AN OBSERVATION SYSTEM TO AID IN THE EVALUATION AND IMPLEMENTATION OF EARLY INTERVENTION PROGRAMS FOR CHILDREN WITH AUTISM

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Thesis Prepared for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

May 2009

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Geving, Megan McGee. *An Observation System to Aid in the Evaluation and Implementation of Early Intervention Programs for Children with Autism*. Master of Science (Behavior Analysis). May 2009, 107 pp.,15 figures, 7 tables, references, 44 titles.

Early and intensive behavioral intervention outcome research includes descriptions of intervention variables that may increase treatment success. This study was designed to develop an observation system that incorporates and expands on some of these variables. Measures include the number of interventionist teaching units, types of skills addressed during instruction, consequences programmed by interventionists, and engagement with teaching materials. This system allowed for a view of the differences in teaching behaviors among the participants. It is proposed that this observation system is a start toward standardized intervention measures that can be applied to evaluate varied treatment models. Such standardization can help in ensuring that all children have access to evidence-based services.

ACKNOWLEDGEMENTS

First, I would like to thank my parents. I would not be the person I am today without their encouragement to excel at following my dreams. I would like to thank my advisor, Dr. Shahla Ala'i-Rosales. With her gentle shaping, she has shown me the kind of behavior analyst, friend, and woman I will strive to be. Thank you to Dr. Jesus Rosales-Ruiz for providing guidance and support through my graduate career and for being a member of my committee. Thanks also to Dr. Einar Ingvarsson for being on my committee and giving valuable feedback on this research. I would also like to thank my dear friend and colleague Nicole Zeug. You have helped so much in the process and I appreciate your friendship and feedback. The assistance that Claire Anderson provided was invaluable. You have helped with everything from videotaping to writing and I truly appreciate all of your hard work. Thank you Sara Weinkauf for your time spent working on IOA, I appreciate your diligence in observing and counting. I would also like to thank the dear friends I have made at UNT. You will be forever friends and I am grateful for the opportunity to share this experience with you. Last but not least, I would like to thank all of the children who have helped me to find the career path that I care so deeply about and have helped fuel my love for behavior analysis. I am here because of you.

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INTRODUCTION

There is increasing evidence that early and intensive intervention can dramatically change the course of the outcome for a child with autism (Lovaas et al., 1973; Wolf, Risley & Mees, 1964; Fenske et al., 1985; Lovaas, 1987; Anderson et al., 1987; Harris et al., 1991; Birnbrauer & Leach, 1993; McEachin, Smith, & Lovaas, 1993; Koegel et al., 1999; Sheinkopf & Siegel, 1998; McGee, Morrier, & Daly, 1999; Weiss, 1999; Smith, Groen, & Wynn, 2000; Bibby et al., 2001; Eikeseth et al., 2002; Stahmer & Ingersoll, 2004; Howard et al., 2005; Sallows & Graupner, 2005; Cohen, Amerine-Dickens, & Smith, 2006; Reed, Osborne, & Corness, 2007; Remmington et al., 2007; Zachor et al., 2007). Although this is promising, analyses of this body of research have been, at best, in agreement about what independent variables produce change and, at worst, contentious with regard to the independent variables of importance (Dawson & Osterling, 2007). The increasing controversies over the independent variables (selection, configurations, and delivery) is problematic for interventionists in the field and guidance as to objective methods for decision making would be useful (Anderson & Romanczyk, 1999). The present study addressed the problem of quantifying and evaluating various dimensions of the independent variable in early intervention programs for children with autism. The purpose here was to examine the research on intensive and comprehensive interventions and to indentify and quantify some of the independent variables described (but not counted) in that body of research. Standardization and evaluation of the independent variables across programs is important because it will be a way to monitor not only treatment effectiveness, but the differential relationship between variables that are associated with child outcome across

differing procedures and treatment formats. This type of standardization will also help to contribute to the current knowledge of early intervention and will make a positive impact on the autism research (LeLaurin & Wolery, 1992).

Scholars reviewing the autism intervention research point out that measuring implementation as well as outcome is an important practice (Hall & Louchs, 1977; LeLaurin, & Wolery, 1992; Dawson & Oterling, 1997, Wolery & Garfinkle, 2002; Matson, 2008). Measuring program implementation helps to document that the program is being delivered as planned, describing how much exposure to a given program is needed to produce desired effects, and it helps to determine if certain levels of implementation are then associated with certain outcomes (Hall & Louchs, 1977; LeLaurin & Wolery, 1992). Above all, measuring program implementation will help practitioners to make objective adjustments when the implementation is incorrect, inconsistent, or ineffective (Wolery & Garfinkle, 2002).

The early and intensive behavioral intervention literature widely addresses the outcomes of children in each program, but it is much harder to find evidence of how or to what level the program implementation was occurring (Wolery & Garfinkle, 2002). In order to objectively evaluate interventions, there needs to be evaluation of not only the dependent variable of intervention (child outcomes), but evaluation of the independent variable as well (program implementation) (Wolery & Garfinkle, 2002; Baer, Wolf, & Risley, 1968).

The early and intensive behavior intervention outcome studies discuss dependent measures such as pre and post standardized tests for language, social, and adaptive skills, school placement, and skill mastery. The majority of the outcome

studies offer an operational description with respect to the independent variable. The description of program implementation ranged in specificity among the outcome studies. Some provided only a brief description such as an estimate of number of hours in intervention, and/or a brief description of the teaching style that was used, whereas some provided a detailed manual of how to implement instruction. (Lovaas et al., 1973; Wolf, Risley & Mees, 1964; Fenske et al., 1985; Lovaas, 1987; Anderson et al., 1987; Harris et al., 1991; Birnbrauer & Leach, 1993; McEachin, Smith, & Lovaas, 1993; Koegel et al., 1999; Sheinkopf & Siegel, 1998; McGee, Morrier, & Daly, 1999; Weiss, 1999; Smith, Groen, & Wynn, 2000; Bibby et al., 2001; Eikeseth et al., 2002; Stahmer & Ingersoll, 2004; Howard et al., 2005; Sallows & Graupner, 2005; Cohen, Amerine-Dickens, & Smith, 2006; Reed, Osborne, & Corness, 2007; Remmington et al., 2007; Zachor et al., 2007). One problem that arises with only a brief description of the teaching procedures associated with client outcomes is that it may be nearly impossible to replicate said procedures. Furthermore, without quantification and controlled introduction of the variables, it is not clear if they are, in fact, responsible for the changes.

A list of described independent variables were obtained from a review of the early and intensive behavioral intervention literature and are summarized in Table 1. Many of the studies involved the use training manuals and descriptions, which explain the treatment configuration (Lovaas et al., 1980; Maurice, Green, & Luce, 1996; Leaf & McEachin, 1999; McGee, Morrier, & Daly, 1999; Harris et al., 1991; Weiss, 1999, Lovaas, 2000). None of these studies, however, include systematic quantification of the independent variables. A review of Table 1 illustrate's that there are some common

themes among the description of independent variables (early age of onset and intensive treatment), as well as differences (teaching procedure, curriculum, and formats). The table presents the suggested variables responsible for change into four categories: procedure, intensity, curriculum and formats. Each of these are described in relation to the present study.

Procedure referred to the teaching techniques that were used in the study. This included any quantification of the teaching style, how a session was run, or what procedures were being implemented. The present study did not include a quantification of procedures because there was a separate data mechanism with the agency to monitor individualized procedural implementation. For example, if a child had a block imitation program, there would be specific procedure implementation with prompting, shaping, and reinforcement that had been shown to be effective for that particular child and the staff working with that child would be trained accordingly.

The total hours per week spent in treatment as well as the average age of onset describe the *intensity* of the program. The general consensus in the reviews of the autism early intervention literature is that an earlier age of onset and greater intensity of treatment (more hours per week) lead to better child outcomes (Green, 1996; Dawson & Osterling, 1997; Reichow & Wolery, 2009). Greenwood et al. define an opportunity to respond as "the interaction between (a) teacher formulated instruction (the materials presented, prompts, questions asked, signals to respond, etc.), and (b) its success in establishing the academic responding desired or implied by materials, the subject matter goals of instruction" (Greenwood et al., 1994). It can be assumed that the more time spent in treatment would lead to more opportunities to respond, and thus provide

more practice on the skills being learned. In a recent early and intensive behavioral intervention outcome study, Howard et al. (2005) go as far as to suggest that the higher number of opportunities for learning (between 100-150 per hour) in the intensive programs is what led to better child outcome. Studies by Greer (1994) and Greenwood et al. (1994) support this observation. Greer (1994) discusses that the measurement of learn unit is important because it is a measure of teacher productivity, accuracy, and quality of teaching. If teachers are providing a high amount of quality opportunities to respond, it can be assumed that it will positively affect child progress and learning. For these reasons, the present observation system included quantification of learning opportunities.

Curriculum referred to the skill sets that were targeted in each study. Communication, language, self-help, play skills, learn-to-learn skills, social skills, and pre-academic skills were found to be most the commonly targeted skill sets based on reviews of the outcome literature (Dawson & Osterling, 1997; Anderson & Romanczyk, 1999; Wolery, Barton, & Hine, 2005). Additionally, Greer (1994) points out that teach units and their rates can not be counted in isolation. The rate of teaching behaviors will be different based on the type of instruction that is occurring. Thus, the targeted skills need to be analyzed in conjunction with the teaching behaviors in order to fully understand the rates associated with teaching (Greer, 1994). Due to the fairly consistent recommendations regarding curricular targets, this study counted teach units that targeted learn-to-learn skills, functional communication, component language skills, language skills, play and leisure skills, social skills, academic skills, attending skills, and self-help skills.

The location, delivery and programmed consequences during intervention were referred to here as the *format* of teaching. Reviews of the outcome studies as well as the outcome studies themselves discuss that treatment most typically occurred in home, clinic, school and community settings (Green, 1996; Wolery, Barton, & Hine, 2005; Matson & Smith, 2008). However, the specific portion of the time spent in table activities, floor play, or outdoors was either not specified, or was described as some combination of table activities interspersed with free play. With regard to consequence delivery, some of the specified teaching procedures (incidental teaching, pivotal response training, naturalistic teaching, verbal behavior) state that they rely on response specific consequences (Harris et al., 1991; McGee, Morrier, & Daly, 1999; Smith, Groen, & Wynn, 2000; Stahmer & Ingersoll, 2004; Howard et al., 2005; 2006; Reed, Osborne, & Corness, 2007; Remmington et al., 2007; Zachor, 2007). However, the majority of the research gives limited description of the consequences used across studies. For these reasons, the present study counted the specific location of instruction, consequence type (social, edible, and tangible), and consequence relation (related to the response).

Several measures, in the present study were informed by the general practice research (Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993; Jahr, Eldevik, Eikeseth, 2000; Gudmundsdoittir, 2002; Alai-Rosales, Zeug, Baynham, 2008). These measures include material engagement and the social engagement of the child with the interventionist. For example, Evans and Scotti (1989) disucss that a possible beneficial measure would be “engaged time.” These authors point out that engagement with the activities being taught is important to quantify to ensure that the learner is in fact

participating in said activities (Evans & Scotti, 1989). Similarly, the engagement with the interventionist is important to the intervention. If there is a great deal of "down time" during instruction where the child is not engaging with the interventionist or the materials, it would follow that opportunities to respond may be lacking. In light of these issues, the present study counted material type (e.g. flashcards, toy cars, playdoh, or dolls), material engagement (simple, conventional, pretend), total engaged time, and social engagement (cooperative, solitary, parallel).

The purpose of this study was to establish a standard for measuring the implementation of early and intensive behavioral interventions for young children with autism. This portion of standard will place emphasis on the intensity, curriculum, and reinforcer dimensions that make up the teaching behaviors and engagement between child and interventionist. Such measures could be the start of a method to evaluate program effectiveness.

The observation system proposed here will be said to be effective if the conditions that are measured set the occasion for a discussion of the data and how it can be used to inform practitioners about such issues as effective program implementation, child progress, and interventionist accuracy. It could also be used to discriminate differences across a wide range of treatment programs. For example, three treatment different programs could be evaluated. The first program might have high teach units occurring at a table with flashcards and unrelated consequences. The second may have high teach units in play areas, with related consequences with legos. The third program may take place in the community with unrelated consequences (tokens) and with lower teach units due to a focus on riding the bus independently.

Although these three programs may look very different, they may all be extremely effective. The present observation system was designed to help quantify such differences in order to aid in intervention selection and decision making. This observation system is one more step in the direction of quantifying the variables that might determine the effectiveness of treatment programs.

METHOD

Participants

The participants for this study were three boys with a diagnosis of autism and eight interventionists. The boys ranged in age from 3 to 5 years and attended an autism treatment program 8 to 20 hours per week. The children's skill levels were quite diverse. For example, verbal behavior ranged from non-vocal to utterances of several words. Table 2 presents an overview of specific child characteristics and targets.

The interventionists that participated in the study were employees of the program. The interventionists were all female and ranged in age from 24-30 with 0-5 years of experience with autism and/or applied behavior analysis. Table 3 presents an overview of specific interventionist characteristics.

Setting and Materials

The study was conducted during the initial stages of a new non-profit autism treatment program in the southwestern region of the United States. The program serves children ages 3 to 8 with a diagnosis of an autism spectrum disorder. The mission of the autism treatment program is to provide services to children and families at risk due to income, health status, or other difficulties. Children receiving services through the program are eligible for behavioral speech, physical and occupational therapy services. All services are required to be delivered under a behavioral construct.

The autism treatment program provides services from 8:00 to 6:00 Monday through Thursday. Each child enrolled in the program has a case manager, senior interventionist, and 3 to 5 junior interventionists. The case manager (master's level)

manages the overall scope and sequence of the child's programming, the senior interventionist (bachelor's level) makes small adjustments to the programs as needed as well as moving the child along based on progress, and the junior interventionists help provide the therapy. For each child, there is a program book containing program descriptions, session notes, datasheets, and graphs as well as a box with all teaching materials needed for that child.

Therapy is conducted in five therapy rooms that ranged from 88 to 280 square feet, with an occupational therapy gym, a physical therapy gym, and outside play equipment available. This study took place in the therapy room of each participating child. Each therapy room included child-sized table and chairs with books and toys that are appropriate for the age range served.

Materials used throughout the study were age appropriate toys, a video camcorder, lap top computers, timers, datasheets, and pencils. The video camcorder was used to tape all samples and graduate students used the laptop computers, timers and datasheets to record data on each 15-minute sample. All student recorders involved in the study were females between 23 and 25 years of age from the Department of Behavior Analysis at the University of North Texas.

Procedures

This study was conducted in six sessions approximately one week apart and over the course of two months with each interventionist-child dyad. Each dyad was video taped for 15 minutes during each interventionist's regularly scheduled sessions with the child. The experimenter started the tape approximately 30 minutes into each session. The interventionist was told to conduct the session as they normally would.

No feedback was given during the videotaping. However, agency feedback and training took place as usual. After taping, the samples were immediately saved onto the computer at the agency as well as the computer at the University of North Texas Behavior Analysis Department, to be analyzed.

Response Definitions and Measurement

Measures included responses related to the materials used in the session, the teaching interactions, location, and how the child was engaging with the materials.

The first set of measures for this study were teaching behavior measures. Teach units, are a set of measures, that when combined show how many opportunities for responding the interventionist is setting up or capitalizing on during the samples. A frequency count was used to record teaching behaviors. Included in this set of measures were, the teach unit, opportunities, targeted skills, consequence relation, and consequence type. The teach unit is the amount of opportunities the interventionist is either creating or capitalizing on for a child response. The teach unit was scored as successful if it resulted in a correct child response. For example, if the interventionist held out bubbles and said, “bubbles” and the child did not respond, this would be a teach unit that was not successful. If the interventionist gave the model again and the child responded, “buh” resulting in the interventionist blowing bubbles, a second teach unit would be scored as successful. The teaching opportunities could either be created or capitalized. A created opportunity was the interventionist setting up a learning opportunity, whereas capitalized would be the interventionist capitalizing on a child-initiated opportunity. The bubble example can still apply to illustrate opportunities. A created opportunity is when the interventionist holds out the bubbles and gives a model.

A capitalized opportunity would be when the child grabs the bubbles and hands them to the interventionist and then the interventionist delivers the model. The targeted skills were the skill sets that the interventionist was targeting during the teaching opportunities. These ranged from communication and language, to self-help and pre-academic skills. The final piece of the teach unit is the consequence delivery. The consequence relation measured whether the consequence delivered was directly related to the response such as in the bubble example, or if it were unrelated, such as getting a chip for correct matching. Consequence type referred to what kind of consequences were being used, social, tangible or edible. Table 4 presents a more detailed list of the responses included in the teach unit data.

The second set of measures related to material engagement. Together, these measures counted the types of materials being used by the interventionist and child, how long the child engaged with the material, and how they were engaging with the material. The engagement measures were counted using partial interval recording with a 15 second interval. The type of material could either be play (toys and materials used for fun), academic (materials used to teach academic skills such as flash cards), edible (food and drink), and media (movies). Access to materials was scored as controlled if the interventionist controlled access, or noncontrolled if the child initiated access. Material use included how the child was engaging with the material. A simple manipulation occurred if the child handled the material in a way not intended by the designer, conventional use occurred if the child engaged how the designer intended, and pretend play was not simple manipulation but not as the designer intended. For example, if the child flipped over a car to spin the wheels it would be considered simple,

the push the car would be conventional and to use the car as an airplane would be pretend. Social engagement referred to how the interventionist and child engaged with each other. Solitary occurred when the interventionist and child are not interacting, parallel occurred when they were engaged separately in similar activities, and cooperative is engagement in the same activity. An example to illustrate these types is blocks. If the child was playing blocks while the therapist set up the table with academic tasks it would be scored as solitary. If the child and the therapist sat side by side playing with two sets of blocks and not interacting it would be parallel. If the child and interventionist made a castle out of blocks together it would be considered cooperative. Finally, the location showed where instruction was taking place (table, floor, outside, or in the community). Table 5 provides a more detailed list of the responses that make up material engagement.

For a complete list of definitions please see the full observation code in Appendix A and datasheets in Appendix B.

Interobserver Agreement

One sample was scored for each of the interventionist-child dyads to calculate interobserver agreement. The observers were trained as follows: first the author trained the observer on the observation code and discussed examples and non-examples. After learning the code, the observer was trained how to use each datasheet. When the observer felt comfortable with both the code and datasheet, she practiced using the datasheet and code with videos of teaching interactions that were not part of the study. The observer was ready to score the tapes relevant to the study when she was able to get 90% or higher interobserver agreement on the first run of 2 practice tapes. Tables 6

and 7 show the interobserver agreement for each measure. The Interobserver agreement for the teaching behaviors ranged from 83% to 100% and 84.6: to 100% for engagement measures.

Data Analysis

All data were collected from the samples that were taken in each of the six sessions. The samples were converted into a movie player to be scored and analyzed. Data derived from direct observation of the samples were recorded onto datasheets. The raw data from each sample was then transferred to linear scale files.

Behaviors were recorded from each sample. Data sheets were divided into two sets of measures. One data sheet was concerned with responses that were associated with the teaching within the sample. The teach unit data sheet recorded teaching opportunities and the consequence that was delivered. The material engagement data sheet was concerned with how the child was engaging with the materials and the interventionist. Both datasheets are included in Appendix B.

RESULTS

Figures 1-15 display the data derived from the teach unit data and material engagement data for all three children and eight interventionists. Figures 1-5 display the data for Child A, Interventionists 1, 2, and 3. Figures 6-9 display the data for Child 2, Interventionists 4, 5, 6. Finally, Figures 10-15 display the data for Child C, Interventionists 2, 7, and 8.

Figure 1 displays teaching behavior across interventionists. Along the abscissas of each graph are the sessions listed in succession for Interventionist 1, 2, and 3 respectively. The y-axis displays the number of occurrences for each behavior. Interventionist 1's data is on the left graphs, Interventionist 2's data is in the middle, and Interventionists 3's data is on the right graphs.

