PRESCHOOLERS' COMPLIANCE WITH SIMPLE INSTRUCTIONS:

A DESCRIPTION AND EXPERIMENTAL EVALUATION

by

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Abstract

The present study extends previous research on child compliance by describing compliance levels of 15 preschool-aged children, and then evaluating the effects and limits of antecedent and consequence-based strategies within parametric analyses. Our descriptive assessment, which was administered in a similar manner across pairs of preschoolers, showed that compliance was relatively stable for individual children, variable across children, and was positively correlated with age. The impact of six antecedent variables (proximity, position, physical contact, eye contact, vocal attention, and play interruption) was assessed on compliance with four children. The effects of three-step (vocal, model, physical) prompting were then assessed alone, in combination with the antecedent variables, and at different integrity levels for two children. Results of the experimental analyses showed that compliance gradually increased with the addition of each antecedent variable for two of the four children. Three-step prompting in combination with the six antecedent variables increased compliance to high levels for the remaining two children, and high compliance levels maintained until treatment integrity was deceased to 20% of full strength. Implications for promoting high levels of preschooler compliance in the classroom and for the continued study of preschooler compliance are discussed.

DESCRIPTORS: antecedent intervention, compliance, preschoolers, three-step prompting, treatment integrity

Preschoolers' Compliance with Simple Instructions:
A Description and Experimental Evaluation

Noncompliance and problem behavior in young children are common teacher concerns (e.g., Austin & Agar, 2005; Hamlet, Axelrod, & Kuerschner, 1984; Schutte & Hopkins, 1970). From a survey of 3,305 kindergarten teachers, Lin, Lawrence, and Gorrell (2003) found that 78% of teachers rated "follows directions" as "very important" and "essential" when asked to rate the importance of 13 different kindergarten-entry level skills, only the domains of "tells needs/thoughts" and "is not disruptive" were rated higher. In addition, Heaviside and Farris (1993) found that over half of the kindergarten teachers surveyed also noted compliance to be an important factor when asked about kindergarten readiness skills. Finally, in a recent study involving typically-developing preschool and kindergarten children, Austin and Agar (2005) noted that, "noncompliance inevitably leads to fewer educational opportunities for students because they are less likely to engage in important academic and social behaviors requested by their teachers." (p.222). These studies suggest that compliance remains a critical skill upon which preschool teachers should focus when teaching socially-important school readiness skills.

Noncompliance is not only a major concern of teachers, it is also quite prevalent, specifically within the population of preschool-aged children. Roberts and Powers (1988) found that children between the ages of 2 and 4 were less compliant than slightly older children aged 4 to 7; in accordance, Webster-Stratton (1983) found that children between the ages of 2 and 3 displayed higher levels of noncompliance than their older peers. It appears that preschoolers (e.g., 2-4 year-olds) may be in most

need of compliance interventions as these children represent those who are most likely to engage in noncompliance as well as other problem behavior presumably related to demand situations. These preschool-aged children will also soon enter kindergarten classrooms where compliance is expected.

Noncompliance has been described in a variety of ways in the research literature, and is generally noted when a child does not complete specific teacher or parent-delivered instructions. In addition to this rather open description, the compliance literature provides multiple different methods with which to measure compliance including different initiation criteria (Brumfield & Roberts, 1998; Forehand & King, 1977; Roberts, 1985) and multiple completion criteria ranging from 5 to 30 s (Austin & Agar, 2005; Brumfield & Roberts, 1998; Forehand & King, 1977; Goetz, Holmberg, & LeBlanc, 1975; Ndoro, Hanley, Tiger, & Heal, 2006; Neef, Shafer, Egel, Cataldo, & Parish, 1983; Parrish, Cataldo, Kolko, Neef, & Egel, 1986; Peed, Roberts, & Forehand, 1977; Roberts & Powers, 1988; Schutte & Hopkins, 1970; Wilder, Atwell, & Wine, 2006).

To address the definition and measurement differences across studies on noncompliance, Wruble, Sheeber, Sorenson, Boggs, and Eyberg (1991) described an empirical approach to assessing compliance by measuring both the initiation and completion of instructions. In this study, the compliance times of 15 typically-developing children between the ages of 3 and 5 were evaluated. All were non-referred children who attended typical day care centers. Variations such as the type of instruction delivered (direct and indirect), the amount of time a child was allowed to complete an instruction, and whether or not the child was allowed the opportunity to

complete an instruction were measured in this study. Wruble et al. found an instruction completion mean of 6 s (range 0.5 to 14 s) across 15 child-parent dyads. Their empirically-derived mean compliance times correspond with many of the non-empirically-derived compliance criteria in the literature (Forehand & King, 1977; Peed et al., 1977); however, because multiple aspects of the assessment context varied across applications (e.g., unclear 'indirect' instructions were delivered instead of clear and direct instructions, and parents sometimes completed instructions for the children), the need for a more standardized and controlled assessment of compliance exists. A standardized and controlled assessment of compliance would involve directly observing different children's responses to the same types of instructions in similar contexts and using the same implementation and scoring criteria for compliance or noncompliance. This type of assessment would then allow for the impact of a range of independent variables to be evaluated and compared across multiple applied researchers.

With children for whom noncompliance has been identified as a problem, the effects of various teacher-controlled antecedents to compliance have been evaluated. Convincing evidence for the importance of "command form" has been established, and it has been shown that clear and precise instructions promote the highest levels of compliance. Instructions in the form of alpha commands (e.g., brief, clear, and direct commands such as, "Sit down") have been shown to increase compliance levels in preschool and elementary-aged children (Forehand & McMahon, 1981; Peed et al., 1977; Roberts, McMahon, Forehand, & Humphreys, 1978); whereas, instructions in

the form of beta commands (e.g., more indirect and ambiguous commands such as, "Shape up!") typically result in lower levels of compliance. In addition to command form, there is agreement that "do" instructions yield greater compliance than "don't" instructions (Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998; Houlihan & Jones, 1990; Neef, et al, 1983; Parrish et al., 1986). In addition, Adelinis and Hagopian (1999) demonstrated that fewer problem behaviors occur when "do" instructions are issued to interrupt inappropriate behaviors, compared to "don't" instructions.

A range of other variables that occur prior to the delivery of an instruction also may influence the likelihood of compliance (e.g., proximity, eye contact, physical touch, initial social interaction, or interrupting an ongoing activity prior to instruction delivery), but scant evidence exists on the relative impact of these factors. A notable exception was provided by Hamlet, Axlerod, and Kuerschner (1984), who found that compliance was 2 to 3 times higher when eye contact was required before instructions were given. Although evidence on the effectiveness of individual antecedent variables is rare, combined antecedent strategies have been evaluated. For instance, Mandal, Olmi, Edwards, Tingstrom, and Benoit (2000) evaluated the effects of eye contact, praise for eye contact, directive statements, close proximity to the child, and descriptive instructions on child compliance, and found that this antecedent packaged treatment increased compliance relative to baseline levels in four preschool-aged children. Using similar methods, Everett, Olmi, Edwards, and Tingstrom (2005) found similar results. However, because *consequences* differed between baseline and

treatment conditions in both studies (i.e., descriptive praise was programmed for compliance only in treatment), the independent influence of the *antecedent* variables was not determinable. Thus, additional research on antecedent variables other than the form of the command, eye contact, and proximity is warranted.

