator use of OTR, praise, and redirection impact student engagement (i.e., being active or not), and how are these relationships moderated by paraeducator education and years of experience or severity of the disability (mild disabilities vs. MSD)?

Table 1. Demographic Information for Participating Paraeducators' Schools (in percentages).

School[a]	Male	Female	Economically disadvantaged	African American	Latino/ Hispanic	Caucasian	Other
1 (270)	51.76	48.24	81.34	43.31	47.18	6.34	3.17
2 (440)	50.22	49.78	73.48	55.00	19.35	13.04	12.61
3 (492)	51.99	48.01	80.88	4.18	81.47	9.16	5.18
4 (360)	54.14	45.86	78.97	11.72	66.55	17.24	4.48
5 (639)	54.21	45.79	85.15	7.66	75.65	9.34	7.35
6 (301)	55.38	44.62	67.09	37.66	31.33	25.63	5.38
7 (320)	49.83	50.17	79.54	28.38	42.57	18.48	10.56
8 (421)	52.68	47.32	72.82	17.11	63.09	12.75	7.05
9 (279)	47.23	65.11	65.11	37.45	12.77	38.30	11.49
10 (212)	51.64	48.36	72.13	32.79	33.20	16.39	17.62
11 (633)	52.92	47.08	77.73	6.64	75.83	6.16	11.37
12 (377)	52.25	47.75	76.39	58.09	31.83	4.51	5.57
13 (298)	53.36	46.64	91.61	14.77	64.09	9.06	12.08
14 (200)	50.78	49.22	88.97	23.62	56.86	4.10	15.42
15 (100)	58.00	42.00	96.00	56.00	38.00	4.00	2.00

[a]Total enrollment shown in parentheses.

Method

Participants and Setting

Participants were recruited following appropriate institutional review board approval for research with human subjects. Forty-one paraeducators working with students with disabilities across 15 urban elementary schools in the Midwest consented to participate in this study. Table 1 describes the student demographics for each school. Work placements included a variety of classroom settings (e.g., general education and special education) in which 21 paraeducators worked with students with mild disabilities and 20 with students with MSD in those settings. Inclusion criteria were that the paraeducator (a) consented to participate in three 20-min observations and (b) was available to be observed while instructing a student with a disability during an instructional period (math, reading, etc.). Of those 41 paraeducators, 38 provided demographic information and most identified as female (n = 30, 81.1%) averaging 7.1 (SD = 6.4, range = 1–29) years of experience as a paraprofessional. They identified as 50.0% (n = 18) Caucasian, 27.8% (n = 10) African American, 11.1% (n = 4) Latino/Hispanic, and 11.1% (n = 4) as a member of another ethnicity. In regard to education, 61% (n = 25) had some college but no degree, 12% (n = 5) had taken the ParaPro Assessment, and 10% (n = 4), 15% (n = 6), and 2% (n = 1) had an associate's, bachelor's, and master's degree, respectively. Three of the participants were enrolled in a teacher education program at the time of the study. The observations occurred primarily during reading (n = 85, 65.9%), followed by math (n = 23, 17.8%) and other academics (n = 9, 7.0%). Grade levels primarily served by the paraeducators observed were evenly distributed: kindergarten, 52.6%; first grade, 55.8%; second grade, 53.5%; third grade, 65.1%; fourth grade, 53.5%; and fifth grade, 37.2%, noting the percentage exceeds 100% as many paraeducators were assigned across grade levels.

Measurement and Data Collection

Multiple Option Observation System for Experimental Studies (MOOSES; Tapp et al., 1995) was utilized to collect data on the variables of interest. This computer software program allowed for continuous collection of frequency and duration of paraeducator and student behaviors occurring within the classroom. During each of the observation sessions, three categories of behaviors and descriptions were coded: (a) frequency and duration codes

for the paraeducator (e.g., actively teaching, monitoring, praising, redirectioning, and providing OTR), (b) student behaviors (i.e., duration of active-engagement, off-task, disruptive, and downtime behaviors; frequency responses) for the student the paraeducator was working with at the time, and (c) factors related to instructional arrangement (whole-class, small-group, one-on-one, and independent work). Definitions of paraeducator and student behavior codes recorded during the observation study can be found in Tables 2 and 3, respectively.