Teach units are displayed on the top panel in Figure 1. This graph displays the total number of teach units (open circles) and successful teach units (black circles) in each session. Interventionist 1's teach units ranged between 43 and 67 at an average of 52 teach units within the 15-minute session. The general trend for the teach unit data path was steady with no major upward or downward trends. Successful teach units for Interventionist 1 ranged between 11 and 34 with an average of 19 occurrences. The general trend for the successful teach unit data path has a peak in the third session with a slight downward trend for the remaining sessions. Interventionist 2's teach units ranged between 59 and 86 with an average of 75 within the 15-minute session. Initially the data path is stable, peaks at session 3, and then the remaining sessions show a downward trend. The successful teach units for Interventionist 2 range from 36 to 59 with

an average of 51. The general trend for the successful teach unit is initially stable with a slight downward trend from the fifth to the sixth data points. Finally, Interventionist 3's teach unit data ranged from 34 to 58 with an average of 47 occurrences. There is a downward trend for the teach unit data with a peak at the 5th data point. Successful teach unit data ranged from 21 to 33 with an average of 26. The general trend for Interventionist 3's successful teach units is stable with no major upward or downward trend.

The middle panel in Figure 1 displays teaching opportunities. This graph displays opportunities that the interventionist either created (black circles) or capitalized on (open circles). Interventionist 1's created opportunities ranged from 20 to 32 with an average of 25. This data path has a stable trend with a slight upward trend. The capitalized opportunities ranged from 18 to 35 with an average of 27. The general trend of the capitalized data path is mostly stable with a slight downward trend. Interventionist 2's created opportunities ranged between 28 and 56 with an average of 42. There is an upward trend for the first half of the data path, and a downward trend towards the end of the data path. The capitalized opportunities ranged from 29 to 40 with an average of 35. The data path is stable with no major trend in either direction. Interventionist 3's created opportunities ranged from 17 to 40 with an average of 31. The general trend is stable with a slight downward trend from the second data point to the fourth followed by a jump up at the fifth and a jump down at the sixth data point. The capitalized opportunities for Interventionist 3 ranged from 12 to 22 with an average of 16. The trend was very stable over all six data points.

The final panel on Figure 1 is targeted skills. This graph is broken up to three types of skills. Learn-to-learn/functional communication (white), which includes learn-to-learn, functional communication and attending skills. Component/academic skills (black) including skills related to language such as component language, language skills, and academic skills, and play/social skills (grey) includes play skills, social skills and self-help skills. This graph displays the number of teach units that focused on each type of skill during the 15-minute session. This graph does not separate the skills based on correct responding. Interventionist 1 focused the majority of teach units on learn-to-learn/functional communication skills with a range of 21 to 52 with an average of 35. The general trend is bouncy with level changes ranging from 20 to 40 occurrences. The second skill set that was most covered by Interventionist 1 is component/academic skills with a range of 4 to 25 with an average of 17. This data path is bouncy as well with level changes ranging from 5 to 10 occurrences. There were no occurrences of play/social skills. Interventionist 2 mostly focused on learn-to-learn/functional communication skill sets as well. This skill set ranges from 43 to 80 with an average of 62. There is an initial upward trend until the fourth bar, which is followed by a slight downward trend for the remaining bars. There were no occurrences of play/social skills. Interventionist 3 also focused the majority of teach units on learn-to-learn/functional communication skill sets. This data path ranged from 27 to 42 with an average of 35. The general trend is mostly stable with a small amount of bounce. The second most teach units were devoted to component/academic skills. This data path ranges from 5 to 24 with

an average of 12. This data path was mostly stable at around 10 responses except for the fifth bar, which displays 24 occurrences. Finally, Interventionist 3 had two occurrences of play/social skills during the second session.

In summary, the proportion of teach units, teaching opportunities and targeted skills were about the same across all three interventionists. This was true with the exception of Interventionist 2, who had a higher frequency for all three measures.

Figure 2 displays consequences delivered by each Interventionist. Along the abscissas of each graph are the sessions for Interventionist 1, 2, and 3 respectively. The y-axis displays the number of responses during each 15-minute session.

The first panel displays consequence relation. The grey lines indicate the total teach unit for that session, the open circles are unrelated consequences, and the black circles are related consequences. Teach unit data on these graphs is the same as previously described in Figure 1. Interventionist 1's unrelated consequences ranged from 6 to 23 with an average of 12. The general trend for unrelated consequences was stable with a peak on the third data point and a slight downward trend until the fifth data point where the data levels out again. Related consequences ranged from 9 to 12 with an average of 10. There is an overall upward trend that does not occur until the fifth data point as related consequences were at zero until the fifth and sixth data points. Interventionist 2's unrelated consequences ranged from 20 to 43 with an average of 35. The trend is stable with a downward shift at the fourth data point and at the last data point.

The related consequences ranged from 0 to 30 with an average of 17. The trend is inconsistent with some bounce. There is an upward trend from the second data point to the fourth, at the fifth data point it drops to zero, and a jump back up to 20 at the sixth data point. Interventionist 3's unrelated consequences ranged from 10 to 26 with an average of 17. There is an upward trend for the first three data points, followed by a drop at the fourth data point, and again followed by an upward trend in the remaining data points. Interventionist 3's related consequences ranged from 1 to 6 with an average of 4. The general trend for this data path is stable.

The final panel for Figure 2 is consequence type. This graph displays what kind of consequences the Interventionists were giving the children. Social (black circle), Edible (black square), or tangible (open circle). Interventionist 1's social consequences ranged from 6 to 23 with an average of 12. The general trend is stable with a peak at the third data point and a downward trend back to around 10 at the fifth point. Tangible consequences ranged from 0 to 12 with an average of 3. There is an upward trend for this data path. There are no edible consequences for Interventionist 1. Interventionist 2's social consequences ranged from 17 to 42 with an average of 34.5. Overall, there is a slight downward trend. Tangible consequences ranged from 6 to 27 with an average of 16. There is an upward trend through the fourth data point and then a downward trend to 12 for the last two data points. Interventionist 2 one occurrence of edible consequences on the second data point. The rest were zero. Interventionist 3's social consequences ranged from 8 to 26 with an average of 17. The data path

has an upward trend for the first three points and then a drop followed by another upward trend. The tangible consequences for Interventionist 3 range from 1 to 8 with an average of 5. The trend of the tangible data path is stable at just under 10 occurrences throughout. The edible consequences range from 0 to 3 with an average of 1. The general trend was stable as most of the points were at 1.

In summary, all interventionists had similar proportions of consequence relations with the majority of consequences being unrelated. The proportion of the different types of consequences were also similar with the most being social. Interventionist 2 had higher frequencies for both measures than the other two interventionists.

Figure 3 displays materials for Child A, Interventionists 1, 2, and 3. Along the abscissas of each graph in Figure 3 are the sessions for Interventionists 1, 2, and 3 respectively. The y-axis displays the percent of intervals that each response occurred at in each 15-minute session.

The first panel in Figure 3 displays is material access. These graphs display the percent of intervals where the interventionists controlled access to materials (black bars) and the percent of intervals where material access was not controlled (white bars). Interventionist 1's controlled materials range from 0% to 95% with an average of 32%. There is a downward trend for the first three bars, followed by an upward trend in the remaining bars. Non-controlled access ranged from 0% to 47% with an average of 19%. This data bounces approximately 10-40% in each direction. Interventionist 2's controlled access range from 40% to 65% with an average of 58%. The general trend is stable with

a dip of 24% in the fifth session. The non-controlled access for Interventionist 2 ranged from 0% to 28% with an average of 14%. The trend is stable at approximately 30% when it occurs. Interventionist 3's controlled access ranged from 22% to 77% with an average of 49%. There is a general upward trend with some initial bounce of approximately 10% either direction. Non-controlled access ranged from 0% to 18% with an average of 6%. There is an initial slight downward trend and then a stable trend averaging around 6%.

The middle panel of Figure 3 displays material engagement. This graph includes total intervals engaged (grey lines), play materials (open circles), academic materials (black circles), media materials (open triangles), and edible materials (black triangles). Interventionist 1's intervals engaged range from 17% to 100% with an average of 65%. There is an initial downward trend for the first three data points followed by a steep upward trend for the remaining data points. Play materials range from 0% to 98% with an average of 44%. The trend for this data path is similar to intervals engaged. There is a downward trend for the first three points and then a steep upward trend for the remaining points. Edible materials only occur 10% of the intervals during one session. There are no media materials. Interventionist 2's intervals engaged range from 62% to 72% with an average of 63%. The general trend is stable with a slight dip in the fourth session. Play materials range from 28% to 58% with an average of 47%. There is a stable trend for this data path with some bounce in the last few sessions, dropping from 58% down to 28% and back up to 48%. Academic materials range from 23% to 40% with an average of 30%. The general trend again is

stable, with a slight level change from 23% to 40% after the third data point. Edible materials only occur in 3% of intervals in the second session. There are no media materials used by Interventionist 2. Interventionist 3's intervals engaged range from 25% to 80% with an average of 56%. The data path for intervals engaged is very bouncy ranging about 20%. Play materials range from 17% to 58% with an average of 35%. The general trend is an upward climb with some bounce in the middle of 20% each direction. Academic materials range from 2% to 32% with an average of 15%. Academic materials follow an upward trend to the fourth data point where the data drop to 2% in the fifth point and back up to 32% in the final point. Edible materials range from 5% to 30% of intervals with an average of 9%. These materials follow an upward trend in the first few data points and a downward trend for the remaining data points. There are no intervals with the occurrence of media materials.

The bottom panel of Figure 3 displays material use. These graphs include conventional use (black circles), simple manipulation (open circle), and pretend play (grey circles). Interventionist 1's conventional use ranges from 10% to 67% of intervals with an average of 27%. Conventional use for Interventionist 1 follows an increasing trend. Simple manipulation ranges from 0% to 57% with an average of 27% of intervals. The first five data paths follow a decreasing trend followed by and increasing trend for the remaining two data points. There is no occurrence of pretend play. Interventionist 2's conventional use ranges from 37% to 63% of intervals with an average of 52%. There is a stable trend until the fifth data point where there is a level shift of approximately 30%. Simple

manipulation ranges from 7% to 37% with an average of 23% of intervals. The initial trend is downward followed by an upward trend in the last three points. The only occurrence of pretend play is in the first session for 7% of intervals. Interventionist 3's conventional use ranges from 22% to 77% of intervals with an average of 52%. The general trend is stable with a large amount of bounce at an average of 30% in each direction. Simple manipulation ranges from 0% to 18% of intervals with an average of 5%. There is an initial downward trend followed by a stable trend of 2 and 3%. There is no occurrence of pretend play for Interventionist 3.

In summary, for these measures, Interventionists two and three were very similar across all panels. Interventionist 1 had lower frequencies in the first few sessions followed by an increase across all measures in the last few sessions.

Figure 4 displays graphs of engagement for Child A, Interventionists 1, 2, and 3. Along the abscissas of each graph in Figure 4 are the sessions for Interventionists 1, 2, and 3 respectively. The y-axis displays the percent of intervals that each response occurred at in each 15-minute session.

The panel in Figure 4 is social engagement. This includes cooperative (black circle), solitary (open circle), and parallel (grey circle). Interventionist 1's cooperative interactions range from 12% to 55% of intervals with an average of 25%. There is a general upward trend for this data path. Solitary interactions range from 0% to 53% of intervals with an average of 24%. The solitary interactions start with a downward trend into the fourth data point, followed by an upward trend for remaining data points. Parallel interactions range from 0% to

35% of intervals with an average of 7%. The trend for parallel interactions averaged at 0% until the fifth point where it jumped to 35% and then down to 3% in the last session. Interventionist 2's cooperative interactions range from 38% to 77% with an average of 50% of intervals. The cooperative interactions follow an initial downward trend and then remained stable for the remaining data points. Solitary interactions range from 7% to 33% of intervals with an average of 25%. The solitary interactions follow a steady upward trend. Parallel interactions range from 0% to 8% of intervals with an average of 2%. The general trend is stable at approximately 10% and below. Interventionist 3's cooperative interactions range from 25% to 80% with an average of 55% of intervals. There is a downward trend with slight bounce for the first five data points, followed by an upward trend to the last point. Solitary interactions range from 2% to 7% with an average of 4% of intervals. The general trend is stable and always under 10%. There is no occurrences of parallel interactions.

In summary, all three interventionists have mostly cooperative play with Interventionists 2 and 3 at a higher frequency.

Figure 5 displays location for Child A, Interventionists 1, 2, and 3. Along the abscissas of each graph in Figure 5 are the sessions for Interventionists 1, 2, and 3 respectively. The y-axis displays the percent of intervals that each response occurred at in each 15-minute session.

The graph in Figure 5 displays location of each session. This graph includes the table (black circle), floor (open circle), outside (black triangle), and community (grey triangle). Interventionist 1 was at the table for a range of 0% to

100% of intervals with an average of 48%. There is an initial down step followed by a steep upward trend for the first three data points, followed by a steep downward trend for the remaining data points. Interventionist 1 was on the floor for a range of 0% to 100% of intervals with an average of 54%. This data path mirrors that of the table data path. An initial upward jump followed by a downward trend for two data points and then a steep upward trend for the remaining points. There were no intervals where outside or the community occurred. Interventionist 2's table data path ranges from 0% of 100% with an average of 62%. There is an inconsistent trend for the table data, with heavy bounce from 0% to 100% of intervals. Interventionist 2 was on the floor for a range of 0% to 100% of intervals and an average of 38% of intervals. Like the table, the floor also had an inconsistent trend, with heavy bounce from 0% to 100% of intervals spent on the floor. There were no intervals where outside or the community occurred. Interventionist 3 spent a range of 43% to 100% of intervals at the table with an average of 79%. There is an increasing trend for the table data path. Interventionist 3 was on the floor for a range of 0% to 55% and an average of 23%. This data path follows a decreasing trend. There were no intervals where outside or the community occurred.

In summary, Interventionists 1 and 2 spend about equal time on the floor and at the table, whereas Interventionist 3 spends most time at the table. None of the interventionists spent time outside or in the community.

Figure 6 displays teaching behavior for Child B, Interventionists 4, 5, and 6. The top panel of Figure 6 displays teach unit and successful teach unit.

Interventionist 4's teach unit ranges from 37 to 76 with an average of 61. There is a steep downward trend for the first two data points, followed by a steady upward trend. The successful teach units for Interventionist 4 range from 27 to 56 with an average of 44. The first three data points follow a downward trend, which is followed by an upward trend for the remaining data points. The teach unit for Interventionist 5 ranges from 46 to 75 with an average occurrence of 54. The teach unit data follows an upward trend. Successful teach unit ranges from 32 to 61 with an average of 44. This data path follows an upward trend as well. Interventionist 6's teach unit ranges from 33 to 69 with an average of 48. There is an initial jump up from 50 to 69 and then a steady downward trend until the fifth data point followed by an upturn to the sixth data point at 56 occurrences. Successful teach unit ranges from 22 to 58 with an average of 31. This data path shows an initial up turn from 28 to 58 and then and down turn to 25 followed by a steady trend for the remaining data points.

The middle panel for Figure 6 displays teaching opportunities. Created opportunities for Interventionist 4 range from 19 to 51 with an average of 36 opportunities. There is an initial level shift from 39 to 19 with a steady upward trend for the remaining data points. Interventionist 4's capitalized opportunities range from 18 to 37 with an average of 25 opportunities. The general trend is steady with a downward shift from points one to two, an upward shift from two to four, followed by another downward shift from four to six. Interventionist 5's created opportunities range from 30 to 55 with an average of 40. Created opportunities follow an upward trend. Capitalized opportunities range from 14 to

20 with an average of 15. This data path has a steady trend with little bounce. Created opportunities range from 17 to 40 for Interventionist 6 with an average of 27. This data path follows an initial up turn, followed by a downward trend through the fourth data point, again followed by an upward trend. Capitalized opportunities range from 11 to 29 with an average of 21. The trend is stable with some bounce (from 12 to 18 occurrences in either direction).

Targeted skills are displayed on the bottom panel of Figure 6. Interventionist 4's primary focus on learn-to-learn/functional communication skills range from 36 to 76 with an average of 57. There is an initial drop from 76 to 36 followed by a steady upward trend. The second most targeted skills are play/social skills with a range of 0 to 11 and an average of 3 occurrences. These targeted skills follow an upward trend. Component/academic skills range from 0 to 5 with an average of 1. These skills only occur in sessions three and four and then return to zero showing a downward trend. Interventionist 5's most targeted skills are learn-to-learn/functional communication related ranging from 52 to 88 with an average of 70 occurrences. This data path has a steady trend with little bounce. The second most targeted skills for Interventionist 5 is play/social skills ranging from 0 to 20 and an average of 5. This data has an abrupt upward shift followed by a steep downward shift from the fifth and sixth data points. The most targeted skill set for Interventionist 6 is learn-to-learn/functional communication ranging from 17 to 56 with an average of 37. This data path follows an initial downward trend, followed by an upward shift for the final two bars. The second most targeted skill set is play/social skills with a range of 0 to 11 and an average

of 6 occurrences. Play/social skills show an initial shift up to 10 and downshift back to zero, followed by an upward trend for the remaining data points. The third most targeted skill set is component/academic ranging from 3 to 8 and averaging 5 occurrences. Component/academic skills follow and upward trend.

In summary, the proportions for all measures were similar across interventionists. However, Interventionist 6 had a slightly lower amount of targeted skills, but a wider range of skills targeted than the other two interventionists.

Figure 7 displays consequence data for Child B, Interventionists 4, 5, and 6. The top panel of Figure 6 displays the consequence relations. Interventionist 4's related consequences range from 3 to 23 and average 16 occurrences. This data path shows an initial downward trend in the first half, followed by a level shift of approximately 15 to 19 occurrences. Unrelated consequences range from 20 to 48 with an average of 37. There is an initial downward trend for unrelated consequences followed by a slight upward trend for the remaining data points. Teach unit data is the same as previously described. Interventionist 5's related consequences range from 14 to 39 with an average of 26. There is an initial jump up from 14 to 39 followed by a jump down to 20, and again followed by a steady upward trend. Unrelated consequences range from 20 to 50 with an average of 36. Unrelated consequences follow a steady upward trend. Teach unit data is the same as previously described. Interventionist 6's related consequences range from 0 to 21 with an average of 6. Related consequences show a peak in the second data point at 53 followed by a down shift where the

data follow a stable trend below 10 occurrences. Unrelated consequences range from 17 to 53 with an average of 48 occurrences. Initially, there is a peak at 21, followed by a downward shift through the fourth data point, and then a slight upward trend for the remaining data points.

Consequence type is displayed on the bottom panel for Figure 7. Social consequences range from 19 to 48 for Interventionist 4 with an average of 38 occurrences. There is an initial drop from 43 to 19 in the first two points followed by an upward trend for the remaining points. Tangible consequences for Interventionist 4 range from 2 to 14 with an average occurrence of 7. Tangible consequences have a stable trend with a small amount of bounce (7 to 11 occurrences in either direction). Edible consequences range from 2 to 33 with an average occurrence of 17. Edible consequences drop initially from 29 to 2 and then steadily increase until the fifth data point where there is a slight turn down to the sixth data point. Interventionist 5's social consequences range from 32 to 51 with an average of 42. The general trend follows an upward climb with a peak of 51 during the second session. Tangible consequences range from 8 to 28 with an average of 19 occurrences. Tangible consequences follow an initial upward trend followed by a slight downward trend at session four. Edible consequences range from 0 to 22 and average 7 occurrences. Interventionist 5's edible consequences follow a steady upward trend. Social consequences range from 17 to 53 with an average of 26 for Interventionist 6. There is a peak in data point two to 53, followed by a downward shift through the fifth data point where there is a slight turn up. Tangible consequences range from 2 to 15 with an average of 8.

There is a slight upward trend for tangible consequences with some bounce (between 7 to 11 occurrences in either direction). Edible consequences range from 0 to 43 with an average of 8. This data path jumps from 0 to 43 in the first two data points followed by a return to 0 until the last data point where there is a slight turn up.

