2005

Evaluating Positive Behavior Support Plan Implementation In The Home Environment Of Young Children With Challenging Behavior

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by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Special Education
College of Education
University of South Florida

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Date of Approval:
October 10, 2005

Keywords: component analysis, early childhood, family, maintenance

Table of Contents

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ABSTRACT

In recent years, a central focus of the field of early intervention/early childhood special education has been to investigate ways to effectively support young children with challenging behavior and their families (Center for Evidence-Based Practice: Young Children with Challenging Behavior, 2003; DEC, 1999). Positive behavior support (PBS) is one of the most promising evidence-based practices for young children with challenging behavior and their families. The central purposes of PBS are to both help people develop and engage in socially desirable behaviors and to help minimize patterns of socially stigmatizing responding (Koegel, Koegel, & Dunlap, 1996).

Research documenting the utility and applicability of PBS with preschool-aged populations remain scarce, particularly within natural environments (e.g., Blair, Umbreit, & Eck, 2000; Duda, Dunlap, Fox, Clarke, & Lentini, 2004; Moes & Frea, 2000). Several gaps in the research remain, including studies incorporating natural intervention agents, natural settings, and studies measuring technical aspects of behavior change (e.g., maintenance). Though studies of maintenance may be difficult to execute, they may provide researchers with a greater understanding of which factors in the change process are most critical to successful implementation, as well as to enhance the "goodness of fit"

between specific plan components and the ecology in which implementation occurs (Albin, Lucyshyn, Horner, & Flannery, 1996).

The purpose of this research study was to first assess the relationship of support plan components to behavior change, and then systematically fade the functional components, reducing the plan to naturalistic strategies that may be easy for the family to use over time. Results indicated each of the three child participants consistently maintained low levels of challenging behavior and high levels of engagement within each routine, despite the fact that clear functional relationships among individual intervention components were not attained. Procedural fidelity data indicated that intervention components were both implemented by the mother on a consistent basis and were easily adapted into natural family routines over time.

List of Tables

List of Figures

Chapter One

Introduction

In recent years, a central focus of the field of early intervention/early childhood special education (EI/ECSE) has been to investigate ways to effectively support young children with challenging behavior and their families (Center for Evidence-Based Practice: Young Children with Challenging Behavior, n.d.; Center on the Social and Emotional Foundations for Early Learning, n.d.; DEC, 1999). Challenging behavior refers to "any repeated pattern of behavior or perception of behavior that interferes with or is at risk of interfering with optimal learning or engagement in pro-social interactions with peers and adults" (Smith & Fox, 2003). While typically developing young children (i.e., under six years of age) often demonstrate such behavior (e.g., tantrums, aggression, dropping to the floor, excessive crying), concerns usually resolve as their repertoire of social and communication skills increase. In contrast, children with challenging behavior continue to demonstrate these behaviors over time, using their behavior as a primary means of communication. As patterns of challenging behavior intensify, opportunities for meaningful social interaction and/or learning are lost, resulting in a host of negative child and family outcomes, such as eligibility for special education services, family stress, community isolation, and psychiatric diagnosis/treatment (Campbell, 1994; Huffman, Mehlinger, Kerivan, Cavanaugh, Lippitt, & Moyo, 2001; Keenan & Wakschlag, 2000; McEvoy & Reichle, 1995; Pierce, Ewing, & Campbell, 1999).

Despite the variety of available intervention procedures to support young children with challenging behavior and their families, available evidence supporting their efficacy varies drastically. Positive behavior support (PBS) is among the most promising evidence-based practices for young children with challenging behavior and their families. An empirically-supported model of problem solving designed to enhance the capacities and skills of individuals and their families (Carr, Horner, Turnbull, Marquis, McLaughlin, McAtee, Smith, Ryan, Ruef, Doolabh, & Braddock, 1999; Horner, Dunlap, Koegel, Carr, Sailor, Anderson, Albin, & O'Neill, 1990; Koegel, Koegel, & Dunlap, 1996), the central purposes of PBS are to both help people develop and engage in socially desirable behaviors and to help minimize patterns of socially stigmatizing responding (Koegel, Koegel, & Dunlap, 1996).

Research documenting the utility and applicability of PBS with preschool-aged populations is in its relative infancy. At present, studies of preschoolers conducted within natural environments are relatively scarce (e.g., Blair, Umbreit, & Eck, 2000; Duda, Dunlap, Fox, Lentini, & Clarke, 2004; Frea, Arnold, & Vittimberga, 2001; Schepis, Ownbey, Parsons, & Reid, 2000). Several gaps in the research remain, including studies incorporating natural intervention agents (e.g., parents, siblings), natural settings (e.g., home, daycare/preschool, community), and studies measuring technical aspects of behavior change, such as treatment integrity, maintenance, or generalization. Studies are needed to document the extent by which support plans can be implemented by parents, child care providers, and teachers with a degree of fidelity and consistency required to ensure meaningful outcomes over time.

In addition to investigations of its technical aspects, researchers continue to look toward ways to make behavioral intervention more manageable for parents and community providers. A major goal has been to not only understand how to develop effective behavior support plans, but also to discover the means by which effective behavior plans may be maintained by caregivers over time. Despite the apparent simplicity of such questions, challenging behaviors displayed by young children are often complex and may occur for either multiple reasons or for entirely different reasons in different contexts (e.g., settings, routines, individuals, time of day). As complexity increases and the number of intervention components expand, the relationship of each component to the desired outcome is often unknown. As a result, parents and caregivers are often asked to implement multi-component support plans over a prolonged period of time without truly knowing which aspects of the plan are most effective and likely to sustain meaningful behavior change.

Following this rationale, one of the most challenging issues facing researchers, practitioners, and families alike is maintenance. Maintenance is defined as "a stimulus control relationship that is stable or consistent across time" (Horner & Billingsley, 1988). At present, the existing literature base lacks studies that investigate critical features of support plan durability—researchers may wish to consider evaluating behavior support plans to learn why the process itself or which individual components were most critical to achieving durable and meaningful outcomes. Likewise, the field also lacks studies of acquisition—studies often do not use an adequate degree of experimental control allowing one to demonstrate clear functional relationships between the independent variable and changes in behavior (Rusch & Kazdin, 1981). Though studies of

maintenance and acquisition may be challenging and difficult to execute, they may provide researchers with a greater understanding of which components are most essential to affect change or which factors in the change process itself are most critical to successful implementation of the PBS model. Likewise, such studies may also help discover ways to streamline support plans, thereby enhancing both the practicality and durability of support plans, as well as the "goodness of fit" existing between specific features of a support plan and the ecology in which an intervention is implemented (Albin, Lucyshyn, Horner, & Flannery, 1996).

Purpose

This study was an extension of a recently conducted pilot research study. The pilot study, which was presented by Fox, Clarke, and Duda (2005), provided an examination of the effect of multi-component behavior support plans o n the challenging behavior of three young children within family routines. Documenting behavior change using a concurrent multiple baseline design across routines, this researcher and her colleagues implemented and measured the outcomes of four behavior support plans across four routines within the family's home environment. As the family moved closer toward implementing and maintaining their use of the four plans on their own to support the engagement and reduced challenging behavior of the children, it was unknown exactly which components were related to behavior change. Consequently, the purpose of this study was to first assess the relationship of support plan components to levels of problem behavior, and then systematically fade the functional components, reducing the plan to naturalistic strategies that may be easy for the family to use over time.

Research Questions

1. Which elements of a multi-component intervention that was effective in reducing levels of challenging behavior are functional in maintaining low levels of challenging behavior?
2. Given that some elements are demonstrated to be functional in maintaining low levels of challenging behavior, is it possible to use a systematic fading procedure so that selected elements are no longer needed to maintain the low levels of challenging behavior?

Definitions

For the purpose of this study, the following definitions were used. As a measure of consistency, selected definitions coincided with those specified by the Center for Evidence-Based Practice: Young Children with Challenging Behavior (2003) whenever possible.

Artificial Intervention Components

"Artificial" intervention components were defined as components within a multi-component positive behavior support plan that were introduced by this researcher during the pilot study and judged by the natural intervention agent as being cumbersome, requiring special materials, or difficult to implement in a variety of natural settings. Examples include social stories, self-monitoring materials, and antecedent modifications (e.g., predetermined seating arrangements, using music to cue the beginning of a routine).

Challenging Behavior

Smith & Fox (2003) defined "challenging behavior" as "any repeated pattern of behavior, or perception of behavior, that interferes with or is at risk of interfering with optimal learning or engagement in prosocial interactions with peers and adults" (p. 6).

Functional Relationship

According to Sulzer-Azaroff and Mayer (1991), the term "functional relationship" refers to "a lawful relationship between values to two variables." The authors noted that, "a dependent and independent variable are considered to be functionally related if the behavior changes systematically with changes in value of the independent variable" (p. 590).

Natural Intervention Components

"Natural" intervention components were defined as components that were either used by the natural intervention agent prior to the initiation of the pilot study or were judged by the natural intervention agent to be easily adaptable to natural family routines. Examples include specific praise, verbal cues, and choice making.

Procedural Fidelity

Procedural fidelity was defined as "the extent to which the independent variable is implemented" (LeLaurin & Wolery, 1992). Used to provide an estimate of the quality of an intervention's implementation over time, the term "procedural fidelity" may be considered equivalent to other terms such as "treatment integrity," "procedural reliability," or "fidelity of treatment."

Maintenance

Maintenance was defined as “a stimulus control relationship that is stable or consistent across time” (Horner & Billingsley, 1988).

Systematic Fading

According to Sulzer-Azaroff and Mayer (1991), the term fading referred to “the systematic, gradual removal of usually artificial or intrusive prompts, or discriminative stimuli such as directions, imitative prompts, physical guidance, and other cues.” The authors noted that the systematic fading procedure is used to “foster independence from supplemental prompts, and/or to shift control over to the stimuli designated to evoke the response” (p. 590).

Chapter Two

Literature Review

The purpose of this literature review was to present and discuss relevant research findings that provide a rationale for this research study. Toward such a goal, research literature have been presented and discussed pertaining to positive behavior support (PBS) and specific gaps in its implementation for young children with challenging behavior. Specific topics were discussed relative to both PBS and gaps in the PBS literature base for young children with challenging behavior including: 1) definition of PBS and theoretical framework; 2) empirical support for PBS; 3) multi-component behavior support plans; 4) contextual fit; 5) longitudinal research; and 6) programmatic features of maintenance.

Positive Behavior Support (PBS)

Definition and Theoretical Framework

Traditionally, challenging behavior has been addressed through the implementation of aversive approaches in which the behavior is responded to in a manner intended to reduce the future occurrence of challenging behavior (Horner et al., 1990). This type of consequence for disruptive behavior is equivalent to what is commonly referred to as "punishment," with attention directed toward disruptive behavior rather than providing the skill building opportunities for appropriate replacement behaviors. In response to such concerns, positive behavior support (PBS) emerged as an empirically-

supported model of problem solving designed to enhance the capacities and skills of individuals and their families (Horner et al., 1990; Koegel, Koegel, & Dunlap, 1996; Carr et al., 2002). PBS comprises a set of comprehensive intervention strategies custom designed to both help people develop and engage in socially desirable behaviors and to help minimize patterns of socially stigmatizing behavior (Koegel, Koegel, & Dunlap, 1996). Descended from psychology and applied behavior analysis, PBS "represents an evolution toward a new applied science that 1) views consumers of research as collaborative partners; 2) values ecological, social, and internal validity; 3) seeks to promote lifestyle change; and 4) views social systems as units of analysis and intervention" (Carr et al., 1999; Turnbull, Turnbull, Wehmeyer, & Park, 2003). Merging a conceptual framework for understanding the functional relationships associated with a child's behavior with a goal of achieving meaningful and durable lifestyle change, research indicates that PBS may be the best treatment approach toward the enhancement of a child and family's quality of life (Singer, Goldberg-Hamblin, Peckham-Hardin, Barry, & Santarelli, 2002; Turnbull et al., 2003).

The PBS process incorporates the use of functional assessment to help lead key stakeholders to understand the purpose or function of challenging behavior, and the development of support strategies for preventing challenging behavior and teaching new skills (Fox et al., 2003; Fox, Dunlap, & Cushing, 2002). Working toward goals identified by the child's parents and caregivers, PBS utilizes scientifically-endorsed research practices to help minimize challenging behavior and to teach new skills that are both more positive and socially appropriate (Koegel, Koegel, & Dunlap, 1996). Support plans developed using the PBS model are individualized and collaboratively designed to

promote a functional understanding of the child's behavior, prevent or minimize future occurrences of challenging behavior, enhance critical skills (e.g., communication, language, socialization), and ultimately, improve lifestyles and quality of life.

Empirical Support

A growing body of research has accumulated documenting the efficacy of PBS as an empirically-supported practice (Carr, Horner, Turnbull, Marquis, McLaughlin, McAtee, Smith, Ryan, Ruef, Doolabh, & Braddock, 1999; Horner, Dunlap, Koegel, Carr, Sailor, Anderson, Albin, & O'Neill, 1990; Koegel, Koegel, & Dunlap, 1996; Lucyshyn, Dunlap, & Albin, 2002). Initially, the vast majority of work in this area has either focused on conceptual issues (e.g., Carr et al., 1999; Dunlap & Fox, 1996; Horner et al., 1990; Weigle, 1997) or case studies illustrating individual-level support (e.g., Vaughn, Dunlap, Fox, Clarke, & Bucy, 1997; Clarke, Worcester, Dunlap, Murray, & Bradley Klug 2002; Dunlap et al., 1993; Vaughn, Clarke, & Dunlap, 1997; Dunlap, Foster-Johnson, & Robbins, 1990). Since then, PBS has expanded across environments, populations, age ranges, and levels of prevention (i.e., tertiary to primary). Empirical demonstrations of the utility and applicability of PBS research and practice can now be found for children with a variety of medical/developmental disabilities and challenging behaviors relative to: 1) a wide array of natural, complex community environments, including homes, general and special education classrooms, libraries, churches, banks, restaurants, and retail stores (e.g., Carr et al., 1999; Clarke et al., 2002; Dunlap et al., 1995; Kern & Dunlap, 1999; Lucyshyn, Albin, & Nixon, 1997; Vaughn et al., 1997); and 2) primary, secondary, and tertiary levels of prevention (Sugai et al., 2000; Lewis & Sugai, 1999;

Sugai & Horner, 1994, 1999; Todd, Horner, Sugai, & Sprague, 1999; Sugai, Sprague, Horner, & Walker, 2000; Turnbull et al., 2002; Walker et al., 1996).

Gaps in the PBS Literature Base for Young Children with Challenging Behavior

Despite its rapid growth, several gaps in the PBS literature base remain. As reported by Carr and his colleagues (1999), the field is working toward addressing five primary research gaps: 1) increasing implementation of lifestyle change interventions; 2) measuring stimulus and response generalization; 3) conducting research studies in applied family settings and contexts; 4) measuring the outcomes of multi-component stimulus- and reinforcement-based intervention plans as they are implemented within typical community settings; and 5) exploring ways to efficiently modify environments as a means of preventing occurrences of challenging behavior (p. 75). In addition to these areas of interest, there has been a nationally recognized effort to attend to the needs of preschoolers with challenging behavior and their families (Center for Evidence-Based Practice: Young Children with Challenging Behavior, 2003; Center on the Social and Emotional Foundations for Early Learning, 2003; DEC, 1999). From a prevention standpoint, children with challenging behavior who receive services and supports in their preschool years may acquire critical social and communication skills that serve as a foundation for long-term growth and development (Bricker, 1992; Dunlap & Fox, 1996; National Research Council & Institute of Medicine, 2000). Given that services designed to enhance a child's progression of social and communication skill acquisition have the potential to minimize or prevent subsequent delays later in life, populations of young children with challenging behavior represent an opportunity for the field of PBS to make a lasting and meaningful contribution to the well-being of children and families.

In support of such a goal, a growing number of applied research studies have demonstrated the applicability of PBS as a means of supporting young children with challenging behavior within home and community preschool settings (e.g., Duda et al., 2004; Frea, Arnold, & Vittimberga, 2001; Lawry, Danko, & Strain, 1999; Walker, Stiller, & Golly, 1999). Despite such progress, much work remains, particularly with regard to addressing gaps identified by Carr and his colleagues within natural preschool contexts (e.g., measuring outcomes of multi-component stimulus- and reinforcement-based intervention plans, measurement of maintenance outcomes).

Multi-Component Behavior Support Plans

One of the core characteristics of PBS entails the use of multi-component behavior support plans incorporating stimulus- and reinforcement-based strategies (Lucyshyn, Horner, Dunlap, Albin, & Ben, 2002). Multi-component behavior support plans are explicitly designed to prevent and teach; children are taught age-appropriate social and communication skills, natural intervention agents (e.g., parents, teachers, siblings) are taught to implement effective support strategies, and natural environments are redesigned to prevent future occurrences of challenging behavior (i.e., environmental modification). When used together, multi-component behavior support plans incorporating both antecedent- and consequence-based intervention strategies help make challenging behavior functionally irrelevant and less effective than using the functionally-equivalent, age-appropriate skills taught in replacement (Favell & Reid, 1988; Horner et al., 1990; O'Neill et al., 1997).

Relative to young children with challenging behavior, multi-component behavior support plans poses a challenge for at least three reasons. First, multi-component

behavior support plans limit one's ability to determine the impact of a specific intervention strategy. Unless one is able to assess changes in dependent measures when individual intervention components are systematically introduced and withdrawn, the efficacy of individual intervention components cannot be measured when a multi-component support plan is implemented. Although both this concern and replicability are frequently cited limitations associated with PBS research studies (e.g., Kern et al., 1994; Dunlap, White, Vera, Wilson, & Panacek, 1996; Moes & Frea, 2000), it is equally important to note that a central contribution of the PBS literature has been to validate the assertion that multiple interventions may be an optimal means of achieving meaningful and durable behavior change over time, as well as an optimal practice for use in achieving contextual fit with family life (Horner et al., 1990; Lucyshyn, Horner, Dunlap, Albin, & Ben, 2002; National Institutes of Health, 1990).

A second limitation related to what is known about multi-component behavior support plans pertains to limited case illustrations. Though multiple examples of multi-component behavior support plans can be found within the PBS literature base (e.g., Clarke et al., 2002; Dunlap, Foster-Johnson, Clarke, Kern, & Childs, 1995; Dunlap et al., 1996; Ervin, Kern, Clarke, DuPaul, Dunlap, & Friman, 2000; Kern, Childs, Dunlap, Clarke, & Falk, 1994; Vaughn et al., 1997), relatively few can be found that demonstrate the ease of multi-component plans within natural environments or with natural intervention agents for young children with challenging behavior (e.g., Blair, Umbreit, & Bos, 1999; Dunlap & Fox, 1999; Galensky, Miltenberger, Stricker, & Garlinghouse, 2001; Moes & Frea, 2000). Consequently, it is reasonable to question the relative

efficacy of multi-component behavior support plans and/or degree of contextual fit with young children with challenging behavior.

