

# A Preliminary Evaluation of Functional Communication Training Effectiveness and Language Preference When Spanish and English are Manipulated

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**Abstract** We evaluated whether differences in treatment effectiveness or preference between languages emerged across Spanish and English during functional communication training (FCT) for young children with developmental disabilities exposed to Spanish and English in the home environment. Participants were 2 young children with developmental disabilities who displayed destructive behavior maintained by social contingencies and whose families spoke Spanish and English at home. All procedures were conducted in the participants' homes by their mothers with coaching from the investigator. The effectiveness of FCT was evaluated within a reversal design across baseline, FCT, and extinction conditions. A multielement design across language type (Spanish and English) was embedded within the reversal design during the extinction and FCT conditions to evaluate differences in treatment effectiveness across type of language. Finally, during all FCT sessions, a concurrent schedules design was used to evaluate participant preference for type of language. Results suggested that FCT was effective in reducing destructive behavior, increasing manding, and/or increasing task completion for these 2 participants across Spanish and English treatment conditions. Preference for the type of language did not emerge for either participant during FCT. Results are discussed in terms of the merits of systematically evaluating language variables when working with culturally and linguistically diverse families and children.

**Keywords** Functional communication training · Language · Preference · Developmental disabilities · Culturally and linguistically diverse variables

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Linguistic diversity has steadily increased in the United States during the past 30 years. According to the U.S. Census Bureau (Shin and Kominski 2010), in 2007, 20% of people over the age of 5 years living in the United States (55.4 million) spoke a language other than English in their homes, and of these people, 44% reported that they spoke English less than “very well”. This constitutes an increase of approximately 140.4% from the 1980 Census (23.1 million). Linguistic diversity has also been reported for children with disabilities. One estimate reported that in U.S. public schools, the number of children with disabilities who come from homes where English was not the first language increased from 3.3 to 14.2% from 1987 to 2001 (Zehler et al. 2003).

Linguistic diversity and language choices may be particularly relevant for children with developmental disabilities who come from homes where English is not the first language because one characteristic of autism and other developmental disabilities is impairment in communication skills (Klinger et al. 2003). However, professionals and educators in the United States sometimes make language recommendations and decisions for children with developmental disabilities without conducting systematic evaluations of these recommendations. For example, professionals may instruct parents to speak only English to their children at home instead of their native tongue (Kremer-Sadlik 2005; Wharton et al. 2000).

To date no published studies have looked at how linguistic diversity may impact the effects of behavioral treatments for children with developmental disabilities who display problem behavior. The most common reinforcement-based treatment program in the behavioral literature is functional communication training (FCT; Tiger et al. 2008). FCT is a behavioral treatment that teaches individuals to gain reinforcement by engaging in appropriate communicative responses (mands) as an alternative to problem behavior such as aggression and self-injury (Carr and Durand 1985). Although type of language has not been investigated as an independent variable during FCT, previous studies have shown that variables related to language may impact the results. For example, the type of language used in FCT might be based on variables such as how language increases the effort in emitting the mand (Horner and Day 1991; Richman et al. 2001), the child’s preference for specific types of mands (Harding et al. 2009; Winborn et al. 2002; Winborn-Kemmerer et al. 2009), or the quality of attention provided by the parent (Gardner et al. 2009; Peck et al. 1996).

Researchers have shown that the response effort required to emit a mand impacts the effectiveness of FCT (Horner and Day 1991; Richman et al. 2001). For example, Horner and Day (1991) conducted FCT with a child with developmental disabilities. They demonstrated that the participant engaged in higher levels of aggression when reinforcement was provided contingent on a high-effort mand (signing a sentence) versus a less effortful mand (signing one word). The implication of these studies is that treatment effectiveness may be affected if manding in one language is more effortful than manding in another language.

Children with developmental disabilities may display a preference for the type of mand they use (e.g., vocal, signed, PECS) during FCT, even though each type of mand produces the same reinforcer (Harding et al. 2009; Winborn et al. 2002; Winborn-Kemmerer et al. 2009). Harding et al. (2009) and Winborn et al. (2002)

conducted FCT with preschool-age children with developmental disabilities who displayed severe problem behavior. In the Harding et al. (2009) study, the children were taught to mand for positive reinforcers (toys or attention) via vocal requests, manual signing, or touching a microswitch. Over time, each child displayed a preference for a specific type of mand, but no differences in treatment effectiveness emerged across the mands. In the Winborn et al. (2002) study, the children were taught to mand for negative reinforcement via an existing mand (vocal request) and a novel mand (microswitch or communication card). The children showed a preference for existing mands, but the preferred existing mands were correlated with higher levels of problem behavior during FCT. Thus, it is unclear whether preference for the type of mand influences the effectiveness of treatment, but mand preferences have been identified among children receiving FCT.

Peck et al. (1996) conducted FCT with a young child who engaged in pulling out intravenous medication lines to obtain adult attention. The child was taught to touch a microswitch for attention as an alternative to pulling out lines. Caregivers attended to line pulling in a brief, neutral fashion, whereas they provided longer and higher quality attention for manding. Results showed that inappropriate behavior decreased to zero levels as the child learned to obtain high-quality attention via appropriate communication. Although it has not been specifically evaluated, it is possible that delivering reinforcement in one language may affect the quality of reinforcement and therefore the effectiveness of FCT.

These studies have suggested that the effectiveness of FCT may be influenced by the effort required to emit a mand, by individuals' preferences for specific mands, and by the relative quality of reinforcement produced by manding. Therefore, preference for communication in a specific language and delivering reinforcement in a preferred language may influence the effectiveness of FCT. In this study, we describe a preliminary methodology for evaluating the influence of Spanish and English language on treatment effectiveness during FCT for young children with severe developmental disabilities exposed to both Spanish and English in the home environment. Second, we evaluated whether participants displayed a preference for Spanish or English language during FCT.

