A Functional Analysis of Response Contingent Full Physical Guidance

Richard J. Jackle
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A FUNCTIONAL ANALYSIS OF RESPONSE CONTINGENT
FULL PHYSICAL GUIDANCE

Richard J. Jackle, M. A.
Western Michigan University, 1981

Two experiments were conducted in this study of effects of full physical guidance (folding the subjects' hands) that was made contingent on a mechanically defined leg movement response. Two severely mentally impaired adolescents served as subjects. Experiment I compared the effects of baseline and contingent full physical guidance procedures upon the leg movement response. Experiment II compared the effects of several procedures incorporating full physical guidance to ones which developed operant baselines of leg movement responses. The results indicated that full physical guidance functioned as an evocative stimulus for Subject 1 and as mild reinforcement for Subject 2.
ACKNOWLEDGEMENTS

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I specifically want to thank Dr. Jack Michael, my committee chairperson, not only for his suggestion of the topic for this thesis but for his careful and considerate guidance of my master's degree program.

Richard J. Jackie
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CHAPTER I

INTRODUCTION

During the past several decades, numerous procedures have been developed to control human behavior, some by inclusion of reinforcing consequences (e.g., adult attention, food) or punishing consequences (e.g., time-out, shock, response cost) within the procedure. Others control behavior by altering antecedent conditions, changing the physical arrangement of the setting, presenting prompts (e.g., verbal prompts, gestural prompts, modeling), or moving the subject through part (graduated physical guidance) or all (full physical guidance) of the desired behavior.

In applied settings, a behavior control procedure is usually analyzed either in terms of its function as an antecedent or in terms of its function as a consequence. That is, a consequence delivered for one behavior is rarely analyzed in terms of its function as an antecedent for behaviors which follow it or its function as a consequence for other nontarget behaviors. Furthermore, an antecedent stimulus presented for one behavior is rarely analyzed in terms of its function as a consequence for behaviors it follows. A review of the published behavioral literature reveals that the multiple effects of full physical guidance (FPG) also have not been thoroughly investigated. However, the absence of a functional analysis of any procedure can lead to clinical problems.

FPG consists of a trainer manually moving a subject through the
topography of a desired response. Consequently, it is sometimes also referred to as manual guidance or "putting through." FPG and graduated physical guidance are distinguished by the amount of manual guidance provided by the trainer. When FPG is presented, the trainer provides complete manual guidance to the subject.

The subject does not complete any of the response components without the aid of trainer-provided manual guidance. On the other hand, when graduated physical guidance is presented, the trainer provides only as much manual guidance as is necessary to get the subject to respond correctly. Therefore, when graduated physical guidance is presented, it is possible, in some cases, for the subject to complete the final response components without much, if any, manual guidance.

FPG is a common component of procedures applied when teaching the handicapped. It has been used in combination with instructions and modeling (Brown, Bellamy, Perlmutter, Sackowitz, & Sontag, 1972; Cuvo, Leaf, & Borakove, 1978; Horner & Keilitz, 1975), shaping (Stokes, Baer, & Jackson, 1974), vibratory stimulation (Murphy & Doughty, 1977), food (Stokes et al., 1974), gestural prompts (McDonald, McCabe, & Mackle, 1977), and social reinforcement (Brown et al., 1972; Stokes et al., 1974). FPG has also been a part of procedures aimed at teaching the handicapped toothbrushing (Horner & Keilitz, 1975), wrapping index cards (Brown et al., 1972), janitorial skills (Cuvo et al., 1978), imitation (Baer, Peterson, & Sherman, 1967), instruction following (Whitman, Zakaras, & Chardos, 1971), controlled arm movements (Murphy & Doughty, 1977), greeting responses (Stokes et al., 1974), eating skills (McDonald et al., 1977), and discriminations (Close, Irwin,
There is a wide range of literature, as noted above, addressing the usefulness of FPG as an antecedent stimulus. Little or no information is available, however, concerning the function of FPG as a consequence (Desmond, Note 1). This is especially puzzling in light of two other bodies of behavioral literature. The first addresses the reinforcing function of tactile stimulation used alone or in combination with other stimuli. Bailey and Meyerson (1969) applied stimulation in the form of vibration of the bed of a profoundly retarded child to reinforce the child's lever pressing. Clements and Tracy (1977) presented contingent touch from a teacher to increase the rate of attending to math assignments. Clements and Tracy went on to find that teacher touch was even more effective at increasing the rate of attending to math assignments when it was combined with the teacher's verbal praise. Thomas, Becker, and Armstrong (1968) applied hand pats and embraces along with praise and smiles from a teacher to increase appropriate classroom behavior. Hall, Lund, and Jackson (1968) demonstrated that pats on the shoulder and verbal comments reinforced the study behavior of a group of regular education students. Tactile stimulation is a component of any FPG procedure. However, the function of FPG as a consequence has not been widely investigated (Desmond, Note 1), despite the existence of ample evidence to suggest that tactile stimulation functions as a consequence.

The second body of literature that makes the lack of information about FPG's function as a consequence puzzling is one which clearly indicates the importance of conducting a functional analysis whenever
any stimulus is used to alter behavior. Commonly applied procedures may not bring about typically predicted changes in behavior. For example, Burleigh and Marholin (1977) demonstrated that verbal prompts (generally considered as antecedent stimuli which will increase the probability of behaviors which follow them) actually increased the percentage of inappropriate behaviors which preceded them because they reinforced those inappropriate behaviors. This relationship was again demonstrated by Madsen, Becker, Thomas, Koser, and Plager (1968) when commands to "sit down" presented by a teacher led to increases in some inappropriate behaviors which the commands followed. Plummer, Baer, and LeBlanc (1977) showed that time-out led to an increase (not a decrease, as expected) in a targeted inappropriate behavior despite a validated reinforcement system in the time-in environment. Furthermore, Steeves, Martin, and Pear (1970) demonstrated that bar press responses of an autistic child increased when those responses produced 30 seconds of nonpresentation of the training task. Physical restraint is often used to decelerate inappropriate behaviors. Favell, McGimsey, and Jones (1978) used physical restraint, contingent upon increased periods of no self-injurious behavior and correct marble placement, to increase these behaviors in profoundly retarded, self-injurious individuals. Finally, the functional effect of a procedure upon collateral behaviors is important to carefully assess, as Epstein, Doke, Sajwaj, Sorrell, and Rimmer (1974) pointed out in their study of the side effects of over-correction. They discovered both desirable (decreases in collateral inappropriate vocal behaviors) and undesirable (increases in collateral inappropriate foot movements) side effects when overcorrection was made.
contingent upon one particular inappropriate behavior (inappropriate hand movements). It is clear, based on these studies, that the functional analysis of one procedure may demonstrate a range of potential outcomes.

