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ESTABLISHING COMPLIANCE WITH LIQUID MEDICATION ADMINISTRATION IN A CHILD WITH AUTISM

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Children with autism often display difficulty with swallowing pills and liquid medications. In the current study, stimulus fading and positive reinforcement established compliance with liquid medication administration in a young boy with autism. The boy's mother eventually administered liquid medication on her own.

Key words: liquid medication, autism, stimulus fading

Children often display difficulty with swallowing medication (Anderson, Zweidorff, Hjelde, & Rodland, 1995), including medications in liquid form. Previous research has demonstrated that multicomponent behavioral interventions, including stimulus fading, positive reinforcement, and modeling, are effective at establishing pill swallowing among individuals with developmental disabilities (e.g., Ghuman, Cataldo, Beck, & Slifer, 2004). By contrast, little research has identified procedures that address the issue of compliance with swallowing liquid medication for this population. The existing research on the treatment of liquid refusal has implications for developing effective procedures for increasing liquid medication consumption (e.g., Patel, Piazza, Kelly, Ochsner, & Santana, 2001). To apply fading to the presentation of liquid medication, at least two different variables could be gradually altered: the distance to the medication and the composition of the medication (i.e., proportion of water to medicine). In the current study, a proximity fading component was adapted from Shabani and Fisher (2006), and a procedure for fading the composition of the liquid was adapted from Patel et al. (2001). We evaluated these procedures to increase compliance with liquid medication administration in a young boy with autism.

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METHOD

Participant and Setting

Lukas was a 3-year-old boy with autism who displayed mild delays across multiple developmental domains. He had ben diagnosed by a clinical psychologist on behalf of a state developmental center using the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1988) and relevant diagnostic criteria. At the time of this study, Lukas was receiving 14 hr per week of home-based behavioral intervention services that were designed to address all deficit areas (e.g., language, motor, social, play, and academic skills). All sessions took place during his regularly scheduled therapy sessions, which were conducted in a spare room in his home.

Lukas suffered from frequent bouts of otitis media, and his consistent refusal of oral medication (in liquid or solid form) necessitated the administration of antibiotics via suppository. In addition, his mother wanted to be able to administer liquid medication when he contracted coughs and colds; thus, it was of significant concern to her that Lukas learn to tolerate taking liquid medication. His mother reported that he would yell and elope when she presented liquid medicine and that he would refuse to drink milk or juice if medicine was mixed in with it. As a result, she often resorted to using physical restraint to administer medicine, which generally resulted in significant distress for both of them and rarely resulted in successful medicine consumption.

Response Measurement and Interobserver Agreement

During each trial, data were collected on correct responding and avoidance (i.e., turning his head at least 45° away from the syringe in any direction, ducking his head below the space in which the syringe was presented, or eloping from the room). The definition of correct responding varied according to the step of the procedure being implemented, but progressed from remaining seated (Step 1) to consuming the full dose of medicine (Step 54). For a response to be considered correct, it had to occur in the absence of avoidance. His home-based clinicians served as data collectors during Sessions 1 to 84. Starting with Session 85, his mother was trained to collect data and continued to serve as the primary data collector for the remainder of the study.

Interobserver agreement was assessed by having a second observer independently collect data during 51% of sessions. Trial-by-trial agreement was calculated by dividing the number of trials in which both observers scored the same occurrence or nonoccurrence data by the total number of trials in a session, and this ratio was converted to a percentage. Mean interobserver agreement was 99% (range, 67% to 100%) for correct responding and 99% (range, 67% to 100%) for avoidance.

Procedure

A reversal design was used. All baseline sessions consisted of three trials in which the clinician approached Lukas with the terminal dose of medicine in a plastic syringe and said "Time to take your medicine." If Lukas displayed avoidance, the clinician terminated the trial and Lukas was allowed to escape for 30 s. His mother also conducted one baseline session in this manner.

