

The Wing Institute
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Results and Discussion Report

CHAPTER 4

RESULTS

The research questions for this study are:

1. Can assessment information based on descriptive and brief structural analyses produce verifiable hypotheses of antecedent conditions when performed with preschool children in a Head Start classroom?
2. Is there a functional relationship between antecedent-based intervention procedures and observed changes in problem behavior?

To answer the first question, data was reported from phase one (assessment and hypothesis development) and phase two (verifying hypotheses via brief structural analyses) of this study. Phase one included structured interviews with teachers and parents and direct observations. This information was used to develop a hypothesis about the antecedent conditions that predicted increase in academic engagement or decrease in disruptive behavior. Phase two verified the hypothesis conditions through a structural analysis procedure which utilized a single-subject withdrawal experimental design.

The second question was answered by phase three of the study which implemented the antecedent-based intervention for each student. The assessment information was directly transferred to the intervention plan so that the best antecedent conditions became components of the intervention plan. Lastly, results of phase four (social validity) are described to indicate teachers' perspective of the acceptability of

assessment and intervention procedures.

The results for both questions are presented below for each student. Visual

representation of data is presented to show two graphs. The first graph shows the results from the brief structural analysis and the second graph represents the antecedent-based intervention and effect on behavior. In the brief SA, the independent variables are the hypothesized conditions. The best components of the brief SA were used as the antecedent-based intervention. The dependent variables included (a) percentage of intervals in which disruptive behaviors were observed for Donny and Korana, (b) percentage of correct responses give opportunities to respond for Timothy, and (c) percentage of on task behaviors intervals for Dion. Accordingly, for Donny and Korana, high numbers on the graph represent high numbers of negative behavior but for Timothy and Dion, high numbers represent high levels of positive behavior.

Both graphs illustrate a withdrawal research design in which the independent variable was introduced then withdrawn to establish demonstrations of experimental effect. Experimental effect is determined when behavior change (i.e. dependent variable) covaries with manipulation (introduction and removal) of the independent variable. The independent variables are expected to produce immediate effects on the dependent behavior. The traditional approach to analysis of single subject research data involves visual interpretation of level, trend, and variability within and across conditions (Kennedy, 2005). Level refers to the mean performance during a condition, trend refers to the rate of increase or decrease of the dependent behavior, and variability refers to the degree the dependent behavior fluctuates during a phase. Active inspection of the data by level, trend, and variability guided decisions as to when variables were introduced or removed to establish experimental effect.

Timothy

Phase one: FBA Procedures- Assessment and Hypothesis Development

Structured interviews with the teacher and mother identified student preferences, academic performance, and activities in which Timothy was more likely to be on task. During a 40-minute structured interview with the teachers, they described Timothy as compliant and well liked by his peers. The primary concern was off task behavior (e.g. lack of responding) during large group circle time activities. Although he was not disruptive, he was often the only student not participating and responding to teacher questions. This limited participation with the group and engagement in learning activities.

At the beginning of the school year, the Brigance, an early academic screening tool, was administered in which Timothy scored in the low-average range. At quarterly teacher checks on numeracy and phonic skills, he was making adequate progress and was on track to start Kindergarten in the fall. On the Child Behavior Checklist, Timothy scored in the at risk range for attention problems. Off task behavior occurred the most during large group circle time from 9:30-10:00 and 4:00-4:30. Activities during this time included, calendar skills (e.g., numbers), songs and movement, and story reading by the teacher.

Structured direct observations. During the FBA, off task behavior during large group circle time was identified as the problem behavior. Off task behavior was defined as a lack of verbal responding to teacher prompts or questions directed toward the group or individually within two seconds of teacher request. This hypothesis was confirmed during descriptive direct observations. Descriptive data were collected in an A-B-C format (Bijou et al., 1968) during 30-minute observation periods in which off task behavior (e.g., lack of academic engagement) was most and least likely to occur.

The primary data collector recorded the antecedent conditions in which occurrence and nonoccurrence of responding took place and the consequences that immediately followed each occurrence. ABC data was collected until a pattern in which

the occurrence of responding or non-responding was identified. For five days, observations were conducted each morning and afternoon during teacher-led large group activities (i.e., center time, music and movements time, and small group table time) for a total of 12 accumulated direct observation hours.

Hypothesis development. Based on direct observations, two hypotheses were developed about the antecedent conditions. Hypothesis one was that Timothy responded to teacher-provided opportunities to respond when he knew the content. This hypothesis was developed during A-B-C observations in which Timothy responded and did not respond depending on teacher-directed routines. Routines were categorized by activity (large group circle, large group music and movement, and small group arts and crafts) then by content (academic and non-academic). Timothy engaged in teacher-provided opportunities to respond during non-academic activities such as large group music and movement and small group arts and crafts. However, when new songs were introduced, Timothy did not respond but engaged sporadically in the motions that he knew. Content of activities were probed to see what Timothy knew and did not know during typical large group circle time questions (e.g. number identification and rote counting numbers on the calendar). With numbers 1-10, Timothy could identify and rote count up to the number five and he could identify alternating patterns (e.g., up, down).

Hypothesis two was that Timothy would respond to individual prompts or group prompts when there was a delay between the question or instruction and onset of group responding. Based on A-B-C observations during large group circle time, Timothy responded sporadically to teacher questions or instruction when the group responded immediately after the teacher question or instruction. Timothy sat quietly but did not respond to teacher-provided group opportunities to respond during calendar activities, which typically asked for group rote counting and number identification followed by

immediate responding by the group. When provided with an individual prompt, Timothy responded after a short delay, correctly if he knew the answer (e.g., pattern identification, colors). For questions he did not know, he responded incorrectly by stating a number that he did know. Consequence events were also recorded. Teachers provided verbal praise for correct responding. For incorrect responses, teachers did not immediately provide the correct response, rather other students were called on to provide the answer. Timothy' final hypothesis statement is presented in Table 1.

Table 1.

Timothy' Hypothesis Statement Based on FBA Information.

Setting Event	Antecedent	Behavior	Consequence
Large Group Circle Time	Difficult Content (i.e. numbers, new songs)	Does not respond	Teacher asks another peer to answer
Large Group Circle Time	Group Prompt	Does not respond	Activity continues
Large Group Circle Time	Delayed Prompt	Verbally responds	Teacher praise
Large Group Circle Time	Individual Prompt	Verbally responds	Teacher praise

Phase Two- Verifying Hypotheses Via Brief SA

Each hypothesis was tested during large group circle time, which occurred in the morning and in the afternoon by the lead researcher. Testing of brief SA conditions occurred across three school days. Following teacher opportunities to respond, correct or incorrect responding was recorded manually by a data collector. Correct responses were

divided by the total number of opportunities to respond to get a percent. In addition, the number of opportunities to respond was divided by duration of time to get a rate of opportunities per minute. This was calculated to match the lead teacher's rate of opportunities to respond (6 opportunities to respond per minute) during brief SA conditions. Hypothesis 1 (content) and hypothesis 2 (group delayed prompt and individual prompt) were tested in a series of four conditions:

1. Content modification
2. Content modification and delayed prompt
3. Group prompt with delay
4. Content modification and individual prompt

Prior to starting these conditions, academic probes were conducted on typical circle time instructional materials to identify content that Timothy knew. Content probes included letters, letter sounds, numbers, patterns, and colors. When presented with two letter choices and asked to identify the letters T, M, P, E, and C, he correctly identified the following letters T, M, and P 33% of the time. He could not provide any correct letter sounds. When asked to rote count to 10, he responded correctly up to five 100% of the time and up to six 50% of the time. He correctly identified alternating patterns and colors (red, blue, white, black) with 100% accuracy. This information was used during the antecedent conditions, content modification, in which the instructional material presented during the brief SA condition matched the probes that Timothy answered correctly.

In the first brief structural analysis condition, instructional delivery remained the same and only the content was modified. In 3 minutes, 22 opportunities were provided at a rate of seven opportunities per minute. Correct responding was observed 12 times for a percentage of 55.

For the second condition, the content was modified and in addition, a delayed prompt was included. To incorporate a delayed prompt, the teacher asked the group a question. She then created a 2 second delay with verbal fillers such as “wait, think about it, get ready,” then provided a cue (e.g., nod, hand signal, state “okay”) for group responding to occur. There were 32 opportunities to respond within 6 minutes for a rate of approximately 5 per minute. Five group prompts and three individual prompts were provided. Correct responding was observed 29 times for a percentage of 91.

In the third condition, the content remained the same but a delayed group prompt was introduced. Timothy was provided with 24 opportunities to respond with a delayed group prompt within 5 minutes for a rate of approximately 5 per minute. Timothy correctly responded 15 times for a percentage of 57%..

In the fourth condition, content was modified and only individual prompts were provided. Given four individual opportunities to respond with content that Timothy knew, he correctly responded four times for a percentage of 100.

During the modified content and delayed or individual prompts, Timothy engaged in high levels of correct responding ($M = 97\%$). This supports hypothesis one that Timothy engaged in opportunities to respond when he knew the content and hypothesis two that Timothy engaged in responding when prompts provided a delay between the teacher question and onset of group or individual responding. Brief SA data for Timothy is presented in Figure 1.

