

Kelsey Hendershott

COMMUNICATION IN ROUTINES BETWEEN CAREGIVERS AND CHILDREN WITH DOWN SYNDROME

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Biography:

Kelsey Hendershott published in the journal during her studies as an undergraduate student in the School of Communication Science and Disorders at Florida State University. Her undergraduate interests included interventions for young children with developmental and communication delays and disorders.

How did the research that was published in this journal impact your direction?

The research I published with *The Owl* provided me with the foundation for my current career in the field of speech language pathology. As I collected data and investigated literature related to the diagnosis of Down syndrome I began to appreciate the impact that speech language pathologists have on the families and the individuals they work with. It was my undergraduate research that encouraged me to apply for graduate school, earning a master's degree in speech language pathology.

What inspired your passion for language development for young children with communication disorders?

I began taking American-Sign Language courses my third year of high school. These courses sparked my interest in individuals with hearing impairments. As I pursued an undergraduate degree at Florida State University, I investigated additional opportunities to take courses related to this field of study. During my second semester as a first year college student, I took a course entitled "Communication Disorders" and fell in love with the idea of helping individuals who exhibit difficulty communicating.

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Have you gone on to further study this topic? If yes, did publishing your research in *The Owl* benefit your continued research?

Following my undergraduate career, I pursued a master's degree and discontinued research on this specific subject matter. I was fortunate enough however to publish with another publishing company entitled Lambert Academic Publishing as well as present my research in a number of symposiums throughout Florida State University.

What were some of your biggest difficulties in researching the communication between caregivers and children with Down syndrome? Did you find quantitative hurdles that needed to be overcome?

The largest hurdle I encountered was finding a dependable coder as a means of obtaining interrater reliability to ensure sound data. In order to verify that my coding skills were appropriate, I asked several cohort peers to train with the coding system. This process was very difficult, as I was asking these individuals to use their personal time to help me with my research. After several weeks of trial coding with sample videos, one specific peer obtained 90% interrater reliability and I was able to proceed.

What was the main reason you wanted to share your research in this journal?

I chose to pursue publication as a means of sharing my findings with students also interested in the health sciences. *The Owl* journal gave me an opportunity to expand the research literature on the subject of Down syndrome and its many interesting facets. I thought that if I could provide basic research about this specific diagnosis, other students might also be interested in further pursuing the subject matter and perhaps add to the literature with their own findings.

What was your biggest take away from your undergraduate research experience?

Through my undergraduate research experience, I learned that time management and organization can be your very best friends. I found that managing my time wisely while simultaneously implementing a system of organization was the key to my sanity throughout the process.

COMMUNICATION IN ROUTINES BETWEEN CAREGIVERS AND CHILDREN WITH DOWN SYNDROME

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Abstract:

The purpose of the study was to describe the communication of toddlers with Down syndrome in everyday routines with their caregivers within four intervention time points. Archival video data of caregiver-implemented language intervention from the KidTalk Tactics Project were used to describe the communication of three children, ages 12 to 20 months, measured at four time periods across caregiving, pre-academic, and play routines. Increases in the frequency of single words and multiple word phrases were evident for all children. Variability in the frequency of communication acts in different routines were noted. The results of this study contribute to the expanding literature on caregiver-implemented intervention in natural environments by examining the unique profiles of toddlers with Down syndrome and the context in which they participated with their caregivers.

Parents welcome smiles, vocalizations, gestures and the arrival of first words as they track their children's early communication development. The first three years of life are the most important years for language development as children learn to use communication to interact with others, participate in social exchanges, learn about the world surrounding them, and gain new information.¹ While the study of communication has been a focus of developmental research for decades, recent findings have added to our knowledge base about what children learn, when, and importantly, how interactions with caregivers support their growth and development.²

Children with developmental delays and impairments may develop communication skills at a slower rate compared to their typically-developing peers. Parents and other caregivers can use language intervention strategies to effectively increase communication skills for young children with communication impairments.³ However, the impact of different activity contexts on caregiver-implemented communication intervention within a child's natural environment has not been examined in the research literature. The present study examined the communication skills of toddlers with

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Down syndrome as they engaged in daily routines with their caregivers. More specifically, the frequency of communication acts across routine types and the differential effects of various settings were investigated.

