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Indirect Effects of Functional Communication Training on Non-Targeted Disruptive Behavior

Kelly M. Schieltz,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

David P. Wacker,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Jay W. Harding,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Wendy K. Berg,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

John F. Lee,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Yaniz C. Padilla Dalmau,

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Jayme Mews, and

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Muška Ibrahimović

The University of Iowa, Iowa City, IA 52242-1011, USA; Center for Disabilities and Development, 100 Hawkins Drive, Room 251, Iowa City, IA 52242-1011, USA

Abstract

The purpose of this study was to evaluate the effects of functional communication training (FCT) on the occurrence of non-targeted disruptive behavior. The 10 participants were preschool-aged children with developmental disabilities who engaged in both destructive (property destruction, aggression, self-injury) and disruptive (hand flapping, spinning in circles, shrill laughter, screaming, crying) behaviors. Only destructive behavior was targeted for the functional analyses and FCT, but data were also collected on disruptive behaviors. All procedures were conducted in

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kelly-schieltz@uiowa.edu.

¹Juan's functional analysis results for destructive behavior and stereotypy were presented in Wacker et al. (2009b). Andy's functional analysis results for destructive behavior were presented in Harding et al. (2009) and Schieltz et al. (2010), and FCT results for destructive behavior were presented in Harding et al. (2009) and Nevin and Wacker (in press). Jasper, Jose, Kevin, Kurt, and Rose's functional analysis results for destructive behavior were presented in Schieltz et al. (2010). Tina's functional analysis results for destructive behavior were presented in Schieltz et al. (2010) and summarized in Wacker et al. (2009a), and FCT results for destructive behavior were presented in Wacker et al. (2009b).

the participants' homes by their mothers with investigator coaching. Phase 1 consisted of conducting a functional analysis within a multielement design. Phase 2 consisted of conducting FCT with demand fading and repeated extinction baselines within a reversal design. Single-case data are provided for 3 participants, and summary data are provided for all 10 participants. Results of phase 1 showed that all participants' destructive and disruptive behavior was maintained, at least in part, by negative reinforcement. Results of phase 2 showed that both destructive behavior and non-targeted disruptive behavior occurred at lower levels during FCT when compared to the functional analysis demand condition and baseline conditions, suggesting that FCT was effective in decreasing both target destructive behavior and non-targeted disruptive behaviors.

Keywords

Functional analysis; Functional communication training; Destructive behavior; Developmental disabilities; Long-term treatment

Introduction

Functional communication training (FCT) is the most commonly used intervention for destructive behavior maintained by social (positive and negative) reinforcement (Tiger et al. 2008). FCT is a differential reinforcement procedure in which the individual is taught appropriate communication (mands) to access reinforcement as an alternative to destructive behavior (Carr and Durand 1985). For example, if a functional analysis identifies that destructive behavior is maintained by negative reinforcement, then FCT is implemented by providing negative reinforcement (e.g., a break from the task) contingent on the emitted mand (e.g., "break, please") while destructive behavior is placed on extinction.

Carr and Durand (1985) demonstrated the effects of FCT on destructive behavior displayed by four children with disabilities. Relevant and irrelevant vocal communicative phrases were taught to each child within the context that maintained their destructive behavior. Results showed that relevant communicative phrases were effective at decreasing destructive behavior, whereas irrelevant communicative phrases were ineffective at decreasing destructive behavior. For example, one child's destructive behavior was shown to occur when difficult task demands were in place and when low levels of attention were being provided. These results suggested that this child's destructive behavior was maintained by both negative (escape from demands) and positive (gaining access to adult attention) reinforcement. For both of these contexts, the child was taught a relevant and an irrelevant vocal communicative phrase. During the difficult task demand context, the child was taught to say, "I don't understand" (relevant phrase) and "Am I doing good work?" (irrelevant phrase). During this demand context, the relevant phrase of "I don't understand" was most effective at decreasing the child's destructive behavior because it prompted the adult to provide assistance with the difficult task. In contrast, the irrelevant phrase of "Am I doing good work?" was shown to be ineffective at decreasing destructive behavior as this phrase prompted the adult to provide praise, which did not assist the child with the difficult task. Overall, results of this study suggested that communicative responses must be relevant to the function of the destructive behavior in order to maximize treatment effects.

