Published in final edited form as:

J Exp Anal Behav. 2018 September ; 110(2): 252–266. doi:10.1002/jeab.462.

A Laboratory Model for Evaluating Relapse of Undesirable Caregiver Behavior

Daniel R. Mitteer,

University of Nebraska Medical Center's Munroe-Meyer Institute

Brian D. Greer,

University of Nebraska Medical Center's Munroe-Meyer Institute

Wayne W. Fisher,

University of Nebraska Medical Center's Munroe-Meyer Institute

Adam M. Briggs, and

University of Nebraska Medical Center's Munroe-Meyer Institute

David P. Wacker

University of Iowa

Abstract

The success of behavioral treatments like functional communication training depends on their continued implementation outside of the clinical context, where failures in caregiver treatment adherence can lead to the relapse of destructive behavior. In the present study, we developed a laboratory model for evaluating the relapse of undesirable caregiver behavior that simulates two common sources of disruption (i.e., changes in context and in treatment efficacy) believed to affect caregiver treatment adherence using simulated confederate destructive behavior. In Phase 1, the caregiver's delivery of reinforcers for destructive behavior terminated confederate destructive behavior in a home-like context. In Phase 2, the caregiver implemented functional communication training in a clinical context in which providing reinforcers for destructive or alternative behavior terminated confederate destructive behavior. In Phase 3, the caregiver returned to the home-like context, and caregiver behavior produced no effect on confederate destructive or alternative behavior, simulating an inconsolable child. Undesirable caregiver behavior relapsed in three of four treatment-adherence challenges.

Keywords

parent training; persistence; procedural integrity; relapse; renewal; treatment adherence

Individuals who engage in severe destructive behavior (e.g., self-injurious behavior, aggression, property destruction) often do so to access attention or preferred items from caregivers or to escape nonpreferred events presented by caregivers (Beavers, Iwata, &

Lerman, 2013; Hanley, Iwata, & McCord, 2003). Functional communication training (FCT) is an intervention based on differential reinforcement that is commonly prescribed for the treatment of such behavior (Fisher, Greer, & Boussein, in press; Tiger, Hanley, & Bruzek, 2008). After identifying the reinforcer(s) maintaining destructive behavior via functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), behavior analysts implement FCT by (a) teaching the child a functionally equivalent but otherwise more appropriate response (called a functional communication response [FCR]) and (b) placing destructive behavior on extinction (Carr & Durand, 1985). Behavior analysts have used FCT to produce rapid and robust decreases in destructive behavior while maintaining practical reinforcement schedules for the FCR (Greer, Fisher, Saini, Owen, & Jones, 2016; Hagopian, Fisher, Thibault-Sullivan, Acquistio, & LeBlanc, 1998; Rooker, Jessel, Kurtz, & Hagopian, 2013).

Despite FCT's success in the clinic, treatment challenges occur when caregivers implement FCT in other settings, such as in the home, and when caregivers are unable to respond to the FCR, such as when attending to an ill sibling. Basic, translational, and applied researchers alike have become increasingly interested in the potential for otherwise effective FCT-based interventions to result in later treatment relapse. As such, the durability of common treatments for destructive behavior is a point of focus in recent discussions of treatment maintenance (Nevin & Wacker, 2013; Wacker et al., 2011), with an implicit goal being the development of durable treatments whose effects maintain when challenged.

Toward that end, recent research has sought to enhance the durability of FCT-based interventions by improving the maintenance of treatment effects across (a) extended periods of extinction for the FCR (Fisher et al., 2018; Fisher, Greer, Fuhrman, Saini, & Simmons, in press; Fuhrman, Fisher, & Greer, 2016; Lichtblau, Greer, & Fisher, in press; Mace et al., 2010; Romani et al., 2016; Wacker et al., 2011) and (b) changes in treatment contexts (Greer et al., under review; Fisher, Greer, Fuhrman, & Querim, 2015). Each of these previous studies addressed issues of durability from the perspective of mitigating the relapse of *child* behavior by manipulating aspects of how FCT is implemented. To our knowledge, no study has examined the relapse of *caregiver* behavior following training on FCT procedures. Ultimately, tactics for mitigating relapse that account for both child and caregiver behavior may be necessary for the complete elimination of treatment relapse, as caregiver behavior sets the occasion for child destructive behavior and vice versa. We focus this paper on the variables affecting caregiver behavior as they relate to the correct and consistent implementation of FCT-based interventions, as well as the conditions likely to challenge caregiver treatment adherence with the goal of developing a laboratory model for evaluating the relapse of undesirable caregiver behavior.

Caregiver Treatment Adherence

Caregiver treatment adherence (i.e., precise and consistent delivery of treatment components; Allen & Warzak, 2000) is often necessary for treatment effects to maintain outside of clinical contexts. Treatment adherence to FCT-based interventions requires low levels of *undesirable caregiver behavior*, such as delivering reinforcers following the child's destructive behavior or withholding reinforcers following the child's FCR (i.e., commission

and omission errors, respectively). Such undesirable caregiver behavior can result in the collateral recurrence of child destructive behavior following successful treatment with differential reinforcement-based interventions, like FCT (St. Peter Pipkin, Vollmer, & Sloman, 2010). Should destructive behavior recur to the point of necessitating a readmission to the clinic, this could have a discouraging effect on the family and markedly increase the cost of treatment.