Finally, multi-component behavior support plans complicate implementation efforts. Given the fact that precise implementation of the independent variable (i.e., treatment integrity, Wolery, 1994) is of paramount importance to researchers, the degree of implementation precision may be logically jeopardized when one adds multiple intervention components. The implementation of a single component by an intervention agent is much easier than remembering an array of strategies. Additional concerns about the implementation of a "package" of components relates to the lack of inference that can be made about the value of any single component in the package or the need for all components to be used across stages of learning (e.g., initial acquisition, fluency, generalization). These reasons are in addition to the complexity of having multiple components, particularly in situations when: 1) multiple components are sometimes needed only at the beginning of an intervention to promote skill acquisition; and 2) intervention components vary in their relative ease of implementation. Such concerns are only magnified within an applied research context, where multi-component behavior support plans are implemented by natural intervention agents within natural environments (e.g., home, preschool/daycare, community). In addition, researchers rarely take into account issues pertaining to "goodness of fit," such as the natural intervention agent's perspective of an intervention component's relative importance or the amount of effort and inconvenience associated with its implementation (Albin et al., 1996). Although the research literature on contextual fit (described below) has contributed to increases in treatment fidelity (e.g., Albin et al., 1996; Harrower, Fox, Dunlap, & Kincaid, 1999), it is

clear that additional research in this area is needed, particularly with respect to case illustrations of multi-component behavior support plan implementation for young children with challenging behavior by natural intervention agents within natural environments.

Contextual Fit

Contextual fit refers to the congruence existing between specific features and components of behavior support plans and the ecological and interpersonal variables relating to individuals and environments (Albin, Lucyshyn, Horner, & Flannery, 1996; Bailey, Simeonsson, Winton, Huntington, Comfort, Isbell, O'Donnell, & Helm, 1986; Harrower et al., 1999; Lucyshyn, Dunlap, & Albin, 2002). Contextual fit is a term used to describe the degree to which behavior support plans consider and accommodate variables associated with the individual targeted for support (e.g., specific strengths and challenges, values, goals, and beliefs), variables associated with individuals responsible for plan implementation (e.g., specific skills or strengths, values, goals, and beliefs), and environmental factors (e.g., specific features of an environment, available resources). It has been proposed that when behavior support plans possess a high degree of contextual fit, they are more likely to be: 1) implemented with accuracy and precision; 2) applied across natural contexts; 3) implemented over a prolonged period of time; and 4) rated as being effective and useful (Albin et al., 1996; Lucyshyn, Horner, Dunlap, Albin, & Ben, 2002).

At present, studies of the use of positive behavior support with preschoolers who have challenging behavior conducted within natural environments comprise only a small proportion of the PBS research literature (e.g., Duda et al., 2004; Dunlap & Fox, 1999;

Frea, Arnold, & Vittimberga, 2001; Schepis, Ownbey, Parsons, & Reid, 2000; Blair, Umbreit, & Eck, 2000). Despite the recent abundance of PBS research and practice and recent emphasis on young children and their families, relatively few studies have reported demonstrations of maintenance of PBS interventions for preschoolers within natural environments (e.g., Hancock & Kaiser, 2002; Moes & Frea, 2000; Schreibman, Whalen, & Stahmer, 2000; Wert & Neisworth, 2003) and with natural intervention agents (Baker, 2000; Barry & Singer, 2001; Frea, Arnold, & Vittimberga, 2001). Likewise, the need exists to explore the extent to which components of corresponding behavior support plans are implemented with fidelity (e.g., identifying goals, collecting information, developing hypotheses, designing and implementing support plans, monitoring and evaluating interventions over time, maintenance, generalization; Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003; Koegel, Koegel, & Dunlap, 1996). Studies are needed to document the extent by which such support plans can be implemented by parents, child care providers, and teachers with a degree of fidelity and consistency required to ensure meaningful outcomes for young children with challenging behavior within their natural environments. Consequently, it is reasonable to conclude that demonstrations for preschoolers within natural environments (e.g., home, preschool/daycare, community) and with natural intervention agents (e.g., parents, teachers, siblings) are not only needed, but may serve an instrumental role in working toward the articulation of recommended practices in facilitating effective intervention for parents and community providers alike.

Longitudinal Research

Another important way by which the existing literature base in PBS may be enhanced is through longitudinal research (Albin, Dunlap, & Lucyshyn, 2002; Carr et al.,

1999; Dunlap, Clarke, & Steiner, 1999; Horner et al., 1990). One of the most convincing ways in which to demonstrate the durability of an intervention, longitudinal research is defined as "a type of investigation that involves describing changes in a sample's characteristics over a specified period of time" (Gall, Borg, & Gall, 1996). Though uncommon, research documenting the sustainability and relative effect of intervention components paired with clearly defined intervention procedures have the potential to serve as seminal research studies for the field. Such studies have been recommended by several experts in the field, most notably Carr and his colleagues (1999) and Albin, Dunlap, and Lucyshyn (2002). Families are looking for long-term solutions to their child's challenging behavior (Carr et al., 1999). More specifically, Carr and his colleagues (1999) note:

> "consumers tend to be concerned about problem behavior over long periods of time," and that "the database reveals a substantial gap between the needs of consumers for long-term demonstrations of efficacy and the interests of researchers who follow individuals for short periods of time, most typically for less than six months and in no case for more than two years" (p. 76).

Articulating their need and rationale for collaborative research with families, Albin, Dunlap, and Lucyshyn (2002) strongly support such claims. Together, the authors cited a professional "obligation to extend research on PBS and to further establish the external, social, and ecological validity of research outcomes on PBS" (p. 375).

Programmatic Features of Maintenance

In addition to the aforementioned gaps in the PBS literature, there is even less information available regarding programmatic features of intervention studies, such as maintenance or generalization (Horner, Dunlap, & Koegel, 1988; Stokes & Baer, 1977; Stokes & Osnes, 1989). Favell and Reid (1988) noted that the definitions of both maintenance and generalization relate to the improvement of target behaviors under conditions of reduced or discontinued treatment (p. 185). Maintenance is generally defined as "how well the intervention effects last over time" (Carr, Levin, McConnachie, Carlson, Kemp, & Smith, 1994) or "the durability of target behaviors under natural environmental conditions" (Sulzer-Azaroff & Mayer, 1991).

Some researchers have assessed maintenance with either a return to baseline conditions with continued measurement of dependent variables in the absence of independent variable implementation (e.g., Baker, 2000; Buggey, Toombs, Gardener, & Cervetti, 1999; Garfinkle & Schwartz, 2002; Koegel, Harrower, & Koegel, 1999), whereas others have used a "follow-up" condition to assess changes in dependent variables with continued implementation of the independent variable over time either with or without modifications in contingencies (e.g., Armendariz & Umbreit, 1999; Barry & Singer, 2001; Hancock & Kaiser, 2002; Hupp & Reitman, 2000; Koegel, Symon, & Koegel, 2002). In either circumstance, the purpose of "maintenance" or "follow-up" conditions are to fade from the contrived context of clinical treatment toward a more natural context for the child and family.

Discrepancies in the way that maintenance conditions are included in research studies and embedded within behavior support plans may be linked to the complexity of

the concept itself. Despite its apparent simplicity, maintenance is far more complex than it may appear. Maintenance occurs as a function of a stimulus control relationship between an intervention and a target behavior across time (Horner & Billingsley, 1988). In other words, maintenance exists when there is a consistent pattern of behavior change when an intervention is applied. However, maintenance is a dynamic construct; it is influenced by both the stability or consistency of a stimulus control relationship, and the ever-changing context in which the target behavior is observed (e.g., the child's natural environment, intervention agents, reinforcement contingencies, variables influencing skill acquisition, the passage of time).

As a means of achieving a better grasp of its complexity, researchers have studied the interaction between generalization, maintenance, and skill acquisition variables relative to changes in stimulus conditions, response requirements, and reinforcer values (Dunlap, Horner, Carr, Sailor, Turnbull, Koegel, & Koegel, 1998; Horner & Billingsley, 1988). These researchers have argued that maintenance of specific replacement behaviors and skills (i.e., alternative and desired behaviors) are affected by a combination of instructional, antecedent, and consequence variables, including:

1. Selection of efficient and effective alternative behaviors to teach;
2. Teaching alternative behaviors to high fluency/accuracy criteria;
3. Teaching alternative behaviors as general case skills;
4. Avoiding presentation of setting events and discriminative stimuli for challenging behavior;
5. Continued presentation of discriminative stimuli for alternative behavior;
6. Ensuring regular opportunity to perform alternative behavior;

7. Providing reinforcement for desired behavior;
8. Providing reinforcement for alternative behavior; and
9. Extinguishing challenging behavior;

(Dunlap et al., 1998; Horner & Billingsley, 1988).

Researchers suggest that consideration of these nine variables contribute to both the design of interventions and the design of the environment in which the child is expected to perform desired and alternative behaviors. However, the ultimate durability of socially appropriate target behaviors also depends on macro-level ecological variables operating on the individual's environment, including family and provider support systems, the community, state and local agencies, and political/cultural values (Bronfenbrenner, 1986; Dunlap et al., 1998; Dunlap & Plienis, 1988; Horner & Billingsley, 1988. Together, this conceptualization suggests that maintenance is far more complex and dynamic than it may initially appear, particularly in circumstances when desired and alternative behaviors are measured well beyond the initial implementation of intervention procedures

Though few studies prioritize the measurement of maintenance, its inclusion is critically important, as it allows one to assess the utility and efficacy of an intervention after its initial implementation and demonstration (i.e., the intervention phase of a research study; Dunlap, Horner, Carr, Sailor, Turnbull, Koegel, & Koegel, 1998; Horner & Billingsley, 1988; Horner, Dunlap, & Koegel, 1988). Carr and his colleagues (1999) conducted a systematic review of the PBS literature, reporting that while a relatively small proportion of the studies using PBS measured long-term maintenance effects (i.e., 5 months beyond intervention), two-thirds of those reporting short-term outcomes (i.e., less than 5 months beyond intervention demonstrated success (relative to a 90% reduction

criterion). None of the studies reviewed measured maintenance for follow-up periods of 25 months or more (p. 48). Given such findings, it is reasonable to conclude that research studies incorporating the maintenance of target behaviors may not only help extend the longevity of support plans for preschoolers, but also to measure, document, and strongly support the utility of PBS technology for preschool-aged children and their families.

Component Analysis. Central to the issue of maintenance are the concepts of measurement and design (Bailey & Burch, 2002; Kazdin, 1982; Rusch & Kazdin, 1981; Shirley, Iwata, Kahng, Mazaleski, & Lerman, 1997). Given the fact that maintenance allows one to assess efficacy of an intervention, one must pay particular attention to the specific means by which dependent variables are measured in the maintenance condition. In order to systematically assess changes in the dependent variable over time, a greater degree of experimental control must occur, which necessitates the use of a design that allows one to analyze functional relationships between changes in variables. Such an issue is magnified further when one considers the limitations associated with drawing conclusions about individual interventions embedded within multi-component intervention packages (i.e., groups of interventions or supports that are implemented either simultaneously or in succession). Under such conditions, assessment of the independent variable is complicated by the fact that a functional relationship cannot be determined relative to a specific intervention component unless the impact of the component is isolated and its strength demonstrated over time (e.g., Dunlap et al., 1996; Ervin et al., 2000; Kazdin, 1982).

The existing literature bases in both PBS and EI/ECSE presently lack studies that investigate why the process itself or which individual components are most critical to achieving durable and meaningful outcomes over time. As a result, it becomes difficult to enhance the field without consideration of which components are most essential to affect change or which factors in the change process itself are most critical to successful implementation of the model. Given such circumstances, it becomes necessary to consider the means to systematically assess the effects of the individual components of a comprehensive intervention package (Bailey & Burch, 2002; Kazdin, 1982; Kern, Wacker, Mace, Falk, Dunlap, & Kromrey, 1995).

The research literature indicates that several single case research designs can be used when conducting component analyses. Indicated for the evaluation of multi-component intervention packages, component analyses are typically conducted using designs that briefly withdraw the treatment after its effect has been established, or through the use of assessment probes (Kazdin, 1982; Tawney & Gast, 1984). In a discussion of designs used to examine transfer of training and response maintenance, researchers have specified three groups of designs: 1) probe designs; 2) withdrawal designs; and 3) between-group designs (Kazdin, 1982; Rusch & Kazdin, 1981). Though each type of design has its own distinct advantages and disadvantages, Kazdin (1982) cited withdrawal designs offer the researcher the unique opportunity to assess changes in performance (i.e., changes in the dependent variable) while specific intervention components are systematically excluded or included from a multi-component intervention package (p. 213). Toward this goal, three variations of the withdrawal design exist: 1) the sequential-withdrawal; 2) the partial-withdrawal; 3) the combined

sequential and partial-withdrawal design. According to Kazdin, the sequential-withdrawal design entails "gradually withdrawing different components of a treatment package to see if behavior is maintained," whereas the intervention is gradually withdrawn across different persons or baselines in partial-withdrawal designs (pp. 213-215). Alternatively, both designs may be combined, thereby allowing the researcher to preview which components are most likely to be maintained before they are completely withdrawn from a multi-component intervention plan (Kazdin, 1982).

Conclusion

The purpose of this literature review was to synthesize the available research literature pertaining to this study. Research was discussed relative to PBS and gaps in the PBS literature base for young children with challenging behavior. As a result of this literature review, several findings appear noteworthy. The research literature provides convincing demonstrations of the efficacy of PBS, an emerging field of behavioral science that has been applied successfully in a number of capacities (i.e., individual-, classroom-, and school-wide implementation; diverse settings, intervention agents, age ranges, and clinical populations). As the field continues to grow, researchers have begun to investigate the impact of PBS upon young children with challenging behavior and their families. Despite encouraging results, the increasing prevalence and widespread impact of challenging behavior upon both the family and service system provides a strong rationale for the continued application of PBS technology for this population of children (Campbell, 1994; Division for Early Childhood, 1999; Powell, Fixsen, & Dunlap, 2003).

Important gaps remain as the field continues to strive toward desired quality of life outcomes for young children with challenging behavior and their families. Relatively

few research studies using PBS with young children with challenging behavior have been conducted in natural environments or with natural intervention agents. Likewise, experts in the field have called for additional longitudinal research studies (e.g., Carr et al., 1999; Horner et al., 1990; Albin, Dunlap, & Lucyshyn, 2002), assessment of technical aspects of applied research studies (e.g., treatment integrity or maintenance; Favell & Reid, 1988; Kazdin, 1982; Wolery, 1994), or measured outcomes associated with individual components of multi-component behavior support plans. As researchers in both PBS and EI/ECSE strive to enhance the accountability and quality of their research (Bailey, McWilliam, Darkes, Hebbeler, Simeonsson, Spiker, & Wagner, 1998; Carta, 2002; Guralnick, 2000), each of the above issues deserve careful consideration, especially if the intent of the research is to obtain a convincing demonstration of specific components of multi-component PBS plans for young children with challenging behavior and their families.

Chapter Three

Methodology

Purpose

This study constituted an extension of a recently conducted pilot research study. This chapter has been organized into three major sections: 1) participants and setting; 2) description of the pilot research study (i.e., purpose, dependent and independent variables, measurement and design, procedures, data analysis, results); and 3) description of this study (i.e., purpose, research questions, dependent and independent variables, measurement and design, data analysis, limitations, contributions to research and practice).

Participants and Setting

The participants in both the pilot and this research study were a mother, her 5 ½ year-old daughter Emmy, and fraternal twin 3 ½ year-old sons Max and Zak (all pseudonyms). The family's home environment was selected as the setting for both studies. With regard to presenting concerns, the family was initially concerned with Max, who had a history of failure to thrive, feeding difficulties, and expressive language delays (i.e., delays with both expressive language and articulation of speech sounds). After receiving a developmental evaluation through the local early intervention program, Max was determined eligible for language and behavior support services. Max reportedly learned to demonstrate a wide variety of challenging behaviors (e.g., tantrums, hitting,

biting, throwing toys, excessive crying, difficulties with turn taking, noncompliance, elopement). Despite parent reports that Max was a loving, affectionate, and curious young child, Max's behavior had consistently disrupted his family's functioning, particularly during playtime and dinner routines.

This researcher initially established contact with Max and his family in response to his need for behavior support services. After initial meetings, interviews, and behavioral observations, this researcher observed that Max's two siblings also demonstrated challenging behavior. Max's fraternal twin brother, Zak, was described as a very bright and inquisitive child who has a well-developed interest in vehicles. In spite of these strengths, Zak's mother reported that he frequently demonstrated challenging behavior, in the form of hitting, food dumping, spitting, biting, noncompliance, throwing toys, excessive crying, difficulties with turn taking, and elopement. In addition, it was also apparent that Max and Zak's older sister, Emmy, consistently demonstrated challenging behavior. According to both her mother and this researcher's observation, Emmy was an artistic child who enjoys her role as a leader for her two younger brothers (e.g., helping mother with household chores). However, it also appeared that Emmy's leadership skills had proven to be a challenge at times, as she had been observed modeling and encouraging noncompliant behavior and inappropriate language for her brothers.

Prior to initiating the pilot study, parental informed consent was obtained as a means of ensuring both permission and a degree of commitment to the completion of the study. Approval from the university institutional review board (IRB) was obtained as a means of ensuring the safety and confidentiality of the entire family. Consent was

pursued relative to participation, confidentiality, and the use of videotaping and photography. This process was repeated prior to the initiation of this research study, with informed consent to precisely match the procedures of the study.

Pilot Research Study: Assessment and Support Plan Implementation

The purpose of the pilot research study was to develop an effective assessment-based behavior support plan that could be implemented by the parent in family routines to reduce problem behavior and promote child engagement or independence in targeted family routines. The dependent variables in this study were engagement and challenging behavior, both of which were operationally defined in the same manner as in this research study (Table 1). Challenging behavior was measured relative to both individual children (i.e., Max, Zak, and Emmy) and as an overall composite of all three children (i.e., reflecting the mother's perception of whether or not challenging behavior was present during the session). The independent variable in this study was the implementation of an assessment-based individual-level positive behavior support plan (Horner et al., 1990; Koegel, Koegel, & Dunlap, 1996).

Measurement and Design

Systematic behavioral observations were used to measure changes in the dependent variables over time. Rates of challenging behavior, composite challenging behavior, and engagement were scored by trained observers via videotape using a 10-second continuous interval recording system. Data were collected relative to operational definitions and expressed as the percentage of intervals of a dependent variable's occurrence. Each session was independently videotaped by this researcher and subsequently scored by three trained observers for occurrence of each dependent variable.

The two observers watched the videotape simultaneously and independently scored the occurrence/nonoccurrence of each dependent variable using the interval recording system.

Reliability. Interobserver agreement was scored for occurrence, non-occurrence, and total IOA for each operationally defined dependent variable. Interobserver agreement (IOA) was scored for occurrence, nonoccurrence, and total IOA for both engagement and total challenging behavior per child. Reliability was assessed on at least 33% of all videotaped sessions. Total IOA scores (e.g., means, ranges) were calculated for each routine and child participant with no less than a 87% mean Total IOA score obtained between data collectors. Composite IOA data indicated that reliability was achieved at a level of 93% (range = 89-100%) for clean up, 96% (range = 90-100) for twin play, 97% (range = 93-100%), and 95% (89-100%) for dinner. Reliability coefficients for each individual child are listed below in Table 1.

Table 1

Mean IOA Coefficients By Routine and Child: Pilot Study

Routine	Child	Variable	Total IOA (Range)
Clean Up	Max	Total Challenging	97% (89-100%)
		Total Engagement	97% (83-100%)
	Zak	Total Challenging	88% (92-100%)
		Total Engagement	97% (89-100%)
Twin Play	Max	Total Challenging	96% (90-100%)
		Total Engagement	96% (91-100%)
	Zak	Total Challenging	97% (93-100%)
		Total Engagement	97% (95-100%)
All Play	Max	Total Challenging	98% (93-100%)
		Total Engagement	98% (92-100%)
	Zak	Total Challenging	97% (94-100%)
		Total Engagement	97% (93-100%)
	Emmy	Total Challenging	97% (93-100%)
		Total Engagement	96% (86-100%)

(Table Continues)

Table 1 (Continued)

Dinner	Max	Total Challenging	97% (91-100%)
		Total Engagement	95% (81-99%)
	Zak	Total Challenging	94% (89-100%)
		Total Engagement	94% (84-100%)
	Emmy	Total Challenging	95% (90-98%)
		Total Engagement	95% (86-99%)

With regard to design, data were evaluated using a concurrent multiple baseline design across four routines (Tawney & Gast, 1984). This design was used to both ensure consistent evaluation of changes in the dependent variable (i.e., composite challenging behavior) and an adequate degree of experimental control both within and across conditions.