Observer Impression Scale. The Observer Impression Scale is a nine-item researcher-created rating scale used to rate the quality of the implementation of instructional behaviors. The items are designed to quantifiably measure the quality of paraeducator interactions with the identified target student, providing information beyond what could be obtained through direct observation. For example, MOOSES allows data collection on the frequency of OTRs, whereas the Observer Impression Scale provides a means to evaluate the quality of those OTRs. Items include respectful and positive interactions, support of student learning, reinforcing positive behavior, promoting engagement, managing disruptive behavior, support of OTRs, maximizing instructional time, encouragement of student talk, and engaging in data collection. Each item included a 4-point Likert-type scale with each anchor behaviorally defined, wherein 1 was the lowest rating (*poor quality* or *not implemented*) and 4 was the highest rating (*high quality* or *observed for the majority of the observation*). The Observer Impression Scale was uploaded onto Access so that observers were able to complete the rating form immediately following data collection utilizing Wi-Fi-enabled tablets. Table 4 displays two of the scales from the Observer Impression Scale that are most relevant to this study; the entire scale is available from the first author.

Interrater reliability. Two members of the research team trained in the data collection procedures simultaneously, yet independently, collected observation data utilizing the MOOSES data collection and the Observation Impression Scale for 25% of the observations. Time stamping for each recorded behavior, as obtained from MOOSES, allowed for accurate analysis of interobserver agreement (IOA). For frequency behavior, the time-stamped data were divided into 5-s intervals, and an agreement was counted if both observers indicated an occurrence or nonoccurrence of a behavior. IOA for frequency codes was calculated utilizing exact count-per-interval IOA. Exact-count IOA, which is the percentage of intervals for which the same target behavior was recorded by both observers, is an accurate and conservative measure of IOA for frequency count data (Cooper et al., 2007). For duration data, mean-duration-per-occurrence IOA was calculated (Cooper et al., 2007), which is also a similarly conservative measure of IOA. The average IOA for each paraeducator and student behavior coded utilizing MOOSES is found in Tables 2 and 3, respectively. For the Observer Impression Scale, the average reliability ranged from 87% to 100%, with an overall average of 95.2%.

Procedures

Observer training. The first three authors and three other members of the research team conducted the observations after being trained in the data collection procedure. The first two authors defined the codes and then conducted practice observations to ensure agreement on the definitions and made revisions to achieve clarity and increase reliability. Once agreement was obtained and codes finalized, the first two authors conducted observations until reliability was achieved, defined as three consecutive observations with IOA at 80% or higher. Data collected when calibrating definitions and getting reliable were not utilized in the final data set. Following this, the first author trained the remaining observers in the coding procedures. Training involved an initial review of the MOOSES codes and Observer Impression Scale definitions as well as directions on how to utilize MOOSES and the Access data file on the tablet. Utilizing two video samples of paraeducators working with students, the first author and each of the observers individually practiced coding data, providing an opportunity for clarifying any codes or quality items

Table 2. MOOSES Observation Definitions for Paraeducator and Student Behaviors.