Improving caregiver treatment adherence first requires identification of the variables maintaining undesirable caregiver behavior. Although undesirable caregiver behavior can be sensitive to child-mediated positive reinforcers, such as child affection (Wahler, 1976), it is more likely that undesirable caregiver behavior is negatively reinforced by the termination of child destructive behavior (Stocco & Thompson, 2015; Patterson, 1982, 2002). Support for this interpretation comes from a variety of sources. For example, when a caregiver delivers reprimands in response to their child's destructive behavior, and the reprimands act as an abolishing operation that results in the temporary cessation of destructive behavior, that temporary reprieve from the child's destructive behavior can function as negative reinforcement and increase the future probability of caregiver reprimands (Miller, Lerman, & Fritz, 2010; Sloman et al., 2005). In addition, teachers tend to respond incorrectly (e.g., by providing attention or escape) following increases in child destructive behavior (Addison & Lerman, 2009). Finally, teachers are less likely to deliver demands to children who engage in destructive behavior, and when they do, they issue tasks historically associated with less destructive behavior (Carr, Taylor, & Robinson, 1991). As such, research on improving caregiver treatment adherence has focused on ways to shift caregiver behavior from reinforcing child destructive behavior to reinforcing child appropriate behavior.

Caregiver Training

The goal of FCT caregiver training is to teach caregivers to respond to child behavior in ways that reinforce appropriate behavior, such as the FCR or compliance, and reduce destructive behavior (e.g., via extinction or punishment). *Behavioral skills training* (BST) is a commonly used method for teaching caregivers to implement treatment components and typically consists of the following: (a) written and/or didactic instructions, (b) modeling, and (c) roleplay with feedback (Brookman-Frazee, Vismara, Drahota, Stahmer, & Openden, 2009; Ingvarsson, Cammilleri, & Smith, 2010). When teaching FCT components to caregivers, BST typically ends once the caregiver demonstrates mastery with implementing FCT components, which is evaluated using a pre-specified criterion (e.g., three consecutive trials with no undesirable caregiver behavior). Following BST, the caregiver then conducts FCT with the child, and the training afforded by BST is often sufficient for caregivers to implement FCT with high levels of treatment adherence, such that FCT treatment effects generalize to the caregivers when they implement treatment in a clinical context (cf. Greer et al., under review; Fisher et al., 2015).

Although FCT treatment effects may appear to be firmly established with the caregiver following BST, caregiver treatment adherence can be challenged in a variety of ways. For example, contextual changes (e.g., returning home) can fail to evoke desirable caregiver behavior (Cordisco, Strain, & Depew, 1988; Koegel, Glahn, & Nieminen, 1978; Miller &

Sloane, 1976). Competing sources of reinforcement (e.g., attending to a sibling) or punishment (e.g., public disapproval of extinction or punishment procedures implemented for destructive behavior) may make treatment adherence less likely to occur in the behavior analyst's absence (Allen & Warzak, 2000). Additionally, the recurrence of child destructive behavior (due to factors other than lapses in treatment implementation) also may challenge caregiver treatment adherence.

Research has shown that such "treatment-adherence challenges" can disrupt caregiver treatment adherence (e.g., Addison & Lerman, 2009). For example, caregivers often fail to demonstrate generalization of newly trained skills (e.g., differential reinforcement, extinction) to novel contexts without additional training in those contexts (Cordisco et al., 1988; Miller & Sloane, 1976). Some of these failures may be explained in relation to *renewal*, or the recurrence of previously reinforced behavior when the stimulus context changes from the training context (Context B) to the original context (Context A) or to a novel context (Context C; Bouton, Winterbauer, & Todd, 2012). Although renewal effects have been examined historically in relation to respondent behavior, renewal of operant behavior has been evaluated in basic preparations with nonhuman animals (e.g., Bouton, Todd, Vurbic, & Winterbauer, 2011), as well as in applied settings with humans (see Podlesnik, Kelley, Jimenez-Gomez, & Bouton, 2017, for a review). Renewal effects are pertinent to caregiver training because caregiver training often occurs in a clinical setting prior to the caregivers returning home or entering a new public setting.

Escalations in child destructive behavior can result in caregivers reverting to previous strategies (e.g., providing attention or escape) for responding to destructive behavior, despite recent training to respond differently (Addison & Lerman, 2009). This may be explained in relation to *resurgence*, or the recurrence of previously reinforced response when a recently reinforced response contacts a worsening of reinforcement conditions such as extinction (Epstein, 1983; Lattal et al., 2017). Experimental analyses of caregiving behavior (Bruzek, Thompson, & Peters, 2009; Thompson, Bruzek, & Cotnoir-Bichelman, 2011) have demonstrated the susceptibility of negatively reinforced caregiver behavior to recur during periods of extinction. During Phase 1 of these studies, caregivers learned to soothe a crying infant doll by engaging in a target response (e.g., vertical rocking). In Phase 2, the target response was extinguished (i.e., infant crying persisted despite vertical rocking) prior to caregivers learning an alternative response (e.g., feeding the infant) that terminated the infant cry. In Phase 3, both responses failed to terminate the infant cry, and extinction of the alternative response often led to recurrence of the target response across caregivers, especially when target responding had a longer history of reinforcement (Bruzek et al., 2009; see also Todd, Winterbauer, & Bouton, 2012). When treatment adherence fails to terminate the child's destructive behavior, this type of treatment-adherence challenge may result in relapse of negatively reinforced undesirable caregiver behavior.