## Method

### Participants and Setting

The participants were two young children, one girl (Sofia) and one boy (Javier), enrolled in a federally funded research project for the assessment and treatment of destructive behavior (Wacker et al. 2004). The participants were referred to the project by clinic staff in a behavioral outpatient clinic due to the participants' severe destructive behavior. Inclusion criteria for enrollment in the project were that the children were 6 years old or younger, displayed destructive behavior maintained by negative reinforcement, had a developmental disability, and were exposed to both English and Spanish in the home setting.

Sofia, age 5 years 3 months, was diagnosed with spinal muscular atrophy and pervasive developmental disorder. Sofia was not ambulatory. Her destructive behavior included self-injury (e.g., head banging, slamming body against surfaces), aggression (e.g., hitting, scratching), and property destruction (e.g., throwing toys). Sofia's communication consisted of single words mostly in English ("eat," "juice," "milk," "no") and pointing. Her mother's primary language was Spanish, and she knew only a few words of English. Sofia's parents spoke Spanish almost exclusively. Sofia received schooling in English only within a self-contained special education classroom.

Javier, age 6 years 2 months, was diagnosed with autistic disorder and mild intellectual disability. His destructive behavior included self-injury (e.g., hitting fingers against hard surfaces, hitting arm against floor), property destruction (e.g., throwing toys, kicking toys), and aggression (e.g., hitting, hair pulling). Javier's communication consisted of picture exchange for a few desired items (e.g., snack items). His mother's primary language was Spanish but she was fluent in English. Javier's parents spoke a combination of Spanish and English at home. Javier received schooling in English only within a self-contained special education classroom. According to Javier's mother, when he was diagnosed with autistic disorder, she had been instructed by professionals to speak to him in English at home to avoid confusion between home and school languages and to increase the possibility that he would eventually speak.

The investigator, who was fluent in English and Spanish, conducted 1 hr (Javier) or 2 hr (Sofia) weekly to monthly visits to the participants' homes. All assessment and treatment procedures were conducted in the participants' homes by their mothers during these visits. On average, the investigator visited Sofia's home every 46.9 days for 1 year and 8 months and Javier's home every 12.8 days for 2 years. Sofia's sessions were conducted in her family's living room. Javier's sessions were conducted in a play room. The investigator videotaped all sessions for subsequent data coding.

### Response Definitions and Data Recording System

Trained data collectors recorded four categories of child behavior: destructive behavior, language choice, independent target manding, and independent task completion. *Destructive behavior* was defined as aggression (e.g., hitting, pulling hair), property destruction (e.g., throwing toys, kicking objects), and self-injury (e.g., hitting self, head banging). *Language choice* was defined as independent manding for reinforcement in Spanish or English by pressing one of two voice output microswitches presented concurrently without a specific adult prompt. *Independent target manding* was defined as an appropriate request for reinforcement (e.g., pressing microswitch with "play" card, saying "play," signing "play") without a specific adult prompt. *Independent task completion* was defined as completion of a target task without physical guidance.

Data collectors recorded destructive behavior and independent target manding using a 6-s partial-interval recording system. Paper data collection forms were divided into 6-s intervals with distinct codes for each child behavior. The data

collectors utilized one data collection form for each individual session. Each interval included a code for three topographies of destructive behavior, aggression, self-injury, and property destruction, and a code for independent target manding.

Data collectors recorded language choice and independent task completion using an event-recording procedure. Two different paper data collection forms were utilized to record language choice and independent task completion. The language choice data collection form included five trials. For each trial, the data collector recorded on which side of the child (left or right) each language choice was presented and the language and side the child chose. The task completion data collection form included 15 possible trials. For each trial, the data collector recorded if the task was completed independently (without physical guidance), if it was not completed, or if it was completed with physical guidance.

### Interobserver Agreement

One investigator served as primary data collector for all child behavior and coded 100% of all sessions. A second investigator independently coded 30% of each session to calculate interobserver agreement. To obtain interobserver agreement for destructive behavior and independent target manding, the investigators conducted an exact interval-by-interval comparison in which the number of agreements was divided by the number of agreements plus disagreements and multiplied by 100%. Interobserver agreement for destructive behavior and independent target manding was collected on 30% of each session and averaged 96.1% across participants.

To obtain interobserver agreement for language choice and independent task completion, investigators conducted trial-by-trial comparisons in which the number of agreements was divided by the total number of trials and multiplied by 100%. Interobserver agreement for language choice and independent task completion was collected on 30% of each session and averaged 100% across participants.

### Experimental Design

The investigation was conducted in two phases: assessment and treatment. During the assessment phase, two procedures were conducted. A preference assessment (Roane et al. 1998) was conducted to identify participants' relative preference for toys available in the home and the target task used during the functional analysis. A functional analysis (Iwata et al. 1982/1994) was conducted within a multielement design to identify the maintaining variables for destructive behavior. The treatment phase was conducted within a reversal design across baseline, extinction, and FCT conditions to evaluate the effectiveness of the treatment. A multielement design across language type (Spanish and English) was embedded within the reversal design during the extinction and FCT conditions to evaluate differences in treatment effectiveness across Spanish and English. Finally, during all FCT sessions, a concurrent schedules design was used to evaluate participant preference for Spanish or English language.