Similar effects of FCT have been shown with participants who were nonverbal and were taught to mand using augmentative communication. Wacker et al. (1990) showed that augmentative communication modes such as signing and touching a microswitch were effective in decreasing destructive behavior and increasing appropriate communication. For example, one participant's destructive behavior was shown to be maintained by positive reinforcement (gaining access to preferred items). The participant was taught to sign

“please” to gain access to the preferred item, while self-injury was placed on extinction. Results showed that the FCT treatment package was effective for decreasing the participant’s destructive behavior and increasing the participant’s appropriate communication. Similar effects have been obtained with microswitches and have been replicated by other researchers (Winborn-Kemmerer et al. 2009; Winborn et al. 2002). These positive effects of FCT have also been shown in more large-scale studies in different settings such as hospitals (Asmus et al. 2004), outpatient clinics (Kurtz et al. 2003), communities (Wacker et al. 2005), and homes (Wacker et al. 1998).

Overall, studies to date have shown that manding or other adaptive behaviors (e.g., compliance) often covary with destructive behavior (Parrish et al. 1986) such that increases in manding are related to decreases in destructive behavior (Carr and Durand 1985; Derby et al. 1997; Durand 1999; Durand and Carr 1987; Harding et al. 2009; Wacker et al. 1990), and especially when destructive behavior is placed on extinction or produces punishment (Hagopian et al. 1998). For example, Harding et al. (2009) demonstrated that when compliance and manding were targeted during FCT, these adaptive behaviors increased and destructive behavior decreased. Conversely, when compliance and manding no longer resulted in reinforcement, the adaptive behaviors decreased and destructive behavior increased.

A few studies (Berg et al. 2007; Derby et al. 1997; Wacker et al. 1998) have also shown improvement in non-targeted behavior during treatment with FCT. For example, Derby et al. (1997) evaluated the effects of FCT on non-targeted appropriate behaviors (i.e., parent interactions, toy play) and showed that these appropriate behaviors increased throughout the course of treatment. These researchers measured the first occurrence and ongoing responses of social and toy play behaviors of four children with disabilities who displayed destructive behavior in their homes. During FCT, they were required to emit a mand to receive the reinforcer identified in the functional analysis (e.g., signing “please” to receive parental attention) as maintaining destructive behavior. The non-targeted social behaviors were measured to evaluate the collateral or side effects of long-term FCT. FCT was shown to be effective not only for the target behaviors (decreasing destructive behavior and increasing appropriate communication) but also for increasing the non-targeted social behaviors for all children who participated in the study.

The results of the study by Derby et al. (1997) suggested that FCT may impact behaviors that are correlated with the target behavior, even when they do not directly receive treatment. Many children who display severe destructive behavior also display other forms of disruptive behaviors such as stereotypy, elopement, crying, and screaming (Carr and Durand 1985; Hagopian et al. 1998; Wacker et al. 2005). To date, most FCT studies have focused on either specific target behaviors (e.g., Wacker et al. 1990) or combined multiple responses into a single class of behaviors called destructive (e.g., Fisher et al. 1998) or disruptive (e.g., Carr and Durand 1985) behavior. Therefore, it is unclear what effects FCT may have on these disruptive behaviors if they are not targeted during treatment.

The purpose of this study was to evaluate the effects of FCT on non-targeted disruptive behavior. For each child, both a specific destructive response (e.g., self-injury) and a specific disruptive (e.g., stereotypy) response were identified by the parent and shown to occur in the demand context of a functional analysis. During FCT, a microswitch was used as the targeted communicative response as outlined by Schieltz et al. (2010). FCT was applied only to the destructive behavior, but observations of both destructive and disruptive behavior occurred throughout treatment to determine whether the effects of FCT were restricted only to the target behavior or whether FCT also produced indirect effects on disruptive behavior.

Method

Participants and Settings

Ten children¹ who were participants in a federally funded research project (Wacker et al. 2004) were included in this study. Schieltz et al. (2010) provided a detailed description of criteria for enrollment in the project, information obtained during an initial parent interview, and the setting in which the project was conducted. Briefly, the children were required to be 6 years old or younger, have a developmental delay, and display destructive behavior maintained by negative reinforcement. Parents conducted all sessions within their homes during weekly 1-h visits with coaching from investigators. A detailed description of parent training is provided by Harding et al. (2009). The only other criterion for inclusion in the present study was that the child displayed both destructive behavior and non-targeted disruptive behavior during the demand condition of a functional analysis.

