The Use of Behavioral Contracting to Eliminate Procrastination in a “PSI” Course

Thomas M. Welsh
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THE USE OF BEHAVIORAL CONTRACTING TO ELIMINATE PROCRASTINATION IN A "PSI" COURSE

by

Thomas M. Welsh

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

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Thomas M. Welsh
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INTRODUCTION

Personalized Systems of Instruction (PSI) have gained popularity since their introduction in the 60's (Keller, 1968, 1969). Beginning in psychology classrooms with university students, the range of application has grown to the point where PSI procedures have now been used in teaching physics (Austin & Gilbert, 1973), anthropology (Witters & Kent, 1972), and chemistry (Leo, 1973) as well. PSI procedures are also being adopted in elementary and secondary education classrooms (McLaughlin & Malaby, 1974a, 1974b).

The research comparing PSI methods with more traditional educational methods generally favors PSI (Traveggia, 1976). The use of PSI techniques results in better student learning (Born, Gledhill, & Davis, 1970; Goldwater & Acker, 1975; McMichael & Corey, 1969; Sheppard & MacDermot, 1970). These researchers reported that students taught with PSI techniques scored higher on final examinations and rated the course more favorably than students taught with more traditional instructional procedures such as lectures with only two or three exams during the course. Goldwater and Acker (1975) also found that PSI students performed better on a one year follow-up exam than students taught with more traditional techniques.

In recent years, researchers have attempted to isolate the components of PSI to determine the effective and ineffective aspects of the procedures. One component receiving attention in the
literature is the "self-pacing" or "go-at-your-own-pace" feature. As dictated by this feature, students are permitted to work through the course at a rate they determine individually rather than at a pace established by the instructor for all students.

However, when students have no immediate contingencies placed on their rate of progress, they often procrastinate, leaving a substantial amount of work for the end of the semester (Sutterer & Holloway, 1975; Born & Whalen, 1973; Keller, 1968, 1969; McMichael & Corey, 1969; Sheppard & MacDermot, 1970). The end of the semester rush that results from procrastination leads to problems for both students and course staff.

A common problem is that some students do not finish the course during the term. When this happens, instructors must make special arrangements for these students to complete the work at another time or the students must settle for lower grades than they are capable of achieving (Keller, 1968, 1969).

Those students who finish the course after prolonged procrastination work so rapidly at the end of the term that they may not do an effective job of learning the course material (Skinner, 1968). Students who rush through a PSI course may not do as well on final and follow-up exams as students who complete the course at a less rushed pace.

Casual observation of students working at high rates under the pressure of rapidly approaching end of the course deadlines, suggests that the students are more likely to act aggressively
toward the course staff, the program, and on occasion, their peers. These aggressive interactions are, at the very least, discouraging for the staff and the students involved.

It also seems common for students working under rushed conditions to find the pressure created by those conditions aversive. The aversiveness may become associated with the rushed educational activities. Students then seek to escape that pressure by ending the activity and may avoid the activity in the future. Certainly, educators do not want to teach students to avoid educational activities.

Finally, designers of PSI courses must be concerned with staff efficiency and its relation to the procrastination problem. Unless instructors have great flexibility in adjusting staffing schedules during the term, they are likely to find their staff idle in the middle of the term and overworked at the end of the term. This can be detrimental to the students because the staff members don't have the time to work as carefully as they should. The overworked staff members are also more likely to aggress toward students. When students are aggressive toward the staff the staff are more likely to react aggressively generating a spiraling cycle of aggression.

Researchers have designed studies with the specific intent of investigating the occurrence of the problem of procrastination. For example, Mawhinney, Bostow, and Laws (1971) observed students' study time as a function of three different testing schedules:
daily, weekly, and tri-weekly. They found that students worked at a more stable rate with more frequent quizzing.