## Procedure

Participants' mothers conducted all assessment and intervention procedures with coaching from the investigator (first author) in the mothers' first language. The investigator used the procedures described by Harding et al. (2009) to train the parents to implement the assessment and treatment procedures. The investigator explained the overall purpose of all assessment and treatment procedures to the participants' mothers and what to expect during each visit. Before each session, the investigator explained the procedure (e.g., how to respond to the child's behavior) to the parent and answered questions. The investigator used modeling to demonstrate procedures (e.g., three-step prompting) to the parents before the sessions and as needed in between sessions. During the sessions, the investigator prompted the parent to complete the components of the condition (e.g., present a demand, provide reinforcement) as needed. During sessions in which the parent was required to speak English, the investigator modeled the English prompts to Sofia's mother. The investigator also provided feedback to the parent during and after the sessions to ensure treatment integrity.

### Phase 1: Assessment

#### *Preference Assessment*

The investigator asked the parents to list the toys and activities that were typically available to the participant. For each toy, the investigator asked the parent to identify whether the participant liked the toy, whether the toy was easy for the participant to manipulate, and the amount of parent contact the participant needed to play with each toy. Based on the list the parent provided, the investigator chose five items to include in a direct preference assessment using a group presentation method (Roane et al. 1998) to evaluate the participants' relative preference for the toys. The investigator used a 6-s partial-interval system to record the participants' engagement with each toy during 5-min sessions. The participant had continuous access to the toys and parent attention during the sessions. The toy that the participant engaged with most was identified as a highly preferred (HP) toy. The toys that the participant engaged with least were identified as less preferred (LP) toys. Toys for Sofia included books (e.g., musical books, sticker books), small toys (e.g., bouncing balls), blocks (e.g., large blocks), doll house, and animals (e.g., plastic dinosaurs). Toys for Javier included puzzles (e.g., letter puzzles, peg puzzles), kitchen toys (e.g., plastic silverware, plastic Velcro foods), shape sorter, Mr. Potato Head, and musical toys (e.g., drum set, guitar). The investigator instructed the mothers to use the language they typically used in the home during this assessment.

#### *Functional Analysis*

Four conditions were conducted during the functional analysis: free play, attention, tangible, and escape. The four conditions were counterbalanced across 14 sessions for Sofia and 15 sessions for Javier. For Javier, after an initial undifferentiated

functional analysis, escape and free-play conditions were conducted within a multielement design for six additional sessions (Iwata et al. 1994). Destructive behavior (e.g., aggression, self-injury, property destruction) was reinforced during the functional analysis, and manding was ignored.

The free-play condition was conducted as a control condition. Participants had continuous access to parent attention and preferred toys during the free-play condition. During the attention condition, the mother diverted her attention from the participant. If the participant engaged in destructive behavior, he or she received 20-s access to parent attention in the form of reprimands (e.g., “Don’t do that; you’re going to hurt yourself”) and redirection to play with toys. In the tangible condition, the child was allowed to play with a preferred toy. The mother removed the preferred toy after approximately 30 s and gave the child a less preferred toy. Both toys had been identified previously through the group presentation preference assessment. The mother returned the preferred toy for 20 s if the participant engaged in destructive behavior. During the escape condition, the mother delivered demands with a less preferred toy every 30 s. The target task chosen for the escape condition was an age-appropriate task with a less preferred toy identified through the preference assessment. Sofia’s task was putting blocks in a bucket and Javier’s task was putting pieces in a Mr. Potato Head. Parents used a three-step least-to-most restrictive prompting procedure to deliver the demands; they made requests vocally, then used gestures, and finally, physically guided the child to complete the demand. If the child engaged in destructive behavior, he or she received a 20-s break from the demand. The investigator instructed the mothers to use the language they typically used in the home during this assessment. All sessions were counterbalanced and 5 min in length.

## Phase 2: Treatment

### *Baseline*

For Sofia, five additional functional analysis escape sessions were conducted separate from those in the assessment phase to serve as her initial baseline. Sofia’s mother spoke in Spanish during this condition. Her mother delivered demands every 30 s with the same task that was used during the previous functional analysis escape condition (putting blocks in a bucket). The investigator instructed Sofia’s mother to use a three-step least-to-most restrictive prompting procedure to deliver the demand. Her mother reinforced Sofia’s destructive behavior with a 20-s break from demands. The microswitches and picture/word cards used during treatment sessions were not present during Sofia’s baseline condition, and her mother ignored manding.

Javier’s initial baseline measure consisted of extinction sessions conducted in both Spanish and English. The investigator instructed his mother to speak only in the designated language for each session. His mother delivered demands every 30 s with the same task that was used during the functional analysis escape condition (putting pieces in a Mr. Potato Head). The investigator instructed Javier’s mother to deliver the demand using a two-step prompting procedure. She first made the request vocally (e.g., “Put the piece in”) and then modeled the correct response,

but did not use physical guidance. She ignored or neutrally blocked Javier's destructive behavior. The microswitches and picture/word cards used in treatment sessions were not present, and his mother ignored manding.

### *Treatment*

For Javier, one to two treatment sessions ( $M = 1.6$  sessions) were conducted during each of the investigator's visits to his home for a total of 25 sessions. For Sofia, one to six treatment sessions ( $M = 3.2$ ) were conducted during each investigator visit for a total of 16 sessions. Treatment was in place for both participants for approximately 11 months.