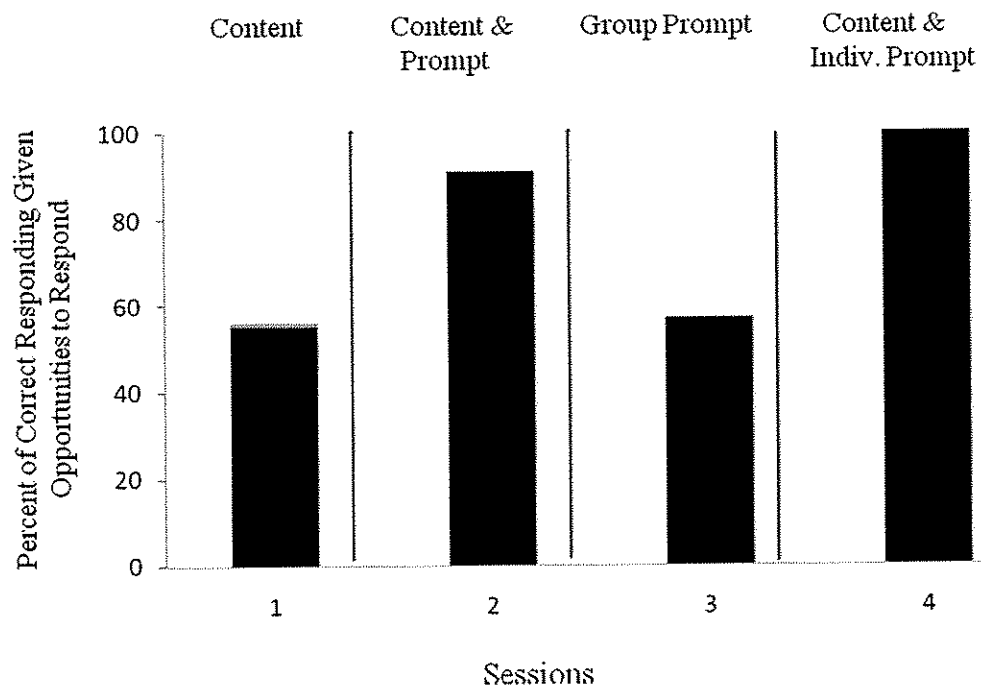


Figure 1. Brief Structural Analysis Results for Timothy

Phase Three- Conducting the Antecedent-based Intervention

This phase examined the effects of an antecedent-based intervention supported by assessment results and verified by a structural analysis. The structural analysis demonstrated that modified content and prompts increased correct responding during large group circle time activity. The first component of the intervention included pre-teaching numbers six through eleven in which the lead author provided direct instruction on a numeric skill until 100% accuracy was reached on discrete trials of verbal responding. Pre-teaching sessions typically lasted 5-7 minutes, occurred 30-to-45 minutes before morning circle time, and incorporated number identification and rote counting exercises. Numbers were pre-taught until correct responding reached 80% during the intervention. As new numbers were introduced, prior numbers were reviewed during rote counting sessions.

The second component of the intervention included a combination of group and individual prompts. A short delay was provided after the group prompt for one second so that the group would respond together and at least two individual prompts were provided during the large group activity. For example, the teacher may ask, “What number is this? Think about it (wait)” then signal for group responding (e.g., point to number again). Consequences for correct and incorrect responding remained consistent with procedures observed during structured observations. Teachers provided praise for correct responding and provided other students with an opportunity to respond when incorrect responses were provided. The intervention was developed by the lead researcher and validated by committee members to ensure that the assessment matched the antecedent-based intervention.

Baseline. The effects of the intervention were assessed using a withdrawal research design (e.g., baseline, intervention, baseline, intervention) to demonstrate experimental effect of the intervention and change in behavior. The lead teacher instructed the large group as she typically had throughout the school year. Baseline consisted of five observation sessions ($M = 12\%$) during the morning and afternoon circle time activities for a total of three days.

Intervention for the number six. The number six was pre-taught and Timothy correctly responded ($M = 95\%$) during four sessions. Sessions occurred in the morning or afternoon large group circle time activities. The first session occurred in the afternoon large group, the second and third session occurred in the morning and afternoon sessions, and the fourth session occurred in the morning large group for a total of three days.

Intervention for the number seven. For one session, seven was pre-taught with correct responding at 78%.

Withdrawal of intervention. The two components of the intervention- (a) no pre-teaching and (b) no delayed prompt were withdrawn during the second session of the number seven. The withdrawal sessions were conducted in five minute intervals. At this time, correcting responding decreased to 33%.

Intervention for the number seven. Following the withdrawal of the intervention in the morning, the intervention was reinstated for the number seven for the afternoon large group and correct responding increased ($M = 96\%$). The intervention for seven occurred for three sessions and lasted two days.

Intervention for the number eight. The intervention for the number eight occurred for one day because correct responding was high across two sessions ($M = 100\%$).

Intervention for the number nine. The second withdrawal of the antecedent- based intervention occurred for the number nine. Correct responding was predicted to decrease; however, Timothy correctly responded to 80% of the opportunities to respond. Reviewing the data recording form, three group prompts preceded individual prompts. It was speculated that the correct group response acted as a discriminative stimulus for the next opportunity to respond. Therefore, for the next session, the intervention for nine was withdrawn and three individual prompts preceded one group prompt to determine if correct responding occurred for the number 9 without the pre-teaching intervention. Correct responding for nine decreased ($M = 23\%$). This was repeated for two sessions to confirm that the responses were related to the withdrawal of the intervention and individual prompts and not other unrelated factors. When the intervention for nine was re-introduced, correct responding increased ($M = 85\%$).

Intervention for the number ten. Similar to the withdrawal for nine, the number ten was not pre-taught and three individual prompts preceded a group prompt. As predicted by the previous effect on behavior (e.g., responding during the number 9),

correct responding decreased to 33%; however following the intervention and individual prompts, correct responding increased ($M = 87\%$).

Intervention for the number eleven. The number eleven started with no pre-teaching and individual prompts in order to predict and replicate similar responding patterns for the numbers nine and ten. During no-preteaching and individual prompts, responding was predicted to be low. During no-preteaching and group prompts, responding was predicted to be high. When intervention of pre-teaching occurred and individual prompts provided, responding would be high. As predicted, during no pre-teaching and individual prompts, correct responding was 0% but increased to 75% when group prompts were provided even without pre-teaching. Following pre-teaching and individual responding, correct responding remained high for four subsequent sessions ($M = 90\%$).

The intervention sessions were recorded once or twice daily across a span of seven weeks; which included baseline, functional behavior assessment, brief structural analysis conditions, and intervention. Visual representation of the intervention data is provided in Figure 2.

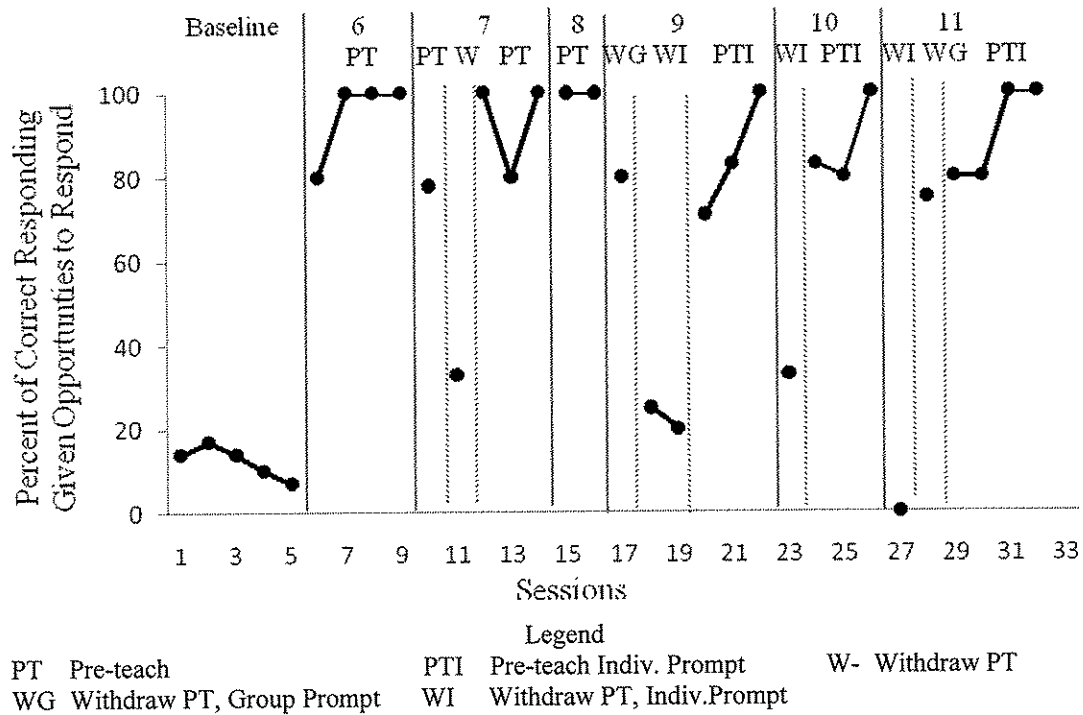


Figure 2. Experimental analysis for Timothy.

Inter-observer reliability. The first author served as the primary data collector with a second independent observer conducting reliability measures across 20% of sessions to provide an index of inter-observer agreement. The second observer was trained prior to data recording in the classroom. Practice opportunities were provided in recording correct and incorrect student responses. Agreements for the number of opportunities to respond were calculated using an exact response-by-response method (Kazdin, 1982) in which the number of agreements was divided by the number of agreements plus disagreements and multiplied by 100. Agreement rates at or above 80% is often used to reflect stability in measurement (Kazdin, 1982) and was used as the criteria in this study. In total, there were 36 sessions across baseline, assessment, and intervention phases. Inter-observer agreement was collected on seven occasions across 20% of intervention and withdrawal of the intervention phases. Total agreements for the

occurrence of correct responses averaged 86% across sessions with a range of 75% to 100%.

During the intervention phase, procedural integrity was collected on the same form as the opportunities to respond data collection sheet for 20% of the interventions. Intervention 1 components included: (a) pre-teaching, (b) at least two individual prompts, and (c) a one second delay after the group prompt. Intervention 2 included pre-teaching and two individual prompts before a delayed group prompt. The first author facilitated the process by providing a visual sequence of tasks (e.g., individual prompt, group prompt... wait, rote count to ten). Before each session, the tasks were reviewed and placed in visual proximity to the teacher. The intervention components included a yes-or-no format and the number components completed were divided by the total number of components and multiplied by 100. Procedural integrity averaged 100% across intervention phases.