Language Development in Down Syndrome

Down syndrome is a chromosomal abnormality caused by the presence of trisomy on chromosome 21.4 Trisomy refers to the presence of three copies instead of the typical two copies of all or part of chromosome 21, the smallest human chromosome.⁴ Due to this abnormality, overall cognitive and communication development is slower in children with Down syndrome. In addition to language difficulties resulting from cognitive impairments it is common for children with Down syndrome to have additional challenges such as facial hypotonicity (low muscle tone), oral structural impairments, reduced nasal resonance, recurrent otitis media (ear infection), hearing loss, and/or motor planning difficulties. These cognitive and physical issues may inhibit the ability to produce and fine tune speech production and result in expressive language delays characterized by reduced speech intelligibility, short phrase length, and limited vocabulary.⁵

The aim of early intervention is to improve communication through participation within natural environments.

Early Intervention for Children with Down Syndrome

Early intervention (EI) describes services and supports for children age birth to three with developmental delays or disabilities and their families. For young children with communication impairments, the aim of EI is to improve communication outcomes through participation within natural environments.⁶ Communication intervention strategies that are naturalistic, or embedded in the context of everyday activities, can increase opportunities to practice intervention outcomes through teaching and learning interactions with caregivers.⁷ By following their child's lead, frequently sharing conversational turns, and commenting on their child's focus of attention, caregivers can support communication skills in everyday activities.⁸ For children with Down syndrome, environmental factors, attention, response to communication attempts, and the use of intentional intervention in functional activities can result in increased communication outcomes if implemented consistently.⁹

Incorporating communication opportunities into daily routines

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provides a predictable, meaningful framework to embed communication intervention, and increases opportunities to participate in a given daily activity with caregivers. Early intervention for children with developmental disabilities including children with Down syndrome can result in increased caregiver use of intervention strategies in daily routines, which in turn then increases opportunities for children to practice intervention targets.¹¹

An important aspect of embedded communication intervention is the context, or activity setting in which caregivers and children participate. Activity settings consist of naturally occurring everyday experiences in which children interact with preferred and familiar activities and routines.¹² Embedding intervention in a variety of activity settings can support the development and use of more sophisticated communication through repetition and scaffolding.¹² Scaffolding is used as a tool to support children in their learning by limiting complexity of a given task and encouraging the child to complete that task with as little caregiver support as possible.¹² These strategies are utilized frequently among specialists and are two important factors of Enhanced Milieu Teaching intervention.

Enhanced Milieu Teaching (EMT)

EMT is a parent-implemented, evidence-based intervention used with young children to increase communication skills with a focus on communicative initiations. It includes teaching caregivers how to arrange the child's environment, increase responsive interactions and use milieu teaching, or prompting.¹⁴ EMT is beneficial with children in the early stages of communication development who have developmental/communication delays including intellectual disability, autism, specific language impairment and severe impairments to increase overall rates of communication.¹⁵ The understanding that EMT is an effective form of intervention for children with developmental/communication delays, encouraged the development of the KidTalk Tactics Project.

KidTalk Tactics Project

The KidTalk Tactics Project (KTTP) is a research study at the Florida State University and Vanderbilt University investigating parent-implemented early communication interventions for young children age birth to three with communication delays and disorders. In KTTP, parents participate in 24 intervention sessions with a communication coach to learn how to support their child's communication in daily routines and activities.