Table 1 shows the demographic characteristics of all participants. The children ranged in age from 1 year and 8 months to 4 years and 4 months (Mean = 2 years and 6 months). Juan, Cam, and Bud are the three children for whom individual results are presented. For all children, the primary behaviors of concern were destructive behaviors. Juan, aged 3 years and 10 months, was diagnosed with autism. Destructive behaviors were aggression and self-injury, and disruptive behavior was stereotypy (e.g., hand flapping, teeth grinding, spinning in circles). Cam, aged 2 years and 11 months, was diagnosed with developmental delays. Destructive behaviors were aggression and self-injury. Disruptive behaviors were jumping on the couch, climbing on furniture, and dropping to the floor. Bud, aged 3 years and 6 months, was diagnosed with autism and mild mental retardation. Destructive behaviors were self-injury and aggression, and disruptive behavior was high-pitched shrill laughter.

Materials

A free-operant preference assessment (Roane et al. 1998) was conducted during the functional analysis free-play sessions to identify preferred and non-preferred toys that were used during all functional analysis and FCT conditions. A non-preferred toy was used as the task item during demands and the non-preferred toy during the tangible condition for all children. The preferred toys were used as free-access items in the free-play and attention conditions and as the reinforcer in the tangible and FCT conditions.

During FCT, picture cards and a microswitch were used with all children. All picture cards were 4 in. by 4 in. A Boardmaker™ picture card of a child sitting at a desk was used to indicate “Time to work.” The word “work” was written at the top of the picture. To request a break from work, all children were presented with a BIGmack® microswitch with an attached picture card. The attached card included a Boardmaker™ picture of a child playing with toys to indicate “play” (e.g., escape from the demand). The word “play” was written at the top of the picture. Touching the microswitch produced a pre-recorded message of the parent saying, “Play, please.”

Other materials included child-size tables, chairs, and desks for some children. Investigators used video recorders to record all sessions for subsequent data collection. A timer within the video recording system was used to cue parents when to deliver specific procedures (e.g., provide a task request, deliver and remove reinforcement, etc.).

Response Definitions

Table 2 provides specific topographies of destructive and non-targeted disruptive behaviors for all children. Destructive behavior was defined as self-injury, aggression, and property destruction. Juan’s destructive behavior was defined as self-injury (e.g., throwing self on the

floor, hitting or scratching his legs, arms, or stomach) and aggression (e.g., head butting, pushing, hitting). For Cam, destructive behavior was defined as self-injury (e.g., head banging), aggression (e.g., shoving, kicking, hitting, striking with object, pulling hair, head butting), and property destruction (e.g., throwing toys, standing or jumping on toys). Bud's destructive behavior was defined as self-injury (e.g., hand mouthing, head hitting, head banging, hitting head with toys), aggression (e.g., pushing book at mom, standing on mom's foot, hitting book in mom's hand, hitting mom), and property destruction (e.g., standing on table, twisting book pages, throwing toys).

Non-targeted disruptive behavior was defined as problem behaviors such as stereotypy, crying, screaming, swearing, task refusal, and elopement. Juan's non-targeted disruptive behavior was defined as stereotypy that consisted of hand flapping, teeth grinding, and spinning in circles. For Cam, non-targeted disruptive behavior was defined as jumping on the couch, climbing on a shelf, and dropping to the floor. Bud's non-targeted disruptive behavior was defined as loud, high-pitched laughter.

Observation System and Interobserver Agreement

A 6-s partial-interval recording system was used to measure child destructive and non-targeted disruptive behavior. Two trained data collectors recorded the occurrence of destructive and disruptive behavior independently from videotapes. Within each interval, all codes were matched to determine the occurrence of an agreement or disagreement. For example, if the intervals included codes for destructive behavior and disruptive behavior, then the interval was compared between data collectors to determine whether an agreement or a disagreement occurred on each code individually. If the primary data collector scored an occurrence of destructive behavior and disruptive behavior and the interobserver agreement data collector scored only an occurrence of destructive behavior, then interobserver agreement would be calculated as one agreement divided by one agreement plus one disagreement and multiplied by 100 equaling 50%.

Interobserver agreement for all children was calculated during 30% of each session. For all children, interobserver agreement averaged 97% (range = 90–100%) for both the functional analysis and the FCT phases. Interobserver agreement on destructive behavior and disruptive behavior was calculated separately during 30% of each session for Juan, Cam, and Bud for the functional analysis and FCT phases. For Juan, overall interobserver agreement averaged 100% and 94% (range = 50–100%) for destructive and disruptive behavior, respectively. Cam's overall interobserver agreement for destructive behavior averaged 100% and disruptive behavior averaged 94% (range = 33–100%). For Bud, overall interobserver agreement averaged 94% (range = 0–100%) for destructive behavior and averaged 96% (range = 75–100%) for disruptive behavior. Low interobserver agreement was the result of the behaviors occurring infrequently during some sessions.