A multicomponent procedure that consisted of stimulus fading and positive reinforcement was implemented during the treatment phase. Each treatment session consisted of three trials, with the exception of those sessions in which the terminal dose of the medicine was presented (Steps 46 to 54), which consisted of only one trial. Each trial was separated by 30 s of either reinforcement contingent on correct responding or escape contingent on avoidance. Two to three sessions were conducted per day, 2 to 4 days per week. Fading consisted of 54 steps. For the sake of brevity, only abbreviated descriptions of the steps are provided below (detailed description of each step is available from the second author). Steps 1 through 4 involved fading the duration that the empty syringe was visually present (from less than 1 s to 5 s). (The syringe was empty until Step 30.) Steps 5 through 9 involved requiring Lukas to open his mouth for increasing durations with the syringe visibly present (from less than 1 s to 3 s). Steps 10 through 29 involved gradually decreasing the proximity between the empty syringe and Lukas (from 60 cm to 0.5 cm from his mouth), using a ruler to ensure accuracy. For Steps 30 through 32, Lukas was required to swallow gradually increasing volumes of water from the syringe (from empty to 2.5 ml). Steps 32 through 46 involved gradually increasing the ratio of placebo liquid medication (Ora-Sweet) to water in the syringe (starting at 0.28 ml Ora-Sweet combined with 2.22 ml water, ending at 2.5 ml Ora-Sweet with no water). In Step 46, the clinician gave Lukas a 2.5-ml dose of liquid medication (e.g., children's cough syrup that contained diphenhydramine and phenylephrine). Steps 47 to 52 involved fading the presence of the clinician from the room (starting at 1 m away to standing several meters away in the hallway of the house) while the mother gradually assumed responsibility for conducting the trials using the placebo liquid medication. In Step 53, the syringe contained actual medication and the session was conducted by the mother, with a clinician present in another room. Step 54 was identical to Step 53 except that no clinician was present in the house.

At the start of each trial, the clinician (or the mother, in later steps) gave Lukas an instruction describing what was going to occur on that trial

(e.g., during earlier steps, the instruction given was "I'm going to show you the medicine but you don't have to take it," and during later steps "I'm going to give you some medicine and I want you to swallow it. Open your mouth."). Mastery of a step was defined as 100% correct responding across two consecutive sessions, after which the procedure was advanced to the next step in the following session. In an effort to eliminate unnecessary steps during Steps 1 to 32, probes were conducted at a level that was three steps ahead, each time Lukas mastered three consecutive steps. If 100% correct responding occurred on the probe, an additional probe was conducted three steps ahead of the last. For example, after mastery of Steps 7, 8, and 9, the clinician probed Step 12. Lukas responded correctly on that probe, which progressed the next probe to Step 15. If correct responding did not occur at 100% on a probe, the next session was conducted at the last successful step. In addition, up until the point at which placebo medicine was added to the water in the syringe, probe trials of baseline conditions (i.e., approaching Lukas with a syringe of real medicine and the instruction "Time to take your medicine") were conducted by the clinician after mastery of every three steps that were explicitly taught.

Prior to beginning each trial in the treatment phase, the clinician conducted a preference assessment (DeLeon & Iwata, 1996) to identify the reinforcer to be used for that trial. Reinforcers included candy, balloons, and toys (e.g., figurines, foam rockets, a slingshot). For each trial, if a correct response occurred, the clinician delivered one or two pieces of candy or 30-s access to a toy. As in baseline, if Lukas displayed any avoidance, he was given 30-s escape (i.e., escape extinction was not programmed during any phase of the study).

RESULTS AND DISCUSSION

Figure 1 depicts the percentage of trials with correct responding (top) and the percentage of trials with avoidance (bottom). The stimulus fading step being implemented is depicted by the gray columns. Correct responding never occurred during any baseline sessions, and avoidance occurred during 100% of baseline sessions. Correct responding increased to 100% of trials and avoidance decreased to 0% of trials when treatment was initiated. Correct responding remained at 100% during all nonprobe treatment sessions, except for Sessions 41 to 43 and Session 60. Fading steps were gradually increased until the terminal step was reached at Session 96. Probes generally did not result in omitting fading steps, except in Sessions 25 to 29, during which fading steps were advanced from Step 9 to Step 24. His mother conducted Session 1 and Sessions 89 to 96, with Session 96 occurring without a clinician in the home. Expulsion never occurred.

These results provide preliminary support for the use of stimulus fading combined with positive reinforcement to increase compliance with liquid medication administration. Systematic probes were included that allowed occasional omission of fading steps, thereby potentially increasing the efficiency of the procedure. However, the fact that avoidance occurred during several of the probes (i.e., Sessions 30, 40, and 50) suggests that the fading procedure was necessary. Further, the treatment was effective despite the exclusion of an escape extinction component. Previous research has often demonstrated the necessity of escape extinction in the treatment of food refusal and other escape-maintained behaviors (Piazza, Patel, Gulotta, Sevin, & Layer, 2003). Escape extinction was not included in the current treatment package because parents have often not preferred it (Kerwin, 1999).

