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TOWARD A FUNCTIONAL ANALYSIS OF PRIVATE VERBAL SELF-REGULATION

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We developed a methodology, derived from the theoretical literatures on rule-governed behavior and private events, to experimentally investigate the relationship between covert verbal self-regulation and nonverbal behavior. The methodology was designed to assess whether (a) nonverbal behavior was under the control of covert rules and (b) verbal reports of these rules were functionally equivalent to the covert rules that control nonverbal behavior. The research was conducted in the context of teaching shopping skills to persons with mild intellectual disabilities using a self-instruction training format. In Phase 1, 4 participants were successfully taught to perform shopping skills using overt and covert self-instructions. The self-instructions were then blocked under overt and covert self-instruction conditions, which resulted in a reversal of shopping skills to baseline levels. This indicated that the overt and covert self-instructions might be controlling responding. In Phase 2, we demonstrated that the self-instructions, when used as external directives, produced successful shopping with 3 other participants. By demonstrating that self-rules can produce correct responding when used as external directives, we were more confident that it was the self-instructions and not other verbal or nonverbal behavior that controlled responding under overt, covert, and blocking conditions in Phase 1.

DESCRIPTORS: self-instruction, self-regulation, private events, functional analysis, mild disabilities, rule-governed behavior

One of the fundamental tenets of radical behaviorism that differentiates it from methodological behaviorism is the consideration of private events as a legitimate topic for scientific investigation (Skinner, 1953, 1974, 1984, 1989). Private events are behavioral events in which the response, the stimulus, or both are directly accessible to one person and are therefore not intersubjectively verifiable (Place, 1993; Skinner, 1953). Two classes of private phenomena have been identified in the behavioral literature: (a) internal sensations such as bodily functions and (b) covert behavior such as self-rules (Moore, 1984, 1995). Although privacy is an essential thesis for understanding many of the underlying constructs of radical behaviorism (e.g., the nature of scientific understanding) and how radical behaviorism relates to other contemporary theoretical and philosophical approaches in psychology (e.g., cognitivism, mentalism, literal dualism), it has received relatively little empirical attention. This may be due to the inherent methodological difficulties in evaluating functional relations involving private behavior.

Experimental research on human responding to operant schedules is one notable exception to this lack of attention to private events by behavioral researchers. Early investigations demonstrated that human responding on fixed-interval schedules did not produce the pause-respond patterns that are ubiquitous across the rest of the animal kingdom (Leander, Lippman, & Meyer, 1968; Lippman & Meyer, 1967; Weiner,

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1964). Subsequent operant research has examined the role of covert self-rules on human schedule responding (Bentall & Lowe, 1987; Catania, Matthews, & Shimoff, 1982; Lowe, Beasty, & Bentall, 1983; Rosenfarb, Newland, Brannon, & Howey, 1992). Methodologies employed by these researchers to access covert self-rules have included post hoc and within-session self-reports by participants on the rules they used during experimental sessions (Bentall, Lowe, & Beasty, 1985; Catania et al., 1982; Lowe, 1979).

Such verbal reports are insufficient to prove the existence of a functional relationship among covert self-rules, self-reports of covert self-rules, and nonverbal behavior because a causal relationship is not established. To conclude that the relationship is functional, it must be shown that covert self-rules control (i.e., vary systematically with) behavior. In addition, it must be shown that the verbal reports of self-rules are functionally equivalent to the covert self-rules that control behavior. The critical issue, then, is one of experimental access; that is, how do we evaluate functional relations involving private events? The answer involves the use of more rigorous methodological controls. Hayes, Zettle, and Rosenfarb (1989) have suggested a set of experimental procedures to assess "understanding" that, if appropriately adapted, could provide the experimental control that is required for a functional analysis of covert verbal self-regulation. Hayes and his colleagues referred to the set of procedures as the silent dog strategy (Hayes, 1986; Hayes et al., 1989). The strategy is derived from Ericsson and Simon's (1984) protocol analysis and is consistent with a number of criteria outlined by Reese (1989) when inferring rule use.

To demonstrate the functional equivalence of overt (verbal report) and covert self-rules, it must first be shown that task performance is similar under both overt and covert conditions. An overt self-rule may produce the same behavior as a covert self-rule because equivalent events are influencing behavior (i.e., the behavior is rule governed and the overt self-report is merely the outward manifestation of the rule). "Unless other nonverbal processes perfectly mirror rule governance, we are left with the conclusion that—like Sherlock Holmes' famous case of the silent dog—it is the absence of effect that demonstrates the effect" (Hayes et al., 1989, p. 201).

Showing a lack of effect is an interpretively risky exercise. The possibility exists that task performance could be similar under overt and covert self-rule conditions, not because overt and covert self-rules are functionally equivalent but because the overt self-rules are unrelated to the behavior (i.e., they are a totally separate response system from that which produces the performance). To conclude that overt and covert self-rules are functionally equivalent and control nonverbal responding requires two additional findings. First, it must be shown that blocking self-rules (e.g., by asking participants to repeat nonsense syllables during trials) under overt and covert self-rule conditions results in a return of nonverbal behavior to baseline levels. This blocking procedure demonstrates that self-rules may be controlling behavior. It may be, however, that blocking interferes with other verbal and nonverbal behavior (i.e., other than the self-rules) that controls responding. It must finally be shown that the self-rules can be used as external directives for other participants (who are not exposed to the prior experimental conditions) to produce similiar nonverbal responding. By demonstrating that self-rules can produce similiar nonverbal responding when used as external directives with naive participants, we are more confident that the self-rules and not other verbal and nonverbal responding controlled task responding under previous overt, covert, and blocking conditions. All three findings interconnect to allow us to infer the existence of a functional relationship between covert self-rules and nonverbal responding.