Changes in the antecedents to compliance may be effective in altering the probability of compliance because they either signal the availability of reinforcement for compliance (or punishment for noncompliance) or because they alter the value of the consequences for either compliance or noncompliance (i.e., the antecedent changes function as discriminative stimuli or as motivating operations, respectively). Because both of these operations are intimately linked to the consequences of compliance, other researchers have evaluated the effects of consequence-based treatments. Providing praise or other types of attention for compliance is a simple and non-intrusive consequence-based treatment commonly used to increase compliance. Schutte and Hopkins (1970) investigated the effects of praise statements including, "Thank you for doing what I asked" and "That's nice!" contingent on compliance. Praise statements were shown to increase compliance for two children from 60 and 69% to 78 and 84%. In addition to providing contingent vocal praise, Russo, Cataldo, and Cushing (1981) found increases in compliance with three children identified as noncompliant when different combinations of small edibles, physical praise, and tokens were delivered contingent on compliance. This differential reinforcement intervention not only increased compliance, but also decreased non-targeted problem behaviors to very low levels. In a systematic replication, Parrish et al. (1986) applied

both reinforcement for compliance and differential reinforcement of other behaviors (DRO) for problem behavior with four preschool-aged children with developmental disabilities and found both increases in compliance and decreases in problem behavior.

Rather than, or in addition to, differential reinforcement of compliance, removing the reinforcer for noncompliance via escape extinction has also been shown to increase compliance. For instance, Zarcone, Iwata, Mazaleski, and Smith (1994) physically guided adults with developmental disabilities and severe self-injurious behavior (SIB) to complete tasks that historically resulted in escape-maintained SIB. Noteworthy in this study were the increases in compliance and simultaneous decreases in SIB when the escape extinction component was in place, and the subsequent decrease in compliance and increase in SIB when the escape extinction component was removed. Escape extinction took the form of continued prompting by providing gestural and physical prompts to complete instructions when compliance was not observed following the vocal issuance of the instruction. Others have used this same three-step prompting procedure to increase compliance (e.g., Cote, Thompson, & McKerchar, 2005; Horner & Keilitz, 1975; Wilder, et al., 2006) even when the functional reinforcer for compliance was not determined. Nevertheless, this procedure may be best considered a consequence-based procedure as it is formally and probably functionally similar to escape extinction in most cases. For instance, Wilder et al. showed that two typically-developing preschool children, who completed instructions less than 15% of the time in baseline, completed the same

instructions 79 and 91% of the time when three-step prompting was implemented. In an additional study, Wilder, Chen, Atwell, Pritchard, and Weinstein (2006) showed that the combination of three-step prompting and DRO rapidly reduced tantrums and increased compliance associated with instructions to transition in two typically-developing preschool-aged children.

It is evident that multiple antecedent-based and consequence-based strategies increase compliance in young children. Although treatment packages involving changes to both the antecedents and consequences of compliance and noncompliance have been demonstrated to be effective (e.g., Everett et al., 2005; Mandal et al., 2000), the compliance literature is lacking an *integrative analysis* of the effects of multiple antecedent and consequence-based strategies. A logical next step in compliance research is to determine the interaction between combinations of antecedent-and consequence-based strategies designed to promote compliance with preschoolers.

A final and relatively understudied area of children's compliance pertains to the integrity of procedural variables. The integrity of procedural implementation is important to evaluate because it is unlikely that procedural integrity remains at 100% when it is implemented by teachers or other non-researcher behavior-change agents. Vollmer, Roane, Ringdahl, and Marcus (1999) provided a model evaluation of procedural (treatment) integrity in the context of a differential reinforcement of alternative behavior (DRA) intervention for problem behavior. They found that when treatment was implemented with less than perfect integrity, inappropriate behavior

increased and alternative behavior tended to persist, but at less than desirable levels. More recently, Wilder et al., (2006) evaluated three treatment integrity levels (100, 50, and 0%) of three-step prompting on typically-developing preschooler's compliance with one-step instructions. They found that compliance percentages for two children were between 79 and 91% with 100% treatment integrity, between 41 and 54% with 50% integrity, and between 0 and 6% with 0% treatment integrity, thus providing an important demonstration that treatment integrity and effectiveness were indeed positively correlated. This study emphasized the importance of the integral implementation of three-step prompting for promoting satisfactory levels of compliance. However, because only three integrity levels were evaluated and because integrity was only evaluated for a single type of intervention for noncompliance, additional analyses of varying levels of integrity of different compliance treatments are clearly warranted.

The purpose of this study was fourfold. First, an idiographic and standardized assessment was developed to describe the probability of compliance among 15 preschool-aged children and to identify children for whom compliance was relatively unlikely. These descriptive data were then used as baselines to evaluate the impact of different levels of an antecedent-intervention package for promoting compliance with four of the children for whom compliance was low. Specifically, the additive effects of the antecedent variables of teacher proximity, position, physical contact, eye contact, vocal attention, and play interruption were analyzed. The impact of a three-step prompting procedure was then evaluated for two children for whom compliance did not increase to an acceptable level with the antecedent package. Finally, a

parametric integrity analysis was conducted with two children to identify the strength of a packaged intervention involving both antecedent and consequence-based strategies necessary to sustain acceptable levels of compliance.

Study 1

Method

Participants, Setting, and Materials

Participants in this study included 15 typically-developing children from preschool classrooms in the Edna A. Hill Child Development Center at the University of Kansas. The children ranged in age from 2.6 to 5.0 years of age, all had age-appropriate language skills and appeared to understand most simple one-step instructions. Informed consent was obtained prior to the start of the study and assent was obtained prior to each daily session.

Daily 10-min sessions were conducted in a carpeted area of the preschool classroom during free-play times, apart from the on-going free-play activities and other children. Two children participated in the assessment simultaneously in order to create a natural assessment context akin to one in which a typical preschool teacher delivers instructions. This natural context was arranged such that children were allowed to play with toys that would potentially compete with compliance, and possibly result in more valid levels of compliance. Instruction-related materials remained constant throughout the study and included two small balls, two small toy cars, two small toy trucks, a shape sorter with two shapes to put into corresponding holes, a peg board with two pegs, a six-piece non-interlocking wooden puzzle, a box

of moist towelettes, a child-sized vest with a zipper, eight small plastic bears of two different colors, eight small wooden blocks of two different colors, four small plastic horses, and four small plastic cows. Other age-appropriate toys to occasion play within sessions included an action figurine, two small dolls, two small ponies, and 30 plastic food objects. Children were allowed to play with any of the items for the duration of each session. Multiple exemplars of each instruction-specific item were present so that the experimenter could place a target item in front of the child before she delivered the instruction even if the other child was interacting with another one of the exemplars (e.g., Alice was instructed, "Give me a red block," even though Daniel was playing with two of the four red blocks).

Measurement

One or two trained observers collected data via a hand-held computer during all sessions. While the experimenter delivered instructions to each of the two children, observers recorded the amount of time between the instruction delivery and instruction completion by pressing one key (a duration key) as soon as the experimenter finished delivering the instruction, and pressing the same key again once the child completed the instruction. An additional key (a frequency key) was scored to indicate compliance. If the child did not complete the instruction within 30 s, the duration key was simply pressed again following a 30-s period.