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The present study examined how EMT strategies embedded in the child and family's preferred routines impacted the communication skills of children with Down syndrome. Previous studies have identified EMT as an effective intervention for young children when delivered in a clinical setting¹⁶ with limited research on the use of these strategies by caregivers in natural environments using daily routines as the context for intervention. In addition, previous studies measured child communication outcomes using standardized tests¹³; which may not provide detailed information of children's communication. The present study measured child communication by gestures, vocalizations, single words/signs and multiple utterances/signs in typically occurring daily activities with caregivers. Archival video data from KTTTP was used to answer the following questions:

- 1) What was the frequency of total communication acts in caregiving, pre-academic, and play routines for children with Down syndrome?
- 2) What was the change over time in the types of communication acts (gestures, vocalizations, words/signs) and multi-word across routines used by children participating in KTTTP?
- 3) What was the frequency of communication initiations and responses to communication in these routines?

Method

Participants

Parent-child dyads were identified through KTTTP archival records according to the following inclusionary criteria: (1) consent for participation in KTTTP was obtained following the child's first birthday and before the child produced word combinations, (2) caregivers consented to standardized assessments and videotaping for data collection, and (3) caregiver-child dyads completed a minimum of 24 intervention sessions to ensure sufficient data to analyze across time points. All child participants were diagnosed with Down syndrome prior to participation in KTTTP. Three dyads met the inclusion criteria and are described in the following table.

Participating caregiver-child dyads agreed to participate in a research study on caregiver-implemented intervention for children with language delays and disorders.

Setting

All KTTTP intervention sessions took place in the child's home with

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the caregiver present and were video recorded. Caregivers selected a variety of naturally occurring daily routines as the context for embedded communication intervention throughout the 24 KTTP sessions.

Table 1: Child and Caregiver Characteristics

Pre-Intervention Child Characteristics	Kelly	Elizabeth	Jasmine
Age in Months	18	20	12
Gender	Female	Female	Female
Race	Caucasian	Caucasian	Caucasian
Primary Language	English	English	English
CSBS Standard Score	102	74	90
MSEL-ELC	97*	70	73
PLS-4-AC	75	68	71
PLS-4-EC	73	79	77
PLS-4: Total Language Score	71	71	71
Mother's Age	36	36	35
Mother's Highest Level of Education	Bachelors's Degree	Bachelor's Degree	Graduate Degree
Family Income	(\$50,000+)	(\$50,000+)	(\$50,000+)

Note: CSBS = Communication and Symbolic Behavior Scales,¹⁷ MSEL-EC = Mullen Scales of Early Learning - Early Learning Composite,¹⁸ PLS-4 = Preschool Language Scale, 4th ed. (AC = Auditory Comprehension subscale, EC = Expressive Communication subscale),¹⁹ MacArthur-Bates Communicative Development Inventories - Words and gestures, NSC.²⁰

*Kelly's MSEL score was at 24 months.

Research Design

The present study was a post-hoc descriptive study of the communication of three children with Down syndrome in the context of daily routines. A sample of each child's communication was coded in three different family routines prior to participating in KTTP, and at baseline (prior to intervention), as well as at the beginning (sessions 7, 8, 9), middle (sessions 15, 16, 17), and end of intervention (sessions 23, 24, 25). The purpose of a baseline measure is to gain an understanding of a child's established communication prior to intervention, for data analysis. This approach allowed the researcher to describe communication in different types of routines as

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well as at time points during the intervention.

Sample Selection and Coding

In order to measure each child's communication three, three-minute video clips were identified at four points during KTTP; baseline (pre-intervention), beginning of intervention, middle of intervention, and end of intervention, in all three routine categories. Three-minute segments were identified as reasonable for two reasons. First, the very young age of the children influenced the length of the routines, especially caregiving routines that often did not last more than three minutes. Second, previous intervention research had effectively used three-minute segments to code child communication.²¹ All video clip samples were coded using the Child Communication Coding System (CCCS) to identify frequency of communication and change over time in communication across routines for each child. The CCCS was adapted from the Communication and Symbolic Behavior Scales¹⁷ and characterized communication acts as gestures, vocalizations, words/signs, or multiple word/sign combinations. A communicative act is directed toward another person and serves a communicative function. All communicative acts were coded as mutually exclusive events and categorized according to gestures, vocalizations, single words/signs, or multiple words/signs. Each communication act was then coded as either an initiation or response to adult communication. This procedure enabled the researcher to determine the frequency of communication acts in the three routines by initiations and responses, as well as change over time in types of communication acts.