In addition to the analytical difficulties associated with conducting a functional analysis of covert self-rules, private verbal behavior is problematic in that it is unrecorded, it is a product of unknown history, and it is controlled by unspecified contingencies. Such verbal behavior may depend on prior nonverbal responding, may be similiar to earlier verbal behavior upon which nonverbal responding depended, or may be related to prior nonverbal responding in other undetermined ways (Harzem, Lowe, & Bagshaw, 1978). It is therefore important to control for the emergence of self-rules within an experimental context when conducting a functional analysis of covert self-rules. Previous experimental research has attempted to control for the emergence of self-rules when examining the function of self-rules by shaping self-rule formulation within the experimental context (Catania et al., 1982). Similarly, methodologies to shape self-rules in complex applied settings are evident in the self-instruction literature (Meichenbaum & Goodman, 1971). Self-instructional training (e.g., Wacker et al., 1988) provides a training protocol whereby a repertoire of self-rules is shaped over a number of training sessions. Self-instructions can be observed under well-specified conditions, recorded on a more or less continuous basis, and brought under a degree of experimental control. The possibility of documenting the development of verbal self-rules and concurrent nonverbal responding may provide an experimental context within which to conduct a functional analysis of covert verbal self-regulation.

The primary purpose of this study was to combine the recommendations of Hayes et al. (1989) with self-instructional training to develop a methodology that allows us to access covert self-rules. To date, no comprehensive experimental analysis that has established a functional relationship between covert self-rules and nonverbal behavior has been reported in the literature (Agran & Martella, 1991; Matthews, Shimoff, & Catania, 1987). We addressed these issues in the context of teaching participants with mild intellectual disabilities to purchase items appropriately in grocery stores. In Phase 1 of the study, 4 participants were taught to perform the steps of a shopping task analysis across training and generalization stores using overt and covert self-instructions. Self-instructions were then blocked under overt and covert conditions, which resulted in a reversal of shopping skills to baseline levels. In Phase 2, we demonstrated that self-instructions, when used as external directives, produced successful shopping performance with 3 additional participants. By demonstrating that self-instructions can produce correct responding when used as external directives (Phase 2), we were more confident that it was the self-instructions and not other verbal or nonverbal behavior that controlled responding under overt, covert, and blocking conditions in Phase 1.

METHOD

Phase 1: Overt and Covert Self-Instructional Training

Participants. Four participants with mild intellectual disabilities participated in overt and covert self-instructional training. These included Peter, a 29-year-old man with an overall Vineland score of 60 and a communications subscore of 46; Anne, a 23-year-old woman with an overall Vineland score of 62 and a communications subscore of 48; Mike, a 25-year-old man with an overall Vineland score of 63 and a communications subscore of 52; and Linda, a 33-year-old woman with an overall Vineland score of 59 and a communications subscore of 42.

Settings and sessions. Self-instruction training sessions were conducted 4 days per week. Each training session consisted of classroom self-instruction training followed by supermarket self-instruction training. Classroom training was conducted in a room located in a vocational training center. Following classroom training, each participant received self-instructional training in one of three stores. These supermarkets were selected to represent the range of stimulus and response variations of all supermarket settings in the local community. Three supermarkets that were similar to those used during training were used to assess generalization. These were located in an adjacent town. One generalization probe was conducted every third session during overt self-instruction training. Generalization probes were subsequently conducted every second session during blocking and covert self-instruction phases. Training and generalization supermarket settings were sequentially selected from their respective pools for use during a particular session.

Table 1
Steps of the Supermarket Shopping Task Analysis

Step	Description
1	Walks from car to supermarket[a]
2	Enters the supermarket through the correct door[a]
3	Lifts a basket
4	Looks at shopping list[a]
5	Looks on shelves for item[a]
6	Puts item in basket or picks up item[a]
7	Looks at list for next item[a]
8	Looks on shelves for item[a]
9	Puts item in basket or picks up item[a]
10	Checks list to see that both items are in the basket
11	Goes to correct checkout (i.e., express checkout)
12	Takes place in line[a]
13	Behaves appropriately in line (i.e., moves forward when line moves)[a]
14	Puts contents of basket on counter[a]
15	Replaces basket
16	Pays for items using next dollar strategy[a]
17	Waits for change[a]
18	Packs sack[a]
19	Picks up sack[a]
20	Exits store through correct door[a]
21	Returns to car[a]

[a] Essential steps.

Target behaviors. Participants were taught 21 steps of a supermarket shopping task analysis (see Table 1). The task analysis was based on a comprehensive review of the literature and on consultation with staff at the vocational training center. Concurrent with each step of the task analysis, participants were taught to verbalize four self-instruction statements: (a) a statement of the problem (e.g., "I need to walk to [supermarket name]"); (b) a statement of the correct response (e.g., "walk to [supermarket name]"); (c) report on the response (e.g., "I am at [supermarket name]"); and (d) self-acknowledgment (e.g., "well done"). Participants were allowed to develop their own adaptations of each self-instruction statement for all steps of the task analysis.

Dependent and independent variables. The dependent measures were (a) number of correct responses on the task analysis in supermarket training settings and (b) number of correct responses on the task analysis in generalization supermarket settings. The independent measures were (a) number of overt self-instructions in supermarket training settings and (b) number of overt self-instructions in generalization supermarket settings. During baseline, occurrence of a self-instruction was scored if a participant gave a correct verbal response to the probe provided by the trainer (see below). During training or generalization probes, occurrence of a self-instruction statement was scored only if it was verbalized and unprompted, following completion of a prior step on the task analysis or prior self-instruction statement. If statements were used out of sequence, they were scored as incorrect. A task analysis response was scored as correct during baseline, training sessions, or generalization probes if the participant independently completed the response.

Experimental design. A multiple baseline design across participants with multielement phases embedded (i.e., blocking and non-blocking) was used to determine the effects of overt and covert self-instruction.

Baseline. No instructional feedback was given during this phase. In each baseline session, a participant was provided with a two-item pictorial shopping list and three pound coins. The participant was instructed to go to a particular supermarket and to purchase the items on the shopping list. The participant was accompanied to the selected supermarket settings by the trainer. Before performing a particular step of the task analysis, the participant was asked, (a) "What do you do now?" (i.e., statement of the problem), and (b) "How do you do that?" (i.e., statement of correct response). Following responses to these probes, the participant was told to perform the task analysis step. If the task analysis step was performed correctly, the participant was asked, (a) "What have you just done?" (i.e., report on the response), and (b) "How do you feel about that?" (i.e., self-acknowledgment). If a task analysis step was not performed correctly, the conditions necessary for the next step of the task analysis were set up (e.g., the trainer verbally instructed the participant to go to the checkout).