Mean latencies to comply with instructions were calculated by subtracting the times at which instructions were delivered from the times at which the instructions were completed. (If an instruction was not completed, it was not included in the

latency analysis). These data were then used to identify the percentage of instructions that were completed within either a 6-s or a 30-s compliance criterion.

Interobserver Agreement

Interobserver agreement (IOA) was collected on 31% of sessions, with a mean agreement of 94% in Study 1. Agreement was determined by partitioning each observation into 10-s intervals and comparing data collectors' records on an interval-by-interval basis. Within each interval, the smaller number of responses was divided by the larger number. These quotients were then averaged across intervals and multiplied by 100%. Mean agreement on latency measures was 91% (range, 66 – 98%), and mean agreement on compliance measures was 97% (range, 72 – 100%).

Procedures

The experimenter delivered one instruction to a child every 30 s by following a timer that signaled the delivery of instructions (i.e., because there were always two children, each child experienced an instruction once per min). A digital watch was used to time the 30-s interval in which the child was allowed to complete each instruction. A paper data sheet on a clipboard contained the 10 instructions to be delivered by the experimenter. During each session, two instructions from each category were randomly delivered such that 10 instructions were delivered to each child within each session (see Table 1 for details). Six different data sheets were created containing two sets of 10 instructions (one set for each child) with randomly determined objects for use within each type of instruction. Data sheets were rotated

each session so that children did not experience the same instructions in consecutive sessions.

Because we were interested in assessing children's compliance within a preschool setting, we arranged for a familiar classroom teacher from whom all children had a history of receiving instructions, to deliver instructions within the assessment. We also found it important to standardize our assessment to ensure that children were only given direct instructions, were allowed a standard amount of time to complete all instructions, and that the experimenter never (accidentally) completed the instruction for the child.

Each child was randomly paired with another child as sessions were conducted with two children at a time, and five sessions were conducted with each child. Because daily sessions were conducted based upon child availability, pairs of children changed slightly across the assessment. Before each session, the two children were randomly labeled as child A or B for that particular session. The experimenter invited the children to sit on the floor in a carpeted area of the classroom, away from on-going free-play activities. Prior to each session the experimenter took the toys out of the box one at a time and labeled each item or set of items for the children. Once all of the toys were removed from the box and labeled, the experimenter told the children that they may play with any of the toys, and that they should stay in the area until she told them they were finished and it was time to clean up. The children were then allowed to play with the toys for 1 min, after which the session began with an instruction to child A.

In terms of the experimenter behavior and proximity in relation to the children before and while delivering instructions, no target antecedent variables were present in Study 1 (see Table 2). Before and while delivering each instruction, the experimenter was at least 1 m away from the target child, was standing, did not touch the child, did not deliver vocal attention to the child, did not make eye contact with the child, and did not interrupt the child's play. As soon as the experimenter finished delivering the instruction, she started a 30-s timer to count down the interval the child had to complete the instruction. Child A had 30 s to complete the instruction, incorrectly complete the instruction, or simply not respond to the instruction. If the child correctly completed the instruction within 30 s, the experimenter immediately praised the child's behavior (e.g., "Great job, you rolled the ball to me!"). Descriptive praise was provided for all correct responses within 30 s; however if the child did not complete an instruction within 30 s, the experimenter simply delivered the next instruction to the other child. Thus, there were no direct consequences for noncompliance, however depending on the child's instructional history; escape may have been a functional reinforcer for noncompliance. Instructions were provided in this manner (approximately every 30 s) until each child experienced all 10 instructions. Once the approximately 10-min session was complete, children assisted in cleaning up the materials and returned to the regularly scheduled classroom activities.

Results and Discussion

Each of the 15 children in Study 1 experienced five sessions each, and these descriptive data are shown in Figure 1. No child consistently completed all 10 instructions, and no child completed zero instructions in any given session. As would be expected, all children completed more instructions with the 30-s criterion than with the 6-s criterion (see the dashed and dotted mean lines in Figure 1). Yet, regardless of which criterion was applied, some children consistently completed a high number of instructions (Jenny, Mel, and Justin), others consistently completed a low number of instructions (Kevin and Logan), and still others completed a variable number of instructions (majority of the children).

Figure 2 presents the mean number of instructions each child completed using both the 30-s and the 6-s compliance criteria across the five sessions in Study 1. Across all children, the mean number of instructions completed ranged from 6.6 to 9.8 with the 30-s criterion. Notably, all 15 children completed a mean of at least 60% of the instructions within the 30-s criterion (i.e., their mean number of instructions completed was at or above the dashed line at 60% on the top panel of Figure 2). The mean number of instructions completed ranged from only 2.2 to 8.8 with the 6-s criterion. Only 6 of the 15 children (Jenny, Mel, Justin, Erin, Ellie, and Randy) completed a mean of at least 60% of the instructions within the 6-s criterion (Figure 2, bottom panel). The majority and remaining nine children (Andrew, Alice, Daniel, Abby, Kate, Amy, Adam, Kevin, and Logan) completed a mean of less than 60% of instructions across five sessions with the 6-s criterion.

The correlation between each child's compliance level each session, and their assessment peer's compliance level for that particular session was 0.04 with the 30-s criterion, and was 0.33 with the 6-s criterion. Thus, these statistically insignificant and weak correlations between pairs of children suggested that the assessment partner had little effect on children's observed compliance levels. We also compared compliance level and child age and found a strong, positive, and statistically significant correlation of .79 between age and mean compliance level ($p < .01$). We conducted a t-test to determine if there was a significant difference between mean compliance levels for boys and girls and did not find a statistically significant effect ($t = .33$, $p > .05$). When not actively completing instructions, children were generally engaged with the toys and instructional materials throughout all sessions, although no direct measures were taken on engagement.

In general, our descriptive study showed that compliance was relatively stable for individual children (a mean *SD* of 1.0 and 1.5 were found for the 30-s and 6-s criterion data, respectively), and that compliance was more variable across children (an overall *SD* of 1.4 and 2.6 for the 30-s and 6-s criterion data, respectively). We were able to identify children with relatively high levels of compliance as well as children with relatively low levels of compliance within a small sample of typically-developing children (see Figure 2). The results of Study 1 showed no significant difference in mean compliance level between male and female children; however, older children completed more instructions than younger children. These findings are consistent with previous research (Brumfield & Roberts, 1998; Shriver & Allen,

1997) and suggest that age of the child may be predictive of compliance level and that comparisons to similarly-aged peers should be made when determining goal levels of compliance for children in compliance training programs.