Experimental Design and Procedure

This study was conducted in two phases: (a) functional analysis and (b) functional communication training with demand fading. The functional analysis was conducted within a multielement design, and FCT with demand fading was conducted within a reversal design consisting of extinction baseline and FCT conditions. Both the functional analysis and FCT phases were conducted to evaluate the occurrence of destructive and disruptive behavior during 5-min sessions.

Functional Analysis—Free-play, escape, attention, and tangible conditions were counterbalanced for each child. The microswitch with picture card was not provided in any conditions. Destructive behavior resulted in the relevant reinforcer during all test conditions,

and no programmed consequences were provided for disruptive behavior. Each condition was implemented two to six times until stability in the occurrence of destructive behavior was observed.

The free-play (control) condition consisted of providing the child with access to toys and non-contingent parental attention (e.g., play and social interaction), and no demands were placed on the child. Parents were instructed to block destructive behavior in a neutral fashion (e.g., no reprimands or discussion) and to ignore non-targeted disruptive behavior. There were no other programmed consequences for destructive behavior or non-targeted disruptive behavior.

The escape condition consisted of providing the child with access only to the non-preferred toy. Demand trials were presented every 30 s and consisted of the parent providing a specific instruction (e.g., “Point to the airplane”) to the child. If the child did not engage in destructive behavior or complete the task, the parent modeled how to complete the task and provided hand-over-hand assistance if task refusal continued in the absence of destructive behavior. Twenty seconds of reinforcement (removal of the task) were provided contingent on the occurrence of destructive behavior. Brief praise was provided for independent task completion within the 30-s trial.

The attention condition consisted of providing the child with access to preferred toys and no parental attention. If the child engaged in destructive behavior, he or she received 20 s of parental attention in the form of reprimands and redirection.

The tangible condition consisted of providing the child with access to the non-preferred toy (the same toy used in the demand condition), while the parent removed the child’s access to the highly preferred toy. Non-contingent parental attention was provided throughout this condition. The child received 20 s of reinforcement (e.g., access to the highly preferred toy) contingent on the occurrence of destructive behavior.

Treatment Evaluation—Extinction baseline and functional communication training conditions were conducted within the demand context. During both conditions, destructive behavior was ignored or blocked without reprimands or discussion, whereas non-targeted disruptive behavior continued to produce no programmed consequences.

Extinction Baseline: Demand trials were presented every 30 s and consisted of providing the child with access only to the task materials and a specific instruction (e.g., “Point to the airplane”). If the child did not complete the task, the parent re-presented the instruction and modeled how to complete the task. Hand-over-hand assistance was not provided during this condition, and breaks were not provided for the occurrence of destructive behavior. Brief praise was provided if the child completed the task within the 30-s trial.

Initially, the extinction baseline condition was conducted to determine whether the occurrence of destructive behavior would decrease quickly in the absence of negative reinforcement, suggesting that treatment may not be warranted. We returned to the baseline condition throughout the course of FCT when destructive behavior decreased to zero or near-zero levels to determine whether destructive behavior re-emerged in the absence of the FCT contingencies. The re-emergence of destructive behavior during the baseline condition suggested that FCT was still needed to produce durable treatment effects. If destructive behavior re-occurred during a return to baseline, the previous FCT condition was re-implemented to demonstrate the control of FCT on destructive behavior.

Functional Communication Training: During the FCT condition, the room was divided into two areas: a work area and a play area. The work area consisted of an area set away from the child's preferred toys in which he or she completed the required work task. This work area included the task materials, the microswitch, and either a spot on the floor or a child-sized desk or table and chairs. The play area consisted of the child's preferred toys, and the child had free access to the toys during breaks from the task. During FCT sessions, the child was shown the "work" picture card, informed that it was "time to work," and directed to the work area. A specific instruction (e.g., "Point to the airplane") was then provided to the child. If the child did not complete the task or engaged in destructive behavior, the parent re-presented the instruction, modeled how to complete the task, and used hand-over-hand assistance. Following hand-over-hand assistance, the parent presented the child with a new specific instruction (e.g., "Point to the apple") until the child completed the task independently. When the child completed the task independently, the parent provided praise and presented the child with the microswitch and attached "play" picture card to mand for a break. Touching the microswitch, saying "play" or pointing to the preferred toys resulted in the child receiving a 1-min break to play with preferred toys and non-contingent parental attention. If destructive behavior occurred during reinforcement periods, the child was directed back to work and presented with a demand. During demand trials, disruptive behavior was ignored, and the trial continued until the child completed the task. During reinforcement periods (breaks from work), disruptive behavior was ignored while the child and parent continued to play.

