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# Maternal Command Rate and Child Compliance

by

(C) William J. Koch

A THESIS

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## Dedication

This manuscript is dedicated to Tracy, who provided all the incentive and much of the effort required to complete it.

## Abstract

A within subjects reversal design was replicated on five mother-child dyads in an attempt to test the command rate hypothesis that increases in parental command rate decrease child compliance. The results failed to support the command rate hypothesis. Regression analyses suggested that the proximity of the child to the compliance object prior to the mother's command was the critical variable controlling compliance. The present data, then, disconfirm the command rate hypothesis of compliance, and suggest a more important role for the child's orientation and proximity prior to the mother's command. Additionally, several methodological and conceptual issues in child compliance research are discussed.

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# I. Introduction

The purpose of this study was to experimentally investigate the relationship of parental command rate to child compliance. The major hypothesis was that parental command rate would bear an inverse relationship to child compliance.

Failure to comply to parental commands has been described as the most widely cited specific problem behavior in most classes of child conduct disorders (Johansson, Note 4). More specific statements are myriad. The major reason for referral given by parents of diagnosed hyperactive children is non-compliance (Barkley & Cunningham, 1979). Parents of aggressive children target non-compliance as a problem requiring change (Patterson & Reid, 1973; Taplin & Reid, Note 8) and mothers of retarded children cite non-compliance as their children's major behavior problem (Tavormina, Henggeler, & Gayton, 1976). Des Lauriers and Carlson (1969) and Cowan, Hoddinott, and Wright (1965) have also reported non-compliance to be a primary problem in psychotic children. In addition, observations of families not referred for clinical problems have demonstrated non-compliance to be the most frequent of 13 deviant child behaviors (Johnson, Wahl, Martin, & Johansson, 1973).

Therefore, it appears that failure to comply is a referral problem that (a) occurs across different diagnostic categories, (b) occupies a primary position in the hierarchy of specific clinical referral problems, and (c) occurs frequently enough in normal populations to suggest that a continuum of variation may exist with respect to this variable. Together, these conclusions suggest a need for analytic research concerning the maintenance of compliance.

**Variables Influencing Child Compliance**

Variables affecting child compliance can be divided into antecedent and consequent variables. Consequent variables (e.g., differential reinforcement of compliance, time out contingent on non-compliance) will not be discussed here. The reader should refer to Forehand (1977) for a discussion of consequence control of compliance.

Nine antecedent variables have been hypothesized, and/or demonstrated, to control child compliance. These variables can be classified according to whether they (a) exist within the Compliance Interaction Sequence, or (b) precede the parental command. The term "Compliance Interaction Sequence" was used by Koch (Notes 5 & 6) to describe the topography of parent-child interactions initiated by a parental command or request and terminated by either a child's compliant act, the timing out of an opportunity-to-comply interval, or some additional parental act. Those variables within the sequence can be differentiated as being either command characteristics, or post-command characteristics, of the sequence. All these variables will be briefly discussed before detailed discussion of the data concerning command rate. A more detailed discussion of the empirical literature, conceptual issues, and measurement problems concerning all these variables can be found in Koch (Note 5). Table 1 (adapted from Koch, Note 6) illustrates the compliance interaction sequence.

The two antecedent variables outside the Compliance Interaction Sequence are (a) the orientation of the child to the compliance object (Schaffer & Crook, 1980), and (b) the rate of commands during the immediately preceding temporal interval (e.g., Forehand & Scarboro, 1975). These variables are considered external to the sequence because they express at least part of their topographic value prior to the command initiating a new sequence. The degree of orientation toward the compliance object appears to bear a positive relationship to compliance (Schaffer & Crook, 1980) while the rate of parental commands appears to bear a negative relationship to compliance (e.g., Forehand & Scarboro, 1975).

Five variables have been identified within the command topography itself. First, the existence of aversive elements (e.g., threats, tones of anger) associated with the command is associated with decreased compliance (Delfini, Bernal, & Rosen, 1976). Second, the behavioral specificity of a command is frequently considered by behavioral observation systems in command definition because it is thought to be important in mediating measureable compliance (c.f., Koch, Note 6). Third, commands phrased as suggestions have been shown to obtain different percentages of compliance than have imperatively-stated commands (Lytton & Zwirner, 1975;

Schaffer & Crook, 1980; and Zegiob & Forehand, 1978). However, the direction of this effect is controversial. Schaffer and Crook obtained data indicating that imperative commands were superior to suggestive commands in obtaining compliance, whereas the other two studies found data supporting the superiority of suggestive commands. Fourth, commands phrased as directive questions obtain higher percentages of compliance than imperative commands (Green, Forehand, & McMahon, 1979). Fifth, commands directing the child to inhibit an activity rather than to initiate an activity have been shown to be emitted more frequently by mothers with non-compliant children than by mothers with normal children (Green, Forehand, & McMahon, 1979).

Two other variables that are intimately intertwined within the Compliance Interaction Sequence are (a) verbal and physical intrusions of the parent shortly after a command and (b) the opportunity-to-comply interval length. Budd, Baer, and Green (Note 1); Forehand, Gardner, and Roberts (Note 2); and Roberts, McMahon, Forehand, and Humphreys (1978) found that verbal and physical intrusions following the command were a powerful inhibitory variable for compliance. Associated with such intrusions, the time allowed for the child to comply has an effect on compliance (c.f., Koch, Notes 5 & 6). This latter variable seems to be the product of a measurement artifact, the use of observational time limits that preclude recording compliance when the compliant act follows the command at some latency greater than an arbitrarily-determined interval.

However, the control of compliance is a complex process about which little is known, despite the number of controlling variables that have been investigated. Until recently most of the conceptual and methodological issues involved in studying child compliance had not been discussed and no data are presently available concerning interactions among any of these independent variables (Koch, Note 5). Additionally, designs capable of assessing the direction of control (e.g., experimental within-subjects designs) have not been used to investigate the effects of these antecedent variables. The present manuscript proposes the controlled study of command rate and compliance using a within-subjects reversal design. The command rate variable, and its effects, are discussed in the next section.

## The Effect of Command Rate

Command rate may vary for at least two reasons. First, child behavior may influence the rate of parental commands in two ways. Children who show behavioral excesses may set the occasion for a high rate of inhibitory commands, and children who show behavioral deficits may set the occasion for a high rate of initiation commands (c.f., Bell & Harper, 1977). Alternatively, the failure of a child to comply may inflate the command rate because of the necessity of repeating commands. Second, parents may spontaneously produce differentially high rates of commands either because they give more original commands than do other parents, or because they give insufficient opportunity to comply before emitting a repeated command. Therefore, as a dependent variable, command rates may be mediated by either parental or child variables. It is very important to note that command rate may assume the status of either a dependent or independent variable. This study is concerned with the independent variable characteristics of command rate. However, a researcher could legitimately be concerned with the variables controlling command rate. In fact, if command rate is shown to be an influential independent variable, it will likely become a popular dependent variable.

For the present purposes, it is important to note that some literature exists suggesting that command rate influences compliance. This is to say that, independent of its own genesis, a particular rate of commands may have an effect on compliance. This hypothesized causal relationship is outside the artifactual relationship caused by the sequential dependency of compliance on commands. Because it is impossible to measure compliance without a command having occurred, command rate places an upper limit on the number of compliant acts possible. Specifically, the command rate hypothesis is that, under high rates of commands, the probablity of obtaining a compliance to any one command will decrease.

Such a process could occur in either of two ways. First, repeated or chain commands could interfere with the opportunity to comply to any preceding command or link. This interference could reflect a behavioral process because parental verbalizations impinge on the child's compliance activity (e.g., by commanding attention or precluding verbal responses), or the interference could be an artifact of the observational system (as in Reid, 1978), creating non-compliance where no opportunity for coding compliance existed (c:f., Koch, Note 5). Second, command rate could directly influence compliance by lowering predispositions to comply, or by slowing initiations of compliance when command rate is high. This could be colloquially termed the "nagging effect". The purpose of the present study is to determine whether the nagging effect hypothesis can be ruled out.

The following authors have found results suggesting that command rate may be related to the percentage of compliance to parental commands. Delfini, Bernal, and Rosen (1976), in a home observation study comparing deviant and normal families, found a trend for an inverse relationship between command rates and compliance percentage. Also, Doleys, Cartelli, and Doster (1976), and Forehand, King, Peed, and Yoder (1975) found command rate to be inversely related to compliance percentage in clinic settings. Lytton and Zwirner (1975) found that mothers and fathers were differentiated both by their command rates and the percentages of compliance to their commands. Finally, Piat, Sadler, and Vickers (Note 7) found an inverse relationship between command rate and compliance in classroom settings.

Failures to replicate this relationship do exist. Johnson and Lobitz (1974), in home observations, and Forehand and his associates (Zegiob & Forehand, 1978; and Green, Forehand, & McMahon, 1979), in clinic analogue settings, have not noted any relationship between command rate and compliance percentage. Two qualifications to these failures must be made. First, neither the presence nor the absence of relationships noted between command rates and compliance percentage when neither is under experimenter control can aid us in determining the direction of control, if any. Other explanations for either replication or failure do exist, as noted above. Second, a number of parental variables changed as a function of the experimental manipulations in the Johnson and Lobitz (1974), Zegiob and Forehand (1978), and Green et al. (1979) studies, suggesting the possibility that other variables overshadowed the relationship of command rate to compliance percentage.

If the studies cited so far were the only ones germane to this problem, command rate would obviously not exist as an issue because of the numerous alternative variables more reliably implicated in determining compliance percentage. However, two lines of more experimental evidence support the hypothesis that command rate controls compliance. Mash and Terdal (1973) and Hanf and Kling (Note 3) reported clinical intervention studies in which the parents were taught to (a) differentially reinforce compliance, and (b) reduce the frequency of their commands. Additionally, Hanf and Kling trained parents to reduce the frequency of criticisms. Increases in appropriate consequences and decreases in command rate were associated with increases in compliance. Forehand and King (1977) replicated Hanf and Kling (Note 3), using the same intervention package, and found similar results. Thus, three clinical studies found decreases in command rate to be associated with improvements in compliance. Unfortunately, differential reinforcement procedures were confounded with reductions in command rates, thus preventing the conclusion that the reductions in command rate were responsible for any part of the change in compliance. Also, it is not clear that this change in compliance was independent of the opportunity-to-comply issue because inter-command intervals were not controlled.

Forehand and Scarboro (1975) reported the only study in which command rate was intentionally controlled to study its effect on compliance. The authors had mothers emit, in a clinic setting, 12 standard commands to their 5-year-old children at 3 minute intervals. Using a time-sampling system adapted from Wahler (1969), the observers coded the child's behavior as either cooperative or oppositional for each 10 second sampling interval. Two results are important. First, oppositional behavior decreased with time from command. Second, oppositional behavior during the 30 seconds immediately post-command was more frequent for the second 6 commands than for the first 6 commands. The authors interpreted this as demonstrating that command rate primarily influenced compliance initiation, although they suggested that, in a more refined analysis, command rate might be found to control compliance maintenance. Because of the long (three minutes) inter-command intervals in the Forehand and Scarboro (1975) study, the lack of opportunity variable appears insufficient, by itself, to explain the relationship between command rate and compliance.

Although cited earlier as not replicating other observational evidence regarding command rate and compliance, the Green et al. (1979) data offer some support for the effect of command rate when viewed across phases. These authors were primarily interested in the effects of command topography, and consequences for compliance, on compliance percentage. In addition, they compared normal and non-compliant dyads on the ability of the mothers to respond to instructional sets designed to make their children look either compliant or non-compliant. When they changed from "look compliant" and "look non-compliant" phases to a standard commands phase, the rate of commands changed from a mean of 4.265 commands per minute to 2 commands per minute. Compliance averaged 41 percent during the first 2 phases and 65 percent during the standard commands phase. Because the original data are not available, the statistical significance of this difference is unknown but the results are as easily attributable to a decrease in command rate as they are to a change in command content or topography.

## Internal Validity Issues in Compliance Research

Internal validity is best conceptualized as the degree to which a researcher can be confident that changes in the dependent variable were caused by changes in the independent variable (Cook & Campbell, 1979). An experiment may be tightly controlled so that only one dimension varies between the samples of behavior. Alternatively, one or more extra dimensions may vary but do so orthogonal to the dimension of interest. If an experiment has been designed properly and been carried out as designed, a researcher can then assume that the study has a high degree of internal validity, all else equal.

The "all else equal" is covered by what Cook & Campbell refer to as statistical conclusion validity. This component of internal validity concerns the degree to which specific data allow the computation of legitimate statistical tests to make inferences of association between independent and dependent variables. Issues of heterogeneity of variance, dependence between means and variances, and dependence among separate data points all influence the statistical conclusion validity of any experiment that is evaluated by inferential statistical techniques.

There are several major problems in concluding from the child compliance literature that command rate exerts a controlling influence on compliance. Most of the literature shows only an association between command rate and compliance. Such data do not allow any conclusions concerning either (a) the existence of actual control, or (b) the direction of control within the relationship. This should be considered a flaw in the internal validity of child compliance research. The only actual experiment testing the command rate-compliance relationship was that of Forehand & Scarboro (1975). However, that study is subject to the criticism that command rate was not "reversed" so that experimental sessions of different command rates were alternated.

Because the most reasonable hypothesis concerning the nagging effect is that command rates influence the probability, latency, or maintenance of compliances in the immediate future, but have no long term effects, this effect should be considered a within subjects, as opposed to between subjects, effect. A single subject A-B-A reversal design would be most appropriate for showing this effect (c.f., Hersen & Barlow, 1976).

Another general problem with most of the research bearing on the command rate-compliance relationship is the confounding of independent variables. The presence of aversive elements in the command has been confounded with command rate in home observations of deviant and normal families (Delfini, Bernal, & Rosen, 1976). Differential reinforcement of compliance, or punishment of non-compliance has also been confounded with changes in command rate (e.g., Mash & Terdal, 1973; Hanf & Kling, Note 3; and Forehand & King, 1977), and unspecified changes in command content and form (e.g., imperative, interrogative, prohibitive, etc.) may have occurred in a number of these studies unmonitored, but still confounded, with changes in command rate.

One issue that plagues both laboratory and field studies of command rate is that command rate is usually confounded with the opportunity-to-comply interval. As command rate increases, the opportunity interval will decrease. Detailed and time-consuming observation procedures may control this problem to some extent. For example, observers can continue looking into the future for compliance to a past command irrespective of how many other commands have intervened. However, this procedure may do little to solve the more important problem of interference by rapid commanding via some attention-controlling mechanism. For example, very rapid successions of commands may lead the child to respond to only a subset of those commands occurring later in the string. This would be analogous to a recency effect in free recall paradigms.

Finally, none of the studies reviewed above controlled for the attention or orientation of the child to the compliance object. This is an important matter for both internal validity and for the construct validity of compliance. Because the attention or orientation of the child has not been controlled in previous studies, it is impossible to know whether effects attributed to other independent variables were due solely to those variables or whether the child's proximity and/or orientation to the compliance object was responsible for some proportion of the explained variance.

This variable is a difficult one to control for a variety of reasons. First, if the experimenter were to instruct mothers to command children only when the child was oriented to the compliance object mothers might have difficulty performing to criterion unless prompted by the researcher. If mothers were so prompted, there is no guarantee that the child's orientation would not change between the time the experimenter instructed the mother and the time that the mother commanded the child. Therefore, the orientation variable is one that may be exceedingly difficult to control in studies of compliance.

**External Validity Issues in Compliance Research**

Several issues concerning the external validity of compliance research are discussed below. Briefly, these are (a) the relative efficacy of different dependent measures for describing the processes of mother-child interactions involving child compliance, (b) the generalizability of results from between groups studies to within-individual variation, (c) the generalizability of laboratory results to processes in "natural" settings such as homes, (d) the implications of child effects research (e.g., Bell & Harper, 1977) to the compliance phenomenon, and (e) the construct validity of the independent variable of concern in this study, command rate.

Very little attention has been paid to deriving a meaningful dependent measure in the compliance literature (c.f., Koch, Note 6). The measure used most frequently has been percent compliance, computed as the number of compliance acts during a session divided by the number of parental commands during that same session (e.g., Forehand, 1977; Lytton & Zwirner, 1975; Roberts et al., 1978; and Schaffer & Crook, 1980). Forehand & Scarboro (1975) suggested that measures of compliance latency and compliance duration might also be valid measures for description of the compliance process. Compliance latency and compliance duration correspond to the time between the maternal command and compliance initiation, and the time between compliance initiation and termination of the compliance activity, respectively.

Although no dispute concerning the validity of the primary dependent measure exists in the literature, the validity of dependent measures in any area should be a matter of careful scrutiny. Koch (Notes 5 & 6) has provided a theoretical framework for both research and clinical assessment of child compliance. Implicit in the concept of "Compliance Interaction Sequence" is the notion that the compliance phenomenon is best considered to be a discrete trials phenomenon, and that percent compliance, or some other measure that expresses the relationship of a compliance activity to its antecedent event (i.e., a command) rather than to time, would be the measure of choice.

On the other hand, if compliance is considered to be a behavior emitted by the child, and differences in compliance between children to discriminate those children, some measure other than the percent measure would seem more appropriate. This is because the percent compliance measure does not provide any information about between-parent differences in command rate while possibly being affected by those differences in command rate. Thus, differences in child behavior might be inferred between children exhibiting different percentages of compliance when, in fact, this difference is controlled by differences in maternal command rate. Thus, researchers concerned with child behavior might mistakenly attribute between-parent differences to differential child predispositions to behave.

The argument above points to a flaw in the conceptions presently guiding research and assessment in the area of child compliance (c.f., Koch, Notes 5 & 6). However, it is important to recognize that this argument is based on the specific assumption that compliance is an aspect of child behavior, rather than of parental behavior, and that compliance as a behavior class can be studied separately from a set of antecedent events, including maternal commands.