One of the few studies, if not the only one, that assessed the effects of FPG as a consequence was conducted by Desmond (Note 1). In a pilot study, he evaluated FPG that was and was not followed by edibles and praise upon two instruction-following responses of a severely mentally impaired nursing home resident. The procedure consisted of the presentation of an instruction to touch a specific body part. When the subject emitted an approximation to following one of the instructions, the trainer guided him through the response (i.e., presented FPG) of touching the body part specified in the instruction. When the subject emitted an approximation to following the second of the two instructions, the trainer guided him through the response of touching the body part specified in the second instruction (i.e., presented FPG) and followed the FPG with the presentation of edibles and praise. The results indicated that FPG followed by edibles and praise led to an increase in the percentage of trials with correct instruction-following responses but FPG alone only resulted in a temporary increase in the percentage of trials with correct instruction-following responses. Therefore, for the subject of the pilot study, FPG functioned as mild reinforcement.

In his main study, Desmond (Note 1) evaluated FPG that was followed by edibles upon specified "intervening" responses of three severely mentally impaired nursing home residents. For two of the
subjects, the procedure consisted of the presentation of an instruction to touch a particular body part. The subjects never followed the instruction. When the subjects emitted an intervening response (i.e., vocalization and head nodding) after the presentation of the instruction, the trainer immediately guided the subject through the response (i.e., presented FPG) of touching a particular body part that had been described in the unfollowed instruction. The FPG was followed by the presentation of an edible. For the third subject, the procedure was similar to that used with the first two subjects except that FPG and edibles were presented on a differential reinforcement of other behavior (DRO) schedule. That is, when the subjects did not emit the intervening response (i.e., head shaking) for 10 seconds following the presentation of the instruction, the trainer immediately guided him through the response of touching the body part described in the unfollowed instruction.

The results of Desmond’s (Note 1) main study indicated that when FPG followed by edibles was made contingent upon the emission of an intervening response, the percentage of trials with intervening responses showed a sustained increase. On the other hand, when FPG followed by edibles was made contingent upon not emitting an intervening response, the percentage of trials with intervening responses showed a sustained decrease. It can be concluded, therefore, that FPG followed by edibles may, under certain circumstances, function as powerful reinforcement for certain responses.

The present study represents an attempt to extend the three bodies of literature previously mentioned. In particular, it was a
systematic replication of Desmond's (Note 1) research. An assessment was conducted of whether FPG presented alone (without being paired with other reinforcement) functioned as reinforcement for specific behavior of two severely mentally impaired subjects. FPG, in the form of moving a subject's hands to the folded position, was made contingent upon a leg movement response; and the resultant effects on the leg movement response were compared to those achieved when no stimulus change was made contingent upon a leg movement. As a result of preliminary analyses, it was hypothesized that, presented in this way, FPG would serve as reinforcement for the leg movement response of the two subjects. This appeared likely for three reasons. First, both were residents of nursing homes and, as such, were generally deprived of normal rates of physical contact. Second, these subjects often did not respond to the first presentation of an instruction during sessions but, instead, waited for subsequent presentation of physical guidance. Third, they frequently tended to use their hands to reach and touch staff members working with them. The latter two reasons were based on subjective observations by the experimenter and school staff members familiar with the two subjects.
CHAPTER II

EXPERIMENT I

Overview

The first experiment represented an attempt to evaluate whether FPG, presented alone and contingent upon a leg movement response, would serve as reinforcement for that leg movement response. The experiment was designed based on the assumption that the leg movement response targeted was a valid operant response for the experimental question and that a simple reversal design comparing the rate and duration of leg movements during baseline (no special contingency) conditions to those during contingent FPG conditions was sufficient to determine if FPG functioned as reinforcement.

Method

Subjects

Two subjects served in Experiment I. During the day, both attended the special education Severely Mentally Impaired (SMI) Program at Croyden Avenue School operated by the Kalamazoo Valley Intermediate School District, Kalamazoo, Michigan. Both were residents of area nursing homes for the severely handicapped. Subject 1 was a 19-year-old SMI woman who was partially ambulatory. She exhibited some spastic motor behavior and little verbal behavior. She frequently engaged in self-stimulatory behavior which involved the hands, face, and/or objects.
She tended to show a preference for being touched on the hands and face by others rather than being touched elsewhere on the body. During instructional sessions, she often waited for physical guidance to be presented before she responded to training tasks. Preliminary observations made by this researcher also indicated that she would occasionally swing her left leg when her foot was not resting on the floor. Subject 2 was a 17-year-old hydrocephalic SMI young man who was partially ambulatory. He wore a brace on the lower part of each leg. He did not exhibit vocal verbal behavior. He frequently engaged in self-stimulatory behavior including body swaying, leg swinging, hand flapping, and self-stimulatory toy play. He often reached out with his hands in order to touch or grab the hands of trainers during instructional sessions. During those sessions, he also tended to wait for physical guidance to be presented before he responded to the task.

Setting

The experiment was conducted at the Severely Mentally Impaired (SMI) Program, Croyden Avenue School, Kalamazoo, Michigan. Sessions were conducted in a corner of an open classroom. Other sessions and activities were going on nearby, although the subjects' view of the rest of the classroom was limited since they were seated facing a corner. For each subject, sessions were run twice a day, five days a week, Monday through Friday, when school was in session. The two sessions were run sequentially during the same hour of each day. Each occurred at approximately the same time each day. Attempts were made to standardize the schedule of activities before and after each of the experimental
sessions in order to control for the types and amount of stimulation each subject received just prior to experimental sessions. Subject 1's typical schedule consisted of: 9:30 - 9:40 a.m., toileting; 9:40 - 9:50 a.m., standard instructional session; 9:50 - 9:55 a.m., set up for experimental session one; 9:55 - 10:05 a.m., experimental session one; 10:05 - 10:15 a.m., toileting; 10:15 - 10:20 a.m., set up for experimental session two; 10:20 - 10:30 a.m., experimental session two. Subject 2's typical schedule was the following: 10:30 - 10:45 a.m., standard instructional session; 10:45 - 10:50 a.m., set up for experimental session one; 10:50 - 11:00 a.m., experimental session one; 11:00 - 11:15 a.m., standard instructional session; 11:15 - 11:20 a.m., set up for experimental session two; 11:20 - 11:30 a.m., experimental session two. Standard instructional sessions consisted of educational tasks that were arranged so the trainer did not need to physically guide the subject.