Other researchers have worked to develop procedures to stabilize students' rate of progress in PSI courses. Some have established deadlines for each course unit and programmed aversive consequences for failure to meet the deadlines (Fraley & Vargas, 1975; Malott & Svinicki, 1968; Miller, Weaver, & Semb, 1974; Semb, Conyers, Spencer, Sanchez Sousa, 1975). Others have awarded "bonus" points for remaining on or close to a pre-established schedule (Powers & Wald, 1975; Semb et al., 1975). Still other researchers have developed more exotic procedures, like the debit procedure of Fraley and Vargas (1975) in which students begin the course accruing debit points which count against their course grades. They may decrease the rate at which they accrue debits only by completing course work. Each of these studies has reported moderate success in stabilizing student rate of progress in PSI courses.

Behavioral contracting is a procedure which also shows some promise for dealing with the procrastination problem. Contracting procedures exert control over a subject's behavior in the "natural" environment where control by immediate contingencies is difficult (Tighe & Elliot, 1968).

Generally, the procedure involves an agreement between two parties, much like a legal contract. Behavioral contracts usually include specification of a target behavior, conditions and criteria
for successful completion of that target behavior, and a deadline. They also specify consequences which will follow successful or unsuccessful "completion" of the target behavior. Both parties sign a written form of the contract to show that they understand and agree to the conditions stated (Tighe & Elliott, 1968).

The contracting procedures have advantages over the absence of procedures to control progress rates which make their use particularly appropriate for solving the procrastination problem in PSI courses. First, contracting involves clear specification of the behavior of interest. For PSI courses, the student and the instructor may agree upon an appropriate amount of work and a due date for completion of that work.

Second, specific consequences are programmed to follow the occurrence of the desired behavior. While the actual occurrence of the specified consequences is often delayed, the contract, with its explicit statement of desired response, contingency, and consequence(s), serves to mediate the delay.

Finally, the subject may participate in the specification of the target behavior(s) and/or the design of the contingencies. In this way students play an important role in establishing their own rate of progress. This may be an important factor in helping them acquire skills for controlling their own behavior before they are set "free" in the professional world (Homme, 1972).

Contracting procedures also could have advantages over the use of instructor-scheduled deadlines. Contracting allows students
flexibility in scheduling their course work around other demands on their time, such as: assignments in other courses, outside employment schedules, and personal problems. Contracting procedures will allow for differences between individual students. The progress of one student need not be affected by the progress of others.

Bristol and Sloane (1974) used a behavioral contracting procedure to increase the amount of time their students spent studying. The contract, which was designed by the instructor, specified a number of study activities students were to complete. The students monitored and recorded their own study activities. Each time students reported that they had completed the specified activities they earned one dollar. This procedure showed the greatest effect with "poorer" students, those with low grade point averages.

Grocochinski (1976) also employed behavioral contracting in an attempt to control students' study rate. In this study, students met with a course assistant after each exam to schedule a date for their next exam. Students were given the opportunity to reschedule three exams during the semester. Any exams rescheduled after the first three cost the students one course point per exam rescheduled. The results of this study suggest that students worked at a more stable rate when behavioral contracting was used to control study rate than when it was not used.

When the procrastination problem was encountered in the Student...
Centered Education Project\textsuperscript{1} at Western Michigan University, the course staff designed a procedure employing the principles of behavioral contracting to deal with the problem. The procedure required students to plan each week's work in advance, then provided course point contingencies for student-scheduled progress. The purpose of this study was to examine the effectiveness of the contracting procedure for eliminating procrastination in a PSI course.

\textsuperscript{1}The Student Centered Education Project is a special program in the Department of Psychology at Western Michigan University. The program allows psychology majors and minors to work through the first four courses in the Psychology Core Curriculum at an accelerated rate.
METHOD

Subjects and Setting

Volunteers were solicited from a class of 30 first semester undergraduate psychology students at Western Michigan University. Fifteen students volunteered to participate in this study. The volunteers were ranked on the basis of their rate of progress during the first four days of the course. They were then randomly assigned, by pairs, to one of two experimental procedures, contracting ($N = 7$) or no-contracting ($N = 8$) for the duration of the course.

The study took place in an experimental education program entitled the Student Centered Education Project. The program facilities included a study center consisting of three small class-rooms, each equipped with 30 private study carrels.