In summary, the proportion of consequence relation and types were similar across interventionists with a slightly higher frequency for Interventionists 4 and 5. The majority of consequences were unrelated and social across interventionists.

Figure 8 displays materials for Child B, Interventionists 4, 5, and 6. The first panel in Figure 8 displays material access. Interventionist 4's controlled access ranges from 65% to 88% with an average of 75%. The general trend is steady with little bounce. Non-controlled access ranges from 0% to 47% with an average of 11%. This data path shows an initial increasing trend followed by a drop to 0% and a slight up turn in the last session. Controlled access for Interventionist 5 ranges from 43% of intervals to 100% with an average of 77%. There is an initial downward shift in the first two bars, followed by an increasing trend through the fifth bar, followed by a down turn to the last bar. Non-controlled access ranges from 0% to 5% with an average of 2%. The general trend is stable. Interventionist 6's controlled access ranges from 63% to 72% of intervals with an average of 72% of intervals. The general trend is stable. Non-controlled access ranges from 0% to 22% with an average of 7% of intervals. The general trend is stable with an up turn to the last bar.

Material engagement is displayed by the middle panel in Figure 8. Interventionist 4's total intervals engaged range from 70% to 93% with an average of 84%. The general trend is steady with a dip to 70 at the third data point. Play materials range from 27% to 75% with an average of 43%. There is an initial peak from 27% to 75%, followed by a downward trend for the remaining data points. Academic materials range from 22% to 63% with an average of 42%. Academic materials follow an increasing trend. Media materials only occur in 8% of the intervals for the second session. Edible materials for Interventionist 4 range from 7% to 93% of intervals with an average of 27%. There is an initial decreasing trend for the first three data points for edible materials, followed by an increasing trend through the fifth data point, followed by a down turn to the last point. Interventionist 5's total intervals engaged ranges from 48% to 100% with an average of 79% of intervals. There is an initial drop in the data from the first to the second points, followed by an upward trend through the fifth data point and a down turn to the last data point. Play materials range from 40% to 70% with an average of 55% of intervals. Play materials general trend is stable with little bounce. Academic materials range from 23% to 62% of intervals with an average of 48% of intervals. This data path also has a steady trend with little bounce. Edible materials for Interventionist 5 range from 0% to 42% with an average of 20% of intervals. There is a steep increasing trend in the last three data points for Interventionist 5. Total intervals engaged for Interventionist 6 range from 72% to 87% of intervals with an average of 80%. The general trend is steady with little bounce. Play materials range from 30% to 70% for

Interventionist 6 with an average of 56%. There is an initial down turn, followed by an increasing trend through the fourth data point, followed by a slight decreasing trend for the remaining data points. Interventionist 6's academic materials range from 17% of intervals to 52% with an average of 29%. There is a peak in the first two data points from 22% to 52%, followed by a downward trend through the fourth data point, followed by a slight increasing trend for the remaining data points. There are no occurrences of media material for Interventionist 6.

The bottom panel for Figure 8 displays material use. Conventional use for Interventionist 4 ranges from 28% to 80% with an average of 52% of intervals. This data path follows an increasing trend. Simple manipulation ranges from 30% to 72% with a 48% average of intervals. There is a general decreasing trend for simple engagement with little bounce. There are no occurrences of pretend play. Interventionist 5's conventional use range from 38% to 97% of intervals with an average of 59%. There is an overall increasing trend with some bounce (between 20 and 50% in either direction). Simple manipulation ranges from 7% to 53% with an average of 27% of intervals. The general trend is steady with bounce (ranging from 30 to 50% in either direction). There are no occurrences of pretend play. Conventional use for Interventionist 6 ranges from 22% to 75% with an average of 54% of intervals. There is a general increasing trend with some bounce (between 20 to 50% in either direction). Simple manipulation ranges from 0% to 57% of intervals with an average of 29%. The trend mirrors that of conventional use with a decreasing trend and bounce

(between 20 to 50% in either direction). There are no occurrences of pretend play.

In summary, the interventionists were very similar for these measures. A majority of the materials were controlled, play or academic, and ranged between conventional and simple manipulation.

Figure 9 displays social engagement for Child B, Interventionists 4, 5, and 6. Cooperative interactions for Interventionist 4 range from 37% to 80% with an average of 64%. Cooperative interactions follow an initial decreasing trend, followed by a level shift of approximately 40%, followed by an additional slight decreasing trend. Interventionist 4's solitary interactions range from 15% to 57% of intervals with and average of 28%. This data path jumps from 15% to 57% in the first two data points, followed by a decreasing trend for the remaining data points. Parallel interactions only occur in 5% of intervals in the first session and remain at 0% for the rest. Cooperative interactions for Interventionist 5 range from 48% to 95% of intervals with an average of 78%. There is an initial decrease from 8 to 2%, followed by an increasing trend. Solitary interactions range from 2% to 10% with an average of 6% of intervals. The general trend is steady with little bounce. There are no occurrences of parallel interactions for Interventionist 5. Interventionist 6's cooperative interactions range from 53% to 75% with an average of 68%. There is an increasing trend. Solitary interactions range from 5% to 37% of intervals with an average of 22%. There is an overall decreasing trend. There are no occurrences of parallel interactions for Interventionist 6.

In summary, the majority of time was spent engaged cooperatively with Interventionists 4 and 6 spending more time in solitary than Interventionist 5.

Figure 10 displays location. Interventionist 4 is at the table ranging from 65% to 100% of the sessions with an average of 89%. This data path follows an upward trend with some initial bounce (40 to 50% in either direction) followed by three data points at 100%. The time spent on the floor ranges from 0% to 40% with an average of 14%. There is an overall decreasing trend with some bounce (30 to 40% in either direction). There are no occurrences of outside or community. Time spent at the table for Interventionist 5 ranges from 65% to 100% of intervals with an average of 94% of intervals. All occurrences are at 100% except the second session, which is at 65%. Time spent on the floor ranges from 0% to 35%. All data points were 0% other than the second session, which is at 35%. There are no occurrences of outside or community. Interventionist 6's time at the table ranges from 92% to 100% of intervals with an average of 99%. There is a stable trend. Time spent on the floor ranges between 0% and 15%. All sessions are at 0% except the first, which is 15%. There are no occurrences of outside or community.

In summary, all interventionists spent almost all of their time at the table with only a few instances of floor time.

Figure 11 displays the teaching behaviors for Child C, Interventionists 2, 7, and 8. Interventionist 2's teach unit ranged from 60 to 106 with an average of 76. The general trend is stable with a peak in the third session at 106. The successful teach units range from 43 to 83 with an average of 54. This trend

closely matches the teach unit with a peak of 83 in the third session. Teach units for Interventionist 7 range from 48 to 84 with an average of 66. There is an increasing trend. Successful teach units range from 23 to 53 with an average of 39. The general trend for successful teach units is upward as well. Interventionist 8's teach units range from 59 to 97 with an average of 78. The general trend is increasing for the first four sessions and decreasing for the remaining. Successful teach units range from 44 to 74 with an average 56 occurrences. The trend for this data path is also increasing for the first four sessions and decreasing for the remaining sessions.

The middle panel for Figure 11 displays teaching opportunities for Child C, Interventionists 2, 7, and 8. Interventionist 2's created opportunities range from 36 to 54 with an average of 45 opportunities. The trend is increasing with a slight downward turn towards the last few data points. The capitalized opportunities range from 24 to 52 with an average of 31. The trend is stable with a level change of approximately 20 in the third and fourth sessions. Interventionist 7's created opportunities range from 25 to 51 with an average of 39 occurrences. There is an increasing trend. Capitalized opportunities range from 21 to 27 with an average of 27. There is a general increasing trend across all sessions. Created opportunities for Interventionist 8 range from 40 to 63, with an average of 48. The trend is stable with a peak of 63 in the fourth session. Capitalized opportunities range from 19 to 34 with an average of 30. The data is stable with a slight increasing trend for the first three sessions and a slight decreasing trend for the last two sessions.

Targeted skills are displayed on the bottom panel of Figure 11. Interventionist 2 spends the majority of the session targeting component/academic skills with a range of 46 to 74 and an average of 54. The trend is increasing for the first three sessions and decreasing for the remaining sessions. The second most targeted skill set is learn-to-learn/functional communication, ranging from 14 to 34 and with an average of 22. There is an increasing trend for the first four sessions followed by a down turn for the last sessions. Finally, Interventionist 2 targets play/social skills once in session five. The range for component/academic skills is 19 to 67 with an average of 40 for Interventionist 7. There is an increasing trend for the first five sessions followed by a down turn in the final session. The bounce ranges about 20 occurrences in either direction. The second most targeted skill set is learn-to-learn skills ranging from 7 to 39 occurrences with an average of 26 occurrences. The trend is inconsistent with bounce ranging from 10 to 20 occurrences in either direction. There are no occurrences of play/social skills. Interventionist 8 targets learn-to-learn/functional communication skills most often, ranging from 21 to 39 occurrences with an average of 31 occurrences. The general trend is decreasing with bounce ranging from 2 to 10 occurrences. The second most targeted skill set is component/language skills ranging from 21 to 63 and averaging 45 occurrences. There is an increasing trend for the first four sessions, followed by a downward trend for the last two. Play/social skills are targeted ranging from 0 and 5 occurrences with an average of 2. The trend is decreasing.

In summary, the proportion of teach units, teach opportunities, and targeted skills were similar across interventionists with Interventionist 2 and 8 having a slightly higher frequency.

Figure 12 displays the consequence data for Interventionists 2, 7, and 8. Related consequences range from 6 to 10 with an average of 8 for Interventionist 2. The general trend is stable. Unrelated consequences range from 21 to 56 with an average of 29. The trend for unrelated consequences is also stable, with an outlier of 56 in session three. Teach units are the same as previously described. Interventionist 7's related consequences range from 0 to 4 and average 2. The general trend is stable. Unrelated consequences range from 48 and 84 with an average of 66 occurrences for Interventionist 7. There is an increasing trend for this data path. Teach units are the same as previously described. Related consequences for Interventionist 8 range from 3 to 14 occurrences, with an average 9. There is a decreasing trend for the first three sessions, followed by an increasing trend for the remaining data points. Unrelated consequences range from 24 to 49 with an average of 34 occurrences. There is an increasing trend for the first four data points, followed by a decreasing trend in the last three sessions. Teach units are the same as previously described.

The bottom panel for Figure 12 is consequence type. Interventionist 2's social consequences range from 22 to 40 with an average of 27. The general trend is stable with a peak of 40 in session three. Tangible consequences range from 3 to 28 with an average of 9. The general trend for tangible is stable again,

with a peak of 28 in session three. There are no occurrences of edible consequences. Social consequences for Interventionist 7 range from 15 to 44 with an average of 28. There is an increasing trend with a small amount of bounce ranging between 3 to 20 occurrences in either direction. Tangible consequences range from 0 to 4, with an average 2 occurrences. There is a general decreasing trend. There was only one occurrence of an edible consequence that occurred in session three. Interventionist 8's social consequences range from 25 to 49 with an average of 36. There is a general increasing trend. Tangible consequences range from 0 to 18 with an average of 7. There is a downward trend for this data path. An edible consequence occurred once in the fifth session.

In summary, the frequencies of related and unrelated consequences and consequence type were very similar across interventionists. The majority of consequences were unrelated and social.

Figure 13 displays materials for Child C, Interventionists 2, 7, and 8. The top panel in Figure 13 displays material access. Interventionist 2 controls access for a range of 30% to 72% with an average of 58%. The overall trend is steady around 65%. Non-controlled access ranges from 0% to 8% with an average of 3%. Non-controlled access follows an overall downward trend. Controlled access for Interventionist 7 ranges from 33% to 67% of intervals with an average of 45%. There is an increasing trend for the first three sessions, followed by a level change of 30% and ending with an increasing trend. Non-controlled access ranges from 0% to 7% with an average of 3%. There is a decreasing trend.

Interventionist 8's controlled access ranges from 18% to 85% of intervals with an average of 56%. There is an overall decreasing trend. Non-controlled access ranges from 0% to 17% with an average 6%. There is an initial decreasing trend with and increasing trend in the last session.

The middle panel for Figure 13 display material engagement. Interventionist 2's percentage of total intervals engaged ranges from 35% to 73% with an average of 64%. The trend is steady at approximately 70%. Play materials range from 17% to 43% of intervals with an average of 31%. The trend is steady between 20 and 40%. Academic materials range from 18% to 53% and average 33% of intervals. There is an overall increasing trend. There are no occurrences of media and only 3% of intervals have an occurrence of edible materials in the first session. Interventionist 7's total intervals engaged ranges from 40% to 67% with an average of 48%. There is an increasing trend for the first three sessions followed by a level change of approximately 30% and ending with a slight increasing trend. Play materials range from 0% to 33% of intervals, with an average 13%. Overall, there is a decreasing trend. Academic materials range from 25% to 42% with an average of 35%. Academic has a very stable trend with most occurrences around 30% of intervals. There is no occurrence of media materials and edible materials only occur in Session three for 5% of intervals. Interventionist 8's total intervals engaged range from 30% to 93% with an average of 62% of intervals. The overall trend is decreasing. Play materials range from 0% to 72% of intervals with an average of 21%. Play materials show a decreasing trend until the last two sessions where there is an increase.

Academic materials range from 8% to 68% of intervals with an average of 42%. The data show an increasing trend for the first two sessions where it levels off for three sessions and then decreases in the remaining sessions. There is no occurrence of media materials and only 2% of intervals show edible materials in the fifth session.

The bottom panel for Figure 13 displays material use. Conventional use ranges from 33% to 63% with and average of 54%. The trend is stable with little bounce. Interventionist 2 ranges from 2% to 18% for simple manipulation with an average of 10%. There is a slight upward trend. Pretend play ranges from 0% to 7% with and average of 2%. The trend is mostly stable below 10%. Simple manipulation for Interventionist 7 ranges from 0% to 12% with an average of 6%. The trend is stable with little bounce. Conventional use ranges from 27% to 57% with an average of 42%. There is a slight downward trend. There are no occurrences of pretend play. Interventionist 8's simple manipulation ranges from 0% to 3% of intervals with an average of 1%. The trend is stable with little bounce. Conventional use ranges from 27% to 85%, averaging 59%. There is a decreasing trend. Pretend play ranges from 0% to 12%, averaging 2% of intervals. The trend is stable with a peak of 12% in the fifth session.

In summary, the interventionists are quite similar with regard to these measures, with Interventionists 2 and 8 having slightly higher frequencies throughout. Most of the materials are controlled, academic or play materials and are engaged with conventionally.

Figure 14 displays engagement for Child C, Interventionists 2, 7, and 8. Interventionist 2 ranges from 3% to 13% of intervals for solitary interaction with an average of 7%. The trend is stable with little bounce. Parallel interaction ranges from 0% to 5% with an average of 1%. There is stable with little bounce. Cooperative interactions range from 32% to 77% with and average of 62%. There is an overall downward trend for this measure. Interventionist 7's solitary interactions range from 2% to 10% with an average of 6% of intervals. There is a slight increasing trend. Cooperative interactions ranges from 35% to 65% of intervals and an average of 47%. There is an increasing trend, followed by a level shift of approximately 20%, followed by another increasing trend. There are no occurrences of parallel interactions. Solitary interactions for Interventionist 8 range from 0% to 7% with an average of 2%. There is a stable trend. Cooperative interactions range from 28% to 85% with an average of 58% of intervals. There is an overall decreasing trend. The only occurrence of parallel interactions for Interventionist 8 were in the first session for 7% of intervals.

In summary, the majority of the time was spent in cooperative play across interventionists.

Figure 15 displays location of instruction. Interventionist 2 is at the table for a range of 48% to 100% of intervals with an average of 73%. The trend is steady between 70% and 80% of intervals. Time spent on the floor ranges from 0% to 52% with an average of 30% of intervals. The general trend is stable at about 20% of intervals. There are no occurrences of outside or community. Interventionist 7 spends a range of 73% to 100% of intervals and 96% of

intervals at the table. The range is stable and mostly 100%. Instruction occurs on the floor ranging from 0% to 27% with an average of 5% of intervals. The trend is stable at mostly 0%. There are no occurrences of outside or the community. Interventionist 8's time spent at the table ranges from 25% to 100% with an average of 76% of intervals. There is an increasing trend between the first and second sessions followed by a steady state at around 100% and then a decrease from the fifth to the sixth session. Time spent on the floor ranges from 0% to 77% with an average of 25%. There is an initial downward trend followed by steady state at around 0%, followed by an increase between the fifth and sixth sessions. There are no occurrences of outside or the community.

In summary, the majority of time was spent at the table across interventionists, however, Interventionists 2 and 8 spent a higher frequency of time on the floor than did Interventionist 7.

DISCUSSION

It is understood in the autism community that early and intensive behavioral intervention is not only effective, but can dramatically alter the course of a child's outcome (Lovaas et al., 1973; Wolf, Risley & Mees, 1964; Fenske et al., 1985; Lovaas, 1987; Anderson et al., 1987; Harris et al., 1991; Birnbrauer & Leach, 1993; McEachin, Smith, & Lovaas, 1993; Koegel et al., 1999; Sheinkopf & Siegel, 1998; McGee, Morrier, & Daly, 1999; Weiss, 1999; Smith, Groen, & Wynn, 2000; Bibby et al., 2001; Eikeseth et al., 2002; Stahmer & Ingersoll, 2004; Howard et al., 2005; Sallows & Graupner, 2005; Cohen, Amerine-Dickens, & Smith, 2006; Reed, Osborne, & Corness, 2007; Remmington et al., 2007; Zachor et al., 2007). In order to understand what produces these changes, quantification of the independent variables of intervention programs is the next useful step in applied research programs (Hall & Louchs, 1977; LeLaurin, & Wolery, 1992; Dawson & Oterling, 1997, Wolery & Garfinkle, 2002; Matson, 2008). Additionally, this type of measurement would allow for a standard to be developed for autism treatment. Standardization of treatment will not only affect treatment effectiveness, but will allow researchers to further understand which variables are in fact responsible for better outcomes across treatment programs (LeLaurin & Wolery, 1992).

The purpose of this study was to establish a standard for measuring the implementation of early and intensive behavioral interventions for young children with autism. This standard will place emphasis on the intensity, curriculum, and reinforcer dimensions that make up the teaching behaviors and engagement between child and interventionist.

The present study included eight interventionists and three children with a diagnosis of autism. The backgrounds of the interventionists ranged widely as did the skill level of each child. Behaviors associated with teaching were counted for each interventionist (teach units, teach opportunities, targeted skills, consequence relation, consequence type, material access, material engagement, material use, social engagement, and location) in six 15-minute video samples once a week for a span of approximately 2 months. These methods allowed a picture to develop of some aspects of each interventionists teaching over time.

In summary, all of the interventionists included in this study are in keeping with what scholars reviewing the autism intervention outcome literature recommend. Although none of the children in the study were in treatment for 40 hours per week as some of the children in the outcome studies, the interventionists teaching opportunities were clearly above the 150 per hour recommendation, ranging between 200-300 per hour. This suggests that the intensity of this program is at a beneficial level for the children involved (Greer, 1994; Howard, 2005).

The curricular skills that were targeted during intervention were at differing levels but all focused around component skills and academic skills, play and social skills, and learn-to-learn and functional communication skills. The specific targets within each skill set were child specific and each were included in the skill sets that scholars recommend to be important for autism intervention (Dawson & Osterling, 1997; Anderson & Romanczyk, 1999; Wolery, Barton, & Hine, 2005).

In terms of the format of teaching, this study focused on location, and consequences. Some importance has been placed on the location of instruction

(Green, 1996; Wolery, Barton, & Hine, 2005; Matson & Smith, 2008), this study also counted allocation of time spent in activities at the table and on the floor. As far as the relation and type of consequences, many studies point out that consequences directly related to child response are more beneficial for child progress (Harris et al., 1991; McGee, Morrier, & Daly, 1999; Smith, Groen, & Wynn, 2000; Stahmer & Ingersoll, 2004; Howard et al., 2005; 2006; Reed, Osborne, & Corness, 2007; Remmington et al., 2007; Zachor; 2007). This study found that for all children and interventionists, both related and unrelated consequences were used, but unrelated consequences were at a higher frequency. Some of what could account for this is the use of social consequences as they were often counted as unrelated and often paired with the related consequences.