Upon watching each video clip, the routine was identified as caregiving, pre-academic, or play. Caregiving routines included bath/hygiene related, medical/comfort related, dressing related and eating related. Pre-academic routines described activities such as reading books, song, rhymes, writing, or drawing. Play routines included play with objects, physical play, pretend play, and social games. The researcher served as the primary data coder and identified specific videos for the study.

Data Analysis

Child communication data was entered into a spreadsheet and the three samples of each routine type at each of the four points were averaged and graphed for each child using Microsoft Excel, allowing for visual inspection of the data to answer the first and second research questions. To address the third research question, child communication data was displayed

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table indicating the frequency of communicative initiations and responses for each child, by routine category.

Inter-rater Reliability

An undergraduate coder and the researcher independently coded 25 percent of the video clips from the baseline, beginning, middle and end periods of intervention. Training for coding reliability occurred using video footage that was not included in the study. Both coders achieved initial reliability of at least 80% on five sample segments for coding of both routine-type and communication acts. Inter-rater reliability was conducted on 25 percent of the data. Percentage of agreement was calculated by dividing the number of agreements by the total number of opportunities, and total inter-rater reliability was 85%.

Results

Frequency of Total Communication Acts

In order to answer the primary research question and determine the frequency of each child's communication by routine type, child communication data was graphed by intervention stage (baseline, beginning, middle, and end of the 24-session intervention period) using Microsoft Excel. Figures 1-3 display total communication across routines for all three child participants.

As displayed in Figure 1, Kelly's average frequency of total communication ranged from zero to 5.7 communicative acts per three-minute sample in the baseline period, from zero to 18 at the beginning of intervention, from 0.3 to 18.7 in the middle of intervention, and from 1.3 to 19.3 at the end of intervention across all three routines. Kelly's frequency of total communication was highest in play routines before the start of intervention and highest in pre-academic and caregiving at the end of intervention.

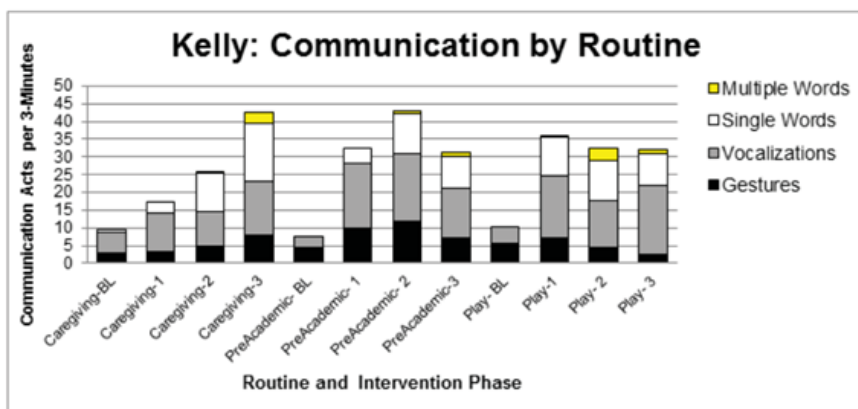
Figure 2 shows Elizabeth's average frequency of total communication acts across routines. Elizabeth's average total communication ranged from zero to 9.7 communicative acts per three-minute sample in the baseline period, from zero to 21 at the beginning of intervention, from zero to 24.3 in the middle of intervention, and from zero to 12.3 at the end of intervention across all three routines. Elizabeth's frequency of total communication was highest in play routines before the start of intervention and highest in pre-academic at the end of intervention.