Course Description

The course in which this study took place was a PSI course modeled after the one reported by Keller (1968, 1969). Students engaged in three major course activities including: preparation for and completion of unit quizzes, preparation for and participation in small group seminars, and completion of a series of elementary animal laboratory experiments. The students earned points for each of these activities which, when combined with their final exam performance, determined their course grades. Those
course activities and policies which had a direct bearing on this study are described below.

Unit quizzes

Preparation for and completion of the unit quizzes were the most heavily weighted course activities, constituting 54% of each student's course grade (see Table 1). The major course text, *An Introduction to Behavior Modification* (Malott, 1974), was divided into 27 short study units, each requiring about one hour of study. Each unit included a list of study objectives.

### Table 1

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
<th># of Times</th>
<th>Points Possible</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Quizzes</td>
<td>10 pts per unit</td>
<td>28 units = 280</td>
<td>Pts. 54%</td>
<td></td>
</tr>
<tr>
<td>Weekly Seminars</td>
<td>20 pts/seminar</td>
<td>5 seminars = 100</td>
<td>Pts. 19%</td>
<td></td>
</tr>
<tr>
<td>Animal Laboratory</td>
<td>25 pts/report</td>
<td>4 reports = 140</td>
<td>Pts. 27%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 pts/quiz</td>
<td>4 quizzes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>520 pts.</strong></td>
<td><strong>100%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Study Center was open four hours each day. In the Study Center, trained undergraduate teaching apprentices helped students with the more difficult aspects of the course material. Students
could use the study facilities and request help from the staff any time during the four hours the Center was open.

Once students finished studying a particular course unit, they had the opportunity to demonstrate mastery of that unit by taking a 10 point quiz. The quizzes, requiring multiple choice and short essay answers, sampled mastery of the most important aspects of each unit. With the aid of an answer key, the teaching apprentices graded the quizzes, scoring each between zero and ten based on the accuracy of the students' answers. Students had to earn a 9 or 10 (90% minimum mastery criterion) to demonstrate mastery of each unit. If they did not score 9 or 10, they re-studied the course unit in preparation for an alternate form of the unit quiz. And they repeated the process until they demonstrated mastery (90%). Only when students mastered a particular unit were they permitted to go on to the next.

The design of this component of the course permitted students to work through the course units "at their own pace" as described below.

Final exams and course points

Although the course lasted a total of 30 days, the last day students were permitted to take quizzes was the 27th day of the course. On the 28th day, all students took a comprehensive final examination. The exam covered only topics from the major text. Students who did not perform well on the initial exam had the opportunity to take a Remedial exam on the final day of the course.
On the day between exams the course staff discussed errors on the initial exam with students, administered a remedial quiz over the most often missed items on the first exam, and provided study time for those retaking the exam.

Each student's final course grade depended on their performance in the three major course activities and on their performance on the final exam. Students who earned 90% of the points for the course activities had guaranteed themselves a "B" grade in the course before taking the final exam (80% a "C", 70% a "D", etc.) (see Table 2). Students could raise their course grades by one letter by scoring in a percentage range equivalent to or higher than their course activity scores. For example, a student who scored 90% or better in the course activities earned a "B" grade before the exam. A score of 90% or better on the exam raised that grade to an "A". A student who scored between 80% and 90% on the course activities earned a "C" grade before the exam. A score of 80% or better on the exam raised that grade to a "B" (see Table 3). Poor performance on the exam had no effect on students' course grades.