The present study also address material and social engagement. The recommendation of Evans & Scotti (1989) was that engaged time be recorded in order to make sure that the children receiving intervention were actually engaging in what they were being taught. The present study found that this was the case. The children were engaged a great deal in play and academic materials, and that they were engaging in those materials cooperatively with their interventionist.

Evaluation of this data shows that the interventionists are exhibiting the recommended qualities of what has been suggested to be effective in early and intensive behavior interventions for children with autism. What remains to be seen is if these measures relate to child progress.

A future direction for this research is the inclusion of child progress in the data analysis. It is important to measure the independent variable of treatment, and what is most beneficial for supervisors and program developers is to monitor the independent

variable in the context of child progress. Child progress needs to be compared analyzed in the context of the teaching behavior. Additionally, this observation system needs to be utilized across a wide array of treatment programs. In order to fully understand if these are the behaviors associated with best outcome, the observation needs to be able to capture the important aspects of treatment programs that may all be beneficial, but that look very different.

If the behaviors measured in this study are related to child outcome across programs, this observation system could be the beginning of a system to evaluate and compare outcomes within and across programs for children with autism. To that end, this could be the beginning of a standard for measuring treatment efficacy across interventionists and programs.

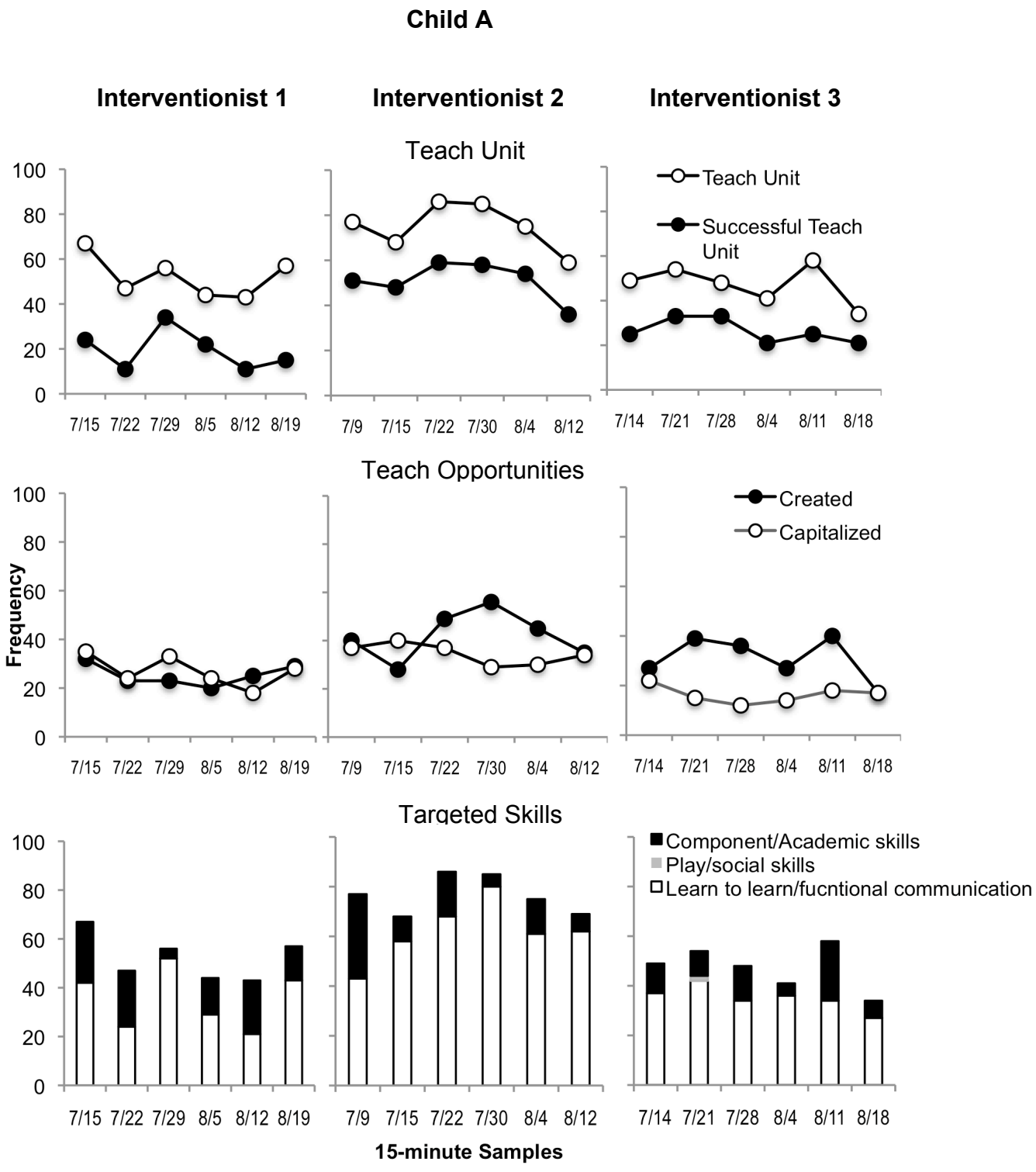

Figure 1. Child A teaching behaviors across interventionists.

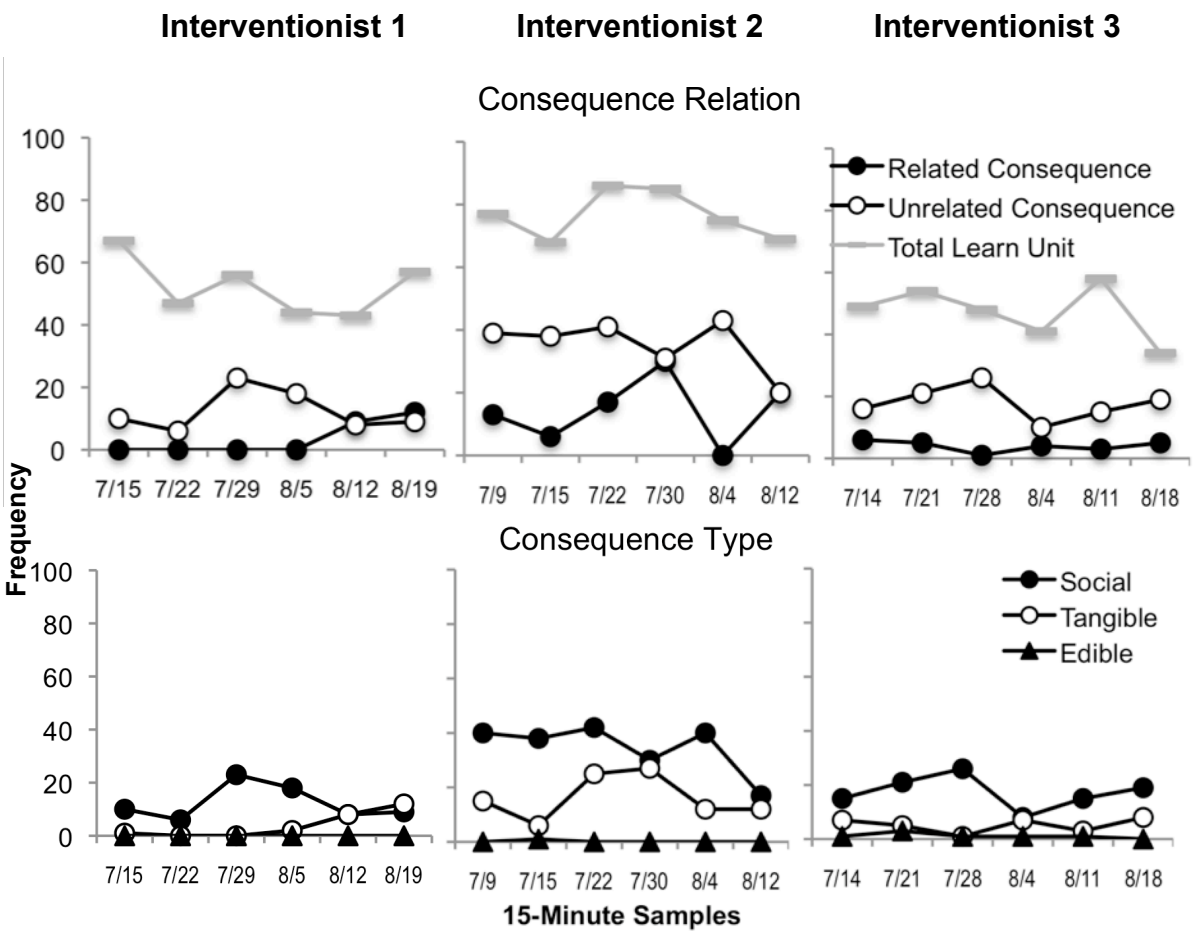

Figure 2. Child A consequences across interventionists.

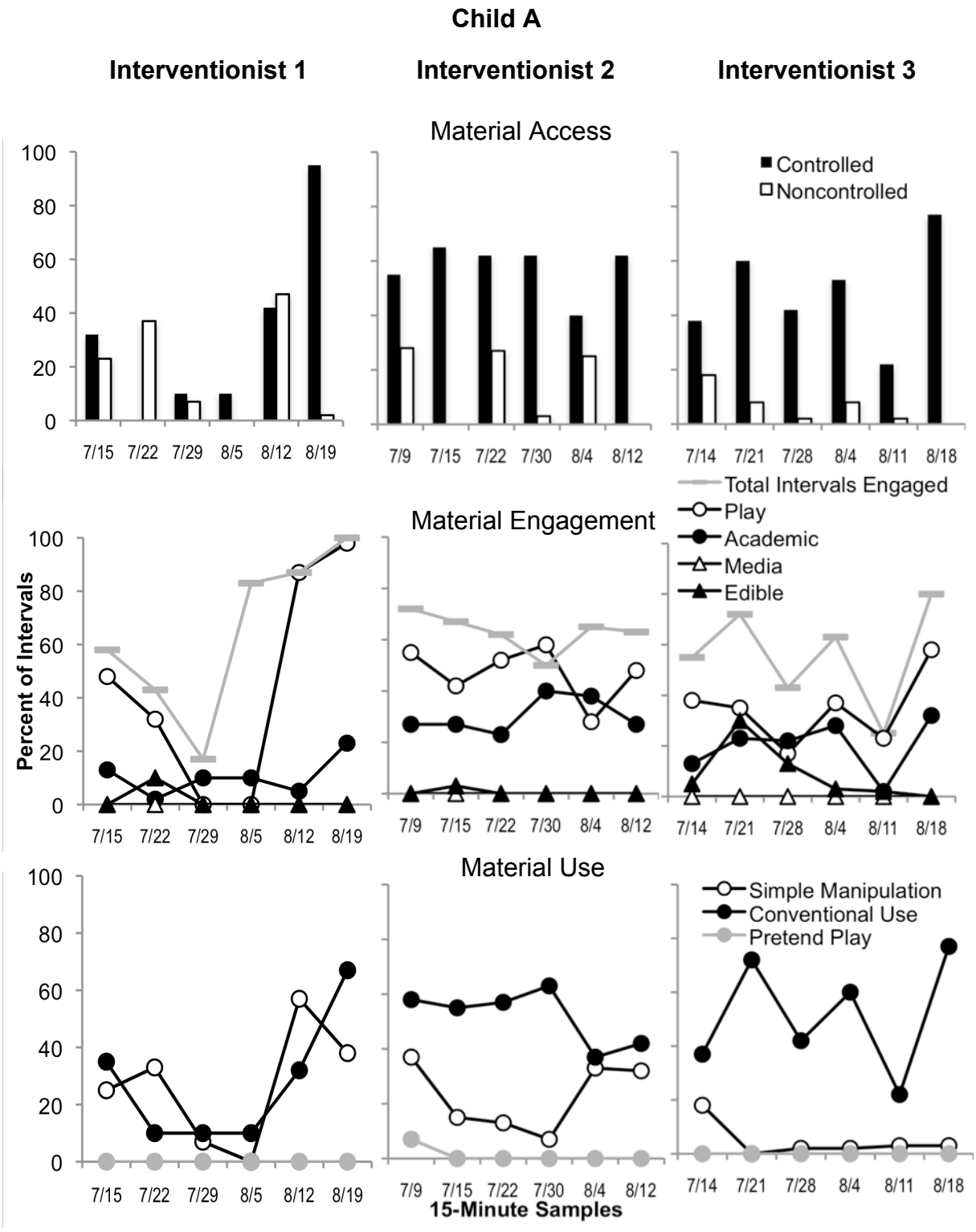

Figure 3. Child A materials across interventionists.

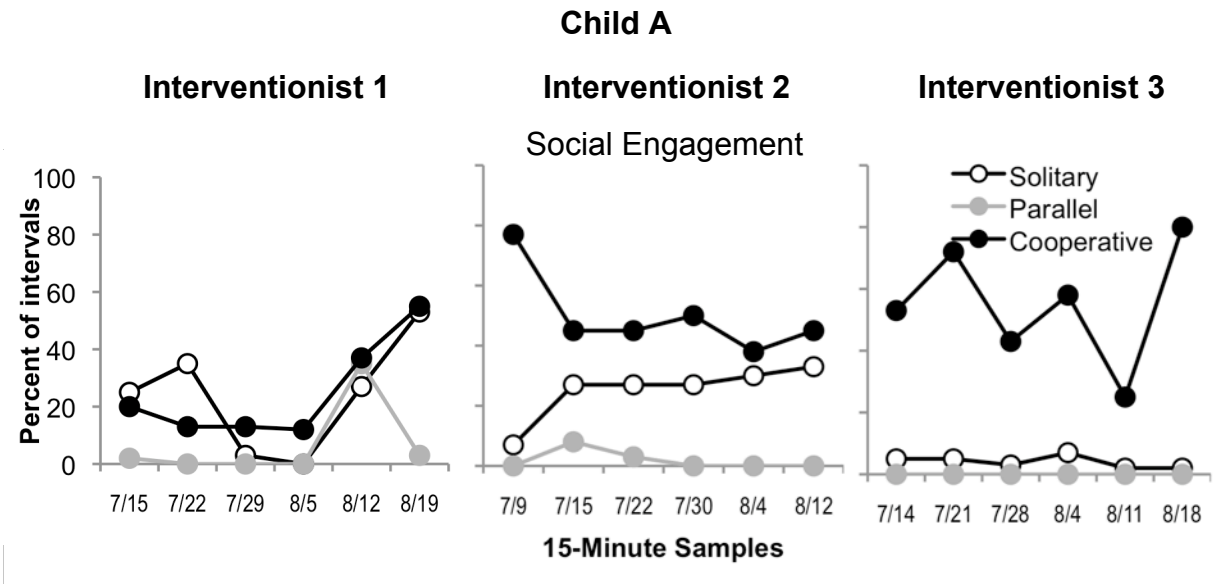

Figure 4. Child A engagement across interventionists.

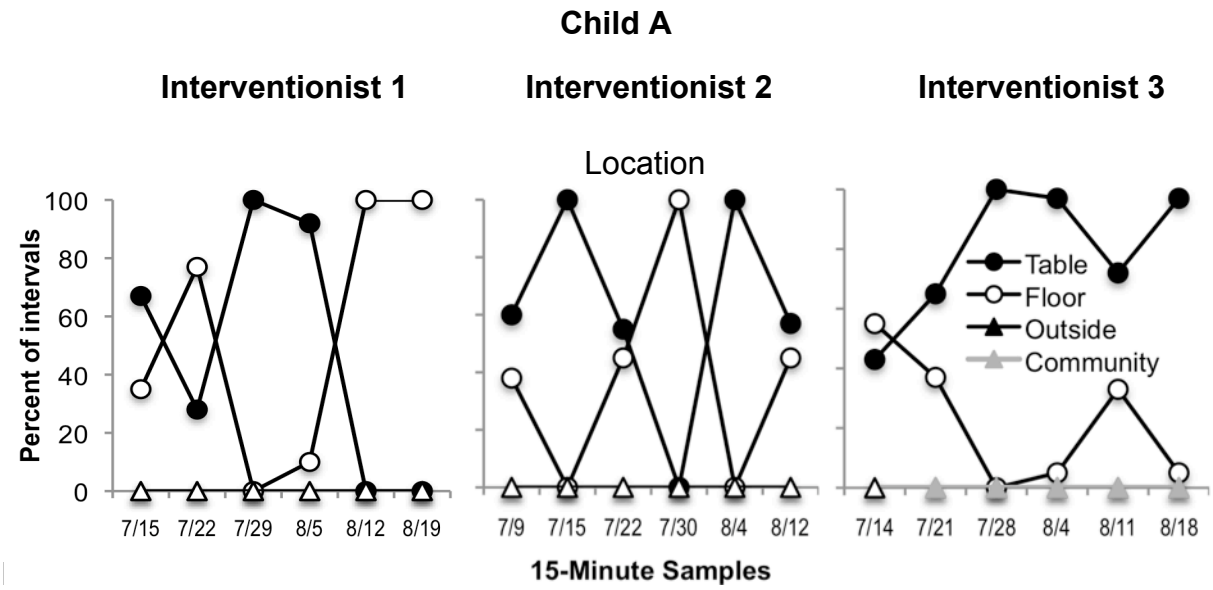

Figure 5. Child A location across interventionists.

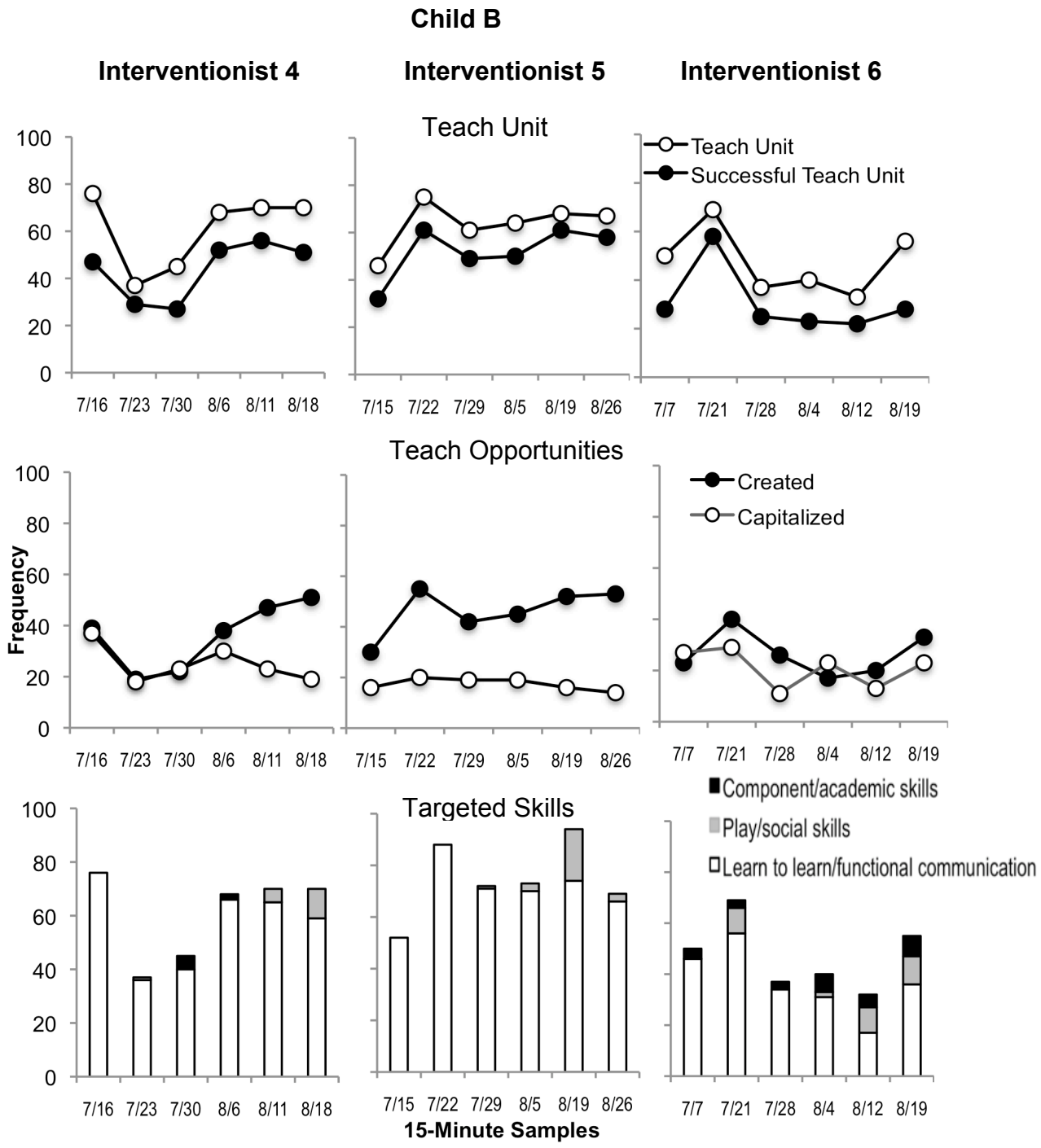

Figure 6. Child B teaching behaviors across interventionists.