Trainers were Western Michigan University practicum students who worked with the subject throughout the hour blocks previously described. Each subject had a different trainer. The trainers stood in front of the subject who was seated in the special apparatus (see apparatus section that follows) during all conditions.

Apparatus

Equipment was designed to record movements of the left leg. The subject was seated in a chair that was placed on a 1 ft. high wooden platform. Attached to the front of the platform were two adjacent vertical sections. Each vertical section was narrowly structured so
that it could contain the respective knee, lower leg, and shoed foot; but little lateral move was possible. The right foot rested on a horizontal board placed in the right vertical section. The left foot dangled off the floor within the left vertical section so that the subject could move it without resistance. The primary movement possible with the left leg was a forward swing from the knee of the lower leg and foot. Velcro straps were employed to maintain the subject's left leg in a constant position relative to a microswitch against which the left ankle rested when not moving. This also insured that the same amount of effort was required for each leg movement response. A string attached inside the left vertical section and in front of the left knee was used to gauge whether or not the subject was properly positioned before and after each session.

Three microswitches and a standard event recorder were used to record data. A leg movement response was recorded when the microswitch, attached to a flat vertical plate, which the back of the subject's ankle rested against, was opened. When the subject was seated in the apparatus and the left foot and lower leg was still, the leg was bent at approximately a 90° angle at the knee; and the microswitch was closed. When the subject's left leg moved forward about .25 in. (6.35 mm) and/or the left knee moved up about .5 in. (12.70 mm), the microswitch would open; and a response was recorded on one of the three pens of the event recorder located in a distant room. This response was also recorded on a counter located near the chair. A second microswitch was connected to a foot pedal that was operated by the trainer to record the implementation of FPG. A mechanical counter was attached to the.
foot pedal. Counter readings were used to determine the number of FPG presentations. A third hand operated microswitch was used to designate the beginning and end of each session and to make reliability recordings. The second and third microswitches were connected to the same event recorder used to record leg movement responses.

A lap board was placed in front of the subject so it rested on top of the two vertical leg sections and so the subject could not see his/her legs. Two .5 in. (12.70 mm) diameter dots were placed on the lap board. They were approximately 1 ft. (.30 m) apart, and each was about 1.5 ft. (.46 m) from the subject's stomach. The dots were used as the standard place to fold the subject's hands when FPG was presented.

Data Recording

Two dependent measures were recorded. The primary measure was the number of leg movements per minute during each session. A leg movement was recorded on the event record and the counter whenever the subject's leg moved such that the microswitch behind the left leg opened. The total number of leg movements per session registered on the counter was divided by the exact length of the session in minutes to yield the rate of leg movements per minute. The trainer used the hand operated microswitch to make marks on the event record which designated the beginning and ending of each session. Exact session length was calculated based on measurement of the distance between the marks in millimeters. The event record paper moved at a rate of 1 mm per second so the total length of a session in minutes was equivalent to the number of
millimeters divided by 60.

The second dependent measure was the total duration of all leg movements within a session. Each leg movement caused the event record pen to be displaced upward for as long as the microswitch behind the leg remained open. The distance in millimeters of each displacement was then calculated by measurement of the event record. Individual distances were summed to determine the total distance for the session. The total distance was then divided by 60 to determine the total duration in minutes that the leg was away from the microswitch (i.e., that the microswitch was open) during a session.

Decisions with regard to the stability of the data and condition changes were based solely on the primary dependent measure, rate of leg movements per minute. Stability was based on visual assessment of the graphic display of the rate measure.

After completion of the experiment, a third measure, "corrected rate," was calculated. This was equal to the number of leg movements per session divided by the "corrected" session duration. The corrected session duration was equal to the session duration minus the total duration of leg movements in the session.

Reliability

Reliability checks were conducted on equipment operation. Inter-observer agreement checks were conducted on implementation of the independent variable and accuracy of data recording from event records.

The event recorder was checked for the rate of paper movement approximately once each phase. The event recorder was run for 60 seconds,
and the record was measured. All checks indicated a constant rate of 1 mm per second.

Once a week, all microswitches, counters, and event pens were operated a known number of times prior to running a session in order to check for one-to-one correspondence between each microswitch opening/closing, counter tallies, and event pen records. All checks indicated complete correspondence of relevant mechanisms.

The experimenter checked the implementation of FPG two times during each of the two FPG conditions for Subject 1 and three times during the one FPG condition for Subject 2. During these checks, the experimenter used the hand operated microswitch to record each FPG presentation. The trainer's operation of the foot pedal was not visible to the experimenter. Percentage agreement on FPG implementation was calculated by dividing the lowest number of FPG presentations for the session by the highest number of FPG presentations for the same session and multiplying by 100. Interobserver agreement on implementation of FPG was 100% for all checks.

A third person measured the session and leg movement durations from one session with a relatively high and one session with a relatively low rate of leg movements within each phase. Interobserver agreement was calculated by dividing the lowest duration measure by the highest duration measure and multiplying by 100. Agreement on session duration averaged 99.9% and ranged between 99% and 100%. Agreement on the duration of leg movements averaged 90% and ranged between 71% and 100%.
Design and Procedures

A reversal design was employed in Experiment I for both subjects. For Subject 1, an ABAB design was employed; and for Subject 2, an ABA design was used. Two procedures were applied to each subject. The independent variable was the presence versus the absence of FPG. FPG was initiated when the trainer used his/her left hand to grasp the subject's right hand and his/her right hand to grasp the subject's left hand. Grasping occurred such that the palm of the appropriate trainer hand touched the palm of the appropriate subject hand. The subject's hands were then slowly moved from wherever they were located toward one of the uncovered dots located on the lap board. If the subject's hands were already folded and/or covering one of the dots, they were unfolded and moved to the most distant of the two dots. Once near the dot, the trainer placed the subject's hands into the folded position such that one was palm down on the lap board and the other was palm down on top of the first hand. Each presentation of FPG took approximately 3 to 5 seconds. The trainer recorded each presentation of FPG as it occurred with the foot pedal described previously. The foot pedal was depressed as soon as the trainer grasped the subject's hands and was released as soon as the subject's hands were released.