A different assumption can be made, no less tenable from a theoretical perspective, that the unit of analysis in compliance interactions is a sequence of events, including a parental command, a number of other events, and/or a child response that matches the motor act criterion specified by the command. In this case, the critical question would not be how many child responses of a specified topography are emitted within a session, but, given a parental command of unspecified topography, what events control the probability of a response matching criterion. This latter view would require investigation using the percentage compliance measure. Thus, different assumptions guide the preference for different dependent measures. It should be noted that present linguistic habits may also interfere with unbiased understanding of this phenomenon. For example, psychologists typically speak of the "behavior" of individual organisms as their subject matter. Thus, when an author refers to compliance, it is quite easy to refer to this as "compliance behavior" and consider such events to be "behaviors" emitted by some single individual. However, such a conclusion may not be well suited to a phenomenon that can only occur under restricted social circumstances, in which the units of analysis include acts emitted by two individuals.

Nonetheless, for the purposes of the present study this conceptual dispute has important consequences. Should maternal command rate be manipulated and percent compliance vary inversely with command rate, while compliance rate (within sessions) varies positively with command rate, those researchers assuming that the compliance phenomenon is an aspect of child behavior will remain unconvinced of the command rate hypothesis. On the other hand, those researchers assuming that the unit of analysis is the sequence of events must logically infer according to the effects on the percent measure. This issue appears to reduce to a paradigm conflict. Unless the latency or duration measures covary with one or the other of percent and rate of compliance, there appears to be no empirical resolution to this conflict. However, the issue alerts the reader to a major question concerning the appropriate unit of analysis within the compliance phenomenon. This author takes the position that the percentage measure is more heuristic, based on (a) the child compliance literature which has more frequently used the percent measure, (b) the logical analysis presented above and in Koch (Notes 5 & 6), and (c) face validity considerations suggested by non-psychologists.

A second issue concerns the unfortunate lack of single-subject designs in the analysis of compliance phenomena. The only study that approximated a within-subjects design in this area was that of Forehand & Scarboro (1975). This was also the only study that approximated a true experiment designed to study the effect of some variable on child compliance specifically. Thus, studies have either compared clinically-referred and non-referred families and have noted that specific parent behaviors covaried with children's percent compliance between the two groups (e.g., Delfini et al., 1976), or they have pooled observational data across families or dyads and have noted differential percent compliance associated with different parental behaviors (e.g., Lytton & Zwirner, 1975; Schaffer & Crook, 1980).

Although Forehand and Scarboro (1975) studied the influence of a variable (number of commands) over time on children's percent compliance, the authors pooled the data across children. Additionally, the latter authors did not actually manipulate command rate. They had their mothers emit commands at 3 minute intervals for a 36 minute period and then measured compliance with respect to the preceding command. A defensible explanation for the Forehand and Scarboro effect would be that some unknown variable, independent of command frequency, summated across time within the experimental session and resulted in the lower compliance for commands later in the session.

Because Forehand and Scarboro did not report data from every day parent-child interaction, the extent to which their paradigm approximates such natural interaction is unknown. Such a comparison of natural versus experimentally-constrained conditions would be helpful in determining the generalizability of their results to settings other than the laboratory under constrained circumstances in which mothers are emitting commands according to a temporal schedule.

Thus, the Forehand and Scarboro (1975) study was not a true single-subject design for two reasons. First, because data were pooled across subjects it is impossible to make inferences about within-subject variation associated with the independent variable. Second, the independent variable was not command rate, as suggested by the authors, but time within the session. This problem has been discussed as a problem of external validity because such pooled data do not allow inference concerning an effect of the independent variable on the dependent variable within a single subject. This is particularly important when investigating command rate as an independent variable because it is likely to vary widely within, as well as between, mothers.

Additionally, some dispute exists concerning the generalizability of laboratory results to natural settings, specifically with respect to parent-child interaction (Hughes & Haynes, 1978). The data on this issue are too complex for discussion here however it should be mentioned that there are readers who will remain unconvinced of the generality of any findings within a laboratory study to the process as it exists outside the laboratory.

A more theoretically interesting, if less capable of solution, issue is that of parent- versus child-effects within the child compliance phenomenon. The child-effects literature is well established (c.f., Bell & Harper, 1977), and considerable evidence exists suggesting that specific individual differences in children operate on parents' child-rearing behaviors (Bell & Harper, 1977). This issue has not yet surfaced in the child compliance literature. The absence of this issue is in itself rather interesting, for many parents free from theoretical biases speculate that their commanding behavior is under the influence of their child's behavior rather than the child's behavior being under the influence of parental commands.

As well, a recent observational study (Schaffer & Crook, 1980) suggests that one variable affecting child compliance to parental commands is the orientation of the child toward the compliance object. The orientation of a child may be under some degree of control by the parent but an equally viable hypothesis would be that the child's orientation controls the parent's command so that the child controls what the parent tells the child to do. Thus, the child might look at, or approach, an object, and influence the parent's commanding behavior. A means of testing the direction of effect is not immediately obvious but such a possibility, which appears to have escaped the authors in the child compliance area, should be considered.

A final consideration of external validity concerns the construct validity of command rate. This reduces to two questions. What constitutes a command for the purposes of computing command rate, and are all commands weighted equally? Other authors mentioned above have differentiated commands on the (a) grammatical form, (b) prohibitive versus directive quality, (c) negativeness, and (d) specificity of the commands. Simply put, no one has considered whether it is best to consider command rate an unweighted sum of each of several types of commands or whether particular types (e.g., directive versus prohibitive) should receive greater weights. Command rate can only be computed by summing commands over some specific length of time. It is unknown whether 5, 30, 60, or 600 minutes is the appropriate session length for expressing the influence of command rate. Unfortunately, such information is not presently available.

The discussion of external validity suggests that some part of the child compliance research may be colored by arbitrary decisions or theoretical biases. It is wise to keep these issues in mind not only when criticizing past research but when evaluating alternatives.

**Specific Hypothesis**

The experimental hypothesis for this study was that some one of the dependent measures, percent compliance, compliance latency, and compliance duration, would vary as a function of the command rates associated with experimental phases. This hypothesis then demands that (a) percent compliance and compliance duration be higher in phases with command rates lower than baseline levels and lower in phases with command rates higher than baseline levels, and (b) compliance latency be shorter in phases with command rates lower than baseline levels and longer in phases with command rates higher than baseline levels.

## II. Method

### Design

The experimental design for this study was a single subject reversal design. An additional phase (i.e., A′) was instituted to assess the implications of changing command content and form. Therefore, the design was an A-A′-B′-A′-C′-A′ design. For convenience, A phases were run on separate days, and the two interventions were introduced on separate days. Thus, a dyad exposed to each intervention would be exposed to phase A on days 1 and 2, to phases A′-B′-A′ on day 3 or 4, and to phases A′-C′-A′ on day 3 or 4. The A phase was a baseline phase in which (a) subjects were intended to habituate to the laboratory room, and (b) a free-operant rate of maternal commands was established. Baseline lasted 135 minutes for Dyad 1 and 120 minutes for Dyads 2 through 5. A′, B′, and C′ phases generally lasted 30 minutes each. Dyad one's last A′ phase lasted only 15 minutes.

The A′ phases were arbitrary baseline (AB) phases in which experimenter-supplied commands were to be emitted by the mothers at the same rate at which they emitted commands during the A phase. However, during AB and the intervention phases commands were issued on an arbitrarily-determined temporal schedule, as in Forehand and Scarboro (1975). The B′ and C′ phases were those phases during which commands were supplied by the experimenter at either double or one-half the rate established during baseline by each individual mother, respectively. These were called High Command Density (HD) and Low Command Density (LD), respectively. Comparisons of compliance dependent measures between baseline and AB, where command rate was matched but command content and form were different, were intended to allow the test for effects of uncontrolled variables including command content and form. Comparisons of HD and LD with their surrounding AB phases permitted the test for effects of command rate (c.f., Hersen & Barlow, 1976). Dyads were counterbalanced for order of presentation of B′ and C′ phases. More detailed descriptions of the phases are provided below. At this point, it should be noted that an adequate test of the command rate hypothesis is dependent upon two assumptions. First, it is assumed that maternal command rate is a variable with some construct validity that can be experimentally controlled. Second, it is assumed that 30 minutes is a reasonable interval in which to observe such effects.

**Children**

Mothers and children were recruited by newspaper advertisements. Mothers committed themselves and their children to 4 2-hour sessions of videotaped interaction in return for an equal number of hours of parent training and an intellectual assessment of the child.

Besides the children whose data are reported in this paper, three other children were videotaped. Two hours of baseline and 30 minutes of AB data were collected for a

19-month-old male. Data collection was terminated for this dyad because the child's compliance fell immediately to zero during AB, and the researcher felt that the child was unresponsive to the mother's verbalizations when the mother could not physically prompt him. A 17-month-old female was only filmed for 30 minutes of baseline because her compliance was zero under those conditions. As well, a 24-month-old female was videotaped for 2 hours of baseline, before her mother ceased appearing for sessions.

Child 1 was a 4 year old male with no reported behavior problems. However, child one was reported by his mother to have had considerable hearing deficiencies throughout his life, which had been rectified during the previous year. He had a Verbal IQ of 107, Performance IQ of 126, and Full Scale IQ of 118, as measured by the Wechsler Pre-School and Primary Scales of Intelligence (WPPSI).

Child 2 was a 6 year, 5 month old female whose mother reported behavior problems of lying, daytime urinary incontinence, and high rate attention-seeking behavior. Her Verbal, Performance, and Full Scale IQs were 99, 114, and 106 as tested by the WPPSI. Child two was the older sister of child one so that the same mother served as a subject mother twice.

Child 3 was a 4 year, 5 month old female, with WPPSI Verbal, Performance, and Full Scale IQs of 127, 126 and 129, respectively. Child 3 had no reported behavior problems.

Child 4 was a 4 year, 11 month old female. Her mother considered her to have expressed some unspecified behavioral excesses in the year following the mother's divorce. Child 4 was tested on the McCarthy Scale of Children's Abilities (MSCA). This developmental scale has six subscales including a Verbal skills scale (normative age group mean equal to 50, standard deviation equal to 10) and a General Cognitive scale (mean equal to 100, standard deviation equal to 16). Child 4 had a Verbal scale score of 59 and a General Cognitive scale score of 117.

Child 5 was a 3 year old male. His mother considered him highly non-compliant and to be unusually physically aggressive. No intellectual assessment was obtained for this child.

**Apparatus**

All dyads were run in a laboratory room approximately six metres square. A 1 by 2 metre viewing screen was situated in one wall. A mobile JVC color camera was used to track the children from behind the viewing screen. Two stationary JVC color cameras were situated behind barriers at one end of the room and were used to film the mothers and track the children in corners hidden from the mobile camera. Five microphones were set in the ceiling. No mothers or children noted the microphones, and only child 2 was noted to respond purposively to the camera lens more than once. Thus, with the possible exception of child 2 the observation apparati were relatively unobtrusive. Pictures from the cameras were superimposed onto a JVC color monitor through a Viscount 1127 special effects programmer, and were recorded on a JVC VHS recorder/player.

Communication from the experimenter to mothers was conducted from a TECT model WEM-16 wireless FM microphone to an FM radio with attached earphone. Mothers' voices were audible to the experimenter over the audio monitor. The experimenter and camera person communicated via Realistic walkie-talkies.

The wireless microphone communication system was tested prior to every session by the researcher emitting 10 commands to the cameraperson. The cameraperson transcribed the 10 commands with 100 percent accuracy on every test.

Within the laboratory were 3 tables, 1 chesterfield, 1 straight-backed chair, 1 bean bag chair, and approximately 20 toys. Toy stimuli are listed in Appendix 1. Toys were used as compliance objects because Forehand and Scarboro (1975) used toys in their laboratory study.

## Coding System

Five maternal verbal behaviors were of primary interest in this study. These behaviors were sub-classes of commands that were thought likely to have differential effects on compliance: Imperative, Indirect, Negative, Prohibitive, and Vague commands.

An Imperative command was any parental verbalization that directed the child to initiate a specific motor act, or set of acts, in an imperative grammatical form, and without any accompanying aversive elements. Examples of such commands are "Play with the red toy" and "Please pick up the blocks". The primary distinguishing characteristics of Imperative commands were that they specified a motor act, a specific object or direction of movement, and were verbalized in such a way that they could not be interpreted as suggestions.

Indirect commands were parental verbalizations that "suggested" the child initiate a motor act, or set of acts (e.g., "Wouldn't you like to play with the red toy?").

Negative commands were parental verbalizations that directed the child to either initiate, or terminate, an act. Associated with the command must have been one of the following elements; (a) a threat of aversive consequences, (b) an angry tone of voice or increased intensity of vocalization, (c) a verbal expression of disapproval of the child, or (d) an objective statement of urgency. To be associated with the command, these elements must have existed either within the sentence containing the command, or immediately adjacent to the command sentence. Therefore, instances of commands and threats that were separated by one or more sentences would not have been considered Negative commands. Examples of Negative commands would be "Pick up the red blocks or you'll get spanked", "You know I don't like it when you disobey. . . Now pick up the blocks".

Vague commands were parental directives that possessed insufficient specificity of action for the observer to determine what compliance criterion would be (e.g., "Be a good boy. . ., "Don't be such a bother").

A Prohibitive command was any parental directive, other than negative commands, that called for the child to inhibit some specific behavior.

Compliance was defined as the first visible sign that the child was initiating the required act. Where possible, this involved contact of an object.

Compliance Latency was defined as the time between the mother's command and the first physical sign that a child was initiating the specified act. However, this was a much more complex variable than that definition suggests. The following rules were used to make this variable more reliable. Timing of latency always began at the end of the sentence containing the mother's command. This was the case even when phrases irrelevant to the command existed in the sentence. When pauses existed between phrases and were connected with an "and" the observer considered whether sufficient time existed between the phrases for the child to understand the command (i.e., was he able to think about it or was he still in the process of attending to the mother's verbalizations?). If sufficient time existed observers began timing from the end of that phrase. If sufficient time did not exist, observers began timing from the end of the complete sentence. With respect to noting the initiation of compliance (i.e., the point at which observers stopped the stopwatch when timing latency), different rules existed for prohibitive versus directive commands.

For prohibitives, observers waited to stop the watch until the child had gone five seconds without emitting the prohibited act. A common occurrence was exact five second latencies, because the child would have either (a) not been performing the act when commanded, or (b) stopped immediately upon hearing the prohibitive. However, there were instances of the child emitting the prohibited behavior for some time after the command (either sporadically or continuously) in which case compliance latencies were greater than five seconds. Observers timed compliance to prohibitive commands by (a) starting the stopwatch at the end of the command sentence or phrase, (b) waiting for the child to cease emitting the prohibited activity, (c) counting to five at a once-per-second pace, (d) re-counting should the child re-initiate the prohibited act, and (e) stopping the stopwatch when the observer reached five seconds. Compliance latencies to prohibitive commands were not less than five seconds by definition.

For directive commands (i.e., commands telling the child to initiate some act), observers stopped the stopwatch either (a) when the child contacted the toy with which he was told to play or (b) in those circumstances when the child was already in contact with the compliance object, when the child initiated the specific act commanded in the command sentence (e.g., "turn the teddy bear on his tummy"). It was permissible to use either visual or auditory cues to determine contact with an object. For example, the child may have been instructed to play with the xylophone, but the xylophone was partially hidden from the camera so that when the child grasped it, the observer heard the contact prior to seeing contact. In this case, the observer stopped the stopwatch when (s)he heard the contact.

Compliance Duration was defined as the time from the first visible sign of the child's initiation of compliance to some point at which observers could reliably say (s)he had ceased emitting that behavior. Because (a) compliance initiation to prohibitive commands was partially defined by a timing rule in addition to response topography, and (b) durations of compliance to prohibitives frequently lasted an entire experimental session, observers did not code durations of compliance to prohibitive commands. For directive commands, however, duration was timed in the following way. First, timing began at the initiation of the criterion act. Second, whenever the child was not contacting the object or engaging in the criterion act, the observer began counting to five. If the child did not re-initiate the compliance act within five seconds, the stopwatch was stopped and a compliance duration was recorded.

Additional rules for coding the videotapes were as follows. Commands, Compliance Latencies, and Compliance Durations were coded in separate coding sessions. The maximum compliance latency to be coded was 120 seconds. All times were recorded in seconds (e.g., 70 seconds versus 1 minute, 10 seconds). Times were always rounded to the nearest second (upwards when the decimal was .50 or greater). When a command was repeated, observers timed and recorded the compliance latency for each instance of the command. It should be noted that all these latencies have the same end point but different beginning points.

Observers were trained for approximately 40 hours each in identifying different command classes and the occurrence of compliance. Feedback concerning their coding agreement with the researcher was given following each observation session during training. The first 20 hours of training involved the use of an electronic data collection device (Datamyte), but because of the extreme limitations of this device, observers were allowed to train and observe using paper data sheets and stopwatches.

**Independent Variable**

Command rates were computed as the sum of all Imperative, Indirect, Prohibitive, Negative, and Vague commands coded for each mother during baseline, and divided by the number of minutes during baseline. "Scripts" of Imperative and Indirect commands were constructed which directed the children to touch or play with in some specific manner toys included on the toy stimuli list in Appendix 1. Following computation of each mother's baseline command rate, the rate per minute was multipled by 30, the number of minutes planned for each AB phase, to obtain the total number of experimenter-supplied commands for that dyad during AB. A multiple of that product was then taken which would allow either one or two command repetitions per toy during each AB phase. For example a rate per minute of .50 would, when multiplied by 30, equal 15 commands in each AB phase. In this example, fifteen toys would then be randomly selected as stimuli toward which Indirect or Imperative commands would be issued. Increases or decreases in command rates during HD and LD were accomplished by doubling or halving the number of commands to play with each specific, randomly-selected toy. In those cases where only one repetition occurred for each toy during AB, toy stimuli were selected randomly for LD from the stimuli used in AB.

Although the procedure above appears unduly complex, it should be noted that changes in command rate were independent of toy stimuli. This prevents the criticism that differentially attractive toy stimuli were used in different phases.