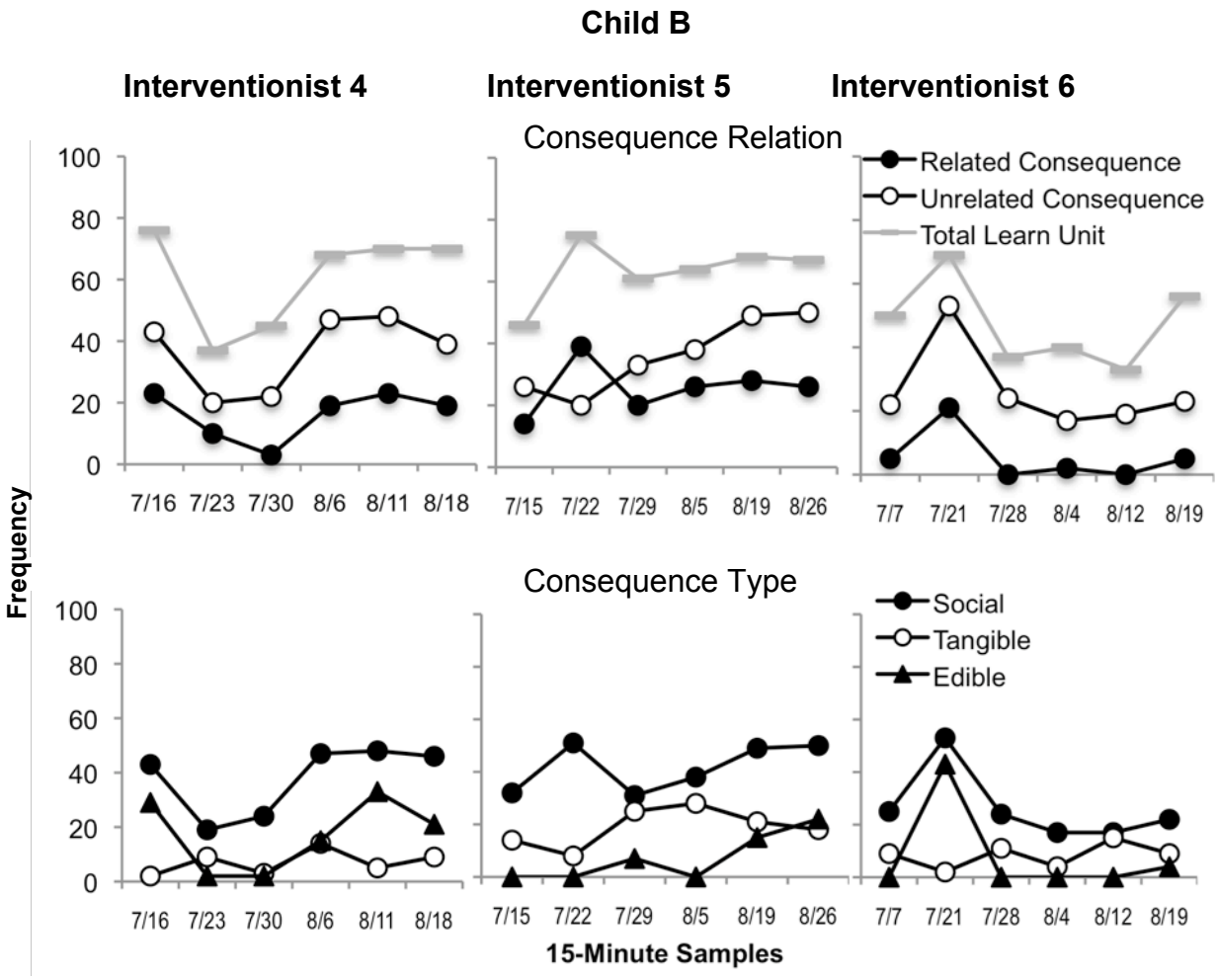

Figure 7. Child B consequences across interventionists.

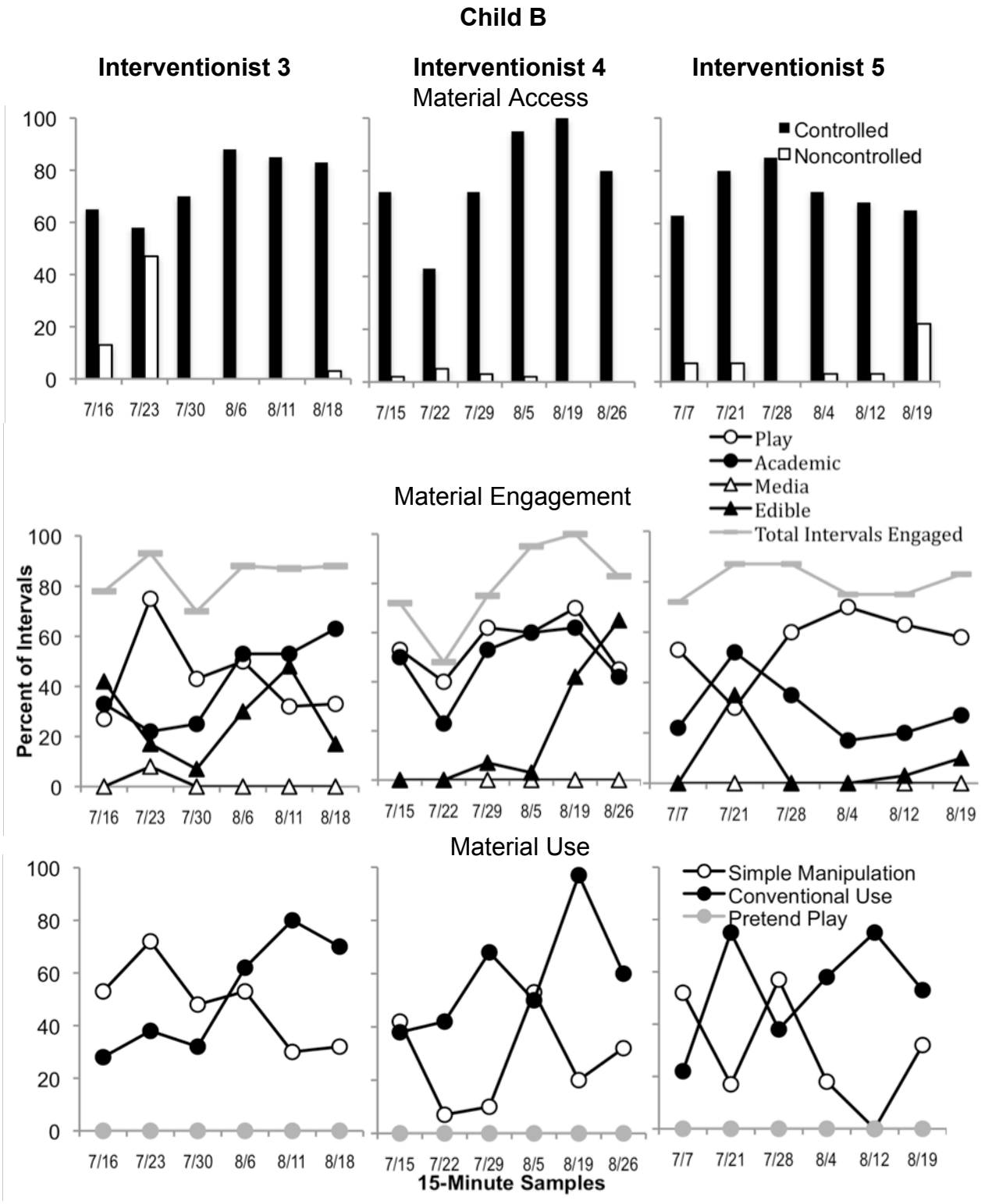

Figure 8. Child B materials across interventionists.

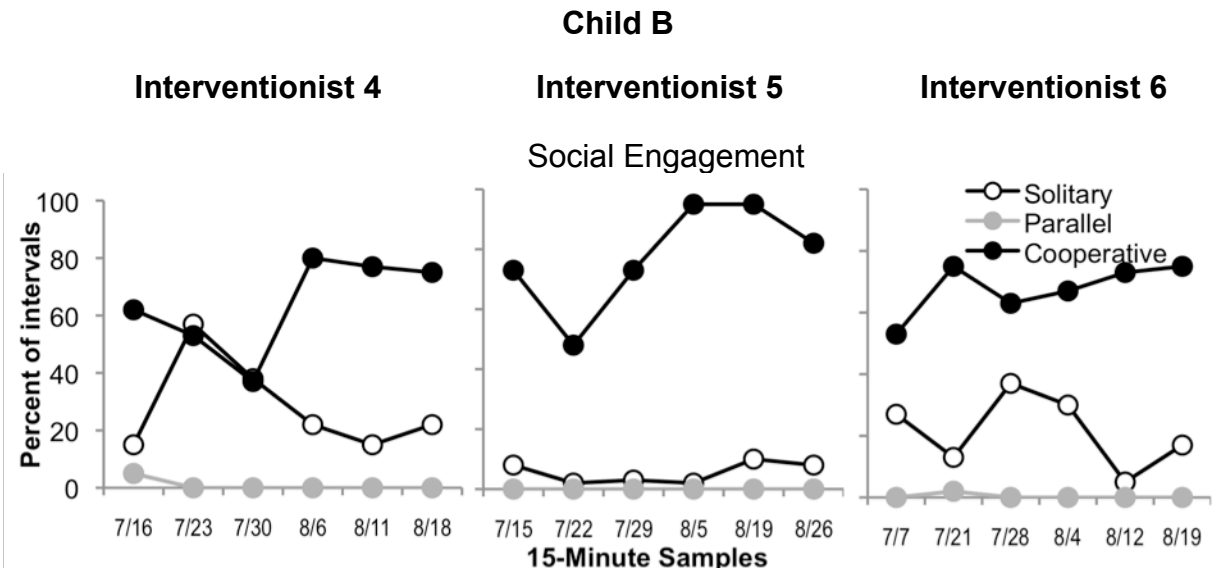

Figure 9. Child B engagement across interventionists.

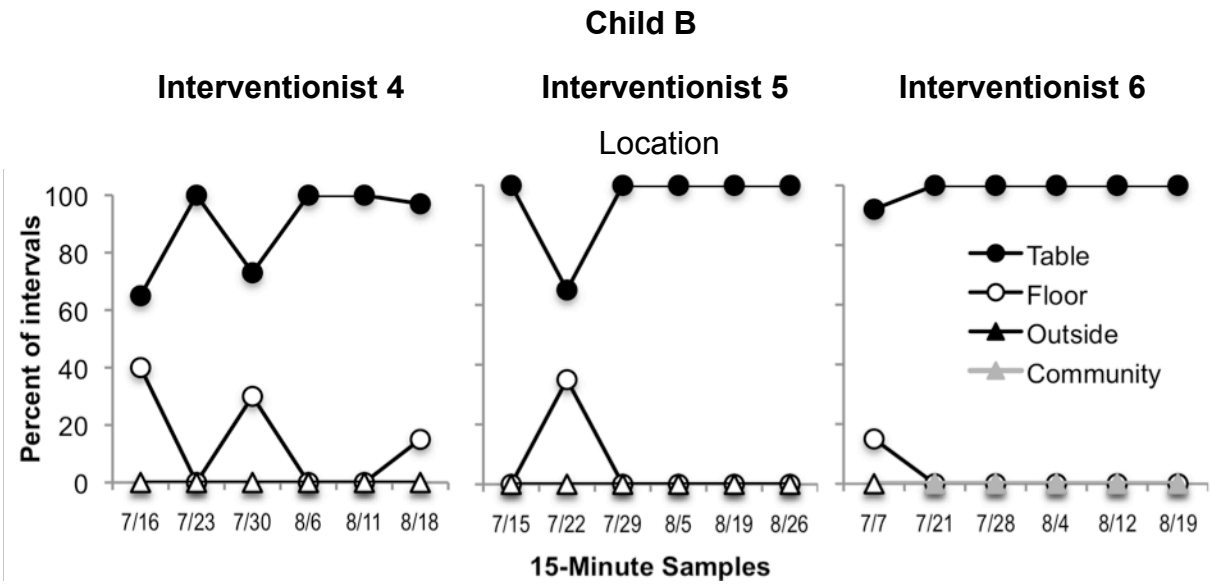

Figure 10. Child B location across interventionists.

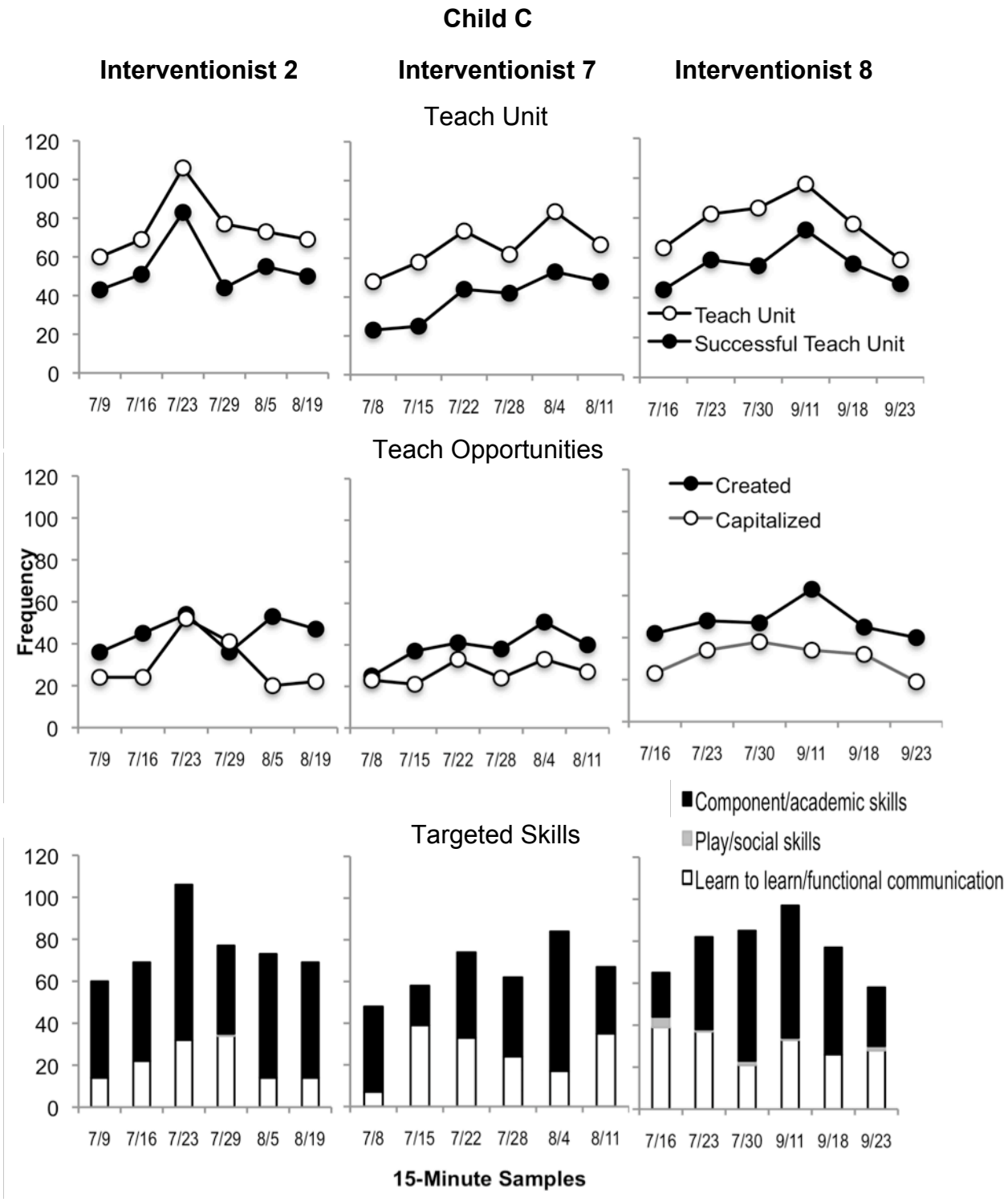

Figure 11. Child C teaching behavior across interventionists.

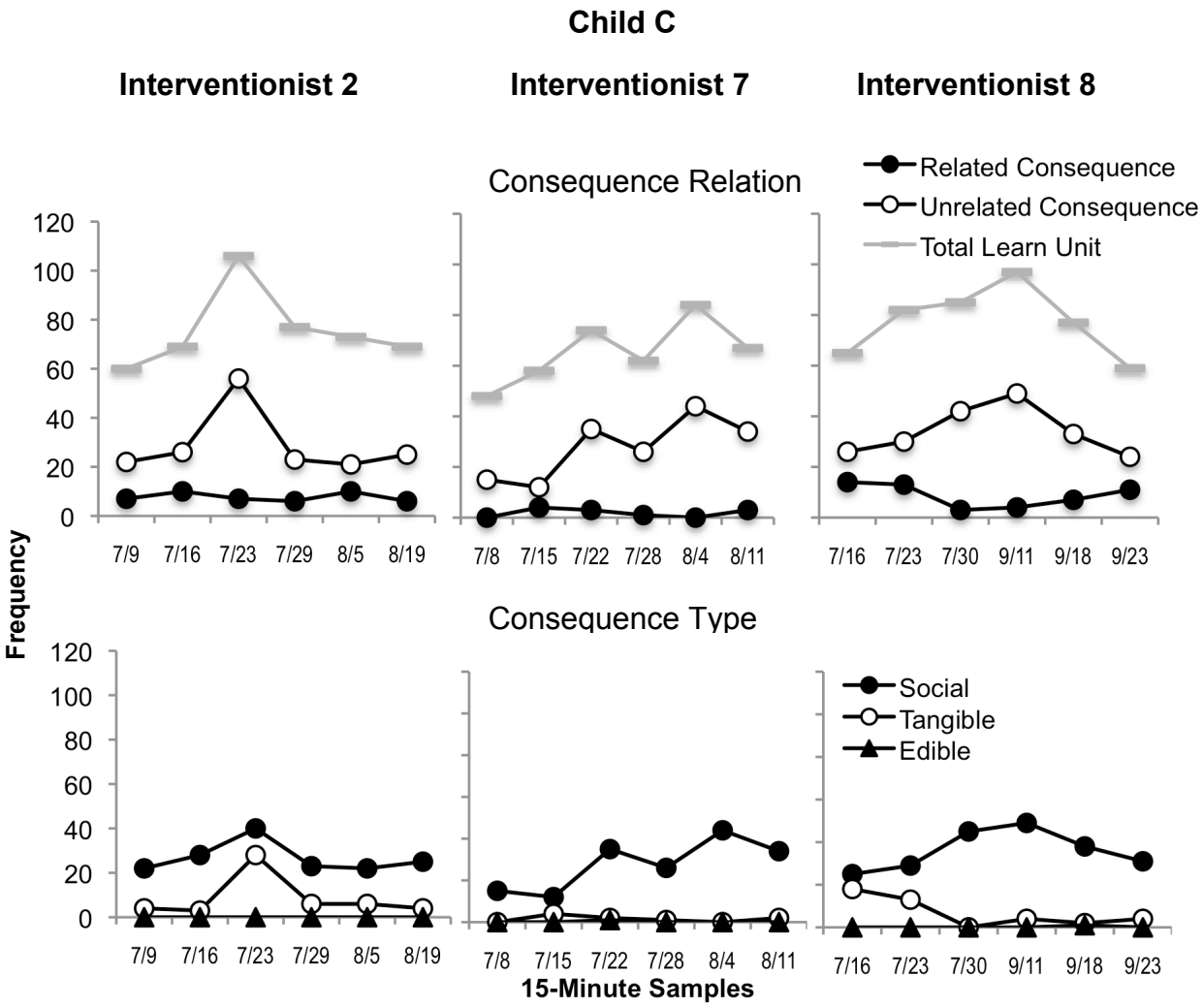

Figure 12. Child C consequences across interventionists.