Procedural Fidelity. Procedural fidelity data were collected across routines and conditions by trained data collectors as a means of assessing the degree to which intervention components were implemented with integrity. Data were obtained on the specific intervention components that could be directly observed during sessions. Employing the same videotapes used to record the dependent variables, observers scored whether components were implemented as specified in the support plan corresponding to the specific routine. Observers used a checklist of each component from the support plan for the specific routine, scoring whether each individual component was observed during the session (i.e., yes or no). After obtaining an implementation fidelity score for each component per individual sessions, an average score of component fidelity was calculated for each component across all intervention sessions. These data were later used to inform decision-making during the intervention component reduction process of the subsequent research study.

Procedures

Once the family's concerns were identified, this researcher and colleagues conducted the pilot research study in the family's home environment. Grounded in the family's goals and obtained functional assessment data (O'Neill, Horner, Albin, Sprague, Storey, & Newton, 1997; Repp & Horner, 1999), this researcher facilitated the collaborative development of individualized, comprehensive behavior support plans targeting four routines: clean up, "twin play" (i.e., playtime with Max and Zak), "all play" (i.e., playtime with Emmy, Max, and Zak), and dinner. After brief periods of coaching, each support plan was implemented by the children's mother until stable rates of behavior change were obtained (i.e., changes in each of the three operationally-defined dependent variables). Intervention components were customized to fit within the context of each routine, each consisting of a combination of prevention strategies (e.g., antecedent modifications, choice making, clear expectations), parent responses, and skill-building interventions (e.g., compliance with expectations, play skills, teaching rules, self-monitoring, leading activities for younger brothers).

Data Analysis

Visual analyses served as the primary means of analyzing changes to the dependent measures across conditions (i.e., baseline, intervention). Data were graphed in order to determine changes in trend and level across conditions (Kazdin, 1982). Visual analyses of trend considered changes in direction both within and between conditions. Changes in level were assessed through visual inspection of the magnitude of each dependent variable. With regard to procedural fidelity, data analysis were expressed as

mean percentage of sessions with fidelity of implementation, with IOA estimates to be calculated across components and routines for a minimum of 33% of all sessions.

Summary of Results

Visual analyses of the obtained data indicated the presence of several noteworthy patterns. In general, data indicated that rates of challenging behavior consistently decreased during the intervention condition across routines per child, while rates of engagement increased during intervention across routines per child. Visual inspection of both dependent measures revealed that changes occurred relative to level and trend.

Relative to composite challenging behavior, data indicated that both the percentage of observed intervals and trend decreased during intervention across routines. Data obtained following a brief break in the data indicate a continuation of the same patterns (i.e., lower levels of composite challenging behavior, decreasing trend, less variability). With respect to data collected relative to individual children, rates of challenging behavior were consistently scored at lower levels for Max, Zak, and Emmy during the intervention condition across all routines. Visual analyses indicated that rates of challenging behavior were consistently lower, less variable, and recorded in a decreasing trend across intervention conditions. Finally, rates of engagement were consistently scored at a higher level for Max, Zak, and Emmy during the intervention condition across each routine. While visual inspection revealed inconsistent patterns of direction during baseline conditions, analyses of trend indicated that rates of engagement either maintained a flat or increasing trend across intervention conditions. Scores were also more tightly dispersed during the intervention conditions for each of the children,

suggesting that rates of engagement were more consistent and less variable during each intervention condition.

Research Study: Support Plan Component Evaluation

Purpose

In this research study, experimental procedures were used to systematically identify the functional components of the multi-component behavior support plan used by the parent and then fade the functional components of the plan that were "artificial" or identified by the parent as burdensome for continued implementation. The goal was for the family to fade components of their behavior support plans so that the plans consisted of natural strategies that were easier to maintain within everyday routines and settings. Toward this end, the following research questions were articulated:

Research Questions

1. Which elements of a multi-component intervention that was effective in reducing levels of challenging behavior are functional in maintaining low levels of challenging behavior?
2. Given that some elements are demonstrated to be functional in maintaining low levels of challenging behavior, is it possible to use a systematic fading procedure so that selected elements are no longer needed to maintain the low levels of challenging behavior?

Participants and Setting

Max, Zak, Emmy, and their mother participated in this research study. The entire study was conducted within the family's home environment. In addition, parental informed consent was obtained prior to the commencement of this study as a means of

ensuring both permission and a degree of commitment to the completion of the study. Approval from the university institutional review board (IRB) was obtained as a means of ensuring the safety and confidentiality of the entire family. Consents were pursued relative to participation, confidentiality, and the use of videotaping and photography.

Dependent and Independent Variables

The dependent variables in this research study were the same as those included in the pilot research study (i.e., challenging behavior, composite challenging behavior, and engagement; Table 2). Each session was independently videotaped by this researcher and subsequently scored by three trained observers for occurrence of each dependent variable. Challenging behavior and engagement was measured relative to both individual children (i.e., Max, Zak, and Emmy) and as an overall composite of all three children's challenging behavior. From the mother's perspective, challenging behavior was scored if it occurred during an interval regardless of which child demonstrated the behavior. The same method of coding composite challenging behavior was used as in the pilot research study. Occurrences of composite challenging behavior were scored whenever challenging behavior was observed with any child within the 10-second interval.

Table 2

Operational Definitions of Dependent Variables for the Research Study

Behavior	Recording Instructions
Challenging Behavior	Score challenging behavior in activity if child exhibits any of the following for the majority of the interval: **Inappropriate Verbalizations**: Score any occurrence in interval of screaming (voice tone louder than normal), crying, whining [e.g., high pitched begging, complaining, or acting as if crying without tears (i.e., fake crying)]. **Inappropriate Social Interactions**: Score any occurrence in interval of verbal resistance (e.g., verbal utterances that suggest resistance to the situation) such as "No!," or "Stop!" If the child expressed desire to do something else in a negative tone but was not indicating resistance to the current situation, the behavior may be marked as an "Inappropriate Vocalization." This behavior should also be scored for any occurrence of social interaction directed toward another that is considered bossy (e.g., "Gimme that!," or "Shut up!"), mocking, or berating another person (e.g., imitating mother's verbal instruction, arguing with mother). Include statements made to siblings with a connotation to chide them into appropriate behavior (e.g., egging on, instigating statements), that may result in being reprimanded). **Aggression**: Score any occurrence in interval of child attempting or following through with hitting, kicking, biting, wrestling, or attempting to pick up another person. Also score if child destroys another's property (e.g., knocks down others' block castle currently playing with, grabs another's toy, physical "tug of war," or struggle with another over object. Continue marking "Aggression" for each interval involved with struggle until behavior terminates. Include property destruction or attempt to deface or destroy others' toys or materials. **Out of Area**: Score any occurrence in interval of child leaving assigned area (e.g., leaves dinner table before finished with food, runs out of play area to get mother). **Inappropriate Use of Materials**: Score any occurrence in interval of behavior in which materials are used in a manner that is inappropriate or not what object was intended for (e.g., spitting out food, throwing toys, standing on dinner chair, jumping off table, slamming doors). If materials are used in completing aggression, mark both categories. **Noncompliance**: Score any occurrence in interval of child failure or refusal to follow instructions or directives for 5 or more seconds (e.g., Mother instructs, "Let's clean up," "Take your plate to the garbage can," or if child runs away or continues playing).
Engagement	Score engagement in activity if child is appropriately following sequence of activity for the majority of the interval. Engagement may still be scored if challenging behavior is recorded. If child exhibits challenging behavior throughout entire 10-second interval, do not score as engaged.

The independent variable in this study was the implementation of an assessment-based individual-level positive behavior support plan across four routines (Horner et al., 1990; Koegel, Koegel, & Dunlap, 1996). The independent variable was selected because the intention of this research study was to develop and implement four efficient, contextually-fitting positive behavior support plans for implementation by natural intervention agents within naturally-occurring family routines over time.

Measurement and Design

Systematic behavioral observations of rates of dependent measures (i.e., challenging behavior, composite challenging behavior, engagement) were conducted and scored via videotape using a 10-second continuous interval recording tool. Data collection corresponded to operational definitions and were expressed as the percentage of intervals of composite challenging behavior, as well as percentage of sessions in which a single intervention component was implemented as specified in the routine-specific support plan.

Reliability. Interobserver agreement was scored for occurrence, non-occurrence, and total IOA for each operationally defined dependent variable. Interobserver agreement (IOA) was scored for occurrence, nonoccurrence, and total IOA for both engagement and total challenging behavior per child. Reliability was assessed on at least 33% of all videotaped sessions. Total IOA scores (e.g., means, ranges) were calculated for each routine and child participant with no less than a 88% mean Total IOA score obtained between data collectors. These data are presented below in Table 3.

Table 3

Mean IOA Coefficients By Routine and Child: Research Study

Routine	Child	Variable	Total IOA (Range)
Clean Up	Max	Total Challenging	98% (90-100%)
		Total Engagement	95% (76-100%)
	Zak	Total Challenging	98% (91-100%)
		Total Engagement	98% (91-100%)
Twin Play	Max	Total Challenging	98% (98-100%)
		Total Engagement	97% (95-99%)
	Zak	Total Challenging	99% (95-100%)
		Total Engagement	100% (100-100%)
All Play	Max	Total Challenging	97% (95-99%)
		Total Engagement	97% (91-100%)
	Zak	Total Challenging	99% (97-99%)
		Total Engagement	99% (98-100%)
	Emmy	Total Challenging	98% (97-100%)
		Total Engagement	99% (97-100%)
Dinner	Max	Total Challenging	99% (98-99%)
		Total Engagement	96% (95-98%)
	Zak	Total Challenging	96% (93-99%)
		Total Engagement	95% (89-97%)
	Emmy	Total Challenging	94% (93-95%)
		Total Engagement	95% (92-97%)

Procedural Fidelity. In order to assess the degree to which intervention components were implemented with integrity, procedural fidelity data were collected during the natural only condition for each routine. Data were obtained relative to components that could be observed completely during sessions (i.e., intervention components that were clearly observable on videotape without interference or obstruction). Data were expressed as the mean percentage of completed steps.

Design. With regard to design, data were evaluated using a sequential withdrawal design. Using this design, individual components were systematically withdrawn and represented in a non-random fashion in order to determine whether changes in dependent measures have maintained (Kazdin, 1982; Rusch & Kazdin, 1981). Often embedded within the context of withdrawal or multiple baseline designs, the sequential withdrawal

design allows one to compare the strength of the behavior support plan's stimulus control relationship over the dependent measure as it is systematically faded to the use of naturalistic strategies (i.e., to identify the specific plan components that have a functional relationship to the dependent variable).

Procedures

Specific procedures used within this study are described below relative to each condition. Additional sections are discussed relative to unanticipated procedural variations to the research study as it was originally proposed.

Intervention Component Reduction. The first set of procedures were selected to facilitate the systematic reduction of the total number of individual intervention components into as efficient and durable a support plan as possible per routine. In order to complete this task, two sets of data were used to determine which individual artificial components would be included within the next phase of the research study (i.e., component analysis): procedural fidelity data from the pilot research study and parent rating scales completed by the mother for each routine. Data from the former were used to determine which components were implemented by the mother on a consistent basis, whereas the latter data set were used to determine both the mother's perceptions of intervention component efficacy and preference for long-term use. Guided by a set of decision rules for each data set, this researcher used these data to reduce the total number of individual intervention components per routine in as objective and systematic a manner as possible.

With regard to the procedural fidelity data, this researcher used procedural fidelity data from the pilot research study to determine the degree of which individual

intervention components were implemented as specified in their corresponding behavior support plan. Scoring each videotaped session relative to the presence or absence of individual intervention components, trained observers obtained estimates of procedural fidelity for each intervention component per routine. Given the fact that procedural fidelity data were presented as the mean percentage of completed steps for each intervention component across intervention sessions, it became necessary to develop a decision rule specifying which specific components would be included and excluded from the component analysis. Consequently, a decision rule was created, specifying that components with procedural fidelity estimates equal to or less than 50% would be assessed further to determine whether or not they would be included within the research study. The condition for exclusion involved visual analysis of the corresponding composite challenging behavior graph; composite challenging behavior data were visually analyzed by this researcher on sessions in which the intervention component in question (i.e., the intervention component with a procedural fidelity estimate equal to or less than 50%) was both implemented and omitted.

The second data set used to determine which individual components would be included within the next phase of the research study were parent rating scales completed by the mother for each routine. The mother was asked to complete a rating scale corresponding to procedural fidelity checklists for each routine. Following this procedure, the mother was presented with a three-point Likert rating scale to indicate: 1) whether she perceived there to be a relationship between a certain component and the child's challenging behavior; and 2) whether the component was something she can see herself using six months into the future. Data were used to determine which individual

components were considered candidates for subsequent component analysis (i.e., components considered to be "artificial") and which were considered "natural" to her family context (i.e., components that would stay constant and remain in place during this analysis as specified in their corresponding behavior support plans).

Upon acquisition of both sources of data, this researcher made decisions to reduce specific intervention components. Though both sources of data were used, decisions of whether or not to include or omit specific components were weighted with procedural fidelity data (i.e., the procedural fidelity decision rule applied first, followed by parent responses reported via the rating scales). On occasions when an intervention component with low procedural fidelity data (i.e., equal to or less than 50%) had been rated by the mother as being either effective (i.e., demonstrating a relationship with her child's challenging behavior) or desired for long-term use, this researcher presented both sets of data pertaining to the specific component to the mother for her decision to include or exclude from the next phase of the research study (Appendix B).

Component Analysis. The first step of the component analysis was to systematically test each component labeled "artificial." Each component was assigned a letter and sequentially withdrawn, re-presented, then withdrawn again in a "mini" reversal fashion. The sequence of the presentation of each component was determined by the mother's rating of what specific steps she perceived as the most necessary to maintain low levels of challenging behavior. In other words, it was the mother's opinion that the removal of the specified component from the behavior support plan would result in increased challenging behavior. Those perceived as "most necessary" to keep levels of challenging behavior low were manipulated first, followed by the component with the

second-highest “most necessary” ranking, and so forth. This step was repeated concurrently across routines until every “artificial” component was tested. Natural intervention strategies (i.e., the “natural” components) stayed constant and remained in place during this analysis as specified in their corresponding behavior support plans. Likewise, coaching was not provided to the parent during this phase, though presentation of data and plan review occurred at the end of each “mini- reversal.”

Data obtained using these procedures allowed this researcher to further reduce the total number of intervention components per routine (see “Data Analysis” section for specific data analysis procedures used to determine the presence of a functional relationship). Based upon changes in level of composite challenging behavior, individual components that demonstrated change were tagged for systematic fading in a subsequent phase of the study (i.e., the component analysis was used to filter out which “artificial” components will remain in the streamlined plan, as determined by changes in the dependent variable during systematic stimulus control manipulation).

Streamlined Plan. The purpose of this condition was to combine the remaining “artificial” components that had demonstrated a functional relationship to the dependent variable (i.e., composite challenging behavior) during the component analysis with the “natural” components.

Systematic Fading of Artificial Components. In the next condition, each “artificial” component included was to be placed on a thinning schedule until components were no longer necessary to maintain levels of challenging behavior (as indicated by stability of visual analyses). Natural intervention strategies (i.e., the “natural” components) were to remain constant and in place during as specified in their

corresponding behavior support plans. Prior to this condition, a single "artificial" component was scheduled for withdrawal, providing an additional manipulation designed to assess the strength of the stimulus control relationship.

Natural Only. The final condition of this study entailed monitoring the "natural" components over a brief period of time. In contrast to the intervention phase of the pilot study, implementation of this condition did not entail coaching; the mother was asked to implement the behavior support plan independently without any form of coaching or assistance. The parent did not receive any instruction regarding which components to implement. The purpose of this condition was to demonstrate the efficacy of the "natural" support plan components within each routine. Data were collected to assess the plan over a brief period of time for the family's eventual long-term use.

Unanticipated Procedural Variations. Although the aforementioned procedures were initially articulated for this research study, changes were made due to unanticipated outcomes. Upon completion of the component analysis, this researcher intended to implement streamlined plans for each routine, and then systematically fade those plans before moving into the natural only condition. However, as the research study progressed, it became apparent that the behavior support plans originally developed for the family were already streamlined in their current state. Consequently, the streamlined plan and systematic fading procedures originally articulated for this research study were no longer necessary for inclusion within the current research study.

Chapter Four

Results

The results of this investigation have been presented in this chapter. Data pertaining to the intervention component reduction process (i.e., patterns of reduction and parent ratings) have been presented by routine (i.e., clean up, twin play, all play, dinner), whereas changes in the dependent measures across the intervention condition of the pilot study, and both the component analysis and natural only condition of the current study have been presented in relation to each participant.

Intervention Component Reduction

The first step of the procedures for this research study entailed systematically reducing the total number of individual intervention components into as efficient and durable a support plan as possible per routine (Tables 9-12; Appendix B). The purpose of the intervention component reduction procedures was to both reduce the total number of individual intervention components per routine in as objective and systematic a manner as possible, and to make each behavior support plan easier for the parents to implement overt time. In order to complete this task, two sets of data were used to determine which individual components would be included within the next phase of the research study (i.e., component analysis): procedural fidelity data from the pilot research study and parent rating scales completed by the mother for each routine. Data from the former were used to determine which components were implemented by the mother on a consistent

basis, whereas the latter data set were used to determine both the intervention agent's perceptions of intervention component efficacy and preference for long-term use. Using procedural fidelity data from the pilot study, a decision rule was created exclusively for "artificial" intervention components (i.e., intervention components that are not typically incorporated within family routines, as determined by the primary intervention agent of this research study). The decision rule specified that components with procedural fidelity estimates equal to or less than 50% would be tagged for further assessment to determine possible inclusion within the component analysis (i.e., individual components were visually analyzed to determine whether their presence or absence appeared to influence changes in dependent measures).

The second set of data entailed the use of parent rating scales completed by the natural intervention agent for the current research study. The mother was presented with a three-point Likert rating scale to indicate: 1) whether she perceived there to be a relationship between a certain component and the child's challenging behavior; and 2) whether the component was something she can see herself using six months into the future. Data were used to determine which individual components were considered candidates for subsequent component analysis (i.e., components considered to be "artificial") and which were considered "natural" to her family context (i.e., components that would stay constant and remain in place during this analysis as specified in their corresponding behavior support plans).

In the event that an intervention component with low procedural fidelity data (i.e., equal to or less than 50%) had been rated by the mother as being either effective (i.e., demonstrating a relationship with her child's challenging behavior) or desired for long-

term use, the mother was given the opportunity to decide whether to include or exclude the specific intervention component from the next phase of the research study.