The standardized construction of our assessment allowed us to determine the compliance level of 15 different children, and to make comparisons across multiple children, ages, and sexes. The current study controlled for the influence of task demands in that all instructions were simple one-step instructions that could be completed in a relatively short period of time, with similar effort, and were akin to those often given by teachers to perform simple gross and fine motor actions and common self-help tasks, identify different concept items (e.g., colors and shapes), and clean up or transition. The instructions in the present study varied slightly from trial to trial and from session to session, but remained within similar preschooler-appropriate concept classes and within similar instructional frames (see Table 1). In addition, because of precedent in the literature to assess compliance by using clear and direct or alpha commands (Forehand & McMahon, 1981; Peed et al., 1977; Roberts, McMahon, Forehand, & Humphreys 1978), the experimenter only delivered instructions that were; (a) clear (a specific command was verbally delivered), (b) brief (one short sentence in length), and (c) direct (stated as a command rather than a question, e.g., “Give me a block” rather than, “Could you give me a block, please?”).

There are multiple benefits to the standardized assessment used in this study. The assessment is brief (approximately 55 min per pair of children) and may be conducted by a classroom teacher. The assessment allows for an ecologically

sensitive snapshot of children's compliance because it was conducted by a known adult within the preschool classroom while children played with a known peer and with developmentally relevant, typical, and presumably preferred materials. In other words, reactivity to novel settings (e.g., therapy rooms), novel people (therapists, researchers), novel materials (assessment materials), and novel instructions were greatly minimized in this assessment. Although the assessment has a "natural feel" to it, a high degree of control is also maintained such that stable baselines of compliance are generated. Therefore, we think that applied behavioral researchers interested in assessing independent variables on preschooler's compliance will benefit from the use of this assessment.

A limitation of our assessment includes the absence of the assessment of multiple types of instructions (e.g., instructions to transition across the room, chained instructions, or complex instructions such as clean up tasks). Therefore, different forms of instructions and more challenging instructions should be evaluated in future research with preschool-aged children in order to better describe compliance with young children and identify those who may benefit from early intervention.

Although higher compliance levels were found with the 30-s criterion, it is possible that a 30-s criterion may be too liberal a criterion for a preschool-aged child to complete a simple one-step instruction such as those listed in Table 1. Our results showed that all 15 children completed at least 60% of instructions with this criterion, and only 6 of the children completed at least 60% of the instructions with the 6-s criterion. Because the 6-s criterion adequately identified children with low levels of compliance, is a reasonable amount of time for a child to complete a simple one-step

instruction, and because it mapped onto the descriptive assessment results of Wruble et al. (1991) and the clinical definition of noncompliance described by Forehand and King (1977), the standardized compliance assessment and the 6-s compliance criterion were used to establish baseline levels of compliance from which to evaluate the effects of antecedent and consequence-based interventions in Study 2.

Study 2

Method

Participants, Setting, and Materials

Study 2 took place immediately after Study 1 was completed. Because Kevin, Abby, Logan, and Adam displayed low levels of compliance (i.e., they completed less than 60% of all instructions) within the 6-s criterion in Study 1, these children were selected for participation in Study 2. In all sessions throughout this study, Logan and Adam were paired, and Kevin and Abby were paired. Consent for participation was obtained from parents and assent was again obtained prior to each daily session. The setting and materials for Study 2 were identical to those in Study 1.

Measurement

The same measures described in Study 1 were used in Study 2. Completion of an instruction within 6 s of the vocal prompt is reported as compliance.

Interobserver Agreement

Interobserver agreement for all measures in Study 2 was determined as in Study 1. IOA was collected on 36% of all sessions, with a mean agreement of 96% across all sessions. Mean agreement on latency measures was 93% (range 74 – 99%),

and mean agreement on the compliance measure was 98% (range 87 – 100%). Mean IOA on prompts was 97% (range 87 - 100%).

Procedures

The descriptive data from Study 1 were used as the initial baseline sessions for all children in Study 2. All subsequent baseline sessions in Study 2 were carried out in the exact same manner as in Study 1. Kevin and Abby's initial baselines were continued until stable levels were observed before the initial intervention was implemented.

Additive antecedent intervention (AAI). The AAI phase followed baseline sessions. AAI sessions were run in the exact format as baseline sessions except that target antecedent variables were additively implemented across sessions. In these sessions, experimenter behavior and proximity in relation to the child prior to, and while delivering an instruction, changed across sessions. Table 2 outlines these changes. The antecedent variables were additively implemented across the phase such that in the first session of the AAI phase, the only change in experimenter behavior – from the baseline arrangement – was that the experimenter was *within 0.3 m* of the child prior to and while delivering each of the 10 instructions for that particular session. During the next session, the second antecedent variable was added, such that the experimenter was *within 0.3 m,* and also *crouched* next to the child prior to and while delivering each instruction. During the next session, the third antecedent variable was added, such that the experimenter was *within 0.3 m, crouched*, and also gently *touched* the child's shoulder prior to and while delivering each instruction. During the next session, the fourth antecedent variable was added, such that the

experimenter was *within 0.3 m, crouched,* gently *touched* the child's shoulder, and delivered approximately 5-s of vocal *attention* prior to delivering each instruction. Vocal attention consisted of comments directed at the target child such as, "You are playing nicely with those toys. I really like that tower you built with the blocks." During the next session, the fifth antecedent variable was added, such that the experimenter was *within 0.3 m, crouched,* gently *touched* the child's shoulder, delivered 5-s of vocal *attention,* and attempted to make *eye contact* with the child prior to and while delivering each instruction. In the final session, the sixth antecedent variable was added, such that the experimenter was *within 0.3 m, crouched,* gently *touched* the child's shoulder, delivered 5-s of vocal *attention,* attempted to make *eye contact* with the child, and *interrupted* the child's play by placing her hands over the child's hands to stop their play prior and while delivering each instruction.

Following sessions in which all six antecedent variables were present, one return to baseline session was conducted. Following the return to baseline session, the antecedent variables (1-6) were again additively implemented across six sessions. This process continued until both pairs of children experienced three complete phases of the AAI. Two exceptions to this general outline are found with the procedures for Kevin and Abby. In sessions 27-35, the return to baseline was implemented for 9 sessions, rather than only one session. In addition, once all six antecedent variables were additively implemented in the final AAI phase (session #40), five additional sessions with all six antecedent variables present were conducted.

Noncompliance (consequence) intervention. Logan and Adam experienced the noncompliance intervention because the number of instructions they completed per session had not increased after the implementation of three AAI phases. During the noncompliance intervention sessions, the experimenter wore a plain red colored t-shirt as a discriminative stimulus for the contingencies associated with the noncompliance intervention. The noncompliance intervention involved three-step prompting (vocal, model, and physical prompts) to promote compliance to instructions. When a child did not complete an instruction within 6 s of the vocal instruction (vocal prompt), the experimenter modeled the correct response and allowed 6 additional s for instruction completion. If the child did not complete the instruction within 6 s after the model prompt, the experimenter physically prompted the child to complete the instruction. Descriptive praise was provided for completing the instruction within 6 s of the vocal or model prompt, or following physical guidance.

Full antecedent plus noncompliance intervention (FANI). FANI phases combined the full antecedent intervention, plus the noncompliance intervention, such that every instruction delivered in these sessions was preceded by the implementation of all six antecedent variables, and the experimenter implemented the three-step prompting procedure if the child did not comply with any instruction within 6 s.