Purpose of the Current Study

We expect that these contextual and contingency changes may occur simultaneously following caregiver training, with the family leaving the clinic context in which training occurred and a potential for child destructive behavior to persist despite treatment adherence,

perhaps because the same contextual variables may lead to renewal of destructive behavior. Given the potential for relapse of undesirable caregiver behavior during treatment-adherence challenges, and the potential for the collateral recurrence of child destructive behavior, experimental evaluations of caregiver treatment adherence to FCT-based interventions are warranted. In the present study, we sought to develop a laboratory model to evaluate the relapse of undesirable caregiver behavior that emulates a typical outpatient model in which caregivers learn to implement FCT-based interventions in a clinic setting before then needing to implement that treatment in a more naturalistic setting with the child, during which time the child may display continued destructive behavior within the context that has not been associated with FCT previously. We evaluated the relapse of undesirable caregiver behavior using confederates as children who engaged in analog destructive behavior, thereby controlling child destructive behavior and, by extension, opportunities for undesirable caregiver behavior across phases (cf. Jarmolowicz et al., 2008; Miller et al., 2010). The use of confederates also allowed us to avoid (a) evoking high rates of child destructive behavior for the sake of examining the relapse of undesirable caregiver behavior and (b) potentially strengthening child destructive behavior during treatment due to relapse of undesirable caregiver behavior.

Method

Participants and Settings

Caregiver participants.—Four caregivers (three women, one man) whose children were enrolled in, or on the waiting list for, a university-affiliated clinic specializing in the assessment and treatment of severe behavior disorders completed the study. Michelle was a 26-year-old woman whose son had engaged in destructive behavior for approximately three years and was on the waiting list for our clinic's program. Michelle had completed an undergraduate degree in psychology and had received 12 weeks of parent-child interaction therapy (Eyberg & Matarazzo, 1980; McNeil & Hembree-Kigin, 2010) approximately six months prior to the current study. Debbie was a 38-year-old woman whose son had engaged in destructive behavior for two years and was enrolled in our clinic's program. Debbie was employed in an early childhood child care facility and had received weekly outpatient psychology services related to compliance training using differential attention and time-out for three months prior to the start of the current study.

Nicole was a 43-year-old woman whose son had engaged in destructive behavior for two years prior to the study and was on the waiting list for our clinic's program. Nicole completed undergraduate courses in developmental, adolescent, and abnormal psychology and participated in a two-day training in Trust-Based Relational Intervention® (Purvis, Cross, Dansereau, & Parris, 2013; Purvis, Howard, & Call, 2017) and a seven-day training in a related attachment-based intervention prior to participating in the current study. Chandler was a 40-year-old man whose son had engaged in destructive behavior for 11 years and was enrolled in our clinic's program. Chandler had no prior education in psychology or related fields and had not received parent training or similar behavioral services prior to his son's admission to our clinic.

Three other caregivers participated but did not complete the study. Of those three, we excluded two caregivers based on the absence of undesirable caregiver behavior in baseline, and one caregiver voluntarily withdrew due to scheduling conflicts. All caregivers completed the informed-consent process prior to participation. Per clinic policy, all caregivers receive specific training on their child's individualized treatment procedures, which these caregivers received only after their participation in the present study. Caregivers received \$20 per hour for compensation, and each caregiver's participation lasted approximately two hours.

Confederate therapists.—The first author served as the confederate for all sessions in baseline (Phase 1), FCT (Phase 2), and in the treatment adherence challenge (Phase 3). To facilitate discrimination between the home-like and clinical contexts (described below), the confederate wore a pink t-shirt with a white hat in Phases 1 and 3 and a yellow t-shirt with a blue hat in Phase 2. A behavior technician wearing scrubs served as the confederate during BST, which followed Phase 1 but preceded Phase 2.

Settings.—We conducted Phases 1 and 3 in a home-like context containing a couch, armchair, coffee and end table, flower vase, and wall decorations. We also used a floor lamp to cast yellow light throughout the room. We conducted BST and Phase 2 in a clinical context, which contained child-size tables and chairs and white fluorescent lighting. For three of the four caregivers, the clinical context included padded walls and floors. All contexts included a one-way observation window for discrete data collection, a bag of Skittles to be used as edible reinforcers (note that Nicole was the only caregiver who delivered the edibles to the confederate during the evaluation), and an iPad for the caregiver to use as a leisure item.

Response Measurement

Caregiver behavior.—Our primary dependent variable was *undesirable caregiver behavior*, which we defined as the caregiver providing the programmed reinforcer (attention or an edible) within 2 s of the confederate's destructive behavior and failing to provide the programmed reinforcer within 2 s of the confederate's FCR (commission and omission errors, respectively). For caregivers who delivered attention, we scored any physical (e.g., high fives, back rubs, hand squeezes) or vocal (e.g., reprimands, soothing statements) attention following destructive behavior as undesirable caregiver behavior. For Nicole, who delivered edible items, we scored any extension of an edible toward the confederate following destructive behavior as undesirable caregiver behavior. Trained data collectors scored the frequency of undesirable caregiver behavior using BDataPro (Bullock, Fisher, & Hagopian, 2017), which converted frequency data to responses per min.

Confederate behavior.—Data collectors also measured the frequency of confederate destructive behavior and FCRs. *Confederate destructive behavior* consisted of self-injurious behavior (hitting or biting oneself) and property destruction (hitting or kicking furniture or surfaces). *Functional communication responses* were vocal-verbal utterances for the specified reinforcer programmed for destructive behavior (e.g., "High Five?" for attention or "Skittle?" for an edible). Table 1 displays the mean and ranges of the frequency of confederate behavior by type (i.e., destructive behavior or FCRs) across experimental

phases. Fewer confederate responses occurred in baseline and in the FCT phases than in the treatment-adherence challenge because data collection continued during reinforcement intervals, and sessions were capped at 3 min.