Procedural Fidelity Criterion

Procedural fidelity data from the pilot study were used to complete the first step of this task. Looking at obtained procedural fidelity estimates for each intervention component per routine, this researcher identified several components that were discarded using visual analyses (i.e., specific intervention components whose procedural fidelity estimates were equal to or less than 50% were assessed relative to changes in dependent measures when the component was both implemented and omitted). For example, data obtained during the all play routine indicated that procedural fidelity was consistently low when the mother reviewed the rules pertaining to Emmy's social story and provided Emmy with access to the "rule list." The procedural fidelity estimate for this intervention component was 33%. Conversely, the mother consistently selected a third toy set to help create a theme during the twin play routine. Procedural fidelity for this intervention component was 100%. Applying the decision rule to these examples, the intervention component for the all play routine was discarded, whereas the one used during twin play was retained.

An analysis of decisions made using the procedural fidelity criterion yielded a number of distinct patterns across routines. With regard to the clean up routine, procedural fidelity was consistently low (i.e., 50% or lower) for procedures requiring the mother to provide transition cues. The same pattern was noted during the all play and dinner routines. Similarly, procedural fidelity data indicated that the mother was less consistent implementing procedures requiring specific praise (i.e., twin play, all play,

dinner). Finally, data indicated that the mother implemented artificial components such as social stories and self-monitoring procedures with less accuracy (e.g., reading all play social story to Emmy prior to all play routine, providing choice menu for Emmy if she matches with mother and has over 80% appropriate behavior).

Parent Rating Scale

The second step of the reduction process entailed further reducing intervention components relative to parent perceptions regarding the utility of each support plan. The mother was asked to indicate whether individual components for each routine were perceived to be directly related to her children's behavior and to indicate whether or not she'd like to continue implementing the component in the future (e.g., six months from now). Data were obtained for both questions using a three-point Likert-type rating scale completed by the mother relative to each routine (Appendix B). With respect to the former question, scores were obtained relative to whether the mother perceived a relationship existed between the component and her children's behavior (i.e., I do not think there is a relationship, felt unsure, and I think there is definite relationship).

Across each routine, several trends were observed. First, the mother tended to perceive that the majority of intervention components were related to her children's behavior. Across each routine, the mother reported that the majority of intervention components were related to the children's behavior. Second, the mother tended to report that intervention components tied to either setting clear expectations and providing specific praise were more closely related to her children's behavior. Again, this pattern was evident across routines.

Finally, the mother reported that intervention components tied to antecedent modification were inconsistently tied to her children's behavior. Within this general category of intervention components, the mother consistently reported that components tied to environmental manipulations were more related to changes in her children's behavior than those related to choice making. For example, intervention components such as playing the Dragon Tales song during clean up, having dinner completely prepared and on the table before dinner, as well as using a consistent seating arrangement during dinner were each rated as being tied to the children's behavior. In contrast, intervention components tied to choice making were estimated to be less related (i.e., earning an "unsure" rating). Examples of this pattern include choice of food items during dinner, access to additional toy sets during twin play and all play, and choice of a preferred reinforcer during clean up.

With regard to the latter question, the mother was asked to estimate the degree to which she'd like to continue implementing individual intervention components in the future (e.g., six months from now). A review of parent ratings to the specific intervention components the mother would like to continue in the future yielded similar trends as that of the first question. As noted with the previous question, the mother's responses held consistent across routines. Likewise, the majority of intervention components in each routine earned the most positive response (e.g., close relationship between an intervention component and my children's behavior, would like to continue implementing a specific intervention component in the future). In addition, the mother reported that both intervention components that entailed the use of materials and those used to provide choice were less preferred for subsequent intervention in the future. Examples of these

types of less-preferred components included additional toy sets during twin play and all play, self-monitoring materials and the choice menu used during dinner and all play, choice of song or character during clean up, and choice of preferred reinforcer during clean up. However, it is still important to note that some "artificial" intervention components (e.g., choice of character during clean up) whose procedural fidelity data fell below the 50% decision rule were included within the component analysis per the parent's interest in incorporating the specific component within natural routines over time.

Summary. The purpose of the intervention component reduction procedures was to systematically reduce the total number of individual intervention components into as efficient and durable a support plan as possible per routine. A two-step process was used to accomplish this task (i.e., a predetermined procedural fidelity criterion and parent ratings of each component's utility). Several intervention components were discarded using the procedural fidelity criterion, many of which were also rated to be discarded using the parent rating scale. However, several intervention components whose procedural fidelity coefficients suggested discontinuation (e.g., prior to the routine, dinner was completely prepared and put on the table) were retained with positive parent ratings, thereby resulting in a series of behavior support plans that were both as streamlined and contextually fitting as possible. These behavior support plans were then marked for inclusion within the subsequent component analysis condition.

Systematic Behavioral Observations

In this section, time series data have been presented and described relative to both composite challenging behavior and data obtained for each individual child (i.e.,

challenging behavior, engagement). In order to adequately assess changes in dependent measures over time, data from the intervention condition of the pilot study, the component analysis, and the natural only condition have been presented. Systematic behavioral observations were used to obtain estimates of composite challenging behavior across routines (Figures 2 through 5; Appendix A) and both challenging behavior and engagement for each individual child participant across routines and conditions (Figures 6 through 9; Appendix A). Data have been first presented relative to composite challenging behavior estimates, followed by challenging behavior and engagement data obtained for each of the three individual child participants. In the final portion of this section, procedural fidelity data collected during the natural only condition have been presented. Patterns of plan implementation are discussed relative to the remaining components in the natural only condition for each routine.

Data Analysis

Visual analyses served as the primary means of analyzing changes to the dependent measures. Data were graphed in order to determine changes in the trend and level of all three dependent variables across conditions (Kazdin, 1982). Visual analyses of trend considered changes in direction both within and between phases, whereas changes in level were assessed through visual inspection of the magnitude of each dependent variable. Data obtained during the current research study were also compared relative to the pilot study in order to provide a context for analyzing changes in dependent measures over time.

Component Analysis. Due to the fact that the component analysis condition entailed three dependent variable observations across component groupings (i.e.,

withdrawal, reintroduction, withdrawal), data were assessed by visual inspection of level changes across individual data points. Decisions to keep or cut each component during the component analysis condition were determined by the magnitude of change in level of the dependent variable as determined by visual inspection and an analysis of any setting events that may have impacted the data. A functional relationship was determined by either the magnitude of the difference between the level of the dependent variable when it was reintroduced versus when it was withdrawn. Data that demonstrated an appreciable difference between phases would therefore have been judged to reflect a functional relationship. If the level of challenging behavior and engagement did not fluctuate on sessions that were being targeted for the specific component, it was determined that a functional relationship could not be demonstrated by this researcher.

Composite Challenging Behavior

Pilot Study. Across each routine of the pilot study (see Appendix A), visual analyses comparing baseline and intervention data consistently indicated that rates of composite challenging behavior demonstrated a decreasing trend during the intervention condition. Relative to observations of trend, visual analyses of baseline data collected during the clean up routine maintained an increasing trend, a downward trend during twin play, and a slightly downward trend during the all play and dinner routines. Composite challenging behavior during baseline was highest in the clean up and twin play routines, and lowest during the dinner and all play routines.

Data collected across both routines and conditions indicated that rates of composite challenging behavior consistently demonstrated both a lower level and lesser degree of variability during the intervention condition. Data indicated that rates of

composite challenging behavior across routines consistently dropped during the intervention conditions. Across routines, mean levels of composite challenging behavior dropped a minimum of 43% and a maximum of 71%. With regard to variability, visual analyses indicated that composite challenging behavior during the clean up and twin play routines was more variable during the intervention conditions. The opposite pattern was observed during the all play and dinner routines. Though the data obtained during the latter routines provide a more convincing demonstration of behavior change (relative to changes in variability), it is important to note that the increased variability observed during the clean up and twin play conditions appeared to be a function of the sharp changes in level that were obtained. Together, an assessment of changes in trend, level, and variability suggest that the children's rate of composite challenging behavior was much lower as the result of intervention implementation.

Component Analysis. Specific intervention components subjected to component analysis procedures are located in Table 4. A minimum of two intervention components were manipulated per routine, in addition to conditions measuring changes in dependent measures in which both components were included (i.e., "typical") or omitted (i.e., the "NN" or "RN" condition).

Table 4

Intervention Components Included in the Component Analysis Procedures.

Clean-Up		**Twin Play**		**All Play**		**Dinner**	
AB	Typical	**AB**	Typical	**AB**	Typical	**AB**	Typical
A	Music	**A**	Full toy sets (Boys pick 2)	**A**	Full toy sets (Everyone picks 1)	**A**	Self monitoring
B	Dragon characters	**B**	Praise	**B**	Praise	**B**	Seating arrangement
NN	No music and No dragon characters	**RN**	Reduced toy sets No praise	**RN**	Reduced toy sets No praise	**NN**	No self monitoring No change in seating

Across routines, visual analyses of systematic behavioral observation data across all four routines indicated that levels of composite challenging behavior were consistently lower during the component analysis conditions than during the baseline condition of the pilot study (Figures 1 and 2). In contrast, rates of occurrence maintained a pattern similar to that of the pilot study intervention condition. For example, mean rates of composite challenging behavior within the clean-up routine ranged from 16-34% during the conditions AB (typical), condition B (dragon characters), and condition NN (no music and no dragon characters). Similar results were obtained during the other three routines and conditions, thereby indicating that the children demonstrated similar rates of challenging behavior since the initiation of the intervention condition approximately a year before.

The only exception to this pattern of low composite challenging behavior was observed in condition A of the clean up routine, which entailed the manipulation of music (mean = 60%, range = 9-95%). Rates of composite challenging behavior more than doubled that of the pilot study intervention condition on the two occasions in which the

component was manipulated, thereby providing tentative support for the presence of a functional relationship between the inclusion/exclusion of music within the clean up routine and occurrences of composite challenging behavior. However, it is important to note that the data obtained during this condition were influenced by a single child participant (i.e., Zak), whose behavior himself appeared to have been influenced by setting event variables (e.g., the presence of preferred objects, reactions to changes of any kind within the routine). As a result of these variables (described subsequently in Chapter 5), it is reasonable to conclude that visual analyses suggesting the presence of a functional relationship between variables are presently inadequate and do not confirm such a relationship.

Natural Only Condition. Within the natural only condition for each routine, the mother was given the opportunity to both implement or omit any specific intervention procedures she wished (Tables 13-16; Appendix C). Implementing each behavior support plan without coaching or prior preparation, the mother was encouraged to implement the specific components she felt necessary to help her children maintain lower rates of challenging behavior and higher rates of engagement over time. Examples of specific intervention components implemented over the course of the three natural only condition sessions included: 1 specific praise and clearly stated expectations (clean up); 2) choice of toy sets and play themes (twin play); 3) self-monitoring and expectations to ask Maggie for help (all play); and 4) antecedent modifications such as seating arrangement and sitting with children for entire duration of mealtime (dinner).

Visual analyses indicated that rates of composite challenging behavior demonstrated a more variable and slightly increasing trend during the clean up and twin

play routines, whereas a much less variable and slight downward trend was observed during the all play and dinner routines. Rates of composite challenging behavior occurred at a lower level than that of the baseline conditions and more closely approximated intervention conditions of the pilot study. The following mean rates of composite challenging behavior were obtained: clean up (mean = 39%); twin play (mean = 25%); all play (mean = 13%%); and dinner (mean = 15%). Relative to pilot study comparisons, mean composite challenging behavior data obtained in each of the natural only conditions approximated both the pilot study intervention condition and condition AB of the component analyses (i.e., the typical condition).

Max

Pilot Study. With regard to Max's behavior during the pilot study, visual analyses indicated both challenging behavior and engagement changed as a function of the implementation of behavior support plans across routines. With respect to changes in the variability and level of both dependent measures, data are presented below in Table 5.

Table 5

Changes in Variability and Level of Challenging Behavior and Engagement for Max: Pilot Study

Routine	**Challenging Behavior**		**Engagement**	
	Baseline Mean (Range)	**Intervention** Mean (Range)	**Baseline** Mean (Range)	**Intervention** Mean (Range)
Clean Up	83% (73-100%)	8% (0-45%)	7% (0-20%)	94% (67-100%)
Twin Play	47% (18-70%)	11% (0-27%)	51% (17-86%)	89% (72-100%)
All Play	25% (13-65%)	7% (0-17%)	77% (39-88%)	95% (87-100%)
Dinner	17% (6-24%)	13% (3-25%)	84% (64-94%)	90% (84-98%)

Comparing data between both the baseline and intervention conditions, rates of challenging behavior maintained a consistently downward trend, moderate degree of variability, and a lower level during the intervention condition of the clean up routine.

Only small exceptions were noted across the other three routines. Challenging behavior was more variable during the baseline condition in the twin play routine, but was less variable during the intervention condition. The same patterns were noted during the all play and dinner routines. Relative to rates of engagement during the pilot study, Max was consistently more engaged during each intervention condition. Specifically, data indicated that rates of engagement during the clean up routine were consistently upward in trend, less variable, and higher in level during the intervention condition. This pattern was also evident within the other three routines.

Component Analysis. During the component analysis, both Max's challenging behavior and engagement maintained a similar degree of consistency as demonstrated during the intervention condition of the pilot study. In light of the fact that three individual intervention components were manipulated for each condition (in addition to measuring behavior during the "typical" implementation of the behavior support plan), Max's behavior only fluctuated slightly when praise was manipulated during the clean up routine (i.e., visual analyses indicated that challenging behavior increased and engagement decreased). Specifically, mean rates of challenging behavior within the clean-up routine ranged from 4-17% during conditions AB (mean = 7%), condition B (mean = 17%), and condition NN (mean = 4%). In contrast, mean rates of engagement ranged from 81-98% during the same routine across conditions AB (mean = 92%), condition B (mean = 81%), and condition NN (mean = 98%). Similar results were obtained during twin play (e.g., means ranging from 12-23%), all play (e.g., means ranging from 19-200%), and dinner (e.g., means ranging from 17-35%).

Although the initial child targeted for support, Max's behavior changed very little in response to individual intervention component manipulations. In other words, Max's challenging behavior and engagement did not appear to demonstrate a functional relationship to specific intervention components. In contrast, however, both Max's challenging behavior and engagement varied on occasions when he obtained less sleep than typical. On occasions when he obtained less sleep than typical, Max's behavior the following day was described as both more challenging and less engaged than on occasions when he obtained his typical amount of sleep.

Natural Only Condition. Upon completion of the component analysis condition for each routine, Max's behavior was briefly assessed through the implementation of a natural only condition. Measuring both rates of challenging behavior and engagement across three data points, Max's rate of challenging behavior and engagement approximated the levels, variability, and trends consistently observed during the pilot study intervention and component analysis conditions.

Zak

Pilot Study. With respect to Zak's behavior during the pilot study, data consistently indicated his challenging behavior and engagement also changed as a function of the implementation of behavior support plans across each of the four routines. Data are presented below in Table 6, describing the level and variability of both Zak's rate of challenging behavior and engagement over the span of the pilot study.

Table 6

Changes in Variability and Level of Challenging Behavior and Engagement for Zak: Pilot Study

Routine	Challenging Behavior		Engagement	
	Baseline Mean (Range)	**Intervention** Mean (Range)	**Baseline** Mean (Range)	**Intervention** Mean (Range)
Clean Up	57% (23-84%)	20% (0-92%)	37% (16-69%)	81% (80-100%)
Twin Play	47% (27-56%)	18% (0-28%)	56% (46-73%)	92% (74-100%)
All Play	25% (13-65%)	7% (0-17%)	77% (39-88%)	95% (87-100%)
Dinner	29% (8-69%)	12% (0-24%)	84% (64-94%)	90% (84-98%)

Comparing data between both the baseline and intervention conditions of the clean up routine, rates of challenging behavior maintained a consistently downward trend, less variability, and a lower level during the intervention condition. Similar trends were noted during the other three routines (i.e., twin play, all play, dinner). In relation to rates of engagement measured during the pilot study, Zak was consistently more engaged during each intervention condition. Specifically, data indicated that rates of engagement for Zak during all four routines followed a consistently upward trend, less variability, and a higher level during the intervention condition.

Component Analysis. During the component analysis, both Zak's challenging behavior and engagement maintained a similar degree of consistency as demonstrated during the intervention condition of the pilot study. Mean rates of challenging behavior ranged from 19-85% during clean up, 3-25% during twin play, 6-9% during all play, and 7-40% during the dinner routine. Likewise, mean rates of engagement ranged from 74-83% during clean up, 87-100% during twin play, 93% during all play, and 65-91% during dinner. Although Zak's rates of challenging behavior and engagement across routines appeared similar to that of the pilot study intervention condition, this researcher observed an additional pattern to Zak's behavior in response to component analysis procedures.

However, it is important to note that this pattern appeared to be tied less to the manipulation of a specific intervention component than the presence of a change to the typical routine itself. For example, Zak demonstrated more challenging behavior on occasions when his preferred toys were not present during a specific routine (e.g., 85% challenging behavior and 20% engagement during condition A). In light of the fact that three individual intervention components were manipulated for each condition (in addition to measuring behavior during the "typical" implementation of the behavior support plan), Zak's behavior appeared to change more in response to changes in materials typically included within the routine than a specific component manipulated during the routine itself. This pattern was observed during the pilot study's clean up routine across different intervention component manipulations (e.g., reduced number of toys, praise, self-monitoring) and routines (e.g., twin play, all play), thereby lending support to the notion that the concern with routine-specific materials may have influenced Zak's response to task demands.

Natural Only Condition. Upon completion of the component analysis condition for each routine, Zak's behavior was briefly assessed through the implementation of a natural only condition. Measuring both rates of challenging behavior and engagement across three data points, Zak's rate of challenging behavior and engagement approximated the levels, variability, and trends consistently observed during the pilot study intervention and component analysis conditions.

Emmy

Pilot Study. With respect to Emmy's behavior during the pilot study, data consistently indicated both challenging behavior and engagement changed as a function

of the implementation of behavior support plans across routines. Comparing data between both the baseline and intervention conditions, rates of challenging behavior maintained a consistently downward trend, less variability, and a lower level during the intervention condition of the all play and dinner routines. Data reflecting the changes in both variability and level are presented below for each routine and condition in Table 7.

Table 7

Changes in Variability and Level of Challenging Behavior and Engagement for Emmy: Pilot Study

Routine	Challenging Behavior		Engagement	
	Baseline Mean (Range)	**Intervention** Mean (Range)	**Baseline** Mean (Range)	**Intervention** Mean (Range)
All Play	28% (11-36%)	6% (0-12%)	79% (71-97%)	97% (90-100%)
Dinner	40% (22-66%)	8% (0-22%)	65% (50-78%)	93% (75-100%)

Assessing the degree of change between conditions and routines, data indicate that Emmy's greatest degree of behavior change occurred during the dinner routine. Though Emmy's rates of challenging behavior and engagement consistently improved (i.e., challenging behavior decreased, while engagement increased) relative to both routines and dependent measures, she demonstrated a greater degree of challenging behavior reduction over time than an increase in her rate of task engagement.

Component Analysis. During the component analysis, both Emmy's challenging behavior and engagement maintained a similar degree of consistency as demonstrated during the intervention condition of the pilot study. In light of the fact that three individual intervention components were manipulated for each condition (in addition to measuring behavior during the "typical" implementation of the behavior support plan), Emmy's behavior fluctuated very little (i.e., challenging behavior decreased, engagement increased). Specifically, mean rates of challenging behavior and engagement within the

all play routine ranged from 7% and 96-97% during both conditions AB and condition B, respectively. With regard to the dinner routine, Emmy's mean rates of challenging behavior and engagement during conditions CB, B, and A were 2-21% and 90-95%, respectively. Consequently, Emmy's challenging behavior and engagement did not appear to demonstrate a functional relationship to specific intervention components.