Full antecedent plus noncompliance intervention challenge (FANI Challenge). FANI challenge sessions consisted of systematically removing the antecedent and consequence-based strategies on progressively more instructions until a disruption in

compliance was found. A disruption in compliance was defined as four or fewer instructions completed (within 6 s) by one or both children. In each session of the FANI challenge phase, the integrity of the FANI was reduced by randomly selecting one of the 10 instructions to *not* provide the full antecedent intervention, and then by randomly selecting one of the 10 instructions to *not* provide the noncompliance intervention for that particular session (such that each instruction had an equal and independent chance of having or not having the full antecedent intervention and the noncompliance intervention in place). Progressively greater numbers of instructions were selected to be delivered in the absence of intervention in subsequent sessions. More specifically, in the first session of this phase, only 9 instructions were preceded by the full antecedent intervention, and only 9 instructions were followed by the noncompliance intervention (if compliance was not met within 6 s). If the number of instructions completed (compliance level) remained above 4 for that session for one or both children, only 8 instructions were preceded by the full antecedent intervention, and only 8 instructions were followed by the noncompliance intervention in the next session. Thus, the integrity level of the FANI was subsequently reduced by 1 each session until a disruption in compliance was found. At this point, sessions continued with that level of integrity until 3 consecutive sessions were conducted with a compliance level of 4 or lower, or until the compliance level increased above 4 for either child. If the compliance level increased, the integrity for the next session was again decreased. This phase continued until the compliance level remained at 4 or lower for 3 consecutive sessions for either child.

Experimental Design

A reversal design was used in Study 2 to assess the relative effectiveness of the additive antecedent intervention on compliance for all participants. A reversal design was also used with Logan and Adam to determine the effects of the noncompliance intervention, the FANI, and the FANI challenge. Mean compliance at or above 60% for each member of the dyads under the 6-s compliance criterion was considered a satisfactory outcome in these evaluations.

Results and Discussion

Kevin and Abby's data are shown in Figure 3, and Logan and Adam's data are shown in Figure 4. Before the implementation of the AAI, additional baseline sessions were conducted with Kevin and Abby due to the increasing trend in Kevin and Abby's data. With the implementation of the first AAI phase, the number of instructions Kevin completed increased in the last session of the phase. Then, with a return to baseline, the number of instructions Kevin completed decreased relative to the number of instructions completed in the last session of the AAI, and was similar to the level found in the first baseline. An increasing trend in compliance was found in the next AAI phase. A final baseline was then conducted, and here Kevin continued to complete a low and variable number of instructions across 9 sessions (again, similar to the level found in the first baseline). With a final return to the AAI, Kevin again completed an increasing number of instructions across the phase.

The number of instructions Abby completed across the first AAI phase generally increased as well. In the initial return to baseline, Abby completed zero

instructions. With a second implementation of the AAI, Abby's compliance level did not reverse back to the trend found in the first AAI phase, and remained low across the phase. With the third baseline Abby again completed a low and variable number of instructions (similar to the first baseline), and with a final return to the AAI, she again completed an increasing number of instructions across the phase, thus replicating the effect of the first AAI phase.

Overall, Kevin and Abby completed the most instructions in the AAI phases. Kevin completed the most instructions when all 6 of the antecedent variables were in place and Abby completed the most instructions when at least 5 of the 6 antecedent variables were in place. Of the AAI sessions that Kevin and Abby experienced, Kevin completed 106 (46%) of the 230 given instructions and completed 60% or more of the instructions in 26% of these sessions. Abby completed 129 (56%) of the 230 given instructions and completed 60% or more of the instructions in 52% of these sessions. Combined, Kevin and Abby completed a mean of 2.6 instructions across all baseline sessions, a mean of 5.1 instructions across all AAI sessions, and a mean of 6.4 instructions in AAI phases when all six antecedent variables were present. Although the effect of the AAI was less reliable with Abby, we did show control over the independent variable with this intervention for both children.

Logan and Adam responded differently to the AAI. Logan's AAI data show no effect of the antecedent variables. In the AAI sessions, Logan never completed more instructions than in any of the first three baseline sessions. Across three phases of the AAI, the number of instructions he completed steadily decreased to and

remained at zero for the last 8 of the total 18 AAI sessions. Adam's data were much more variable and we did not observe replicable increases in the number of instructions completed across the AAI phases relative to baseline. Of the AAI sessions that Logan and Adam each experienced, Logan completed only 17 (9%) of the 180 given instructions and never completed 60% or more of the instructions in any session. Adam completed 37 (21%) of the 180 given instructions and completed 60% or more of the instructions in only 22% of these sessions.

The noncompliance intervention was implemented next with Logan and Adam (Figure 4, closed squares). The number of instructions Logan completed steadily increased with the implementation of the noncompliance intervention phase. The noncompliance intervention had no effect on the number of instructions Adam completed relative to baseline and no improvement relative to the previous AAI phases. A return to baseline resulted in a moderate level of compliance for both Logan and Adam (both below a mean of 60%). It is important to note that changes to the independent variables were made contingent on an *individual* child's performance and not on the performance of both children in the pair. Therefore, although an effect of the noncompliance intervention was found with Logan, the lack of the effect with Adam was the impetus for the implementation of the FANI with both children.

The initial implementation of the FANI occurred next. In this phase, the number of instructions both children completed immediately increased relative to previous levels. Together Logan and Adam completed a mean of 70% of instructions – the highest level of instructions completed up to that point in the assessment. A

return to baseline resulted in a decrease in the overall number of instructions both children completed with a mean of only 29%. The FANI was then again implemented and the number of instructions both children completed rapidly increased to a mean of 71%.

In the next phase, the number of instructions both children completed remained at high levels until only two of 10 instructions were implemented with full integrity. Thus, Logan and Adam completed 80% of instructions when only 3 of the 10 instructions were either preceded by the target antecedent variables, noncompliance was followed by additional prompting, or both. The integrity of the FANI was at 10% when the performance disruption criteria were met. In these three sessions, together Logan and Adam completed a mean of only 3.5 instructions. A final return to the FANI effectively and rapidly increased compliance to the previously observed high levels, with a mean of 76% of instructions completed.

In sum, the impact of six antecedent variables (proximity, position, physical contact, eye contact, vocal attention, and play interruption) was assessed on compliance with four children. For two children, the experimental analyses showed that compliance was most probable when multiple target antecedent variables were in place, suggesting that for some children, a more involved teacher presence prior to delivering an instruction may be an important variable for increasing or maintaining children's compliance.

There are several possible explanations for the effect of the AAI with Kevin and Abby and the lack of an effect of the AAI with Logan and Adam. Kevin and

Abby's compliance behavior may have been more sensitive to praise as a reinforcer for compliance than Logan and Adam's compliance behavior. Alternatively, Logan and Adam's compliance behavior may have been more sensitive to escape from the instructions than Kevin and Abby's, such that not completing the instructions (and escaping the demand) was more reinforcing for Logan and Adam than for the other children. Finally, the alternative activities (e.g., playing with the toys, playing with each other) may have been more reinforcing for Logan and Adam's compliance behavior than they were for Kevin and Abby's, thus resulting in less compliance with the antecedent only approach for these boys.