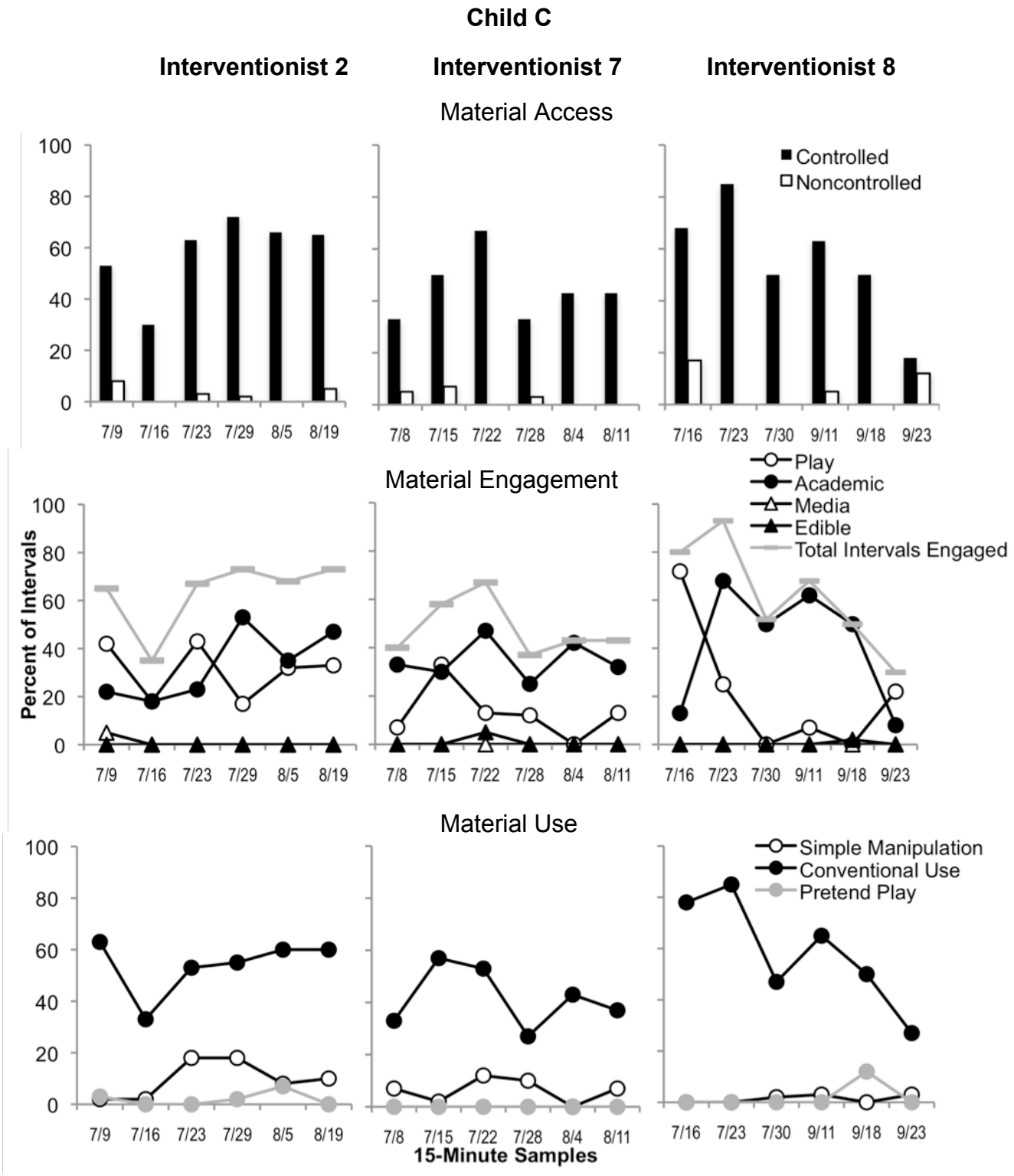

Figure 13. Child C materials across interventionists.

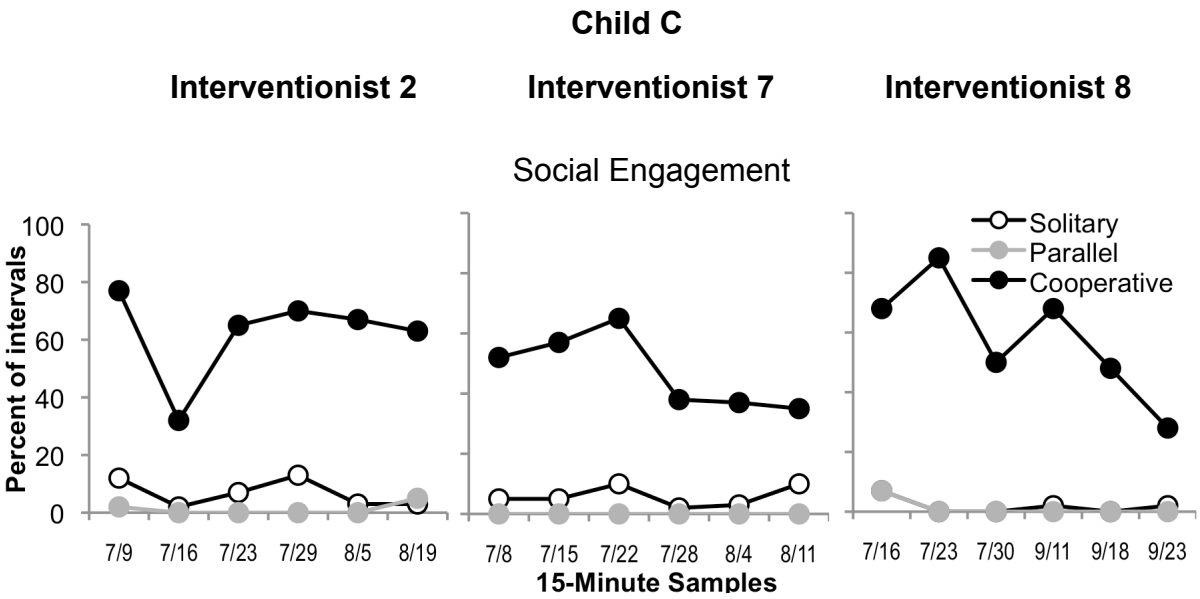

Figure 14. Child C engagement across interventionists.

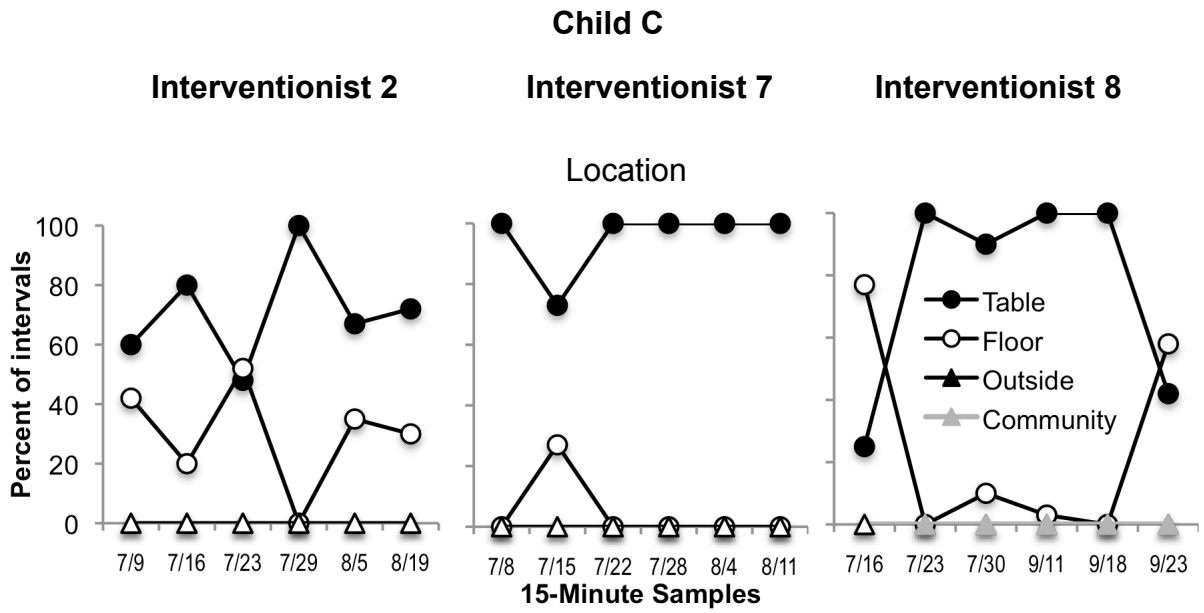

Figure 15. Child C location across interventionists.

Table 1

Suggested Variables Responsible for Change

Reference	Suggested Variables Responsible for Change
Wolf, Risley, & Mees (1964)	• **Procedure** – Behavioral: mild punishment, extinction, shaping, differential reinforcement • **Intensity –** not specified • **Curriculum** – reduction of problem behavior (tantrums, bedtime problems, and throwing glasses) and increase duration of wearing glasses, language and communication • **Formats** – intervention conducted in a hospital setting and in home, consequences for desired behavior included the door being opened to his room, edibles, and tangible
Lovaas, Koegel, Simmons, & Long (1973)	• **Procedure** – Behavioral: increase the behavior by reinforcing it, then only reinforce it after it occurs within 5 seconds of the model, tighten the accuracy by reinforcing closer approximations, then add new target (use of contingent reinforcement withdrawl, contingent aversive stimulation, reinforcement of incompatible behavior) • **Intensity** – not specified • **Curriculum** – language training, self-help and social skills training • **Formats** – in clinic, mostly language based programs, primary reinforcers used
Fenske, Zalenski, Krants & McClannahan (1985)	• **Procedure** – Behavioral: 30 minute classes with a change of activity, room, and teacher after each class • **Intensity** – early age at entry, 30 hours a week of treatment • **Curriculum –** language and communication skills, play, social skills, academics, learn-to-learn skills, and reduction in non-desired behaviors • **Formats** – in clinic; day school and treatment program, parent training, individualized transition programming, follow up services
Anderson, Avery, DiPietro, Edwards, & Christian (1987)	• **Procedure** – Behavioral: Discrete trial training (prompt, response, consequence) • **Intensity –** 15-25 hours per week • **Curriculum** – parents and therapists developed training objectives in language, behavioral, self-help, motor/play, preacademic, and social skill areas • **Formats –** in home setting
Lovaas (1987)	• **Procedure** -Behavioral: Lovaas et al., 1980 –use of task analysis, selecting rewards and punishment and their use, shaping, prompts and prompt fading, discrete trial format (teacher instruction-child response-consequence, 1-20 trials per minute) • **Intensity** – 40 hours per week • **Curriculum** – Target areas include – building compliance to requests, imitation, toy play, expressive and abstract language, peer play, pre-academics, emotions • **Formats** – instruction in home, school and community,

(*table continues*)

Table 1 (*continued).*

Harris, Handleman, Gordon, Kristoff, & Fuentes (1991)	• **Procedure** –Behavioral: incidental teaching and discrete trial training • **Intensity** - 20-30 hours per week • **Curriculum** – Language intensive program • **Formats –** Preschool format clinic based,
Brainbrauer & Leach (1993)	• **Procedure** – Behavioral: 10 to 20 trials conducted depending on child's responding. After 3 correct responses the task was terminated and the child could play • **Intensity –** 24-38 months of age at entry, approximately 20 hours per week • **Curriculum** – compliance training, imitation, object discrimination, and communication – designed by program coordinator and mother • **Formats** – in-home setting with trips to places in the community
McEachin, Smith, & Lovaas (1993)	• **Procedure** – Behavioral: (Lovaas et al., 1980) • **Intensity** – 40 to 46 months of age at intake, 40 hours per week • **Curriculum** – Follow up from curriculum used in Lovaas, (1987) • **Formats** – in home, school and community settings
Sheinkopf & Siegel (1998)	• **Procedure** – Behavioral: (Lovaas et al., 1980), discrete trial format (prompt-response-reinforcing stimulus • **Intensity** – 10-20 hours per week • **Curriculum** – receptive language, nonverbal imitation, nonverbal problem solving, expressive language, pre-academics, play and social skills • **Formats** – school setting, mild aversives used
Koegel, Koegel, Harrower, & Carter (1999)	• **Procedures** - Behavioral: Pivotal response intervention (discrete trial format (prompt-response-reinforcing stimulus) with motivational factors (child choice, reinforcing attempts, interspersing maintenance, natural and direct reinforcers, and response to multiple cues)) • **Intensity** – 3-4 years of age at onset, • **Curriculum** – communication, initiations, self-help, academic, social, and recreational skills • **Formats** – in clinic, home and school, use of child choice, reinforcing consequences, use of toys or other materials found in the child's natural environment to teach

(table continues)

Table 1 (*continued).*

McGee, Morrier, & Daly (1999)	• **Procedures** – Behavioral: incidental teaching (child initiated, environmental arrangement, prompting, errorless instruction, instruction for language shaping) • **Intensity –** 15-30 months of age at onset, 50 hours per week of engaged time • **Curriculum** – verbal expressive language, engagement with toys, social responsiveness to adults, social tolerance/imitation of peers, independence in daily living, • **Formats –** in home and in clinic, use of consequences related to the response of the child
Weiss (1999)	• **Procedures** –Behavioral: instructional demands insterspersed with free play, discrete trial format with 5-20 trials in a block, skills introduced in isolation, prompting occurred after 2 incorrect responses, mastery was after 90% correct across 2 instructors across 2 sessions • **Intensity** – 40 hours per week • **Curriculum** – nonverbal imitation, object manipulation, identical object matching, receptive commands, receptive labels, verbal imitation, expressive labels, social questions • **Formats** – in home setting
Smith, Groen, & Wynn (2000)	• **Procedures** –Behavioral: (Lovaas et al., 1981), discrete trial teaching and some naturalistic instruction • **Intensity** – 18-24 months of age at onset, 30 hours per week • **Curriculum** – communication, instruction following, toy play, self-help • **Formats** – in home and school settings
Bibby, Eikaseth, Martin, Mudford, & Reeves (2001)	• **Procedures** – Behavioral: (Lovaas et al., 1981), discrete trial format • **Intensity** – 30-40 hours per week • **Curriculum** – not specified • **Formats** – in home setting
Eikaseth, Smith, Jahr, & Eldevik (2002)	• **Procedures** – Behavioral: (Lovaas et al., 1981), shaping, chaining, discrimination training, contingency management, without the use of aversives • **Intensity** – 4-7 years of age at onset, 20-30 hours per week • **Curriculum** – responding to requests, verbal and nonverbal imitation, labeling objects, identifying actions, abstract concepts, conversation skills, social skills and toy play (functional, parallel, pretend, cooperative) • **Formats** – in school setting

(*table continues)*

Table 1 *(continued).*

Stahmer & Ingersoll (2004)	• **Procedures** – Behavioral and Developmental: incidental teaching, pivotal response training, discrete trial training, structured teaching, floor time, PECS, sign language • **Intensity** – 28 months of age at onset, 15 hours per week • **Curriculum** – play skills, self-help, social skills, language skills, communication • **Formats** – in school setting, appropriate toys for different levels of play (pretend, gross motor, manipulative, etc)
Howard, Sparkman, Cohen, Green, & Stanislaw (2005)	• **Procedures** – Behavioral: 50-100 learning opportunities per hour in discrete trial and incidental teaching techniques • **Intensity** – under 3 years received 25-30 hours per week, over 3 years received 35-40 hours per week • **Curriculum** – individual goals and programs were created to match each child's deficits • **Formats** – in home, school, and community settings
Sallows & Graupner (2005)	• **Procedures** –Behavioral: (Lovaas et al., 1981), without the use of aversives • **Intensity** – 24-42 months at onset, 40 hours per week • **Curriculum** – not specified • **Formats** – in clinic setting
Cohen, Amerine-Dickens, & Smith (2006)	• **Procedures** – Behavioral: discrete trial instruction (trial blocks of 3-8 trials followed by a break), shaping through positive reinforcement of successive approximations, systematic prompting and fading, discrimination learning, task analysis • **Intensity** – 30-45 hours per week • **Curriculum** – communication, play, language, social skills, • **Formats** – in home, clinic, and community settings, consequences include edibles, tangible, and social
Reed, Osborne, & Corness (2007)	• **Procedures** –Behavioral: 8-14 tasks which lasted 5-10 minutes each followed by a 5-10 minute break, discrete trial format • **Intensity** – 2-4 years of age at onset, 20-40 hours per week • **Curriculum** –"Lovaas itervention" (Lovaas, 1987) or Verbal Behavior (Sundberg & Michael, 2001) programs • **Formats** – in home setting, consequences include edible, social and activities

(table continues)

Table 1 *(continued).*

Remmington et al. (2007)	• **Procedures** –Behavioral: discrete trial procedures with elements of naturalistic instruction and verbal behavior • **Intensity** – 30-42 months of age at entry, approximately 25 hours per week • **Curriculum** – language, motor, and social skills targeted • **Formats** – in home setting
Zachor, Ben-Itzchack, Rabinovich, & Lahat (2007)	• **Procedures** –Behavioral: discrete trial teaching, naturalistic instruction, and incidental teaching techniques. Skills were broken into units and were taught as separate tasks • **Intensity** – 35 hours per week • **Curriculum** – imitation, receptive and expressive language, joint attention, non-verbal communication, pre-academic skills, play, fine motor, adaptive living skills • **Formats** – center-based setting

Table 2

List of Child Participants and Skill Level

Child	Age	Family	Learning Targets
A	3 years	Only child living with his mother in an apartment and spending some weekends with his father	Sign language, PECS, and the beginning of speech sounds. Learn-to-learn skills such as imitation, instruction following, and component training.
B	5 years	Living in a house with both parents and 2 siblings. One twin with a diagnosis of autism and an older brother with a diagnosis of autism.	Functional communication targets starting with eye contact and the beginning of vocals. Other targets focus on imitation, instruction following, and receptive language.
C	4 years	Eldest sibling living in a house with both parents and an 18 month old sister.	Echolalic speech with utterances from 3-5 words. Targets included expressive language, and pre-academic skills such as counting and letter sounds.