Natural Only Condition. Upon completion of the component analysis condition for each routine, Emmy's behavior was briefly assessed through the implementation of a natural only condition. Measuring both rates of challenging behavior and engagement across three data points, Emmy's rate of challenging behavior and engagement approximated the levels, variability, and trends consistently observed during the pilot study intervention and component analysis conditions. Though Emmy exhibited a greater rate of challenging behavior in the dinner routine during this condition, her mean rate of challenging behavior remains 26% lower than it was during the pilot study baseline condition.

Summary of Natural Only Conditions

With regard to the specific components selected for inclusion into the natural only support plans, several patterns were observed (Appendix C). The mother expressed interest in implementing a combination of antecedent- and consequence-based interventions in order to both prevent the occurrence of challenging behavior and to teach her children prosocial skills. In reference to the former goal, one of the mother's main priorities was to maintain a sense of structure, ensuring that expectations were clearly stated and understood (e.g., indicating to the boys when it was time to clean up, telling the boys to play with their sister while she was in the kitchen during all play, stating that

playtime was “all done” at the end of twin play). Given that both intervention components had been implemented in the previous conditions of the pilot and current research studies, these components were included within each routine. Additional antecedent modifications were also retained for use within the dinner routine (e.g., seating arrangement, sitting with children for duration of meal).

With respect to the latter goal (i.e., to teach prosocial skills), the mother continued to deliver specific praise in each of the natural only support plans. Procedural fidelity data indicated that the mother had learned to effectively deliver specific praise to her children and had demonstrated the ability to consistently deliver specific praise to each of her three children for following directions during the all play and dinner routines. Similarly, the mother also demonstrated an understanding of choice and preference, electing to provide choices of toy sets during twin play and all play, and to present the children with preferred reinforcers whenever they successfully completed their routines. Though each routine necessitates subtle variations in procedure (e.g., the type of specific praise or language used in delivering clear expectations), each of these components were both preferred by the mother and implemented with precision across previous conditions.

Finally, it is important to acknowledge patterns in dependent measures obtained during the natural only condition within the context of both the pilot and current research studies. Data collected nearly a year after initiating services with the family indicated that rates of composite challenging behavior remain much lower than at its original baseline state (Table 8).

Table 8

Changes in Level of Composite Challenging Behavior Across Conditions and Routines

Routine	**Baseline Condition** Mean	**Intervention Condition** Mean	**Natural Only** Mean
Clean Up	96%	25%	39%
Twin Play	69%	22%	25%
All Play	54%	11%	13%
Dinner	64%	21%	15%

Across both the pilot and current research studies, composite challenging behavior data also indicate that rates of challenging behavior have remained at levels similar to the intervention condition of the pilot study. Given the fact that the intervention condition concluded approximately six months ago, this finding supports the durability of the children's resulting behavior change over time.

Summary

In accordance with data collection procedures articulated in the methodology, data were collected in order to obtain estimates of group and individual target behaviors (i.e., composite challenging behavior, challenging behavior, engagement). Behavior support plans for each routine were systematically reduced and implemented independently by the primary intervention agents (i.e., mother, older sister) within their natural routines. Across routines, levels of composite challenging behavior and challenging behavior equated to or were less than the highest level obtained during intervention conditions, and levels of engagement were higher than levels obtained during the intervention conditions of the pilot study. These findings maintained across both time and child participants.

Despite such encouraging findings, it is important to note that the component analyses conducted within each of the four routines did not result in the identification of a functional relationship between a single intervention component and changes in dependent measures. Although this aspect of the research study was not originally hypothesized, explanations of its occurrence are presented and discussed in the next chapter.

Chapter Five

Discussion

Review of Research Questions

This study entailed the demonstration of behavior change resulting from the implementation of four multi-component positive behavior support (PBS) plans. Each plan was derived from functional assessments conducted within the family's natural environment. Behavior support plans were developed in collaboration with and implemented by natural intervention agents, teaching age-appropriate replacement skills. Efforts were made to ensure a high degree of contextual fit relative to both the ease of implementation and procedural fidelity over time.

The results of this research study indicated that the children consistently maintained low rates of challenging behavior and high rates of engagement within each routine over time. In addition, procedural fidelity data indicated that intervention components were implemented as the parent had intended on a consistent basis and that the plans were easily adapted into natural family routines. To further discuss these outcomes within the context of early intervention/early childhood special education (EI/ECSE), it is necessary to review the research questions addressed in the study. Specific outcomes are linked to individual questions as they are presented. Findings are discussed relative to each question, followed by a discussion of limitations and contributions to research and practice.

Research Questions

Research Question #1: Which elements of a multi-component intervention that was effective in reducing levels of challenging behavior are functional in maintaining low levels of challenging behavior?

The purpose of the first research question was to determine the specific functional relationships between individual intervention components of four multi-component behavior support plans. Changes in dependent measures were assessed over time (i.e., between the pilot and current studies), as well as both within and between child participants and routines. Results of the pilot study indicated that rates of both composite and individual challenging behavior decreased steadily and maintained both lower levels and less variability as a function of the implementation of each behavior support plan in each routine. Conversely, changes in levels of engagement consistently increased for all children across all four routines. Such patterns of dependent variable occurrence were also observed in the current study.

With respect to the current study, this researcher initially sought to investigate the specific functional relationships of individual components within a multi-component behavior support plan implemented within family routines, assess rates of dependent measures when nonfunctional components were removed, and the resulting plan systematically faded over time. Using reduction procedures designed to systematically test intervention components, this researcher and the mother collaborated to determine which components were the most natural and implemented with the highest degree of fidelity in order to attempt to understand long-term use, the mother also rated each behavior support plan component. Following this procedure, component analyses were

conducted within each routine in order to determine the effectiveness of each "artificial" intervention component.

Assessment of Functional Relationships. It was initially hypothesized that differences in the degree of functional relationship among "artificial" components would be evident, thereby necessitating the remaining steps of the proposed methodological procedures in order to arrive at the most natural, contextually fitting support plan possible (i.e., to create a "streamlined plan" that consisted of intervention components demonstrating the greatest degree of functional relationship, and to systematically fade the remaining "artificial" components).

Contrary to hypotheses stated by this researcher, the results obtained from the component analysis did not identify a set of "artificial" components that clearly demonstrated an individual functional relationship. Data obtained across routines and conditions provided inconclusive evidence supporting stronger functional relationships than those obtained from the implementation of each behavior support plan in its "typical" state. Though efforts were made to investigate the impact of specific intervention components, it was not possible to detect a functional relationship since challenging behavior was consistently low.

Consequently, the findings of the current research study indicated that the implementation of each PBS behavior support plan in its entirety was associated with durable behavior change over time rather than for individual intervention components within each routine (i.e., a functional relationship was observed with the multi-component behavior support plans rather than individual intervention components). More precisely, however, is the fact that these behavior support plans appeared to have

demonstrated a high degree of contextual fit (Albin et al., 1996; Lucyshyn et al., 2002). Following suit with previously reported findings, each of the four behavior support plans was: 1) implemented with accuracy and precision; 2) applied across natural contexts; 3) implemented over a prolonged period of time; and 4) rated as being effective and useful (Albin et al., 1996; Lucyshyn, Horner, Dunlap, Albin, & Ben, 2002). Though additional studies are needed within this area, the findings obtained in this research study, serve as a case illustration of contextually-fitting positive behavior support plan implementation within a family's home environment.

In an effort to explain the cause of this phenomenon, one must reconsider this finding relative to those documented within the PBS literature base. Previous studies documenting the implementation of PBS behavior support plans for children and families describe the use of multi-component behavior support plans as a limitation (Dunlap et al., 1996; Kern et al., 1994). In the past, this criticism has been rendered primarily due to the fact that one cannot determine which specific intervention components were most closely related to changes in dependent measures (e.g., Carr, Horner, & Turnbull, 1999; Dunlap et al., 1996). Given the fact that PBS is grounded in the science of applied behavior analysis, this limitation has been reported in the research literature with some regularity.

While the premise of this limitation makes sense from the standpoint of replication and scientific rigor, it is also important to consider the possibility that the same experimental limitation may not be a limitation at all within the context of applied research. Each of the behavior support plans implemented in this research study were developed using PBS technology and included intervention components that were both scientifically endorsed and reflective of evidence-based practices. Given such

characteristics, one may argue that each behavior support plan had an adequate degree of technical adequacy. Consequently, one must also question whether the limitation associated with multi-component behavior support plans is more of a theoretical than an applied research issue. A growing body of research appears to support this notion, asserting that multi-component behavior support plans are needed in order to adequately program for lifestyle changes, ecological adjustments, and proactive strategies designed to promote stronger interpersonal relationships and access to preferred activities (e.g., Horner et al., 1990; Lucyshyn et al., 1997; Lucyshyn et al., 2002).

Similarly, it is reasonable to question whether the findings obtained in this research study provide support to the notion that PBS multi-component behavior support plans have a greater likelihood of including intervention components that are either "natural" and/or easy enough for natural intervention agents to implement over time with a high degree of fidelity. Changes in dependent variables over time (i.e., across both the pilot and current studies) were due to the implementation of a series of contextually-fitting, multi-component PBS behavior support plans rather than for specific intervention components demonstrating a functional relationship in the maintenance of both rates of challenging behavior and engagement. Consequently, is was evident that the original behavior support plans implemented in both the pilot and current research studies were already streamlined and had become "natural" to the family (i.e., it was not necessary to create a more streamlined plan or to systematically fade "artificial" components). Following this argument, it does not appear that one may adequately answer this research question solely with data obtained in the current research study.

Natural Only Condition. The purpose of the natural only condition was to demonstrate the efficacy of the "natural" support plan components within each routine. Data were collected to assess the plan over a brief period of time for the family's eventual long-term use. After receiving comprehensive behavior support for over a year, the mother began to implement each behavior support plan on an independent basis. The culminating product of the intervention component reduction process, each support plan was streamlined to include those intervention components that were determined to be both most preferred and most consistently implemented (as determined by both parent ratings and procedural fidelity data).

With regard to the specific components selected for inclusion into the natural only support plans, the mother expressed interest in learning how to prevent her children from demonstrating further occurrences of challenging behavior, as well as identifying ways to teach them prosocial skills. In addition to achieving these goals through participation in the implementation of antecedent- and consequence-based interventions within each routine, the mother became both more familiar and proficient in identifying the specific triggers associated with each child's challenging behavior. Over the duration of the pilot and current research studies, the mother had learned how to consistently prevent her children from demonstrating challenging behavior in favor of socially appropriate alternatives. The mother learned a number of effective strategies, each of which she had become comfortable using within her natural daily routines. Although positive, this phenomenon deserves acknowledgment, as the mother had become so fluent implementing intervention components over the course of the current research study that she no longer relied upon back up strategies (e.g., using physical guidance to help a child

pick up a toy; requiring the children to remain at the table for 5 minutes before). On occasions when she observed challenging behavior during the natural only conditions, the mother routinely implemented the strategies with which she was most comfortable and proficient.

Although brief in its duration due to the time of the year in which the study was conducted (i.e., end of summer), data collected during the natural only conditions are encouraging. Following an extended period of intervention implementation and coaching during the pilot study and participation in the component analysis in the current research study, the mother independently implemented each support plan for three days. Aside from observing setting events that likely influenced the children's behavior during the first day of the natural only condition (described in the section below), data indicated that levels of each dependent measure (e.g., composite challenging behavior, individual challenging behavior, individual engagement) approximated levels previously obtained during the component analyses.

Setting Event Variables. Analyzing the obtained results further, it is also necessary to acknowledge the potential role of setting events that may have influenced the children's behavior. This researcher compared changes in Zak's behavior relative to changes across component manipulations occurring during both the clean up and twin play routines. While conducting these comparisons, it became evident via videotape observations that there was a relationship between Zak's behavior across both the twin play and clean up routines. On several occasions where Zak experienced difficulty during the twin play routine, the same pattern would tend to occur in the clean up routine (which immediately followed). These comparisons indicated that there was yet another

factor influencing Zak's behavior: access to preferred toys (e.g., cars and trucks) during the twin play routine. On such occasions when cars and trucks were present, Zak's rate of challenging behavior was consistently lower and his rate of engagement higher than occasions when preferred toys were absent (e.g., cars and trucks). As a result of these two patterns of observations, it became evident to both the mother and this researcher that Zak's behavior was influenced by both the presence of cars and trucks and whether or not there was a change in his daily routine. Consequently, it appeared more likely to this researcher that any changes in dependent measures occurring during the conditions in which this pattern was observed are more likely attributable to the pattern itself rather than implying a functional relationship between a specific intervention component.

In addition to observing unexpected changes in Zak's behavior, it also appeared that Max's behavior was influenced by fatigue. On occasions when their mother reported illnesses for any of the children, instances in which the children did not receive an adequate amount of sleep the night before, or occasions when the children did not fall asleep during naptime, Max consistently exhibited higher rates of challenging behavior and lower rates of engagement. On days in which this pattern was observed (e.g., the first day of the natural only condition), videotape observations indicated that Max's behavior followed a similar pattern across morning and afternoon routines.

In addition to these setting event variables, it became increasingly apparent as data collection progressed that the children were sensitive to changes in routine, and on occasions when such changes were observed, rates of challenging behavior tended to be higher. Examples of such changes include interruptions observed during the clean up and twin play routines (e.g., repairmen, telephone calls) and instances when Emmy was home

from school. While these unanticipated variables were associated with higher levels of composite and individual challenging behavior, data indicated that Zak was particularly sensitive to the influence of such changes. For example, during the clean up routine, Zak became increasingly frustrated (as evidenced by elevated rates of individual challenging behavior and decreased rates of engagement) when changes were made (e.g., inclusion or exclusion of music). The same pattern was also observed upon return from the family's summer vacation.

Research Question #2: Given that some elements are demonstrated to be functional in maintaining low levels of challenging behavior, is it possible to use a systematic fading procedure so that selected elements are no longer needed to maintain low levels of challenging behavior?

The second research question addressed the utility of systematic fading procedures used as a means of maintaining low levels of challenging behavior. Changes in dependent variables over time (i.e., across both the pilot and current studies) were due to the implementation of multi-component PBS behavior support plans rather than for specific intervention components demonstrating a functional relationship in the maintenance of both rates of challenging behavior and engagement. Upon completion of the component analysis, this researcher intended to implement streamlined plans for each routine, and then systematically fade those plans before moving into the natural only condition. However, as the research study progressed, it became apparent that the behavior support plans originally developed for the family had became sufficiently streamlined over time. In comparison between the intervention conditions of the pilot study and natural only conditions of this research study, the mother was able to use fewer

intervention components to help her children reduce their rates of challenging behavior and to increase their rates of engagement. As the mother became more proficient implementing each support plan, she reported that she had also learned when to use each intervention component (i.e., she understood how specific intervention components were chosen to fit the function of her children's behavior). As a result of this understanding, it had become easier for the mother to both implement each behavior support plan and to also choose which individual components she intended to continue to implement over time. Consequently, is was evident that the original behavior support plans implemented in both the pilot and current research studies had become "natural" to the family (i.e., it was not necessary to create a more streamlined plan or to systematically fade "artificial" components). Following this argument, it does not appear that one may adequately answer this research question solely with data obtained in the current research study.

In light of such findings and tentative conclusions, it is also important to acknowledge an alternative explanation for these outcomes. While it appears accurate to report that changes in dependent variables were functionally related to the multi-component behavior support plans themselves, it is also possible that changes in dependent measures within each natural only condition were due to the implementation of a multi-component behavior support plan that was modified during the component analysis' component reduction process. While separate conditions were originally proposed to create a streamlined plan (i.e., the streamlined plan and systematic fading of artificial component conditions), it is important to acknowledge the fact that the reduction procedures in the component analysis may have served the same purpose (i.e., to create more efficient and streamlined plans). Although this explanation warrants further

research, data from the current research study indicate similar patterns of trend, level, and variability during each natural only condition to those obtained during the pilot study. Consequently, if one were to subscribe to this explanation, it is possible to argue that: 1) a systematic fading procedure was used in the current research study (i.e., the component reduction procedures); 2) visual analyses supported similar patterns during the pilot study intervention and current study's natural only conditions; and as a result; 3) rates of dependent variable occurrence were functionally maintained by streamlined multi-component behavior support plans.

Limitations

It is important to acknowledge the limitations inherent to this research study. The first limitation pertained to external validity. Given the fact that the participants of both the pilot and current research studies were from an individual family of five, it is not possible to assume that the results of this study are directly replicable with another family, other family members (e.g., father) or within another context (e.g., school or community). Generalizing results to other children, regardless of age, culture, gender, socioeconomic status, or diagnosis should be made with caution as well.

The second limitation is associated with measurement. It is possible that a degree of observer drift may have existed as a result of systematically coding behavioral observations over time. However, it is equally important to recognize that efforts to minimize these untoward effects were made, through both periodic review of operational definitions and interobserver agreement (via observer training prior to data collection and measurement of IOA per condition).

With regard to the component analysis, two limitations deserve consideration. The first pertained to the brief withdrawal of intervention components in order to determine stimulus control relationships. There was a clear rationale for using component analysis to help the family fade the plan of behavior support so that it will be easy for them to maintain within everyday routines and settings. However, the mother may have experienced some degree of discomfort when asked to temporarily withdraw a preferred intervention component. It is also important to note that each component was withdrawn for no more than two sessions, and the intervention components were in no way designed to prevent accident or injury. Therefore, the brief withdrawal did not appear to cause a measurable degree of stress or risk for the family other than a temporary change in routine.

The second limitation related to component analysis is that one could argue the sequential withdrawal design was not necessarily required to assess response maintenance. As Rusch and Kazdin (1981) noted, "it is quite possible that behavior in a study may be maintained with a complete withdrawal (i.e., a complete withdrawal of all components following acquisition" (p. 134). Consequently, this researcher intended to manipulate at least one artificial component that had demonstrated a functional relationship to the dependent variable during the component analysis prior to initiating the "natural only" condition. A manipulation subsequent to the component analysis and "streamlined plan" condition was considered as a means of enhancing the rigor of the study and further demonstrate the strength of the stimulus control relationship associated with the specific intervention component (thereby demonstrating the strength of the artificial component's stimulus control relationship and justifying the selection of the

sequential withdrawal design). Given the fact that the outcomes of the current research study did not demonstrate a functional relationship between changes in dependent measures and specific individual intervention components, the intended manipulation did not occur. Consequently, one could still argue that the sequential withdrawal design was not needed to assess response maintenance, but perhaps would have served more use in the creation of each behavior support plan.

Finally, limitations existed relative to the developmental maturation of the three children. For example, as the study progressed, it was apparent that Max and Zak were using expressive language in a more efficient manner (i.e., use of grammar, syntax, length of utterance, articulation that is easier to understand). While it is possible that changes in the boys' language development could be attributable to the implementation of the independent variables in both the pilot and current research studies, the opposite is equally possible (i.e., changes in their development over time influenced the implementation and measurement of the independent variable).

Contributions to Research and Practice

The current research study offers several contributions to research and practice. The pilot study provided a case example of the application of PBS with a sibling set of preschool-aged children and their parent. Though research is growing in this area, the unique features of this study may inspire future research (e.g., interventions designed to support fraternal twins and an older sibling, measurement of social validation and procedural fidelity). Given the fact that the current research study was a continuation of an ongoing research study (i.e., the pilot study), perhaps the most valuable aspect of the

research study is the fact that it documented the utility of longitudinal, family-centered support consistently provided for over a year.