Contingent FPG was the second type of procedure applied. The trainer presented FPG whenever the onset of a leg movement occurred. The trainer discriminated onsets through use of a light that flashed momentarily when the leg movement began (i.e., when the microswitch first opened). Each leg movement was followed immediately by FPG. An exception to this occurred whenever FPG was being presented and the
onset of another leg movement was indicated by the onset of the light. In such cases, the trainer ignored the additional leg movement(s) and completed presentation of FPG. After completion of the previous FPG presentation, a new FPG presentation occurred as soon as another leg movement was indicated.

Results

Figure 1 shows the rate and duration of leg movements for Subjects 1 and 2. Table 1 summarizes the rate, corrected rate, and duration of leg movements in terms of their respective medians and ranges for each phase and for both subjects.

Subject 1

Compared to the first baseline, the rate was lower during the first contingent FPG phase. The duration was generally lower compared to the first baseline, but it remained variable. Implementation of the second baseline led to partial recovery of the rates and durations established during the first baseline. When the second contingent FPG phase was implemented, both the rates and durations were generally higher compared to the first contingent FPG phase but generally lower compared to the second baseline.

The corrected rate was plotted but not shown in Figure 1. When plotted, it closely mimicked the rate shown in the figure. Possibly significant deviations from the plotted rate occurred when the duration was relatively high. During each session, the corrected rate was higher than the plotted rate. This was most apparent during the baselines.
CONSECUTIVE SESSIONS

Fig. 1. Rate and duration of leg movements for Subjects 1 and 2 during two procedures, baseline and contingent FPG (C/FPG).
Table 1

Median and Range of the Rate, Corrected Rate, and Duration for Leg Movements of Subject 1 and 2 during Experiment I

<table>
<thead>
<tr>
<th>Phase</th>
<th>Rate&lt;sup&gt;a&lt;/sup&gt; Median (Range)</th>
<th>Corrected Rate&lt;sup&gt;b&lt;/sup&gt; Median (Range)</th>
<th>Duration&lt;sup&gt;c&lt;/sup&gt; Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>3.74 (.50 - 8.67)</td>
<td>3.74 (.50 - 14.28)</td>
<td>.74 (.08 - 5.20)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>.42 (.10 - 1.71)</td>
<td>.42 (.10 - 2.40)</td>
<td>.06 (.02 - 4.33)</td>
</tr>
<tr>
<td>Baseline</td>
<td>2.00 (.20 - 13.08)</td>
<td>2.00 (.20 - 18.80)</td>
<td>.34 (.02 - 5.00)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>.80 (0 - 8.18)</td>
<td>.80 (0 - 9.90)</td>
<td>1.25 (0 - 2.07)</td>
</tr>
<tr>
<td>Subject 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>.10 (0 - 17.00)</td>
<td>.10 (0 - 31.50)</td>
<td>.41 (0 - 5.03)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>.12 (0 - .40)</td>
<td>.12 (0 - .40)</td>
<td>.02 (0 - .07)</td>
</tr>
<tr>
<td>Baseline</td>
<td>.37 (0 - 5.02)</td>
<td>.37 (0 - 6.34)</td>
<td>.08 (0 - 2.17)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Rate is expressed in leg movements per minute.

<sup>b</sup>Corrected rate is expressed in leg movements per minute.

<sup>c</sup>Duration is expressed in minutes.
Subject 2

The rate and duration were lower during the contingent FPG phase compared to both baselines. The rate and duration were near zero during the last seven sessions of the first baseline and continued at that level through the entire contingent FPG phase and through the first seven sessions of the second baseline.

The corrected rate for Subject 2 had the same characteristics as the corrected rate for Subject 1. It mimicked the plotted rate and was higher during sessions when the duration was relatively high.

Discussion

Results of Experiment I showed that contingent FPG did not have a clear cut functional effect upon either the rate, corrected rate, or duration of leg movements for either subject. It did not function as powerful reinforcement because implementation of contingent FPG did not result in consistent increases in the rate, corrected rate, or duration of leg movements as compared to baseline. In fact, the data indicated that during contingent FPG conditions responding, especially in terms of the rate, was lower overall than during baselines. This led to several tentative conclusions about possible causes for the results. First, contingent FPG could have functioned as punishment to suppress the rate of leg movements relative to baselines. Second, contingent FPG could have functioned as a stimulus change that evoked behavior incompatible with leg movements (i.e., sitting still behaviors). Third, especially in the case of Subject 2 (whose leg movements were near zero on all three
dependent measures for seven sessions before, all sessions during, and seven sessions after contingent FPG), it was possible that the leg movement response was not an appropriate operant for the purpose of this experiment.
CHAPTER III

EXPERIMENT II

Overview

Experiment II was a systematic replication of Experiment I. Experiment I was designed to demonstrate that FPG in the form of folding a subject's hands contingent upon a leg movement could function as reinforcement for that leg movement. The results from that study, however, were unclear. For one subject, it was possible to conclude that FPG functioned either as punishment or as a prompt which evoked behaviors incompatible with leg movements. For the second subject, the function of FPG as a consequence could not be readily demonstrated due to cellor effects. Furthermore, it was not clear for either subject whether the experimental question could be adequately answered using the targeted leg movement response since little operant control of that response had been demonstrated in Experiment I. Therefore, Experiment II was designed, in part, to evaluate whether the leg movement response was a valid operant to use for evaluating the consequent function of FPG. That is, procedures other than FPG were applied contingent upon leg movements in an effort to demonstrate operant control over leg movement responses. In addition, development of a moderate operant rate of leg movement would enable subsequent applications of FPG to result either in increases or decreases in the rate of leg movements and make possible the demonstration that FPG functioned as reinforcement, punishment, or an evocative stimulus change.
To these ends, a reversal design was used to evaluate a variety of procedures. However, strict adherence to an ABA-type reversal design was abandoned in favor of the systematic application of procedures which were logical outgrowths of whatever results had been attained up to that point. Therefore, the length and order of application of the procedures were dependent upon the extent of the change in rate of leg movements.

Method

Subjects, Setting, and Apparatus.