Instructions to Mothers

During the first two baseline sessions all mothers were instructed (a) that they must keep the earpiece in their ear at all times that they were sitting in the loveseat, (b) that they must avoid leaving the loveseat unless absolutely necessary, (c) that they must read at least one of the magazines or the newspaper on the end table completely during the session, (d) that they must ensure that the child played with every toy in the room, and (e) that they must not compliment, praise, or hug the child as a consequence for any of his/her actions during the session. Mothers were prompted if their command rates were too low to "make sure (s)he plays with all the toys". Instructions during Arbitrary baseline and Intervention phases were identical to those during baseline with one exception. Mothers were told during these phases that they were to emit only those commands that the experimenter told them over the microphone , that they must emit those commands exactly as they heard them, and that they were not to emit any prohibitive statements to the child during the phases. Mothers were reminded to emit only those commands provided by the experimenter if they showed persistent patterns of either repeating commands, spontaneously emitting commands, or significantly altering the command quality from that provided by the experimenter.

**Procedure**

All videotaped sessions proceeded in the same fashion. After introductions and greetings in the reception room, the mother, child, researcher, and cameraperson entered the play room. Before the first session, the cameraperson introduced the child to each toy, giving each a standard name and prompting the child to play with each. During this interaction between the cameraperson and the child, the researcher instructed the mother in a different room. During subsequent sessions with each dyad, the cameraperson helped the child play with the toys while the mother was instructed in another room.

Following instructions, the mother and researcher returned to the playroom. The mother sat in the loveseat and placed the earphone in her ear. At this time, both the researcher and cameraperson left the room, closing the door, and returned to their respective positions. When the cameraperson began tracking the child with the mobile camera, the researcher began timing and recording the session.

During intervention sessions, the researcher prompted the mother according to the appropriate script. With the exception of the first mother, the researcher frequently reminded mothers to emit only those commands provided by the researcher, to emit those precisely as did the researcher, and to avoid repetition of commands.

# III. Results

## Inter-Observer Agreement and Serial Dependency

Prior to coding experimental data, observers were tested on a videotape of mother-child interaction. Percent agreement for both observers one and two with an experimenter-established key was 81 percent for the occurrence and form of maternal commands. For observer one, percent agreements for code categories were 94 percent for Imperatives, 73 percent for Indirects, 87 percent for Prohibitives, and 72 percent for Vague commands. Percent agreements for observer two were 93 percent for Imperatives, 95 percent for Indirects, 100 percent for Prohibitives, and 52 percent for Vague commands. No instances of Negative commands occurred in this videotape. Vague commands were the only commands for which either observer was at less than a reasonable level.

Pre-data collection agreement for compliance rates was also high. Observer one was at 95 percent agreement with an experimenter-established key on her first compliance coding session, and observer two was at 92 percent agreement on her first compliance coding session. Pearson correlation coefficients between observer one and the author for latency and duration were .88 and .81, respectively. For observer two, these coefficients were .85 and .81, respectively.

Agreement with the author was assessed once more for observer two and four more times for observer one. All assessments were performed for one hour baseline sessions.

Observer one was the criterion observer for Dyads 1, 3, 4, and 5. Observer two was the criterion observer for Dyad 2. Percent agreements for command classes were consistently above .70 for both observers and all classes of commands except for observer two on Vague commands. Observer two's percent agreement for Vague commands with the author assessed during coding of Dyad 2 was only .60. Compliance agreements were also consistently above 90 percent on all re-assessments for both observers. Pearson correlation coefficients for latency and duration between each observer and the author were consistently above .80. Therefore, problems of inaccuracy should not be considered sufficient to reduce the integrity of the data.

To assess the degree of serial dependency in the dependent measures, autocorrelations and partial autocorrelations for sequential lags 1 through 6 were computed for each dyad on each dependent measure during the baseline sessions. In general, the dependent measures were not autocorrelated, allowing one to analyze these data by conventional analysis of variance and regression techniques. Two exceptions to this involved the latency dependent measure. Both dyads 4 and 5 showed significant lag 1 autocorrelations and partial autocorrelations for compliance latency. Because of this serial dependency, and because of the small number of latency data points for dyad 4 during their first intervention session, it was decided to not analyze the latency data for these 2 dyads. Tables illustrating all computed autocorrelations and partial autocorrelations are included in the appendix.

**Baseline Data for all Dyads**

Baseline command rate and form, and percent compliance data are illustrated in Tables 2 and 3. As shown in Table 2, maternal command rate had a range from .52 to 1.08 commands per minute. The primary command forms were Imperative, Indirect, and Vague commands. No instances of Negative commands were noted in baseline.

Percent compliance for all children is noted in Table 3. The range of percent compliance was 59 to 67 percent summed across all command forms. More inter-dyad variation was appparent when data were differentiated by command type. For the sum of Imperative and Indirect commands, the range was 62 to 88 percent compliance. For Imperatives alone, the range was 69 to 100 percent, and for Indirects the range was 44 to 86 percent compliance. Notably, considerably more variation in compliance occurred to Indirect and Imperative commands than to Vague and Prohibitive commands. Thus, the choice of Indirect and Imperative commands as those commands to be manipulated and measured during intervention sessions appears to have been a wise choice. Also, it should be noted that for all dyads Imperative commands appeared to be superior to Indirect commands in obtaining compliance. These data appear to support the results of Schaffer and Crook (1980) rather than those of Lytton and Zwirner (1975) and Zegiob and Forehand (1978).

**Manipulation of Command Rate**

To check the independent variable manipulations, one way analyses of variance were computed for command rate across LD, AB, and HD phases for all dyads.

Means for each experimental phase, F values, and protection levels for all dyads are included in Table 4. All analyses of variance were significant. However, LD did not differ significantly from AB for dyads 2 and 5. While LD differed from AB for dyads 1 and 3 using relatively liberal comparisons (i.e., Tukey HSD and Tukey B), they did not differ significantly using the conservative Scheffe comparison.

It should be noted that dyad 4 was incomplete because of an equipment failure during one intervention session, thus no data exist for the LD phase.

These results suggest that (a) HD phases reliably differed from both AB and LD phases for all dyads, thus confirming that half of the independent variable manipulation, and (b) LD phases reliably differed from HD and AB phases for only dyads 1 and 3, and then only with a liberal multiple comparison. Visual inspection of Figures 1, 3, 5, 7, and 9 confirms the presence of increased command rates in HD and the absence of decreased command rates in LD. Therefore, differences between LD and AB on any of the dependent measures should not be expected. The considerable difficulties in controlling maternal command rates by instructions and prompting are illustrated in all the time-series of command rate.

**Test of the Command Rate Hypothesis**

Analysis of variance results for compliance rate and percent compliance are discussed below. Analysis of variance results for compliance latency and duration are presented in the appendix rather than in this section because these data were not sufficiently orderly. For each dependent measure a dyad X experimental phase table was constructed to illustrate means for each phase, and the associated F and protection level values from the analyses of variance. In several cases, heterogeneity of variance existed among phases. In such cases, either a reciprocal transformation (e.g., 1/latency) suggested by Edwards (1972) for transforming time measures, or a logarithmic transformation suggested by Edwards for data in which means and variances are proportional, was computed prior to the analysis of variance. Means reported in Table 4 are based on non-transformed raw data, whereas F and protection level values are based on analyses of transformed data when such transformations were appropriate.

Table 4 illustrates means for compliance rate per 5-minute interval for each experimental phase for each dyad. Only the analysis of variance for dyad 3 was significant ($F = 37.321$, $df = 2,33$, $p < .01$). Subsequent multiple comparisons showed only HD to differ from both AB and LD (ranges = 3.62, $p < .05$). The much greater mean of 13.167 compliances per 5-minute interval in HD is reflected in

Figure 5 by the startling increase in the mother's command rate during HD. As is evident in Figure 5, the child tracked the mother's commands reasonably closely despite this large increase in command rate. Therefore, despite reliable changes in command rate, changes in compliance rate could be reliably noted for only one dyad. This mother was notably the mother most difficult to keep under experimental control.

Mean percents compliance for each phase within each dyad are also illustrated in Table 4. These data show no effect of the command rate variable. Only one analysis of variance approached significance. Dyad 3 showed a trend ($F = 2.979$, $df = 2,33$, $p < .07$) toward HD having higher percent compliance than either LD or AB (Duncan's ranges = 2.88, 3.02, $P < .05$). This result is in the opposite direction to that suggested by the command rate hypothesis. This trend for dyad 3 is difficult to perceive in Figure 6, the time-series of percent compliance. Considerable variability exists within phases and an apparent decrease appears to occur over time in session four. This contradictory trend and the nonsignificant results for the other four dyads are not supportive of the command rate hypothesis.

The data collected from these five dyads failed to provide any consistent support for the command rate hypothesis on any of the compliance rate, percent compliance, compliance latency measures, or compliance duration. In fact, dyad 3 showed an increase in compliance rate during HD, and a trend toward a similar increase in percent compliance during HD. Although most authors in the compliance literature would not regard compliance rate as an appropriate measure having implications for the compliance phenomenon, the percent compliance result for dyad 3 is quite disruptive for the command rate hypothesis.

The major conclusion from the primary analyses is that the command rate hypothesis was not supported. Additional analyses were computed in an attempt to describe other phenomena apparent in the time series. These results are described below.

**Regression Analyses**

In an effort to ascertain what might have controlled one or more of these dependent measures, two "paradigm variables" were quantified and each 5-minute interval, compliance latency, and compliance duration was assigned a value for each of these paradigm variables. These variables were called (a) "maternal control", and (b) "time within session".

The maternal control variable refers to the procedural difference between baseline and intervention sessions. During baseline sessions the mothers were instructed to make their children play with all the toys. Thus, mothers were left to their own devices with minor restrictions. However, during intervention sessions mothers were prompted at constant intervals to emit specific commands to play with specific toys. Therefore, the degree of control nominally exerted by the mother over the timing, form, and content of commands was greater during the baseline sessions than during intervention sessions. Baseline data points were assigned a value of 1, indicating the "presence" of maternal control, and intervention session data points were assigned a value of 0, indicating the "absence" of maternal control. Thus, if compliance were to decrease during intervention sessions relative to baseline sessions, a positive relationship would be seen between maternal control and compliance. It should be noted that the baseline sessions were more similar to every day mother-child interaction while the intervention sessions were more similar to the artificial interactions created in Forehand and Scarboro (1975).

The "time-within-session" variable refers to the temporal placement of each 5-minute interval within a session. Intervals early in each session had small values (e.g., 1,2,3), while intervals late in each session had large values (e.g., 12,15,18). Because sessions 1 and 2 (baseline) were each 60 minutes in duration (with the exception of Dyad 1, whose session 1 was 75 minutes long), this variable took on values 1 through 12. Because sessions 3 and 4 were 90 minutes long (again, with the exception of Dyad 1, whose session 4 was only 75 minutes long), this variable took on values 1 through 18 for those sessions. Therefore, a negative relationship between time within session and percent compliance would indicate that percent compliance became lower later in each session.

Multiple regression analyses were then computed for each dependent measure across all sessions within each subject. All predictors were entered simultaneously, and any predictors with intercorrelations equal to or greater than .60 were considered to be colinear. The colinear predictor with the worst simple correlation with the dependent measure of interest was then not included in the regression for that dependent measure. Correlation matrices for all multiple regressions are listed in the appendix.

Tables 5 and 6 illustrate the (a) beta weights, (b) F values, (c) B coefficients, and (d) proportions of variance associated with each predictor for compliance rate and percent compliance, respectively. As well, the total explained variance for each multiple regression is included. Similar tables for the multiple regressions of compliance latency and duration can be found in the appendix.

**Multiple Regressions of Compliance Rate**

Table 5 illustrates the multiple regression results for compliance rates for all predictors within dyads. The first notable result is that all multiple regressions were significant with between 46 and 87 percent of compliance rate explained by the sum of all variables. Therefore, it appears that the regression approach resulted in increased explanation of these data.

Second, the mothers' actual command rates were significant predictors of compliance rate for all five dyads. Proportions of variance explained ranged from 11 percent for dyad 4 to 83 percent for dyad 3. The positive beta weights indicate a positive relationship between command rates and compliance rates, suggesting that the children "tracked" their mothers' commanding behavior. These results are reflected in Figures 1, 3, 5, 7, and 9 by fluctuations in compliance rate associated with similar changes in command rate.

A third result of some interest concerns the maternal control variable. Significant contributions to compliance rate are indicated by the multiple regression for dyads 2 through 5. The positive beta weights indicate that the presence of maternal control was associated with increased rates of compliance. However, the proportions of variance in compliance rate explained by maternal control are relatively small, ranging from 3 percent to 29 percent. Analysis of variance comparing dyad four's baseline mean of 1.542 compliances per 5-minute interval with the intervention sessions mean of .50 compliances per 5-minute interval was not significant ($F = 0.373$, $df = 1,40$, $p > .54$). Therefore, the case with the largest maternal control contribution to compliance rate was not significant using analysis of variance techniques. For this reason, the maternal control contribution to compliance rate is not considered important.

As well, a significant contribution to compliance rate by time within session was noted for dyad 1. However this explained only 5 percent of the variance in compliance rate.

Apparently, maternal command rate is the best predictor of child compliance rate for 4 of 5 dyads. This general relationship seems reasonable if one assumes this phenomenon to be a discrete trials phenomenon, and should be of little theoretical interest. These results tell us merely that children "attempt" to match their mothers' commanding behavior with their own motor acts, even under circumstances where those commands are emitted on an arbitrary temporal schedule. The positive effect of command rate on compliance rate merely confirms the traditional belief that some proportion of the child's compliance behavior is under the antecedent control of the mother's commanding behavior. Thus, compliance rate is not further analyzed.

**Multiple Regressions of Percent Compliance**

Similarly, a multiple regression with all non-colinear predictors entered simultaneously was computed for percent compliance within each dyad. The results of these multiple regressions are illustrated in Table 6. Actual command rate was excluded for dyads 1, and 3 through 5, because of colinearity with experimental phase values for dyads 3 through 5, and with maternal control for dyad 1. Multiple regressions for dyads 1, and 3 through 5 were significant. Total explained variance ranged from 14 percent for dyad 2 to 68 percent for dyad 4. The major predictor was maternal control for dyads 1, and 3 through 5. As well, time within session was a significant predictor for dyad 1.

Thus, the primary contributor to percent compliance in the 4 significant regressions over all 4 sessions appears to have been maternal control, and the second most important contributor appears to have been time within session.

**The Effect of Maternal Control**

Given the important contribution of maternal control in the regression analysis, an important question concerns whether a change in the level (mean) of percent compliance occurred as a function of this variable. This change in level could be tested in two ways. First, the mean percent compliance for baseline sessions could be compared to the mean for intervention sessions. Second, the mean for baseline sessions could be compared to the first 30 minutes of AB in session 3. These two different comparisons would tell one if a general change occurred, and if this change occurred as a immediate function of the switch to AB.

To answer the first question, analyses of variance were computed for percent compliance across the two values of maternal control for dyads 1, and 3 through 5. Dyad 2 was not included in this analysis because of the non-significant regression contribution by maternal control for that dyad. Results of these analyses are illustrated in Table 7. All these analyses were significant indicating that percent compliance was greater during baseline sessions than during intervention sessions. These differences are reflected in Figures 2, 6, 8, and 10 as reduced levels of the percent compliance variable in sessions 3 and 4. Therefore, it is apparent that something about the control procedures in effect during intervention sessions decreased percent compliance.

To answer the second question, analyses of variance were computed on percent compliance between baseline sessions and the first 30 minute AB phase. The results of these analyses are illustrated in Table 8. These results are not so clear as are the previous results. The baseline means for dyads 1 and 4 were significantly greater than the means for the first 30 minutes of AB, but no such significant difference was found for either dyad 3 or 5. However, it should be noted that these two non-significant differences were in the same direction as the significant differences. Therefore, the change in level of percent compliance associated with the intervention sessions occurred immediately for 2 dyads but not so immediately for another 2 dyads.

In summary, the major predictor of percent compliance was maternal control. To illustrate the strength of this variable for dyads 1, 3, 4, and 5, note that of the 50, 25, 69, and 25 percents of variance explained in the total regressions for those dyads, 32, 12, 44, and 22 percent were associated with maternal control. Thus, maternal control was the most powerful predictor for each of those four dyads, and accounted for over 50 percent of explained variance for 3 of those 4. For 4 dyads, reliable decreases in the level of percent compliance were observed between baseline and intervention sessions, and for 2 of these 4, the drop in percent compliance could be detected within the first 30 minutes of the first intervention session.

The question of import at this point is the mediation of the maternal control effect on percent compliance. One possibility might be the orientation or proximity of the child to the compliance object. As mentioned in the introduction, orientation of the child toward the compliance object was noted as controlling some degree of "contact compliance" by Schaffer and Crook (1980, p. 57). For example, 15-month-old and 24-month-old children increased their percentage of contact compliance from 06 to 40, and from 21 to 50 associated with orientation to the compliance object. A reasonable hypothesis is that some similar variable is important for older children as well. To explore the possibility, a crude system was devised for assessing the child's proximity to the compliance object.

Under the assumption that physical proximity was conceptually similar to orientation, a crude attempt was made to assess the proximity of child 1 to the compliance object at the time of the maternal command during both baseline and intervention sessions. Two levels of proximity were differentiated, less than or equal to 3 feet from the object, and more than 3 feet from the object. Commands occurring in 3 randomly selected 5-minute intervals during each session were coded according to the child's proximity to the compliance object. No agreement data were collected for this procedure because of its post-hoc and exploratory nature.

A chi square with 2 classes for 2 samples (baseline and intervention sessions) was then computed. The contingency table for this chi square is shown in Table 9. The chi square is not significant but the percentages suggest a trend for the child to be more proximal to the compliance object during baseline than during intervention sessions (chi square = 3.673, df = 1, $p < .10$). As well, a chi square was computed for the occurrence of compliance versus no compliance for the two classes of proximity. The contingency table for this chi square is illustrated in Table 10. Once again, this chi square of 3.505 (df = 1, $p < .10$) is not significant but the pattern of percentages indicate a trend for the child to be more compliant when he was proximal to the object.

Although these effects can not be said to be reliable, primarily because of a small sample size, they do suggest that some of the variance in percent compliance associated with maternal control may be a function of the proximity of the child to the compliance object. Obviously, other variables may also account for some of the variance associated with maternal control.