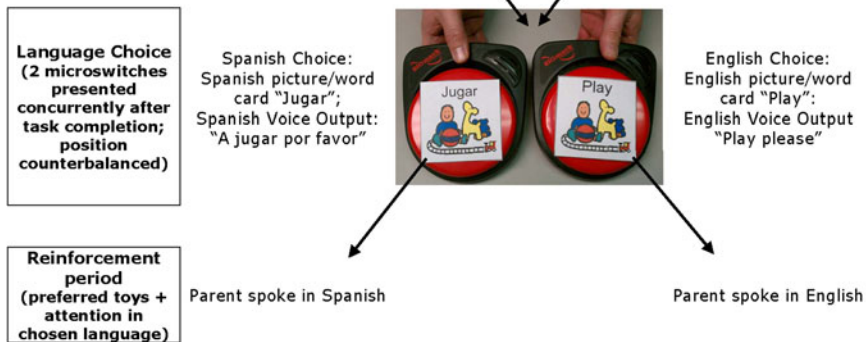
During treatment, FCT was conducted to decrease destructive behavior and increase communication and compliance as described by Harding et al. (2009). Two FCT procedures were implemented to evaluate the effectiveness of the intervention across languages: FCT in Spanish with language choice and FCT in English with language choice. Participants were taught to comply with a specific task and then to request for reinforcement (a brief 1- to 2- min break) by pressing one of two microswitches with an attached picture/word card. During both FCT procedures, participants were allowed to choose the language their mothers spoke during the reinforcement period in order to evaluate their preference for type of language.

Table 1 depicts the two FCT procedures conducted during the treatment sessions. Each FCT session began with a brief (20–30 s) play period during which the parent played with the child with preferred toys and spoke in either Spanish or English depending on the session. During the play period, Sofia's preferred toys were placed on a table in front of where she was sitting (e.g., wheelchair, couch), whereas Javier's toys were placed on the floor of the play room. After this play period, the parent showed the participant a picture/word card with the word "trabajar" in Spanish or "work" in English and was told "es tiempo de trabajar" in Spanish or "it's time to work" in English. Sofia's mother removed the toys from the table and replaced them with the work materials (i.e., blocks and bucket). Javier was directed to sit at a table to complete his work. The participants were then prompted by their mothers to complete one to four tasks independently using a three-step least-to-most prompting procedure. The parent first provided a verbal prompt to complete the task in either Spanish (e.g., "Ponlo adentro") or English (e.g., "Put it in") depending on the session. If the participant did not comply after the verbal prompt, the parent modeled the correct response. The parent physically guided the participant to complete the task if he or she had not complied after the first two prompts. If the parent had to physically guide compliance, she presented a new task for the participant to complete independently. The participant had to complete the required number of tasks independently before being allowed to mand for reinforcement. The target task was the same task used during the participant's functional analysis escape sessions and baseline sessions (i.e., putting blocks in bucket for Sofia, putting pieces in a Mr. Potato Head for Javier). Demand fading was conducted for both participants to gradually increase the task requirement to baseline levels (10 tasks presented) or more. Over time, the task requirements increased from five tasks per session (FCT [5]) during the course of five trials (i.e., one task per trial), to



**Table 1** Functional communication training with language choice procedures

	FCT Spanish with Language Choice (Spanish)	FCT English with Language Choice (English)
<b>Initial play period (preferred toys + attention)</b>	Parent spoke Spanish	Parent spoke English
<b>Picture/Word Card</b>	Spanish word card "Trabajar"	English word card "Work"
<b>Task Prompting (1-4 tasks per trial)</b>	Spanish prompts "Ponlo adentro"	English prompts "Put it in"



10 tasks (FCT [10]) per session (i.e., 2 tasks per trial), and finally to 20 tasks (FCT [20]) per session (i.e., 4 tasks per trial for Javier only). For Sofia, task requirements were increased to only 10 tasks (FCT [10]) per session (i.e., 2 tasks per trial).

After the child completed the tasks independently, he or she was presented with two microswitches side-by-side each with an attached picture/word card as depicted in Table 1. One microswitch had a Spanish word card and voice output recording (“A jugar por favor”), and one had an English word card and voice output recording (“Play please”). Both participants had demonstrated being able to use this type of augmentative communication device in Spanish and English to obtain reinforcement during a previously conducted procedure (Schieltz et al. 2010). The parent presented the choice by activating each microswitch one at a time as she said, “Do you want to play in English or jugar en español” during the English sessions or “Quieres jugar en español o play in English” during the Spanish sessions. The position of the microswitches for Spanish choice and the English choice was counterbalanced across trials. If the participant did not make a choice within 5–10 s after the first presentation of the choice, the parent represented the choice. After the child manded for one of the two choices, the reinforcement period was delivered in the language he or she chose. The reinforcement period consisted of a 1- to 2-min break with access to parent attention and preferred toys.

Parents blocked destructive behavior neutrally during the work periods. During the reinforcement periods, destructive behavior resulted in termination of the

reinforcement and return to work. All FCT sessions lasted until five trials were completed. For Sofia, sessions ranged from 6 to 10 min and averaged 9 min. For Javier, sessions ranged from 6 to 15 min and averaged 11 min.

Participants' mothers were also asked to conduct FCT practice sessions daily for 10–15 min during convenient times of the day. The investigator provided written instructions to guide their practice sessions. For Sofia's mother, the investigator provided a sheet with the English phrases used during practice sessions written phonetically so that she could read them accurately to Sofia. The mothers were asked to alternate the language of the daily practice sessions so that the participants had equal exposure to training in Spanish and English. One microswitch was provided to each mother to use during practice sessions. No treatment integrity measures were collected on the mother's implementation of treatment between investigator visits.