Behavior	Definition
Paraprofessional	
Teaching (duration)	Paraeducator is actively teaching (any student).
Addressing behavior (duration)	Paraeducator is addressing challenging behavior (any student).
Monitoring	Paraeducator is passively monitoring—not engaging with yet clearly attending to student(s).
Not teaching/not addressing behavior (duration)	Paraeducator is not working with student(s) on either academic or behavior and not clearly monitoring. Activities may include grading papers or doing paperwork, working on a computer, or preparing materials.
Task-related adult talk (duration)	Appropriate job- or task-related talk with another adult (paraeducator, teacher, parent, specialist, administrator).
Opportunities to respond (OTR) (frequency)	An instructional question or statement from the paraeducator to the target child (or to a group that includes target child), that seeks an academic response orally or publicly ("What is . . . ?" "Raise your hand if this is true"; "Students, read these words while I point" [each word is an OTR]).
Praise	Verbal statement that indicates approval of behavior over and above an evaluation of adequacy or acknowledgement of a correct response to a question. This includes pats, a high five, and so on.
Reprimands	Verbal comments, such as scolding or negative statements about behavior indicating disapproval of the student's social behavior, used with the intent to stop the student from misbehaving.
Student	
Active engagement (duration)	Student is appropriately working on the assigned or approved activity. Examples of active student engagement include words read orally, questions answered, and words written.
Passive engagement (duration)	Student is appropriately attending to the assigned or approved activity yet not measurably writing, reading, talking, or nonverbally responding: (a) quietly listening to paraeducator or teacher, (b) looking at or attending to the material and the task, (c) waiting appropriately.
Off task (duration)	Student is not participating in an approved or assigned activity.
Downtime (duration)	Student or class is transitioning, or the student is waiting for the paraeducator or teacher yet there is no assigned activity for the student.
Disruptive behavior (duration)	Verbal, physical, or motor displays of inappropriate behavior. This includes posturing or gestures that are intended to provoke others, drawing attention to self, using classroom materials inappropriately, or self-stimulating in a disruptive manner.
Response to OTR (frequency)	Response to academic instruction or academic behavior within 5 s. This includes teaching trials and answers or responses to teacher questions. Academic response includes active participation in games when led by the teacher.
No response (frequency)	Student fails to comply or begin to comply with an OTR in 5 s.

Note. MOOSES = Multiple Option Observation System for Experimental Studies (Tapp et al., 1995).

Table 3. Means, Standard Deviations, and Ranges for Paraeducator Behaviors.

	Percentage of time (%)				Average frequency		
Disability level	Target	Teaching	Monitoring	Not teaching	OTRs	Praise	Redirection
Mild disabilities							
M	74	75	16	5	175	28	14
SD	19	29	18	9	121	20	11
Min.	39	6	0	0	23	1	0
Max.	100	100	55	40	464	87	48
Moderate-to-severe disabilities							
M	66	58	22	9	146	24	13
SD	26	31	22	14	81	16	7
Min.	29	2	0	0	36	7	4
Max.	100	100	71	45	303	62	26

Note. Average for all three sessions (60 min). OTR = opportunities to respond.

Table 4. Sample Scales From the Observer Impression Scale.

	Rating			
Scale	1	2	3	4
Respectful and positive interactions	Fewer than 25% of interactions are positive as evidenced by patience, sensitivity, pleasant verbal and nonverbal communications	Fewer than 75% of interactions are positive as evidenced by patience, sensitivity, pleasant verbal and nonverbal communications	More than 75% interactions are positive as evidenced by patience, sensitivity, pleasant verbal and nonverbal communications	All positive interactions as evidenced by patience, sensitivity, pleasant verbal and nonverbal communications without displays of insensitivity, impatience, or annoyance
Supporting OTRs	No OTR support includes any of the following: gains student attention, open-ended questions, wait time of 5 s, scaffold of questioning and responding to facilitate independent response; or no evidence of attempts to support OTRs	Most OTR support includes only one of the following: gains student attention, open-ended questions, wait time of 5 s, scaffold of questioning and responding to facilitate independent response	Most OTR support includes at least two of the following: gains student attention, open-ended questions, wait time of 5 s, scaffold of questioning and responding to facilitate independent response	Most OTR support consists of at least three of the following: gains student attention, open-ended questions, wait time of 5 s, scaffold of questioning and prompting to facilitate response or accurate responding

Note. OTR = opportunity to respond.

that were not clear to the observer. Following this, each observer and the first author conducted observation sessions in actual classrooms and simultaneously but independently coded the paraeducators' and students' behaviors utilizing the noted measures. Reliability training sessions continued until the criterion for reliability (three sessions with IOA of 80%

or higher) was achieved. All observers achieved the reliability criterion within six sessions.

Observations. Paraeducators agreed to participate in three separate 20-min observation sessions in which researchers could collect data on the instructional environment, the paraeducator's instructional behavior, and the behavior of the students with whom they were working. As the primary focus of the observation was the paraeducators' behavior, it was not required that each paraeducator be working with the same student for all observations. In order to account for any unplanned circumstances that might interfere with completion of the data session (e.g., fire drills, paraeducator called out of the room, student called out of the room, etc.), it was determined that any observation session that lasted at least 15 min could be utilized as this still provided ample time to obtain a sample of the paraeducator's and student's behavior.