Demand fading was conducted within FCT. The initial FCT condition consisted of all children completing two specific instructions independently within each 5-min session. The number of instructions the children were required to complete prior to being presented with the microswitch was gradually increased once a stable decrease in destructive behavior was observed. The independent task requirements increased from two tasks (FCT [2]) to four tasks (FCT [4]) to eight tasks (FCT [8]) over the course of the study. Eight tasks was the target number because that was approximately the number of tasks that could be completed during a 5-min baseline session (e.g., instructions provided every 30 s = 8–10 requests).

Results

Juan's, Cam's, and Bud's functional analyses and FCT results are shown in Figs. 1, 2, and 3, respectively and provide specific examples of the results achieved with each child. A summary for all 10 children is shown in Fig. 4.

For Juan (Fig. 1), the functional analysis showed that destructive behavior (top panel) was maintained by positive (access to tangibles) and negative reinforcement. Non-targeted disruptive behavior (stereotypy) occurred across all conditions (middle panel). The results of Juan's FCT (bottom panel) showed that both his destructive behavior and stereotypy decreased to zero or near-zero levels. Specifically, Juan's initial extinction baseline condition showed that stereotypy occurred during all five sessions, whereas destructive behavior occurred only during the first two sessions. Thus, baseline was effective for decreasing destructive behavior but not for decreasing stereotypy. FCT with demand fading resulted in continued low levels of destructive behavior and a decrease in stereotypic behavior. Over the first five sessions of FCT, stereotypy decreased from 18% to 2%. Decreases in both destructive behavior and stereotypy were maintained during demand fading (e.g., FCT [4], FCT [8], FCT [12]) and during both returns to the baseline condition. Destructive behavior did not occur in any condition following the initial extinction baseline condition. After the initial FCT (2) condition, stereotypy occurred only rarely and occurred on average during 0.8% of the final five FCT sessions. This represents a 94% reduction in stereotypy even though it was not targeted during FCT.

Cam's results are shown in Fig. 2. Similar to Juan's functional analysis, Cam's destructive behavior (top panel) was shown to be maintained by positive (access to tangibles) and negative reinforcement. His non-targeted disruptive behavior (middle panel) occurred at variable levels during all conditions. The results of FCT are shown in the bottom panel. During Cam's initial extinction baseline condition, he displayed higher levels of non-targeted disruptive behavior ($M = 5\%$; range = 4–8%) than those of destructive behavior ($M = 3\%$; range = 2–6%). When FCT (2) was implemented, both destructive behavior and non-targeted disruptive behavior occurred at varying levels until both decreased to zero levels during the final three sessions. A return to the baseline condition showed an increase in destructive behavior ($M = 7\%$; range = 0–14%), while non-targeted disruptive behavior, following the first session, continued to remain at relatively low levels ($M = 3\%$; range = 0–10%). A return to FCT resulted in a decrease for both destructive and non-targeted disruptive behavior to zero levels by session 24, and these levels were maintained even as the amount of work increased. Increases in destructive and non-targeted disruptive behavior occurred during the second return to baseline condition, but both decreased to 0% with the reimplementation of FCT. During the final baseline and FCT conditions, destructive and non-targeted disruptive behavior remained at zero levels, representing a 100% decrease in both destructive and non-targeted disruptive behavior when compared to the initial extinction baseline condition.

