AN EVALUATION OF EVIDENCE-BASED INTERVENTIONS TO INCREASE COMPLIANCE AMONG CHILDREN WITH AUTISM

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We evaluated 4 evidence-based interventions to increase compliance. Three children with autism who exhibited noncompliance when asked to relinquish a preferred toy were exposed sequentially to interventions that included a reduction in response effort, differential reinforcement, and guided compliance. Results indicated that effort reduction alone was ineffective and that each participant's compliance improved after exposure to a different intervention; these results highlight the need to individualize treatments for compliance.

Key words: autism, compliance, noncompliance, response effort

Noncompliance, defined as the failure to follow an instruction within a specified period of time, is one of the most pervasive childhood behavior problems. Kalb and Loeber (2003), for example, reported that 25% to 65% of children aged 2 to 16 years have problems with noncompliance. Among children with autism, compliance with instructions may be particularly important because of the many opportunities to comply with adult directions in early intensive behavioral intervention programs.

Both antecedent-based (e.g., high-probability instructional sequence; Mace et al., 1988) and consequence-based (e.g., guided compliance; Wilder & Atwell, 2006) interventions have been shown to increase compliance. However, these same interventions have been shown to be ineffective in some cases (e.g., Wilder & Atwell, 2006). This highlights the need to individualize treatments to increase compliance.

In this study, we evaluated four evidence-based interventions to increase compliance with an instruction to relinquish a toy among children with autism. We first examined a reduction in response effort in the form of travel distance required to comply with the

instruction. We selected this intervention because, although the effects of response-effort manipulations on compliance have been evaluated, no studies have involved the specific alteration of the required travel distance (Boelter et al., 2007). When response-effort reduction was ineffective, we added differential reinforcement, guided compliance, and differential reinforcement plus guided compliance in that order, as necessary. We selected these interventions because they have received some support to increase compliance and are commonly used in clinics and schools.

METHOD

Participants and Setting

Three children with diagnoses of autism who could respond appropriately to multiword instructions participated. Alfonso was 11 years old; Tino and Neroli were 9 years old. Parents or teachers reported that all participants were noncompliant when asked to relinquish a preferred toy. We conducted three to five sessions per day, 2 to 3 days per week, in a small room at either a local preschool, an autism treatment clinic, or in participants' homes. Each session consisted of five trials. A break (approximately 3 min) separated sessions. A graduate student, unfamiliar to the participants before the study began, served as the therapist throughout the study.

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Response Measurement and Definitions

We defined the dependent variable, *compliance*, as initiating within 10 s and following within 15 s the verbal instruction presented by a therapist. Observers collected data on the occurrence and nonoccurrence of compliance during each five-trial session and on problem behavior, which included aggression, screaming, disruption, running away, and verbal protests (e.g., saying “no”). Observers did not score the specific topography of problem behavior. During guided compliance conditions, compliance was scored only if the participant complied with the first (i.e., the vocal) prompt. We calculated the percentages of compliance and problem behavior in each session by dividing the total number of trials in which the participant complied or engaged in problem behavior by the total number of trials in each session and converting the result to a percentage. Because noncompliance in the natural environment occurred when participants were asked to relinquish a preferred toy, all sessions were conducted in the context of toy clean-up, during which participants were asked to put a preferred toy in a toy bin 3 m away.

We collected data on interobserver agreement and treatment integrity for a minimum of 50% of sessions for each participant. To assess interobserver agreement, two observers simultaneously but independently recorded participants’ responses on a trial-by-trial basis. We defined an agreement as two observers recording that compliance or problem behavior either occurred or did not occur during the same trial. Agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting the result to a percentage. Mean agreement for compliance was 98% (range, 80% to 100%), 98% (range, 80% to 100%), and 100% for Alfonso, Tino, and Neroli, respectively. Mean agreement for problem behavior was 96% (range, 60% to 100%), 94% (range, 60% to 100%), and 97% (range, 80% to 100%) for Alfonso, Tino, and Neroli, respectively.

A second observer also scored treatment integrity. We calculated treatment integrity by

dividing the number of trials the protocol was implemented correctly by the total number of trials observed. Integrity was 100% across all conditions and participants.

Design and Procedure

Reversal designs were used to evaluate the effects of reducing response effort (i.e., distance) alone and in combination with common, empirically supported interventions to improve compliance, including differential reinforcement, two-step guided compliance, and two-step guided compliance plus differential reinforcement, in that order.

Preference assessment. We first conducted separate edible and tangible paired-choice stimulus preference assessments (Fisher *et al.*, 1992) to identify most and least preferred items for each participant. Prior to each session, we also conducted four-item, one-trial multiple-stimulus without replacement preference assessments (DeLeon & Iwata, 1996) to determine which of the items from the paired-choice assessments was most preferred. Toy and edible assessments were conducted separately.

General procedure. Each 1-min trial consisted of a 30-s preinstruction period, the presentation of the instruction, and a 30-s postinstruction period (i.e., the remainder of the 1-min interval). A trial consisted of presentation of a verbal instruction by the therapist (i.e., “[child’s name], put the [toy] in the toy bin”) followed by “thank you,” contingent on compliance. The child was able to maintain access to the toy if he did not comply. No other highly preferred toys were available during the 30-s postinstruction period. Before beginning each new condition, the therapist briefly described the contingencies.