The only instruction provided to the participating paraeducators was to engage in their typical behaviors as if they were not being observed. The observer entered the paraeducator's classroom at the agreed-upon time and found an unobtrusive location in the classroom in which he or she was able to see and hear the interactions between the paraeducator and the student(s) with whom they were working. The MOOSES program was then started on the tablet utilized for data collection. Data collection began and lasted until the session ended, as indicated by the built-in timer in the MOOSES program. Immediately following completion of the observation, the observer left the room and completed the Observer Impression Scale on Access, utilizing the same tablet on which MOOSES was stored.

Data Analysis

To answer Research Questions 1 and 2, we used descriptive statistics including means, standard deviations, and ranges across variables for visual inspection of differences between paraeducators working with students with mild disabilities and MSD. Descriptive statistics were calculated for both MOOSES and the Observer Impression Scale to indicate frequencies of paraeducator and student behaviors across classes and sessions.

Regarding Research Questions 3 and 4, we conducted multilevel logistic regression analysis using the software package Mplus (Version 7.4; Muthén & Muthén, 1998–2012) with the Bayes estimator (Asparouhov & Muthén, 2010). Multilevel models were necessary to adjust for clustering in the data (Peugh, 2010; Singer & Willett, 2003). In this study, data were naturally clustered at four levels: classroom, paraeducator, session, and repeated record. For each question, we estimated the interclass correlation for different levels and eventually kept three levels (i.e., classroom, session, and repeated record) in all the models (see Results section for more details). To answer Research Question 3, we conducted a logistic regression analysis based only on the records when OTRs were used. A binary variable that indicated whether or not each OTR was responded to by the target student within 5 s was created and used as the outcome. The unconditional model (intercept only) was first estimated. Then the effect of predictors, such as setting, quality of the OTR, paraeducator education and years of experience, and disability type (mild disabilities vs. MSD), were added and estimated simultaneously. To answer Research Question 4, we removed observation periods with downtime as these were periods in which the paraeducator allowed the student to have a break or had not given the student a task. We then conducted a binary logistic regression analysis, in which we treated the largest category in student engagement, active, as reference group and examined whether the odds of being passive, disruptive, or off task versus active was impacted by the rates of OTR, praise, and redirection. Possible moderators, such as paraeducator education, years of experience, and disability type (mild disabilities vs. MSD), were added into the model one at a time. Setting was also included as a control variable. For both Research Questions 3 and 4, 1% of the total records were removed due to missing

Table 5. Average Ratings of Paraeducator Behavior on the Observer Impression Scale.

Scale	Mean rating	
	MD	MSD
Interactions demonstrate respect and positive rapport	3.2	2.6
Assist in student's learning	2.7	2.6
Managing students positive behavior	2.1	2.1
Promotes engagement	2.5	2.4
Managing disruptive behavior consistently and appropriately	2.2	1.8
Supporting opportunities to respond	2.4	2.2
Maximizes instructional time	3.0	2.6
Encourages child vs. adult talk	1.8	1.7
Evidence of data collection	1.5	1.3

Note. Averages based on ratings of 4-point Likert-type scale ranging from 1 to 4. MD = mild disabilities; MSD = moderate-to-severe disabilities.

data on the record-level variables. Missing data on paraeducator-level predictors were handled by the Bayes estimator simultaneously with parameter estimation.

Results

A total of 129 observations were conducted; however, due to seven instances in which recorded files were corrupted, a total of 122 (94.6% of total observation) independent observations were used for analysis within this study. The average length of time of all included observations was 19.29 min (range = 15–20 min, $SD = 1.43$), as 13 (10.6%) of the observations ended prior to the completion of 1,200 s but met the minimum of 900 total seconds. All observations occurred during class time where paraeducators were working with students who were engaged in either reading or math and in either large-group, small-group, or a one-on-one format. For each paraeducator, all three observations occurred within a 2-week time period with the exception of three paraeducators (7.0%), for which the completion of all three observations took longer than 2 but less than 3 weeks, due to absences or school events that interfered with scheduled observations. A total of 1,220 min (approximately 21 hr) of instruction was observed with paraeducators serving students with mild disabilities ($n = 21$ paraeducators), ranging from 47 to 60 total min ($M = 58$ min). A total of 1,146 min of instruction were observed with paraeducators serving students with MSD ($n = 20$ paraeducators), ranging from 49 to 60 min ($M = 57$ min).