Likewise, the current research study also demonstrated the maintenance of four multi-component PBS behavior support plans implemented within natural family routines. Though few studies prioritize maintenance, its inclusion is critically important, as it allows one to assess the utility and efficacy of an intervention after its initial implementation and demonstration (i.e., the intervention phase of a research study; Dunlap, Horner, Carr, Sailor, Turnbull, Koegel, & Koegel, 1998; Horner & Billingsley, 1988; Horner, Dunlap, & Koegel, 1988). Such a contribution has been previously endorsed by Carr and his colleagues (1990), who argued that research studies incorporating the maintenance of target behaviors may not only help extend the longevity of behavior support plans, but also to document and strongly support the overall utility of PBS technology for children and their families.

Similarly, the current research study offered an experimental demonstration of the relationship of individual components to challenging behavior. In the majority of studies on PBS, multi-component plans are developed that may include components that are perceived to have a relationship to reduce challenging behavior without data that affirms a functional relationship. While the current research study failed to offer conclusive evidence demonstrating a functional relationship between specific intervention components and dependent measures, the study may serve as a methodological case example of such an attempt. Though the findings were not anticipated, the procedures stated prior to the execution of this research study may deserve consideration in future research efforts, particularly those assessing the efficacy of individual intervention

components embedded within functional assessment-based intervention plans for children and families (i.e., instances when PBS is not used). This is particularly true given the fact that the efficacy of each behavior support plan was initially determined and then evaluated for durability. Given that the majority of component analyses are conducted prior to implementation, this feature may serve to promote future research, as the field continues to study ways by which both implementation of the independent variable may be enhanced and investigation of specific features of the PBS model are conducted.

Another methodological contribution associated with this research study pertains to the articulation of an effective intervention component reduction process. Using the procedures stated and implemented in the current research study, it was possible to identify and eliminate specific intervention components that were unnecessary to maintaining behavior change (i.e., those with procedural fidelity coefficients less than or equal to 50 percent, those reported by the natural intervention agent to be unnecessary and non-preferred for long-term implementation). Additional research in this area may help refine such procedures for use in both applied research and practice.

The current research study also offers useful contributions to future practice. The first contribution involves the use of natural intervention agents. Both the mother and older sister served as natural intervention agents in the study. The mother served as the natural intervention agent for each of the four routines, while Emmy assumed such a role during the “all play” and “dinner” routines. In this regard, the current research study may serve as a useful case example for practitioners interested in facilitating the PBS process with children and families within home environments, as well as conducting research entailing a high degree of collaboration with natural intervention agents.

Similarly, this research study also reflected an attempt to consider challenging behavior from the parent's perspective. In addition to measuring challenging behavior and engagement relative to operational definitions, it was evident to this researcher that challenging behaviors demonstrated by three children (on many cases simultaneously) created an appreciable amount of stress for the parent. In this regard, the parent communicated that she often experienced the stress of her children's behavior together (i.e., she perceived each child's behavior to be challenging on instances in which at least one sibling demonstrated challenging behavior, despite the fact that an individual child may have demonstrated prosocial behavior at the same time). As a result of these reflections, this researcher attempted to measure challenging behavior as a composite of the three children in addition to measuring challenging behavior and engagement individually for each child. Though each family system is different, the means by which challenging behavior was measured in this study may be a useful tool for further understanding family stress resulting from young children with challenging behavior.

The findings of the research study also underscore the value and importance of parent-child interaction. Through participation in the research, the mother was able to successfully implement comprehensive behavior support plans designed to teach prosocial skills to her children within the family's natural environment (both with and without the assistance of her oldest child as an additional intervention agent). The mother learned a combination of new skills/strategies, as well as the specific decision rules associated with when and where to use each strategy. Given the fact that the mother demonstrated the acquisition and implementation of these skills over a prolonged period of time within her family's natural environment, it is reasonable to assume that she may

be more likely to independently prevent future occurrences of challenging behavior and to continue to teach prosocial skills to her children in the future. Within the larger system of care, this finding may serve as a rationale supporting the provision of individual-level positive behavior support for young children and their families. Though further research in this area is necessary, the findings of both the pilot and current research studies offer encouraging outcomes that support the use of PBS as an alternative to existing community-based methods of treatment (e.g., parent training groups, parenting workshops, outpatient assessment and intervention). In this regard, PBS methodology may be particularly useful when designing programs for groups of parents and caregivers in need of strengthening the quality of their parent-child interaction (e.g., foster parents, parents charged with abuse and neglect).

An additional contribution pertains to family-centered practices. The current research study was intended to be as family-centered and collaborative as possible, thereby providing a potentially useful case example of family-centered support practices (e.g., fostering collaboration, identifying the family's vision and goals, teaching the PBS process, designing streamlined behavior support plans directly linked to family goals). Similarly, the current research study offers a means by which to provide assessment and intervention related to a parent's perspective of his/her family's stress. In addition to collaboratively developing and monitoring the implementation of PBS behavior support plans in natural family contexts, efforts were made to learn more about implementation from the parent's perspective (i.e., using a parent rating scale customized specifically to address parent perceptions of each intervention component's utility and preference for implementation over time, providing frequent opportunities for feedback). Not only does

such a step make practical sense from the standpoint of support plan implementation, but it also communicates to the parent that a priority is placed upon the degree to which the plan is a good fit within family preferences and natural routines. Consequently, one might also find that such information may be useful in further refining existing surveys designed to assess goodness of fit in future applied research and practice with children and families (Albin et al., 1996).

Conclusions

Research documenting the utility and applicability of PBS with preschool-aged populations is in its infancy. Though studies of preschoolers conducted within natural environments are being reported with greater frequency, few incorporate a combination of natural intervention agents, natural settings, and the measurement of technical aspects of behavior change (e.g., maintenance). Though studies of maintenance may be difficult to execute, they may provide researchers with a greater understanding of which factors in the change process are most critical to successful implementation, as well as to enhance the "goodness of fit" between specific plan components and the ecology in which implementation occurs (Albin, Lucyshyn, Horner, & Flannery, 1996).

The purpose of this research was to first assess the relationship of support plan components to rates of behavior change, and then systematically fade the functional components, reducing the plan to naturalistic strategies that may be easy for the family to use over time. The results of this research study indicated that each of the three child participants consistently maintained low rates of challenging behavior and high rates of engagement within each routine. In addition, procedural fidelity data indicated that intervention components were implemented as by the natural intervention agent (i.e., the

mother) on a consistent basis and that the plans were easily adapted into natural family routines. Though clear functional relationships among individual intervention components were not attained, the current research study offers tentative support for the acknowledgement of multi-component PBS behavior support plans as an optimal intervention modality for young children with challenging behavior and their families within natural family routines. Demonstrating a functional relationship between four multi-component PBS behavior support plans over time (as a relative strength than a perceived weakness), the current research study demonstrated both family-centered practices, as well as a means for measuring maintenance and functional component relationships.

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Appendices

Appendix A: Figures

Figure 1. Composite Percentage of Intervals with Challenging Behavior

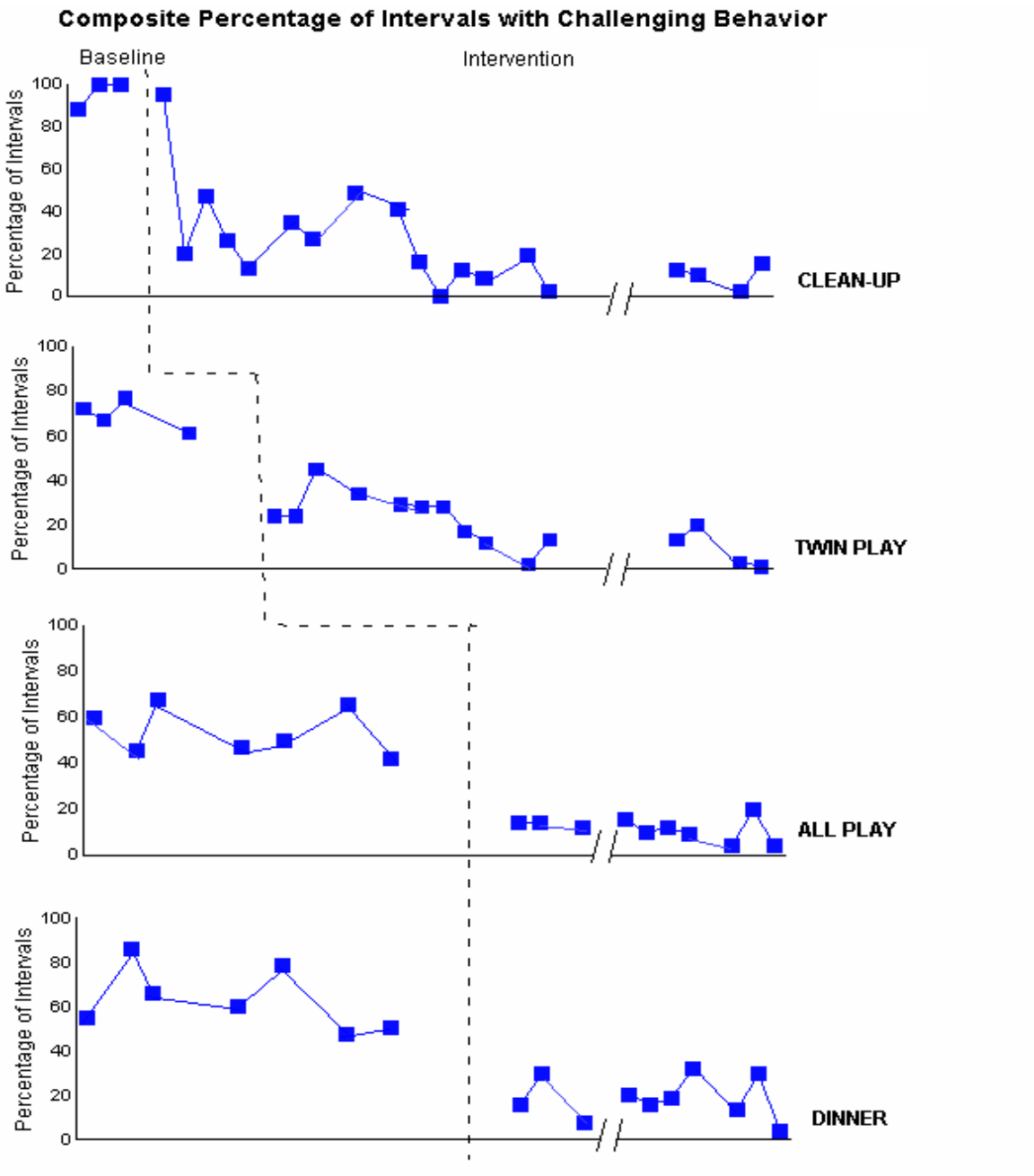


Figure 2. Composite Percentage of Intervals with Challenging Behavior and Engagement: Baseline and Intervention—Clean Up and Twin Play

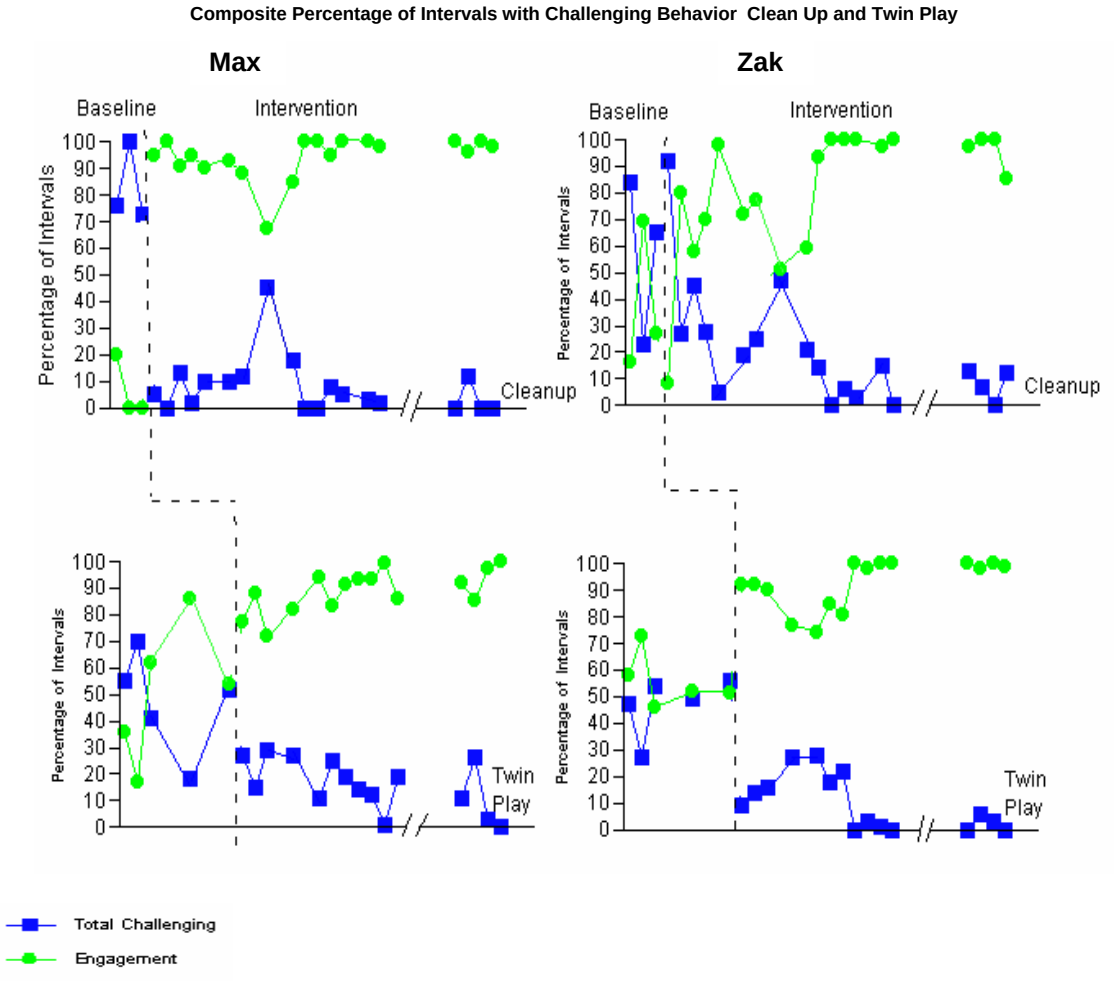


Figure 3. Composite Percentage of Intervals with Challenging Behavior and Engagement: Baseline and Intervention—All Play and Dinner

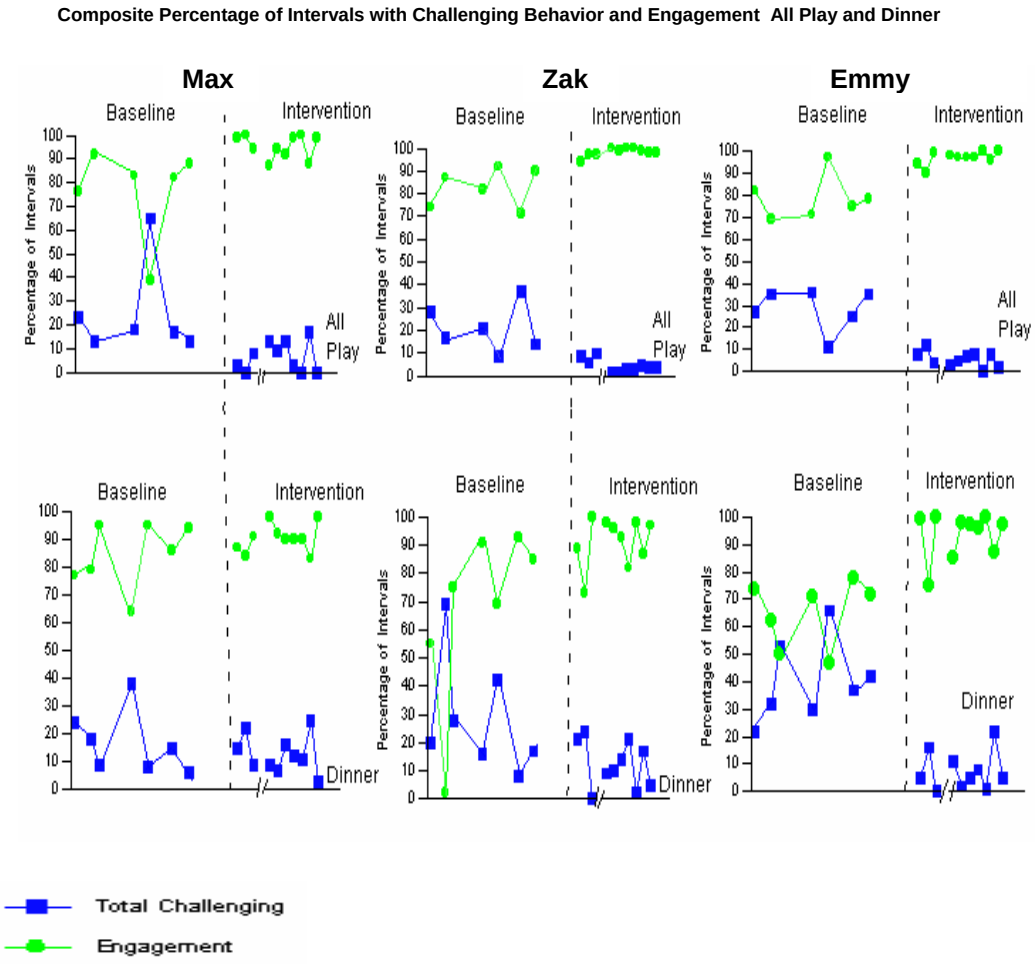


Figure 4. Composite Percentage of Intervals with Challenging Behavior: Component Analysis—Clean Up and Twin Play

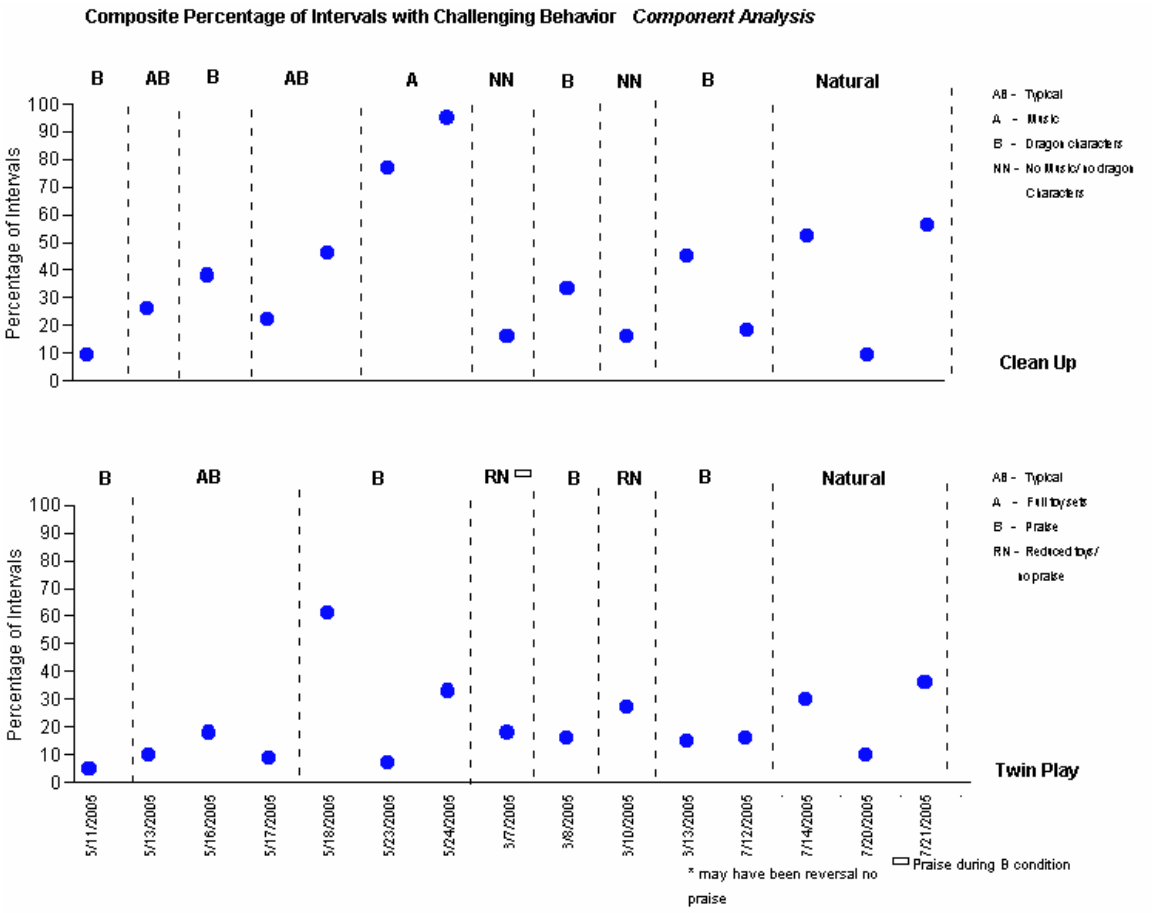


Figure 5. Component Analysis Individual Percentage of Intervals with Challenging Behavior: Clean Up