Rate of progress

All students were subject to the same progress contingencies during the first week of the course. The course syllabus outlined the progress contingencies as follows:

1. A list of target dates is attached to this syllabus.
2. The target dates specify the last day that quizzes will be available for each unit.
### Table 2
**Course Grade W/O The Exam**

<table>
<thead>
<tr>
<th>Course Points</th>
<th>Percentage Score</th>
<th>Course Grade Before Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>468 points or more</td>
<td>90% or more</td>
<td>B</td>
</tr>
<tr>
<td>416 points or more</td>
<td>80% or more</td>
<td>C</td>
</tr>
<tr>
<td>364 points or more</td>
<td>70% or more</td>
<td>D</td>
</tr>
<tr>
<td>Less than 364 points</td>
<td>Less than 70%</td>
<td>E</td>
</tr>
</tbody>
</table>

### Table 3
**The Effect of the Final Exam on the Course Grades**

<table>
<thead>
<tr>
<th>Course Grade Before Exam</th>
<th>Exam Score</th>
<th>Final Course Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>with 90% or more</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>with less than 90%</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>with 80% or more</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>with less than 80%</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>with 70% or more</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>with less than 70%</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td>with 60% or more</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td>with less than 60%</td>
<td>E</td>
</tr>
</tbody>
</table>
3. Students who have not mastered a specific unit by the target date for that unit will receive no points for the unit and should proceed directly to the next unit.

4. Students may complete units ahead of the target dates but must complete the units in the specified order.

The target dates required students to complete about one course unit each day. All students had to complete the first five units by the end of the first week. Students received a written explanation of the experimental progress contingencies on the first day of class. Those who volunteered to participate in the study were notified which condition they were assigned at the end of the first week. Those students who did not volunteer to participate in the study remained subject to the target date procedure outlined previously.

Incomplete grades

The University policy on the assignment of incomplete grades is reasonably strict at Western Michigan University. Here is how the incomplete procedure was explained to students in the course syllabus:

This course officially ends on February 13. University policy does not allow us to assign the grade of incomplete except in extreme cases such as prolonged illness. If you find that you are unable to attend regular class activities, please come to the program office and fill out a petition for a course grade of incomplete as soon as possible.

None of the students who participated in this study applied for incomplete grades.
Procedure

Contracting

Each Friday, the students assigned the contracting condition completed a quiz scheduling form (see Figure 1). The form specified the number of course units the student planned to complete each day of the following week. Note that a unit was considered complete when the student had demonstrated mastery by scoring 90% on the unit quiz. If a student failed to complete a scheduling form on Friday, the most current form on file became effective for the next week. This occurred only once with one student during the study.

Teaching apprentices monitored and recorded each student's progress through the course. Each day that students completed at least the number of units they had scheduled for that day, they received one point per unit scheduled. Each day students did not complete the number of units scheduled, they lost one point per unit scheduled and not completed. Completing more units than scheduled did not earn the student any extra contracting points.

The experimenter tabulated the points earned or lost by each student at the end of each week and posted the scores for student viewing. Points earned or lost as a result of this procedure were added to each student's earned-point total at the end of the course. Points earned or lost did not affect the total "possible" for the course. These contracting points were, in a sense, "bonus"
Figure 1. Quizzing schedule (contract) completed by contracting students each Friday.
**QUIZZING SCHEDULE**

For (Name): __________ and for the week of: __________ through __________.

Please designate the number of units you plan to complete each day by marking an "X" in the same number of boxes for that day.

Schedule no more than three (3) units each day.

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Date:</td>
<td>Date:</td>
<td>Date:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

**DO NOT WRITE IN THE BOXES BELOW**

I agree to complete (master) the number of units I have scheduled for each day on that day. Each day I master the number of units or more than the number of units I have scheduled for that day, I will receive (+1) scheduling point per unit scheduled. Each day I do not complete (master) the number of units I have scheduled I will lose one (-1) scheduling point per unit scheduled and not completed (mastered). I understand that scheduling points are equal in value to unit score points and that they will be added or subtracted from my cumulative point total at the end of the semester.

Please make two copies of this schedule. Keep one for your own records and give the other to your Teaching Apprentice.

Student: ______________________

T.A.: ______________________
points. Students could earn a maximum of 27 progress points which is less than 5% of the total course grade.

While explicit contingencies followed performance which did or did not correspond to the schedules once students had designed them, no specific contingencies were programmed to control the number of units students scheduled to complete each week.