For Bud (Fig. 3), the functional analysis showed that destructive behavior (top panel) was maintained by both positive (access to tangibles) and negative reinforcement. Disruptive behavior (shrill laughter) also occurred during the demand and tangible conditions (middle panel). Bud's FCT results are shown in the bottom panel. During the initial extinction baseline condition, shrill laughter occurred at higher levels ($M = 20\%$; range = 4–44%) than destructive behavior ($M = 7\%$; range = 2–10%). Destructive behavior decreased to zero or near-zero levels during FCT (2) by session 20, whereas shrill laughter continued to occur at higher levels ($M = 25\%$; range = 0–64%) but appeared to be on a downward trend. A return to the baseline condition showed that destructive behavior occurred on average during 1% (range = 0–2%) of sessions, whereas shrill laughter occurred on average during 24% (range = 14–38%) of sessions. As FCT task requirements increased, Bud continued to show relatively lower levels of destructive behavior ($M = 2\%$; range = 0–6%), whereas disruptive behavior occurred at variable levels (range = 0–42%; $M = 15\%$). Both destructive and non-targeted disruptive behavior decreased to zero levels by session 38. However, both destructive behavior and shrill laughter reoccurred during the return to baseline. Destructive behavior ($M = 10\%$ and $M = 2\%$) and non-targeted disruptive behavior ($M = 22\%$ and $M = 11\%$) continued to occur at variable levels during the remaining baseline and FCT conditions, respectively, with lower levels of behavior occurring for both destructive behavior and shrill laughter during the FCT condition relative to baseline. Both destructive and disruptive behavior decreased to zero levels during the final baseline condition representing a 100% decrease when compared to the initial extinction baseline. During the final three FCT sessions, destructive behavior occurred on average during 3% of sessions and non-targeted disruptive behavior occurred on average during 13% of sessions, representing a 59% decrease in destructive behavior and a 37% decrease in non-targeted disruptive behavior when compared to the initial extinction baseline condition.

A summary of the results for all 10 children (Fig. 4) was computed by averaging the occurrence of destructive behavior (top panel) and non-targeted disruptive behavior (bottom panel) during (a) demand sessions in the functional analysis, (b) sessions in the initial extinction baseline condition, (c) the final three sessions during FCT (2), (d) the final three sessions during FCT (4), (e) the final three sessions during FCT (8), and (f) the final three sessions during the final baseline condition.

Results demonstrated that non-targeted disruptive behavior ($M = 48\%$; range = 6–100%) occurred at higher levels than destructive behavior ($M = 16\%$; range = 0–46%) during the functional analysis demand condition across children. During both the initial and the final baseline conditions, destructive behavior ($M = 19\%$ and $M = 5\%$) was shown to occur at levels similar to non-targeted disruptive behavior ($M = 18\%$ and $M = 2\%$). During all FCT conditions, non-targeted disruptive behavior ($M = 3\%$) occurred at higher levels than destructive behavior ($M = 1\%$). Specifically, non-targeted disruptive behavior occurred on average during 3% of sessions of FCT (2), FCT (4), and FCT (8). In contrast, destructive behavior occurred on average during 0.8% of sessions of FCT (2), 1% of sessions of FCT (4), and 0.8% of sessions of FCT (8).

A 71% reduction was observed between the initial and final baseline conditions for destructive behavior, and a 90% reduction was observed for non-targeted disruptive behavior. Both destructive and non-targeted disruptive behavior occurred at lower levels during all FCT conditions, representing a 94% overall decrease in destructive and non-targeted disruptive behavior when compared to the functional analysis demand condition. Similarly, across all FCT conditions, a 95% overall decrease in destructive behavior and an 84% overall decrease in non-targeted disruptive behavior were observed across children when compared to the initial baseline condition.

Discussion

Previous studies such as Derby et al. (1997) have shown that FCT can produce changes in non-targeted behaviors. For example, Derby et al. (1997) showed substantial improvement in appropriate social behaviors. The current study extended and replicated these findings by demonstrating the indirect effects of FCT on non-targeted disruptive behaviors. FCT appeared to decrease non-targeted disruptive behavior to almost the same amount as the more severe destructive behaviors that were targeted during the treatment. These results are also consistent with those reported by Berg et al. (2007), who reported substantial stimulus generalization following FCT treatment. The combined results of previous studies and the current study suggest that FCT can produce substantial response and stimulus generalization.

Relative to the current study, there are at least three plausible explanations for the decrease in non-targeted disruptive behavior. First, non-targeted disruptive behavior may have occurred within the same response class or as part of a response chain with destructive behavior. Several studies (Borrero and Borrero 2008; Lalli et al. 1995; Richman et al. 1999; Smith and Churchill 2002) have shown that contingencies maintaining severe destructive behaviors may also maintain less severe problem behaviors. Decreasing one topography of behavior within a response class may also decrease other behaviors within that same response class. Visual inspection of the functional analysis graphs in the current study showed that non-targeted disruptive behavior occurred during the demand condition for all participants. Thus, it is possible that destructive and disruptive behaviors occurred within the same response class or as part of a response chain within the specific context (e.g., demand) selected for treatment. Subsequently, when destructive behavior decreased during FCT, non-targeted disruptive behavior also decreased. To further test this hypothesis, the procedures used by Richman et al. (1999) would need to be conducted. If, for example, disruptive behaviors were often displayed prior to destructive behavior, then during treatment, both sets of responses would be placed on extinction. However, in the current study, separate contingencies for disruptive and destructive behaviors were not provided and thus we do not know whether they were maintained by the same reinforcers.