Research Question 1

What are the observed paraeducator and student behaviors during classroom observations of instructional times, and are these different based on disability type? In regard to paraeducators behaviors (Table 5), paraeducators serving students with mild disabilities spent 74% of their time with the intended target student and 75% engaged in teaching, followed by 16% monitoring students and 5% not teaching. Other paraeducator behaviors were addressing behaviors (averaging 3%) and adult talk (averaging 8%). Paraeducators serving students with MSD spent 66% of the time with the intended target student, 58% teaching, 22% monitoring, and 9% not teaching. The amount of time spent addressing behavior problems and engaging in adult talk averaged 3% and 8%, respectively.

The frequency of providing OTRs for paraeducators serving students with mild disabilities averaged 175 for 60 min (three sessions) across paraeducators, with a wide range of 23 to 464. For paraeducators serving students with MSD, the average was lower, at 146, and again with a wide range from 36 to

Table 6. Results of Multilevel Logistic Regression on Odds of Student Response to Paraeducator-Delivered OTRs.

Parameter	β	Credible interval	Odds ratio (exp[β])
Model 1 (intercept only)			
Intercept	.859	[1.132, 0.692]	2.361
Model 2			
Instructional setting			
One-on-one vs. whole group	−.004	[–0.245, 0.156]	0.996
Small group vs. whole group	.025	[–0.17, 0.201]	1.025
High vs. low quality of OTR	.269*	[0.001, 0.543]	1.309
Mild disabilities vs. MSD	.398*	[0.065, 0.694]	1.489
Paraeducator's years of experience	−.006	[–0.026, 0.013]	0.994
Paraeducator's education[a]	.144	[–0.226, 0.508]	1.155

Note. OTR = opportunity to respond; MSD = moderate-to-severe disabilities.
[a]1 = bachelor's or higher; 0 = lower than bachelor's.
*$p < .05$.

303. More than half of paraeducators serving students with mild disabilities and MSD delivered 150 or fewer OTRs in 60 min. Praise among paraeducators for students with mild disabilities averaged 28 total across three observations, ranging from 1 to 87 across paraeducators. Frequency of praise was lower among paraeducators serving students with MSD, averaging 23.5 and ranging from 7 to 62. However, the average frequency of redirections was the same for both groups of paraeducators, averaging 13.7 (range = 0–48) and 13.2 (range = 4–26) for those serving students with mild disabilities and MSD, respectively.

In regard to student behaviors (Table 6) during the observations, students with mild disabilities were actively engaged for 66% of the time, passively engaged 15%, and off task 11%; had downtime for 6% of the time; and disruptive behavior was observed only 2% of the time. On average, students with mild disabilities responded to OTRs 81% of the time (range = 61%–99%). Students with MSD were, on average, actively engaged much less than those with mild disabilities, at 46%, with a higher rate of passive engagement, 20%. Off-task behavior and downtime among students with MSD occurred at a slightly higher rate than among those with mild disabilities, averaging 13% and 14%, respectively. The response to OTRs among students with MSD was also slightly lower than among those with mild disabilities, averaging 67% (range = 21%–87%).

Research Question 2

What are observer impression ratings of paraeducators' interactions to support student learning, engagement, and appropriate behavior, and are these different based on disability type (mild disabilities vs. MSD)? Ratings on nine items reflected observers' impressions of the general interactions and teaching procedures used by the paraeducators. Average ratings across questions for the Observer Impression Scale for paraeducators for students with mild disabilities were all somewhat higher than ratings for paraeducators for students with MSD (Table 7). As shown in the top panel, ratings for paraeducators serving students with MSD ranged from a low of 1.5 (evidence of data collection) to a high of 3.2 for "Interactions demonstrate respect and positive rapport." Other, higher ratings were given for "Maximizes instructional time," at 3.0; "Assists in students learning," at 2.7; and "Promotes engagement," at 2.5. For paraeducators serving students with MSD, the highest ratings were for "Interactions demonstrate respect and positive rapport," "Assists in student's learning," and "Maximizes instructional time," all at 2.6. "Promotes engagement" and "Supporting

Table 7. Results of Multilevel Logistic Regression of the Impact of Paraeducators' Use of OTR, Praise, and Reprimand on Student Engagement.