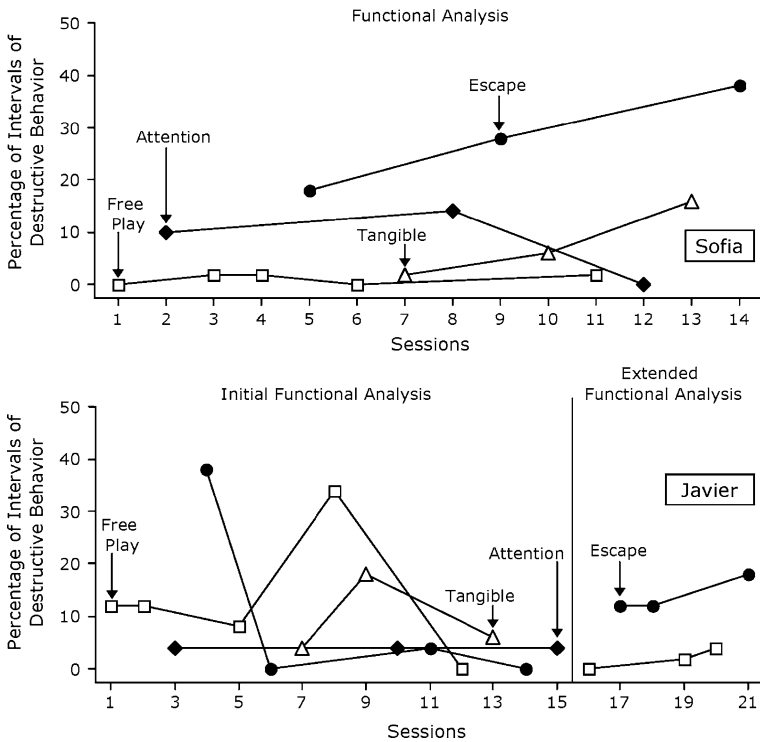
### *Extinction*

Treatment was removed and extinction sessions in Spanish and English were conducted once for Sofia and twice for Javier during the course of intervention to demonstrate experimental control. Three Spanish and four English extinction sessions were conducted 6 weeks from beginning of treatment for Sofia. For Javier, four Spanish and five English extinction sessions were conducted 12 weeks from the beginning of treatment, and five Spanish and English extinction sessions were conducted 32 weeks from the beginning of treatment. For both participants, the procedure for these extinction sessions was identical to Javier's initial baseline extinction sessions. Demands were delivered every 30 s with the same task that was used during the functional analysis escape condition, baseline, and treatment (i.e., putting blocks in a bucket for Sofia, putting pieces in a Mr. Potato Head for Javier). The microswitches and picture/word cards were not present, manding was ignored, and destructive behavior was ignored or blocked neutrally.

## **Results**

### Phase 1: Assessment

Sofia's mean percentage of toy engagement across sessions was highest for books (37%) and small toys (26%) and was zero for blocks, the doll house, and animals. Books and small toys were used as the highly preferred (HP) toys throughout assessment and treatment procedures. The investigator chose blocks as Sofia's less preferred (LP) toy and her mother used blocks for her target task across assessment and treatment procedures. Javier's mean percentage of toy engagement across sessions was highest for puzzles (36%) and kitchen toys (30%) and lowest for Mr. Potato Head (4.4%) and music toys (0%). Puzzles and kitchen toys were used as his highly preferred (HP) toys throughout the assessment and treatment procedures. The investigator chose Mr. Potato Head as Javier's less preferred toy (LP) and his mother used this toy for his target task across assessment and treatment procedures.



**Fig. 1** Percentage of intervals of destructive behavior during functional analysis for Sofia (top panel) and during initial functional analysis and extended functional analysis for Javier (bottom panel)

Functional analysis results for Sofia are displayed in the top panel of Fig. 1. Sofia’s destructive behavior averaged 28%<sup>1</sup> (range = 18–38%) during the escape condition, 8% (range = 2–16%) during the tangible condition, 8% (range = 0–14%) during the attention condition, and 1.2% (range = 0–2%) during the free-play condition. These results suggested that her destructive behavior was maintained by escape from demands and by access to tangibles and parent attention.

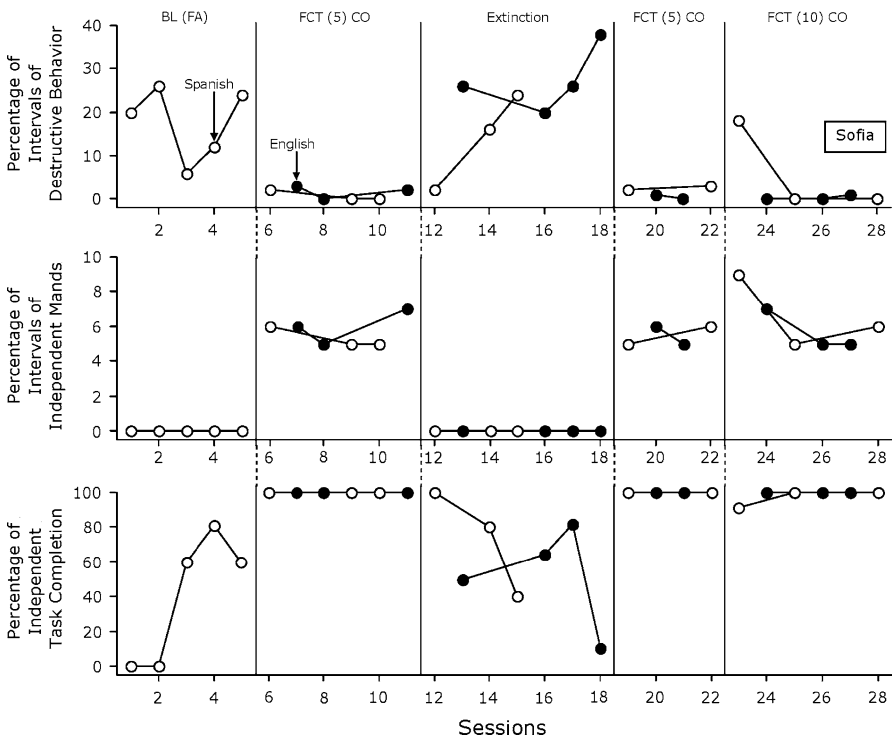
Functional analysis results for Javier are displayed in the bottom panel of Fig. 1. Javier’s destructive behavior was undifferentiated during the initial functional analysis. Destructive behavior averaged 10.5% (range = 0–38%) during the escape condition, 9.3% (range = 4–18%) during the tangible condition, 4% (range = 4%) during the attention condition, and 13.6% (range = 0–34%) during the free-play condition. During the extended functional analysis, Javier’s destructive behavior was elevated during the escape test condition (average 12.7%, range = 12–14%) when compared with free play (average 2%, range = 0–4%). These results