Figure 3 shows Jasmine's average frequency of total communication acts across routines. Jasmine's average total communication ranged from zero to four communicative acts per three-minute sample in the baseline period, from zero to seven at the beginning of intervention, from zero to 5.3 in the middle of intervention, and from zero to 16 at the end of intervention across all three routines. Jasmine's frequency of total communication was highest in play routines before the start of intervention and highest in play at the end of intervention.

Change Over Time Across Routines

Figures 1-3 were used to answer the second research question and determine any change over time in the type of communication acts (gestures, vocalizations, words/signs, and multiple words/signs) from baseline through the end of the 24-session intervention period. Figure I shows Kelly's communication acts from baseline through the third intervention time point in caregiving, pre-academic and play routines, respectively. Within the caregiving routine category, there is an increase in the use of single words from baseline to the beginning, to the middle, and to the end of intervention. Multiple word utterances are seen initially in the middle of intervention in caregiving routines, then continue to increase as the child progresses from the middle of intervention to the end of intervention. Kelly demonstrated increases in single words and in multiple word utterances in pre-academic and play routines as well. For pre-academic routines, single words are not seen in baseline and are observed in the second and third intervention time points. Play routines also show increases in single words (especially from baseline to the beginning of intervention), and multiple words are first observed at the beginning of intervention and increase from the beginning to

Figure 1: Kelly's Communication Acts

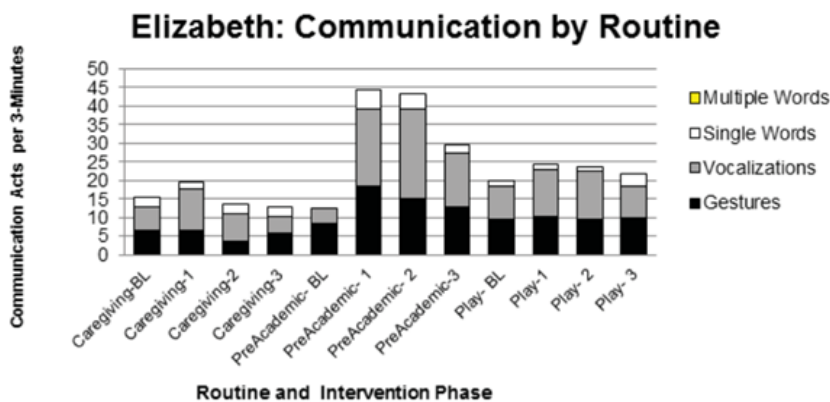


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middle of intervention, demonstrating use of more complex language skills. Kelly showed gains in total communication from the baseline to the end of intervention in all routines. In caregiving routines, Kelly demonstrated increases from baseline to the beginning, then to the middle, and finally to the end of intervention. This sequence of progress was less clear in pre-academic and play routines. In pre-academic routines, Kelly demonstrated increases from baseline to the beginning, to the middle, to the end of intervention.

Figure 2 illustrates communication type from baseline through the third intervention time point for Elizabeth, in caregiving, pre-academic and play routines, respectively. As can be seen throughout caregiving routines there are no specific increases between intervention time points, but rather a relative plateau of total communication acts among all time points for that routine. Throughout pre-academic routines, an increase can be seen between baseline and the first intervention time point. However, again a slight plateau and an eventual decrease in total communication acts are present within intervention time points two and three. Play routines for Elizabeth also exhibit a relative plateau of communication acts across intervention time points. In correspondence to this communicative plateau however, there is an increase in the use of single words, insinuating the use of more complex communication. Elizabeth showed gains in total communication from baseline to the end of intervention in pre-academic routines, a decrease in caregiving routines, and a slight increase in play routines.