Parameter	β	Credible interval	Odds ratio (exp[β])
Model 1 (no moderator)			
Rate of OTR	−0.42*	[–0.828, –0.042]	0.657
Rate of praise	−2.11*	[–3.839, –0.203]	0.121
Rate of redirection	2.826*	[0.674, 4.828]	16.878
Model 2			
Disability Type × Rate of OTR	0.179	[–0.532, 0.833]	1.196
Disability Type × Rate of Praise	−0.084	[–3.076, 2.694]	0.919
Disability Type × Rate of Redirection	1.51	[–1.768, 4.703]	4.527
Model 3			
Experience × Rate of OTR	−0.002	[–0.059, 0.059]	0.998
Experience × Rate of Praise	−0.082	[–0.332, 0.168]	0.921
Experience × Rate of Redirection	−0.134	[–0.445, 0.272]	0.875
Model 4			
Education × Rate of OTR	0.252	[–0.487, 0.786]	1.287
Education × Rate of Praise	−0.453	[–3.474, 2.245]	0.636
Education × Rate of Redirection	3.458	[–0.195, 7.18]	31.753

Note. OTR = opportunity to respond.
*$p < .05$.

opportunities to respond" received an average rating of 2.4 and 2.2, respectively.

Research Question 3

What are the odds that an OTR delivered by a paraeducator elicits a student response, and are they impacted by the instructional setting, quality of the OTR, paraeducator education and years of experience, or disability type? Table 8 shows the results of the unconditional model and best-fitting model. The odds of students' response to an OTR was 2.36, meaning that the probability of a student responding to an OTR is 2.36 times higher than the probability of not responding to it. Among the hypothesized predictors, the quality of OTR and disability type were found to have significant effects on students' responses to OTRs. Specifically, controlling for other factors, the odds of a high-quality OTR eliciting a response from the student was 1.31 times higher than those of a low-quality OTR. The odds of a question being responded to by a student with mild disabilities is 1.49 times higher than by one with a MSD. However, instructional setting, paraeducator years of experience, and education level did not have an effect on students' responses to OTRs.

Research Question 4

How does paraeducators' use of OTR, praise, and redirection impact student engagement (i.e., engaged vs. disengaged), and how are these relationships moderated by paraeducator education and years of experience or disability type (i.e., mild vs. moderate-to-severe disabilities)? Table 9 presents the parameter estimates and corresponding odds ratios in different models. All the main effects were found to be significant. Specifically, controlling for other variables, one more OTR per minute provided by a paraeducator was associated with 1.52 (= 1/0.657) times increased odds of student being engaged rather than disengaged, off task, or disruptive (credible interval [CI] = [–0.828, –0.042]). Similarly, one more praise per minute was associated with 8.25 (= 1/0.121) times increased odds of student being engaged (CI = [–3.839, –0.203]). On the other hand, with one more redirection per minute, the student was 16.88 times more likely to be disengaged, off task, or disruptive than engaged (CI = [0.674, 4.828]). No interaction effect was significant.

Table 8. Results of Multilevel Logistic Regression on Odds of Student Response to Paraprofessional-Delivered OTR.

Parameter	β	Credible interval	Odds ratio (exp[β])
Model 1 (intercept only)			
Intercept	.859	[1.132, 0.692]	2.361
Model 2			
Instructional setting			
One-on-one vs. whole group	−.004	[–0.245, 0.156]	0.996
Small group vs. whole group	.025	[–0.17, 0.201]	1.025
High vs. low quality of OTR	.269*	[0.001, 0.543]	1.309
Mild disabilities vs. MSD	.398*	[0.065, 0.694]	1.489
Paraeducator's years of experience	−.006	[–0.026, 0.013]	0.994
Paraeduator's education[a]	.144	[–0.226, 0.508]	1.155

Note. OTR = opportunity to respond; MSD = moderate-to-severe disabilities.
[a]1= bachelor's or higher; 0 = lower than bachelor's.
*$p < .05$.