Classroom overt self-instructional training. Each session began with the trainer providing a rationale and an explanation of the training procedure to the participants. The trainer then modeled the first step of the task analysis and its accompanying self-instruction statements. Then, each participant performed the first step of the task analysis while the trainer verbally instructed (i.e., provided the four self-instruction statements). Finally, participants performed the first step of the task analysis while overtly self-instructing the appropriate statements. This training sequence was repeated until the remaining steps of the task analysis and their accompanying self-instruction statements had been completed.

If self-instructions or task analysis responses did not occur, a least-to-most restrictive prompting strategy was applied by the trainer until participants self-instructed and performed task analysis steps appropriately. The least-to-most prompting strategy involved an indirect verbal prompt (i.e., "What do you say or do next?"), a direct verbal prompt (e.g., "go to the checkout"), or modeling (i.e., the trainer repeated a self-instruction statement or demonstrated a step of the task analysis).

Supermarket overt self-instructional training. At the start of each supermarket training session, a participant was given a pictorial shopping list of two items and three pound coins. The participant was instructed to go to the supermarket and purchase the items on the shopping list. The participant was reminded to use the overt self-instructions that he or she had learned in the classroom that morning. The participant was accompanied to the supermarket by the trainer. If the participant did not self-instruct or respond correctly on any step of the task analysis, the least-to-most prompting strategy was used to produce desired performance.

Criterion performance on the task analysis was correct performance of all essential behaviors (i.e., 17 correct responses) on three consecutive supermarket training sessions. An example of essential behavior is paying for goods; an example of a nonessential behavior is picking up a basket (see Table 1). Nonessential steps were included at the request of the vocational training staff. Self-instruction criterion was correct verbalization of all self-instruction statements that corresponded with the 17 essential task analysis responses on three consecutive supermarket training sessions.

Blocking of overt self-instruction. It was assumed that blocking and self-instruction would essentially be mutually exclusive (cf.

Ericsson & Simon, 1984; Hayes, 1986; Reese, 1989). The blocking procedure in the supermarket settings required participants to repeat random numbers spoken by the trainer. Numbers were presented by the trainer approximately every second. Each blocking phase was followed by a nonblocking phase (i.e., a return to overt self-instruction training conditions). Each blocking and nonblocking phase consisted of two sessions (i.e., assessment in one training and one generalization setting). All participants readily engaged in the rehearsal of numbers throughout these blocking trials, and no problematic behavior was observed.

Classroom covert self-instructional training. Classroom covert self-instruction training was an extension of classroom overt self-instruction training. It included (a) a provision of rationales for self-instructional training and an explanation of the training procedure, (b) modeling by the trainer of the appropriate self-instruction statements and correct task analysis responses, (c) participants performing the steps of the task analysis while the trainer verbally instructed (i.e., provided the self-instruction statements), and (d) participants performing the steps of the task analysis while overtly self-instructing. On completion of Step 4 of this training sequence, participants were instructed to perform the steps of the task analysis while silently saying the appropriate self-instruction statements to themselves.

The least-to-most prompting strategy was used if a participant did not respond correctly on any step of the task analysis or failed to self-instruct during overt phases of the training sequence.

Supermarket covert self-instructional training. At the start of each supermarket training session, a participant was given a pictorial shopping list of two items and three pound coins. The participant was instructed to go to the supermarket and purchase the items on the shopping list. The participant was reminded to covertly self-instruct. The participant was accompanied to the supermarket by the trainer. If the participant did not respond correctly on any step of the task analysis, the least-to-most prompting strategy was used to produce desired performance. Criterion performance on the task analysis was completion of the 17 essential steps on three consecutive supermarket training sessions. Given the covert nature of self-instructions, self-instruction data were not collected during this phase.

Blocking of covert self-instruction. The procedure used to block covert self-instruction (i.e., repetition of random numbers) was the same as that used during blocking of overt self-instruction. Three blocking and three nonblocking (i.e., a return to covert self-instruction training conditions) phases were presented alternately. Each blocking and nonblocking phase consisted of assessment in one training setting and one generalization setting.

Phase 2: Self-Instructions As External Directives

Participants. Three participants who had not previously participated in the study were used to establish the task relevance of the self-instructions. These included Jennifer, a 39-year-old woman with an overall Vineland score of 62 and a communications subscore of 50; Gary, a 27-year-old man with an overall Vineland score of 59 and a communications subscore of 45; and Paul, a 25-year-old man with an overall Vineland score of 57 and a communications subscore of 40.

Settings and sessions. Task relevance sessions were conducted 3 days per week on an individual basis. They were conducted in one (randomly selected from the pool of three) of the supermarket settings used during self-instructional training.

Experimental design. A multiple baseline across participants was used to demonstrate experimental control.

Baseline. A participant was given a pictorial shopping list of two items and three pound coins. The participant was instructed to go to the supermarket and purchase the items on the shopping list. The participant was accompanied by the trainer. If the participant was unable to complete a step on the task analysis, the trainer completed the step and provided verbal instruction to set up the conditions for the next step of the task analysis. No other instructional feedback was provided during sessions. A correct response was scored only if the participant initiated a response without assistance.

Intervention. A participant was given a two-item pictorial shopping list, three pound coins, and asked to go to the supermarket to purchase the items on the list. The participant was instructed to listen to what the trainer said and then follow his directions. It was made clear that even if the participant knew what to do next, he or she should wait until directions were given. Following a predetermined written protocol, the trainer took the participant through each step of the task analysis. For example, if the next step on the task analysis was to pick up a basket, the following verbal instructions were provided: "You now need to pick up a basket" (i.e., statement of problem); "pick up a basket" (i.e., statement of response). When the participant picked up the basket, the participant was told, "You have picked up a basket" (i.e., report on the response); "well done" (i.e., verbal acknowledgment). The 3 participants completed all steps of the task analysis correctly when given these instructions.

Interobserver Agreement

Interobserver agreement on the two dependent variables was conducted during 30% of all sessions across all phases. In addition, interobserver agreements were obtained for the implementation of classroom and supermarket self-instructional training. These were conducted once in the classroom and once in a supermarket training setting for each participant.