<sup>1</sup> Percentages of destructive behavior and independent manding refer to percentage of intervals of destructive behavior or independent manding.

suggested that his destructive behavior was maintained, at least in part, by escape from demands.

Phase 2: Treatment

Sofia’s treatment results are displayed in Fig. 2. The top panel displays percentage of intervals of destructive behavior. During the five baseline sessions when Sofia had to complete 10 tasks, her destructive behavior averaged 17.6% (range = 6–26%). When FCT (5) was introduced and she had to complete one task per trial and five tasks per session, her destructive behavior decreased across languages to an average of 0.7% (range = 0–2%) during Spanish sessions and 1.7% (range = 0–3%) during English sessions. When treatment was removed and extinction was conducted in both languages from Sessions 12 to 18, destructive behavior showed an increasing trend across languages and increased to an average of 14% (range = 2–24%) in Spanish and 27.5% (range = 20–38%) in English. When FCT (5) was reintroduced, Sofia’s destructive behavior decreased to 2.5%



**Fig. 2** Percentage of intervals of destructive behavior (*top panel*), percentage of intervals of independent target manding (*middle panel*), and percentage of independent task completion (*bottom panel*) during FCT for Sofia. *BL* baseline, *FCT* functional communication training. *Spanish* functional communication training in Spanish with language choice, *English* functional communication training in English with language choice

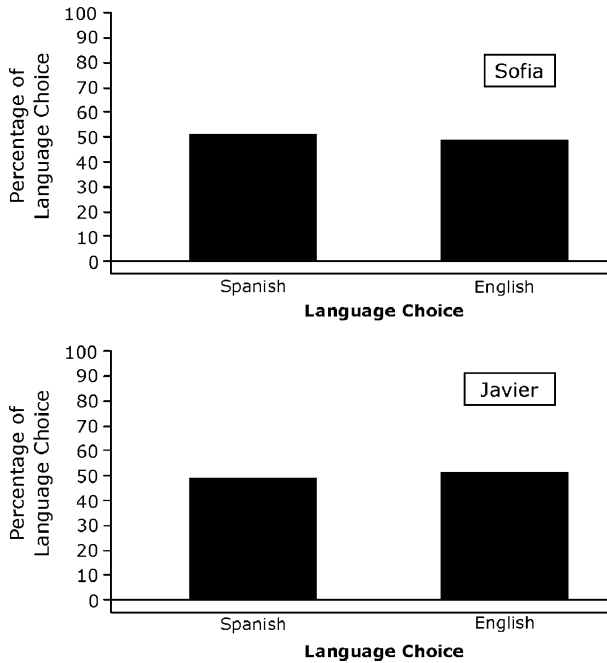
(range = 2–3%) during Spanish sessions and 0.5% (range = 0–1%) during English sessions. The task requirement was then increased to 10 tasks per FCT session and after a brief increase in destructive behavior during the first session, low levels of destructive behavior occurred during Spanish ( $M = 6\%$ ; range = 0–18%) and English sessions ( $M = 0.3\%$ ; range = 0–1%).

The second panel displays Sofia's percentage of intervals of independent target manding. During the baseline sessions, Sofia engaged in 0% independent target manding. During the initial FCT (5), her independent target manding increased across languages to an average of 5.3% (range = 5–8%) during Spanish sessions and 6% (range = 5–7%) during English sessions. She manded independently for reinforcement by pressing a microswitch during every opportunity across both languages. When treatment was removed and extinction was conducted in both languages, independent target manding decreased to 0% across languages. When FCT (5) was reintroduced, Sofia's independent manding increased to stable levels across languages (Spanish and English;  $M = 5.5\%$ ; range = 5–6%). When FCT (10) was conducted, Sofia's independent target manding continued to occur during Spanish ( $M = 7\%$ ; range = 5–10) and English sessions ( $M = 5.7\%$ ; range = 5–7%).

The third panel displays Sofia's percentage of independent task completion. Sofia engaged in an average of 40.2% (range = 0–81%) independent task completion during baseline. Her compliance with requests increased to 100% across all sessions and languages when FCT (5) was introduced. During extinction sessions, Sofia's compliance decreased to an average of 73.3% (range = 40–100%) in Spanish and displayed a decreasing trend. During English extinction sessions, compliance decreased to an average of 51.5% (range = 10–82%). When FCT (5) was reintroduced, independent task completion increased to 100% across both languages. When FCT (10) was implemented, her task completion remained at or near 100% levels across languages (Spanish  $M = 97\%$ , English  $M = 100\%$ ). Sofia's treatment results suggest that FCT was effective in decreasing her destructive behavior, increasing her communication, and increasing her task completion across languages.

Figure 3 (top panel) shows Sofia's language choices during FCT. Sofia chose reinforcement in Spanish during 51% of the 80 trials. She chose reinforcement in English during 49% of the trials. Thus, no preference for manding or obtaining reinforcement in either language was shown.