Considering the additive manner in which the antecedent variables were introduced, it is unknown if it is necessary to implement all six variables in combination to increase compliance because it is possible that the sixth variable (play interruption) was solely responsible for the improvement in compliance. Although some of the other antecedent variables necessarily precede play interruption (e.g., moving close to the child) or are likely to precede play interruption (e.g., eye contact), the independent effects of play interruption and changes in teacher proximity (e.g., instructions from across the room) seem to be the most important single variables to evaluate in future research.

Three-step prompting in combination with the six target antecedent variables (FANI phases) increased compliance to high levels for the remaining two children for whom antecedent variables alone had little positive effect. It is probable that the target antecedent variables eventually served a discriminative function for Logan and

Adam because they reliably preceded the three-step prompting procedure and resulted in high levels of compliance for both boys. Logan and Adam's data demonstrate that antecedent strategies may not be effective unless they are correlated with or predictive of effective consequence-based strategies.

With these children, we carefully arranged our FANI challenge conditions so that the target antecedent variables and the three-step prompting were systematically unrelated. We did this to make it unlikely for children to respond differently when the antecedent variables were or were not in place, and we observed high compliance levels until treatment integrity was deceased to 10 to 20% of full strength. These data suggest that highly irregular implementation of the antecedent and consequence-based strategies can maintain high levels of compliance following a history of this treatment package being implemented at full strength. The extent to which the success of the treatments with moderate or weak integrity depends on the recent history of the full integrity treatment was not determined in this study, but should be evaluated in future research.

The practical implication of our results is that if teachers initially deliver instructions with high integrity (all six antecedent variables and three-step prompting for noncompliance), they may then later be able to deliver instructions with less integrity and still observe high compliance levels. One conundrum in the preschool classroom is that all children regardless of developmental status may benefit from this sort of compliance strategy, but there are simply too many demands placed on a preschool teacher to implement this strategy at full strength with all of the children in her classroom. Therefore, the FANI challenge results are promising in that only

occasional implementation of the FANI may promote high levels of compliance by children in the preschool classroom. Nevertheless, this assertion regarding class-wide improvements in preschooler compliance as a function of the described full antecedent and noncompliance intervention requires empirical inquiry. This type of inquiry is perhaps the most important future research opportunity.

General Discussion

Noncompliance with preschool-aged children is and will likely remain a concern among teachers (Austin & Agar, 2005; Hamlet, et al., 1984; Lin et al., 2003; Schutte & Hopkins, 1970). Because of its prevalence (Roberts & Powers, 1988; Webster-Stratton, 1983), the need for practical and effective methods to decrease noncompliance surely will not dissipate any time soon.

We described a standardized, idiographic, and ecologically sensitive assessment to directly and reliably measure compliance of 15 preschoolers within a relatively short period of time. This assessment identified children who consistently complied less than their same-aged peers and served as an adequate baseline from which to evaluate the effects of factors for improving compliance. We also demonstrated the effects and limits of several independent variables. Our data suggest that multiple antecedent variables including play interruption will increase the probability of compliance and that the probability of compliance is highest when target antecedent variables (close proximity, crouching, touching shoulder, eye contact, providing some brief interaction, and interrupting existing play) are correlated with follow through by teachers via three-step prompting.

Notably, no child consistently complied with all 10 instructions in the descriptive evaluation or under optimal treatment conditions. Increasing compliance to 100% was not the aim of our treatments, nor, we contend, should it be the ultimate goal of compliance research because the most compliant of preschool children do not always comply with requests and because of the potential dangers of teaching young children to respond to all requests (e.g., inappropriate requests from peers or strangers). Future research in the compliance area should identify methods for teaching children discriminated compliance repertoires so that compliance is at strength to appropriate instructions by relevant adults and weak to inappropriate instructions that may place a child in harms way. Finally, it seems important that future research also evaluate the social acceptability of the goals and procedures involved in compliance training programs with teachers, parents, and the children themselves. This may lead to improved understanding over what levels of compliance are expected, or most appropriate for children of different ages.

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Table 1. Instructional Categories, Frames, and Items used to Complete Instructions

Category (2 each)	Frame	Items
Gross Motor	a) Roll the ____ to me b) Put the ____ in the box c) Perform motor action: clap your hands, wave your hands, touch your toes, stand up	Ball, car, truck Ball, horse, etc.
Fine Motor	Put a ____ in the ____	Shape / shape sorter Peg / peg board Piece / puzzle
Self Help	a) Wipe your hands with the towelette b) Zip the zipper up to the top of the vest	Moist towelette Small vest with zipper
Concept Formation	a) Give me a (color) ____ b) Put a ____ in my hand	Plastic bear, wooden block Animal figurine, block, etc.
Transition	a) Put the ____ on/in the ____ b) Give me the/a ____	Any item / shelf / box

Table 2. Antecedent Variables Present (AVP) in Each Condition (Baseline, I, II, III, IV, V, & VI)

	Condition						
AVP	Baseline	I	II	III	IV	V	VI
1	At least 1 m away	*Within 0.3 m*	*Within 0.3 m*	*Within 0.3 m*	*Within 0.3 m*	*Within 0.3 m*	*Within 0.3 m*
2	Stand	Stand	*Crouch*	*Crouch*	*Crouch*	*Crouch*	*Crouch*
3	No touch	No touch	No touch	*Touch*	*Touch*	*Touch*	*Touch*
4	No attention	No attention	No attention	No attention	*5 s attention*	*5 s attention*	*5 s attention*
5	No eye contact	No eye contact	No eye contact	No eye contact	No eye contact	*Eye contact*	*Eye Contact*
6	No interrupt	No interrupt	No interrupt	No interrupt	No interrupt	No interrupt	*Interrupt*

Figure Captions

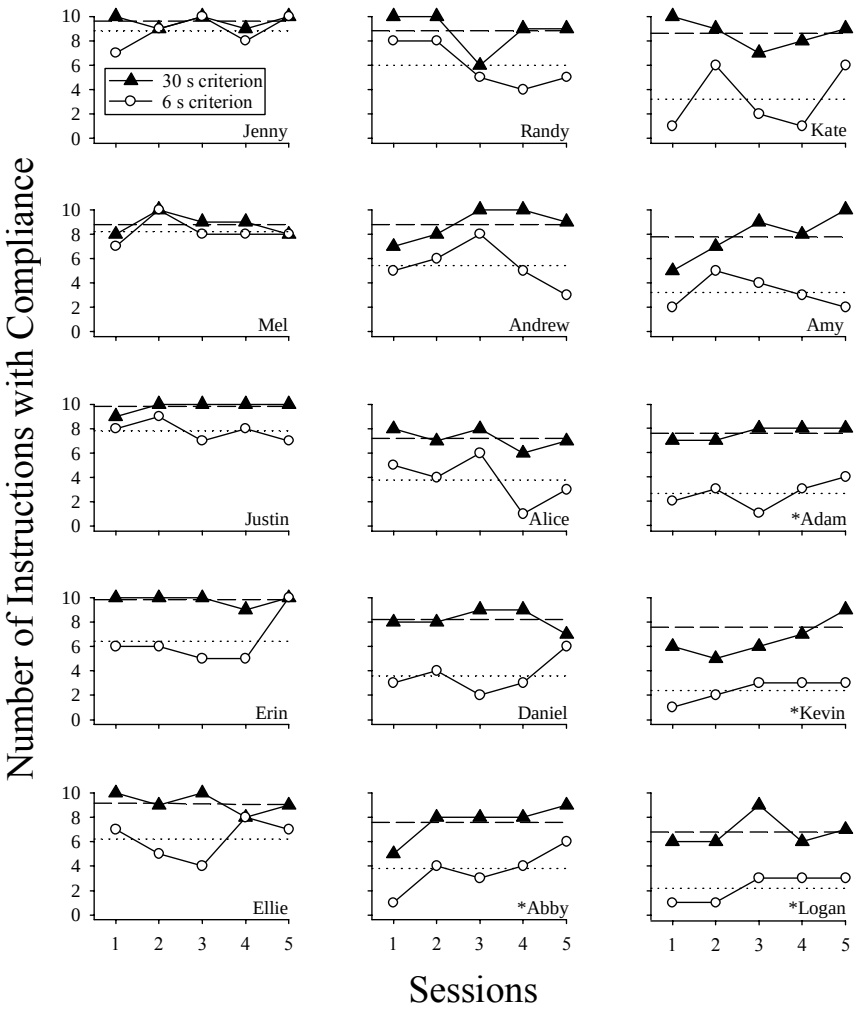
Figure 1. Number of instructions completed for the 15 children in each session of Study 1 according to the 30-s and 6-s criteria. Dashed lines represent the mean number of instructions completed within the 30-s criterion, and dotted lines represent the mean number of instructions completed within the 6-s criterion. Children are ordered from the highest mean number of instructions completed in 6-s (upper left corner) to the lowest mean number of instructions completed in 6-s (lower right corner). Asterisks denote the children that participated in Study 2.