Table 9. Results of Multilevel Logistic Regression of the Impact of Paraeducators' Use of OTR, Praise, and Reprimand on Student Engagement.

Parameter	β	Credible interval	Odds ratio (exp[β])
Model 1 (no moderator)			
Rate of OTR	−0.42*	[–0.828, –0.042]	0.657
Rate of praise	−2.11*	[–3.839, –0.203]	0.121
Rate of redirection	2.826*	[0.674, 4.828]	16.878
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Note. OTR = opportunity to respond.
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Discussion

Although the use of paraeducators as a substitute for highly qualified special educators is in no way a long-term solution to the shortage of special educators. the current reality necessitates identification of more efficient and effective strategies for training paraeducators. Understanding interaction of paraeducator and student behaviors can help inform the focus of such training. A number of studies have employed ecobehavioral assessment to increase understanding regarding the relationship between student and teacher behaviors (Arreaga-Mayer et al., 2003; Kamps et al., 1991; Lee et al., 2009; Wills et al., 2010), yet this is the first study to employ this method to evaluate the relationship

between paraeducator and student behaviors during academic instruction time. Of concern, little is known regarding the instructional strategies implemented by paraeducators and how strategy implementation affects the students with whom they work. With paraeducators outnumbering certified special education teachers and no sign of reversal in this trend, it is crucial that the relationship between paraeducator instructional strategies and student response be better understood. In this vein, the current study serves as an initial step in increasing awareness regarding the relationship between paraeducators' instructional behavior and the learning behavior of the students they are assigned to support.

The use of paraeducators as a substitute for highly qualified special educators is in no way a long-term solution to the shortage of special educators.

Results of this study are encouraging in many ways, particularly as it relates to how paraeducators spend their time. Overall, paraeducators spent the majority of their time working directly with students and actively providing instruction, consistent with previous studies (Carter et al., 2009). The paraeducators spent minimal time managing challenging behavior, engaging in adult talk, and monitoring students. Additionally, impression scale ratings indicated that paraeducators typically interacted with the students in a positive and respectful manner, maximized instructional time, and made efforts to assist in student learning. Further, both groups of students rarely engaged in off-task or disruptive behavior when they were with the paraeducator.

Although previous research has stressed the link between teachers use of well-delivered OTRs and improved engagement (Simonsen et al., 2008; Sutherland & Wehby, 2001), this is the first study that we are aware of that also establishes the importance of paraeducators' use of OTRs. For instance, previous investigations have suggested teacher-delivered OTRs should occur at a minimum rate of 3.5 per minute (Stichter et al., 2009) to facilitate improved student engagement and achievement. Assuming the same rates would apply to instruction delivered by paraeducators, results from this ecobehavioral assessment demonstrate both groups of paraeducators are well below this rate, averaging 2.9 and 2.4 OTRs per minute, respectively. Additionally, evaluation of the quality of the OTRs, as measured by the Observer Impression Scale, indicate the overall quality of the delivered OTRs was relatively poor for both groups of paraeducators and typically included only one element of a high-quality OTR of either gaining students' attention, allowing wait time, or scaffolding prompt level to facilitate independent responding (Steinbrenner & Watson, 2015). Results point to the need for targeted training aimed at improving both the rate and quality of OTRs delivered by paraeducators.

Also consistent with literature regarding the positive correlation between high rates of praise delivered by teachers and increased student engagement (Scott et al., 2012), this study provides evidence that high rates of praise from paraeducators may also effect engagement. That is, students, regardless of disability type, were more likely to be engaged with increased rates of praise from the paraeducator and more likely to be disengaged with higher rates of redirections. Unfortunately, praise for paraeducators working with students with mild disabilities and MSD on average occurred only 2 times more frequently than redirections. This is below the recommended 3:1 praise-to-redirection ratio (Scott et al., 2012). Given the influence of praise on engagement and the importance of engagement to student learning, paraeducator training that emphasizes the importance of praise and methods for increasing positive feedback is warranted. Similar to OTRs, increasing the use of praise is a malleable behavior that is relatively simple to target for improvement.