Table 3

List of Interventionist Participants and Experience

Interventionist	Age	Experience
1	28 years	0 autism and applied behavior analysis experience with a background in speech and language
2	24 years	5 years direct autism and applied behavior analysis experience, 2 years of behavior analysis graduate course work
3	26 years	6 mos. Direct autism experience, 4 years experience with behavior analysis in undergraduate and graduate course of study
4	25 years	5 years direct autism and applied behavior analysis experience, 5 years behavior analysis experience in undergraduate and graduate course work
5	23 years	4 years direct autism and applied behavior analysis experience, 4 years experience in behavior analysis undergraduate and graduate course of study
6	27 years	2 years of autism experience in a special education program with some applied behavior analysis
7	24 years	1 month of direct autism and applied behavior analysis experience. 4 years of behavior analysis experience in undergraduate study
8	30 years	7 years direct autism and ABA experience. 2 years of behavior analysis experience in a graduate course of study

Table 4

Teaching Behavior Response Definitions

Measure	Brief Definition	Responses
Opportunities	The type of learning opportunity	• Created – the interventionist sets up a learning opportunity • Capitalized – the interventionist capitalizes on a child initiated opportunity
Responsive Model	Whether the gave a model that was responsive to the child's skill level	• Responsive model – a model that was responsive to child skill and previous responding • Non-responsive model – a model not responsive to skill and previous responding
Responsive Consequence	Whether the interventionist gave a consequence that was responsive to the child's skill level	• Responsive consequence – a consequence that was responsive based on child skill level and previous responding • Non-responsive consequence – a consequence that was not responsive based on child skill level and previous responding
Targeted Skills	The skill set being targeted during a learning opportunity	• Learn-to-learn – imitation, matching, instruction following • Functional communication – requesting, protesting • Component language – receptive skills, expressive labeling • Language skills – commenting, responding, question asking • Play and leisure – skills associated with play • Social skills – skills associated with interacting with others • Academic skills – reading, writing, math • Attending –nice sitting, looking, listening • Self-help – toileting, dressing, feeding
Consequence Relation	Whether the consequence was related or unrelated to the response	• Related – a consequence with direct relation to the response. EX: getting bubbles after saying "buh" • Unrelated – a consequence with no relation to the response. EX: getting candy for correct matching

(table continues)

Table 4 *(continued).*

Consequence Type	The type of consequence the child received	• Social – social consequence such as tickles, praise, high 5s etc. • Tangible – a consequence of an item such as a toy • Edible – a consequence that is consumed such as candy or juice
Expansions	The interventionist expanding on a vocal statement of the child	An expansion was scored if the therapist expanded on a vocal response of the child

Table 5

Engagement Response Definitions

Measure	Brief Definition	Responses
Material Type	Category of material the child is engaged with	• Play – items used for play without academic purpose • Academic – items used to teach academic skills, can be toys • Media – television or movies • Edible – items that the child eats or drinks
Material Access	Who controlled access to material	• Controlled – the interventionist controlled access to the material • Non-controlled – the child initiated access to the material
Material Use	How the material is being manipulated	• Simple manipulation – engaging in ways that were not intended by the designer • Conventional use – engaging as the designer intended • Pretend play – finding a new use for the toy that is not simple or conventional
Social Engagement	The interaction type between interventionist and child	• Solitary – the interventionist and child are not interacting • Parallel – engaged in a similar activity with no interaction • Cooperative – engaged in the same toy or activity together
Location	Where instruction took place	• Table • Floor • Outside • Community

Table 6

Interobserver Agreement for Teaching Behaviors

Behavior	**1**	**2**	**3**	**4**	**5**	**6**	**2**	**7**	**8**
Created	97%	95%	90%	97%	93%	92%	90%	100%	100%
Capitalized	97%	97%	95%	86%	94%	100%	100%	97%	97%
Responsive Model	96%	100%	95%	92%	95%	93%	93%	99%	99%
Responsive Consequence	96%	96%	93%	100%	91%	100%	93%	98%	98%
Related Consequence	100%	92%	83%	100%	100%	100%	100%	100%	100%
Unrelated Consequence	100%	95%	94%	96%	88%	100%	95%	91%	91%
Repeated Trial	96%	90%	93%	91%	92%	95%	100%	100%	100%
Expansion	100%	100%	100%	100%	100%	100%	100%	100%	100%
Social	90%	93%	93%	93%	94%	100%	95%	91%	91%
Tangible	100%	94%	88%	100%	93%	90%	100%	100%	100%
Edible	100%	100%	100%	100%	100%	100%	100%	100%	100%
Learn to learn	100%	94%	100%	94%	100%	92%	100%	100%	100%
Functional Com.	100%	100%	92%	96%	96%	100%	100%	100%	100%
Component Lang.	100%	100%	100%	100%	100%	100%	100%	98%	98%
Language Skills	100%	92%	100%	100%	100%	100%	100%	92%	92%
Play Skills	100%	100%	100%	100%	100%	100%	100%	100%	100%
Social Skills	100%	100%	100%	100%	100%	100%	100%	100%	100%
Academics	100%	100%	100%	100%	100%	100%	100%	100%	100%
Attending	100%	93%	100%	88%	83%	100%	100%	100%	100%
Self-help	100%	100%	100%	100%	100%	100%	100%	100%	100%
Teach Unit	100%	99%	92%	93%	96%	94%	94%	99%	99%
Successful Teach Unit	100%	100%	93%	94%	91%	93%	100%	96%	96%

Table 7

Interobserver Agreement for Engagement

Behavior	**1**		**2**		**3**		**4**	
First column – agree occur, Second column – agree non-occur								
Play Materials	100%	100%	100%	100%	92.3%	97.8%	100%	100%
Academic Materials	100%	98.1%	100%	100%	100%	100%	100%	100%
Media	100%	100%	100%	100%	100%	100%	100%	100%
Edible Materials	100%	100%	100%	100%	100%	100%	100%	100%
Controlled Access	100%	98.1%	97.4%	100%	92.3%	97.9%	100%	100%
Non-controlled Access	100%	100%	100%	98.3%	100%	100%	100%	100%
Solitary	100%	100%	87.5%	100%	86.7%	100%	95.7%	97.3%
Parallel	100%	100%	100%	100%	100%	100%	100%	100%
Cooperative	100%	98.1%	100%	93.9%	98.3%	92.9%	100%	97.4%
Simple Manipulation	100%	100%	88.9%	98.0%	100%	100%	93.1%	100%
Conventional Use	100%	98.1%	93.9%	92.6%	100%	100%	100%	100%
Pretend Play	100%	100%	100%	100%	100%	100%	100%	100%
Table	100%	100%	100%	100%	100%	100%	100%	100%
Floor	100%	100%	100%	100%	100%	100%	100%	100%
Outside	100%	100%	100%	100%	100%	100%	100%	100%
Community	100%	100%	100%	100%	100%	100%	100%	100%
Percent Engaged	90.9%		100%		93.3%		100%	

(table continues)

Table 7 *(continued).*

Behavior	**5**		**6**		**2**		**7**	
First column – agree occur, Second column – agree non-occur								
Play Materials	91.7%	97.2%	96.6%	96.8%	100%	100%	100%	100%
Academic Materials	92.9%	100%	100%	95.7%	100%	93.5%	100%	89.4%
Media	100%	100%	100%	100%	100%	100%	100%	100%
Edible Materials	100%	100%	100%	100%	100%	100%	100%	100%
Controlled Access	100%	100%	100%	95.8%	97.4%	95.5%	100%	86.7%
Non-controlled Access	100%	100%	100%	98.2%	100%	98.3%	100%	100%
Solitary	98.2%	100%	100%	97.7%	100%	100%	100%	100%
Parallel	93.2%	100%	100%	100%	100%	100%	100%	100%
Cooperative	100%	100%	100%	93.5%	100%	95.5%	97.1%	84.6%
Simple Manipulation	100%	96.9%	84.6%	97.1%	100%	98.0%	100%	100%
Conventional Use	100%	96.4%	100%	91.3%	100%	96.4%	100%	84.6%
Pretend Play	100%	100%	100%	100%	100%	100%	100%	100%
Table	100%	100%	100%	100%	100%	100%	100%	100%
Floor	100%	100%	100%	100%	100%	100%	100%	100%
Outside	100%	100%	100%	100%	100%	100%	100%	100%
Community	100%	100%	100%	100%	100%	100%	100%	100%
Percent Engaged	100%		96%		100%		90.2%	

(table continues)

Table 7 *(continued).*

Behavior	**8**	
	First column - agree occur, Second column - agree non-occur	
Play Materials	100%	100%
Academic Materials	100%	100%
Media	100%	100%
Edible Materials	100%	100%
Controlled Access	100%	100%
Non-controlled Access	100%	100%
Solitary	97.3%	91.3%
Parallel	100%	100%
Cooperative	97.4%	89.5%
Simple Manipulation	100%	100%
Conventional Use	97.4%	90.5%
Pretend Play	100%	100%
Table	100%	100%
Floor	100%	100%
Outside	100%	100%
Community	100%	100%
Percent Engaged	97.6%	

APPENDIX A

OBSERVATION CODE

Monitoring Treatment Fidelity: Quantity and Quality

Observation Code

Adapted from the Family Connections Observation Code

DRAFT

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Scoring Instructions

Converting to percent of intervals:

After viewing a video and tallying the total number of intervals (interval recording data sheet) in which each behavior occurred, divide the total number of intervals in the video (see interval guide on each data sheet) by the total number of intervals in which the behavior occurred and multiply by 100 to convert the raw data to percentage of intervals (e.g. if cooperative play occurred in 17 intervals in a 5 min clip [30 intervals], complete the calculation 17 divided by 30 = .56666 (.57) X 100 = cooperative play occurred in 57% of intervals. Make sure to round each decimal to the nearest hundredths place value. Write the percentage of intervals (57%) right next to the raw data score on the data sheet and circle it.

Interval Scoring Instructions:

Score an "X" through the entire interval cell if the child (social play, activity engagement, &/or social connections) or interventionist (interventionist affect &/or social connections) is not on the tape at all during the 15 s interval OR if the view is blurred or obstructed in some way in which the child and/or interventionist is not able to be clearly seen.

Material Engagement

Instructions: Mark the corresponding letter with the occurrence of **all** types of material engagement (i.e. play, instructional, media, and edible) occurring within engagement episodes (*Material Type*). Material engagement can occur at any point during the 15-second intervals in order to mark the corresponding letter. List the material item or group (class) of items the child engaged with within each episode of engagement within the interval where the episode began (*Material Item*). Place an "X" in the interval where the episode was completed. More than one item or group of items can be engaged with at the same time. List all items or combination of items in corresponding interval where the engagement episode began. When the engagement episode is competed specify with which item (e.g. "X (blocks)"). Total the duration of 15-second intervals where any engagement episodes occurred and where the varying types of engagement episodes occurred (*Duration of Material Engagement Episodes*). **DO NOT mark interval if the child is not engaged (black out) **

General Behavior Definitions

Teach Unit

(Event Recording)

Arranging Teaching Opportunities (creat./capt.)

Interventionist creates and/or capitalizing on a teaching opportunity by controlling or

withholding access to events in the environment. The interventionist creates or contrives a teaching opportunity by arranging the environment to promote the child's interest in events that the interventionist can control access to.

Examples include but are not limited to: interventionist presenting events to the child while maintaining control; interventionist placing preferred materials out of reach; interventionist giving inadequate food/drink portions to the child; interventionist offering choices; interventionist setting up events that require assistance from the interventionist; interventionist setting up a block or an aversive event; interventionist asking a question or making a comment.

Non-examples include but are not limited to: interventionist giving item to child non-contingently; interventionist giving entire container of desired food item to child (french fries, gold fish); all desired toys accessible to child; interventionist saying "hey honey do you want this?" and then giving it to him.

Responsive Model Delivery (M+/M-)

An appropriate adjustment of a model when compared with a previous model delivery.

Examples include but are not limited to; interventionist did not originally deliver a vocal model, but later delivers a vocal model, it would be considered a responsive model because it was adjusted compared to the first model (lack of vocal model); interventionist waits 2 seconds to delivery the next model when the previous model delivery occurred within 1 second of no response, it would be considered a responsive model because it was adjusted compared to the first model (shorter latency); interventionist slowly moves toy upward toward his face to model where the child should look when working on eye contact; interventionist adjusts

placement of a toy (moves it closer or farther away) when child stops crawling towards it

Non-examples include but are not limited to: interventionist didn't originally deliver a vocal model and later still doesn't deliver a vocal model; interventionist waits 2 seconds originally and later waits 2 seconds again; giving the same model--interventionist says "ball" and then says "ball" again without breaking the word down.

Responsive Consequence Delivery (R+/R-)

Interventionist adjusts reinforcer delivery based on closer approximation, previous responding, and desirability of event being delivered. Following a trial, if no consequence is delivered and the trial is repeated score as a Repeated Trial (*).

Examples include but are not limited to: interventionist delivers bubbles when child says, “buh” following a vocal model “buh;” interventionist gives child juice following an instance of communicative eye contact when juice was removed.

Non-examples include but are not limited to: interventionist gives item to child when child turns away; interventionist gives item to child when child begins to whine/tantrum; child reaches for item, gives eye contact, and interventionist does not give item to child.

Relation of Consequence

Whether the consequence was related or unrelated to the response.

Related Consequence (RC)

A consequence with a direct relation to the response.

Examples include but are not limited to child gets bubbles after saying “buh” for bubbles; interventionist gives child a chip after the child says “chip;” child gets to play with blocks after requesting to play with the blocks.

Non-examples include but are not limited to child correctly matches a picture and interventionist says, "Good job matching!" and gives child some juice; child asks to play with blocks and interventionist does not give access to blocks.

Unrelated Consequence (UC)

A consequence with no relation to the response.

Examples include but are not limited to child getting an M&M for correct matching; child labels picture correctly and interventionist gives child some chips; interventionist says, "Great job looking at me!" after child looks at interventionist

Non-examples include but are not limited to child gets bubbles after saying "buh" for bubbles; interventionist gives child a chip after the child says "chip;" child gets to play with blocks after requesting to play with the blocks. …

Type of Consequence

The type of consequence the child receives.

Social (S)

A social consequence such as tickles, praise, and high fives.

Tangible (T)

A consequence of an item such as a toy.

Edible (Ed)

A consequence that is consumed such as candy.

Expansion of Child Initiations (E+/E-):

Interventionist accepts a child initiation and then interventionist immediately adds/participates in and additional sequence within the same pattern, activity, or vocalization while delivering access. Delivering access includes providing materials/activity related to a vocalization that was inaccessible prior to the initiation; or providing continued access to materials/activity that the child was engaged with at the time a non-vocal play sequence was initiated.

Examples include but are not limited to the child saying "vvv" in the presence of the tv, mom says "video," and provides access to a video. Child is looking at a book and touches a flap, mom lifts flap up and the child continues to look at the book.

Non-examples include but are not limited to child points to ball and interventionist labels it; child reaches for bear on top shelf and interventionist prompts him to say "b"; interventionist and child count blocks as they stack them; interventionist presents an imitation task during play

Learning to learn

Teaching skills that prepare an individual for further learning through providing a foundation in which other skills or teaching procedures are based, facilitating a positive relationship between student and interventionist, the development of attending skills, or increased awareness of the environment (Adapted from Leaf & McEachin, 1999)

Examples include but are not limited to:

- Gross/Fine Motor Imitation
- Object/Play Imitation
- Vocal Imitation
- Instruction following/compliance
- Matching
- Joint attention
- Attending
- Responsivity to reinforcement

Functional Communication Training

Withholding access to a desired item or event until the child emits the required communicative response (e.g. eye contact, gesture, or vocal approximation). Successive approximations to a target response (e.g. verbal label for desired item, "Oreo cookie") should be required (Adapted from Durand & Carr, 1992)

Examples include but are not limited to:

- Request training
- Protests

Component Language Skills

Teaching skills that will build a foundation for language and a means for communicating and interacting with others around them (Adapted from Leaf & McEachin, 1999)

Examples include but are not limited to:

- Receptive labels
- Expressive labels

Language Skills

Treatments designed to increase any of a wide range of communication skills, including the comprehension, production, content, and use of language (Adapted from Goldstien, 2002)

Examples include but are not limited to:

- Question asking
- Commenting (descriptions)
- Responding
- Comprehension
- Say imitation
- Negation
- Sentence structure
- Grammar
- Syntax
- Pragmatics
- General knowledge
- Reasoning
- Temporal concept

Play & Leisure Skills

Active engagement and interaction with an object or in an activity that appears to be intrinsically motivated, spontaneously performed, flexible and accompanied by positive affect (Wolery & Baily, 1989)

Examples include but are not limited to:

- Expanding activities and interests
- Play engagement/simple manipulation
- Pretend/dramatic play
- Indoor/outdoor leisure activities

Social Skills

Instructional or reinforcement procedures designed to increase skill, frequency, or quality of social behavior (McConnell, 2002), defined as: reciprocity, initiated interactions, maintenance of eye contact, ability to share enjoyment, empathy, ability to infer interests of others (APA, 2000)

Examples include but are not limited to:

- Reciprocity
- Peer interactions
- Conversation
- Social awareness

Academic Skills

The instruction of basic skills of reading, writing, and arithmetic and the range of cognitive and problem-solving activities that involve these basic repertoires (Dunlap, Lee, & Worcester, 2001)

Examples include but are not limited to:

- Reading
- Writing
- Math
- Spelling

Attending

Favorable learner behaviors that the interventionist capitalizes on.

Examples include but are not limited to:

- Good sitting
- Quiet feet, hands, and/or mouth

Self Help

Teaching skills that promote independence (e.g. dressing, eating, hygiene) for an individual throughout his or her lifespan through the individualized goals an methods that break down skills in to small steps and using objects or pictures to communicate step sequence as

necessary, provide frequent practice, and clearly reinforce the completion of a desired behavior (Shea & Mesibov, 2005)

Examples include but are not limited to:

- Eating
- Dressing
- Grooming
- Toileting
- Daily living
- Community
- Vocation

MATERIAL ENGAGEMENT

(Interval Recoding)

Material Item

Any item that the child has an engagement episode with for 5 seconds or longer. Discrete trials will still be scored even if shorter than 5 seconds.

Engagement Episode

The child is differentially attending (e.g. looking in the direction of, talking about) in the direction of particular stimuli for 5 seconds or more. Edibles are the only exclusion to the 5 seconds, any ingestion counts as engagement.

Examples of materials contacted include but are not limited to: Touching "blocks", building with a "peg board", moving "figurines", holding "dolls", pushing "vehicles", jumping on the "trampoline", dipping hands into the "bean bin", moving props for play themes such as play "food" and utensils, "puppets", playing in a pretend "kitchen"; looking at "flashcards" or picture "cards", looking at a "book", playing with animals, a tractor, and a "barn" set, eating "chips"; dancing to "music"; looking in the direction of "candy"; flapping a "flashcard" in front of his/her face; spinning the wheels on a "car" around and around; imitating with "object imitation stimuli"

Non-examples include but are not limited to touching other individuals with their body parts; touching a door knob or cabinet to open or close the door; brushing the side of the table while passing by to access other materials.

Duration of Material Engagement Episodes

Record each interval where the child is at any point engaged with a given material item (see above), oriented or engaging in some sort of attending response (e.g. looking, touching). The duration of an engagement episode begins with some kind of attending response in the direction of the item and ends with a differential response not directed towards the item.

TYPE OF MATERIAL

(Interval Recording)

Play Material (P)

An engagement episode involving stimuli that are considered a conventional play material.

Examples include but are not limited to: stacking blocks, manipulating toy figurines, looking at a person reading a book continuously, looking at a book with another person and commenting with no specific demands being placed; a child puts lotion on hands and rubs them together continuously; a child engages the Velcro part of a diaper continuously

Non-examples include but are not limited to: looking in the direction of flashcards, looking at a person reading a book and asking questions about it, rolling a car across the ground following an imitative model

Academic Material (A)

An engagement episode with stimuli that are typically considered an academic material or when items that are typically considered play materials are used in an instructional arrangement.

Examples include but are not limited to: looking at flashcards, looking at a book during instruction, manipulating blocks during imitation instruction, a child pretends to walk the girl across the play set used within imitation instruction (e.g. "do this") (mark "I" for instructional material) and then begins to play with the girl,

unprompted, in a novel manner by sliding her down the slide (mark "P" for play material); a child looks at a book and is asked to comment on pictures within the book by an interventionist; a child presses a key on an augmentative device more than 3 times within one 15 second interval to request a Cheeto.

Non-examples include but are not limited to: stacking blocks in play, playing with dolls or figurines, toy cars across the ground, jumping on a trampoline, playing with dried beans in a tub, puppets, pretending to cook in a play kitchen, a child puts lotion on hands, rubs it in, and stops.