**The Effect of Time within Session**

Because time within sessions was an important predictor of percent compliance for dyad 1, it is important to know the relation of this variable to maternal control. To answer this question for dyad 1, multiple regressions with non-colinear predictor variables were computed for percent compliance within baseline, and within sessions 3 and 4. Thus, within baseline, only actual command rate and time within session were used as predictors because maternal control and command rate phase had only one value each. Within intervention sessions, only actual command rate and time within session were entered because command rate phase was colinear with actual command rate, and maternal control had only one value.

The multiple regression of percent compliance within baseline was not significant (multiple $r$ = .215, $F$ = 0.487, $df$ = 2,20, $p$ > .62), while the multiple regression within intervention sessions was significant (multiple $r$ = .609, $F$ = 8.821, $df$ = 2,30, $p$ < .01). R squared change associated with time within session was .012 for baseline (Beta = -.116, $df$ = 22, $F$ = 0.283, NS) and .366 for intervention sessions (Beta = -.599, $df$ = 32, $F$ = 16.861, $p$ < .01).

To test whether time within session was a reliably better predictor in intervention than in baseline, a t test for slopes was computed. This test was performed on the beta weights associated with time within session for the two regressions. A correlated t test with the correlation term dropped to 0 because of the absence of significant autocorrelation was computed and gave a t of -2.59 ($df$ = 1,58, $p$ < .025). Therefore, it is concluded that percent compliance decreases over time during intervention sessions more than during baseline as indicated by Figure 2. Thus, something changed between baseline and intervention sessions for Dyad one, resulting in a change in both level and slope for percent compliance.

## IV. Discussion

Three major issues are discussed below. First, the command rate hypothesis is rejected. Second, an alternative explanation for both the present results and for the results of Forehand and Scarboro (1975) is explored. Third, the implications of this study for (a) a model of child compliance, (b) clinical intervention in compliance problems, and (c) the methodology of child compliance research are discussed.

### Rejection of the Command Rate Hypothesis

The major hypothesis of this study was that different rates of maternal commands over 30 minute phases would result in differential compliance, as measured by any one of the percent, compliance latency, or duration measures. To confirm this hypothesis, at least two events were required. First, command rates must have reliably differed among experimental phases. Second, the compliance measures must have been reliably different among phases. Additionally, such differences must have been large enough to seem clinically meaningful. Thus, they must either have been visually striking when plotted in a time series or the differences between means must have been quite large.

The results speak well for themselves. Not only was there a general absence of statistically reliable confirmation of the command rate hypothesis, but no trends associated with command rate were suggested by visual inspection of the time series of percent compliance.

Therefore, the command rate hypothesis is rejected. However, possible criticisms of this experiment should be discussed. First, the experimental manipulation of LD did not succeed reliably for 2 of the dyads, was not attempted for a third, and succeeded to only a trivial extent for 2 other dyads. This is most definitely a flaw in the experiment. However, it is a flaw that does not affect the inferences one would draw from compliance differences, or the absence of differences, between HD and AB. Three levels of command rate were planned as a first approximation to demonstrating linearity of the command rate-compliance relationship. However, only two levels are necessary to show a relationship without specifying its shape. Thus, the failure of LD by itself does not serve as an obstacle to rejection of the command rate hypothesis.

A number of internal validity issues were discussed in the introduction. The confounding of independent variables so common in the naturalistic observation and clinical efficacy studies was eliminated here by experimental control. The only exceptions to this were the orientation of the child, and the possible change in consequences for compliance. Both variables are discussed elsewhere. Otherwise, the present study was better controlled than previous compliance research.

The reader should note that autocorrelation among data points was ruled out by assessing the general absence of such autocorrelation prior to other analyses. Additionally, appropriate transformations were made to the dependent measures in those cases where heterogeneity of variance was reliably indicated. As well, scattergrams of the relationships between predictors and dependent measures were studied prior to the regression analysis to detect possible non-linearity among any relationships. No instances of non-linearity were found.

Another general reservation concerns the external validity of this experiment. This is based on two issues. First, child compliance has predominantly been of concern in "natural" settings in which a process different from that of the laboratory may operate. Therefore, it may be suggested that commands to "pick up your toys" summate differently than commands to "play with the xylophone". Additionally, physical differences between the laboratory and the living room may influence compliance differentially. However, these differences are speculative until it can be demonstrated empirically that a setting difference influences this class of phenomena.

One data-based criticism might concern the reactivity of the child to the observation procedures. Two camera lenses and the mirror side of the viewing window were visible to mothers and children. The reactivity criticism rests on one of two empirical demonstrations; either that (a) children in general comply differently to the same commands at home than in the laboratory, or (b) the children in this study changed their behavior in the setting as a function of the observation apparati. The former data are not available. The latter can only be addressed in terms of the children's orientation toward the observation apparati. As mentioned in the method, no mothers or children noted the microphones. Two of the 5 children were never observed to visually attend to, or touch, either the lenses or the mirror. Child 4 watched her reflection in the mirror for a short time during 1 session, but never regarded the mirror itself with any apparent curiousity. Child 1 touched a camera lens once in baseline, but ceased to attend to it after his mother prohibited him from touching it. Child 2 was the only child who showed signs of reactivity. She noted the camera lenses and several times fixed her gaze on a camera lens. Reactivity may explain the absence of any effect for Child 2, or the apparent decrease in variability during session 4. It is also notable that this was the oldest child in the study and may suggest age limitations in the use of laboratory observation procedures because of reactivity.

A second external validity question concerns the construct of command rate. Within this study, natural command rate was assessed as a sum of several classes of commands. Because of the difficulties inherent in coding compliance to Vague and Prohibitive commands, such commands were not included in programming command rates during the experimental sessions. The possibility exists that variations in command rate in "natural" settings are a function primarily of changing rates of Vague and Prohibitive commands. Therefore, the experimental controls may have eliminated the source of the effect in the natural environment. However, if this is so, the effect would be mis-named as a command rate effect, and would be better named a command form effect.

On the other hand, the change from commands in general to indirect and imperative commands may have increased the total directiveness of the setting because commands directing activity may have greater weights in determining a specific value of the command rate independent variable than commands prohibiting activity. Should this have been the case, a ceiling on percent compliance as a function of the greater directiveness would have to be hypothesized to explain the lack of a command rate effect. However, the great within phase variability, which is generally undesirable for reasons of statistical power, in this case precludes explanation of null effects due to ceiling effects. High percentages of compliance were, in fact, present in HD phases, meaning that great variability was possible and that no arbitrary ceiling existed for compliance.

Yet another criticism of this study might be the absence of any measures of consequences for compliance and the absence of compliance. The critical reader might suggest that mothers ceased reinforcing their children's compliance during the intervention sessions. The only control for this possibility was an instruction given to all mothers not to praise, reward, or criticize the child for his/her response to any commands or requests. All mothers agreed to try this but all expressed reservations about their ability to avoid such consequation. Given the mothers' general difficulties in following instructions, one could question the efficacy of this specific instruction. However, differential consequence explanations are considered inappropriate because percent compliance decreased abruptly in two dyads and did not show the extinction burst characteristic of extinction of an operant behavior in any of the 4 dyads. For a critic to assert that this effect is operant extinction, it would be necessary to ignore the traditional shape of such extinction curves. If anything, the curve for dyad one's percent compliance resembles Pavlovian extinction because of its continuous decrease over time within sessions.

The discussion above may be summarized by saying that whatever faults resided in the experiment, ample opportunity existed for a command rate phenomenon to occur. The absence of a confirmation of the hypothesis in any of the five dyads leads to the rejection of the command rate hypothesis as explaining any important variation in compliance.

**An Alternative Hypothesis**

The present data suggest an explanation of the Forehand and Scarboro (1975) results different than the explanation those authors offered. Remember that Forehand and Scarboro did not manipulate command rate. Rather, they instructed the mothers via a "bug in the ear" device to emit specific commands to the child at specific temporal intervals. This manipulation was conceptually identical to the AB phases in the present study. The only major differences were that (a) the present study attempted to match the AB command rates with the mothers' free operant rates of commands, while Forehand and Scarboro used the same rate for all dyads, (b) their standard command rate was considerably lower than the programmed rates in the present study (.33 commands per minute versus a between-subjects range of .52 to 1.08 commands per minute), and (c) whereas the present results section mentions considerable difficulties in controlling maternal command rate, Forehand and Scarboro reported no such difficulties.

Forehand and Scarboro (1975) collapsed their interval-sampled oppositional behavior estimates across subjects and each of 2 sets of 6 maternal commands. Oppositional behavior (defined as failure to be engaged in the previously directed activity during a sampling interval) was more frequent for the second 6 than for the first 6 commands during the 30 seconds immediately following commands. Thus, those authors concluded that their subjects deteriorated across time because of the number of commands issued by their mothers. However, such a phenomenon can not be seen in baseline sessions for any of the dyads in the present study, even though the free operant command rates in the present study were from 60 to 300 percent higher than in Forehand and Scarboro's study. On the other hand, a reliable downward trend over time was noted during sessions 3 and 4 for dyad 1, and visually striking but unreliable downward trends were noted in the same sessions for dyads 3 and 4.

Therefore, it appears that a downward trend in percent compliance over time within a session is an effect peculiar to controlled circumstances in which mothers are prompted to issue commands on a temporal schedule, and does not reflect more "natural" circumstances. In fact, the most powerful variable operating on percent compliance in the present study was maternal control.

The exploratory data concerning child proximity reported above lead to the suggestion that the maternal control variable was mediated to some as yet unknown extent by the child's proximity to the compliance object. The dramatic amounts of variance associated with maternal control and the suggestive post-hoc data may even suggest that the proximity variable is one of the most crucial independent variables in the child compliance phenomenon.

If the child's proximity to the compliance object can eventually be shown more reliably to mediate some part of the variance associated here with maternal control an interesting possibility arises. Throughout the compliance literature, authors have discussed a variety of parental behaviors as independent variables controlling some amounts of variance in the child's compliance behavior. No one has yet seriously discussed the possibility that a significant proportion of compliance variation is controlled by the child's influence on the mother. Thus, in natural circumstances, a mother who obtains high rates of compliance from her child may, in fact, be more judicious concerning the timing of her command than concerning the rate of her commands. Such a mother may be superior to a mother with a less compliant child not in what she does to control her child but in how she responds to her child. For example, she may be more sensitive to (a) the idiosyncratic cues that specific child emits that indicate he would be amenable to playing with a specific toy, or (b) the proximity or orientation of the child with respect to a toy or task object. Bell and Harper (1977) suggested less specific child effects on parenting behavior under the labels of "upper limit" and "lower limit" controls. Those authors considered this to differentiate children according to activity levels but a more specific case could be made for children's motor behavior expressing some cue value for parents, controlling the nature of the commanding activity, and giving the elusion that the parent is directing the child's behavior. However, the compliance rate data are useful because of the demonstrated tendency of the children to "track" their mothers' commanding behavior irrespective of the timing of the mothers' commands. Thus, at least some portion of the compliance interaction variance is controlled by parental behaviors.

However, any explanation of the downward trend in percent compliance must be more complex than what has presented above. It appears that time within the experimental session may interact with the maternal control variable. Because no objective data are immediately available, explanations for this possible interaction must be considered speculatory. Casual observation of the children during all their sessions suggested that the intervention sessions were highly aversive to the children and were characterized by more whining, crying, demanding, and requests to go to the washroom than were the baseline sessions. Whether children actually did increase their whining, crying, and related escape behaviors between sessions, and whether this change in the distribution of behavior was a function of the change in the extent to which the mothers' commands were controlled by the children's motor behavior is a matter for further research. Why such a hypothetical process would change over time is for the moment open to speculation. Although the mother-child interactions are permanently recorded, development of a coding system to tap all these classes of behavior would be quite time consuming. Therefore, no more will be said on this issue.

I conclude that a more reasonable explanation of Forehand and Scarboro's effect is that their manipulation consisted of weakening the relationship between the child's prior proximity to the compliance object and the content of the mother's command. Thus, lowered compliance in general might not be a function of children's predispositions to behave, but may instead be a function of the mothers' failure to match their commands to the child's ongoing behavior. Such an hypothesis makes the child compliance literature amenable to child-effects analyses (e.g., Bell & Harper, 1977).

**General Implications**

These results are important for Koch's (Note 6) descriptive model of child compliance because they suggest that command rate is not a significant independent variable for explaining intra-individual variation. Thus, they call for a revision of the model, and question the generalizability of many of the observational studies. Additionally, they demand an increased emphasis on such variables as child orientation and proximity. Because of the present failure to confirm the command rate hypothesis, results other than those of Forehand and Scarboro may be re-interpreted. Mash and Terdal (1973), Hanf and Kling (Note 3), and Forehand and King (1977), using treatment packages that involved both decreases in command rate and differential reinforcement of compliance, found positive effects on compliance. The present results suggest that their successes were primarily functions of differential reinforcement of compliance, rather than of decreases in command rate.

From a clinical perspective, the present data are instructive because of the possibility of child effects in cueing the parents' commanding behavior. If parental success in "natural" compliance interactions is partially dependent on the judicious timing of commands, then those parents whose children are seemingly non-compliant may be deficient in recognizing whether the child will comply at any given moment. Thus, the problem might be re-conceptualized as a parental problem independent of any child pathology: This would have effects on attempts to include non-compliance as part of a child behavior syndrome such as hyperactivity (e.g., Barkley & Cunningham, 1979). Although treatment focus would not change greatly because child behavior therapy generally proceeds through changes in parental behavior (e.g., Bernal, Klinnert, & Schultz, 1980), the treatment of choice given the present data would be to change the parents' timing of commands, rather than the rate of commands.

Additionally, the present data may have implications for assessment of problems in child compliance. To the extent that parental deficiencies in the timing of commands contribute to problems in child compliance, one could use structured situation tests to assess parental command timing adequacy. For example, one could show parents videotapes of children playing with toys or misbehaving, and have the parent respond as to when and how they would command the child to change their behavior. Real time recording of the parental responses would allow one to assess whether parents timed their commanding behavior effectively. However, it should be noted that such suggestions assume minimal contributions to the parents' possible deficiencies in commanding by idiosyncratic characteristics of their child.

Beyond such theoretical and clinical concerns, this study has considerable methodological implications for the study of child compliance. First, the difficulties in controlling the mothers' command rates suggest that future laboratory research will have to expend more resources and time in ensuring better control of the mothers. Although this may not be entirely possible because of the spectre of child effects, pre-experimental training of the mothers in definitions of different types of commands and practice in correctly emitting experimenter-supplied commands would greatly improve laboratory experiments.

Second, a more portable communications system such as a "bug in the ear" device is necessary to permit more mobility for the mothers. Using such a device would allow the mothers to move about the room in response to child behavior and would allow the study of non-verbal commanding behavior such as physical prompts or modelling. This would also allow greater generalizability to natural situations because mothers in such natural settings are likely not seated for 60 or 90 minute periods as they were in the present study.

Third, a more efficient behavioral observation system must be devised. Because latency and duration measures did not prove themselves to be very sensitive to changes in these interactions, there appears to be no need to use the tedious timing procedures devised for this study. What is needed is a more complex system that differentiates interactions according to the orientation and proximity of individuals, physical and verbal directives of the mother, verbal and physical responses of the child, and any parental consequences for those child responses. Unfortunately, the development of such a coding system will be an entire research program in itself, but it appears to be necessary to more adequately study the phenomenon. The absence of generally representative observation systems for studying compliance phenomena has been discussed in detail by Koch (Note 5).

Fourth, two aspects of the data suggest that the percent compliance measure is the best measure for describing variation within subjects in this phenomenon. The general absence of autocorrelation among data points seems to indicate that each compliance sequence occurs by itself and is not predicted by previous data points. Actually, this can be described as the error associated with one observation not being predicted by error associated with another. Either way this idea is expressed it suggests the same conclusion, that compliance sequences, with the exception of repetitions, are empirically unrelated events. Therefore, one's concern should be with the "match" between the parental command and the child compliance for any one sequence, rather than some rate over time. Also, the greater sensitivity of the percent compliance measure to the maternal control and time within session variables in this study suggests that it more accurately reflects significant changes in the parent-child interaction.

In conclusion, the command rate hypothesis was not supported, and results were found that suggested Forehand and Scarboro's (1975) results to be a function of the disjunction between the parents' commands and the proximity of the child to the compliance object. Additionally, several methodological problems were discussed and possible solutions were suggested.

## Reference Notes


1. Budd, K. S., Baer, D. M., & Green, D. R. An analysis of multiple misplaced social contingencies in the mother of a preschool child. Presented at the American Psychological Association meetings, New Orleans, 1974.
2. Forehand, R., Gardner, H. L., & Roberts, M. W. Maternal response to child compliance and noncompliance: Some normative data, Unpublished manuscript, University of Georgia, 1976. Advancement of Behavior Therapy meetings, San Francisco, 1979.
3. Hanf, C. and Kling, J. Facilitating parent-child interaction: A two-stage training model. Unpublished manuscript, University of Oregon Medical School, 1973.
4. Johansson, S. Compliance and noncompliance in young children. Unpublished doctoral dissertation, University of Oregon, 1971.
5. Koch, W. J. The nature and assessment of child compliance. Under review by Advances in Behaviour Therapy and Research, 1981a.
6. Koch, W. J. An ethological model of child compliance. Presented at the Association for Behavior Analysis, Milwaukee, 1981b.
7. Piat, J., Sadler, O., & Vickers, M. Command compliance rates in preschool settings. Presented at Southeastern Psychological Association meetings, 1973.
8. Taplin, P. S. & Reid, J. B. Changes in parent

consequation as a function of family intervention. Unpublished manuscript, Oregon Research Institute, 1975.

## References

Barkley, R. A. & Cunningham, C. E. The parent-child interaction of hyperactive children and their modification by stimulant drugs. In R. Knights & D. Bakker (Eds.), *Rehabilitation, Treatment, and Management of Learning Disabilities*. Baltimore, Maryland: University Park Press, 1979.

Bell, R. Q. & Harper, L. C. *Child Effects on Adults*. Hillsdale, New Jersey: Lawrence Erlbaum, 1977.