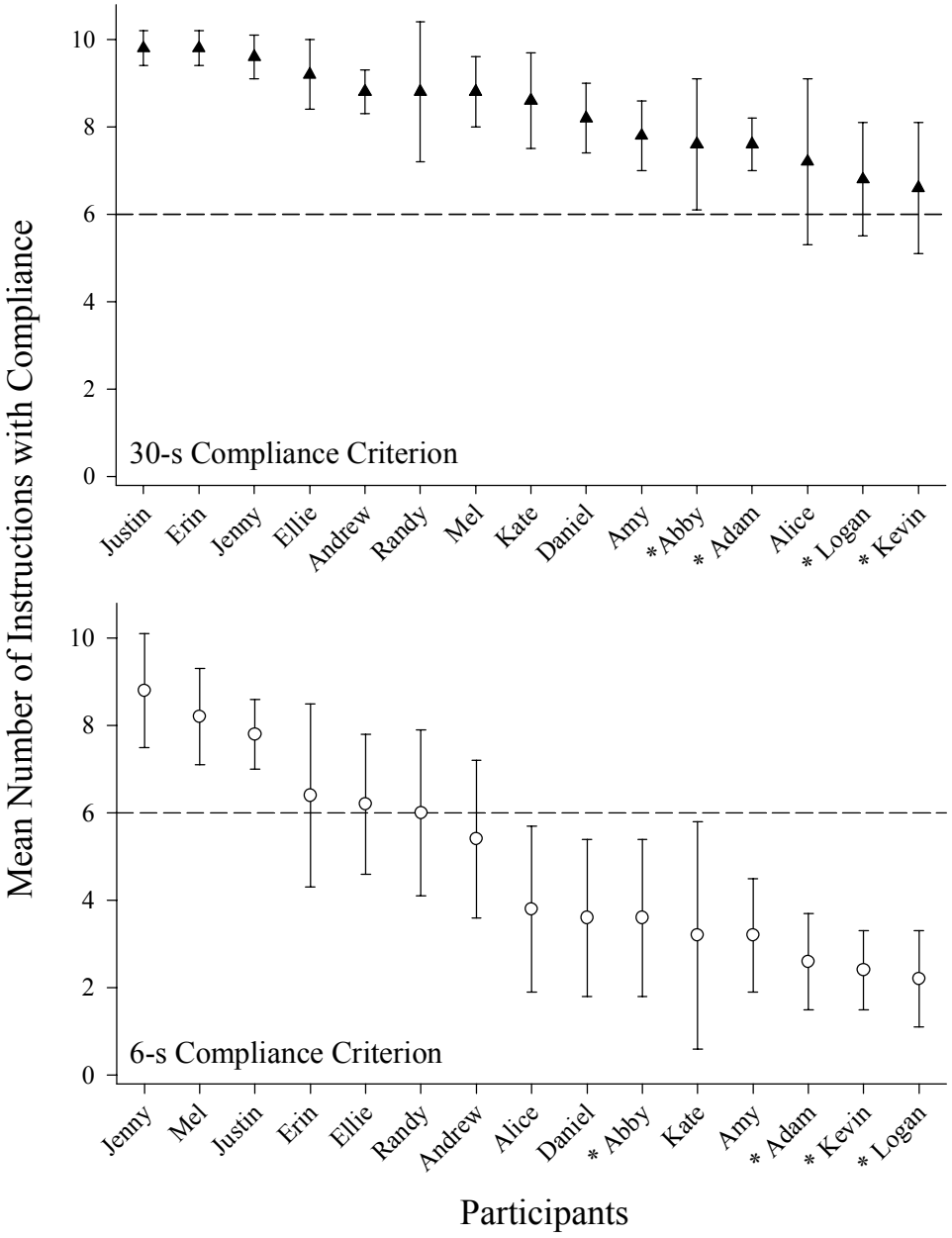
Figure 2. Mean number of instructions completed across the 15 children in Study 1 according to both the 30-s and 6-s criteria. In both panels, children are ordered from left to right based on the highest number of instructions completed within each criterion to the lowest number of instructions completed. Bars represent standard deviations from the mean and asterisks denote the children that participated in Study 2.