Edible (E)

An engagement episode with stimuli that are edible. Edible is scored when the child initially puts it in their mouth.

Examples include but are not limited to: the child is looking at the interventionist holding up chips and cookies, the child sucks on a sucker, the child eats a few pieces of popcorn

Non-examples include but are not limited to: The child is playing with cars on the floor. Another person grabs some pretzels and says, "You want some?" The child says "No thanks."; There are chips and a board game sitting on the table. The child plays with the board game and does not direct any attention to or make contact with the chips at any time.

Media (M)

An engagement episode with electronic stimuli (e.g. computer, TV, video game).

Examples include but are not limited to: the child is looking in the direction of the TV (even though it is turned off) for 3 seconds; the child is looking in the direction of the computer for 23 seconds, looks up at another person for 2 seconds and then returns his/her gaze to the computer screen; the child is looking at the TV for 15 seconds and the child requests to go up in the interventionists arms and "dances" with the interventionist to the music on the TV (looking at the TV the majority of the time).

Non-examples include but are not limited to: the child is engaged with a toy computer; the child glances at the TV for one second between looking out the window and looking in the direction of his/her play-doh.

ACCESS TO MATERIALS

(Interval Recording)

Instructions: Indicate the way that materials items involved within all engagement episodes were initially accessed within each 15-second interval. Following the interval where an engagement episode was initiated, mark controlled (C) or not controlled (N) for every following interval of an engagement episode based on how the material item (involved in that engagement episode) was initially obtained. **For the first interval scored do not mark C or N unless you observe the onset of the engagement episode**

Controlled (C)

Material items involved in an engagement episode were presented/provided in the last 5 seconds to the child by the interventionist.

Examples include but are not limited to: An interventionist and child are sitting at the table. The interventionist places table and the child looks at them and labels them; A child sees some stacking cups up on a high shelf and looks at the interventionist and gestures towards the cups. The interventionist gets the cups down and gives them to the child; The interventionist has a toy duck and places it on the floor in front of the child. The child grabs it from the floor immediately; the TV is paused, when saying "Dora" the interventionist presses play.

Non-examples include but are not limited to: A child initiates play with a farm set, the interventionist follows the child to play along with the child; a child goes and grabs a ball off the shelf and begins engaging with it; The interventionist was engaged with some blocks but then set them off to the side on the table. The child then grabs the blocks a few seconds later; The TV was turned on about 2 minutes prior a child is playing with blocks but then looks in the direction of the TV for 30 seconds.

Not Controlled (N)

Material items involved in an engagement episode were initially obtained by the child independently, and were not presented by the interventionist in the last 5 seconds

Examples include but are not limited to: A child grabs a train off the floor and rolls it down the track; The interventionist is playing with pretend food. The child initiated playing with pretend food along with the interventionist. The child is putting vegetables in a bowl, interventionist hands the child a pretend cob of corn; The child is collecting all of the fruit and putting them in a basket.; The interventionist tells the child to go get the barn, the child does and then starts to play with it; The child begins looking at the TV when it is not turned on.

Non-examples include but are not limited to: The interventionist models rolling a car saying "do this," and then hands the car to the child. The interventionist has an apple and withholds it until the child emits a vocal approximation for "apple."; the child is expressively labeling cards that the interventionist is presenting to the child.

SOCIAL ENGAGEMENT TYPE

(interval recording)

Solitary Play (I)

Child uses play materials independently not within teaching trials. The child may be in proximity to others however, no social interaction occurs (no initiations, responses, verbal exchanges, or interactions occur) within 5 seconds. The solitary play is not scored within teaching trials (e.g. not while interventionist is waiting for the response to occur within a trial).

Examples include but are not limited to: child has back toward mom and is stacking blocks while mom watches; Child looking at a book and is two feet away from interventionist who is building with blocks; child is looking at a book and sibling, one foot away, has back turned to child and is building with Lego's. The child is playing with the Weebles and the interventionist is talking to them but the child makes no response. The child watches the therapist play with a toy but does not engage with or talk about the toy with the therapist.

Non-examples include but are not limited to: child facing peer sitting 1 ft. away while one plays with Lego's and the other colors a picture; child is sitting at table across

from peers and says he does not want to play with them; child is popping bubbles while mom is blowing them.

Parallel Play (II)

Child is engaged in activities similar to another's, using common or similar materials and is within approximately 1 foot of other's body parts; no eye contact (looking at one another's faces and/or eyes) or social reciprocations occur within 5 seconds. (initiations may occur)

Examples include but are not limited to: Children sitting around a train track; child pushes train back and forth on one side of track and other child walks a toy animal down train track; children both sitting on floor playing with blocks; interventionist is pushing car into toy garage and child is putting figurines into another car on the other side of the toy garage; interventionist is touching the same toy as the child and says, "it's a ball," but the child does not look in the direction of the interventionist or make any verbalizations to the interventionist and does not accept any initiations from the interventionist.

Non-examples include but are not limited to children sitting at table eating snack talking about what they will do at recess; child is sitting on the floor reading a book and peers are sitting next to him playing with cars; child and peers are playing with cars while child has back to peers.

Cooperative Play (X)

Child is engaged in an organized play activity and exchanges, initiations, reciprocations, or interactions occur within that activity or theme.

Examples include but are not limited to: Children sitting around a train track; child pushes train back and forth on one side of track and hands a train to peer who takes it; children push a train back and forth to each other; child is pushing a train, peer says "I like your Thomas"; interventionist puts dolls in bed and child says "He is tired"; sibling hands child a dish of play food and says "here is your dinner", child takes the dish and pretends to eat; interventionist reading a book to the child and child is listening and looking at book.

Non-examples include but are not limited to: children sitting at table eating snack, not talking to one another; child gives coat to peer or adult while waiting to go outside; child and interventionist are playing with trains at the table, not looking at one another or talking to one another.

MATERIAL USE

(interval recording)

Instructions: When scoring play type determine which type of play the child is engaging in. Do not score the interval if the child does not engage with materials (e.g. touch, look at, or talk about materials).

Simple Play (S)
Child makes contact with materials and physically doing something with materials that is not according to conventional use, is repetitive, is not pretend play and does not appear to be a component of a conventional activity or play sequence.

Examples include but are not limited to: Banging materials together; picking up a toy car and shaking it; continuously digging through materials; twirling dolls clothes hanger; waving spoons in front of eyes; mouthing blocks; sliding door back and forth at church; kicking a pillow; child watching TV screen while the TV is not on; child just holding onto a frog puppet.

Non-examples include but are not limited to: banging on a drum; picking up a toy and shaking it while stating they are a monster and are attacking the toy; twirling a baton. Routine and Outing examples include but are not limited to: child twirls a fork in front of his face at a restaurant; child repeatedly places wood chips through the hole of a fence at the park. Routine and Outing non-examples include but are not limited to: child throws balls in the ball pit at McDonalds; child slides down the slide head first at the park; child chases a peer around the swing set at the park.

Conventional Play (C)
Child makes contact with materials according to conventional use or engages in an activity according to conventional actions related to the activity.

Examples include but are not limited to: Driving a truck; stirring with a play spoon in a play pot; squeezing balloon of blood pressure meter; turning knob on toy stove; pushing cars; putting together or taking apart legos; putting clothes on doll hanger; drawing with a marker; putting a puzzle together; eating at meal time; playing on outdoor equipment at McDonalds; pushing grocery cart at the store; brushing teeth; playing tickle game; playing patty cake-patty cake; singing with someone.

Non-examples include but are not limited to: climbing on shelves; jumping off of a trampoline and slapping the wall; chewing/biting on play food.

Pretend Play (P)

Child verbalizes (gesture, vocal, signs) the imaginative function and/or uses movements to indicate presence of absent object or to indicate a pretend use of an object or takes on a role in relation to the object or another person. Child's actions are also scored as pretend when supported by adult's or peer's vocalizations or verbalizations if they occur while or immediately after (e.g., up to 5 sec) the adult's or peer's vocalizations/verbalizations.

Examples include but are not limited to: Making a toy dinosaur talk; stirring a block in a bowl with a spoon; saying "I'm the mama, you be sister"; moving a toy fire extinguisher while making water noises; peer says "This is the doghouse" and child crawls under the table; on top of the climber and says “We are ready for takeoff”; hands mom the tooth brush and says “You be the dentist”; pretending a frog puppet is asleep.

Non-examples include but are not limited to: child saying “I hate you;” child banging one's body parts with objects; child putting object into electricity sockets.

CHILD LOCATION

(Interval Recording)

Table

Child sits or stands at or by the table

Examples include but are not limited to: child sits in chair at the table working on sorting task; child stands leaning on table; child gets up from the table and returns within 10 seconds

Non-examples include but are not limited to: child sitting on bed playing with car; child and interventionist sit together on the floor working on a puzzle

Floor

Child sits or stands on floor

Examples include but are not limited to: child lies on floor as interventionist tickles him/her; child walks zoo animals across the floor; child sits stacks blocks as he/she sits on floor; child stands in the middle of the room singing a song

Non-examples include but are not limited to: child stands at table; child sits on floor at the table; child leaves the table to get a toy and brings the toy back to the table within 10 seconds

Outside

Child is not in a building

Examples include but are not limited to: child plays in backyard; child rides bike around neighborhood; child eats lunch with interventionists on patio; child swings in park

Non-examples include but are not limited to: child plays in playroom; child looks out of bedroom window

Community

Child is out in his/her community

Examples include but are not limited to: child swings in park; child visits zoo with family; child sits in classroom; child goes to grocery store with mom; child attends parade; child swims at the local YMCA

Non-examples include but are not limited to: child plays in backyard; child visits grandmother; child plays with sibling at home

APPENDIX B

DATASHEETS

Child Name: _____ Date of Tape:_____ Time started:_____

Interventionist Name:_____ Date Scored:_____ Time stopped:_____

Scorer Name:_____ Observer: P 1

Interventionist and Child Intervention Goals (TU and STU)

Scoring instructions: Upon the interventionist creating or capitalizing on an opportunity, record the corresponding minute in the first column. Next, in the second record whether the interventionist created the opportunity (creat.) or captured the opportunity (capt.). In the fourth column circle either M+ for a responsive model non-responsive model. In the column labeled "target" circle the skill being targeted; L for learning to learn, FC for functional communication, CL for component lar for language skills, P for play and lesisure, S for social skills, A for academic skills, At for attending, and SH for self-help. In the sixth column circle R+ for a respor consequence or R- for a non-responsive consequence. Circle RC if the consequence was a related consequence or UC if the consequence an unrelated conseq social, and * if nothing followed the response or the opportunity was re-presented. In the seventh column circle E+ for an expansion or E- for no expansion.

mir	Opp.		RM		Target		RC		Conseq.	Conseq. Type			E		Teacher Totals:		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Creat:	Capt:	RM:
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	RC:	UC:	S:
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	S:	T:	Ed:
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-			
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Target Totals:		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Learn to Learn (L):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Functional Comm. (FC):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Component Lang. (CL):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Language Skills (LS):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Play and Lesisure (P):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Social Skills (S):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Academic Skills (A):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Attending (At):		
	creat.	capt.	M+	M-	L FC CL LS P S A At SH	*	R+	R-	RC UC	S T Ed			E+	E-	Self-Help (SH):		

Child Name:_____
Teacher Name:_____

Material Engagement

Name of Scorer:_____ P IOA
Date of Tape:_____Date Scored:_____

Scoring Instructions: Mark the corresponding letter with the occurrence of all types of material engagement (i.e. play, academic, media, and edible) occurring within engagement episodes (*Material Type*). Material engagement can occur at any point during the 15-second intervals in order to mark the corresponding letter. List the material item or group (class) of items the child engaged with within each episode of engagement within the interval where the episode began (*Material Item*). Place an "X" in the interval where the episode was completed. More than one item or group of items can be engaged with at the same time. List all items or combination of items in corresponding interval where the engagement episode began. When the engagement episode is competed specify with which item (e.g. "X (blocks)"). Total the duration of 15-second intervals where any engagement episodes occurred and where the varying types of engagement episodes occurred (*Duration of Material Engagement Episodes*). **DO NOT mark interval if the child is not engaged (black out)**

Min.	material	access	play	play ty.	location	material	access	play	play ty.	location	material	access	play	play ty.	location	material	access	play	play ty.	location
0 - 1	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
1 - 2	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
2 - 3	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
3 - 4	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
4 - 5	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
5 - 6	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
6 - 7	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
7 - 8	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
8 - 9	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
9 - 10	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
10 - 11	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
11 - 12	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
12 - 13	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
13 - 14	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C
14 - 15	0-15					15-30					30-45					45-60				
	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C	PAME	C	N	I II	X	S C P				T F O C

TOTALS

P = _____
A = _____
M = _____
E = _____
C = _____
N = _____
I = _____
II = _____
X = _____
S = _____
C = _____
P = _____
T = _____
F = _____
O = _____
C = _____
IE = _____

APPENDIX C

CONSENT FORMS

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to your child's participation in this research study, it is important that you read and understand the following explanation of the purpose and benefits of the study and how it will be conducted.

Title of Study:

The Development of an Observation System to Aid in the Evaluation and Implementation of Early Intervention Programs for Children with Autism

Principal Investigator:

Megan Geving, University of North Texas, Department of Behavior Analysis

Purpose of the Study

Your child is being asked to participate in a research study that is designed to develop an observation system for supervisors to monitor and give feedback to staff working with young children with autism. The goal is to design a standard way of assessing staff performance so that feedback is tailored to their teaching. More efficient training should ensure a more positive and beneficial experience for your child at Easter Seals. To conduct this study your child will be video taped during regular sessions with the Easter Seals staff (who have given consent for participating). Your consent will allow the data to be presented and thus allow the research findings to be disseminated more widely.

Study Procedures:

Your child and their therapists will be video taped for 15 minutes each week for 2 months. The video segments will occur during a regularly scheduled session and will provide a view of a typical session with the therapist and your child. Data will be collected on the therapist's teaching (such as learning opportunities, delivering a desired toy or activity following correct responding, smiles and/or cries, and what activites are occurring during the session). These specific behaviors help managers understand how time is being spent during sessions, whether that time is being spent as productively as possible, and if there are areas where the therapist may need additional training and/or support.

Voluntary Participation:

Participation in this research study is voluntary. Refusal to participate or a decision to discontinue participation will not involve a penalty or loss of benefits to which your child is otherwise entitled.

Foreseeable Risks:

No foreseeable risks are involved in this study. Previous clinical and research reports have identified no harm and substantial benefit from participation in the type of training associated with this study. We will take precautions to be sure that your child does not experience discomfort during the training.

Benefits to the Subjects or Others:

This observation system will allow the managers at Easter Seals to more effectively monitor and give feedback to the applied behavior analysis coaches. Not only will it be more feasible to give feedback, but the feedback will be in direct relation to how the applied behavior analysis coach interacts with your child. This will benefit your child by insuring that their programs are being run as correctly and efficiently as possible.

Procedures for Maintaining Confidentiality of Research Records:

All records including signed consent forms and video tapes will be kept in a locked filing cabinet at the Easter Seals North Texas Carrollton site. For the purposes of data analysis, an additional copy of the videotapes will be kept in the Family Connections Project lab in Chilton Hall Rm. 361E. All research participants will be given a pseudonym that will be used when referring to that participant's data and will be maintained throughout the course of research. Following the research study, all personally identifiable data will be marked with the participant's pseudonym and will remain in The Easter Seals records for at least 3 calendar years. In addition to the principal investigator, additional graduate students may assist with data analysis. All of these graduate students are staff of Easter Seals and/or The Family Connections Project and have completed the NIH clinical research training. Personally identifiable data will not be disclosed to anyone outside of The Easter Seals North Texas Autism Treatment Program Team. The confidentiality of the participants' personal information will be maintained in the master's thesis defense and in any public dissemination, such as appearance in academic journals and/or academic conferences.

Questions about the Study:

If you have any questions about the study, you may contact Megan Geving or the faculty advisor, Dr. Shahla Ala'i Rosales.

Review for the Protection of Participants:

This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-3940 with any questions regarding the rights of research subjects.

For the Research Participants':

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Megan Geving has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that your child do not have to take part in this study, and your refusal to allow your child to participate or your decision to withdraw your child from the study will involve no penalty of loss of rights or benefits. The study personnel may choose to stop your child's participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your child's rights as a research participant and you voluntarily consent to your child's participation in this study.
- You have been told you will receive a copy of this form and that at the conclusion of the study Megan will meet with you to describe the findings and the outcomes.

_____
Printed Name of Child

_____
Printed Name of Parent

_____ _____
Signature of Parent Date

For the Principal Investigator:

I certify that I have reviewed the contents of this form with the participant signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

_____
Printed Name of Principal Investigator

_____ _____
Signature of Principal Investigator Date

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to your participation in this research study, it is important that you read and understand the following explanation of the purpose and benefits of the study and how it will be conducted.

Title of Study:

The Development of an Observation System to Aid in the Evaluation and Implementation of Early Intervention Programs for Children with Autism

Principal Investigator:

Megan Geving, University of North Texas, Department of Behavior Analysis

Purpose of the Study:

You are being asked to participate in a research study that is designed to develop an observation system for supervisors to monitor and give feedback to staff working with young children with autism. The goal is to design a standard way of assessing staff performance so that feedback is tailored to their teaching. More efficient training should ensure a more positive and beneficial experience for you and the children you serve at Easter Seals. To conduct this study you will be videotaped during regular sessions with the children in your caseload. Your consent will allow the data to be presented and thus allow the research findings to be disseminated more widely.

Study Procedures:

You and the children will be videotaped for 15 minutes each week for 6 weeks. The video segments will occur during a regularly scheduled session and will provide a view of a typical session with you and the child. Data will be collected on your teaching (such as learning opportunities, contingencies, affect, and material engagement). These specific behaviors help managers understand how time is being spent during sessions, whether that time is being spent as productively as possible, and if there are areas where you may need additional training and/or support.

Voluntary Participation:

Participation in this research study is voluntary. Refusal to participate or a decision to discontinue participation will not involve a penalty or loss of benefits to which you are otherwise entitled.

Foreseeable Risks:

No foreseeable risks are involved in this study. Previous clinical and research reports have identified no harm and substantial benefit from participation in the type of training associated with this study. We will take precautions to be sure that your child does not experience discomfort during the training.

Benefits to the Subjects or Others:

This observation system will allow the managers at Easter Seals to more effectively monitor and give feedback to the ABA coaches. Not only will it be more feasible to give feedback, but the feedback will be in direct relation to how the ABA coach interacts with the children served. This will benefit the treatment fidelity of programs as well as the ABA coaches and children's time being spent more efficiently at Easter Seals North Texas.

Procedures for Maintaining Confidentiality of Research Records:

All records including signed consent forms and video tapes will be kept in a locked filing cabinet at the Easter Seals North Texas Carrollton site. For the purposes of data analysis, an additional copy of the videotapes will be kept in the Family Connections Project lab in Chilton Hall Rm. 361E. All research participants will be given a pseudonym that will be used when referring to that participant's data and will be maintained throughout the course of research. Following the research study, all personally identifiable data will be marked with the participant's pseudonym and will remain in The Easter Seals records for at least 3 calendar years. In addition to the principal investigator, additional graduate students may assist with data analysis. All of these graduate students are staff of Easter Seals and/or The Family Connections Project and have completed the NIH clinical research training. Personally identifiable data will not be disclosed to anyone outside of The Easter Seals North Texas Autism Treatment Program Team. The confidentiality of the participants' personal information will be maintained in the master's thesis defense and in any public dissemination, such as appearance in academic journals and/or academic conferences.

Questions about the Study:

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For the Research Participants':

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Megan Geving has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw yourself from the study will involve no penalty of loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to your participation in this study.
- You have been told you will receive a copy of this form and that at the conclusion of the study Megan will meet with you to describe the findings and the outcomes.

_____
Printed Name of Participant

_____ _____
Signature of Participant Date

For the Principal Investigator:

I certify that I have reviewed the contents of this form with the participant signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

_____
Printed Name of Principal Investigator

_____ _____
Signature of Principal Investigator Date

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