A second explanation is that extinction was the mechanism responsible for the decreases obtained in disruptive behavior. Disruptive behavior never resulted in programmed consequences and thus may have been placed on extinction from the beginning of assessment with the functional analysis. Other researchers (Hagopian et al. 1998; Wacker et al. 1990) have reported better effects with FCT when extinction or punishment components were added to the treatment package. One reason for the overall effects achieved for disruptive behavior during FCT in the current study is that disruptive behavior never produced social reinforcement and thus weakened the possible relation between disruptive behavior and negative reinforcement. To further evaluate this possibility, assessments of treatment integrity would need to be obtained during all sessions conducted by the parents.

This weakening of disruptive as well as destructive behavior is further shown during the returns to baseline. As discussed by Nevin and Wacker (in press), long-term reinforcement of adaptive behaviors such as task completion and manding coupled with extinction for problem behaviors should lead to increased persistence of adaptive behaviors and decreased persistence of problem behaviors. In the present study, this weakening effect was demonstrated across all participants when a 71% reduction in destructive behavior and a 90% reduction in disruptive behavior were observed between the initial baseline and final baseline conditions. These results suggested that the long-term reinforcement of adaptive behaviors and the extinction of problem behaviors provided during FCT decreased the persistence of these problem behaviors when all behaviors were placed on extinction.

A third explanation for the decrease in non-targeted disruptive behavior may be stimulus generalization in which discrimination of specific stimulus properties occurred. In the present study, the presence of the microswitch during FCT may have exerted stimulus control. For example, Berg et al. (2007) showed that independent manding increased during FCT but returned to baseline levels in the absence of FCT during post-treatment generalization probes, which may suggest that participants discriminated specific stimulus properties related to manding that occurred during FCT. The FCT procedures used in the Berg et al. (2007) study and the present study were similar in that FCT was always conducted in a two-step chain. For example, in the current study, the two-step chain consisted of presenting an augmentative communication device following compliance with the work task, and the child was required to mand in order to receive a break from the task. Fisher et al. (1998) demonstrated that specific stimuli (e.g., photograph of an available reinforcer) controlled participants' destructive behavior and communicative responding even when the signaled reinforcer did not match the function of the participants' destructive behavior. Thus, a possible advantage of using augmentative communication devices such as microswitches, especially when presented at the end of the two-step chain procedure, is that they signal the availability of reinforcers, thereby decreasing both destructive and disruptive behaviors. Requiring the child to always work first may have helped to generalize this response during the return to baseline conditions because working on the task was always a requirement to receive reinforcement.

Another possible advantage of augmentative communication devices is that they reduce the effort to mand. As discussed by Richman et al. (2001), the children may have selected manding over displaying destructive or disruptive behavior because manding required less effort. A number of researchers (Durand 1999; Horner and Day 1991; Richman et al. 2001) have shown that reducing the effort to mand (e.g., touching a microswitch versus vocalizing, signing one word versus signing a full sentence) may increase the occurrence of appropriate behavior and decrease the occurrence of destructive behavior because the appropriate behavior is more efficient at obtaining desirable results (e.g., break from a task) than destructive behavior.

In summary, studies on FCT have shown both direct and indirect effects on a wide range of target destructive behavior and appropriate behavior such as communication and social interactions. One benefit of FCT (Geiger et al. 2010) is that teaching an appropriate communicative response as an alternative to destructive behavior may be viewed as an initial step toward achieving educational and rehabilitative goals (Mace and Roberts 1993) that promote learning and adaptive behavior functioning. This study demonstrated that an additional benefit of FCT may be its effects on behaviors not targeted in treatment. As FCT is conducted, decreases in disruptive behaviors may occur and augmentative communication may facilitate the success of these treatment effects.