No-contracting

Students assigned the no-contracting condition were permitted to work through the course at any rate they deemed reasonable with no immediate contingencies programmed for scheduling or for rate of unit completion. While the teaching apprentices also recorded the rates of progress for these students, the no-contracting students could neither gain nor lose points based on their rates of progress.
RESULTS

Because the major purpose of this study was to determine the effectiveness of the contracting procedure for eliminating procrastination, the most important dependent measures are the rate of progress measures. Individual progress records kept by the teaching apprentices provided all progress measures.

Other performance measures show the effects (or lack of effects) of the contracting procedure. The teaching apprentices also maintained these records.

In addition, the results of an evaluation run at the end of the course are presented to indicate student satisfaction with the scheduling procedure.

Rate of Progress

Course completion

All seven of the contracting students completed all 27 course units while only four of the eight no-contracting students completed all the course units. The median number of units completed by students in each group was 27 units for the contracting students and 26.5 units for the no-contracting students. The median number of days for completion of the course was 25.8 days for the contracting students and 26.7 days for the no-contracting students (see Table 4).
Table 4
A Summary of Procrastination Measures

<table>
<thead>
<tr>
<th>Groups</th>
<th>Median Units Completed</th>
<th>Median Days to Completed</th>
<th>Median Days Off</th>
<th>Median Longest Pause</th>
<th>Median Days Below Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>27</td>
<td>25.8</td>
<td>7.5</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>N=7</td>
<td>(Range)</td>
<td>(19-27)</td>
<td>(2-11)</td>
<td>(1-5)</td>
<td>(0-7)</td>
</tr>
<tr>
<td>No-scheduling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>26.5</td>
<td>26.7*</td>
<td>10.0</td>
<td>3.5</td>
<td>(8.0)</td>
</tr>
<tr>
<td>N=8</td>
<td>(Range)</td>
<td>(21-27)</td>
<td>(25-27)</td>
<td>(7-19)</td>
<td>(2-11) (1-21)</td>
</tr>
<tr>
<td>Median Difference</td>
<td>Mdn$_1$-</td>
<td>-0.5</td>
<td>-0.9</td>
<td>-2.5</td>
<td>-1.0</td>
</tr>
<tr>
<td></td>
<td>Mdn$_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Those students who never completed the course were assigned the maximum number of days (27) for the calculation of the figure.

Days off, pausing, and days behind target

A day off was defined as a day in which a particular student completed no course units either because the student did not attempt any quizzes or because the student attempted one or more quizzes but failed to meet the mastery criterion. A pause was defined as one or more sequential days off and a day below target was defined, simply enough, as a day in which the student was behind the expected rate of one unit per day.

The median number of days off for contracting students was 7.5 days and the median for the no-contracting students was 10 days. The median longest pause for the contracting students was 2.5 days and the median for the no-contracting students was 3.5 days.
days. It is also interesting to note when pauses occurred. Only one scheduling student paused while below the average target line and did so only once for a two day period. However, six of the eight no-scheduling students paused while below the target line.

There were also differences in the number of days students in the two groups were behind target. The median number of days behind target for the contracting students was 2 days while the median for the no-contracting students was 8 days.

**Grouped progress records**

The group progress records appear in Figure 2. The average curve for the contracting students shows a very stable rate of progress, remaining close to the suggested rate of progress throughout the course. The curve for the no-contracting students, on the other hand, shows a drop in the average rate of progress during Week 2 followed by a sharp acceleration. As a group, however, the no-contracting students finished only slightly behind the contracting group.

**Individual progress records**

All the contracting students and no-contracting students 8 through 12 progressed at a generally acceptable rate (see Figures 3 & 4). None of these students showed prolonged procrastination and few paused while below the average target line. However, no contracting students 13, 14, and 15 all paused for considerable periods of time and usually while below the target line.
Figure 2. Average progress records for all students in each group. (The vertical dashed line represents the initiation of the experimental conditions. The solid line running from day 0 to day 27 represents the average expected rate of progress.)
UNITS COMPLETED