Figure 2: Elizabeth's Communication Acts

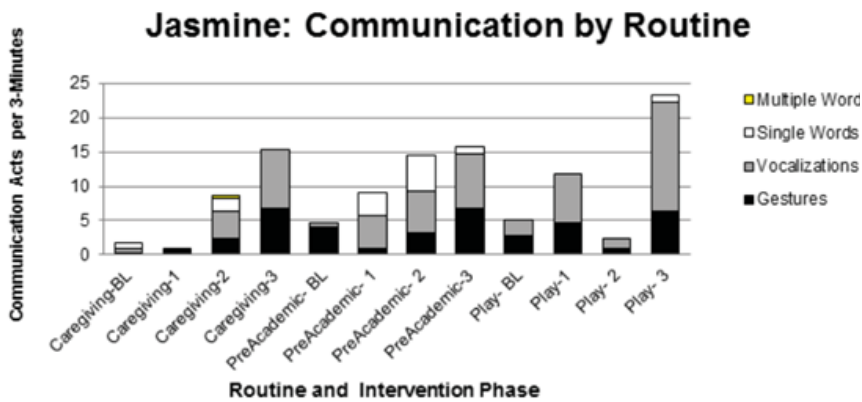


Jasmine's communication, displayed in Figure 3, illustrates a wide variety of types of communication acts across caregiving, pre-academic and play routines, respectively. There is a variation of communication acts within caregiving routines from baseline through the third intervention time point. Baseline for caregiving illustrates the use of gestures, vocalizations

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and single words, while the first intervention time point only presents the use of gestures. Following the first intervention time point there are increases in the use of overall communication acts during intervention time points two and three with and multiple words used in the middle of intervention but not at the end. Pre-academic routines show an increase in vocalizations and words, from baseline through the middle of intervention. Jasmine’s play routine intervention sessions show an increase of communication acts in the third intervention time point (end of intervention), but with variations between baseline and intervention time points one and two. Jasmine showed gains in total communication from the baseline to the end of intervention in all routines.

Figure 3: Jasmine’s Communication Acts



Frequency of Initiations and Responses

In the baseline period for Kelly, an average of between 4.4 and 6.4 communicative initiations were coded in each 3-minute play, caregiving and pre-academic routine sample (see Table 1). Averages between 11.3 and 22.4 initiations were coded at the end of intervention in those same routines. Kelly’s average frequency of initiations for baseline as compared to her average initiations at the end of intervention show increases across all three routines (play, pre-academic and caregiving). The largest increase in initiations was seen in caregiving routines in which Kelly initiated an average of over four times more at the end of intervention as compared to baseline. In correspondence, Kelly’s data represents increases in average communication responses as well. During the baseline period, Kelly presented averages between 3.4 and 4.3, and averages between 16 and 21 at the end of intervention for communication responses. The largest increase in responses was seen in caregiving routines in which Kelly responded an average of over four times

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more at the end of intervention as compared to baseline.

Table 2: Child Communication Kelly

Routine Category (Frequency of Communication Acts)		Communication Acts in Baseline	Communication Acts at End of Intervention	Change from Baseline to End of Intervention
Play	Initiations	6.4	15.9	+9.5
	Responses	4.3	16	+11.7
Caregiving	Initiations	5.3	22.4	+17.1
	Responses	4.3	21	+16.7
Pre-Academic	Initiations	4.4	11.3	+6.9
	Responses	3.4	20	+16.6

Communication Acts columns represent the average of 3 sessions.

In the baseline period for Elizabeth, an average of between 5.3 and 9.3 communicative initiations were coded in each 3-minute play, caregiving and pre-academic routine sample (see Table 2). Averages between 5.3 and 12.4 initiations were coded at the end of intervention in those same routines. Elizabeth’s average frequency of initiations for baseline as compared to her average initiations at the end of intervention show overall increase in play and pre-academic routines, while the caregiving routine remained constant throughout. The largest increase in initiations was seen in pre-academic routines in which Elizabeth initiated over two times more at the end of intervention as compared to baseline. In comparison to initiations, Elizabeth’s increases in responsive communication were not as obvious. During the baseline period, Elizabeth presented averages between 5.3 and 10.6, and averages between 7.3 and 13.9 at the end of intervention for communication responses. The largest increase in responses was seen in pre-academic routines in which Elizabeth responded an average of nearly two times more at

Table 3: Child Communication Elizabeth

Routine Category (Frequency of Communication Acts)		Communication Acts in Baseline	Communication Acts at End of Intervention	Change from Baseline to End of Intervention
Play	Initiations	9.3	12.4	+3.1
	Responses	10.6	9.3	-1.3
Caregiving	Initiations	5.3	5.3	0.0
	Responses	9.9	7.3	-2.6
Pre-Academic	Initiations	5.3	12.0	+6.7
	Responses	7.3	13.9	+6.6

Communication Acts columns represent the average of 3 sessions.