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paraeducator training that emphasizes the importance of praise and methods for increasing positive feedback is warranted.

Limitations

As with most studies, this one is not without limitations. One limitation of this study is the lack of data regarding the accuracy of the students' responses to paraeducators' OTRs. Although analysis indicates students with mild disabilities and MSD on average responded to OTRs, we do not have data regarding the accuracy or quality of these responses or the subsequent behavior by paraeducators contingent on accurate or inaccurate responding. Given the importance of scaffolding prompts and appropriate error correction procedures to facilitate learning, such information would likely provide additional understanding of the interaction during instruction. Further, this study does not include information regarding the teachers' instructional behavior when working with students; thus there are not data to indicate whether paraeducator behavior diverges from classroom teachers in terms of teaching behavior, provision of OTRs, and use of praise and redirections. Inclusion of teacher behavior would have strengthened the study in terms of identifying differences and similarities in terms of paraeducator and teacher behaviors as well as student behavior in the presence of both. Likewise, data on the engagement rates of students without disabilities or those working without paraeducators are beyond the scope of this study.

Similarly, although the observations took place during times when paraeducators were providing instruction in reading and math, as indicated by the supervising teacher, information regarding the content of the lessons was not evaluated, including whether or not the lessons were created by the supervising teachers. Although the primary focus was on the paraeducator–student interaction, it is possible that the source of the instructional content as well as the extent of directions provided to the paraeducator affected instructional behavior. This may be one factor that impacted the variability of the data. The broad ranges and standard deviations suggest that other factors beyond the identified variables may have impacted the data. The inability to control factors such as the types of lessons the paraeducators were providing and the students with whom they were working limits the generalizability of these findings. Additional research with larger samples and more tightly controlled variables is necessary to verify the current results, and the results of the current study must be viewed with the indicated caution.

Implications for Future Research

In addition to replication of this ecobehavioral assessment among paraeducators in schools with varying characteristics, there are other areas of research that would be valuable to explore in order to provide a clearer understanding of the dynamics in play between teachers, paraeducators, and the students they serve. For instance, inclusion of teacher behaviors, paraeducator–teacher relationships, and the accuracy of student responding is needed. Perhaps most important is identification of the most efficient mechanisms for training paraeducators to increase use of praise statements and to deliver a high rate of effective OTRs. Once high-quality OTRs are delivered with sufficient frequency, then other crucial but understudied components of effective scaffolding may be investigated (e.g., transfer of responsibility to students; Van de Pol et al., 2010).

Additionally, research that identifies efficient and effective mechanisms for training in core instructional practices is warranted. For example, self-monitoring interventions have been implemented with positive results to improve practices for teachers (Briere et al., 2015; Lylo & Lee, 2013; Rispoli et al., 2017) and paraeducators (Bingham et al., 2007; Plavnick et al., 2010). Given the low cost and high return rate of self-monitoring in improving practices, additional research exploring the efficacy and utility of self-monitoring as well as other low-cost training procedures for improving paraeducators' use of OTRs and praise is warranted. Additional research in

efficient and acceptable supervisory practices for special education teachers and their assigned paraeducators is also indicated.

Implications for Practice

This study has several implications for practice as it relates to supervision and training of paraeducators. First, this study serves to elucidate training topics that would be beneficial for all paraeducators. As a starting point, professional development focused on increasing praise rates as well as delivery of high-quality OTRs would be beneficial for all paraeducators. Thus, schools may want to consider including these topics as part of the initial training package for all newly hired paraeducators, noting that ongoing training including observation, modeling, and feedback will be required to develop and sustain these skills. Although the foundational knowledge regarding the praise and OTRs may be similar across paraeducators, specific training appropriate to the learning needs of the students with whom they will be working is necessary. Additionally, given federal law requiring supervision of paraeducators as well as information from this study indicating the impact of paraeducators' instructional behavior, Schools must have clear policies and procedures to ensure paraeducator supervision is occurring, including mechanisms to document areas in need of further training and action plans to ensure instructional skills improve.

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