The subjects, setting, and apparatus for Experiment II were the same as used in Experiment I with a minor exception. When Subject 2's schedule permitted (the first 27 sessions), four sessions per day were run instead of the typical two per day. The extra two sessions were run in the afternoon while the first two sessions were run in the morning on the same schedule as in Experiment I. The afternoon sessions were run during a 45-minute time block because the subject's other educational activities precluded use of a longer time block. Subject 2's typical schedule during this 45-minute time block was: 1:30 - 1:35 p.m., set up for experimental session; 1:35 - 1:45 p.m., experimental session three; 1:45 - 2:00 p.m., subject sits at table in classroom; 2:00 - 2:05 p.m., set up for experimental session four; 2:05 - 2:15 p.m., experimental session four.

Data Recording

Data recording methods and the dependent measures for Experiment II
were identical to those in Experiment I. The primary dependent measure was still the number of leg movements per minute, and the secondary measure was still the total duration of all leg movements within a session. Corrected rate was calculated following completion of Experiment II in the same manner described in Experiment I.

Some leg movements were primed. Responses that occurred as a result of a prime or three seconds after the prime were not counted in the total number of responses for the session.

Reliability

Reliability checks on equipment operation were conducted in the same manner described in Experiment I. All checks indicated complete correspondence of relevant mechanisms and a constant rate of 1 mm per second for the event recorder.

Interobserver agreement checks on the accuracy of data recording from event records were carried out as in Experiment I. Agreement on session duration averaged 99% and ranged between 87% and 100%. Agreement on the duration of leg movements averaged 94% and ranged between 75% and 100%.

Interobserver agreement checks on the implementation of FPG were conducted as in Experiment I. Checks were conducted once during each of the escape/avoidance conditions for Subject 1 and twice during each of the contingent FPG conditions for Subject 2. Agreement was 100% for all checks.
Design and Procedures

During Experiment II, both the design and procedures applied to each subject were individualized. The design and procedures will, therefore, be described separately for each subject.

Subject 1

Seven different procedures were applied to Subject 1. The procedures were arranged to incorporate a reversal, resulting overall in an ABCBDEFG design.

The first procedure applied (Phase A) was contingent edibles and attention. This procedure was used to determine whether the leg movement response was a valid experimental operant. The procedure was basically a shaping procedure. The presentation of touches to the face and shoulder, vocal praise, and a small piece of cereal or snack food were made contingent upon independent (unprimed) leg movements. If an independent leg movement did not occur for 15 consecutive seconds, a prime was presented. When primes were presented, the trainer moved the subject's leg out and away from its resting place against the micro-switch and immediately presented physical contact, praise, and edibles as presented for independent responses. No primes were given during the first minute of each session in order to reinforce independent leg movements from the outset of the session when possible. Primes were gradually faded as the number of independent responses within a session increased.

The contingent face and hand contact procedure was also designed
to determine whether the leg movement response was a valid experimen-
tal operant. It was applied during the second phase (B₁) and fourth
phase (B₂). Each independent leg movement was followed by five seconds
of contact to the subject's face and/or hands by one of the trainer's
hands and wrists. The trainer placed the subject's hands around one
of her own wrists and simultaneously rubbed the subject's cheek gently
with the back of the same hand. If independent responses did not occur
for 30 consecutive seconds, a prime (identical to those presented in
the contingent edibles and attention procedure) was presented. Primed
leg movements were immediately followed by five seconds of the same
face and hand contact presented for independent leg movements. If an
independent leg movement did not occur immediately at the start of the
session, a prime was delivered.

Contingent FPG was used in the third phase (C) and was identical to
the contingent FPG procedure in Experiment I.

Contingent FPG plus contingent face and hand contact was applied
during the fifth phase (D). It was basically a combination of two pre-
viously described procedures, namely contingent FPG and contingent face
and hand contact. Four leg movements were primed during each session.
Primes were presented approximately every two and one-half minutes.
Primes were delivered as in the contingent edibles and attention pro-
cedure. Immediately following the primed leg movement, the trainer
presented face and hand contact as in the contingent face and hand con-
tact procedure and continued to do so for approximately 10 seconds.
Any leg movements that occurred after discontinuation of a 10-second
presentation of face and hand contact were immediately followed by
FPG as described in the contingent FPG procedure. The use of this particular combination of procedures was based upon the assumption that the face and hand contact component would increase the number of leg movements within each session and, thus, provide a greater number of opportunities to consequate independent leg movements with FPG than was possible during sessions where contingent FPG was used alone.

The sixth phase (E) consisted of baseline procedures that were identical to the baseline procedures in Experiment I.

In the seventh phase (F), the procedure used was escape/avoidance I. FPG, exactly like that delivered during contingent FPG procedures, was presented every 10 seconds. When a leg movement occurred during the presentation of FPG, the trainer immediately terminated FPG and did not initiate another presentation until 15 seconds had passed without a leg movement. When a leg movement occurred following (but not during) a presentation of FPG, the next FPG presentation was delayed for 15 seconds. This procedure was designed to determine if FPG functioned as an aversive stimulus.

Escape/avoidance II was the procedure applied in the eighth (G) and final phase. It was identical to escape/avoidance I except that FPG was presented every five seconds, leg movements that occurred during FPG presentation terminated the presentation for 20 seconds, and leg movements that occurred following a FPG presentation delayed the next presentation for 20 seconds.

Subject 2

Five different procedures were applied to Subject 2. The design
consisted of the application of a series of procedures ending in a reversal. Overall, this resulted in an ABCDED design.

In the first phase (A), the procedure applied was escape/avoidance. This was identical to escape/avoidance I used with Subject 1 except that leg movements that occurred during a FPG presentation terminated the presentation for 10 seconds and leg movements that occurred following a FPG presentation delayed the next presentation for 10 seconds.

Primed contingent FPG was used during the second phase (B). A leg movement was primed once every minute in a manner identical to that described in the contingent edibles and attention procedure for Subject 1. FPG was presented immediately following primed and unprimed leg movements in a manner identical to that described in Experiment I.

A third phase (C) consisted of a shaping procedure and was designed to determine if the leg movement response was a valid experimental operant. Leg movements were primed every 15 seconds and immediately followed by vocal praise, touches to the shoulder and chest, and a small piece of cereal or sip of pop. Independent leg movements were consequated in the same way. During the first eight sessions, consequation for independent leg movements was presented on an FR-1 schedule. During the next 11 sessions, consequation for independent leg movements was presented on a VR-2.5 schedule. Consequent for independent leg movements was again presented on a FR-1 schedule following the 11th session. Primes for leg movements were faded within and across sessions as the number of independent leg movements increased within and across sessions.