The point-by-point agreement method was used to assess percentage agreement. Agreement was calculated by dividing the number of agreements for each response, self-instruction, or use of prompt by the total number of agreements plus disagreements and multiplying by 100%. The mean agreement for correct responding was 96% (range, 92% to 100%). The mean agreement for self-instruction was 91% (range, 86% to 98%). The mean agreement for implementation of the training protocol in the classroom was 99% (range, 97% to 100%). The mean agreement for implementation of the training protocol in supermarket settings was 96% (range, 94% to 100%).

RESULTS

Overall, the results show that (a) high levels of self-instruction corresponded with high levels of correct responding on the task analysis, (b) task analysis responding during overt and covert self-instruction phases was similar, (c) prevention of self-instruction (overt and covert) reliably produced behavior change, and (d) self-instructions, when used as external instructions, produced desired behavior change with additional participants.

Figure 1 shows the frequency of correct responses on the supermarket shopping task analysis for Peter, Anne, Mike, and Linda in training and generalization settings. Correct responding in training and generalization settings under baseline conditions ranged from 11 to 13 responses for all 4 participants. Task analysis responding increased substantially in both training and generalization settings during the overt self-instruction phase. High levels of responding were maintained throughout the phase. Blocking of

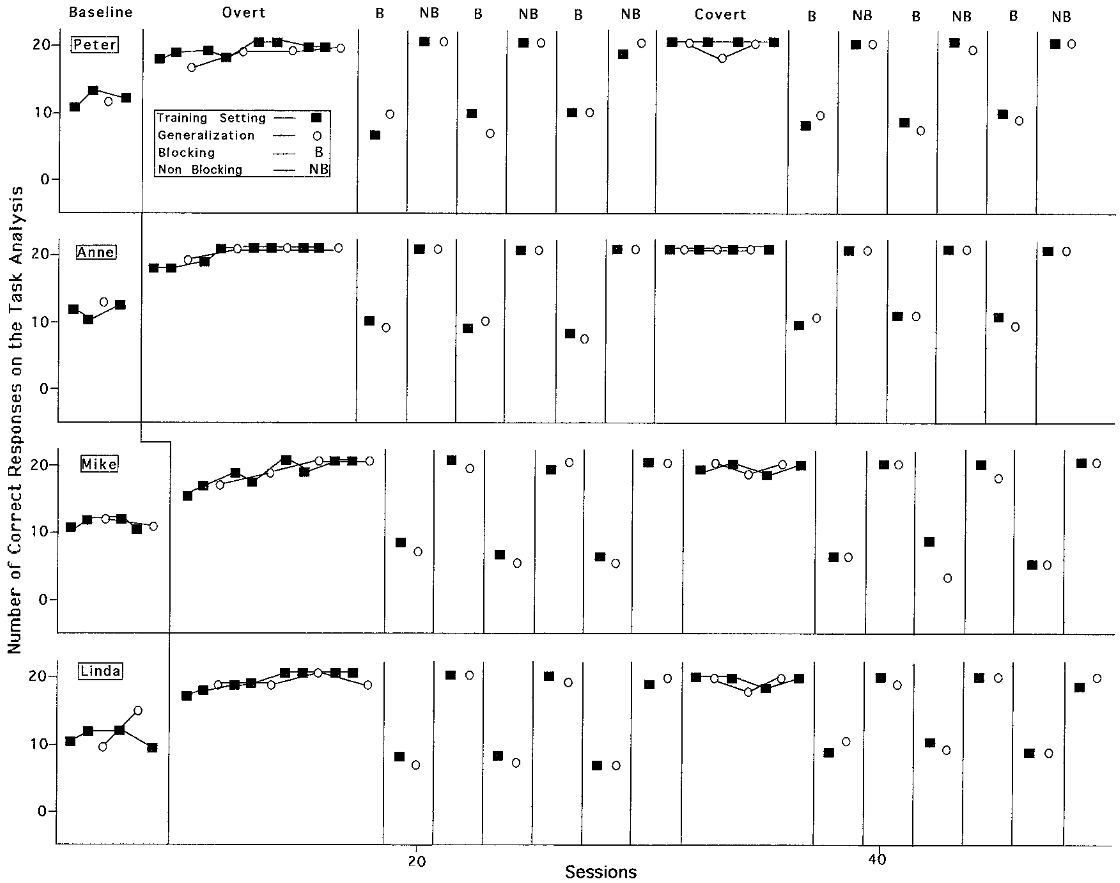

Figure 1. Number of correct responses for the 4 participants who received self-instruction training.

overt self-instruction reduced levels of correct responding in training and generalization settings to original baseline levels. Alternating nonblocking phases demonstrated a return to preblocking levels.

Introduction of covert self-instruction resulted in task analysis performance in training and generalization settings at levels similar to that during the overt self-instruction phase. Blocking of covert self-instructions reduced levels of task analysis responding in training and generalization settings to baseline levels. Decreases in levels of responding were similar to decreases in levels of responding during overt blocking phases. Alternating nonblocking phases demonstrated a return to preblocking levels of task analysis responding.

Figures 2 through 5 show the number of self-instruction statements verbalized for each step on the task analysis by Peter, Anne, Mike, and Linda. The use of the self-instruction statements was low for all participants in both training and generalization settings under baseline conditions. When overt self-instruction training was introduced, there was a gradual increase in the use of self-instruction statements by all participants in training and generalization settings. Blocking of overt self-instructions resulted in the nonoccurrence of self-instructions. All participants rehearsed the numbers throughout each blocking trial. Alternating nonblocking phases demonstrated a return to preblocking levels of responding.