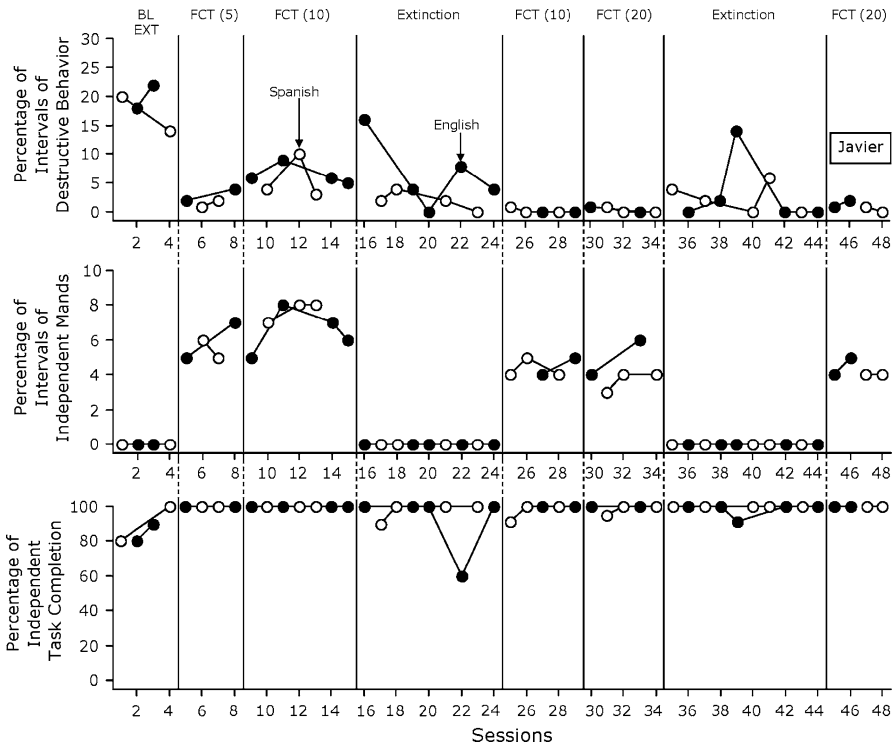
Figure 4 shows Javier's treatment results. The top panel displays percentage of intervals of destructive behavior. During the four baseline sessions when Javier was given 10 tasks, his destructive behavior averaged 17% (range = 14–20%) during Spanish sessions and 20% (range = 18–22%) during English sessions. When FCT (5) was introduced and he had to complete one task per trial (five tasks per session), his destructive behavior decreased across languages to an average of 1.5% (range = 1–2%) during Spanish sessions and 3% (range = 2–4%) during English sessions. The task requirement was increased to 10 tasks per session and destructive behavior slightly increased with the increased task requirement. Javier engaged in 5.7% (range = 3–10%) of destructive behavior during Spanish sessions and 6.5% (range = 5–9%) during English sessions. When treatment was removed and extinction sessions were repeated in both languages during Sessions 14–24, Javier



**Fig. 3** Percentage of trials of language choice in Spanish or English for Sofia (*top panel*) and Javier (*bottom panel*). Data for Sofia represents 80 trials during 16 FCT sessions (5 trials per session). Data for Javier represents 125 choice trials during 25 FCT sessions (5 trials per session)

engaged in 1.8% (range = 0–3%) of destructive behavior during Spanish sessions and 6.4% (range = 0–16%) during English sessions. When FCT (10) was reintroduced, Javier’s destructive behavior decreased to 0.3% (range = 0–1%) during Spanish sessions and 0% during English sessions. The task requirement was increased to 20 per session and Javier’s destructive behavior remained low across languages (Spanish  $M = 0.7\%$ , range = 0–1%, English  $M = 0.5\%$ , range = 0–1%). Treatment was removed a second time and his destructive behavior increased to 2.4% (range = 0–6%) during Spanish sessions and 3.2 (range = 0–14%) during English sessions. Low levels of destructive behavior were observed when FCT (20) was reintroduced across languages (Spanish  $M = 0.5\%$ , range = 0–1%; English  $M = 1.5\%$ , range = 1–2%).

The second panel displays Javier’s percentage of intervals of independent target manding. During the baseline sessions, Javier engaged in 0% independent target manding. During the initial FCT (5), his independent target manding increased across languages to an average of 5.5% (range = 5–6%) during Spanish sessions and 6% (range = 5–7%) during English sessions. He independently manded for reinforcement by pressing a microswitch during every opportunity across both languages. When FCT (10) was conducted, Javier’s independent target manding continued to occur during every opportunity during Spanish ( $M = 6.5\%$ ;



**Fig. 4** Percentage of intervals of destructive behavior (*top panel*), percentage of intervals of independent target manding (*middle panel*), and percentage of independent task completion (*bottom panel*) during FCT for Javier. *BL EXT* extinction baseline, *FCT* functional communication training, *Spanish* functional communication training in Spanish with language choice, *English* functional communication training in English with language choice

range = 5–9) and English sessions ( $M = 7.7\%$ ; range = 7–8%). When treatment was removed and extinction was conducted in both languages, independent target manding decreased to 0% across languages. When FCT (10) was reintroduced, Javier’s independent manding increased to stable levels across languages (Spanish  $M = 4.3\%$ ; range = 4–5%; English  $M = 4.5\%$ ; range = 4–5%). When FCT (20) was conducted, Javier’s independent target manding continued to occur during Spanish ( $M = 3.7\%$ ; range = 3–4%) and English sessions ( $M = 5\%$ ; range = 4–6%). When treatment was removed, independent target manding again decreased to 0% across languages. During the final FCT (20), Javier’s independent manding continued to occur during Spanish ( $M = 4\%$ ) and English sessions ( $M = 4.5\%$ ; range = 4–5%).