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Fig. 1. Percentage of intervals of destructive behavior (*top panel*) and non-targeted disruptive behavior (*middle panel*) during the functional analysis for Juan. FCT with demand fading (*bottom panel*) displays the percentage of intervals of destructive behavior (*open diamonds*) and non-targeted disruptive behavior (*closed circles*) during baseline and FCT conditions. Juan's functional analysis results were provided in "Functional communication training intervention" by Wacker et al. (2009b). *BL* extinction baseline, *FCT* functional communication training

Fig. 2. Percentage of intervals of destructive behavior (*top panel*) and non-targeted disruptive behavior (*middle panel*) during the functional analysis for Cam. FCT with demand fading (*bottom panel*) displays the percentage of intervals of destructive behavior (*open diamonds*) and non-targeted disruptive behavior (*closed circles*) during baseline and FCT conditions. *BL* extinction baseline, *FCT* functional communication training

Fig. 3. Percentage of intervals of destructive behavior (*top panel*) and non-targeted disruptive behavior (*middle panel*) during the functional analysis for Bud. FCT with demand fading (*bottom panel*) displays the percentage of intervals of destructive behavior (*open diamonds*) and non-targeted disruptive behavior (*closed circles*) during baseline and FCT conditions. *BL* extinction baseline, *FCT* functional communication training

Fig. 4. Mean occurrence of destructive behavior (*top panel*) and non-targeted disruptive behavior (*bottom panel*) during the functional analysis demand condition, initial baseline condition, final three sessions of FCT (2), final three sessions of FCT (4), final three sessions of FCT (8), and final three sessions during the final baseline condition for all 10 children. *BL* extinction baseline, *FCT* functional communication training

Table 1

Demographic characteristics of participants

Child	Gender	Chronological age	Medical diagnosis	Intellectual functioning	Behavior topography	Communication
Juan	Male	3–11	Autism	Developmental delay	Aggression, self-injury	Set phrases
Cam	Male	2–11		Developmental delay	Aggression, self-injury	Single words, signing
Bud	Male	3–6	Autism spectrum disorder, mental retardation	Mild mental retardation	Self-injury, aggression	Single words
Andy	Male	2–6	Peter's anomaly	Developmental delay	Aggression, destruction	Single words, signing
Jasper	Male	1–8	Mecke's diverticulum reflux	Developmental delay	Self-injury, aggression, destruction	Single words, signing
Jose	Male	4–4	Fragile-X	Moderate mental retardation	Aggression, self-injury, destruction	Single words, signing, pointing
Kevin	Male	2–3	Viral-induced asthma	Developmental delay	Self-injury, aggression	Single words, signing
Kurt	Male	2–4	Mental retardation	Mild mental retardation	Self-injury, aggression, destruction	Single words
Rose	Female	3–4		Mild mental retardation	Aggression, self-injury, destruction	Single words
Tina	Female	3–11	Autism	Developmental delay	Aggression, destruction	Single words, object exchange

Table 2

Specific topographies of destructive and disruptive behavior

Child	Self-injury	Aggression	Property destruction	Disruptive (non-targeted)
Juan	Throwing self down on floor, hitting or scratching legs, arms, or stomach	Head butting, pushing, hitting	Pounding objects, throwing items	Stereotypy—hand flapping, repetitive jaw/teeth grinding, spinning in circles
Cam	Head banging	Shoving, kicking, hitting, striking with an object, pulling hair, head butting	Throwing toys, standing or jumping on toys	Jumping on couch, climbing on shelves, dropping to floor
Bud	Hand mouthing, head hitting, head banging, hitting head with toys	Standing on mom's foot, pushing book at mom, hitting book in mom's hand, hitting	Standing on furniture, hitting toys, twisting book pages, throwing toys	High-pitched shrill laughter
Andy	Throwing self down, head banging, eye poking	Pinching, kicking, hitting, pushing	Ripping books, throwing toys, knocking over furniture, slamming doors	Crying, screaming, jumping on bed, elopement, refusal to sit in chair, standing in chair, yelling
Jasper	Throwing self down	Scratching, throwing objects	Throwing toys, hitting toys, mouthing toys	Crying, screaming, refusal to go to the table, elopement, growling
Jose	Face hitting, pulling hair, finger biting	Pulling hair		Elopement
Kevin	Throwing self down, head banging, head hitting	Kicking	Throwing toys	Yelling, crying, screaming, elopement
Kurt	Throwing self down	Hitting	Throwing objects, hitting objects, kicking toys	Crying, yelling, screaming, elopement, refusal to go to the table
Rose	Head banging, head hitting, throwing self down	Hitting	Throwing toys, kicking toys	Climbing on couch, elopement, crying
Tina	Throwing self down, head banging	Hitting, kicking, pinching, throwing objects, pushing	Throwing objects, kicking objects	Crying, screaming, task refusal