Figure 6 shows performance of the 3 par-

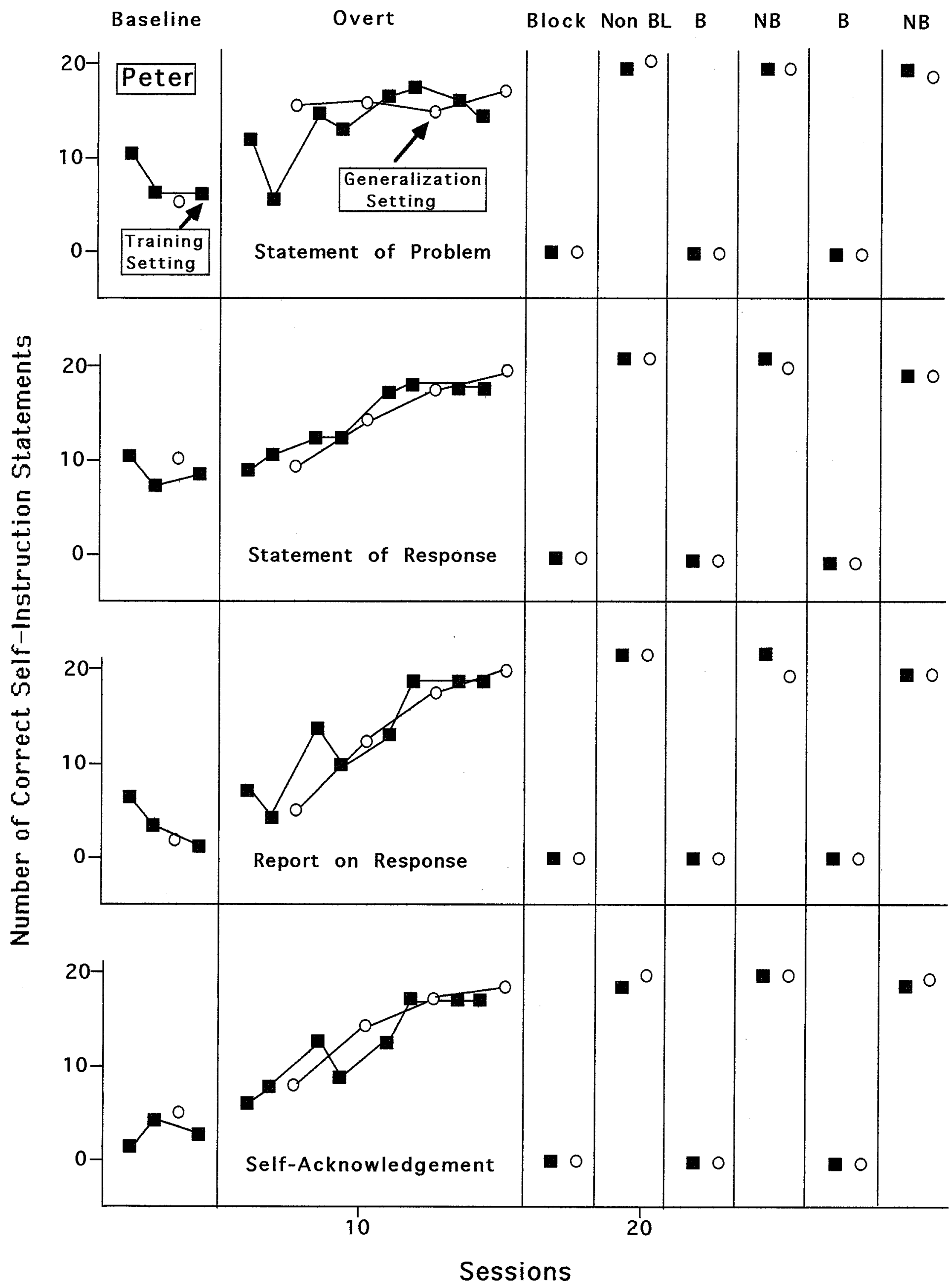

Figure 2. Number of correct self-instruction statements for Peter.

ticipants who were exposed to the self-rules as external directives. Stable baselines were obtained for Jennifer, Gary, and Paul. Introduction of external directives produced 100% correct responding for all 3 participants.

DISCUSSION

The methodology used in this study was designed to assess whether (a) nonverbal behavior was under the control of covert rules and (b) verbal reports of these rules were functionally equivalent to the covert rules