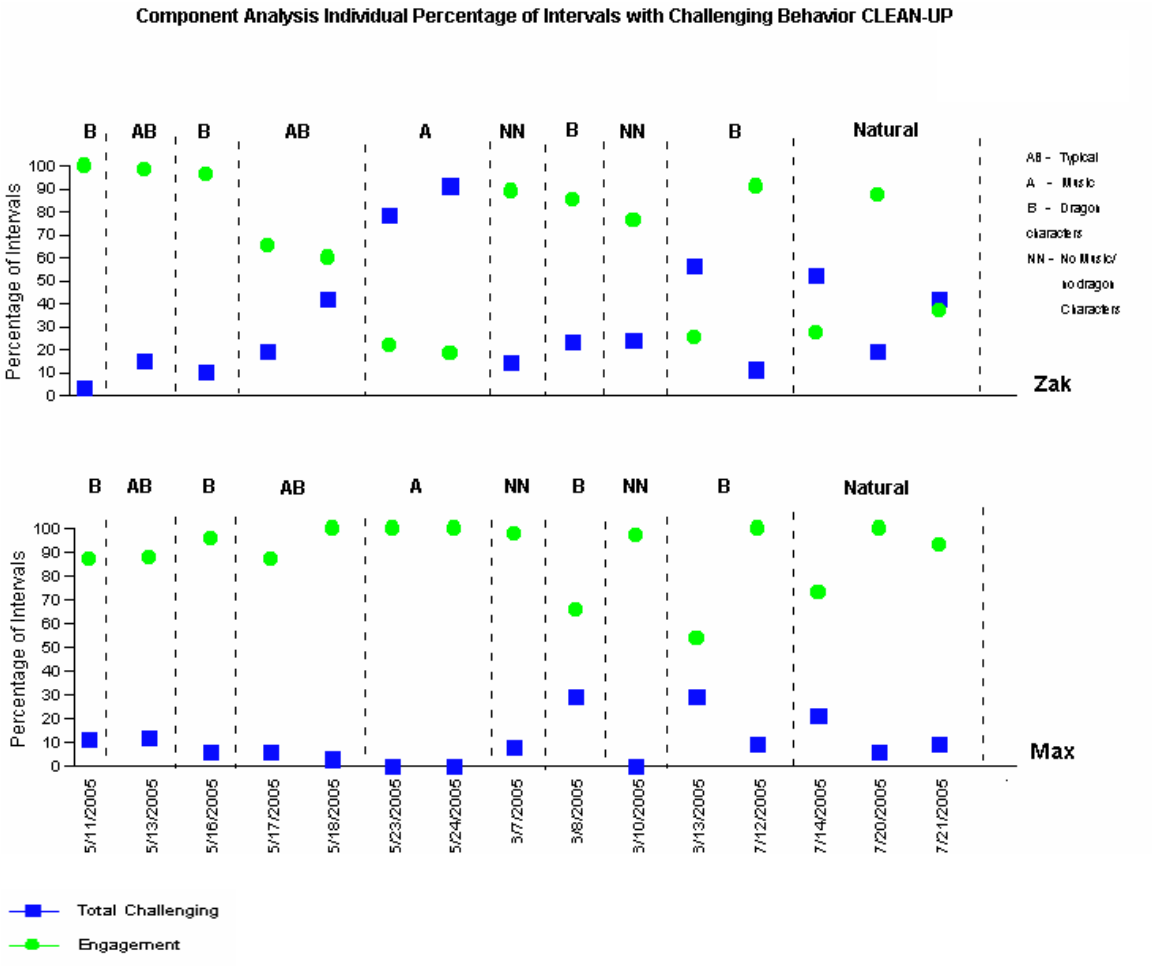


Figure 6. Component Analysis Individual Percentage of Intervals with Challenging Behavior: Twin Play

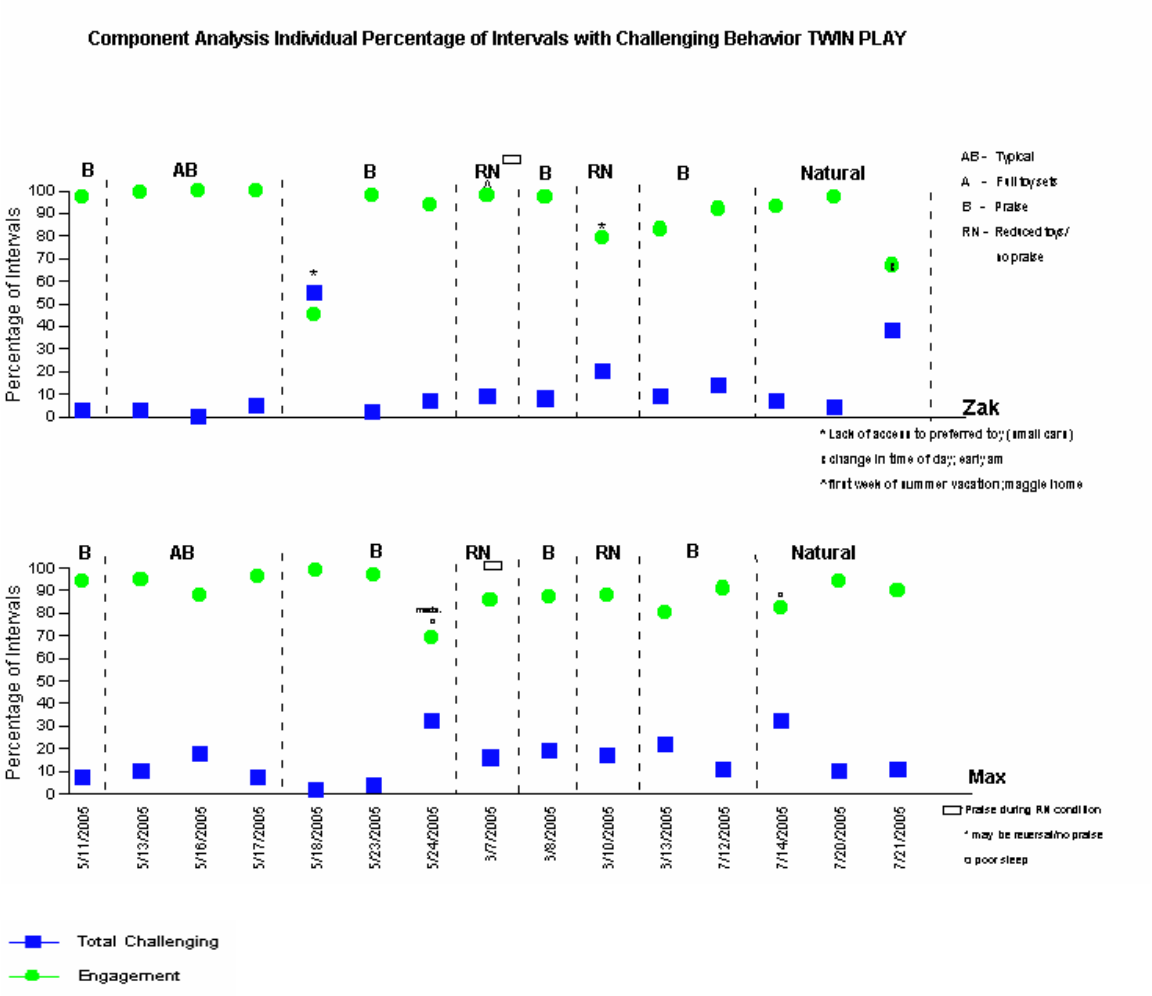


Figure 7. Composite Percentage of Intervals with Challenging Behavior: Component Analysis—All Play and Dinner

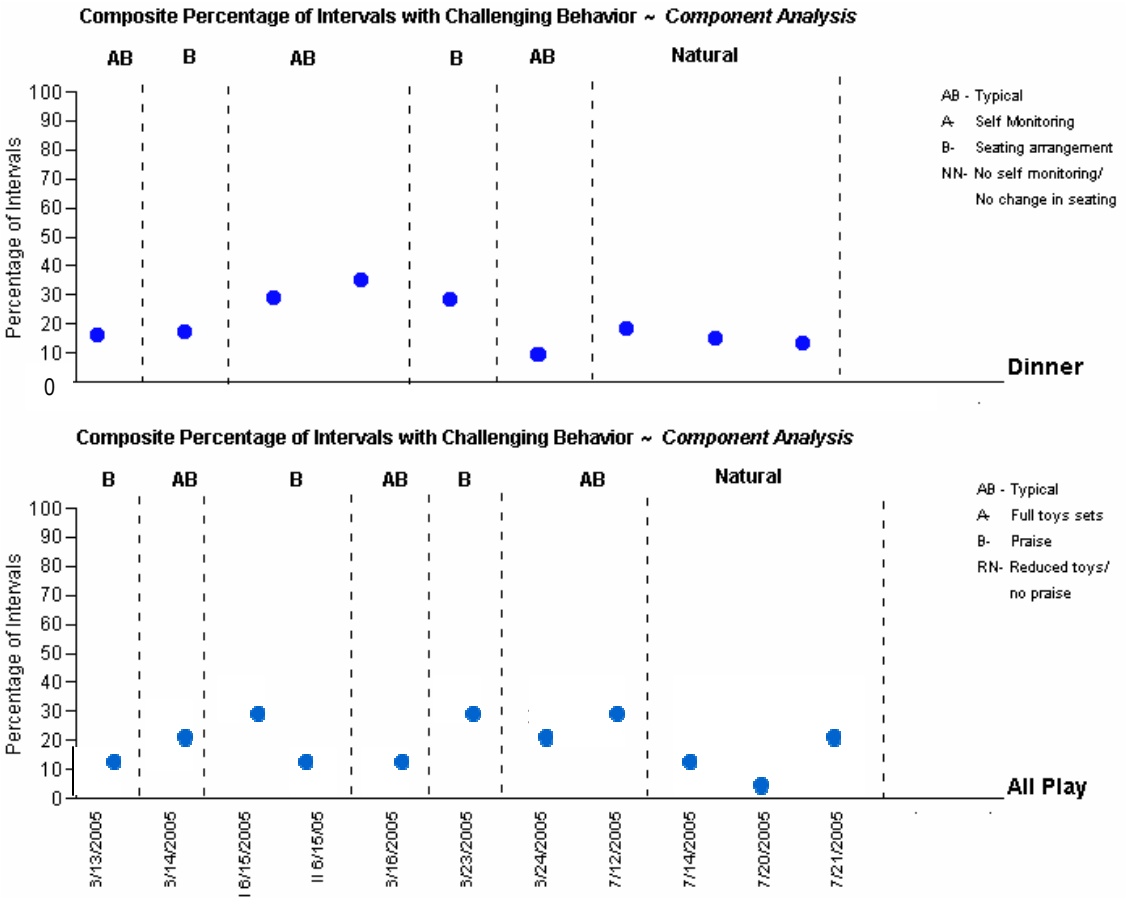


Figure 8. Component Analysis Individual Percentage of Intervals with Challenging Behavior: All Play

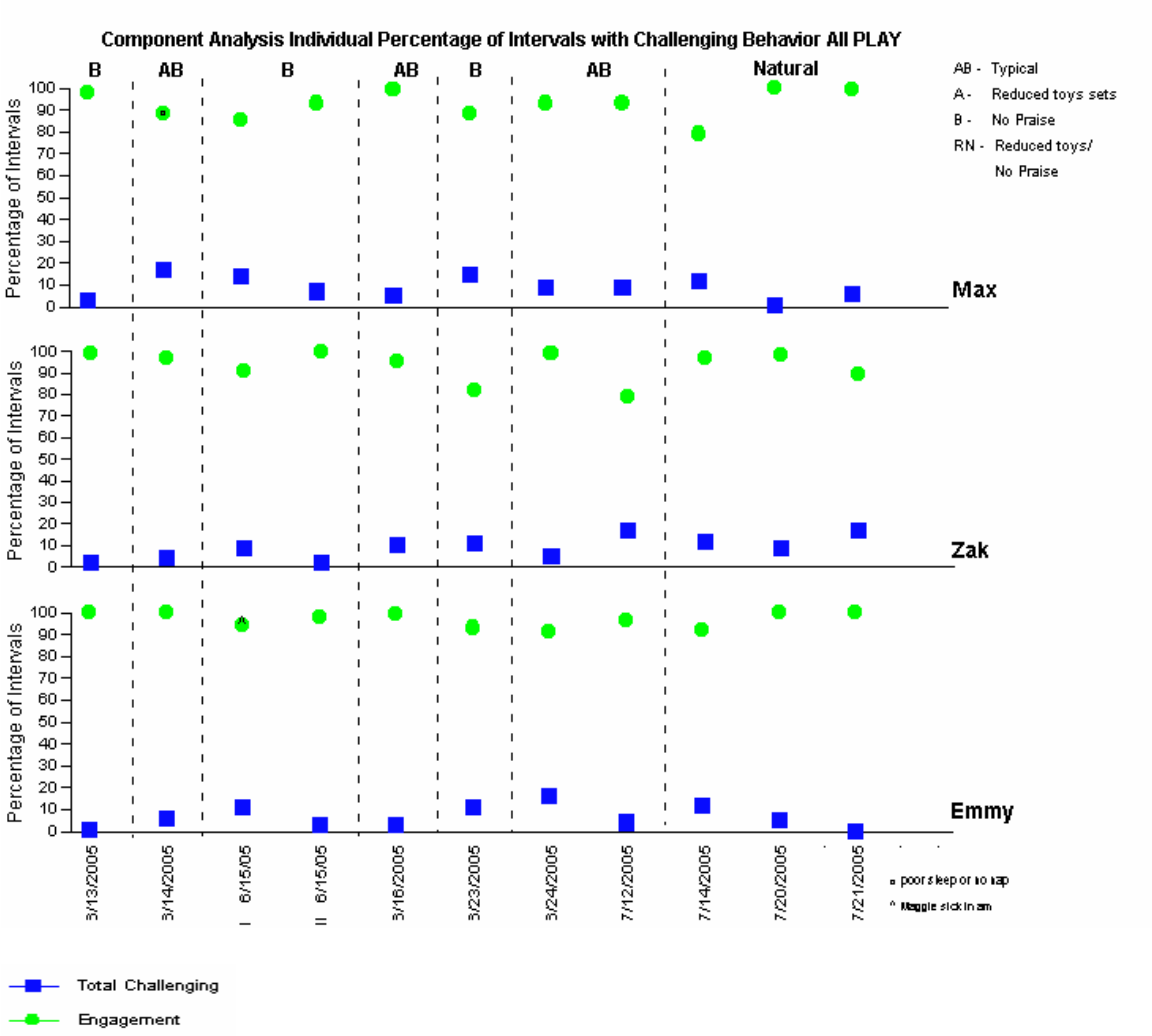
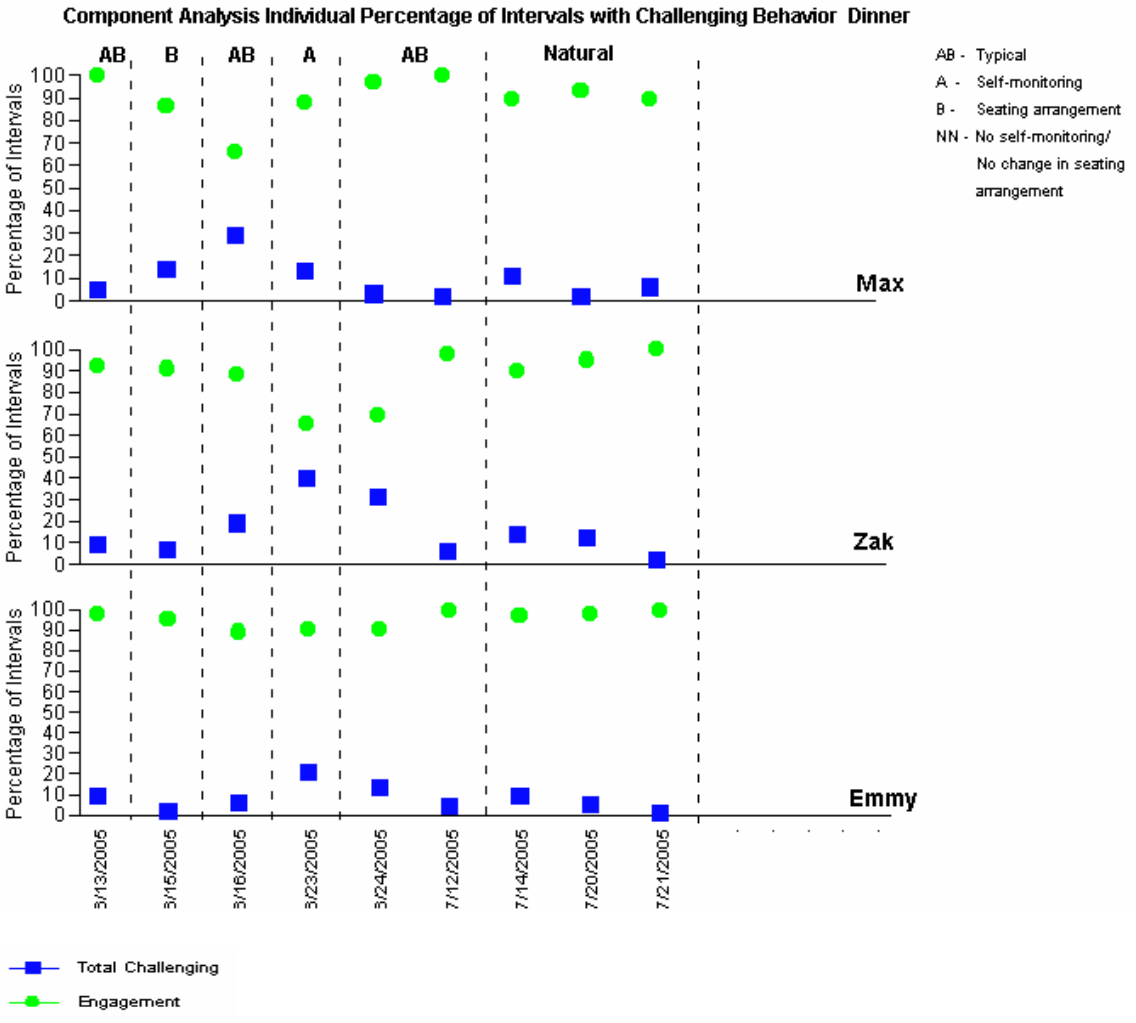


Figure 9. Component Analysis Individual Percentage of Intervals with Challenging Behavior: Dinner



Appendix B: Intervention Component Reduction Data

Table 9. Intervention Component Reduction Data: Clean Up

Intervention Components	Fidelity Score	Parent Rating (Relation)	Parent Rating (Use)	Decision	Remaining Components
1. Give 4 min. warning face to face with child (show photo).	28% Max 44% Zak	3 3	N/A N/A	Cut	-
2. Give 1 min. warning face to face with child (show photo).	33% Max 44% Zak	3 3	N/A N/A	Keep	Give 1 min. warning face to face with child (show photo).
3. "All done" with previous activity clearly stated.	6%	3	3	Keep	"All done" with previous activity clearly stated.
4. "Time to clean up" clearly stated.	94%	3	3	Keep	"Time to clean up" clearly stated.
5. Provided child with opportunity to choose song/character.	76%	2	2	Keep	Provided child with opportunity to choose song/character.
6. Played music to indicate beginning of activity.	100%	3	3	Keep	Played music to indicate beginning of activity.
7. Counted number of toys children put in box.	6% Max 22% Zak	1 1	1 1	Cut	-
8. Provided praise for picking up toys.	88% Max 94% Zak	3 3	3 3	Keep	Provided praise for picking up toys.
9. Celebrated goal at end of activity (i.e., done with clean up).	94%	3	3	Keep	Celebrated goal at end of activity (i.e., done with clean up).
10. Gave verbal cue that clean up is over (i.e., all done).	94%	3	3	Keep	Gave verbal cue that clean up is over (i.e., all done).
11. Provided a reinforcer (reward) for completing routine.	100% Max 100% Zak	3 3	2 2	Keep	Provided a reinforcer (reward) for completing routine.