During the fourth phase (D1) and sixth phase (D2), contingent FPG
was applied. This was identical to the contingent FPG procedures used in Experiment I.

Differential reinforcement of incompatible behavior - FPG (DRI/FPG) was used in the fifth phase (E). This was similar to the contingent FPG procedure except that each presentation of FPG was contingent upon a specified duration of time during which the subject's leg was against the microswitch such that it did not open (i.e., such that a leg movement did not occur). The time criterion for FPG delivery was begun at three seconds and was gradually lengthened to 10 seconds by the fifth session. It remained at 10 seconds for the rest of this condition.

Results

Figure 2 shows the rate and duration of leg movements for Subjects 1 and 2. Table 2 summarizes the rate, corrected rate, and duration of leg movements in terms of their respective medians and ranges in each phase for Subject 1. Table 3 summarizes similar data for Subject 2.

Subject 1

The rate and duration of leg movements was highest during the two contingent face and hand contact phases. On the other hand, the rate and duration was lowest during the contingent FPG phase. When the contingent FPG plus contingent face and hand contact procedure was implemented, the rates and durations were higher than in the contingent FPG phase but considerably lower compared to either of the contingent face and hand contact phases.
Fig. 2. Rate and duration of leg movements during seven procedures for Subject 1 and five procedures for Subject 2. For Subject 1, the procedures were contingent edibles and attention (C/EA), contingent face and hand contact (C/FH), contingent FPG (C/FPG), contingent FPG plus contingent face and hand contact (C/FPG + C/FH), baseline, escape/avoidance I (E/A-I), and escape/avoidance II (E/A-II). For Subject 2, the procedures were escape/avoidance (E/A), primed contingent FPG (PC/FPG), shaping, contingent FPG (C/FPG), and differential reinforcement of incompatible behavior FPG (DRI/FPG). "P's" that occur behind any of the above symbols indicate that primes were used throughout the phase in conjunction with the described procedure.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Rate$^a$ Median (Range)</th>
<th>Corrected Rate$^b$ Median (Range)</th>
<th>Duration$^c$ Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingent edibles and attention</td>
<td>1.74 (0 - 4.91)</td>
<td>1.74 (0 - 5.35)</td>
<td>.25 (0 - 1.12)</td>
</tr>
<tr>
<td>Contingent face and hand contact</td>
<td>5.00 (.93 - 11.50)</td>
<td>8.00 (1.2 - 50.52)</td>
<td>2.74 (.17 - 10.07)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>.24 (0 - .40)</td>
<td>.24 (0 - .40)</td>
<td>.03 (0 - .05)</td>
</tr>
<tr>
<td>Contingent face and hand contact</td>
<td>5.74 (.20 - 11.27)</td>
<td>6.24 (.20 - 16.52)</td>
<td>1.37 (.03 - 4.52)</td>
</tr>
<tr>
<td>Contingent FPG plus contingent</td>
<td>2.24 (.97 - 2.60)</td>
<td>3.50 (1.04 - 2.87)</td>
<td>.65 (.23 - 1.42)</td>
</tr>
<tr>
<td>face and hand contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>.54 (0 - 2.20)</td>
<td>.54 (0 - 2.24)</td>
<td>.14 (.02 - 4.30)</td>
</tr>
<tr>
<td>Escape/avoidance I</td>
<td>.22 (0 - 1.39)</td>
<td>.22 (0 - 23.00)</td>
<td>.22 (0 - 9.42)</td>
</tr>
<tr>
<td>Escape/avoidance II</td>
<td>.30 (0 - 9.27)</td>
<td>.30 (0 - 9.90)</td>
<td>.08 (0 - .85)</td>
</tr>
</tbody>
</table>

$^a$Rate is expressed in leg movements per minute.

$^b$Corrected rate is expressed in leg movements per minute.

$^c$Duration is expressed in minutes.
Table 3
Median and Range of the Rate, Corrected Rate, and Duration for Leg Movements of Subject 2 during Experiment II

<table>
<thead>
<tr>
<th>Phase</th>
<th>Rate(^a) Median (Range)</th>
<th>Corrected Rate(^b) Median (Range)</th>
<th>Duration(^c) Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escape/avoidance</td>
<td>.10 ( .09 - 1.55)</td>
<td>.10 ( .09 - 1.58)</td>
<td>.10 ( .02 - .22)</td>
</tr>
<tr>
<td>Primed contingent FPG</td>
<td>.07 ( 0 - .10)</td>
<td>.07 ( 0 - .10)</td>
<td>.07 ( 0 - .02)</td>
</tr>
<tr>
<td>Shaping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>5.42 ( .42 - 17.64)</td>
<td>9.44 ( .43 - 82.40)</td>
<td>3.42 ( .13 - 9.40)</td>
</tr>
<tr>
<td>FR-1 (session 9-16)</td>
<td>3.50 ( .42 - 9.64)</td>
<td>5.00 ( .43 - 14.38)</td>
<td>2.50 ( .13 - 3.89)</td>
</tr>
<tr>
<td>VR-2.5 (session 17-27)</td>
<td>2.32 ( .95 - 5.54)</td>
<td>2.66 (1.00 - 6.95)</td>
<td>.10 ( .50 - 3.12)</td>
</tr>
<tr>
<td>FR-1 (session 30-52)</td>
<td>9.42 (3.76 - 17.66)</td>
<td>21.66 (4.50 - 82.40)</td>
<td>5.50 (1.73 - 9.40)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>6.24 (2.77 - 11.35)</td>
<td>9.28 (4.33 - 22.03)</td>
<td>2.66 (1.48 - 8.37)</td>
</tr>
<tr>
<td>DRI/FPG</td>
<td>1.30 ( 0 - 8.74)</td>
<td>1.41 ( 0 - 13.40)</td>
<td>.78 ( 0 - 4.52)</td>
</tr>
<tr>
<td>Contingent FPG</td>
<td>4.12 ( 0 - 16.43)</td>
<td>5.74 ( 0 - 22.64)</td>
<td>1.32 ( 0 - 3.97)</td>
</tr>
</tbody>
</table>

\(^a\)Rate is expressed in leg movements per minute.
\(^b\)Corrected rate is expressed in leg movements per minute.
\(^c\)Duration is expressed in minutes.
The rate and duration decreased during the baseline phase compared to the previous phase (i.e., contingent FPG plus contingent face and hand contact) and continued to do so throughout the escape/avoidance I phase. This trend continued with the exception of six sessions during which the rate was comparable to that in the contingent face and hand contact phases.