Interobserver Agreement and Procedural Integrity

We video recorded all sessions and randomly selected at least one third of sessions in each experimental phase for a second observer to collect interobserver agreement and procedural-fidelity data. We calculated interobserver agreement for each dependent variable by dividing the session into 10-s intervals and using the block-by-block proportional agreement method. We divided the smaller number of responses by the larger number of responses within each interval, averaged those quotients across intervals, and then converted the average to a percentage. The second data collector also measured procedural fidelity by scoring correct and incorrect confederate responses (i.e., terminating or continuing the scripted confederate behavior [described below] as programmed) per confederate response opportunity. Table 2 displays the means and ranges for each of these measures across caregivers.

Materials

Confederate behavior audio scripts.—We created automated audio tracks to prompt the confederate to emit particular responses (e.g., self-injurious behavior, property destruction, the FCR) at select times during sessions, which played via a Bluetooth earbud, audible only to the confederate. We derived the rate of confederate responding (30 responses per min) and the ratio of destructive-behavior topographies from the baseline data of the 25 applications of FCT included in Greer et al. (2016). We created five randomized orders of these response topographies for each experimental phase and randomly selected one of the 3-min scripts prior to conducting a session.

Negative-vocalization audio tracks.—Because there were brief, 2-s pauses in confederate destructive behavior within the scripts for Phase 1, we programmed negative-vocalization audio tracks to minimize the possibility that these pauses would follow discrete instances of caregiver behavior and result in the adventitious (negative) reinforcement of caregiver behavior. Additionally, using audio of the negative vocalizations emitted by each caregiver's actual child could result in sessions approximating episodes of destructive behavior experienced by the caregiver outside of the study. Prior to baseline, we asked each caregiver to provide an audio sample of their child crying or screaming. We obtained a recording from only one caregiver (Chandler). With Nicole, Michelle, and Debbie, we used an audio track of a male child yelling and sobbing, which we obtained at <http://www.freesound.org> under the Creative Commons licenses. All audio tracks lasted 3 min and consisted of a looped 20-s episode of negative vocalizations. We played the tracks through a wireless speaker in the room, controlled by either the confederate or the data collector.

Reinforcement Schedules

Negative reinforcement in the form of a 20-s termination of confederate behavior and negative vocalizations was delivered according to a fixed-ratio 1 schedule for undesirable caregiver behavior in Phases 1 and 2 and for honoring the child's FCR in Phase 2. We programmed this reinforcement schedule because child destructive behavior and FCRs

terminated immediately following therapist reinforcer deliveries in nearly all the 25 applications included in Greer et al. (2016), suggesting that caregiver behavior in that study was negatively reinforced on a continuous or near-continuous schedule. We did not program extinction for undesirable caregiver behavior in Phase 2 because, as suggested above, child destructive behavior often ceased when adults delivered the reinforcer maintaining destructive behavior in Greer et al., regardless of the presence of alternative reinforcement. Additionally, resurgence may be greater following differential reinforcement without extinction than differential reinforcement with extinction (Lichtblau et al., in press). It should be noted, however, no caregiver made commission errors in Phase 2, and therefore, none contacted the negative-reinforcement contingency for doing so. If commission errors had persisted during Phase 2, we would have conducted remedial BST booster sessions with the caregiver (see description of procedures below).

Experimental Design

Replicating procedures described by Bruzek et al. (2009), we evaluated relapse of undesirable caregiver behavior during a treatment-adherence challenge (Phase 3) involving extinction of caregiver treatment adherence, and we also programmed a return to a home-like context (associated with past reinforcement of undesirable caregiver behavior in Phase 1). We designed this phase to simulate an inconsolable child (i.e., extinction of caregiver treatment adherence *and* undesirable caregiver behavior). Additionally, we staggered the implementation of Phase 2 across caregivers to evaluate whether longer histories of reinforcement for confederate destructive behavior produce higher levels of relapse, as suggested by previous research (Bruzek et al., 2009; Todd et al., 2012). All sessions lasted 3 min, and data collection continued during reinforcement deliveries. In collaboration with our institutional review board, we limited sessions to 3 min to minimize caregiver discomfort due to continued exposure to simulated destructive behavior and negative vocalizations. An experimenter intermittently confirmed with each caregiver throughout the course of the study that she or he wished to continue participation. Intersession intervals for Phases 1 and 2 lasted approximately 2–3 min to allow for data collectors to reset BDataPro or so that experimenters could prepare experimental settings, during which time caregivers could continue to engage with their leisure activities or use the restroom. There was no intersession interval during Phase 3, which was conducted over nine consecutive minutes across three, 3-min sessions.

Procedures

Preliminary procedures.—We received approval from our institutional review board to withhold procedural details and study hypotheses from the caregivers during their participation. During the informed-consent process, the first author used verbiage similar to that used by Bruzek et al. (2009) to explain the purpose of the study:

“We are conducting this study to learn how adults will respond to a simulated caregiving situation. We will ask you to do what comes naturally. Although the confederate will roleplay as a child with destructive behavior, he will never physically touch you. At the end of the study, a member of the research team will

meet with you to discuss all aspects of the study that may not have been clear while you were participating.”

At the beginning of each appointment, the experimenter provided the caregiver with an iPad with pre-downloaded applications chosen by the caregiver for use during and between sessions. We included this aspect of the study to emulate the leisure activities that might otherwise compete with caregiver treatment adherence (e.g., at home). All caregivers completed three sessions of baseline during the first appointment and completed the remaining sessions during a second appointment.