(Table Continues)

(Table Continued)

12. Provided choice of a preferred reinforcer (e.g., letting boys choose a badge/song).	100% Max 100% Zak	2 2	2 2	Keep	Provided choice of a preferred reinforcer (e.g., letting boys choose a badge/song).
13. Provided verbal cue and photo of next activity.	43% Max 60% Zak	3 3	3 3	Keep	Provided verbal cue and photo of next activity.

Notes:
Relation to Behavior: 1 = I do not think there is a relationship; 2 = Unsure; 3 = I think there is a definite relationship; N/A = No response. Long-Term Use: 1 = I'd really like to drop it; 2 = I'd like to drop it if possible; 3 = I can see myself using it; N/A = No response. * = Included within component analysis.

Table 10. Intervention Component Reduction Data: Twin Play

Intervention Components	Fidelity Score	Parent Rating (Relation)	Parent Rating (Use)	Decision	Remaining Components
1. Gave both children a clear verbal cue of what is going to happen (e.g., "It's playtime children! Let's pick some toys").	70%	3	3	Keep	Gave both children a clear verbal cue of what is going to happen.
2. Set clear expectation (e.g., "You are going to play while Mommy is in the kitchen doing her work".)	69%	3	3	Keep	Set clear expectation
3. Each child was given a choice of 1 toy set (e.g., cars, blocks).	79%	3	3	Keep	Each child was given a choice of 1 toy set *
4. Adult selected a third toy set to help create play theme.	100%	2	2	Keep	Adult selected a third toy set to help create play theme*
5. A 4th toy set was selected and put in family room.	100%	2	1	Keep	A 4th toy set was selected and put in family room*
6. Verbal prompt given to take toys into the family room.	83% Max 82% Zak	1 1	1 1	Keep	Verbal prompt given to take toys into the family room.
7. Praised children (each individually) for bringing out toys (e.g., "yeah, it's playtime. That is good helping bringing out the toys").	42% Max 27% Zak	1 1	3 3	Keep	Praised children (each individually) for bringing out toys (e.g., "yeah, it's playtime. That is good helping bringing out the toys").
8. Selected theme and presented it to children (e.g., "you are going to play while Mommy is in the kitchen doing dishes").	100%	3	3	Keep	Selected theme and presented it to children.
9. Once each child picks up first toy, adult set clear expectation (e.g., "Mommy will be in the kitchen, you keep playing").	100%	3	3	Keep	Once each child picks up first toy, adult set clear expectation.

(Table Continues)

Table (Continued)

10. Provided praise while out of area every 5 min. (e.g., "You are playing so nicely together. I like how you are playing while Mommy is doing her work").	79%	2	2	Keep	Provided praise while out of area every 5 min*
11. After 15 min. have passed, mother praised children and gave a verbal warning that playtime is almost "all done."	64%	3	3	Keep	After 15 min. have passed, mother praised children and gave a verbal warning that playtime is almost "all done."

Notes:
Relation to Behavior: 1 = I do not think there is a relationship; 2 = Unsure; 3 = I think there is a definite relationship; N/A = No response. Long-Term Use: 1 = I'd really like to drop it; 2 = I'd like to drop it if possible; 3 = I can see myself using it; N/A = No response. * = Included within component analysis.

Table 11. Intervention Component Reduction Data: All Play

Intervention Components	Fidelity Score	Parent Rating (Relation)	Parent Rating (Use)	Decision	Remaining Components
1. Prior to playtime, "All Play" social story was read to Emmy.	44%	3	2	Cut	-
2. Provided clear verbal cue of what is going to happen (e.g., "It's playtime everybody! Let's pick some toys").	75%	3	3	Keep	Provided clear verbal cue of what is going to happen
3. Children provided clear expectation (e.g., "Pick some toys").	88%	3	3	Keep	Children provided clear expectation
4. Each child was given a choice of 1 toy set (e.g., cars, blocks).	88%	3	3	Keep	Each child was given choice of 1 toy set*
5. Mom selected additional toy sets that are preferred by all children.	80%	2	1	Keep	Mom selected additional toy sets that are preferred by all children*
6. Verbal prompts were given to take toys in the family room.	71% Max/ Zak 67% Emmy	2 2	1	Keep	Verbal prompts were given to take toys in the family room.
7. Praised children for bringing out toys.	29%	3	3	Cut	-
8. Mom reviewed rules with Emmy (i.e., "I can be a helper at playtime") and Emmy had access to "rule list".	33%	3	2	Cut	-
9. Mom or Emmy gave suggestions for toy play activity.	100%	3	3	Keep	Mom or Emmy gave suggestions for toy play activity.
10. Once each child picked up the first set of toys, Mom told children that she is leaving the area and Emmy will help (verbal prompts).	100%	3	3	Keep	Mom told children that she is leaving the area and Emmy will help (verbal prompts).

(Table Continues)

(Table Continued)

11. During playtime, Emmy was coached on prompting and/or teaching brothers how to use toys, as well as how to provide praise.	100%	3	3	Keep	Emmy was coached on prompting and/or teaching brothers how to use toys, as well as how to provide praise.
12. Mom provides praise to children while remaining out of area every 5 min.	100%	3	2	Keep	Mom provides praise to children while remaining out of area every 5 min*
13. Mom provided specific praise to Emmy for being a "helper."	90%	3	3	Keep	Mom provided specific praise to Emmy for being a "helper."
14. After 20 min. have passed, praise children and giver a verbal warning that playtime is "almost all done."	44%	3	3	Cut	-
15. At the end of play Mom asked Emmy if everyone followed the rules and asked how she played.	0%	3	3	Cut	-

Notes:
Relation to Behavior: 1 = I do not think there is a relationship; 2 = Unsure; 3 = I think there is a definite relationship; N/A = No response. Long-Term Use: 1 = I'd really like to drop it; 2 = I'd like to drop it if possible; 3 = I can see myself using it; N/A = No response. * = Included within component analysis.

Table 12. Intervention Component Reduction Data: Dinner

Intervention Components	Fidelity Score	Parent Rating (Relation)	Parent Rating (Use)	Decision	Remaining Components
1. Provided Dinner social story to Emmy prior to dinner.	38%	3	2	Cut	-
2. Emmy was given opportunity to read her social story by herself or read it to her brothers in order to review dinner rules.	38%	2	1	Cut	-
3. Emmy used self-monitoring materials and choice menus.	50%	3	3	Cut	-
4. Emmy was given opportunity to help set the table and/or put food on table.	90%	3	3	Keep	Emmy was given opportunity to help set the table and/or put food on table.
5. Prior to sitting down, dinner was completely prepared and on the table.	50%	3	3	Keep	Prior to sitting down, dinner was completely prepared and on the table.
6. Seating arrangement was modified.	90%	3	3	Keep	Seating arrangement*
7. Choice of 2 food items was provided to children (1 preferred, 1 backup).	67%	2	1	Keep	Choice of 2 food items was provided to children (1 preferred, 1 backup).
8. If Emmy/children refused to eat after choice was given, Emmy / children were instructed that they must sit at table for 5 minutes.	25%	3	3	Cut	-
9. Mom sat with children for entire duration of mealtime.	80%	3	3	Keep	Mom sat with children for entire duration of mealtime*
10. Followed child's lead for dinner conversation.	100%	3	3	Keep	Followed child's lead for dinner conversation.
11. Praise was provided throughout the routine.	40% Max 10% Zak	3	3	Keep	Praise was provided throughout the routine.

(Table Continues)

(Table Continued)

12. Specific praise was provided to Emmy for appropriate behavior and self-monitoring.	10%	3	3	Keep	Specific praise was provided to Emmy for appropriate behavior and self-monitoring*
13. Each child asked to be excused or mother gave permission to leave table once finished with dinner.	90% Max/Emmy 89% Zak	3	3	Keep	Each child asked to be excused or mother gave permission to leave table once finished with dinner.
14. After dinner, mother matched self-monitoring items with Emmy.	57%	2	2	Keep	After dinner, mother matched self-monitoring items with Emmy*
15. Choice menu provided to Emmy for self-monitoring if she matched with Mom and had over 80% appropriate behavior.	20%	3	3	Keep	Choice menu provided to Emmy for self-monitoring if she matched with Mom and had over 80% appropriate behavior.
16. Mother sets up a video for the boys and immediately starts "Mom and Emmy" time.	33%	3	3	Keep	Mother sets up a video for the boys and immediately starts "Mom and Emmy" time*

Notes:
Relation to Behavior: 1 = I do not think there is a relationship; 2 = Unsure; 3 = I think there is a definite relationship; N/A = No response. Long-Term Use: 1 = I'd really like to drop it; 2 = I'd like to drop it if possible; 3 = I can see myself using it; N/A = No response. * = Included within component analysis.

Appendix C: Natural Only Implementation Patterns

Table 13. Natural Only Implementation Patterns: Clean Up

Intervention Components	Natural Only Day 1	Natural Only Day 2	Natural Only Day 3
1. Give 4 min. warning.	-	-	-
2. Give 1 min. warning.	2. Give 1 min. warning.	2. Give 1 min. warning.	2. Give 1 min. warning.
3. "All done" clearly stated.	-	-	-
4. "Time to clean up" clearly stated.		4. "Time to clean up" clearly stated.	4. "Time to clean up" clearly stated.
5. Provided opportunity to choose song/character.	-	-	-
6. Played music to indicate beginning of activity.	-	-	-
7. Counted # of toys children put in box.	-	7. Counted # of toys children put in box.	7. Counted # of toys children put in box.
8. Praised Max for picking up toys.	-	-	8. Praised Max for picking up toys.
8. Praised Zak for picking up toys.	8. Praised Zak for picking up toys.	8. Praised Zak for picking up toys.	8. Praised Zak for picking up toys.
9. Celebrated goal at end.	-	-	-
10. Gave verbal cue that clean up is over.	-	-	-
11. Provided reinforcer for completing routine.	-	-	11. Provided reinforcer for completing routine.
12. Provided choice of preferred reinforcer.	-	-	12. Provided choice of preferred reinforcer.
13. Provided verbal cue and photo of next activity.	-	-	-

Table 14. Natural Only Implementation Patterns: Twin Play

Intervention Components	Natural Only Day 1	Natural Only Day 2	Natural Only Day 3
1. Gave both children a clear verbal cue of what is going to happen.	-	-	-
2. Set clear expectation.	2. Set clear expectation.	2. Set clear expectation.	-
3. Each child given choice of 1 toy set.	3. Each child given choice of 1 toy set.	3. Each child given choice of 1 toy set.	3. Each child given choice of 1 toy set.
4. Adult selected 3rd toy set to create theme.	4. Adult selected 3rd toy set to create theme.	4. Adult selected 3rd toy set to create theme.	4. Adult selected 3rd toy set to create theme.
5. 4th toy set selected and put in family room.	-	-	5. 4th toy set selected and put in family room.
6. Verbal prompt given to take toys into family room.	-	-	-
7. Praised children for bringing out toys.	-	-	-
8. Selected theme and presented it to children.	8. Selected theme and presented it to children.	-	8. Selected theme and presented it to children.
9. Once each child picks up first toy, adult set clear expectation.	9. Once each child picks up first toy, adult set clear expectation.	9. Once each child picks up first toy, adult set clear expectation.	9. Once each child picks up first toy, adult set clear expectation.
10. Provided praise while out of area every 5 min.	-	10. Provided praise while out of area every 5 min.	-
11. After 15 min. have passed, mother praised children and gave a verbal warning that playtime is almost “all done.”	-	-	11. After 15 min. have passed, mother praised children and gave a verbal warning that playtime is almost “all done.”
1. Gave both children a clear verbal cue of what is going to happen.	-	-	-

Table 15. Natural Only Implementation Patterns: All Play

Intervention Components	Natural Only Day 1	Natural Only Day 2	Natural Only Day 3
1. Prior to playtime, social story read to Emmy.	-	-	-
2. Provided clear verbal cue of what is going to happen.	-	-	-
3. Children provided clear expectation.	-	-	-
4. Each child given choice of 1 toy set.	4. Each child given choice of 1 toy set.	4. Each child given choice of 1 toy set.	4. Each child given choice of 1 toy set.
5. Mom selected additional preferred toy sets.	5. Mom selected additional preferred toy sets.	5. Mom selected additional preferred toy sets.	5. Mom selected additional preferred toy sets.
6. Verbal prompts to take toys into family room.	-	-	-
7. Praised children for bringing out toys.	-	-	-
8. Mom reviewed rules with Emmy.	-	-	-
9. Mom/Emmy suggested toy play activity.	9. Mom/Emmy suggested toy play activity.	9. Mom/Emmy suggested toy play activity.	9. Mom/Emmy suggested toy play activity.
10. Mom told children she is leaving area and Emmy will help.	10. Mom told children she is leaving area and Emmy will help.	10. Mom told children she is leaving area and Emmy will help.	10. Mom told children she is leaving area and Emmy will help.
11. Emmy coached on prompting and/or teaching brothers how to use toys and provide praise.	11. Emmy coached on prompting and/or teaching brothers how to use toys and provide praise.	11. Emmy coached on prompting and/or teaching brothers how to use toys and provide praise.	-
12. Mom praised children while remaining out of area every 5 min.	12. Mom praised children while remaining out of area every 5 min.	12. Mom praised children while remaining out of area every 5 min.	12. Mom praised children while remaining out of area every 5 min.
13. Mom praised Emmy for being a “helper.”	-	13. Mom praised Emmy for being a “helper.”	13. Mom praised Emmy for being a “helper.”
14. After 20 min., praised children/gave verbal warning that playtime is “almost all done.”	14. After 20 min., praised children/gave verbal warning that playtime is “almost all done.”	14. After 20 min., praised children/gave verbal warning that playtime is “almost all done.”	14. After 20 min., praised children/gave verbal warning that playtime is “almost all done.”
15. At end, Mom reviewed rules with Emmy.	-	-	-
16. At end, Mom praised Emmy for being a good helper.	-	-	16. At end, Mom praised Emmy for being a good helper.

Table 16. Natural Only Implementation Patterns: Dinner

Intervention Components	Natural Only Day 1	Natural Only Day 2	Natural Only Day 3
1. Provided social story to Emmy prior to dinner.	-	-	-
2. Emmy given opportunity to read social story.	-	-	-
3. Emmy used self-monitoring materials/choice menus.	-	-	-
4. Emmy given opportunity to set the table and/or put food on table.	-	-	-
5. Prior to sitting down, dinner completely prepared and on the table.	-	-	5. Prior to sitting down, dinner completely prepared and on the table.
6. Seating arrangement modified.	6. Seating arrangement modified.	6. Seating arrangement modified.	6. Seating arrangement modified.
7. Choice of 2 food items provided to children (1 preferred, 1 backup).	-	7. Choice of 2 food items provided to children (1 preferred, 1 backup).	-
8. If refused to eat, Emmy /children were instructed they must sit at table for 5 minutes.	-	-	-
9. Mom sat with children for entire meal.	9. Mom sat with children for entire meal.	9. Mom sat with children for entire meal.	9. Mom sat with children for entire meal.
10. Followed child's lead for dinner conversation.	10. Followed child's lead for dinner conversation.	10. Followed child's lead for dinner conversation.	10. Followed child's lead for dinner conversation.
11. Praised Max throughout routine.	11. Praised Max throughout routine.	11. Praised Max throughout routine.	-
11. Praised Zak throughout routine.	11. Praised Zak throughout routine.	-	-
12. Praised Emmy for appropriate behavior and self-monitoring.	12. Praised Emmy for appropriate behavior and self-monitoring.	-	12. Praised Emmy for appropriate behavior and self-monitoring.
13. Max asked to be excused or mother gave permission to leave table once finished.	13. Max asked to be excused or mother gave permission to leave table once finished.	13. Max asked to be excused or mother gave permission to leave table once finished.	13. Max asked to be excused or mother gave permission to leave table once finished.
13. Zak asked to be excused or mother gave permission to leave table once finished.	13. Zak asked to be excused or mother gave permission to leave table once finished.	13. Zak asked to be excused or mother gave permission to leave table once finished.	-

(Table Continues)

(Table Continued)

13. Emmy asked to be excused or mother gave permission to leave table once finished.	13. Emmy asked to be excused or mother gave permission to leave table once finished.	13. Emmy asked to be excused or mother gave permission to leave table once finished.	13. Emmy asked to be excused or mother gave permission to leave table once finished.
14. After dinner, mother matched self-monitoring items with Emmy.	-	-	-
15. Choice menu provided to Emmy for self-monitoring if she matched with Mom and had over 80% appropriate behavior.	-	-	-
16. Mother sets up a video for the boys and immediately starts "Mom and Emmy" time.	-	-	16. Mother sets up a video for the boys and immediately starts "Mom and Emmy" time.

About the Author

Michelle Duda received a Bachelor's Degree in Psychology at the University of Western Ontario in London, Ontario, Canada in 1999 and a Diploma from the Behavioural Science Technology program (Intensive Track) at St. Lawrence College in Kingston, Ontario, Canada in 2000. Later that year, Michelle began graduate study at the University of South Florida. She was the first international student to earn a master's degree in Applied Behavior Analysis in 2002, enrolled in the Special Education doctoral program the same year, and became a doctoral candidate in 2004.

Michelle is a Board Certified Behavior Analyst with extensive experience supporting young children with challenging behavior and their families. She has conducted applied research in the areas of positive behavior support, applied behavior analysis, and early intervention/early childhood special education. Michelle is the author/co-author of several peer-reviewed articles and has presented/facilitated training ranging from the local to international level.