DAYS

CONTRACTING

NO-CONTRACT

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Figure 3. Individual progress records for each of the seven contracting students. (The vertical dashed line represents the initiation of the experimental conditions. The solid lines running from day 0 to day 27 represent the average expected rate of progress.)
Figure 4. Individual progress records for each of the eight no-contracting students. (The vertical dashed line represents the initiation of the experimental conditions. The solid lines running from day 0 to day 27 represents the average expected rate of progress.)
Grouped extremes progress records

The progress records for no-contracting students 13, 14, and 15 have at least one common characteristic; they all contain days of extreme deviation below the target line. Their average record is compared with the average record for the three corresponding contracting students, subjects 5, 6, and 7 (see Figure 5). The average records for the three most extreme cases above the target line in each group, contracting subjects 1, 2, and 3 and no-contracting subjects 8, 9, and 10, appear in Figure 6. There is a reasonably large difference between the average records of the below target extreme cases but very little difference between the average records of the above target extremes.

Units scheduled

To remain on target and to finish the course on time, the contracting students should have scheduled an average of one unit each day. They scheduled an average of 1 or more units on 15 days and scheduled fewer than 1 average on 7 days (see Figure 7). The four arrows indicate days on which seminars were held and all students had less time to devote to study of the major course text.

Course Points and Exams

The number of points earned by students in both groups was similar, a median of 99% for the contracting students and a median
Figure 5. Average progress records for the three "slowest" students in each group. (The vertical dashed line represents the initiation of the experimental conditions.)
Figure 6. Average progress records for the three "fastest" students in each group. (The vertical dashed line represents the initiation of the experimental conditions.)
Figure 7. Daily number of units scheduled by all contracting students. (The vertical dashed line represents the initiation of the experimental conditions. The solid horizontal line represents the average of units students were expected to schedule daily.)
of 98.5% for the no-contracting students. Performance on the final exam was also similar across groups. For the contracting students, the median was 99.8% and for the no-contracting students the median was 98% (see Table 5).

Thirteen of the fifteen students who participated in the study earned "A" grades in the course. Only two students, subjects 14 and 15, both no-contracting students, earned less than "A" grades, one earning a "B" and one an "E."

Student Satisfaction

At the end of the term, all students completed an anonymous written evaluation of the course. The contracting students answered four questions selected for the purposes of this study. The no-contracting students answered only the first of these questions because it was the only one relevant to their particular situation.

Students in both groups preferred studying within the Student Centered Education Project to more traditional courses (see Figure 8). Both groups rated the course similarly. The contracting students found the contracting procedure comfortable but were divided in their opinion of the procedure's effectiveness (see Figures 9 and 10). Most contracting students did feel, however, that they would not have done as well in the course without the contracting procedure (see Figure 11).
Table 5
Course Points and Exam Scores

<table>
<thead>
<tr>
<th>Groups</th>
<th>Course Points</th>
<th>Exam Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduling Students N=7</td>
<td>Median (Range)</td>
<td>99% (96-105)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99.8% (90-100)</td>
</tr>
<tr>
<td>No-Scheduling Students N=8</td>
<td>Median (Range)</td>
<td>98.5% (51-102)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>98% (86-100)</td>
</tr>
<tr>
<td>Median Difference</td>
<td>Mdn₁- Mdn₂</td>
<td>+0.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1.8%</td>
</tr>
</tbody>
</table>

**Test of Significance**

The significance of the daily progress differences between the two groups was tested with the use of the Wilcoxon Matched-Pairs Signed-Ranks test.² The test incorporated Unit completion data for contracting students 1-7 and for no-contracting students 8-14. The differences between groups proved significant at the .05 level on 5 of the 27 days of the course and significant at the .10 level on 7 more days (see Figure 12).