Bernal, M. E., Klinnert, M. D., & Scultz, L. A. Outcome evaluation of behavioral parent training and client-centered parent counseling for children with conduct problems. *Journal of Applied Behavior Analysis*, 1980, *13*, 677-691.

Boneau, C. A. The effect of violations of assumptions underlying the t test. *Psychological Bulletin*, 1960, *57*, 49-64.

Cook, T. D. & Campbell, D. T. *Quasi-Experimentation: Design and analysis issues for field settings*. Chigago: Rand-McNally, 1979.

Cowan, P. A., Hoddinott, B. A., & Wright, B. A. Compliance and resistance in the conditioning of autistic children. *Child Development*, 1965, *36*, 913-923.

Delfini, C. F., Bernal, M. E., & Rosen, P. M. Comparison of deviant and normal boys in home settings. In E. J. Mash, L. A. Hamerlynck, & L. C. Handy (Eds.), *Behavior Modification and Families*. New York: Brunner/Mazel, 1976.

Des Lauriers, A. M. & Carlson, C. F. *Your Child is Asleep*. Homewood, Illinois: The Dorsey Press, 1969.

Doleys, D. M., Cartelli, L. M., & Doster, J. Comparison of patterns of mother-child interaction. *Journal of Learning Disabilities*, 1976, *9*, 371-375.

Edwards, A. L. *Experimental design in psychological research*, New York: Holt, Rinehart, & Winston, 1972.

Forehand, R. Child noncompliance to parental requests: Behavioral analysis and treatment. In M. Hersen, R. M. Eisler, & P. M. Miller (Eds.), *Progress in Behavior Modification: Volume 5*, New York: Academic Press, 1977.

Forehand, R. & King, H. E. Noncompliant children: Effects of parent training on behavior and attitude change. *Behavior Modification*, 1977, *1*, 93-108.

Forehand, R., King, H. E., Peed, S., & Yoder, P. Mother-child interactions: Comparisons of a noncompliant clinic group and a non-clinic group. *Behaviour Research and Therapy*, 1975, *13*, 79-84.

Forehand, R. & Scarboro, M. E. An analysis of children's oppositional behavior. *Journal of Abnormal Child Psychology*, 1975, *3*, 27-31.

Glass, G. V., Willson, V. L., & Gottman, J. M. *Design and Analysis of Time-Series Experiments*. Boulder, Colorado: Colorado Associated University Press, 1975.

Green, K. D., Forehand, R., & McMahon, R. J. Parental manipulation of compliance and noncompliance in normal and deviant children. *Behavior Modification*, 1979, *3*, 245-266.

Hersen, M. & Barlow, D. H. *Single-case Experimental Designs: Strategies for Studying Behavior Change*. New York: Pergamon Press, 1976.

Hollenbeck, A. R. Problems of reliability in observational research. In G. P. Sackett (Ed.), *Observing Behavior: Volume 2, Data Collection and analysis methods*. Baltimore, Maryland: University Park Press, 1978.

Hughes, H. M. & Haynes, S. N. Structured laboratory observation in the behavioral assessment of parent-child interactions: A methodological critique. *Behavior Therapy*, 1978, *9*, 428-447.

Johnson, S. M. & Lobitz, G. K. The personal and marital adjustment of parents as related to observed child deviance and parenting behaviors. *Journal of Abnormal Child Psychology*, 1974, *2*, 193-207.

Johnson, S. M., Wahl, G., Martin, S., & Johansson, S. How deviant is the normal child? A behavioral analysis of the preschool child and his family. In R. D. Rubin, J. P. Brady, & J. D. Henderson (Eds.), *Advances in Behavior Therapy: Volume 4*. New York Academic Press, 1973.

Kratochwill, T. R. *Single subject research:Strategies for evaluating change*. New York: Academic Press, 1978.

Lytton, H. & Zwirner, W. Compliance and its controlling stimuli observed in a natural setting. *Developmental Psychology*, 1975, *11*, 769-779.

Mash, E. J. & Terdal, L. Modification of mother-child interactions: Playing with children. *Mental Retardation*, 1973, *11*, 44-49.

Patterson, G. R. & Reid, J. B. Intervention for families of aggressive boys: A replication study. *Behaviour Research and Therapy*, 1973, *11*, 383-394.

Reid, J. B. (Ed.), *A Social Learning Approach to Family Intervention: Volume 2, Observation in Home Settings*. Eugene, Oregon: Castalia Publishing Company, 1978.

Roberts, M. W., McMahon, R. J., Forehand, R., & Humphreys, L. The effect of parental instruction-giving on child compliance. *Behavior Therapy*, 1978, *9*, 793-798.

Schaffer, H, R. & Crook, C. K. Child compliance and maternal control techniques. *Developmental Psychology*, 1980, *16*, 54-61.

Tavormina, J. B., Henggeler, S. S., & Gayton, W. F. Age trends in parental assessments of behavior problems of their retarded children. *Mental Retardation*, 1976, *14*, 38-39.

Wahler, R. G. Oppositional children: A quest for parental reinforcement control. *Journal of Applied Behavior Analysis*, 1969, *2*, 159-170.

Weinrott, M. R. Improving the validity of global ratings. *Journal of Abnormal Child Psychology*, 1977, 5, 187-197.

Zegiob, L. E. & Forehand, R. Parent-child interactions:

Observer effects and social class differences. *Behavior Therapy*, 1978, *9*, 118-123.

Table 1

Compliance Interaction Sequence

and

Probable Controlling Variables

| Variables Antecedent to the Sequence | Command - - - - - - | Temporal Interval - - - | Child Response |
|---|---|---|---|
| 1. Orientation toward the Compliance Object | 1. Aversiveness of Command | 1. Verbal or Physical Intrusion | 1. Compliance |
| 2. Parental Command Rate | 2. Specificity of Command | 2. Post-Command Interval Length | 2. Failure to Comply |
| | 3. Imperative vs. Suggestive vs. Interrogative Form of Command | | |
| | 4. Prohibitive vs. Directive Type of Command | | |

Table 2

Dyad's command rates and command type distributors during baseline

| Dyads | Command Type | | | | | | |
|---|---|---|---|---|---|---|---|
| | Vague | Negative | Prohibitive | Indirect | Imperative | Sum | Rate Per Minute |
| 1 | 48 | 0 | 21 | 33 | 45 | 147 | 1.08 |
| 2 | 13 | 0 | 6 | 6 | 37 | 62 | 0.52 |
| 3 | 20 | 0 | 21 | 25 | 57 | 124 | 1.03 |
| 4 | 22 | 0 | 5 | 28 | 13 | 68 | 0.57 |
| 5 | 4 | 0 | 2 | 45 | 18 | 69 | 0.59 |

Table 3

Dyad's percent compliance to different

command type during baseline

| Dyads | Command Type | | | | | | |
|---|---|---|---|---|---|---|---|
| | Vague | Negative | Prohibitive | Indirect | Imperative | Sum of Indirects and Imperatives | Sum of all Commands |
| 1 | 00 | - | 90 | 84 | 91 | 88 | 59 |
| 2 | 00 | - | 100 | 67 | 81 | 79 | 64 |
| 3 | 00 | - | 100 | 68 | 80 | 75 | 67 |
| 4 | 00 | - | 100 | 86 | 100 | 88 | 62 |
| 5 | 00 | - | 100 | 44 | 69 | 62 | 59 |

Table 4

Mean command rates, compliance rates per 5-minute interval, and percent compliance for all dyads in experimental phases LD, AB, and HD

| Dyads | | Experimental Phases | | | ANOVA | |
|---|---|---|---|---|---|---|
| | | LD | AB | HD | F | α |
| 1 | Command Rate | 5.667 | 7.857 | 12.500 | 21.986 | .01 |
| | Compliance Rate | 3.000 | 4.095 | 5.333 | 1.246 | .30 |
| | Percent Compliance | 48.333 | 50.714 | 42.000 | 0.266 | .77 |
| 2 | Command Rate | 3.000 | 3.167 | 6.167 | 11.102 | .01 |
| | Compliance Rate | 2.000 | 1.583 | 2.667 | 1.524 | .23 |
| | Percent Compliance | 50.833 | 50.917 | 45.333 | 0.079 | .92 |
| 3 | Command Rate | 4.167 | 6.625 | 16.833 | 60.040 | .01 |
| | Compliance Rate | 1.667 | 3.417 | 13.167 | 37.321 | .01 |
| | Percent Compliance | 40.333 | 48.917 | 77.500 | 2.977 | .07 |
| 4 | Command Rate | not collected | 3.083 | 6.667 | 25.611 | .01 |
| | Compliance Rate | not collected | 0.500 | 0.500 | 0.000 | 1.00 |
| | Percent Compliance | not collected | 15.833 | 9.500 | 0.260 | .62 |
| 5 | Command Rate | 3.667 | 5.167 | 8.667 | 15.217 | .01 |
| | Compliance Rate | 0.833 | 1.375 | 2.167 | 1.275 | .30 |
| | Percent Compliance | 19.167 | 23.500 | 21.000 | 0.080 | .93 |

Table 5

Multiple regression results for compliance rate across baseline and intervention sessions for each dyad

| Dyads | | Maternal Control | Time Within Session | Actual Command Rate | Experimental Phase | Explained |
|---|---|---|---|---|---|---|
| 1 | Beta | NI | -0.311 | 0.844 | -0.182 | |
| | F | NI | 14.525* | 79.479* | 3.741 | 32.127* |
| | B | NI | -0.174 | 0.573 | -0.667 | |
| | $r^2$ | NI | .051 | .522 | .060 | .633 |
| 2 | Beta | 0.231 | -0.138 | 1.013 | -0.257 | |
| | F | 8.179* | 3.413 | 137.505* | 10.723* | 36.209* |
| | B | 0.774 | -0.047 | 0.775 | -0.603 | |
| | $r^2$ | .041 | .001 | .662 | .021 | .725 |
| 3 | Beta | 0.225 | -0.086 | 1.030 | NI | |
| | F | 15.247* | 2.922 | 343.545* | NI | 125.263* |
| | B | 1.772 | -0.070 | 0.912 | NI | |
| | $r^2$ | .035 | .000 | .835 | NI | .870 |
| 4 | Beta | 0.677 | -0.050 | 0.688 | NI | |
| | F | 20.755* | 0.155 | 24.015* | NI | 11.173* |
| | B | 2.106 | -0.017 | 0.434 | NI | |
| | $r^2$ | .290 | .061 | .118 | NI | .469 |
| 5 | Beta | 0.562 | -0.062 | 1.041 | -0.302 | |
| | F | 26.603* | 0.469 | 74.027* | 8.644* | 19.808* |
| | B | 2.059 | -0.023 | 0.713 | -0.773 | |
| | $r^2$ | .198 | .010 | .355 | .027 | .590 |

NI indicates that a specific predictor was not included in the regression because it was colinear with a more predictive variable.

* p < 01

Table 6

Multiple regression results for percent compliance across baseline and intervention sessions for each dyad

| Dyads | | Predictor Variables | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | Maternal Control | Time Within Session | Actual Command Rate | Experimental Phase | Explained |
| 1 | Beta | 0.575 | -0.338 | NI | -0.055 | |
| | F | 33.427* | 11.693* | NI | 0.310 | 17.332* |
| | B | 36.508 | -2.324 | NI | -2.376 | |
| | $r^2$ | .321 | .163 | NI | .015 | .499 |
| 2 | Beta | 0.258 | -0.211 | 0.216 | -0.133 | |
| | F | 3.226 | 2.298 | 1.940 | 0.818 | 2.034 |
| | B | 19.802 | -1.563 | 3.859 | -6.644 | |
| | $r^2$ | .055 | .065 | .016 | .004 | .140 |
| 3 | Beta | 0.360 | -0.171 | NI | 0.293 | |
| | F | 8.627* | 1.982 | NI | 6.249* | 6.191* |
| | B | 22.906 | -1.115 | NI | 12.914 | |
| | $r^2$ | .117 | .070 | NI | .065 | .252 |
| 4 | Beta | 0.764 | -0.110 | NI | -0.053 | |
| | F | 41.932* | 1.061 | NI | 0.215 | 21.658* |
| | B | 69.859 | -1.044 | NI | -3.167 | |
| | $r^2$ | .442 | .112 | NI | .131 | .684 |
| 5 | Beta | 0.484 | -0.051 | NI | 0.002 | |
| | F | 14.746* | 0.165 | NI | 0.000 | 5.639* |
| | B | 34.276 | -0.362 | NI | 0.977 | |
| | $r^2$ | .217 | .030 | NI | .002 | .249 |

NI indicates that a specific predictor was not included in the regression because it was colinear with a more predictive variable.

* $p < .01$

Table 7

Analysis of variance results for the maternal control contribution to percent compliance, comparing baseline sessions to intervention sessions

| Dyads | Means | | F | df | α |
|---|---|---|---|---|---|
| | Baseline | Intervention Sessions | | | |
| 1 | 88 | 48 | 33.617 | 1,54 | .01 |
| 3 | 76 | 52 | 9.323 | 1,57 | .01 |
| 4 | 88 | 14 | 65.172 | 1,32 | .01 |
| 5 | 58 | 32 | 14.429 | 1,20 | .01 |

Table 8

Analysis of variance results for the maternal control contribution to percent compliance, comparing baseline session to the first 30 minute AB phase

Dyads

| | Baseline | AB | F | df | α |
|---|---|---|---|---|---|
| 1 | 88 | 62 | 5.767 | 1,27 | .03 |
| 3 | 76 | 70 | 0.272 | 1,27 | .60 |
| 4 | 88 | 32 | 14.429 | 1,20 | .01 |
| 5 | 58 | 36 | 1.523 | 1,23 | .22 |

Table 9

The percentages of baseline and intervention commands during which child one was either close to or distant from the compliance object.

| | Baseline Sessions | Intervention Sessions | |
|---|---|---|---|
| Close | 63% (10) | 25% (13) | 23 |
| Distant | 37% (6) | 75% (38) | 44 |
| | 100% (16) | 100% (51) | 67 |

Table 10

The percentages of close and distant proximity

by child one

accompanied by complianee or the absence of compliance.

| | Close | Distant | |
|---|---|---|---|
| Compliance | 78% (18) | 55% (24) | 42 |
| No Compliance | 22% (5) | 45% (20) | 25 |
| | 100% (23) | 100% (44) | 67 |

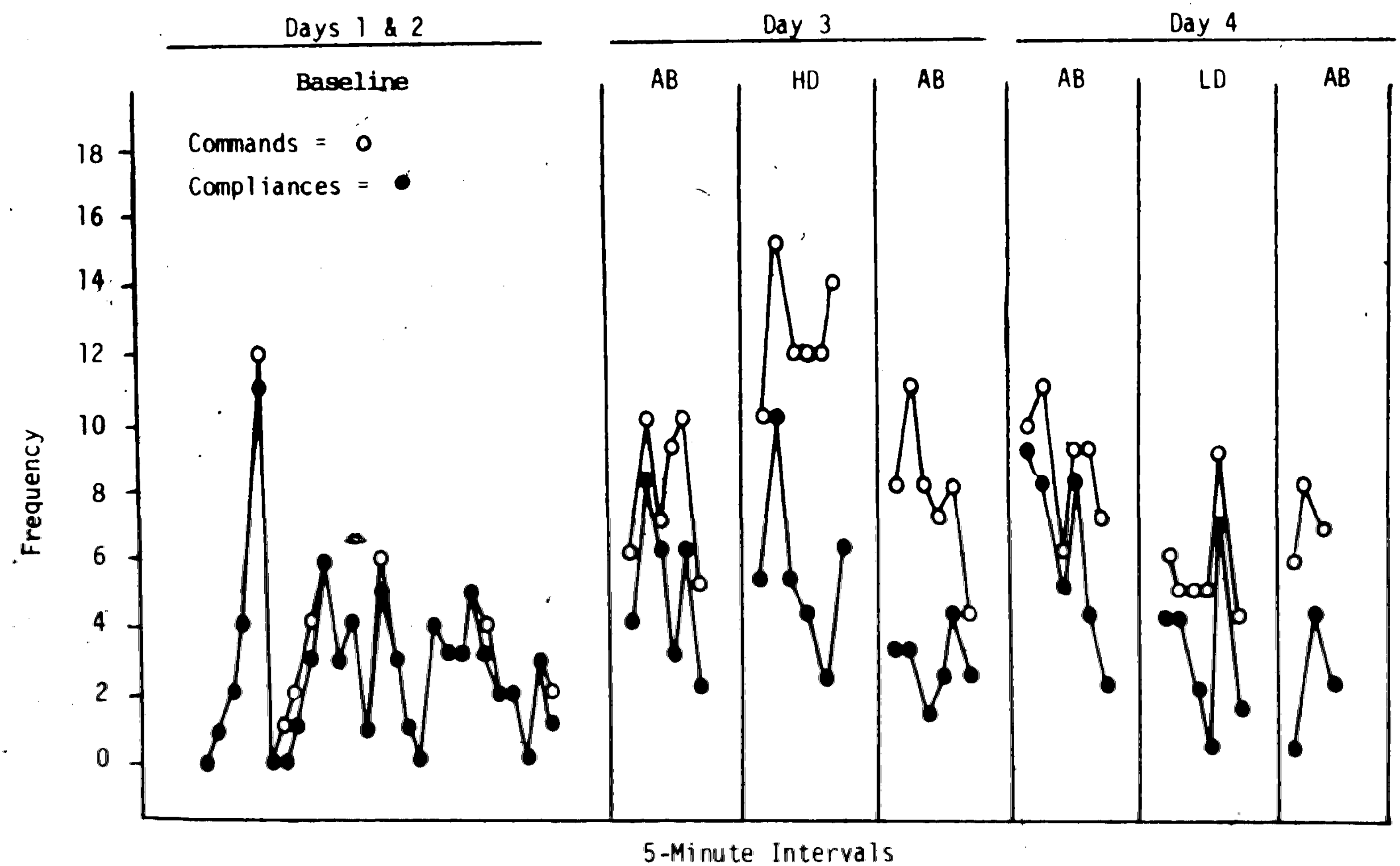


Figure 1. Rates of maternal commands and child compliance initiations for 5-minute intervals across baseline and experimental phases for Dyad 1.