Dion

Phase one: FBA Procedures- Assessment and Hypothesis Development

The FBA assessment methods included structured interview with the teacher for 30 minutes, Child Behavior Checklist, and direct observations. Mother did not attend the two scheduled meetings to conduct the interview. During a 30-minute structured interview with the teacher, she noted that Dion was a bright child who liked puzzles, blocks, and playing on the computer. He was usually engaged and on task during small group centers activities because he enjoyed playing with his peers. Many of his classmates lived in the same neighborhood, a public housing section close to the school. Dion was usually off task during large group activities. He often left his designated area, in peer's personal space, and cried easily. Teacher reported that she was constantly redirecting him to his area in the beginning of the year and decided that he was not

developmentally ready to participate and it was better to let him be off task than to disrupt instruction for the rest of the students.

During the FBA, off task behavior during large group circle time was identified as the problem behavior. Off task behavior was defined as lying on the floor, chewing on his shirt, playing with objects, touching peers, and leaving designated seating area. These behaviors impeded him from participating and engaging in group activities. On the Child Behavior Checklist, Dion scored in the clinical range for internalizing symptoms such as difficulty with affective and withdrawn problems. Large group circle time occurred on the carpet area from 12:00-12:30. Activities during this time consisted of songs and movement, story time, and practice for a performance (stand in line, recite poem), each taking about 10 minutes. Songs and movement and story time activities took place on the carpet area and the class transitions to the center of the classroom to practice the performance. The carpet had alphabet letters that circled around and each student was designated a specific letter to sit on during circle time. Dion had the letter "X" which was located on the right, outside portion of the circle.

Structured direct observations. Descriptive data were collected in an A-B-C format (Bijou et al., 1968) during 30-minute observation periods in which the problem behavior (off task) was most and least likely to occur. During circle time, off task behavior occurred most when engaged in songs and movement and poem practice. During the songs and movement activity, students were asked to stand in their designated area and participate in the associated movements with the song. Dion had difficulty staying in his area and would often wander around and touch peers, which distracted them from the activity. The poem practice activity was another time Dion was highly likely to be off task because Dion had difficulty staying in his designated unmarked space (e.g. between two peers in line) while the class recited a poem. When Dion was off task

during songs and movement, the teacher ignored his behaviors unless, he was physically touching a peer, during which the teacher verbally redirected him to his area. The teacher continued with the activity when Dion was on task.

Observations were also collected during centers and story time when Dion was less likely to be on task, specifically when seated in a defined space (e.g., chair) and engaged in preferred activities (e.g., building blocks, coloring). Dion was also observed to be highly interested in Spiderman memorabilia (e.g., peer’s book bag, peer’s shirt).

Hypothesis development. Based on direct observations, one hypothesis was developed based on an environmental antecedent condition. During large group circle time, Dion is more likely to be on task when provided with a defined place to sit and provided high interest materials. Dion’s hypothesis statement is summarized in Table 2.

Table 2.

Dion’s Hypothesis Statement Based on FBA Information

Setting Event	Antecedent	Behavior	Consequence
Large Group Circle Time	Low interest space marker	Off task	Teacher ignores out of seat and redirects when physically touching peers
Large Group Circle Time	High interest space marker	On task	Participates in ongoing activity

Phase Two- Verifying Hypotheses Via Brief SA

Each hypothesis was tested during large group circle time. The brief structural analysis tested the hypothesis in a series of two conditions:

1. High interest visual space marker (Spiderman picture)
2. Low interest visual space marker (letter "X")

The high interest visual space marker was a black and white picture of Spiderman inserted into an 8 1/2" by 11" clear, heavyweight sheet protector. The low interest "X" was the alphabet letter "X" on the carpet and taped letter "X" on the floor. The structural analysis demonstrated that a high interest space marker (Spiderman picture) increased on task behavior ($M = 87\%$) compared to the low interest space marker ($M = 52\%$). Visual representation of structural analysis results are described in Figure 3.

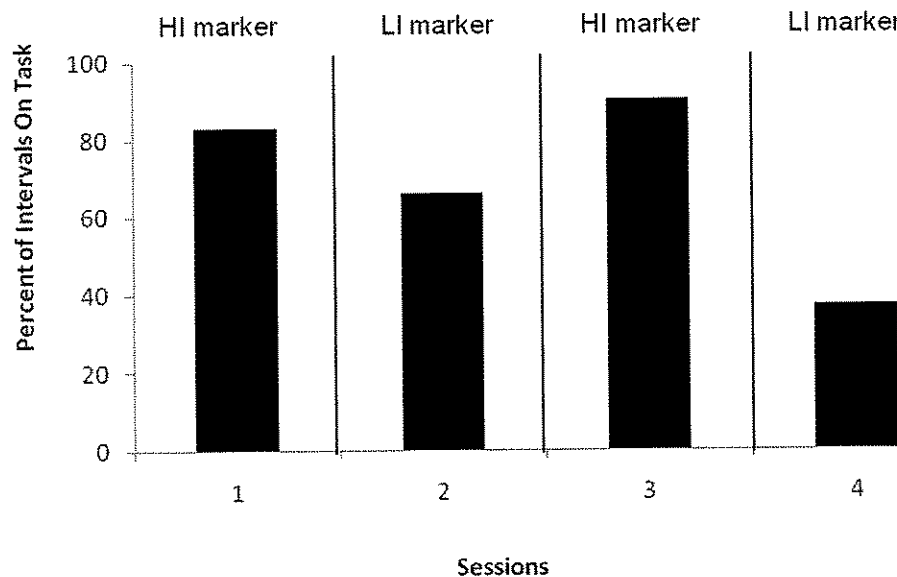


Figure 3. Brief Structural Analysis Results for Dion.

Phase Three- Conducting the Antecedent-based Intervention

This phase examined the effects of the high interest space marker, which was identified as the most effective antecedent condition during the structural analysis. Two high interest space markers were provided during large group circle time. One was placed on the carpet area to designate where Dion needed to sit. The second high interest space marker was placed on the floor on the spot that Dion needed to stand to practice for the class performance. Resources were provided by the lead researcher and implemented by the teacher.

Baseline. Baseline consisted of five observation sessions ($M = 52\%$) during large group circle time, which typically lasted 30-35 minutes. On task behavior was measured using a 10-second partial interval recording form for 10-minute intervals. One to two sessions were conducted in one day. During this time, three activities were presented in the same order: (a) songs and movement on the carpet area, (b) story time on the carpet area, and (c) practice for the class performance (poem recitation). During the class performance practice, all students stood in a designated place in line and recited a poem, *Wonderful World*, by George Weise and George Douglas.

Intervention. The intervention of the high interest space marker (Spiderman picture) was introduced and recorded for three sessions using a 10-second partial interval data recording form for ten-minute intervals. When Dion was off task out of his designated area, the teacher would ignore his behavior but when he physically touched a peer, she would verbally redirect him back to his area. The mean percentage of intervals on task was ($M = 69\%$) with a range of 20% - 95%. During the second session, Dion arrived to school tired. Although he sat in his area, Dion did not participate, chewed on his shirt, or attempted to lie down on the carpet. On task behavior was recorded at 20% of intervals. Excluding this data point, on task behavior remained high ($M = 91\%$). For the last three sessions, Dion carried his high interest place marker from the carpet area to the

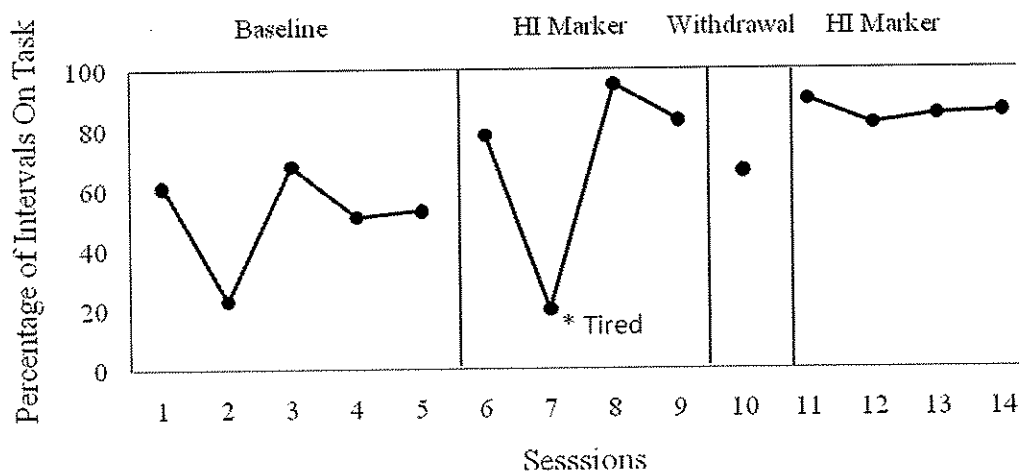
floor. One to two sessions were conducted in a day and intervention data was collected for four days.

Withdrawal of intervention. During the withdrawal phase, the high interest place marker was not provided during large group circle time. The withdrawal session was conducted in five minute intervals. Dion was told to sit or stand in his designated place on the carpet and in line during the class performance. On task behavior was ($M = 58\%$).

Intervention. Following the withdrawal phase, the intervention was implemented again and data recorded for five sessions using a 10-s partial interval data recording form for ten-minute intervals. On task behavior ($M = 87\%$) was recorded. Two sessions were conducted in a day and intervention data was collected for two days. Visual representation of intervention results are described in Figure 4.