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the end of intervention as compared to baseline.

In the baseline period for Jasmine, an average of between 1 and 3.4 communicative initiations were coded in each 3-minute play, caregiving and pre-academic routine sample, respectively (see Table 3). Averages between 9 and 16.6 initiations were coded at the end of intervention in those same routines. Jasmine’s average frequency of initiations for baseline as compared to her average initiations at the end of intervention show increases across all three routines (play, pre-academic and caregiving). The largest increase in initiations was seen in play routines in which Jasmine initiated an average of almost ten times more at the end of intervention as compared to baseline. In correspondence, Jasmine’s data illustrates increases in average communication responses as well. During the baseline period, Jasmine presented averages between 0.6 and 3.3, and averages between 3.7 and 6.7 at the end of intervention for communication responses. The largest increase in responses was seen in caregiving routines in which Jasmine responded an average of eight times more at the end of intervention as compared to baseline.

Table 4: Child Communication Jasmine

Routine Category (Frequency of Communication Acts)		Communication Acts in Baseline	Communication Acts at End of Intervention	Change from Baseline to End of Intervention
Play	Initiations	1.7	16.6	+14.9
	Responses	3.3	3.7	+0.4
Caregiving	Initiations	1.0	10.3	+9.3
	Responses	0.6	5.0	+4.4
Pre-Academic	Initiations	3.4	9.0	+5.6
	Responses	1.3	6.7	+5.4

Communication Acts columns represent the average of 3 sessions.

Discussion

The results of this study indicate changes in overall communication between baseline and the end of intervention for the three child participants. Two of the three children had increasing trends across all three routines, while the third child had increases across only two routines (pre-academic and play). In general, increases were seen in the use of single and multiple words, demonstrating a growth in the use of more complex language skills over time for each child, as would be expected developmentally.²²

Routine Categories

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Across the three child-caregiver dyads, there was no one routine category in which frequency of total communication was consistently higher than the other categories. It was interesting to note that before the start of intervention, all three children had the highest frequency of communication acts in play routines, as compared to caregiving and pre-academic. By the end of intervention, the highest frequencies of communication acts were in pre-academic routines for Kelly and Elizabeth, and in play routines for Jasmine. For each participant, overall communicative acts across routines showed distinct variance. These findings are similar to the findings of previous research which reported that caregivers had individual preferences for types of routines rather than specific types of routines as being preferable for intervention.¹⁰

Frequency and Type of Communication Acts in Routines

Kelly's communication during caregiving routines illustrated gradual increases from baseline to the third intervention time point, while pre-academic and play routines were variable in comparison. For Elizabeth, communicative increases were seen throughout pre-academic routines from baseline through the second intervention time point, while some decrease in communicative acts occurred in the third intervention time point. Even with some decrease in overall communication acts, Elizabeth showed an increase in higher-level communication acts (i.e., increased frequency of single words) within all routine types across the four time points. Jasmine's results represent gradual increase of communication acts throughout pre-academic intervention time points. The most gradual communication increases occurred throughout Jasmine's pre-academic routine intervention time points, however there were also increases across all routines, only with more communicative variation within caregiving and play routines.

It is important to consider maturation and the impact of each child's developmental and chronological age on the results. Kelly increased both in rate as well as use of single and multiple word utterances across the 24 sessions. Her increases could be related to her general developmental progression and the timing may have corresponded to the typical "vocabulary burst" seen in young children learning language.²² Similarly, since Elizabeth used signs rather than verbal words at the beginning of intervention, the changes in her responsive communication could be related to her increase in independent sign use and decreased use of imitation of her caregiver's signs. The signs identified as words in her baseline and earliest intervention sessions could be over-representations of her symbolic language use and may have been more accurately coded as gestures or motor imitations.