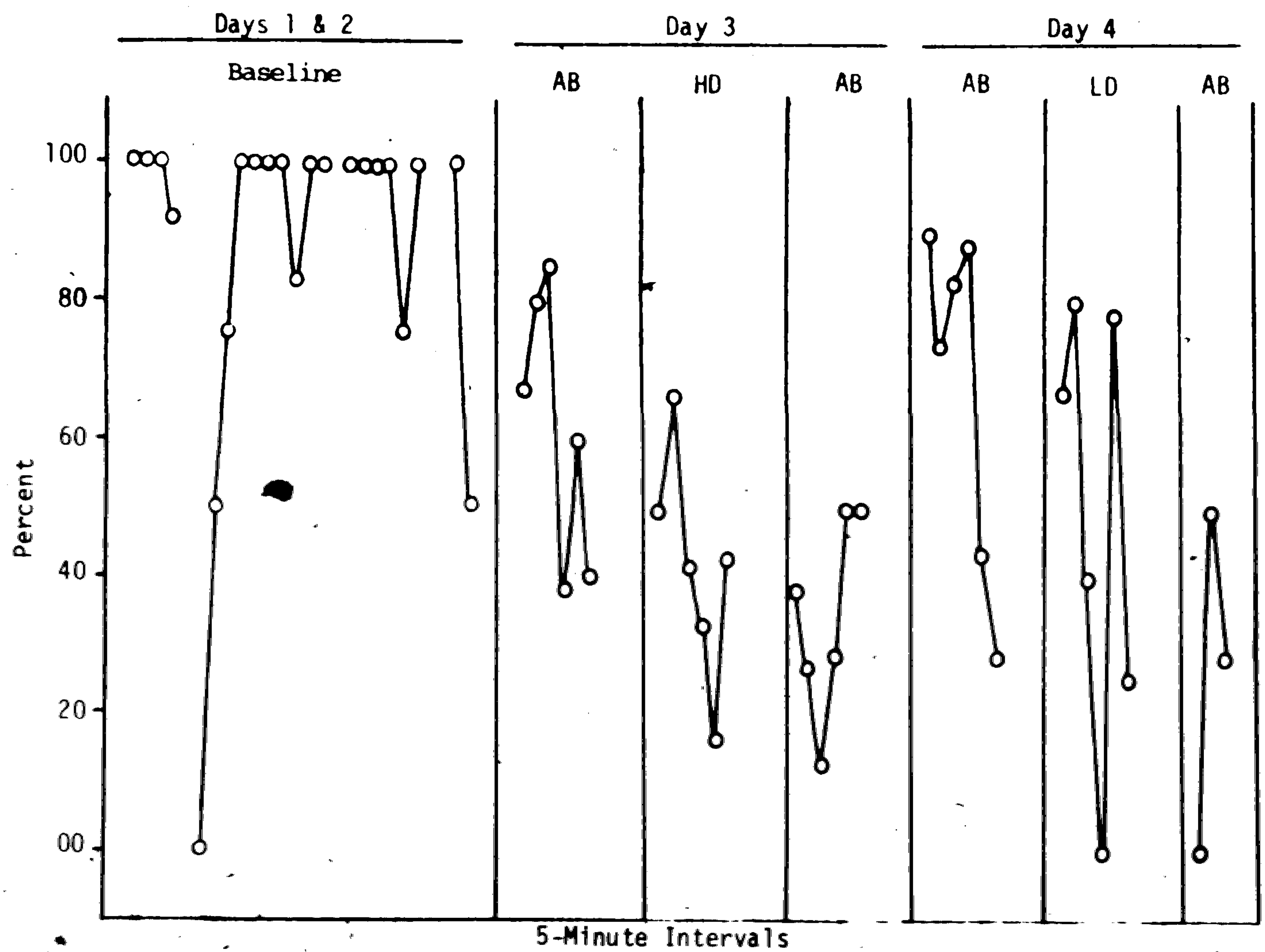


Figure 2. Percent compliance for 5-minute intervals across baseline and experimental phases for Dyad 1.

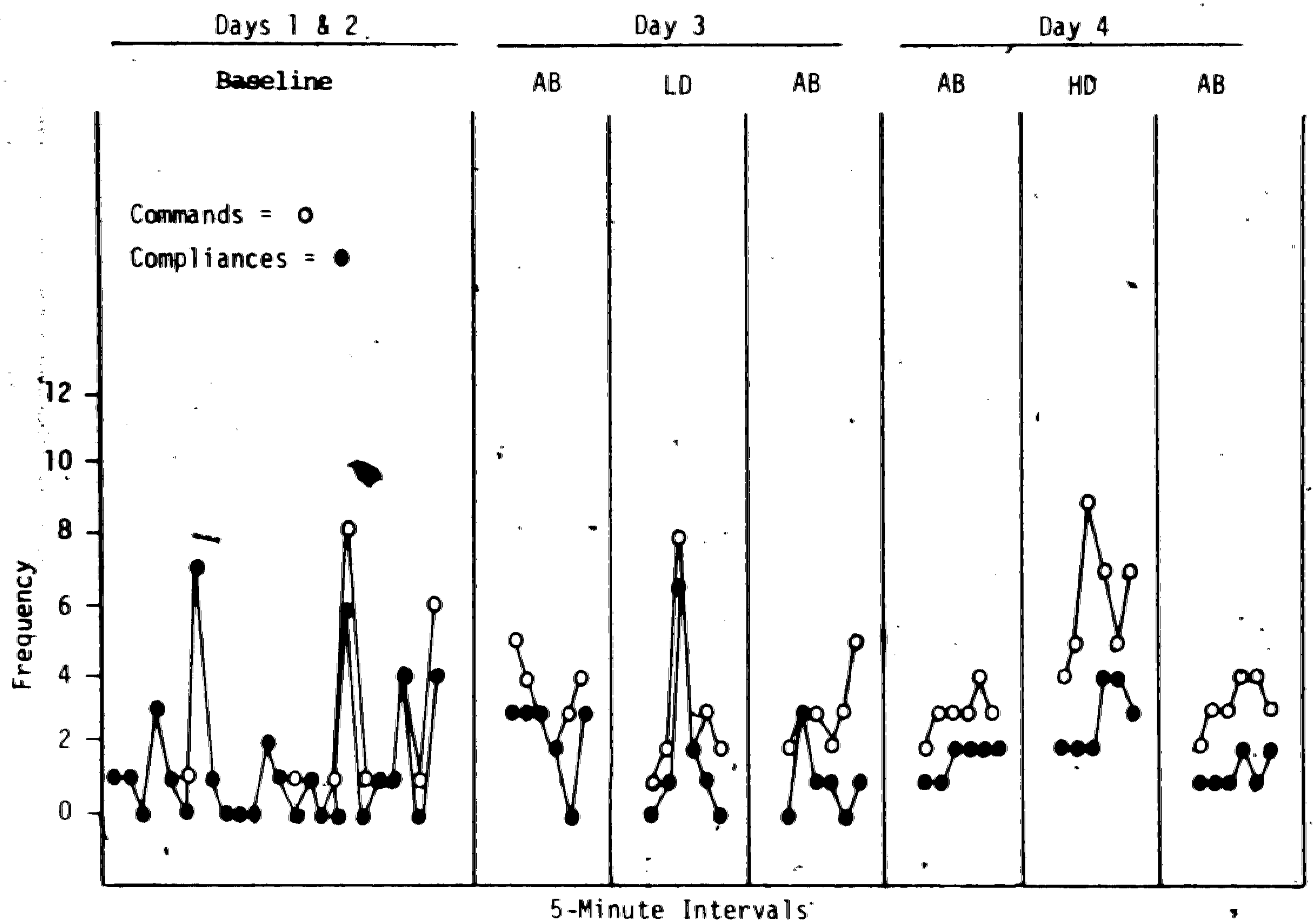


Figure 3. Rates of maternal commands and child compliance initiations for 5-minute intervals across baseline and experimental phases for Dyad 2.

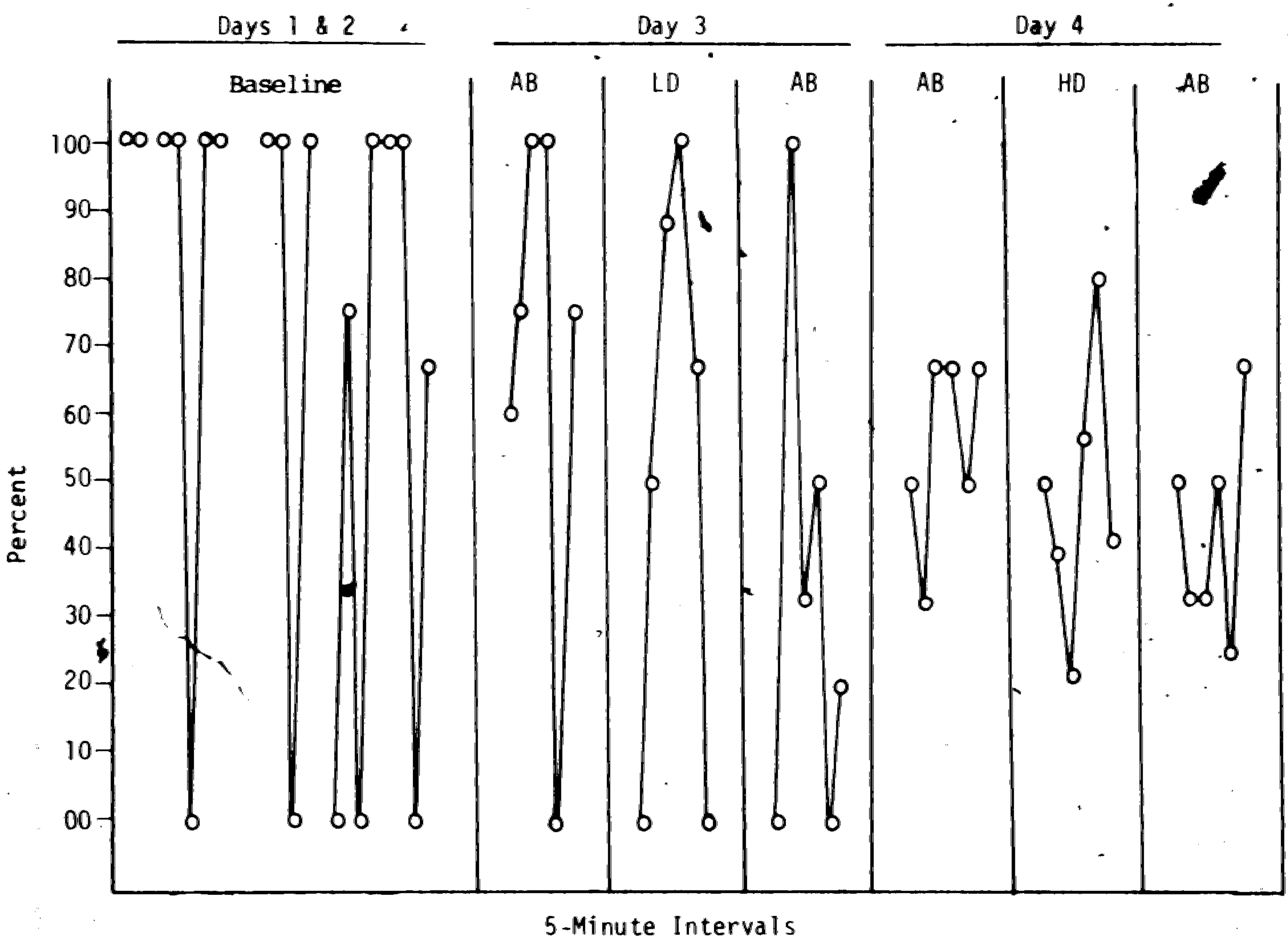


Figure 4. Percent compliance for 5-minute intervals across baseline and experimental phases for Dyad 2.

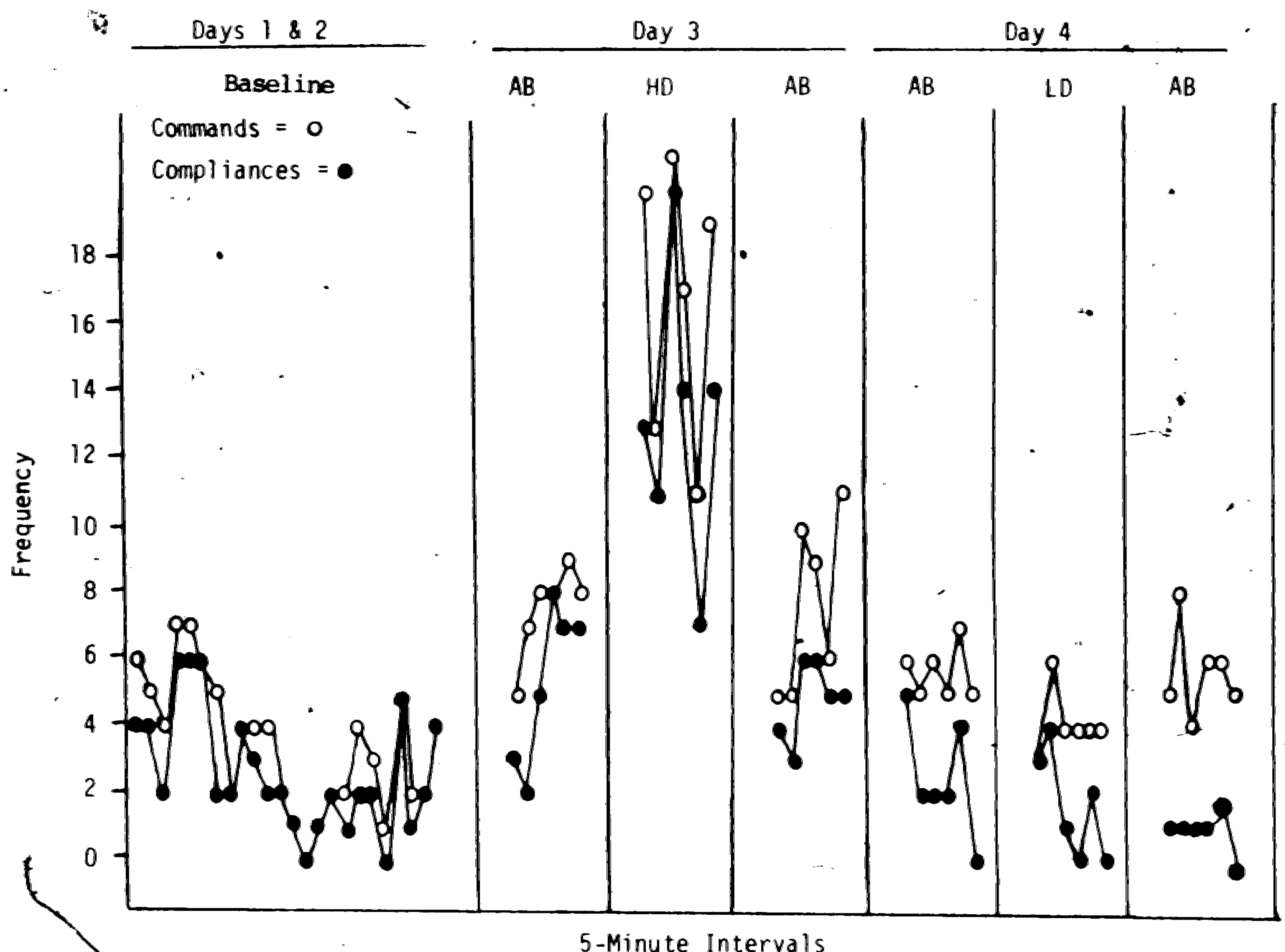


Figure 5. Rates of maternal commands and child compliance initiations for 5-minute intervals across baseline and experimental phases for Dyad 3.

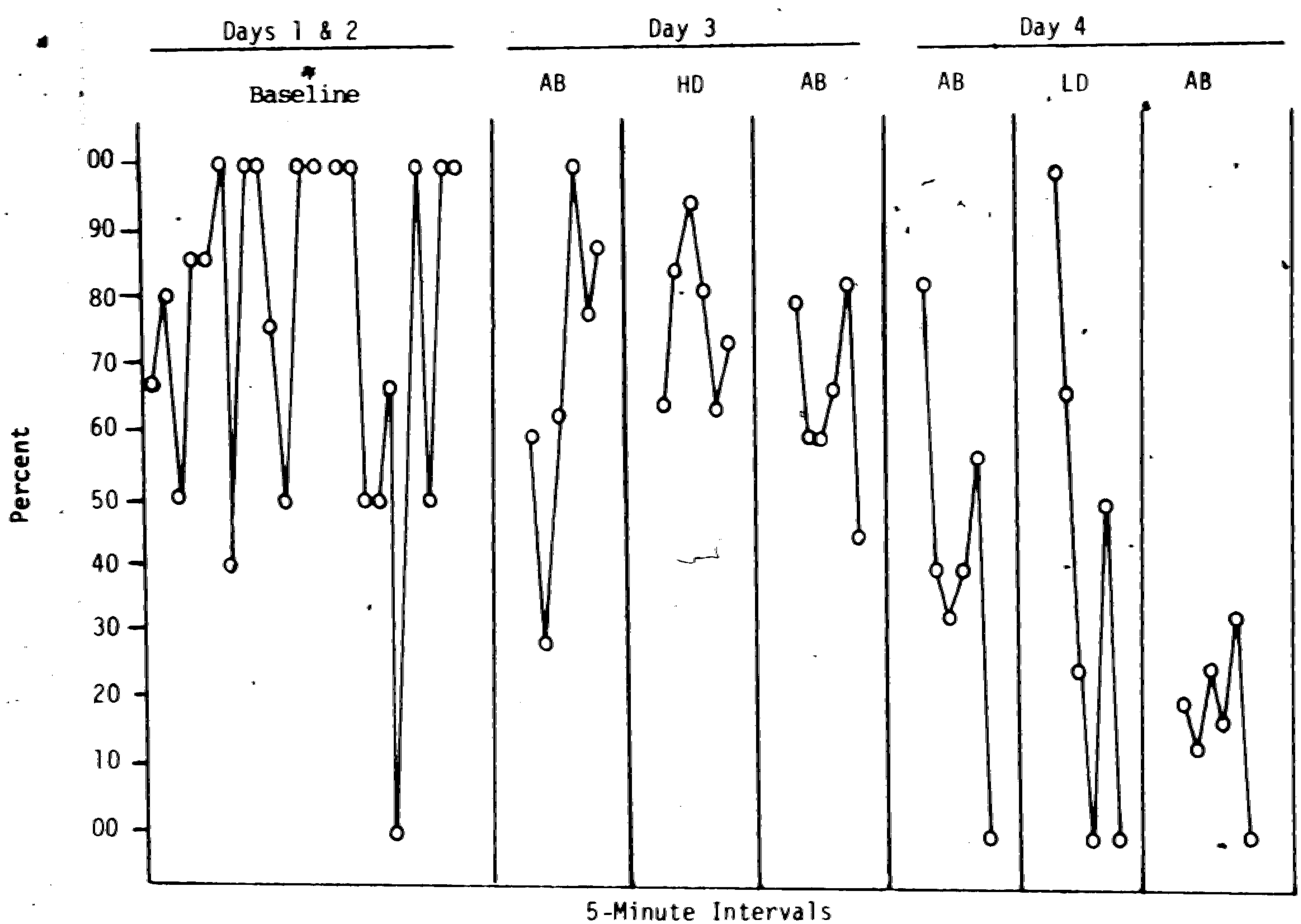


Figure 6. Percent compliance for 5-minute intervals across baseline and experimental phases for Dyad 3.