Figure 4.

Experimental Analysis for Dion.



Inter-observer reliability. The first author served as the primary data collector with a second independent observer conducting reliability measures across 20% of sessions to provide an index of inter-observer agreement. In total, there were 17 sessions

across baseline, assessment, and intervention phases. Inter-observer agreement was collected on 3 occasions during the brief SA and intervention phase. Total agreements for the occurrence of correct responses averaged 87% across sessions with a range of 86% to 90%.

During the intervention phase, procedural integrity was collected. The number of sessions in which the intervention was provided was divided over the total number of sessions. Procedural integrity averaged 100% across intervention phases.

Donny

Phase one: FBA Procedures- Assessment and Hypothesis Development

Structured interview and behavior checklist. The FBA assessment methods included structured interview with teacher and mother, Child Behavior Checklist, and direct observations. On the Child Behavior Checklist, Donny scored in the clinical range exhibiting externalizing symptoms in the attention and aggressive behavior scales. Academically, he performed in the average range. An interview with the mother described a high level of stress at home noting that she was a young single parent with four children all under the age of 6 years. She reported that she felt overwhelmed and did not know what to do to help Donny at school or home. During the interview with the teacher, she described Donny as affectionate but extremely disruptive and aggressive with peers. He enjoyed science activities (e.g., using magnifying glass, magnets) and reading books with adults. He often interrupted the teacher during large group morning time by repeatedly talking out, arguing, or disrupting peers. Two months ago, the teacher received consultation and was provided strategies to manage problem behaviors. She started to implement a behavior system in which Donny was provided behavior feedback (e.g., happy or sad face) on three behaviors (follow directions, hands to self, and stay in area). If he received more positive ratings than negative ratings, he earned a reinforcer

(e.g., sticker, stamp, edibles) at the end of the day. One of the instructional assistants provided the feedback after class activities and provided the reward at the end of the day.

Structured direct observations. Disruptive behavior was identified as the problem behavior and defined as repeated talk outs, arguing with peer or teacher, noise-making, leaving area, touching peers, playing with objects, and crawling, rolling, or laying on the floor. These behaviors often interrupted teacher instruction during large group activities on the carpet area and distracted peers from learning. Descriptive data were collected in an A-B-C format to identify the antecedents and consequences that occurred before and after disruptive and on task behavior. Disruptive behaviors occurred throughout the day but interfered the most with instruction during large group morning time. Large group morning time included: songs, calendar, daily schedule, story time, and discussion. Disruptive behavior was least likely to occur during tasks and activities that he enjoyed (e.g., books, stories, hands on activities) and when he was engaging with staff.

During large group morning time, Donny had two instructional assistants in close proximity to him (e.g., within arm's reach) to redirect him back to task by verbally or physically redirecting him. If he left the carpet area, one of the instructional assistants would physically prompt him back to his area.

Hypothesis development. Based on direct observations, three hypotheses were developed involving staff proximity, high interest materials, and high interest activities. During morning group time, Donny was less disruptive when in close proximity to staff (instructional assistant). During this time, he was also less disruptive when engaged in high interest activities (e.g., related to science, student interests) or when provided with high interest materials (e.g., Spiderman). Donny's hypothesis statement is summarized in Table 3.

Table 3.

Donny's Hypothesis Statement Based on FBA Information

Setting Event	Antecedent	Behavior	Consequence
Morning Group Time	Proximity to staff	On task	Teacher praise, Positive rating on behavior card at the end of the activity
Morning Group Time	High interest activity	On task	Teacher praise, Positive rating on behavior card at the end of the activity
Morning Group Time	High interest material	On task	Teacher praise, Positive rating on behavior card at the end of the activity
Morning Group Time	Low interest activity	Off task	Verbal or physical redirection

Phase Two- Verifying Hypotheses Via Brief SA

Each hypothesis was tested during morning group time. The brief structural analysis tested the hypotheses in a series of seven conditions:

1. Proximity to staff (instructional assistant)
2. High interest (discussion about worms)
3. Low interest (discussion about Louisville)
4. High interest (reading story)
5. Low interest (discussion about Louisville)
6. High interest (reading story)
7. High interest (sitting on Spiderman book)

Proximity to staff and high and low interests were the original conditions. As the brief SA conditions were being conducted, an additional condition was added to determine if proximity to high interest materials would also help reduce off task behavior. This was

added because proximity to high interest materials was more feasible than reading high interest materials as an intervention to implement in the classroom. Brief structural analysis results are depicted in Figure 5.

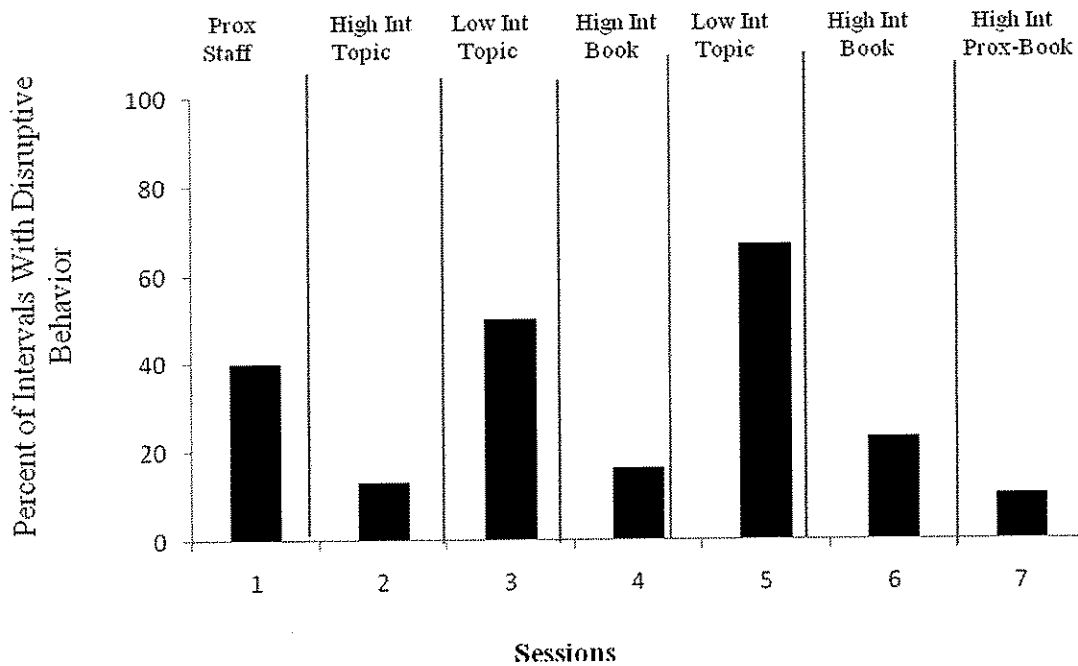


Figure 5. Brief Structural Analysis Results for Donny.

Phase Three- Conducting the Antecedent-based Intervention

This phase examined the effects of proximity to a high interest book on disruptive behavior. High interest materials was hypothesized and verified through the brief SA procedure as an antecedent condition to decrease disruptive behavior, therefore, directly implemented as part of the intervention. The high interest book was a coloring book of Spiderman pictures, which Donny sat on during large group circle time. This resource was provided by the lead researcher. The teacher provided the high interest book at the start of large group and Donny returned it to the teacher at the end of the activity.

Baseline. Disruptive behavior was measured using a 10-s partial interval recording form for 10-minute intervals during large group circle time. This activity lasted 35-40 minutes and baseline was collected during typical large group activities. Baseline was collected until a stable pattern of responding occurred. A total of five observation sessions ($M = 64\%$) were recorded with one to two sessions conducted in one day.

Activities during this time consisted of a variety of tasks including: songs, calendar, weather, schedule, numbers, discussion, and story. Students sat around the carpet area in a designated spot. Donny sat on a star around the outside of the circle, near the instructional assistant who sat at a table nearby. At the end of circle time, the instructional assistant provided behavior feedback on Donny's daily behavior chart. He received either a happy face or sad face based on his performance on three classroom rules: follow teacher directions, keep hands to self, and stay in area. At the end of the day, if Donny earned more happy faces than sad faces, he picked an item from the box of reinforcers.

Intervention. Proximity to the high interest book was introduced and recorded for five sessions. Disruptive behavior was recorded using a 10-s partial interval data recording form for ten-minute intervals. The mean percentage of intervals that Donny engaged in disruptive behavior was ($M = 21\%$) with a range of 11% - 28%.

Withdrawal of intervention. During the withdrawal phase, the high interest book was not provided during large group circle time for two sessions. Donny was told to sit in his designated place on the carpet, which was the star on the carpet. The withdrawal session was conducted in five minute intervals. Disruptive behavior increased ($M = 62\%$) following the withdrawal of the intervention.

Intervention. Following the withdrawal phase, the intervention was implemented again and data recorded for three sessions. There was an immediate effect. Disruptive behavior decreased ($M = 16\%$).

Withdrawal of intervention. A second withdrawal phase was conducted to confirm that it was the implementation of the high interest book that affected change in behavior and not another variable. During large group circle time, Donny often placed his hands underneath his legs to touch the book or used his fingers to rifle the pages of the book. To disconfirm sensory-related variables, another book was introduced similar in size and shape but not a topic of interest. The book, "Hawaii is a Rainbow" by Stephanie Feeney was chosen and confirmed as a topic of non-interest through a preference assessment in which Donny was provided two book options to read during center time. On three occasions, this book was not chosen.

During the intervention session, the teacher provided the non-interest book to Donny which he picked up then threw on the floor. When seated in his designated spot on the carpet, the book was placed next to Donny by the lead researcher. Five minute intervals of disruptive behavior were recorded and behaviors increased to 73% which confirmed that proximity to the high-interest book was the most important variable.