The third panel displays Javier’s percentage of independent task completion. During the baseline sessions, Javier’s task completion averaged 90% (range = 80–100%) during Spanish sessions and 85% (range = 80–100%) during English sessions. His compliance with requests increased to 100% across all sessions and languages when FCT (5) was introduced and during the subsequent increase in FCT

(10). When extinction was implemented, compliance remained high at an average of 97.5% in Spanish and 92% in English. He engaged in 100% compliance across languages except for Session 17 in Spanish and Session 22 in English. When FCT (10) was reintroduced and during the subsequent increase in FCT (20), his task completion remained at near 100% levels across languages (Spanish  $M = 97.5\%$ , English  $M = 100\%$ ). When treatment was removed for a second and final time, Javier's task completion remained at high levels across languages (Spanish  $M = 100\%$ ; English  $M = 98.2\%$ , range = 91–100%). Task completion was 100% during the final FCT (20) across languages. Javier's treatment results suggest that FCT was effective in decreasing his destructive behavior, increasing his communication, and maintaining high levels of task completion across languages.

Figure 3 (bottom panel) shows Javier's language choices during FCT. Javier chose reinforcement in Spanish during 49% of the 125 trials. He chose reinforcement in English during 51% of trials. Thus, no preference for manding or obtaining reinforcement in either language was shown.

## Discussion

Professionals sometimes instruct or counsel parents of children with developmental disabilities whose native language is not English to speak to their children in English in their homes instead of their native tongue regardless of the parents' English proficiency (Kremer-Sadlik 2005; Wharton et al. 2000). In the schools, special educators do not always include parents in decisions about language of instruction for students with moderate to severe disabilities (Mueller et al. 2004, 2006). Manipulations of the home and school language may result in changes in social contingencies that can affect the child's behavior in unpredictable ways. Therefore, conducting systematic and individualized evaluations of how language affects the outcomes of behavioral interventions such as FCT is warranted. This study described a preliminary effort in integrating behavior analytic methodology with language as an independent variable.

Results of this study suggested that FCT was effective in reducing destructive behavior, increasing independent target manding, and/or increasing independent task completion for two participants regardless of language. The type of language that was used to deliver demands, the language of the mand (on the picture card and recorded on the microswitch), and the language that the parent spoke during the reinforcement period did not impact the effectiveness of the intervention. These results would not support a recommendation to the parents and educators of these two children to speak only in English. Our objective in this study was to provide a methodology for evaluating the impact of possible language differences on the effectiveness of FCT and to provide an operant basis for conducting this type of investigation. Language and linguistic differences across children may impact the effectiveness of an intervention via variables such as child or parent preferences, the effort to emit the response, and the quality of attention. The impact of these variables will likely be highly individualistic, thus requiring that methodologies such as those employed in this study be used to identify individualized effects.



This preliminary study raises various methodological issues that should be considered in future studies when evaluating the influence of language on the effectiveness of interventions. First, participants' baseline levels of language ability and extensive records of home language were not evaluated in this study. Participants' language abilities and the language spoken in their home could greatly impact treatment results. For example, Duran and Heiry (1986) found that children with moderate to severe developmental disabilities, who lived in predominately Spanish-speaking homes and who had limited English proficiency or were nonverbal, performed better at filing and collating tasks when prompts were delivered in the native language.

This study did not provide evidence that the participants discriminated between the two languages or the two microswitches used to evaluate language preference. Future studies evaluating preference of language should show that participants discriminate between the two languages or that prompts, such as visual cues, are used to make the contingencies equally discriminable across languages (Fisher et al. 1998).

In this study, we evaluated children's language preference during reinforcement. The only difference in the reinforcement period was the language the parent spoke to the child. However, the function of problem behavior that was treated was escape from demands. Therefore, attention may not have been an active variable for these participants and thus failed to show an effect for language as long as breaks from demands were provided. Future studies should evaluate whether varying the language spoken during reinforcement influences the effectiveness of FCT for children with attention-maintained problem behavior.

Finally, the use of a microswitch may have made both mands equally effortful to emit and the topography of manding for Spanish and English reinforcement was equivalent, thus reducing the potential influence of response effort and mand topography preference. Future studies might systematically evaluate the separate influence of spoken language on the quality of reinforcement (Gardner et al. 2009; Peck et al. 1996), the effort in emitting the mand (Horner and Day 1991; Richman et al. 2001), and the preference for mands (Harding et al. 2009; Winborn et al. 2002; Winborn-Kemmerer et al. 2009).

Evaluations of how culturally and linguistically diverse variables affect children with developmental disabilities are uncommon in behavior analysis. However, the field has a rich history of discussing the impact of social environments, or cultures, on individual's socially meaningful behavior (Skinner 1971, 1981). The preliminary methodology employed in this study can be improved and used to identify the conditions under which language and other cultural variables affect a child's behavior. Kauffman et al. (2008) stated that "ABA research designs are uniquely suited to the study of cultural differences" (p. 256). Rather than using cultural and language knowledge as a fact, behavior analysts working with children with developmental disabilities can develop and test hypotheses about these variables. Hayes and Toarmino (1995) urged behavior analysts to utilize the cultural knowledge of individuals to develop testable hypotheses about function rather than to make sweeping judgments and generalizations. Behavior analysts who develop and test hypotheses based on cultural and language variables may be able to avoid overgeneralizations of children's behavior based on their culture or language.

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