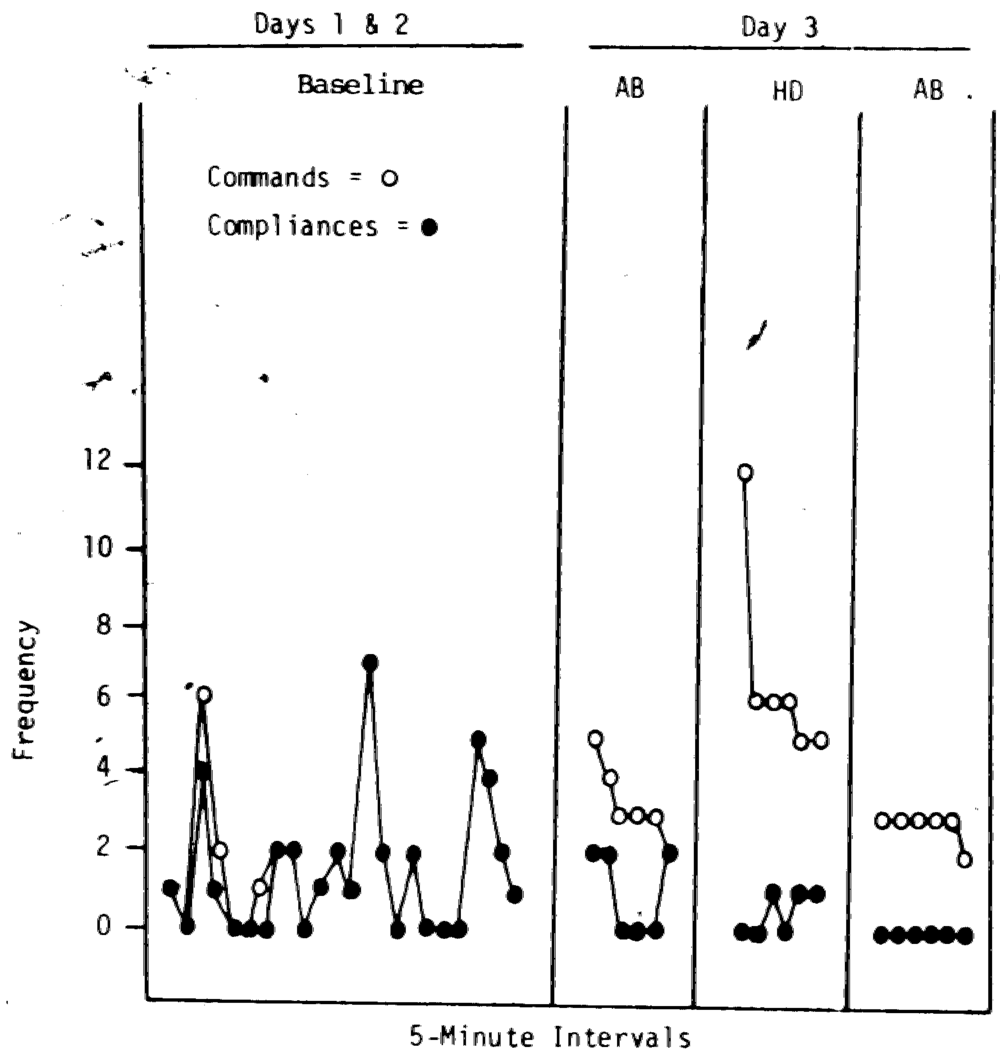


Figure 7. Rates of maternal commands and child compliance initiations for 5-minute intervals across baseline and experimental phases for Dyad 4.

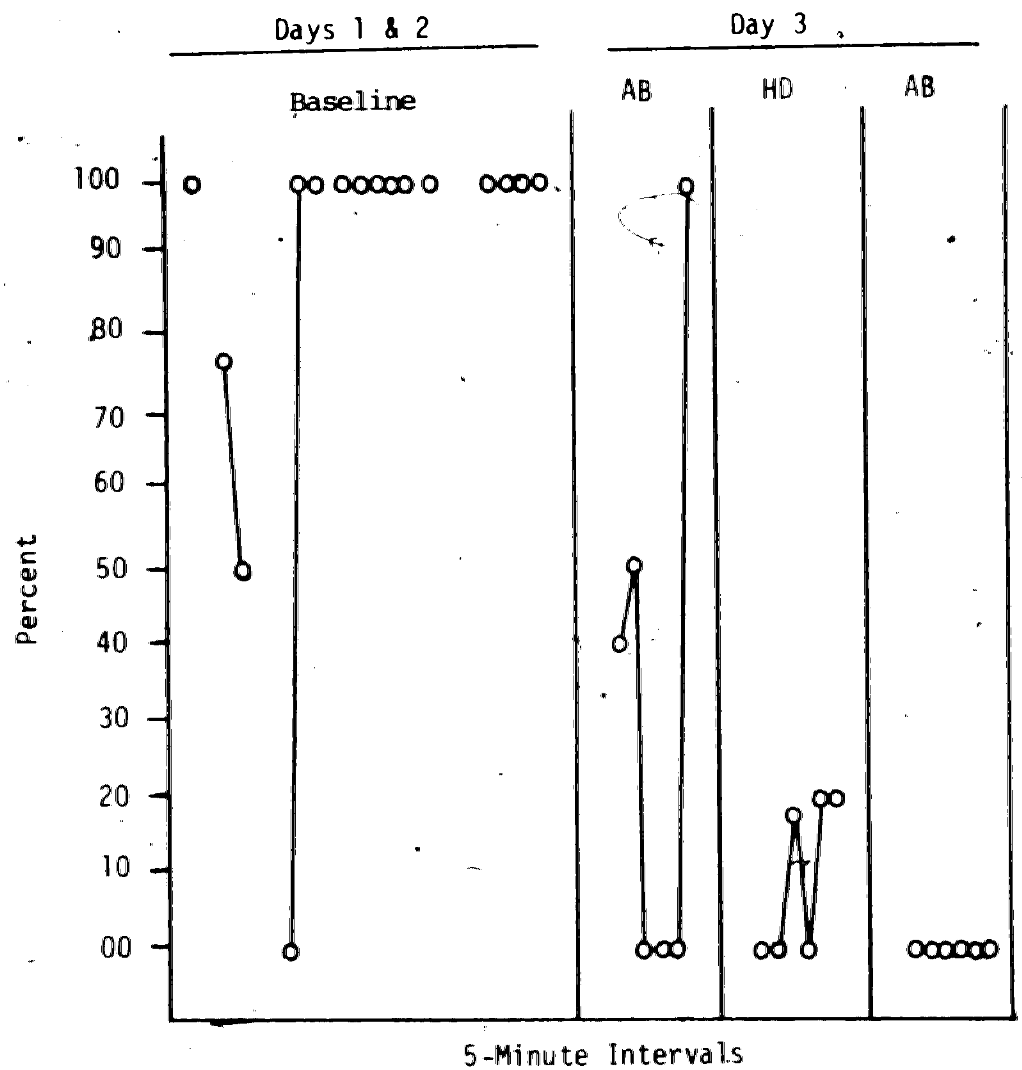


Figure 8. Percent compliance for 5-minute intervals across baseline and experimental phases for Dyad 4.

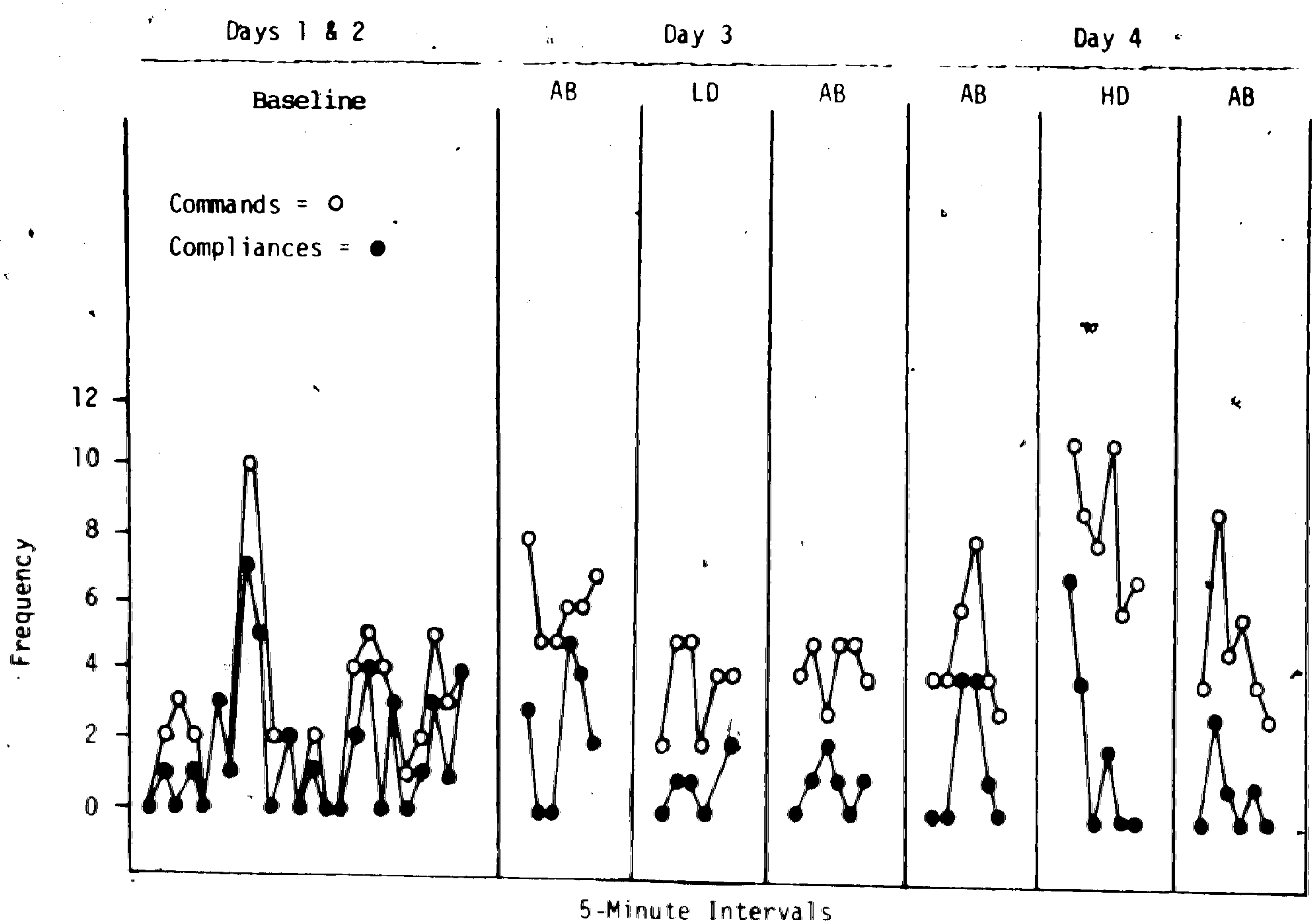


Figure 9. Rates of maternal commands and child comp[illegible]nce initiations for 5-minute intervals across baseline and experimental phases for Dyad 5.

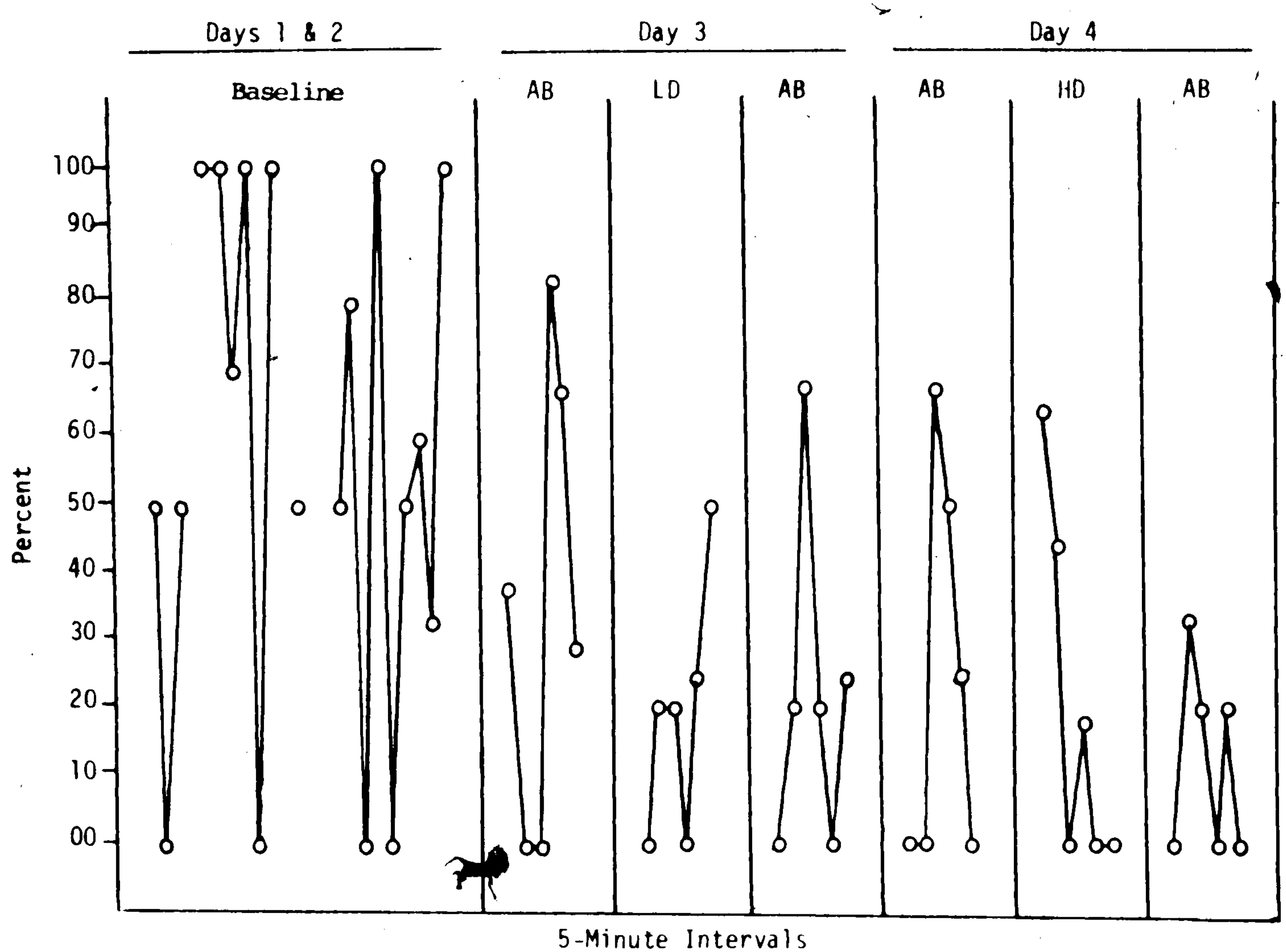


Figure 10. Percent compliance for 5-minute intervals across baseline and experimental phases for Dyad 5.