Baseline (Phase 1).—An experimenter guided the caregiver into the home-like context and noted that the confederate would enter soon, but she provided no instructions regarding how to respond to the confederate. The confederate entered the room and engaged in the scripted destructive behavior and played the negative-vocalization audio track continuously. The maximum number of confederate destructive responses per session was 90 (30 responses per min). For Michelle, Debbie, and Chandler, we selected whichever stimulus (i.e., attention or edible) the caregiver delivered first to serve as the reinforcer for confederate destructive behavior. Because all three caregivers delivered attention exclusively, we programmed the delivery of an edible as the reinforcer for confederate destructive behavior with Nicole to evaluate treatment adherence with another common reinforcer for destructive behavior (Beavers et al., 2013; Hanley et al., 2003). Caregiver delivery of the specified reinforcer following confederate destructive behavior terminated destructive behavior and paused the negative-vocalizations audio track for 20 s. After the 20 s elapsed, scripted destructive behavior and the negative-vocalization audio track resumed.

BST.—A Board Certified Behavior Analyst (BCBA®) trained the caregiver on the implementation of FCT procedures in a clinical context during BST. The BCBA® noted that training would occur in a different room when guiding the caregiver from the home-like context to the clinical context but provided no further details about the contextual change. Behavioral skills training consisted of strategies commonly used to teach caregivers to implement treatment components and lasted approximately 10 min. First, the BCBA® described the purpose of FCT and how to implement differential reinforcement for the FCR and extinction for destructive behavior. Second, the BCBA® modeled these strategies with a behavior technician who simulated child behavior across six trials, some containing immediate confederate FCRs and others with scripted destructive behavior prior to the FCR. The BCBA® described how she was applying differential reinforcement procedures after each trial, along with a rationale (e.g., “Notice that I ignored aggression, but I delivered attention when he asked nicely. Over time, responding in this way will help him learn that the only way to get your attention is by asking nicely”). Third, the caregiver implemented FCT procedures with the behavior technician (i.e., the roleplay component of BST), who engaged in six trials of simulated responses, with FCRs programmed first on three of the trials and destructive behavior programmed prior to the FCR on the other three trials. The order of these trial types was random, and the BCBA® provided the caregiver with immediate feedback following each trial. Behavioral skills training ended when caregivers completed all six trials with 100% accuracy. No caregiver required additional training trials. Had a caregiver made an error during roleplay, the BCBA® would have provided corrective

feedback before conducting remedial trials identical to the trial on which the caregiver erred until the caregiver responded correctly under those same stimulus conditions. Please see the appendix for the BST protocol that the BCBA® used to train the caregivers.

FCT (Phase 2).—Following BST, the BCBA® stated that the caregiver would now have the opportunity to implement FCT with the confederate and left the caregiver in the clinical context. Neither the BCBA® nor the behavior technician associated with BST were present during these sessions. The confederate entered the room and emitted both destructive behavior and the FCR during FCT, but we adjusted the ratio of both responses to simulate changes in child behavior that might reasonably occur across treatment sessions. Recall that confederate destructive behavior could occur up to 90 times in each baseline session. For the first FCT session, we programmed equal numbers of confederate FCRs (45) and destructive responses (45) to simulate an initial treatment effect of FCT on confederate behavior. We then increased the ratio of FCRs to destructive responses in the second FCT session (56 FCRs and 34 destructive responses) and again in the third FCT session (70 FCRs and 20 destructive responses). Across all three FCT sessions, providing the specified reinforcer for confederate destructive behavior or the FCR terminated both responses for 20 s. Additionally, we decreased the volume of the negative vocalizations by 25% across each FCT session. By changing confederate behavior in this way, caregivers experienced the beneficial effects of continued treatment adherence to FCT, which is a common outcome of FCT caregiver training in the clinic.

Treatment-adherence challenge (Phase 3).—Following FCT, an experimenter guided the caregiver back to the home-like context but did not provide any instructions to the caregiver as to the purpose of this transition or how to respond to the confederate within this context. The treatment-adherence challenge was similar to FCT except that the confederate entered the home-like context, and his behavior was no longer sensitive to caregiver treatment adherence. That is, confederate destructive behavior and FCRs continued, irrespective of how the caregiver responded (i.e., the confederate appeared inconsolable). Additionally, confederate destructive behavior and FCRs, as well as the volume of the negative vocalizations, matched those occurring in the first FCT session, but confederate scripts in this condition always began with destructive behavior. We limited the number of sessions in this condition to three consecutive sessions to minimize prolonged exposure to inescapable destructive behavior and negative vocalizations, as suggested by our institutional review board. At the end of the treatment-adherence challenge, the experimenter informed the caregiver that the study was over, debriefed the caregiver on the full purpose of the study, and arranged compensation.

Results

Figure 1 depicts the nonconcurrent, multiple-baseline design across caregivers. All caregivers engaged in high rates of undesirable caregiver behavior during baseline. Behavioral skills training resulted in zero or near-zero rates of undesirable caregiver behavior during the FCT phase for all caregivers. Despite BST's effects on undesirable caregiver behavior in the clinical context during FCT, three of four caregivers engaged in undesirable caregiver behavior during the treatment-adherence challenge upon returning to

the home-like context in which caregiver treatment adherence was placed on extinction. Similar to Bruzek et al. (2009), we observed the highest levels of relapse with the caregivers who had the longest histories of reinforcement for undesirable caregiver behavior.

During the treatment-adherence challenge, Michelle engaged in a commission error immediately following the first confederate destructive response within the home-like context. Following this undesirable caregiver behavior, Michelle made no subsequent errors. Debbie failed to reinforce two confederate FCRs during the initial FCT session; however, she exhibited no further undesirable caregiver behavior during subsequent FCT sessions or within the treatment-adherence challenge. It is worth noting that Debbie stated to the experimenter during the debriefing that, while participating in this study, she received training on how to ignore her child's destructive behavior (i.e., attention extinction) and that she had practiced this skill with her child in their home. It is unclear to what extent this contributed to the lack of relapse observed with Debbie.