Intervention. Proximity to the high interest book was implemented again and data recorded for one session to show an immediate effect in a decrease of disruptive behavior ($M = 18\%$). On the following day, Donny was suspended from the Head Start program for three days for urinating and defecating on the walls in the classroom bathroom. After the third day, a meeting was scheduled with the mother, school administrators, and Head Start representative to discuss the incident, progress on the behavior plan, and referral for additional mental health services within the county. Mother did not attend the meeting and could not be contacted to reschedule another meeting within 14 days of the remaining

school days because the cell phone number was disconnected. Visual representation of the intervention data is provided in Figure 6.

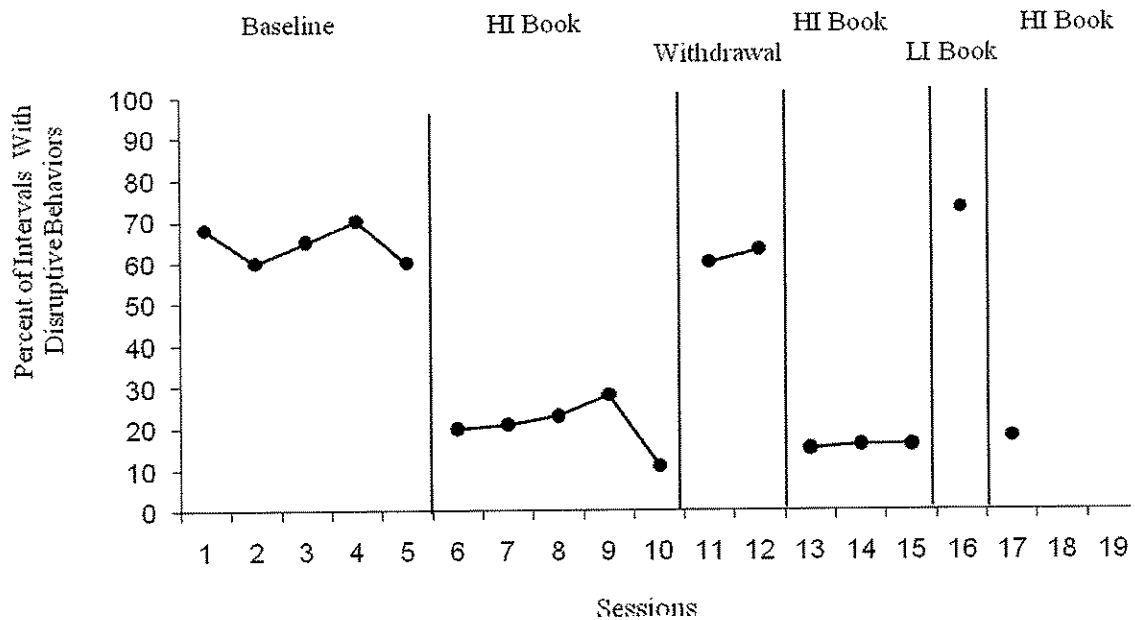


Figure 6. Experimental Analysis for Donny.

Inter-observer reliability. The first author served as the primary data collector with a second independent observer conducting reliability measures across 20% of sessions to provide an index of inter-observer agreement. In total, there were 24 sessions across baseline, assessment, and intervention phases. Inter-observer agreement was collected on 5 occasions during baseline, brief SA, intervention, and withdrawal phases. Total agreements for the occurrence of correct responses averaged 91% across sessions with a range of 75% to 92%.

During the intervention phase, procedural integrity was collected. The number of sessions in which the intervention (Spiderman book) was provided was divided over the total number of sessions. Procedural integrity averaged 100% across intervention phases.

Korana

Phase one: FBA Procedures- Assessment and Hypothesis Development

Structured interview and behavior checklist. On the Behavior Checklist, Korana scored in the clinical range for externalizing behaviors (e.g., attention and aggressive behavior). Structured interviews were conducted with the teacher and mother on separate occasions. The teacher described Korana as performing on average on pre-academic skills but extremely disruptive during teacher instruction. Disruptive behaviors were defined as talking to peers, arguing with the teacher and assistants, whining, touching objects, and leaving the learning area and running around. On several occasions, the school administrator was called to remove Korana from the classroom. These behaviors have increased in frequency over the last three months. Mother recently found out she was pregnant and no other changes have been made to home life. Mother described Korana's interest in Dora and she loved to watch Dora shows on the television.

During the interview, the lead teacher described working relationships with the instructional assistants as challenging. The previous school year, the two instructional assistants were leading classroom activities for four months before the lead teacher took the position in the middle of the school year. Both instructional assistants have been working at the program site for over eight years and behavior management skills have been described as reactive and punitive. During the current school year, the teacher has been working with the instructional assistants to establish classroom rules and consequences in a calm tone of voice without constantly berating of the students.

Structured direct observations. Descriptive data were collected in an A-B-C format (Bijou et al., 1968) during 30-minute observation periods in which the problem behavior (disruptive behavior) was most and least likely to occur. Observations were conducted during teacher-led large group and small group activities for three days and an accumulation of three hours. During large group circle time, disruptive behaviors occurred constantly during calendar, weather, numbers, songs, and discussion activities. Students sat on individual name tags in the carpet area and staff often had difficulty getting Korana to the group. When repeated demands and physical prompts did not work to keep Korana in her area, staff would often let her wander around and play with objects around the room as the lead teacher started the group activity. After about 10-15 minutes, an instructional assistant would physically prompt Korana to sit and hold her until she sat in her area. On one occasion, the lead teacher showed a picture of Dora at the start of large group and Korana independently sat in her area.

Hypothesis development. Based on direct observations, two hypotheses were developed based on environmental antecedent conditions to increase on task behavior. The first hypothesis was physical proximity to staff. The second hypothesis was using student interest (Dora) to engage Korana during large group circle time. During large group activity, physical proximity to adult (sitting on lap) and using student interest (Dora) were hypothesized to decrease Korana's disruptive behaviors. Following disruptive behavior, delayed staff redirection was provided to physically prompt Korana to the group activity. When on task, a specific consequence was not noted and the activity continued to proceed. Korana's hypothesis statement is summarized in Table 4.

Table 4.

Korana's Hypothesis Statement Based on FBA Information.

Setting Event	Antecedents	Behavior	Consequences
Large Group Circle Time	Proximity to staff	On task	On-going activity
Large Group Circle Time	Space marker with student interest	On task	On-going activity

Phase Two- Verifying Hypotheses Via Brief SA

Each hypothesis was tested during large group circle time, which occurred in the morning after breakfast. Brief SA conditions occurred across four days. While testing the first hypothesis, physical proximity to adult, students were engaged in a song activity. In order to test a single variable, physical proximity to adult and song activity were tested singly. Based on consultation with the teacher, the teacher recommended the therapeutic floor wedge as a similar physical accommodation. Sitting on the assistant's lap was not a feasible intervention option in the classroom. The floor wedge sits directly on the floor and is a horse-shoe enclosure with arm rests to provide a physical boundary for students' back and arms. Finding a similar physical enclosure that produced similar results in

behavior would be directly implemented in the antecedent-based intervention.

The second hypothesis, student interest, was tested along with the therapeutic floor wedge then tested singly to verify the combination of the variables to produce the best antecedent conditions to reduce disruptive behaviors. A Dora place mat was inserted inside the floor wedge so that Korana could see the Dora cartoon. Hypothesis 1 (adult lap) and hypothesis 2 (student interest) were tested in a series of eight conditions:

1. Adult lap and song activity
2. Name tag
3. Song activity
4. Lap
5. Therapeutic floor wedge and Dora
6. Tag
7. Therapeutic floor wedge
8. Dora

Results of the structural analysis are described in Figure 7.

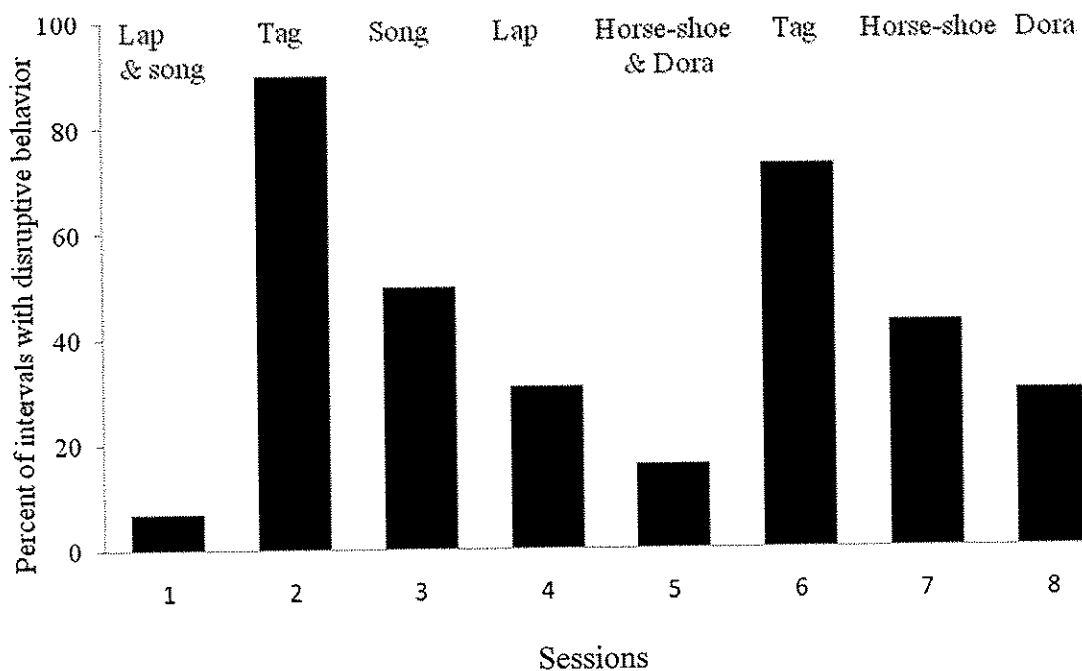


Figure 7. Brief Structural Analysis Results for Korana.