Toy stimuli for command rate study

1. Sesame Street Books
2. Pink Ball
3. Bean Bags
4. Teddy Bear
5. Bobo Doll (3,5)
6. Pink Panther
7. Blue Race Car (2,3,4)
8. Yellow Truck (2,3,4)
9. Airplane (2,3,4)
10. Wooden Blocks
11. Red Form Box
12. Lego Set
13. Xylophone
14. Jacks & Ball
15. Curious George
16. Etch-A-Sketch
17. Rolling Pin
18. Green Peas
19. Kermit
20. Bean Bag Chair
21. Playdough (3,5)
22. Rabbit (1,5)
23. Rowlf (1)
24. Blonde Doll (1,5)
25. Snoopy (1)
26. Coloring Book

1. Not present for Dyad 1
2. Not present for Dyad 2
3. Not present for Dyad 3
4. Not present for Dyad 4
5. Not present for Dyad 5

Autocorrelation and partial autocorrelation functions of all dependent measures for subject 1 during baseline

Autocorrelations

| Dependent Measure | Lag 1 | Lag 2 | Lag 3 | Lag 4 | Lag 5 | Lag 6 |
|---|---|---|---|---|---|---|
| Compliance Initiations | .03 | -.20 | -.34 | -.18 | .20 | .04 |
| Percent Compliance | .32 | -.01 | -.22 | -.14 | -.10 | -.04 |
| Compliance Latency | .01 | -.02 | -.06 | -.10 | .23 | .09 |
| Compliance Duration | -.11 | -.09 | .22 | .06 | -.08 | -.12 |

Partial Autocorrelations

| Dependent Measure | Lag 1 | Lag 2 | Lag 3 | Lag 4 | Lag 5 | Lag 6 |
|---|---|---|---|---|---|---|
| Compliance Initiations | .03 | -.20 | -.34 | -.25 | .05 | -.18 |
| Percent Compliance | .32 | -.12 | -.20 | -.01 | -.08 | -.04 |
| Compliance Latency | .01 | -.02 | -.06 | -.10 | .21 | .08 |
| Compliance Duration | -.11 | -.11 | .20 | .11 | -.03 | -.18 |

Autocorrelation and partial autocorrelation functions of all dependent measures for subject 2 during baseline

Autocorrelations

| Dependent Measure | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Compliance Initiations | -.28 | -.07 | .04 | -.03 | -.07 | .16 |
| Percent Compliance | -.08 | .16 | -.34 | -.08 | -.14 | .54 |
| Compliance Latency | .15 | -.06 | -.15 | -.15 | -.21 | .25 |
| Compliance Duration | -.08 | -.03 | -.06 | -.08 | -.03 | -.04 |

Partial Autocorrelations

| Dependent Measure | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Compliance Initiations | -.28 | -.17 | -.03 | -.04 | -.10 | .12 |
| Percent Compliance | -.08 | .16 | -.33 | -.16 | -.06 | .54 |
| Compliance Latency | .15 | -.09 | -.13 | -.12 | -.21 | .30 |
| Compliance Duration | -.08 | -.04 | -.06 | -.09 | -.05 | -.06 |

Autocorrelation and partial autocorrelation functions of all dependent measures for subject 3 during baseline

Autocorrelations

| Dependent Measure | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Compliance Initiation | .33 | .24 | .32 | .18 | .19 | .02 |
| Percent Compliance | -.10 | .13 | -.09 | -.15 | -.16 | -.14 |
| Compliance Latency | .06 | .08 | -.15 | -.06 | -.09 | .26 |
| Compliance Duration | -.02 | -.15 | -.09 | -.08 | .05 | -.01 |

Partial Autocorrelations

| Dependent Measure | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Compliance Initiation | .33 | .16 | .24 | .00 | .07 | -.16 |
| Percent Compliance | -.10 | .12 | -.06 | -.18 | -.18 | -.15 |
| Compliance Latency | .06 | .07 | -.17 | -.05 | -.06 | .26 |
| Compliance Duration | -.02 | -.15 | -.09 | -.11 | .02 | -.05 |

Autocorrelation and partial autocorrelation functions of all dependent measures for subject 4 during baseline

| | Autocorrelations | | | | | |
|---|---|---|---|---|---|---|
| | Lag | | | | | |
| Dependent Measure | 1 | 2 | 3 | 4 | 5 | 6 |
| Compliance Initiation | .16 | -.19 | -.15 | -.20 | -.05 | -.06 |
| Percent Compliance | .39 | .12 | -.13 | -.05 | -.06 | -.07 |
| Compliance Latency | .53 | .13 | -.14 | -.12 | -.16 | -.15 |
| Compliance Duration | -.27 | .07 | .20 | -.18 | .00 | -.16 |

| | Partial Autocorrelations | | | | | |
|---|---|---|---|---|---|---|
| | Lag | | | | | |
| Dependent Measure | 1 | 2 | 3 | 4 | 5 | 6 |
| Compliance Initiation | .16 | -.22 | -.08 | -.22 | -.04 | -.17 |
| Percent Compliance | .39 | -.04 | -.19 | .09 | -.05 | -.08 |
| Compliance Latency | .53 | -.21 | -.17 | .11 | .19 | -.05 |
| Compliance Duration | -.27 | -.00 | .23 | -.08 | -.11 | -.24 |

Autocorrelation and partial autocorrelation functions of all dependent measures for subject 5 during baseline

| | Autocorrelations | | | | | |
|---|---|---|---|---|---|---|
| | Lag | | | | | |
| Dependent Measure | 1 | 2 | 3 | 4 | 5 | 6 |
| Compliance Initiation | .21 | -.03 | -.04 | -.24 | -.14 | -.19 |
| Percent Compliance | -.34 | .20 | -.06 | -.38 | .36 | -.31 |
| Compliance Latency | .36 | .08 | -.16 | -.24 | -.16 | -.15 |
| Compliance Duration | .28 | .18 | -.03 | -.09 | -.09 | -.09 |

| | Partial Autocorrelations | | | | | |
|---|---|---|---|---|---|---|
| | Lag | | | | | |
| Dependent Measure | 1 | 2 | 3 | 4 | 5 | 6 |
| Compliance Initiation | .21 | -.08 | -.02 | -.24 | -.05 | -.20 |
| Percent Compliance | -.34 | .10 | .04 | -.47 | .17 | -.05 |
| Compliance Latency | .36 | -.05 | -.19 | -.13 | -.02 | -.11 |
| Compliance Duration | .28 | .11 | -.12 | -.09 | -.02 | -.04 |

Mean compliance latency for all dyads in experimental phases LD, AB, and HD

| Dyads | Experimental Phases | | | ANOVA | |
|---|---|---|---|---|---|
| | LD | AB | HD | F | α |
| 1 | 12.333 | 14.744 | 16.094 | 0.250 | .77 |
| 2 | 14.636 | 21.243 | 18.882 | 0.630 | .53 |
| 3 | 16.800 | 14.902 | 11.089 | 0.711 | .49 |
| 4 | not collected | 35.500 | 15.333 | not analyzed | |
| 5 | 14.000 | 23.576 | 13.462 | not analyzed | |

Mean compliance duration for all dyads in experimental phases LD, AB, and HD

| Dyads | Experimental Phases | | | ANOVA | |
|---|---|---|---|---|---|
| | LD | AB | HD | F | $\alpha$ |
| 1 | 41.909 | 37.757 | 47.414 | 2.461 | .08 |
| 2 | 57.000 | 77.568 | 64.647 | 0.424 | .65 |
| 3 | 65.100 | 40.000 | 26.646 | 5.659 | .01 |
| 4 | not collected | 136.833 | 155.000 | not analyzed | |
| 5 | 48.400 | 55.182 | 100.231 | 1.706 | .19 |

Multiple regression results for compliance latency across baseline and intervention sessions for dyads 1-3

| Dyads | | Predictor Variables | | | | |
|---|---|---|---|---|---|---|
| | | Maternal Control | Time Within Session | Actual Command Rate | Experimental Phase | Explained |
| 1 | Beta | -0.202 | -0.023 | -0.109 | 0.105 | |
| | F | 5.556* | 0.100 | 1.081 | 1.378 | 1.753 |
| | B | -7.229 | -0.086 | -0.516 | 2.165 | |
| | $r^2$ | .027 | .000 | .000 | .006 | .034 |
| 2 | Beta | -0.241 | -0.043 | 0.033 | 0.024 | |
| | F | 5.529* | 0.181 | 0.104 | 0.054 | 1.519 |
| | B | -8.701 | -0.170 | 0.249 | 0.481 | |
| | $r^2$ | .055 | .000 | .000 | .005 | .060 |
| 3 | Beta | -0.286 | 0.097 | NI | -0.163 | |
| | F | 16.884** | 2.226 | NI | 5.720* | 7.734** |
| | B | -7.829 | 0.275 | NI | -1.994 | |
| | $r^2$ | .066 | .021 | NI | .004 | .091 |

NI indicates that a specific predictor was not included in the regression because it was colinear with a more predictive variable.

* $p < .05$

** $p < .01$

Multiple regression results for compliance duration across baseline and intervention sessions for dyads 1, 2, 3, and 5.

| Dyads | | Predictor Variables | | | | |
|---|---|---|---|---|---|---|
| | | Maternal Control | Time Within Session | Actual Command Rate | Experimental Phase | Explained |
| 1 | Beta | - 0.113 | -0.020 | NI | 0.131 | |
| | F | 1.427 | 0.063 | NI | 1.721 | 0.689 |
| | B | -11.547 | -0.220 | NI | 7.838 | |
| | $r^2$ | .008 | .000 | NI | .005 | .013 |
| 2 | Beta | - 0.113 | 0.081 | -0.173 | 0.026 | |
| | F | 1.192 | 0.621 | 2.824 | 0.062 | 1.260 |
| | B | -22.473 | 1.749 | -7.219 | 2.871 | |
| | $r^2$ | .012 | .007 | .032 | .000 | .050 |
| 3 | Beta | 0.326 | 0.146 | -0.126 | NI | |
| | F | 19.874** | 5.393* | 3.035 | NI | 14.174** |
| | B | 44.793 | 2.075 | -1.252 | NI | |
| | $r^2$ | .073 | .001 | .082 | NI | .155 |
| 5 | Beta | 0.175 | 0.018 | NI | 0.134 | |
| | F | 2.528 | 0.028 | NI | 1.492 | 1.074 |
| | B | 40.358 | 0.533 | NI | 20.211 | |
| | $r^2$ | .028 | .000 | NI | .008 | .036 |

NI indicates that a specific predictor was not included in the regression because it was colinear with a more predictive variable.

* $p < 05$

** $p < .01$

Correlation matrix for multiple regression

of dependent measure, compliance rate, for Dyad 1

| | Compliance Rate | Command Rate Phase | Actual Command Rate | Time Within Session |
|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.23482 | 0.71703 | -0.22606 |
| Command Rate Phase | 0.23482 | 1.00000 | 0.50965 | 0.04219 |
| Actual Command Rate | 0.71703 | 0.50965 | 1.00000 | 0.10934 |
| Time Within Session | -0.22606 | 0.04219 | 0.10934 | 1.00000 |

Correlation matrix for multiple regression of dependent measure, compliance rate, for Dyad 2

| | Compliance Rate | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.14520 | 0.77804 | -0.12448 | -0.02116 |
| Command Rate Phase | 0.14520 | 1.00000 | 0.42897 | -0.11664 | 0.03569 |
| Actual Command Rate | 0.77804 | 0.42897 | 1.00000 | -0.42239 | 0.19400 |
| Maternal Control | -0.12448 | -0.11664 | -0.42239 | 0.00000 | -0.30594 |
| Time Within Session | -0.02116 | 0.03569 | 0.19400 | -0.30594 | 1.00000 |

Correlation matrix for multiple regression of dependent measure, compliance rate, for Dyad 3

| | Compliance Rate | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.90358 | -0.26432 | 0.01483 |
| Actual Command Rate | 0.90358 | 1.00000 | -0.50043 | 0.16503 |
| Maternal Control | -0.26432 | -0.50043 | 1.00000 | -0.30594 |
| Time Within Session | 0.01483 | 0.16503 | -0.30594 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance rate, for Dyad 4

| | Compliance Rate | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.33402 | 0.33471 | -0.24604 |
| Actual Command Rate | 0.33402 | 1.00000 | -0.52068 | 0.03718 |
| Maternal Control | 0.33471 | -0.52068 | 1.00000 | -0.32750 |
| Time Within Session | -0.24604 | 0.03718 | -0.32750 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance rate, for Dyad 5

| | Compliance Rate | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.15930 | 0.57652 | 0.05691 | -0.10059 |
| Command Rate Phase | 0.15930 | 1.00000 | 0.50813 | -0.11664 | 0.03569 |
| Actual Command Rate | 0.57652 | 0.50813 | 1.00000 | -0.53772 | 0.13868 |
| Maternal Control | 0.05691 | -0.11664 | -0.53772 | 1.00000 | -0.30594 |
| Time Within Session | -0.10059 | 0.03569 | 0.13868 | -0.30594 | 1.00000 |

Correlation matrix for multiple regression
of dependent measure, percent compliance, for Dyad 1

| | Percent Compliance | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Percent Compliance | 1.00000 | -0.13822 | 0.61942 | -0.40404 |
| Command Rate Phase | -0.13822 | 1.00000 | -0.12354 | 0.03610 |
| Maternal Control | 0.61942 | -0.12354 | 1.00000 | -0.11226 |
| Time Within Session | -0.40404 | 0.03610 | -0.11226 | 1.00000 |

Correlation matrix for multiple regression
of percent compliance during UB

| | Percent Compliance | Actual Command Rate | Time Within Session |
|---|---|---|---|
| Percent Compliance | 1.00000 | 0.18151 | -0.10923 |
| Actual Command Rate | 0.18151 | 1.00000 | 0.03765 |
| Time Within Session | -0.10923 | 0.03765 | 1.00000 |

Correlation matrix for multiple regression
of percent compliance during Intervention Session

| | Percent Compliance | Actual Command Rate | Time Within Session |
|---|---|---|---|
| Percent Compliance | 1.00000 | 0.12808 | -0.60538 |
| Actual Command Rate | 0.12808 | 1.00000 | -0.11008 |
| Time Within Session | -0.60538 | -0.11008 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, percent compliance, for Dyad 2

| | Percent Compliance | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Rate | 1.00000 | -0.07081 | 0.03322 | 0.26960 | -0.25481 |
| Command Rate Phase | -0.07081 | 1.00000 | 0.45105 | -0.10850 | 0.03400 |
| Actual Command Rate | 0.03322 | 0.45105 | 1.00000 | -0.32023 | 0.19128 |
| Maternal Control | 0.26960 | -0.10850 | -0.32023 | 1.00000 | -0.31335 |
| Time Within Session | -0.25481 | 0.03400 | 0.19128 | -0.31335 | 1.00000 |

Correlation matrix for multiple regression
of dependent measure, percent compliance, for Dyad 3

| | Percent Compliance | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Percent Compliance | 1.00000 | 0.24633 | 0.37492 | -0.26467 |
| Command Rate Phase | 0.24633 | 1.00000 | -0.11517 | 0.03300 |
| Maternal Control | 0.37492 | -0.11517 | 1.00000 | -0.28654 |
| Time Within Session | -0.26467 | 0.03300 | -0.28654 | 1.00000 |

Correlation matrix for multiple regression of dependent measure, percent compliance, for Dyad 4

| | Percent Compliance | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Percent Compliance | 1.00000 | -0.40027 | 0.81895 | -0.33459 |
| Command Rate Phase | -0.40027 | 1.00000 | -0.43644 | 0.12431 |
| Maternal Control | 0.81895 | -0.43644 | 1.00000 | -0.28484 |
| Time Within Session | -0.33459 | 0.12431 | -0.28484 | 1.00000 |

Correlation matrix for multiple regression
of dependent measure, percent compliance, for Dyad 5

| | Percent Compliance | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Percent Compliance | 1.00000 | -0.05179 | 0.49663 | -0.17244 |
| Command Rate Phase | -0.05179 | 1.00000 | -0.10850 | 0.02724 |
| Maternal Control | 0.49663 | -0.10850 | 1.00000 | -0.25110 |
| Time Within Session | -0.17244 | 0.02724 | -0.25110 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance latency, for Dyad 1

| | Compliance Latency | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Latency | 1.00000 | 0.07798 | 0.06619 | -0.16261 | -0.01336 |
| Command Rate Phase | 0.07798 | 1.00000 | 0.58348 | -0.19555 | 0.11456 |
| Actual Command Rate | 0.06619 | 0.58348 | 1.00000 | -0.55735 | -0.06252 |
| Maternal Control | -0.16261 | -0.19555 | -0.55735 | 1.00000 | 0.04777 |
| Time Within Session | -0.01336 | 0.11456 | -0.06252 | 0.04777 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance latency, for Dyad 2

| | Compliance Latency | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.07204 | 0.02666 | -0.23840 | 0.00061 |
| Command Rate Phase | 0.07204 | 1.00000 | 0.20639 | -0.19228 | 0.12342 |
| Actual Command Rate | 0.02666 | 0.20639 | 1.00000 | 0.02760 | 0.10913 |
| Maternal Control | -0.23840 | -0.19228 | 0.02760 | 1.00000 | -0.15423 |
| Time Within Session | 0.00061 | 0.12342 | 0.10913 | -0.15423 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance latency, for Dyad 3

| | Compliance Latency | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Latency | 1.00000 | -0.03626 | -0.24871 | 0.14537 |
| Command Rate Phase | -0.03625 | 1.00000 | -0.38711 | 0.16439 |
| Maternal Control | -0.24871 | -0.38711 | 1.00000 | -0.26183 |
| Time Within Session | 0.14537 | 0.16439 | -0.26183 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance duration, for Dyad 1

| | Compliance Duration | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Duration | 1.00000 | 0.07168 | -0.06703 | -0.00273 |
| Command Rate Phase | 0.07168 | 1.00000 | -0.25059 | -0.12808 |
| Maternal Control | -0.06703 | -0.25059 | 1.00000 | 0.03044 |
| Time Within Session | -0.00273 | 0.12808 | 0.03044 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance duration, for Dyad 2

| | Compliance Duration | Command Rate Phase | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|---|
| Compliance Rate | 1.00000 | 0.02198 | -0.16187 | -0.13485 | 0.08223 |
| Command Rate Phase | 0.02198 | 1.00000 | 0.20639 | -0.19228 | 0.12342 |
| Actual Command Rate | -0.16187 | 0.20538 | 1.00000 | 0.02760 | 0.10913 |
| Maternal Control | -0.13485 | -0.19228 | 0.02760 | 1.00000 | -0.15423 |
| Time Within Session | 0.08223 | 0.12342 | 0.10913 | -0.15423 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance duration, for Dyad 3

| | Compliance Duration | Actual Command Rate | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Duration | 1.00000 | -0.27285 | 0.35573 | 0.03567 |
| Actual Command Rate | -0.27285 | 1.00000 | -0.54022 | 0.19749 |
| Maternal Control | 0.35573 | -0.54022 | 1.00000 | -0.26183 |
| Time Within Session | 0.03567 | 0.19749 | -0.26183 | 1.00000 |

Correlation matrix for multiple regression

of dependent measure, compliance duration, for Dyad 5

| | Compliance Duration | Command Rate Phase | Maternal Control | Time Within Session |
|---|---|---|---|---|
| Compliance Duration | 1.00000 | 0.08667 | 0.13879 | 0.01250 |
| Command Rate Phase | 0.08667 | 1.00000 | -0.26818 | -0.04632 |
| Maternal Control | 0.13879 | -0.26818 | 1.00000 | 0.00487 |
| Time Within Session | 0.01250 | -0.04632 | 0.00487 | 1.00000 |