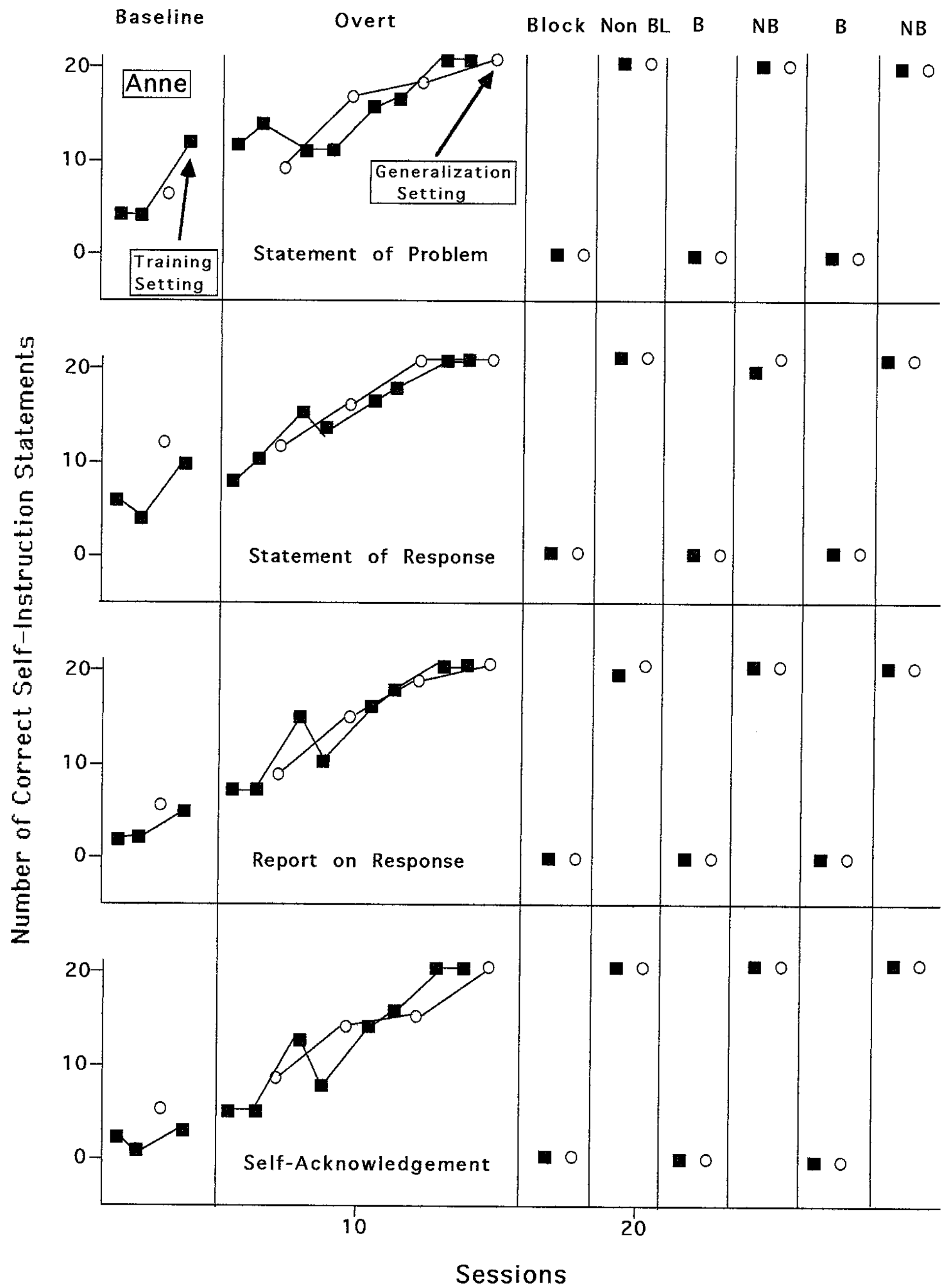

Figure 3. Number of correct self-instruction statements for Anne.

that control the behavior. Methodologies derived from Ericsson and Simon (1984), Hayes (1986), and Hayes et al. (1989), combined with self-instructional training techniques, allowed us to begin to address these questions. In Phase 1, 4 participants were taught to successfully perform the steps of a shopping task analysis across training and generalization stores using overt and covert self-instructions. The use of self-instructions was then blocked under overt and covert conditions, which resulted in a reversal of

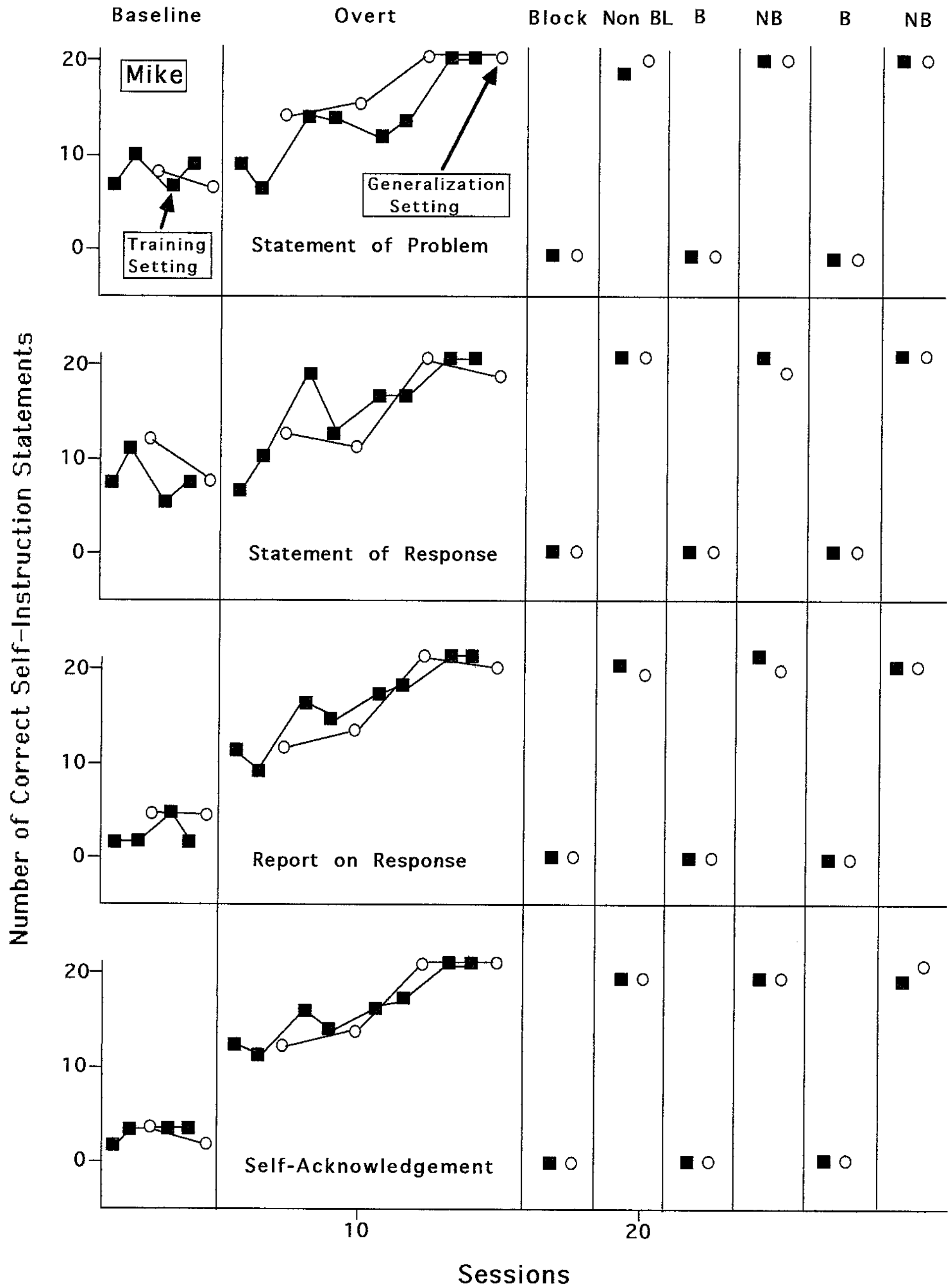

Figure 4. Number of correct self-instruction statements for Mike.