The corrected rate was plotted but not shown in Figure 2. When plotted, it closely mimicked the rate shown in the figure. Possibly significant deviations from the plotted rate occurred when the duration was relatively high. During such sessions, the corrected rate was higher than the plotted rate. The most noticeable differences of this sort occurred in the contingent face and hand contact phases and during the sixth session of the escape/avoidance I phase.

Subject 2

The rate and duration of leg movements was lowest during the first two phases, escape/avoidance, and primed contingent FPG.

During the third phase (i.e., shaping), the rate and duration showed an overall upward trend. Table 3 separately lists the medians and ranges for both applications of the FR-1 schedule and the single application of the VR-2.5 schedule during the shaping phase. The medians and ranges for the entire phase are also listed. The FR-1 schedules led to an upward trend in the rate and duration. The VR-2.5 schedule led to a downward trend in those measures.

Compared to the final application of the FR-1 schedule during the shaping phase, the rate and duration decreased during the first contin-
gent FPG phase. Responding was lower during the DRI/FPG phase compared to both contingent FPG phases. Responding during the second contingent FPG phase was slightly lower and more variable than during the first contingent FPG phase.

The corrected rate was again plotted but not shown in Figure 2. It closely mimicked the rate shown in the figure except during the final FR-1 schedule of the shaping phase. Table 3 shows that under this schedule the median and range for the corrected rate were much greater than that for the plotted rate. In fact, the corrected rate showed an overall upward trend toward the upper limit of the range during the entire second FR-1 schedule. Other upward deviations from the plotted rate were not nearly as significant but occurred when the rate and duration were relatively high. This type of difference was most apparent during the two contingent FPG phases.

Discussion

The results of Experiment II demonstrate that contingent FPG functioned as an evocative stimulus change for Subject 1 and as mild reinforcement for Subject 2. It did not function as punishment for either subject. Furthermore, the leg movement response was clearly a valid experimental operant for Subject 2 but was more difficult to operantly control for Subject 1.

In general, there was little consistent correlation between the rate and duration of leg movements. Additionally, the contingencies in all procedures were placed on the onset of leg movements. For these two reasons, discussion will focus on the rate and corrected rate but
not the duration of leg movements.

In the case of Subject 1, operant control was not adequately established with edibles and attention, contrary to what was expected. More control over the rate of leg movements was possible with the contingent face and hand contact procedure. This procedure may have functioned both as reinforcement for leg movements and to evoke leg movements. The data did not clearly demonstrate which way the procedure functioned, but observations of sessions by the experimenter led to either conclusion. Leg movements often occurred in a chain that consisted of several to many and were often associated with self-stimulatory behaviors that consisted of the subject's repeatedly squeezing and hugging the trainer's hand as the face and hand contact was presented. This self-stimulatory behavior caused the subject's body, including the leg, to move. Hand and face contact was ongoing during these behaviors so it was impossible to determine whether the contact served to evoke general body and leg movements and/or served as reinforcement for preceding leg movements. In either case, the response rates that resulted from the face and hand contact procedure provided a baseline for comparing the effect of FPG when it was presented in other procedures.

That contingent FPG functioned for Subject 1 as an evocative stimulus for behavior incompatible with leg movement and not as punishment can be inferred from several aspects of the data. First, when applied alone, it resulted in zero or near zero rates and durations of responding. Second, when presented in combination with the face and hand contact procedure, rates and durations resulted that were intermediate to
either component of the procedure presented alone. Third, the results achieved in Experiment II during the contingent FPG phase were similar to the results achieved in Experiment I when the same procedure was used and, thereby, reproduced those effects. Four, when FPG was presented on a schedule that provided for its termination or postponement contingent upon a leg movement (i.e., escape/avoidance I and II), the rate of leg movements did not systematically increase but generally remained low. If FPG had functioned as punishment, the rate of leg movements during one or both of the escape/avoidance phases would have been expected to have increased.

In the case of Subject 2, operant control over the leg movement response was adequately demonstrated during the shaping phase which indicated that the response was a valid operant for experimental purposes. This was especially evident when the corrected rate was analyzed during the final FR-1 schedule of the shaping phase. During this part of the phase, the corrected rate was extremely high compared to any other part of the study. A decision to implement the shaping procedure was made after continued failures to demonstrate operant control over Subject 2's leg movements, both in the first two conditions of Experiment II and throughout Experiment I.

The intermediate rates achieved for Subject 2 during both contingent FPG conditions and the relatively low rates achieved during the DRI/FPG procedure where the contingency on leg movements was reversed provide strong evidence that FPG functioned as reinforcement for this subject. This conclusion was further supported by the analysis of the corrected rate which was higher than the plotted rate during much of
the two contingent FPG phases but almost identical to the plotted rate during the DRI/FPG phase.

Therefore, the results of Experiment II helped clarify the conclusions of Experiment I.
CHAPTER IV

GENERAL DISCUSSION

The general purpose of the present experiment was to evaluate the function of FPG when it was presented as a consequence. At the outset of Experiment I, it was hypothesized that FPG would function as reinforcement for the subjects selected. However, the results of that experiment were unclear. Experiment II was conducted in an attempt to further evaluate how FPG functioned as a consequence.

Based on the results of both experiments, the following conclusions are reasonable:

1. FPG may function as reinforcement for a particular behavior of some subjects.

2. FPG may function as an evocative stimulus for certain behavior of some subjects.

3. Adequate evaluation of the function of a particular stimulus change may not be possible prior to the development of substantial operant baselines with consequences that have previously demonstrated functions.

4. The duration and rate of a behavior may not show high degrees of correlation due to the characteristics of the behavior topography.

FPG was not a very potent form of reinforcement for Subject 2's leg movements. It did not increase the low baseline rates in Experiment I. In Experiment II, it only maintained a moderate rate of leg movement which had been previously increased as a result of a shaping procedure. Future studies might, therefore, investigate the conditions under which some subjects require a history of reinforcement with
regard to a particular behavior before FPG functions as reinforcement for that behavior.