Nicole displayed high and persistent rates of undesirable caregiver behavior within the treatment-adherence challenge ($M = 1.1$ responses per min). Nicole engaged in omission errors exclusively in Session 10 and equal rates of omission and commission errors during Sessions 11 and 12. Nicole was the only caregiver who made omission errors during the treatment-adherence challenge. Recall that she was the only caregiver for whom we programmed an edible function for confederate behavior. Delivering the edibles may have required more effort than providing attention, contributing to the increase in omission errors during Phase 3. Chandler engaged in elevated and persistent rates of undesirable caregiver behavior during the treatment-adherence challenge ($M = 0.6$ responses per min), all of which were commission errors.

Discussion

Clinical outpatient services often involve brief appointments at a clinic during which time a behavior analyst works with the referred child to develop an effective intervention for destructive behavior, which is often based on FCT. The behavior analyst then provides caregiver training (e.g., teaching differential reinforcement and extinction procedures) prior to the family returning home. However, leaving the clinical context may cause the renewal of undesirable behavior on the part of the child (e.g., Kelley, Liddon, Ribeiro, Greif, & Podlesnik, 2015) or the caregiver. By simulating this progression of events with caregivers of children who engage in severe destructive behavior, we observed relapse of undesirable caregiver behavior with three of four caregivers, despite all caregivers demonstrating precise implementation of FCT procedures with the confederate in the immediately preceding FCT phase. Of the three caregivers who displayed relapse of undesirable caregiver behavior, three caregivers made commission errors and one caregiver made both commission and omission errors, all constituting an increase in undesirable caregiver behavior relative to the preceding FCT phases that occurred in a clinical context. The present study adds to the growing relapse literature and highlights the importance of addressing caregiver treatment adherence as both an independent and dependent variable when attempting to mitigate the relapse of child destructive behavior.

Decrements in caregiver treatment adherence, such as those observed in the present study, can lead to the collateral relapse of child destructive behavior (St. Peter Pipkin et al., 2010). In fact, one can conceptualize all translational evaluations of resurgence involving destructive behavior (e.g., Fuhrman et al., 2016) to be evaluations of the susceptibility of recently treated behavior to a breakdown in caregiver treatment adherence, as the final phase of the resurgence preparation involves the caregiver or therapist committing a series of omission errors (i.e., failing to reinforce the FCR). Resurgence of destructive behavior following successful treatment with FCT is becoming an increasingly well-documented finding (Briggs, Fisher, Greer, & Kimball, 2018) and may require additional treatment sessions or readmission to a clinical program.

One particularly concerning finding of the present study involves the types of errors that caregivers made during the treatment-adherence challenge. All three caregivers who showed relapse of undesirable caregiver behavior reinforced confederate destructive behavior (i.e., a commission error) at least once. Translational research on the effects of error type on treatment efficacy has shown commission errors to be more detrimental than omission errors (St. Peter Pipkin et al., 2010), although even infrequent omission errors like those made by Nicole may be sufficient to result in the relapse of child destructive behavior (Marsteller & St. Peter, 2012). Nevertheless, commission errors are not included in most translational preparations of relapse (e.g., resurgence and renewal). In further extending basic research on the relapse of operant behavior to applied settings, future researchers should broaden the types of relapse preparations used to help better explore the role of error type on later relapse following FCT-based interventions. Adapting the rapid-reacquisition preparation commonly used with respondent behavior (e.g., Napier, Macrae, & Kehoe, 1992) to examine the relapse of operant behavior may be one such avenue, especially if commission errors are indeed the more prevalent of the two error types. However, such a preparation might require modifications to the confederate scripts (e.g., a burst of destructive behavior without co-occurring FCRs) used in the present study, as it seems odd that child behavior would be differentially sensitive to reinforcer deliveries that followed destructive behavior over those that followed the FCR.

Procedural refinements to the present study should be considered by future researchers. First, researchers should note that the frequency of confederate behavior affected rates of undesirable caregiver behavior. That is, undesirable caregiver behavior was dependent upon emission of confederate behavior, and therefore, the frequency of confederate behavior could affect obtained rates of undesirable caregiver behavior. The randomized order of the scripts sometimes led to differing rates of confederate behavior for certain caregivers. For example, the script for Chandler's Session 10 during Phase 2 involved a series of FCRs at the beginning of the session and, therefore, the confederate did not have the opportunity to emit destructive behavior that was programmed to occur later in the script, which prevented Chandler the opportunity to make commission errors during that session. The frequency of confederate responses sometimes varied across caregivers (see Table 1), mostly during Phase 3. This variation was due, in part, to the rapidity with which the confederate engaged in scripted behavior (i.e., 30 responses per min). During a given session, the confederate had to attend to the audio script and match the programmed response (e.g., self-injurious behavior)

prior to attending to the next programmed response in the script (e.g., an FCR), which occurred within seconds of each other.