shopping skills to baseline levels. This demonstrated that overt and covert self-rules may have controlled the nonverbal responding. In Phase 2, we demonstrated that the self-rules, when used as external directives, produced successful shopping performance with 3 other participants. By demonstrating that the self-rules can produce correct responding when used as external directives (Phase 2), we were more confident that it was the self-instructions and not other verbal or nonverbal behavior that controlled responding un-

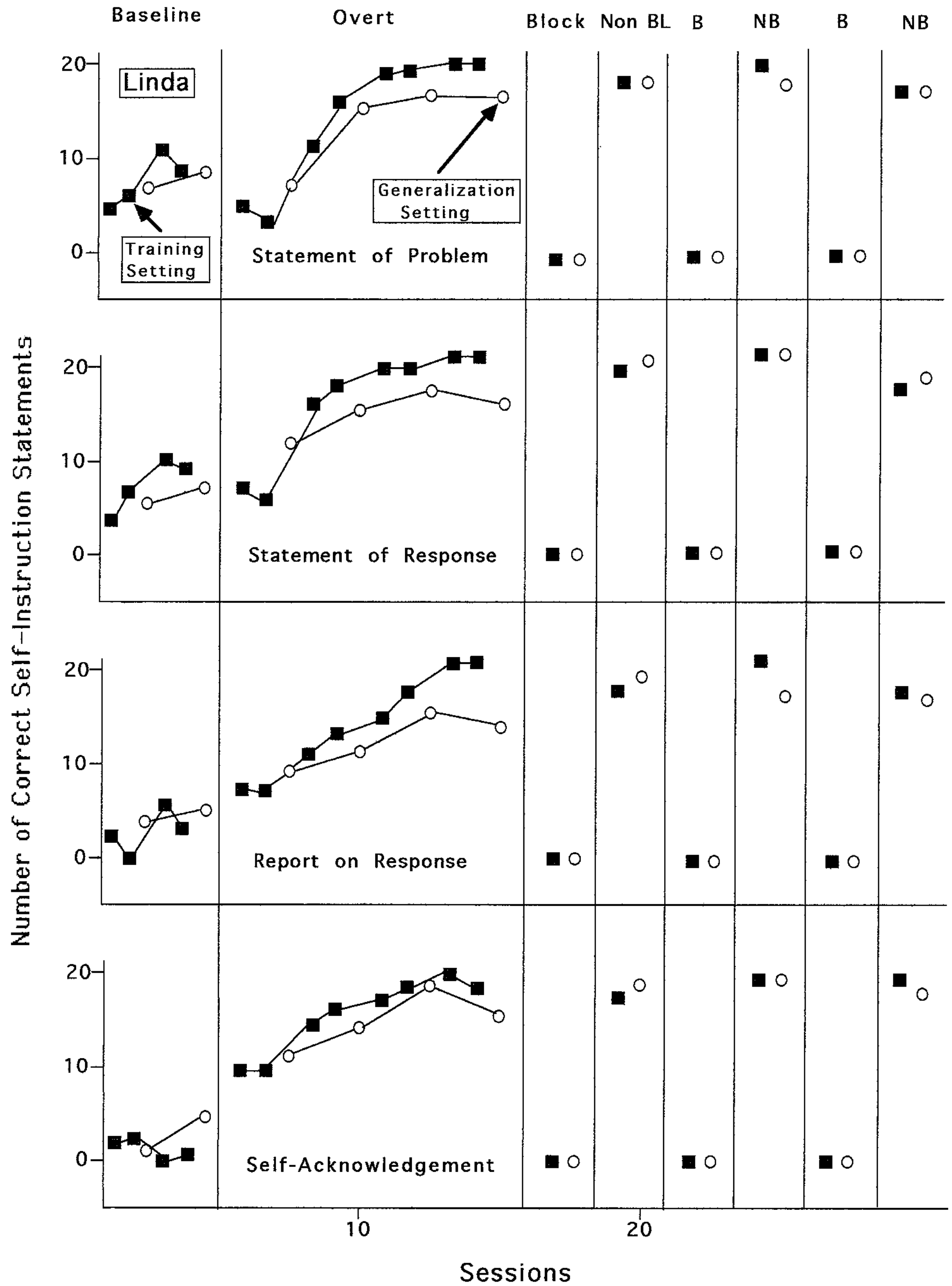

Figure 5. Number of correct self-instruction statements for Linda.

der overt, covert, and blocking conditions in Phase 1.

This combination of findings suggests that overt and covert self-verbalizations acquired a regulatory function in training settings. High levels of task analysis responding corresponded with high levels of self-instruction. Alternatively, significant decreases in task analysis responding corresponded with blocking self-rules. Meeting the additional experimental criteria of establishing task relevance of the rules (Phase 2) and demon-

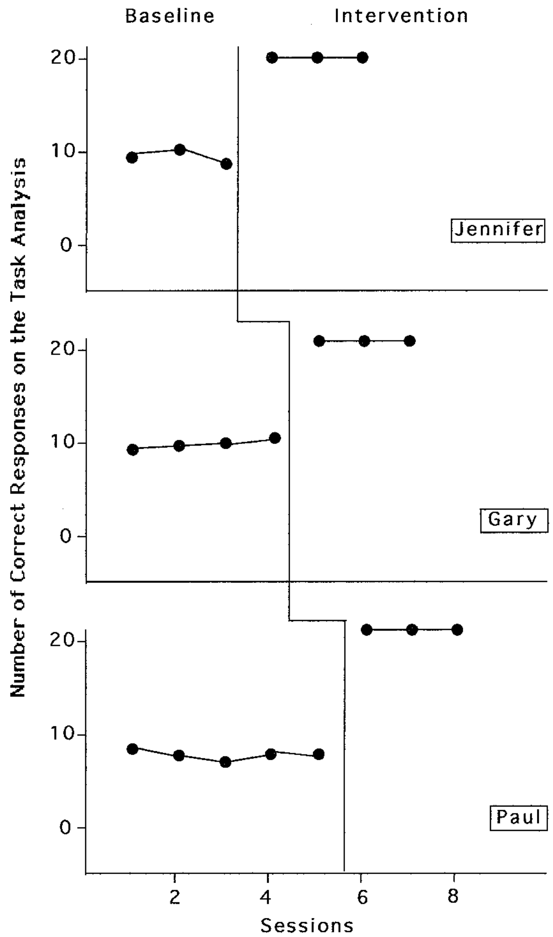

Figure 6. Number of correct responses for the 3 participants who received the self-instructions as external directives.

strating similar patterns of task analysis responding between overt and covert conditions provided compelling evidence of a functional relationship between self-rules and nonverbal behavior. These results are consistent with the results of basic research on the effects of self-generated rules on nonverbal behavior (e.g., Rosenfarb et al., 1992) and theoretical formulations of self-instruction (Luria, 1961; Skinner, 1945; Whitman, 1990).