Reduction in response effort. We assessed the effect of effort by manipulating the distance of the toy bin relative to the participant; the therapist remained at a constant distance from the participant across all conditions and presented the instruction from the same location on each trial. The participants remained in the same location for each trial because the preferred

toy always was placed in this location and the room was arranged so that this was the only available play area. The two dimensions of distance assessed were 0.3 m and 3.0 m, respectively. To ensure integrity of each distance, the primary investigator marked the distances with a pencil. Baseline (i.e., 3 m) was compared to the reduced response-effort condition (i.e., 0.3 m). Before sessions, the bin was identified for each participant; during sessions, the toy bin was always visible. On each trial, the therapist allowed the participant to interact with the toy for approximately 30 s during the preinstruction period and then instructed the child to "put the [toy] in the toy bin." Contingent on compliance the therapist said "thank you"; noncompliance resulted in the participant retaining access to the toy. If the child relinquished the toy, the therapist did not return the toy for the remainder of the 1-min trial. After the interval elapsed, the toy was placed in the play area; the toy was never returned to the child directly.

Differential reinforcement plus effort reduction. The differential reinforcement condition was identical to the response-effort condition (i.e., distance to toy bin was 0.3 m), except that the therapist delivered a small piece of a preferred edible item, as determined by the preference assessment described above, contingent on compliance to the therapist's verbal instruction; noncompliance resulted in continued access to the toy.

Guided compliance plus effort reduction. The two-step guided compliance condition was identical to the response-effort condition (i.e., distance to toy bin was 0.3 m), except noncompliance with the initial instruction after 10 s resulted in the therapist repeating the instruction while using hand-over-hand guidance to help the participant to place the toy in the bin; the toy then remained in the bin for the remainder of the trial. If the child complied with the initial instruction within 10 s of the request, the therapist said "thank you" and the toy remained in the bin for the remainder of the trial.

Guided compliance plus differential reinforcement plus effort reduction. This condition was identical to the guided compliance condition except that the therapist provided a preferred edible item while simultaneously saying "thank you" when the child complied with the initial instruction.

After an effective intervention had been identified, we increased the distance between the toy bin and the participant by 0.9 m until it matched that of the toy bin in baseline. If compliance substantially decreased at any point during fading, we returned to the last condition in which compliance was achieved and then attempted to fade the bin in smaller increments of 0.45 m.

RESULTS AND DISCUSSION

The effects of the interventions on compliance are shown in Figure 1 for all participants. For Alfonso (top), a reduction in effort alone was not sufficient to influence levels of compliance, so differential reinforcement was added. This resulted in an immediate increase in levels of compliance ($M = 94\%$; range, 80% to 100%). However, a substantial decrease in compliance occurred ($M = 32\%$; range, 0% to 100%) when the distance of the toy bin was increased from 0.3 m to 1.2 m. Increasing the bin's distance more slowly, from 0.3 m to 0.91 m, resulted in levels of compliance that remained at 0% throughout the condition. Next, two-step guided compliance was implemented, and compliance was initially high ($M = 87\%$; range, 80% to 100%). After a return to baseline, the bin's distance was faded systematically. Levels of compliance were maintained as the bin distance was faded from 0.3 m to 3 m.

Tino's level of compliance (Figure 1, middle) was sensitive to a reduction in response effort. During baseline, levels of compliance were low ($M = 8\%$; range, 0% to 40%); during the reduced effort condition, levels of compliance increased ($M = 87\%$; range, 80% to 100%). Moreover, this effect was replicated; the return

Figure 1. Percentage of trials with compliance and problem behavior for Alfonso (top), Tino (middle), and Neroli (bottom) during baseline (3 m; BL), response-effort reduction (0.3 m; RE), differential reinforcement (DR), two-step guided compliance (GC), and guided compliance plus differential reinforcement (GC + DR).

to baseline resulted in a decrease in compliance ($M = 0$); levels increased again during the second reduced effort condition ($M = 90\%$; range, 80% to 100%). However, fading in 0.9-m increments was unsuccessful. The bin's distance then was increased more gradually from 1.2 m, to 1.67 m, to 2.1 m, but compliance remained highly variable and decreased to moderate levels in the 2.1-m condition ($M = 57\%$; range, 20% to 80%). Therefore, differential reinforcement was implemented, and the distance to the bin was faded successfully from 0.3 m to 3 m.

Neroli (Figure 1, bottom) exhibited patterns of responding similar to Alfonso; that is, a reduction in response effort did not influence compliance. Implementation of differential reinforcement resulted in highly variable levels of compliance ($M = 27\%$; range, 0% to 80%). Guided compliance initially increased compliance, but levels quickly decreased ($M = 20\%$; range, 0% to 40%). The combination of guided compliance plus differential reinforcement (0.3 m) increased compliance to moderately high levels ($M = 73\%$; range, 60% to 80%). This was replicated, and the distance of the toy bin then was increased successfully from 1.2 m to 3 m while high levels of compliance were maintained ($M = 100\%$).

The percentages of trials with problem behavior for Alfonso, Tino, and Neroli also are depicted in Figure 1. Alfonso's highest levels of problem behavior were observed during the guided compliance (3-m) condition ($M = 90\%$; range, 80% to 100%). Tino exhibited little problem behavior across the entire study. Neroli's problem behavior was highest during guided compliance ($M = 84\%$; range, 20% to 100%).

These results represent a systematic evaluation of evidence-based treatments to increase compliance and highlight the need for individualized interventions; clearly, what is effective for one child may be ineffective for another. A reduction in response effort in the form of reduced distance required to comply with an instruction was effective for only one participant

(Tino), and, even with Tino, differential reinforcement was necessary to increase the distance required to comply with the instruction. Effort reduction plus differential reinforcement was not effective for Alfonso or Neroli. The addition of guided compliance was necessary for Alfonso, and the addition of guided compliance plus differential reinforcement was necessary to increase Neroli's compliance.

One limitation of this study is that differential reinforcement and guided compliance were not evaluated separately from effort reduction. Future research should further evaluate other manipulations of response effort, such as task complexity, as well as additional variations of differential reinforcement and guided compliance. Future research should also examine these interventions in a classroom setting.

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