Phase Three- Conducting the Antecedent-based Intervention

Based on the assessment results, the best antecedent conditions to support Korana during large group activity were the use of both the therapeutic floor wedge and student interest. This phase examined the effects of using both conditions as the antecedent-based intervention. The Dora place mat and the therapeutic floor wedge were provided by the lead researcher. The teacher or instructional assistant placed these items on the carpet area before the start of large group.

Baseline. Disruptive behavior was measured using a 10-s partial interval recording form for 10-minute intervals during large group time. Disruptive behavior was defined as talking to peers, arguing with the teacher, whining, touching objects, and leaving the learning area and running around. Students were given a designated spot identified with a name tag taped to the carpet. Large group time lasted 30 -35 minutes and baseline was collected during typical activities, which included calendar, weather, songs, schedule, and discussion. Baseline was collected until a stable pattern of responding occurred. A total of five observation sessions ($M = 75\%$) were recorded with one to two sessions conducted in one day.

Intervention. Student interest (Dora place mat) and the therapeutic floor wedge were introduced and recorded for five sessions. Disruptive behavior was recorded using a 10-s partial interval data recording form for ten-minute intervals. The mean percentage of intervals Korana engaged in disruptive behavior was ($M = 11\%$) with a range of 8% - 16%.

Withdrawal of intervention. During the withdrawal phase, student interest and the floor wedge were not provided during large group circle time for one session. The interval session was reduced to three minutes because Korana would not join the group

and was disrupting teacher instruction. When the floor wedge and Dora place mat were removed, the percent of intervals with disruptive behavior increased ($M = 100\%$).

Intervention. Student interest (Dora place mat) and the therapeutic floor wedge were implemented again and responding observed for five sessions at ten-minute intervals using 10-s partial interval recording. The mean percentage of intervals that Korana engaged in disruptive behavior was ($M = 7\%$) with a range of 4% - 13%. Visual representation is depicted in Figure 8.

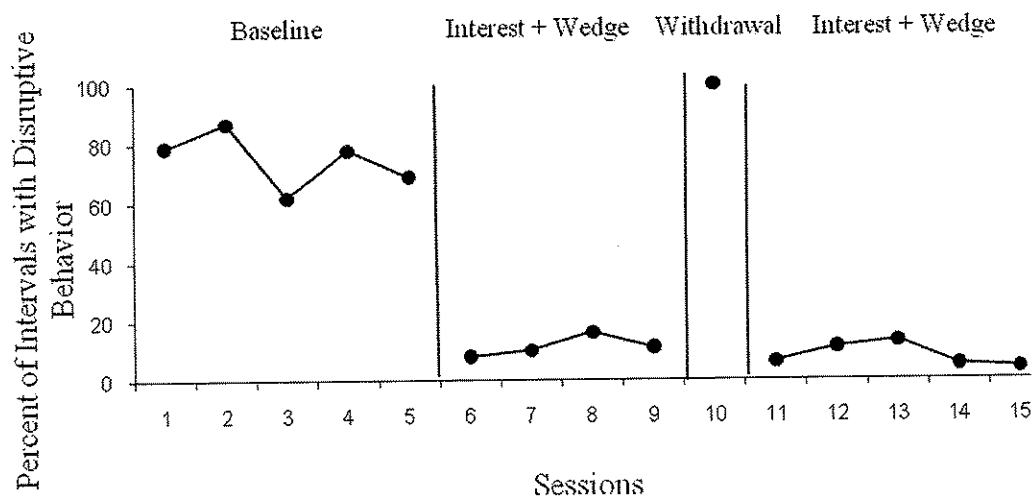


Figure 8. Experimental Analysis for Korana.

Inter-observer reliability. The first author served as the primary data collector with a second independent observer conducting reliability measures across 20% of sessions to provide an index of inter-observer agreement. In total, there were 23 sessions across baseline, assessment, and intervention phases. Inter-observer agreement was collected on 5 occasions during baseline, brief SA, intervention, and withdrawal phases.

Total agreements for the occurrence of correct responses averaged 88% across sessions with a range of 73% to 98%.

During the intervention phase, procedural integrity was collected. The number of sessions in which the intervention (Wedge and Dora place mat) was provided was divided over the total number of sessions. Procedural integrity averaged 100% across intervention phases.

Social Validity

Social validity was measured through a Treatment Acceptability survey in which teachers were asked about the assessment and intervention process through a 6-point Likert scale. All participating teachers completed the survey within 15-20 minutes. Each section is described below.

Assessment process. The assessment process portion of the survey consisted of three questions about the structured interview and direct observations. Teachers report that the assessment process did not affect on-going classroom activities ($M = 5.75$), was time-efficient ($M = 5.75$), and within their ability to implement the assessment procedures ($M = 6$).

Antecedent intervention plan. The intervention plan portion of the survey asked about the individualized antecedent strategies to support the student in the classroom. Teachers highly agreed that the antecedent plan was in the best interest of the student ($M = 6$), and very effective for the student ($M = 6$). Teachers report they were very willing to implement antecedent strategies ($M = 6$) and very likely to implement the strategies the next day ($M = 6$). Teachers also report that the antecedent strategies were easy to implement ($M = 5.75$), acceptable to the teachers ($M = 6$), cost-effective ($M = 6$), and time-efficient ($M = 6$).

CHAPTER 5

DISCUSSION

Chapter five provides a discussion of the major components of the dissertation study investigating the (a) use of structural analysis to produce hypotheses of antecedent conditions and (b) functional relationships between antecedent-based interventions and observed change in problem behavior. This chapter will provide an overview of the purpose of the study, main results and findings, limitation of the study, and lastly, a conclusion and future directions for research.

Overview of the Study

Young children who engage in challenging behaviors represent a population of growing concern to teachers, parents, and policy-makers. With as many as 35% of preschool-aged children exhibiting clinically significant levels of disruptive behaviors (Qi & Kaiser, 2003), many young children are at risk for school failure. If challenging behaviors are not addressed in a timely manner, many preschool children who display early incidents of problem behaviors may continue to demonstrate problem behaviors that persist and develop into more dangerous patterns of behavior (Walker, Ramsey, & Gresham, 1995). There is clearly a need for early assessment and intervention for preschool students at-risk for developing behavioral disorders.

Central to the early intervention approach is utilization of the functional behavior assessment (FBA) process to decrease challenging behavior and increase adaptive responses. FBA is defined as a set of assessment procedures used to identify events in the

environment that may predict and/or maintain challenging behaviors (O'Neill et. al., 1997). Research supporting the theory and use of FBA is substantial and even mandated by legislation. In 1997 and 2004 Congress amended the Individuals with Disabilities Education Act so that schools must conduct FBAs and develop positive behavior support plans for students who engage in behaviors that impede learning for themselves or their peers. This process could especially be beneficial to support young children exhibiting challenging behaviors early on, thereby, providing prevention and intervention before behaviors become chronic patterns of misbehavior.

More recently, there has been an increasing trend in applied research to examine the effect of antecedent variables to prevent the occurrence of problem behavior (Conroy & Stichter, 2003). Antecedent interventions aim to prevent problematic behaviors by altering the conditions that occasion them. Rather than modify consequence events after problem behaviors occur, antecedent interventions remove or modify environmental events that precede problem behaviors and create antecedent conditions that predict student success. To develop antecedent interventions, assessment information is obtained about environmental events that appear to set the occasion for both problem behaviors and adaptive behaviors. Assessment information is directly applied to the intervention to modify environmental events that precede problem behaviors (Kern & Clemens, 2007). This has been especially critical in applied settings because of idiosyncratic variables that may maintain problem behaviors.

Antecedent-based interventions have the potential to be a proactive and efficient process within applied settings but more research needs to be conducted to confirm the validity of antecedents within the FBA process. The purpose of this study was to investigate the role of antecedents to develop interventions for preschool students at-risk

for behavioral disorders and answer the following questions:

1. Can functional behavior assessment information based on descriptive and brief structural analyses produce verifiable hypotheses of antecedent conditions when performed with preschool children in a Head Start classroom?
2. Is there a functional relationship between antecedent-based intervention procedures and observed change in problem behavior?

Summary of Main Findings

Overview of Study Procedures

Assessment information gathered from FBA procedures were verified through structural analysis procedures and directly linked to the development of an antecedent-based intervention. The study was conducted using single-subject research methodologies that (a) measure the effect of the intervention on behavior over time and (b) establish causal relationships between the intervention and change in behavior. Withdrawal treatments designs were used in this study to compare baseline or non-treatment to the treatment phase and the effect on behavior.

The phases of the study included: (1) functional behavior assessment procedures to identify antecedent variables and develop a hypothesis on the antecedent conditions that reliably predict occurrence or nonoccurrence of the problem behavior, (2) structural analysis procedures to validate the conditions, (3) withdrawal research design to demonstrate functional relations between antecedent-based interventions and change in behavior, and (4) teacher interview to gather perspectives on the acceptability of the assessment and intervention procedures.