Similiar findings occurred in the generalization settings, suggesting that the self-instructions mediated generalization (Stokes & Baer, 1977). Although it is not possible to determine precisely how such mediated generalization occurred, Skinner's theoretical writings suggest one possibility. Self-instructions might be conceptualized as self-echoic prompts or verbal statements that were repeatedly stated by participants and that served as verbal stimuli (Skinner, 1957). The participants' unprompted repetition of the self-instructions in the generalization settings may have guided behavior by continually prompting responding. Such an interpretation is consistent with Stokes and Baer's (1977) concept of mediated generalization, which regarded language as "meeting perfectly the logic of a salient common stimulus to be carried from any training setting to any generalization setting" (p. 362).

Although the present study represents an innovative means to conduct a functional analysis of private verbal self-regulation, there are a number of limitations. The first limitation is that our information concerning acquisition and continued use of self-instruction during covert and overt phases is incomplete. For example, the only data collected during covert phases related to task analysis responding. No self-instruction data were collected during these phases. In addition, our overt self-instruction data consisted of unprompted self-instruction statements. It is possible that subjects covertly self-instructed when responding correctly during overt self-instruction phases. The possible occurrence of covert self-instructions could account for discrepancies during overt phases between skill performance and overt self-instruction (e.g., during Session 13, Linda completed 21 steps of the task analysis but stated a problem only 18 times, stated a response 19 times, reported on her response 16 times, and self-acknowledged her response 17 times; see Figure 5). The objective of this study, however, was not to determine the precise use of covert self-instructions (which is technically impossible at present). The objective was to determine the effects of covert self-instructions on overt performance. This objective was achieved to the extent that it was possible to meet the three experimental criteria of our functional analysis.

A second limitation of the present study is the difficulty in attributing behavior change to the absence of self-instruction during the blocking phases. Although the intent of our experimental preparation was to demonstrate that prevention of self-instruction (overt and covert) reliably produced change in nonverbal behavior, it is possible that the change in task analysis responding was brought about not by the absence of self-instructions per se but by the effect of the blocking procedure (i.e., counting) on other nonverbal processes. For example, the possibility exists that counting either directly blocked task behavior or prevented subjects from attending to overt environmental cues that served as discriminative stimuli. A more cognitive explanation is that the blocking procedure prevented subjects from using covert visual cues (not produced by the self-instructions) to guide behavior.

A comparison of rates of responding during baseline and blocking conditions suggests an alternative explanation that is more consistent with the verbal regulation hypothesis (Whitman, 1990). Subjects' performances under baseline conditions and under blocking conditions (overt and covert) were highly correlated (i.e., responses in baseline conditions were very similar to those in the blocking conditions). It is possible that baseline responses and the responses that occurred during the self-instruction blocking conditions were automatic and therefore relatively free from rule-governing effects. Skinner (1974) referred to this type of behavior as skilled or contingency shaped. Those responses that were affected by the absence of self-instruction could be described as rule governed. Those responses that were not affected by the absence of the self-instructions could be described as contingency shaped. Steps taken to prevent self-instructions (rules) may therefore have produced significant behavior change in those responses that were rule governed. Alternatively, steps taken to prevent self-instructions may have had relatively little effect on the contingency-shaped behavior; as a result, this behavior was maintained.

One of the study's main effects (i.e., overt self-instruction increased task analysis responding), however, mitigates against this formulation. Previous research has demonstrated that task-relevant concurrent talk impairs contingency-shaped behavior but does not influence rule-governed behavior (Ericsson & Simon, 1984; Hayes, 1986). If the behavior that was not affected by the blocking exercises was contingency shaped, why was it not affected by the concurrent task-relevant talk during the overt instruction phase of the study? The preceding discussion illustrates the difficulties in determining the behavioral processes that are responsible for change in behavior during blocking phases of the experimental design. What those behavioral processes might be cannot be definitively determined from the present study. Thus, more research is needed to clarify the pertinent controlling variables. Future research might also consider the relevance of intrusions and errors. Verbal and nonverbal behaviors that were not programmed but were emitted might provide additional evidence about self-instructional control of behavior. For example, a person who says the wrong thing, or who says the right thing at the wrong time, and who behaves in a manner consistent with these verbalizations seems to provide strong evidence of self-instructional control of behavior.

The limitations of the present methodology reflect the difficulties encountered in any functional analysis of private events (see Hayes, 1993). Given these limitations, the findings should be considered preliminary. The results of the study do, however, present a potentially compelling case for the controlling properties of covert self-rules, and, as such, the present study should be considered to be an initial step toward a functional analysis of private verbal self-regulation.

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STUDY QUESTIONS

1. According to the authors, what three outcomes demonstrate functional equivalence between overt and covert self-rules?
2. What was done to control for the emergence of arbitrary self-rules? Why was this necessary within the context of the study?
3. What self-instruction statements were the participants taught to verbalize, and where did the statements occur?
4. Describe the sequence of procedures through which responding was brought under control of covert self-rules.
5. What was the purpose of the blocking procedure, and what did it entail?
6. What results were obtained during training and blocking?
7. Given that the participants engaged in a great deal of appropriate behavior prior to checking for control by covert self-rules, it is possible that performance during the covert self-rules phase was due to practice effects. What design manipulation might have controlled for this influence?
8. The authors noted that it is difficult to attribute performance decrements during the blocking phase to the absence of self-instruction. In other words, it is possible that blocking simply interfered with other nonverbal aspects of performance. How might this be tested?

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