FPG may have functioned as an evocative stimulus for Subject 1 because of her history with regard to the particular response topography (i.e., hand folding) for which FPG was delivered. This subject demonstrated an extreme amount of compliance with the physical guide to the point of keeping her hands folded at the spot they had been placed for long durations, sometimes as much as three or four consecutive minutes at a time. She even dozed off while in this position. A plausible explanation for these facts may be found in the way instructional sessions had been run with her in the past. FPG in the form of hand folding may have been the first component of a chain of tutor and subject behaviors which included the subject's sitting still behavior. During sessions when self-stimulatory behaviors occurred (which may have included leg movements), the tutor probably waited for them to stop and/or folded the subject's hands on the table in front of her. Trial presentation and subsequent reinforcement for correct responding or approximations followed cessation of the self-stimulatory movements. That is, hand guidance may have become a stimulus in the presence of which sitting still behavior was reinforced. Observations of typical procedures conducted with this and similar subjects support this hypothesis, as do the observations by the subject's classroom staff members who reported that she typically showed low rates of self-stimulatory behaviors during instructional sessions. An important future study in this area would concern how FPG may come to function as an evocative stimulus for sitting still. Results of such studies could be applied to
similar subjects in order to condition FPG as an evocative stimulus in appropriate situations.

One of the major findings of Experiments I and II concerned methodology rather than functional relationships. It was clear from Experiment I that the rates of responding were not consistently high enough to demonstrate both increases and decreases in rate during the contingent FPG conditions. It was necessary to clearly demonstrate that the leg movement could be operantly controlled through some systematic means. Only when consequences extraneous to the original purpose of this study (which resulted in moderate and relatively stable rates of responding) were applied could the evaluation of the function of FPG as a consequence reasonably proceed. It may be valuable to determine if this is true in general with some types of subjects.

The finding that the rate and duration of leg movements was not highly correlated was not surprising in light of the particular characteristics of the leg movement topography and of the recording mechanism. For one instance of a leg movement response to be recorded, the subject merely had to move his/her leg enough for the microswitch (located behind the left ankle) to open. Following that, the leg could either return to its resting place and thus close the microswitch or remain extended enough for the microswitch to remain open. Keeping the leg extended for more than a portion of a second increased the duration for a particular leg movement beyond the minimum. If this occurred frequently within a session or if one leg movement consisted of prolonged extension, the duration increased much more than the rate. During some sessions, the subjects, especially Subject 1, were observed to
keep their legs extended away from the microswitch for large portions of the sessions, causing it to remain open. For such sessions, the duration of leg movements was very high while very few "leg movements," as defined by microswitch openings, occurred. In order to assess the impact of these facts, the total leg movement duration was subtracted from the session length. The remaining time was then used to calculate the corrected rate. This rate was a measure of the rate of leg movement onsets based on length of time when an onset (i.e., microswitch opening) was possible.

Analysis of the corrected rate did not change the conclusions obtained by analysis of the rate alone, but it did point out the strength of responding generated during the final FR-1 schedule of the shaping phase run with Subject 2 in Experiment II. It also accentuated the higher levels of responding produced in Experiment II with Subject 2 in the contingent FPG phases as compared to the DRI/FPG phase.

The results of the present study can be compared to those attained by Desmond (Note 1). He found that when FPG related to following an instruction was made contingent upon approximations of instruction-following responses, the percentage of those approximations temporarily increased. In addition, he found that responses unrelated to the task (i.e., intervening responses) could be reinforced if FPG followed by edibles and praise was made contingent upon them. The present study was conducted in an attempt to systematically replicate Desmond's (Note 1) study. This study combined the components of Desmond's study related to making FPG contingent upon an intervening or arbitrary response with presenting FPG alone without following it by edibles or
praise. These components were chosen for study in order to determine if FPG, which was not being paired with reinforcement, could function as a consequence for an arbitrary behavior if it was made contingent upon that behavior. In the case of the present study, it appeared that, for some subjects, this was a possibility, at least if they had a prior history of reinforcement with regard to the arbitrary response.

Both the present study and Desmond's (Note 1) study point to the importance of conducting a functional analysis of FPG as a consequence. They highlight the importance of the growing body of literature addressing the importance of determining complete functional relationships with procedures typically considered to function in only one way. They extend that body of literature because they focus on the consequent function of a procedure (i.e., FPG) which is typically only used as an antecedent stimulus change.

Caution must be exercised when applying the results obtained under the limited set of circumstances investigated in this study to other behaviors, types of FPG, and general task conditions. However, it is possible to logically infer how best to incorporate FPG into the instructional sessions of the two subjects who served in this study. In the case of Subject 1 (for whom FPG functioned as an evocative stimulus), the danger of reinforcing inappropriate behaviors by inadvertently following them with hand folding FPG seems small. Guiding the hands to the folded position may, in fact, help control the self-stimulatory behaviors of this subject. However, certain classes of body movements that are desirable may be decreased if hand folding FPG is used. At such times, alternative means of guiding the response, such as grasping
the subject's sleeves instead of the hands, may be needed; or the hand folding topography might be avoided completely. In the case of Subject 2 (for whom hand folding FPG functioned as mild reinforcement), it would be wise to avoid the use of this sort of guidance following noncompliance with an instruction or other types of incorrect responding. Rather, it would be beneficial to grasp the subject's sleeves when guiding the arms and/or hands and to arrange for FPG to follow correct response or correct approximations only. Further study is needed with both subjects to determine the full extent of the parameters controlling the effects of FPG for them.

Improving the subject selection procedures used in the study may have resulted in the clear demonstration of a powerful reinforcing effect of FPG. Such a procedure would begin with frequent and regular observations of the potential subject during the normal school day. These observations should lead to the identification of: existing responses in the subject's repertoire that are of moderate frequency; types of physical guidance that are used with the subject frequently; and the most powerful reinforcers for the potential subject. A brief assessment of the reinforcers would next occur in which one or several would be made contingent upon the moderate rate response. Operant control of the response would, thus, be assessed. Then, and only then, would the subject be actually systematically evaluated for the functional effects of FPG as a consequence.

The results of this study indicate the need for further research regarding the functional effect of FPG as a consequence. This research would be beneficial if it studied additional subjects from the same
population that served in this research as well as subjects from populations with other impairments.
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