The first research question investigated the functional assessment procedures to verify antecedent conditions associated with increase in adaptive behavior or decrease in

disruptive behavior. This question validates the utility of descriptive assessment procedures to guide the development of hypotheses statements and the importance of conducting structural analysis procedures to enhance the effectiveness of the behavior intervention plans. In phase 1 of the study, indirect and direct assessment methods were collected to develop hypotheses about the conditions that triggered adaptive and maladaptive behaviors. Structured interviews were conducted with teachers and parents to identify the behavior of concern, the events that predicted problem behaviors, and the events that following problem behaviors. Direct observations were analyzed to hypothesize the antecedent conditions that triggered behavior. Phase 2 of the study tested the hypothesized conditions to observe the effect on behavior. This was done through an experimental structural analysis procedure in which a withdrawal method was employed. Hypothesized conditions were predicted to increase or decrease behaviors following the presentation or removal of each condition. The effect was replicated to establish control between the condition and the behavioral effect. The prediction and replication of responses provides assurance that the changes observed are due to the presentation and removal of specific conditions and not extraneous variables; thereby, providing greater certainty that the effects are the results of the condition alone.

The second research question investigated the functional relationship between antecedent-based intervention procedures and change in problem behavior. Using a reversal research design, the study demonstrated that problem behaviors of young children can be reduced dramatically when individualized antecedent interventions were implemented within classroom routines. This study also demonstrated functional control between the intervention and observed change in behavior. Functional control is established when predicted change in the student behavior (e.g., disruptive behavior, correct responding, on task behavior) co-varies with the implementation of the

intervention (Horner, Carr et al., 2005). In phase 3 of the study, a single-subjects reversal research design was used to document three demonstrations of experimental effect at three different points in time. The first effect was demonstrated between the baseline condition and the first intervention implementation. A clear difference in level was demonstrated in student responding immediately upon the introduction of the intervention for each student. The second effect was demonstrated between intervention effects and withdrawal of the intervention. It was predicted and confirmed that withdrawal of the intervention would establish a pattern of responding similar to baseline conditions as demonstrated by all participants. The third effect was demonstrated between the withdrawal of the intervention and the second introduction of the intervention. Following the start of the intervention, an immediate change in responding occurred. This is clearly demonstrated by the intervention results for Donny and Korana. Responding patterns replicated the behavior established during the initial intervention implementation and specific withdrawal procedures (i.e. individual and group prompts) for Timothy.

Strengths of the Study

Assessment procedures. The first strength of the procedure was that brief structural analyses (SA) validated hypothesized conditions for each student. For Timothy and Dion, hypothesized conditions showed an increase in the level of responding for adaptive behaviors. For Donny and Korana, hypothesized conditions reduced the level of disruptive behaviors. This indicates that the information collected in phase 1 (structured interviews and direct observations) produced viable hypotheses about the conditions that triggered behaviors. The differential responding patterns validate that conditions were based on reliable assessment procedures and not best guesses as to the preceding antecedents.

A second strength of the assessment procedure was the flexibility in which conditions were modified or clarified with additional conditions. This helped to ensure that the best conditions were isolated for implementation into the intervention plan. As conditions were presented and removed, other variables that may have influenced results were further analyzed to determine the effect of a single variable. For example, Korana's first condition was physical proximity to lap; however, during this condition, a song activity coincided with the condition. To isolate between physical proximity and song activity, both conditions were tested separately. Importantly, the feasibility of conditions within the applied setting was considered to best meet the context and resources available in the classroom. Because physical proximity to staff (i.e., sitting on lap) could not be implemented consistently during large group activity for Korana, an alternative hypothesis (e.g., wedge) was tested to see if results were comparable in reducing disruptive behavior. The therapeutic floor wedge and student interest (i.e., Dora) were tested and shown to also produce positive effects in behavior. Following the replication of the name tag and predicted increase in disruptive behavior, the wedge and student interest were tested separately to determine which condition produced the best effect on behavior: (a) therapeutic wedge, (b) student interest, or (c) combination of wedge and interest. The structural analysis identified the combined effect of the wedge and student interest as the best conditions to reduce disruptive behavior that

Intervention procedures. Several positive features resulted from the antecedent-based intervention. First, functional control was demonstrated between the intervention and improved behavior changes which demonstrated that structural analysis procedures can be prescriptive in developing appropriate interventions. In addition, results of this study provide support for simple instructional modifications (e.g., individual prompt, delayed group prompt, pre-teaching) and environmental modifications (e.g., proximity to

high-interest materials) to improve behavior. For Korana, disruptive behavior decreased significantly ($M = 8\%$) from baseline conditions ($M = 75\%$) with the introduction of student interest and wedge. Donny also showed a decrease in disruptive behavior ($M = 19\%$) following implementation of proximity to high-interest material from baseline conditions ($M = 64\%$). Timothy and Dion showed an increase in prosocial behaviors. Correct responding increased for Timothy ($M = 87\%$) from baseline conditions ($M = 12\%$) and on task behavior increased for Dion ($M = 85\%$) from baseline conditions ($M = 51\%$) following access to high-interest space marker or pre-teaching and prompts. Visual analysis of the graphs illustrated an immediacy of effect and changes in level for all participants. Dion's behavioral data also show changes in variability from baseline conditions (range = 23% - 68%) to the second implementation of the intervention (range = 82% - 84%). Improvements in behavior provide further evidence that problem behaviors (or adaptive behaviors) can be ameliorated in a preventative manner by modifying environmental or instructional variables that are identified through a functional assessment.

Second, intervention procedures for Timothy also demonstrated generalization of responding for untaught numbers. For the number nine, it was predicted that the withdrawal of the intervention would decrease responding; however, following the withdrawal, responding remained high (80%). To understand this effect, correct and incorrect responding on the data recording form was analyzed. For the number 9 (not pre-taught), correct responding occurred only after group responding. It was speculated that

Timothy had learned to generalize the responding of the group through prior stimulus-response-consequence relationships. For example, the teacher provides the prompt (e.g., What number is this?), the group responds correctly, and students are reinforced. The correct group response then acts as a discriminative stimulus for future correct responding for Timothy. In this way, responding was generalized for new numbers.

Group generalized responded was tested for numbers 10 and 11. The withdrawal phase did not include pre-teaching and started with individual prompts to test for content knowledge on the new number. As predicted, responding decreased ($M = 33\%$). When pre-teaching and individual prompts were introduced, responding increased ($M = 88\%$) as predicted. To verify the effects found in the number 9 and replicated in the number 10, the number 11 started with no pre-teaching and individual prompt to produce low responding (0%). The withdrawal phase continued without pre-teaching but started with group prompts to show an increase in responding (75%). The best responding patterns occurred when the new number was pre-taught and individual prompts provided to test knowledge of the number. When the intervention (e.g., pre-teach and individual prompt) was introduced, the pattern of responded replicated effects found in previous numbers and responding increased ($M = 90\%$).

Generalization indicates behavior changes that occur in non-training conditions as was the case in this study. Generalized effects are a critical component of effective interventions and central in producing socially important behavior changes that extend beyond the intervention. Learning to use correct group responses to prompt future correct responses may help Timothy participate more in large group activities, access more teacher praise, and be more successful in learning activities. However, academic deficits

will need to be addressed and Timothy will continue to need effective instruction beyond this antecedent strategy.

The third positive effect was the constant analysis of the intervention effect on observed changes in behavior. Single-subject research allows for continuous evaluation of behavior change. For Donny, intervention components were further analyzed to rule out variability of other factors that may be associated with the decrease in disruptive behavior. Proximity to high-interest materials, as indicated from structural analysis results, were transferred to Donny's intervention plan to include a Spiderman book that he sat on during large group circle time. Observations during the intervention noted that Donny was constantly touching or thumbing the sides of the book which may indicate a sensory-related variable. Proximity to high-interest material was tested through a second withdrawal phase in which a book similar in weight, size, and shape was replaced with the Spiderman book. Donny refused the book (e.g., threw on the floor) when it was presented and the book remained in close proximity to him during large group circle time to show an increase in disruptive behavior (73%). The intervention continued to use proximity to high-interest material and disruptive behaviors remained low (18%). Additional data points were not gathered because after a three-day suspension, mother removed him from the program for the remaining three weeks of the school year.

The fourth benefit is the collaborative effort between the researcher and participating teachers involved in providing intervention support for individual students. Collaborative efforts provided modeling opportunities, increased treatment integrity, and resulted in high social validity ratings. For Timothy, structural analysis procedures provided an excellent opportunity for the researcher to model a delayed group prompt and individual prompt during large group activities. Thereby, during the intervention, the teacher was very willing to and provided the

intervention with high procedural integrity. Because structural analysis conditions were tailored to meet classroom resources, materials, and time, interventions were both feasible and practical for school staff. Social validity results indicate that teachers were very receptive to antecedent strategies because they were easy to implement, cost effective, and time-efficient. In fact, teachers reported they were willing to implement strategies the very next day. The collaborative effort and acceptability of antecedent strategies provide evidence that involvement and participation of school practitioners is critical to ensure treatment integrity. Treatment integrity reflects the accuracy and consistency with which each component of the intervention is implemented as originally designed (Gresham, 2004). Antecedent-based intervention components are more receptive to high treatment integrity because components rely on existing relations between environment and behavior and teachers are more apt to prevent occurrences of problem behavior.

Lastly, improved behavior change demonstrate that (a) results of structural analysis procedures can be conducted in educational settings and (b) the use of antecedent-based strategies for young children at-risk for developing Emotional Disorders.

Limitations and Weaknesses of the Study

Assessment and intervention procedures were directed by the first author who took the role of a mental health consultant within the early childhood Head Start program. Although mental health consultants are frequently used to provide behavior support in early childhood programs, the effects of the researcher as the consultant are not known and therefore, a limitation of the study. During the assessment process, antecedent conditions were identified and refined through collaborative problem-solving between practitioners and the researcher. Practitioners were involved in the decision-making process to determine which antecedent conditions were

feasible and realistic to implement as an antecedent-based intervention in the classroom. This high level of collaborative consultation and practitioner involvement during the assessment and intervention process increased treatment integrity and teacher acceptability to implement the intervention.