²Library program #1.1.1, NONPAR, test #5, Western Michigan University Computer Center.
Figure 8. Frequency distribution of students' responses to the question, "How do you like studying within the SCEP system as compared with the traditional system?"
Figure 9. Frequency distribution of the contracting students' response to the evaluation item, "In terms of helping me work through the course at a reasonable rate, the 'pacing' contingencies were:"
Figure 10. Frequency distribution of the contracting students' responses to the evaluation item, "The pacing contingencies were;"
Figure 11. Frequency distribution of the contracting students responses to the evaluation item, "Without the 'pacing' contingencies, I would have done _____________ in the course."
Percentage of Respondents

MUCH BETTER  MUCH WORSE

5  4  3  2  1

10  20  30  40  50  60

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Figure 12. Average progress records for all students in each group. (The vertical dashed line represents the initiation of the experimental conditions. The asterisks along the horizontal axis represent days on which statistically significant differences in student progress were observed. A single asterisk represents significance at the .10 level and a double asterisk represents significance at the .05 level.)
DISCUSSION

The results of this study suggest that the contracting procedure was effective in reducing procrastination. The contracting students took fewer days off; they paused less often and for fewer days when they did pause; and they spent fewer days behind the expected rate of progress. In addition, none of the contracting students progressed through the course in such a way as to produce progress records resembling the scallop pattern which typically indicates procrastination. On the other hand, two of the eight progress records for the no-contracting students show long pauses followed by rapid rates of progress and a third record shows a broad scallop with considerable pausing. Both of these patterns generally represent procrastination on the part of the students. All results support the notion that the contracting students procrastinated less than the no-contracting students.

The fact that the contracting students scheduled a reasonable amount of work each week is also important. It suggests that students can effectively plan their own course progress when given the opportunity to do so.

No significant differences exist below the course performance measures for the two groups of students. But, few PSI researchers have found that they are able to dramatically affect course performance with small procedural changes like the contracting procedure which was the focus of this study. PSI procedures have been so refined
and improved that nearly all students do well in courses employing PSI techniques.

Two students did not earn "A" grades in the course. They were the two who paused dramatically and then accelerated abruptly. Although not enough evidence exists to make any absolute statement about the relationship of procrastination and course performance, it does suggest the possibility of a functional relationship. In fact, it is not unreasonable to assume that procrastination which results in rushing at the end of a course can be detrimental to performance in more than one aspect of a course. It may also be of interest to determine what effect procrastinating in one course has on performance in other courses in which students may be concurrently enrolled.

The student opinion data suggest that the contracting procedure had value for the students. They found the procedure comfortable and felt they would have done worse in the course without it.

On the basis of these results one may conclude that the contracting procedure was effective for eliminating procrastination but that some students did not need the aid of such a procedure. After all, only three of the no-contracting students showed marked signs of procrastination. If this interpretation is accurate, instructors should begin looking for ways to identify those students who are potential "procrastinators" and arrange to use the contracting procedure with these students. There would be no need
to have "non-procrastinators" contract because the procedure would probably have little effect on their rates of progress.

However, it may be that other factors, factors unique to this experiment, had an effect on student progress which masked the effects of the contracting procedure. For example, the course in which the experiment was run lasted only 7 1/2 weeks. It is conceivable that more procrastination would be observed in a course which lasted 15 or 16 weeks, the usual length of university semesters. Under these conditions, the contracting procedure may have a better chance of showing an effect.

The attempt to acquire information for pairing students before assigning them to groups prompted all students to begin work on the course during the first week. Lloyd and Knutzen (1969) found that students continued to work through their PSI course at high rates once they started. They suggested inducing students to begin earlier in the semester. The one week of "instructor pacing" at the beginning of this course may have successfully eliminated the opportunity for the contracting procedure to show a clear effect.

What are the practical implications for the design of procedures to maintain progress that are suggested by this study? Bitgood and Segrave (1974) suggested that students prefer to schedule their own study time, although many students are "poor schedulers" and should be given deadlines. The present study suggests that scheduling deadlines is not the problem. Students
are perfectly capable of scheduling their own deadlines. What instructors must provide is a set of contingencies for "living up to" their own schedules once students design them. It looks as though behavioral contracting provides an effective means of exerting the necessary control over students' behavior in the "natural" environment where strong competing contingencies must be overcome. Behavioral contracting may be at least one means of retaining self-pacing while avoiding the problems created by procrastination.
REFERENCES