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Initiations and Responses

Each child's communication acts varied in relation to amount of change in initiations and responses with Kelly and Jasmine showing increases overall for both. Kelly's frequency of both initiations and responses greatly increased in all routines from baseline to the end of intervention, with greater increases in initiations in caregiving and greater increases in responses in pre-academic and play routines. Elizabeth and Jasmine's data shows more variation in communication increases among routines. Elizabeth's data illustrated increases in initiations in play and pre-academic routines and a decrease in responses in play and caregiving routines. Like Kelly, Jasmine's data showed increased frequency of communicative initiations and responses across all routine types, however Jasmine demonstrated greater increases in initiations in all routines as compared to increases in responses. Each child's data demonstrate a large variety of differences between initiations and responses for each routine type, caregiving, pre-academic and play, suggesting a need for further research in order to determine the relationship between initiations and responses.

Limitations of the Study

The current research analyzed three individual children with Down syndrome, using a single case design. In this manner, each child was analyzed individually. In doing so, each child was only compared to herself as opposed to comparing to other children or groups of children. There are certain limitations inherent to single case research. One in particular, is the inability to generalize results to the overall population.

The purpose of the KTCP in Tallahassee was to support caregiver-implemented intervention with coaching from an interventionist. While this project yielded a large amount of useful data, it was not designed for a child communication system specifically. In this way, data had to be extrapolated to form useful video segments to be coded for child communication resulting in a less than perfect data analysis for this study. Having a reliable source of data to choose from is an important part of any research project. The intricate process of selection (i.e., selection of three-minute clips for data coding were limited to segments where the interventionist was not part of the interaction in order for natural caregiver-child interactions to be coded) may have impacted the results of the study. Having a larger amount of video footage to randomly select from may have allowed for a more accurate representation of each child's communication acts and may have also allowed for use of longer video clips for coding.

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Like any individual, some days are particularly good and others are not. This statement was true for the children who participated in the KTCP study as well. Some factors that may have contributed to a less than perfect communication day for these children may have included, fatigue, sickness, frustration, etc. The opposite may also be true. Some days included very productive, frequent communication, affecting the results as well. There are many factors that could have affected the communication for each child throughout the intervention sessions.

The purpose of this project was to find trends in the frequency of overall communication acts, either initiated or responded. Unfortunately, the data did not include post-intervention communication frequency. Having this information could possibly illustrate changes in communication in comparison to communication at the start of each child's KTCP intervention process.

Future Research

By analyzing the presented data, there are a number of important factors that could be expanded upon for future studies. For example, the use of longer video samples, as opposed to brief, three-minute samples may result in a difference in the number of and frequency of communication acts. Perhaps a longer sample may allow a greater understanding of communication change over time. Measures of communication opportunities provided by the caregiver would also be important to examine in various routines. It may be that caregivers simply offer more opportunities in play than in caregiving because of the nature of the routine or the role of the caregivers may be more structured in pre-academic and provide more support for providing opportunities. Responses may increase as children are directed to answer questions about pictures in storybooks. Questions that would compare children with Down syndrome to other children with communication disorders would also be of interest.

Summary

This study examined communication rates for toddlers with Down syndrome in their daily routines with caregivers to gain additional insight to potential differential patterns of communication in various routines. Additionally, change-over-time in the rate and types of communication as the caregiver-child dyad progressed in intervention-based treatment were examined for toddlers with Down syndrome. While communication rates and types increased over time for two of the three participants, there was

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variability in the communication production in the various routine types for the participants. Two of the three participants also increased both their use of initiations and responses within the routines over time as their communication types expanded. Further study to examine if there is an impact on the length of routines coded and the child's communication rate and level would be useful.

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