One potential limitation of the study is the length and complexity of the stimulus fading procedure. Some clinicians may not have the time or the expertise required to design, implement, and monitor a fading procedure

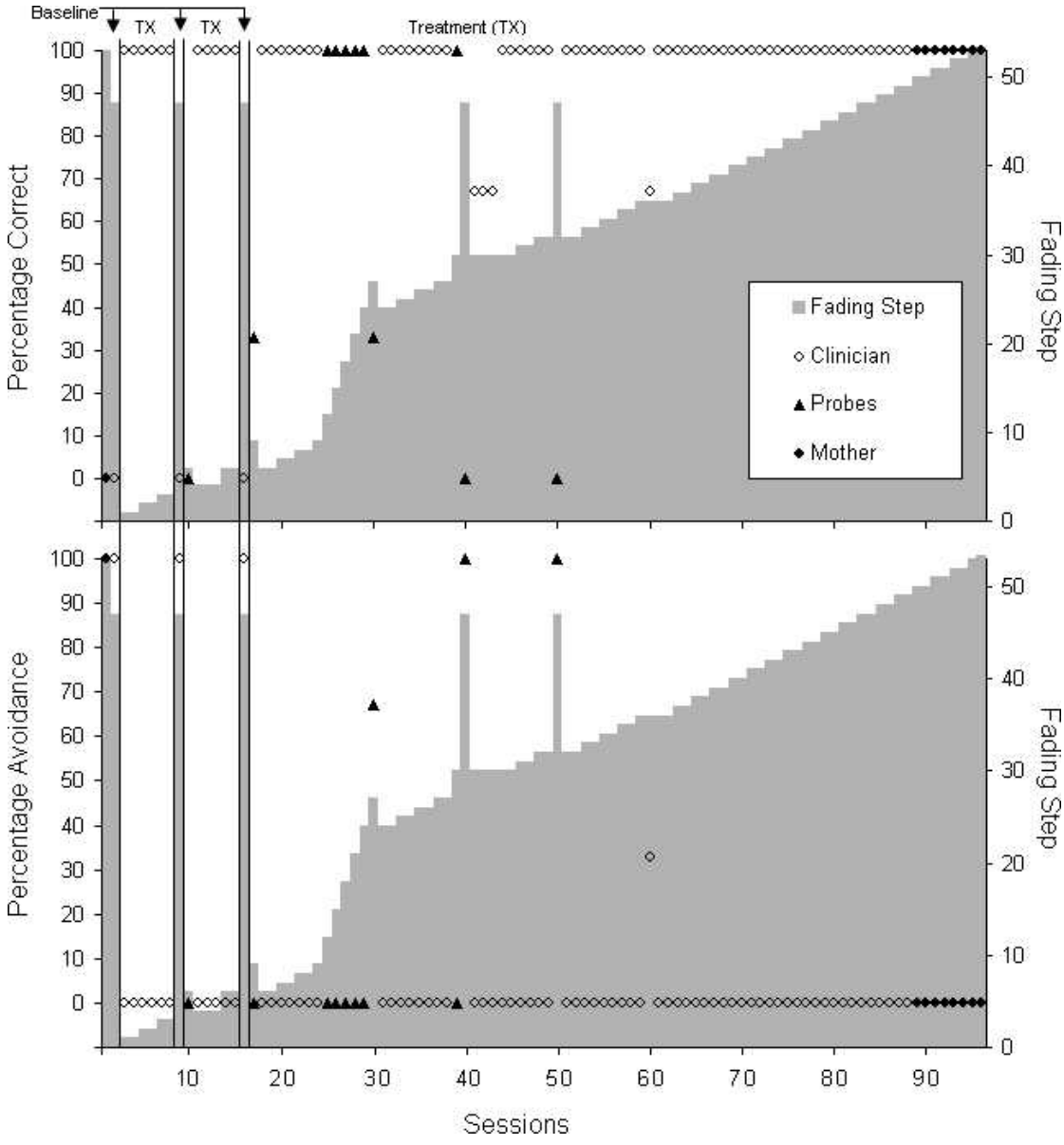

Figure 1. Percentage of trials with correct responding (top) and avoidance (bottom), during baseline, treatment, and probe sessions implemented by the clinician and treatment sessions implemented by the mother. The step of the fading procedure being implemented during a session is depicted by the gray column (right *y* axis).

of such complexity. A related potential limitation is the fact that the procedure contained at least two distinct behavioral intervention components (stimulus fading and positive reinforcement), and it is not possible to determine from the present study which were necessary. In addition, a simpler intervention, such as continuous access to empirically identified preferred items (Wilder, Normand, & Atwell, 2005), might have produced the same favorable outcome. Finally, it is possible that the instructions provided at the start of each trial could have affected responding on that trial (i.e., rule-governed behavior).

The mother reported that difficulties surrounding medication administration were a significant source of distress for her and Lukas before the intervention. As suggested by Shabani and Fisher (2006), studies that decrease avoidance of potentially aversive or fearful stimuli (e.g., needles, medication, etc.) should include measures of participant affect before, during, and after treatment. The current study did not include such measures, but the clinicians who implemented the treatment anecdotally reported that Lukas shouted "no" and ran away during baseline and that he often smiled and requested the medicine during the last dozen or so sessions of treatment. Future research should include empirical data on participant affect during baseline and treatment.

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