The most apparent discrepancy in Table 1 is the frequency of confederate FCRs during Nicole's Phase 3. Recall that Nicole was the only caregiver for whom we programmed an edible function for the confederate's destructive behavior. Across the phases, the confederate always consumed the edible when Nicole delivered one. However, in Phase 3, this had the effect of decreasing the number of confederate FCRs due to consumption of the edibles delaying additional vocal FCRs. This did not affect the number of confederate destructive responses because the confederate was able to engage in destructive behavior while consuming the edible. Interestingly, despite substantial reductions in Nicole's opportunities to make omission errors due to lower confederate FCRs, we observed the highest rates of omission errors with Nicole. Nevertheless, researchers might consider how to alter the confederate scripts to be more reasonable for confederates while ensuring not only procedural fidelity as measured in the current study but also procedural fidelity as it relates to emission of scripted behavior at prespecified times. Unfortunately, we were unable to complete this latter calculation due to the data collector's inability to hear the confederate's audio script.

Second, our procedures for programming 3-min sessions and continuing with data collection during the reinforcement intervals resulted in differing frequencies of confederate behavior in Phases 1 and 2 when compared to Phase 3 (see Table 1). One data-analysis option is to report proportion or percentage of opportunities with undesirable caregiver behavior (i.e., dividing the number of undesirable caregiver responses by the number of confederate responses). We analyzed this approach and still observed relapse for three of the four caregivers, albeit at lower magnitudes. One approach for circumventing this issue in future research would be to program trial-based, rather than time-based, sessions. For example, one could program 10 confederate destructive responses to occur in each session across phases, along with 10 confederate FCRs during each session of Phase 2 and Phase 3. Such a format would allow for a more representative comparison of undesirable caregiver behavior across changing conditions.

Third, the brief sessions and Phase 3 duration may not reflect naturally occurring treatment-adherence challenges outside of this study. For example, a typical duration of persistent child destructive behavior might approach 30 min, rather than the 9 min programmed in Phase 3. Extending the number of sessions within the treatment-adherence challenge would have also allowed us to account for the possibility of bitonic response-rate functions (i.e., initial increases in target responding followed by a decrease; see Podlesnik & Kelley, 2015) that could not occur within the initial three sessions, which may have resulted in low levels of relapse, such as those observed with Michelle. In a recent study by Fisher, Greer, Fuhrman et al. (in press), the highest rate of target responding during a resurgence test occurred after the first session for six of the eight participants. Furthermore, the highest rate of target responding during the resurgence test for three participants occurred after the first three sessions, suggesting that conducting only three sessions during Phase 3 in the present study may have limited our ability to observe higher levels of relapse of undesirable caregiver behavior. We conducted a maximum of three sessions of the treatment-adherence

challenge to limit caregiver discomfort and reduce caregiver attrition, but future researchers should consider extending this final phase to better capture the extinguishing of undesirable caregiver behavior.

Fourth, we taught caregivers to implement a relatively low-effort FCT-based intervention in which they differentially reinforced confederate FCRs using social-positive reinforcement (i.e., attention or an edible). However, FCT is often arranged for negatively reinforced destructive behavior, which often requires physical guidance to ensure that escape extinction remains in place. This would likely constitute a more effortful treatment for the caregivers to implement, which could impact the susceptibility of such treatments to relapse. Future researchers should evaluate the relapse of undesirable caregiver behavior with FCT-based interventions that target negatively reinforced destructive behavior.

Fifth, although we programmed extinction (i.e., continued confederate destructive behavior and FCRs) during the treatment-adherence challenge to simulate an inconsolable child, such insensitivity to caregiver behavior may not be representative of typical child behavior. As described previously, a reanalysis of data from Greer et al. (2016) indicated that destructive behavior rarely continued following the therapist's delivery of reinforcement. A more representative treatment-adherence challenge might involve the termination of confederate destructive behavior and FCRs when caregivers deliver reinforcement. An interesting follow-up study, therefore, could arrange a treatment-adherence challenge without extinction for caregiver behavior to observe the likelihood of relapse in a home-like context following escalated destructive behavior.

Similar to previous studies examining history of reinforcement for target responding on later relapse (Bruzek et al., 2009; Todd et al., 2012), we observed the highest levels of relapse with caregivers who had the longest histories of reinforcement for undesirable caregiver behavior in baseline. This finding needs to be replicated with a larger sample of caregivers, but if the finding proves robust and replicable, it is concerning from an applied standpoint. Families awaiting services for children with severe behavior disorders can wait months or even years for high-quality care. The finding that undesirable caregiver behavior may be more susceptible to later relapse when care is delayed has important implications for the extent to which behavior analysts should prepare for, and potentially guard against, this possibility.

Further analysis of error types in the present study revealed an interesting difference across caregivers. Michelle's Session 8 and Chandler's Session 11 showed that both caregivers made commission errors immediately following the first instance of confederate destructive behavior within the treatment-adherence challenge, prior to the confederate emitting an FCR. Conversely, Nicole made omission errors during Session 10 and only began making commission errors in Session 11 after continued exposure to extinction. Taken together, it appears that contextual control may have contributed to the relapse of undesirable caregiver behavior for Michelle and Chandler (at least initially), whereas exposure to the contingency change may have led to relapse for Nicole. A follow-up study could in one condition of treatment-adherence challenge (a) continue to terminate confederate behavior following caregiver reinforcer deliveries while returning to a home-like context (i.e., contextual

changes only) and in another condition (b) remain in the clinical context but program continued confederate destructive behavior and FCRs, irrespective of caregiver behavior (i.e., contingency suspension only). This would allow for an evaluation of the relative effects of contextual change and contingency suspension, respectively. In practice, we assume that these processes often occur simultaneously during outpatient service delivery because the family returns home from the clinic (i.e., renewal of undesirable caregiver behavior resulting from a context change), and treatment adherence may be challenged by continued child destructive behavior within that context (i.e., renewal of child destructive behavior that may appear initially insensitive to caregiver behavior, similar to resurgence). Prior basic and translational research has shown that the combination of a context change and the discontinuation of reinforcement for alternative behavior can produce large increases in target responding, a phenomenon referred to as super-resurgence (Kincaid, Lattal, & Spence, 2015; Saini & Fisher, 2016).