Because key components of effective consultation in mental health consultations services are not known, many variables may have impacted the quality of consultation services and therefore, the results of this study. Variables in mental health consultations services may include credentials of effective behavior consultants (e.g., training, teaching skills, behavior competency), frequency and duration of behavior support needed to effect change in outcomes (e.g., number of direct consultation hours with each student and staff), and quality of rapport and trust established with program staff. Because the effects of these variables are not known, a limitation of this study includes the lack of descriptive reporting of consultation services delivered within the classrooms.

Further limitations and weaknesses found in the methodology of the study are reported for student.

Timothy. Intervention 1 (pre-teach, delayed group prompt, and 2 individual prompts) and intervention 2 (pre-teach, three individual prompts before delayed group prompt) showed experimental control between implementation of the intervention and observed effect of behavior. Two weaknesses are noted in the methodology of the structural analysis and intervention. First, there was limited structural analysis data, particularly for Timothy to establish experimental control of the effects of the antecedent conditions. It was determined that content and individual prompts produced the highest

percent of correct responding, therefore, these conditions should have been replicated to demonstrate experimental control. The school setting presents limitations on the teacher's time and flexibility to extend assessment procedures through a strictly scientific approach. For example, there were a limited number of school days available before summer vacation, changes in activities, and special program activities and visitors. In consideration of the time and realities of the school setting, the structural analyses focused on the most salient conditions that would be implemented within the intervention plan.

Second, there was a lack of documentation and control for teacher and student consequence events during the assessment and intervention process. Functional assessments indicated consequences for correct and incorrect student responding. During large group circle time, correct responding resulted in teacher verbal praise and incorrect responding resulted in teacher choosing peer to answer the same question. Although procedural integrity of the intervention was recorded ($M = 100\%$), consequence procedures were not measured or controlled for during the intervention. It is then not known if the effect of the antecedent-based intervention was influenced or altered by consequence effects. As noted, Timothy had learned to generalize correct group responding and the increase in correct student responding and teacher praise may have effected antecedent-behavior-consequence relations.

Dion. Following baseline, the intervention produced an increased level of on task behavior for all data points except for the second. On the second data point, on task behavior decreased, overlapping with baseline responding. Although on task behavior was explained (e.g., Dion stated being tired, lying on floor), this setting event was not predicted during functional assessment procedures. Being tired altered the value of antecedent manipulations (high-interest space marker) and potential reinforcers. Another weakness was the lack of consequence

measurement (i.e., teacher consequences) during the intervention. It was noted during the functional assessment that teacher ignored off task behavior (e.g., wandering) and redirected only when Dion physically touched peers. Procedural integrity (access to the high-interest space marker) was high (100%) but consequences following on and off task behaviors (e.g., student and teacher behaviors) were not recorded. An increase in on task behavior may have affected results in two ways: (a) increased teacher attention and praise contingent upon on task behavior and (b) increased student attention because of the access to the high-interest space marker. Spiderman is a popular interest for many children; the effect of having access to this material when peers are not allowed this privilege is not known. Also, novelty of the material may have affected Dion's behavior as well as the limited number of data points.

Donny. Donny's intervention included close proximity to a high-interest material (Spiderman). Limitations are similar to Dion. Consequence measurements, access to high-interest materials, and novelty of the strategy were not measured or controlled for during the intervention. Limited number of data points was also a weakness.

Korana. Lack of consequence measurements, access to high-interest materials (Dora), novelty of the strategy, and limited data points were weaknesses similar to other participants. In addition, the classroom environment and dynamics may also be a factor in the results. During the functional assessment procedures, direct observations noted disagreements between teacher and instructional assistant relations (e.g., structured interview) and negative teacher consequences following problem behaviors (e.g., teacher yelling, physical prompting). Comparative peer behaviors were not recorded to indicate overall levels of problem behaviors in the classroom.

An understanding of teacher practices and classroom dynamics is important to consider because the quality of teacher-student relationships affect overall classroom management (Wang,

Haertel, & Walberg, 1993). Classrooms with high-quality relationships between teachers and students experience fewer discipline problems, rule violations, and problem behaviors (Marzano & Marzano, 2003). When teachers engage in positive social interactions (e.g., clear rules and procedures, praise contingent upon appropriate behaviors), classroom disruptions are minimized for the entire class and everyone benefits from a safe learning environment.

Implications and Future Directions

The technology of behavior analysis not only reduces problem behavior through solid behavioral principles but produces socially important behavior change that generalize across contexts, maintains over time, and is consistent with the skills, values, and resources (contextual fit) of those who implement the intervention (Luiselli & Cameron, 1998). Antecedent control is part of the foundation of behavior analysis and a growing concept compatible with natural settings to broaden the vision for behavior support for young children at risk for Emotional Disorders. Antecedent-based interventions are particularly critical and beneficial in the school setting because of the variability of behaviors and environmental changes inherent in the natural setting (Conroy & Stichter, 2003). Simple antecedent modifications such as group prompts and proximity to preferred materials can produce classroom environments that are positive and more conducive for learning.

Antecedent-based interventions are building support and evidence as a proactive, preventative strategy; however, conceptual and measurement limitations remain areas in which research needs to be clarified (Stichter, Conroy, & Boyd, 2004). These limitations as well as future research directions are provided to enhance antecedent strategies in school strategies.

Functional assessment procedures (e.g., structured interviews and direct observations) resulted in the identification of the best antecedent conditions that produced ideal environments

for students. Hypothesized conditions gathered through direct and indirect procedures were experimentally validated through structural analysis procedures. No specific assessment procedures (e.g., number of observations needed, frequency of ABC relationships) have been developed to determine the confidence of hypothesized conditions. Although studies have supported the use of structural analysis when functional analysis procedures are undetermined (Carr, Yarbrough, & Langdon, 1997), the literature incorporating antecedent and consequence manipulations is relatively limited. More research is needed to define the most effective approach to assessment procedures to guide practitioner use in the school setting. In this study, participating teachers were highly agreeable to using antecedent-based interventions that were developed collaboratively with the primary author. Additional research needs to investigate the role of practitioners in the assessment process and the effects of training school personnel in the ability to administer and quality of assessment procedures. In this way antecedent interventions can be widely used to support more students who are at risk for developing more severe patterns of challenging behaviors.

Assessments, like interventions, might be ordered sequentially so that as challenging behaviors increase, the number of assessment methods (e.g., record reviews, structured interviews, direct observations, experimental analysis) may also increase to match the intensity of behaviors. One approach has looked at statistical indexes to guide direct observations to determine the influence of specific antecedents and relationship within the behavior contingency. Conroy and Stichter (2003) described how correlational relationships between antecedent events, behavior, and consequence events can be calculated through lag sequential analysis to determine the rate of target behavior by antecedents and consequences. Although this correlational model can be more time consuming, it provides a high level of detail about the influences of different

variables as they naturally occur in the classroom. Descriptive antecedent and consequence events can be collected and analyzed on a large scale basis. For example, interactions across classrooms, populations, and locations can be collected to understand the relative effect of specific antecedents and the occurrence (or nonoccurrence) of problem behaviors. Further evidence can be built for universal or best practices that work across classrooms in urban or rural settings.

The effectiveness of functional assessment procedures over non-functional assessment procedures needs to be validated to promote the simplest, acceptable assessment within school settings. The questions that arise include (a) Are individualized functional assessment procedures needed? (b) Are they more effective than selecting common instructional or environmental antecedent variables?, and (c) Can antecedent selection be simplified by sequencing common antecedent variables by level of intrusiveness to classroom routines?

Antecedent-based interventions are preventative strategies that (a) enable practitioners to set the stage for pro-social behaviors and deter occurrence of problem behaviors and (b) prevent exclusionary and reactive consequences for young children at risk for school failure. Future research may investigate potentially aversive stimuli within early childhood classrooms that set the occasion for problem behaviors. As indicated in the limitations section for Korana, overreliance on punishment procedures or poor classroom management may have influenced the onset of problem behaviors. It is important to consider teacher and classroom variables that may instigate problem behaviors for individual students by examining the overall classroom levels of problem behaviors. Antecedent strategies implemented at the class-wide level seek to establish predictable and motivating classroom environments. Once class-wide strategies are in place, individualized antecedent-based interventions may be enhanced. Further investigation is

needed in how to embed antecedent-based procedures within a tiered hierarchy of prevention and intervention, such as Program-wide Positive Behavior Support (PW-PBS) and Response to Intervention (RTI) models. Tiered prevention efforts may facilitate how school teams provide services for challenging behaviors on a school-wide, class-wide, and individual level and has been demonstrated to be successful in many elementary and secondary schools (Bohanon et al., 2006; Colvin & Fernandez, 2000; Horner, Sugai, Todd, & Lewis-Palmer, 2005). Antecedent-based interventions are powerful and may prevent many problem behaviors but they will not work for all behaviors in all settings. Interventions must be comprehensive, built within systems of effective support (e.g., tiered prevention and intervention), and part of functional assessment procedures that incorporate consequence events.

In addition to assessment and intervention procedures, the quality of mental health consultation services in early childhood need to be explored. As early childhood programs try to meet the mental health needs of young children, components of effective consultation and evaluation tools to evaluate the impact of consultation on program outcomes are needed (Hepburn et. al., 2007). Systematic studies that compare variations in consultation services (i.e., qualifications of the consultant, frequency and duration of consultation) are needed so that the impact of antecedent-based interventions can be isolated from the role and quality of mental health consultants. In addition the specific role of mental health consultants can also be extended to determine the effects of consultation services and maintenance of behavior change. Larger systemic roles of local and state educational agencies also need to be considered in order to assist early childhood programs provide more systematic support in early intervention and prevention.

Study results indicate that antecedent control can be applied with young children at risk for emotional and behavioral disorders. Research extends the literature on functional behavior

assessments in early childhood by supporting the feasibility and effectiveness of structural analysis procedures and antecedent-based interventions.