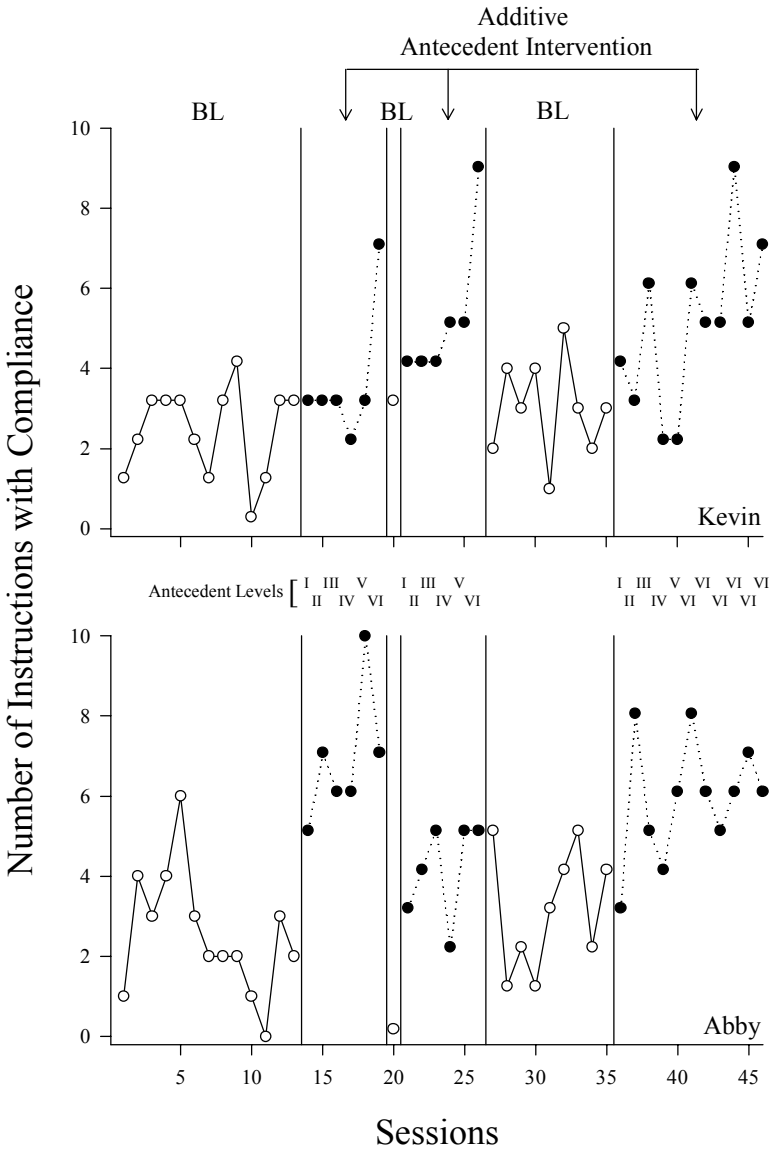
Figure 3. Kevin and Abby's treatment data. The additive antecedent intervention consisted of the additive implementation of the six antecedent variables (depicted by roman numerals I-VI). Baseline sessions are represented by open circles, and AAI sessions by closed circles.

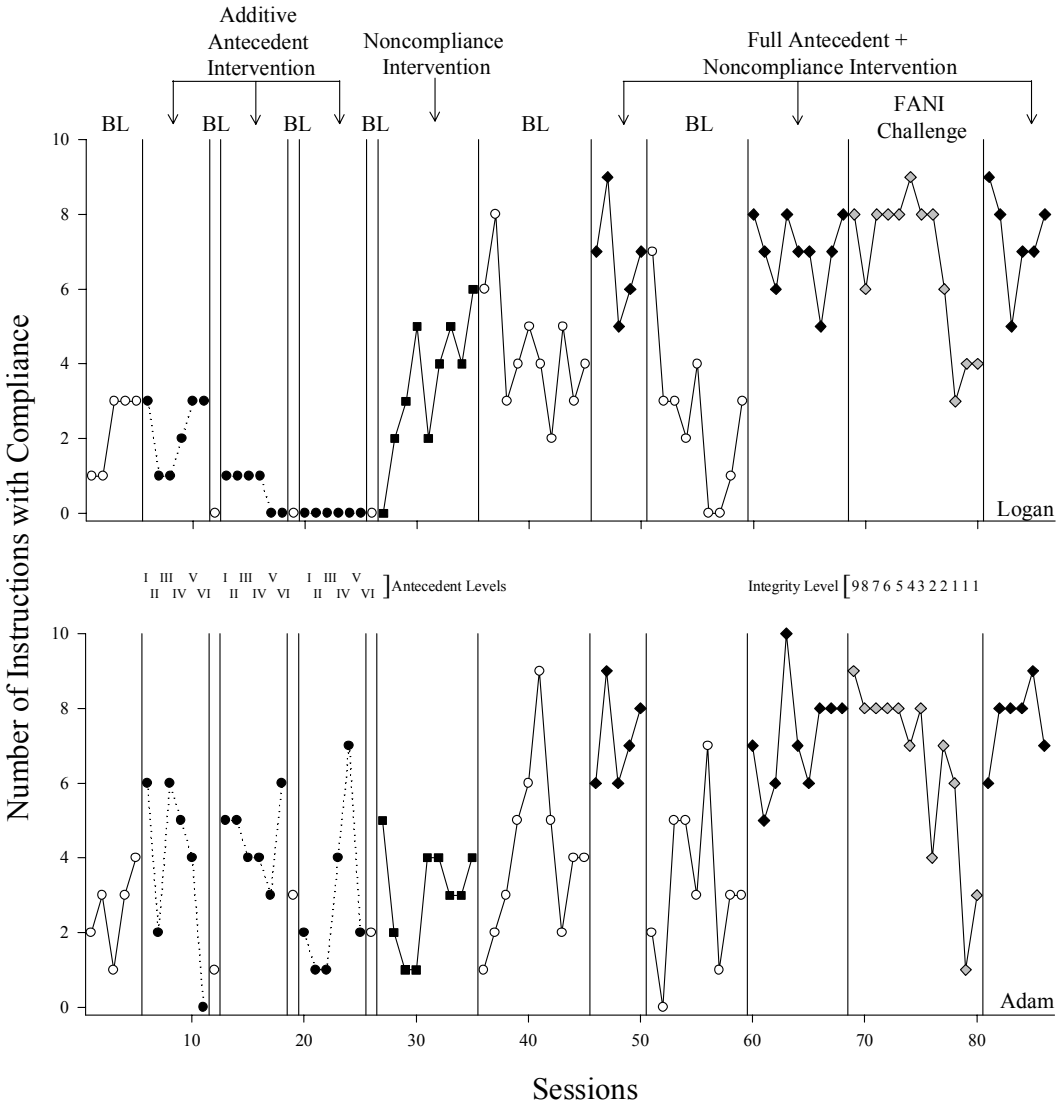
Figure 4. Logan and Adam's baseline data (open circles), AAI data (closed circles), noncompliance intervention data (closed squares), FANI data (black diamonds), and FANI challenge data (grey diamonds). The AAI consisted of the

additive implementation of the 6 antecedent variables (depicted by roman numerals I-VI), and integrity levels are depicted by the numbers 1-9.


Number of Instructions with Compliance
Sessions
30 s criterion
6 s criterion
Jenny
Randy
Kate
Mel
Andrew
Amy
Justin
Alice
*Adam
Erin
Daniel
*Kevin
Ellie
*Abby
*Logan
0
2
4
6
8
10
1
2
3
4
5


Mean Number of Instructions with Compliance
30-s Compliance Criterion
6-s Compliance Criterion
Participants
Justin
Erin
Jenny
Ellie
Andrew
Randy
Mel
Kate
Daniel
Amy
* Abby
* Adam
Alice
* Logan
* Kevin
Jenny
Mel
Justin
Erin
Ellie
Randy
Andrew
Alice
Daniel
* Abby
Kate
Amy
* Adam
* Kevin
* Logan


Additive
Antecedent Intervention
BL
BL
BL
Kevin
Antecedent Levels
I III V I III V I III V VI VI VI
II IV VI II IV VI II IV VI VI VI
Abby
Number of Instructions with Compliance
Sessions


Additive Antecedent Intervention
Noncompliance Intervention
Full Antecedent + Noncompliance Intervention
BL
BL
BL
BL
BL
BL
FANI Challenge
Logan
I III V
II IV VI
Antecedent Levels
Integrity Level 9 8 7 6 5 4 3 2 2 1 1 1
Adam
Number of Instructions with Compliance
Sessions