Examining methods for strengthening caregiver treatment adherence while also enhancing the durability of treatment effects for child behavior could have far-reaching benefits for a number of behavioral interventions. Our research group is currently investigating methods of mitigating relapse of child destructive behavior (for a summary of four such studies, see Fisher, Greer, Craig, et al., 2018). However, the success of these methods ultimately depends on caregiver treatment adherence to refined FCT treatments. Therefore, we have begun examining the effects of embedding renewal- and resurgence-mitigation techniques within caregiver training to mitigate the relapse of undesirable caregiver behavior.

Acknowledgments

This research was conducted in partial fulfillment of the first author's doctoral degree from the University of Nebraska Medical Center and was funded in part by the Society for the Advancement of Behavior Analysis's Innovative Student Research Grant, the University of Nebraska Medical Center's Graduate Studies Fellowship Award, and grants 5R01HD079113 and 5R01HD083214 from the National Institute of Child Health and Human Development.

Appendix: Behavioral Skills Training Protocol

Instructions

The BCBA® read the following to the caregiver:

“We will now teach you about functional communication training, or FCT. FCT is one of the most widely used treatments for problem behavior and consists of (a) delivering what the child wants for appropriate requests and (b) not delivering what the child wants for problem behavior. The current child with whom you are working engages in problem behavior to get [your attention/food]. He recently learned to appropriately request what he wants with his words by saying, “[High Five?/Skittle?].” From now on, we would like you to give him [attention/food] when he uses his words and avoid giving him [attention/food] when he has problem behavior.

“First, we will show you what this looks like and then we will give you a chance to practice. The behavior technician will pretend to be the child with problem behavior who recently learned to appropriately request [attention/food].”

Modeling

The BCBA® and behavior technician roleplayed an FCT session with the BCBA® providing the designated reinforcer assigned to that caregiver’s condition (i.e., attention, tangibles). The behavior technician modeled three trials in which he or she first engages in destructive behavior (resulting in the BCBA® implementing extinction) before emitting an FCR (resulting in the BCBA® immediately delivering reinforcement) and three trials in which he or she first engages in an FCR (resulting in immediate reinforcement) with these scripts randomly assigned across six trials. The BCBA® described the FCT implementation and rationale after each trial and then asked the caregiver to ask any questions about the procedures before proceeding to roleplay.

Roleplay

The behavior technician continued to serve as the confederate during roleplay. The behavior technician engaged in scripted FCRs and destructive behavior as in the modeling component. Following a trial with no caregiver errors, the BCBA® provided descriptive praise (e.g., “Great job ignoring that aggression and waiting for him to ask nicely!”). Contingent upon a caregiver’s commission error (i.e., reinforcing problem behavior), the BCBA® provided corrective feedback (e.g., “Remember, we don’t want to give him what he wants for problem behavior; we should wait for an appropriate request”). Contingent upon a caregiver’s omission error (i.e., not reinforcing an FCR), the BCBA® provided corrective feedback (e.g., “Remember, we want to give him what he wants right away when he asks nicely”). Following any error, the therapist would reinitiate the identical trial until the caregiver responds correctly to that trial. Roleplay should end following six correct trials (with no remedial trials), three of which began with problem behavior first and three of which began with FCRs first.

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Figure 1.

Depiction of undesirable caregiver behavior across caregivers. BST = behavioral skills training. FCT = functional communication training. Note: baseline and treatment-adherence challenge occurred in a home-like context, whereas behavioral skills training and FCT occurred in a clinical context.

Table 1

Summary of Confederate Responses

Caregiver	Count of Confederate Behavior <i>M</i> (range)					
	Baseline		FCT		Treatment-Adherence Challenge	
	Destructive Behavior	FCRs	Destructive Behavior	FCRs	Destructive Behavior	FCRs
Michelle	12.3 (8-20)	0	5.3 (2-8)	7.3 (7-8)	44.7 (44-45)	44.3 (44-45)
Debbie	11.8 (7-20)	0	5.7 (4-10)	7	46 (43-47)	43 (42-44)
Nicole	15.5 (8-34)	0	5.3 (2-8)	7.3 (7-8)	44 (43-45)	24 (23-27) *
Chandler	10.6 (8-14)	0	3 (0-4) **	7.7 (7-8)	41 (37-46)	42 (38-46)

Note: FCT = functional communication training. FCRs = functional communication responses.

* FCRs occurred less frequently in Nicole's treatment-adherence challenge due to the confederate having to consume edibles, which prevented additional vocal FCRs.

** No destructive behavior occurred during Chandler's Session 10 because Chandler's efficient responding earlier in the session precluded later instances of confederate destructive behavior.

Table 2

Interobserver-Agreement and Procedural-Fidelity Coefficients

Caregiver	Interobserver-Agreement Coefficients <i>M% (range)</i>				Procedural-Fidelity Coefficients <i>M% (range)</i>
	Caregiver Commission Errors	Caregiver Omission Errors	Confederate Destructive Behavior	Confederate FCRs	Confederate Behavior
Michelle	97 (89-100)	100	97 (89-100)	100	99 (98-100)
Debbie	99 (94-100)	100	89 (83-93)	98 (91-100)	100
Nicole	100	TBD	95 (80-100)	100	99 (96-100)
Chandler	96 (89-100)	100	97 (87-100)	100	100

Note: FCRs = functional communication responses. BST = behavioral skills training.