

Creative Life-style Management Through On-line and Real-time Application of the Behaviorological Education Practices of Precision Teaching

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Ever since the founding of their science in the 1930s, behaviorological scientists and practitioners have been dedicated to applying their discipline to the many, many behavior-related concerns of people and society (Ledoux, 1997a; Skinner 1953). For instance, concerns about education represent a major area receiving attention since the middle of the twentieth century (e.g., Skinner, 1968; West & Hamerlynck, 1992). One of the most successful educational approaches to come out of behaviorological science is *precision teaching* (Youth Policy Institute, 1988). Another area of concern that has received attention is life-style management (e.g., smoking control; see Ledoux, 1997b).

However, new delivery methods for behaviorological interventions are less common than the interventions themselves. Delivery methods for precision teaching and life-style management interventions have been mostly of the face-to-face variety. With the increasing development of interconnected personal computer technologies, another delivery method, *on-line delivery*, has become available for research and application.

This paper discusses pilot research that combines problems from life-style management with solutions from precision teaching techniques that are delivered on-line, with occasional real-time elements, using personal computer technologies. Precision teaching practices are applied to the management of various life-style concerns through creative computer-based interactions between the client and the educator (often called a therapist). The research reported here involves clients presenting life-style management problems regarding decreases in smoking and weight, and increases in college study skills. A brief overview of precision teaching, including its core principles and various applications, will be followed by a basic description of the methodological elements common to the experimental interventions. Then the experimental interventions with each of the three life-style concerns will be discussed, including the

This paper originated in discussions between its author and the author of *Origins and Components of Behaviorology* (Ledoux, 1997a) concerning a topic suggested for editorial expansion of another paper in this book (Ledoux, 1997b). For reasonable treatment, though, the suggested topic deserved its own space. It is included in this book of readings not only for the value of any particular therapeutic successes it reports, but more for the forward-looking nature of this research into a new, additional, and beneficial delivery medium for helping professions informed by behaviorological science.

instructional procedures employed with each, and a discussion of results. Finally, a general discussion will include a short review of the feasibility of adapting standard daily measures of rates of response as the “independent variable of choice” in on-line educational methodology for effective behavior change.

Precision Teaching: A Copernican Revolution in Instruction

Precision teaching is a method of instruction derived from both the basic laboratory research of B.F. Skinner (1953) and applied operant research of Ogden Lindsley (1956, 1960). Lindsley is known as the founder of precision teaching (Lindsley, 1990). Precision teaching principles have been successfully applied in classroom instruction (Lindsley, 1993; Youth Policy Institute, 1988) as well as in therapy (Johnson, 1972), social work (Green & Morrow, 1972), nursing (Dean, 1973), and medical rehabilitation (Merbitz, King, Cherney, Marqui, Grip, & Markowitz, 1996).

Lindsley (1990) identifies the basic components of precision teaching as:

- ✦ daily measurement of behavioral frequency of correct (acceptable) responses and incorrect (unacceptable) responses;
- ✦ the use of standard charts to display students’ self-recorded frequencies as data; and
- ✦ a reliance on individual student performance data to guide instructional decision-making, as summarized in the phrase “the child knows best.”

Students in a precision teaching instructional system record their own daily learning, and display charts of learning progress to the teacher and others. Using individual student progress charts, teachers facilitate student practice while guiding students through subsequent instruction. Data from students’ daily practice of words read, flashcards said, or other target actions, becomes the foremost guide to the teacher in continuing, abandoning, or revising interactive instructional sequences.

The differences between precision teaching and traditional methods are substantial. While conventional teaching methods stem from the *presentation* model of education, precision teaching procedures arise from the *shaping* model of education (see Vargas, 1996, for details on these models). In a related way, whereas conventional teaching methods have been identified as “teacher-centered to a very high degree” (Ellson, 1986, p. 112), the successful adoption of precision teaching procedures results in increased student-centeredness. The student’s progress (or lack of it) takes a central position in the constellation of factors that determine the fitness or utility of classroom instructional sequences. “The student knows best” which instruction is effective because student-charted learning data is the main indicator of instructional fitness. As Carl Binder notes:

Students assume responsibility for their own learning by measuring and charting the results of their own daily practice, and making decisions with their teachers’ advice about when and how to change procedures or curriculum objectives. (1988, p. 13)

Far from their typical portrayal as passive participants in drill and practice, students in precision teaching actively record and chart the data which in turn shows precision teachers the value of their teaching. What is typical of precision teaching is daily prac-

tice of *active student responding* with respect to instructional content. Active student responding has been shown to generate more learning, and reduce disruptive, off task behavior (Heward, 1994). From the standpoint of student centeredness, precision teaching strategies also generate high rates of active student responding with respect to the self-evaluation and determination of individual instructional progress, since the role of instructional decision maker is shared between student and teacher. Students can see, along with the teacher, whether instruction is producing progress, and can share, along with the teacher, in the decision about “what to do next.”

To borrow a metaphor from the history of science, conventional instruction places the teacher in the center of the instructional solar system, while precision teaching principles have spurred a Copernican revolution in which the student is now the star around which instruction revolves. And this revolution in instruction is as significant as the original Copernican revolution in astronomy.

Precision Teaching: Discovering Effective Instruction

Precision teaching has been called “precision measurement” (Julie S. Vargas, personal communication, 10 March 1994) because precision teaching does not prescribe a particular curriculum or teaching method beyond its core principles of measuring rates of observable student behavior, charting those rates, and using charted progress to guide further instruction. “Advocates of precision teaching do not demand that all teachers teach the same way, but they do demand that teachers monitor what they are doing and change if necessary” (Howell & Lorson-Howell, 1990, p. 20). Precision teachers are not instructional automata, dispensing canned activities from an instructional cookbook—precision teaching does not result in “McTeaching.” Instead, precision teaching principles allow classroom teachers to become discoverers of new and potentially more effective teaching practices.

Lindsley has asserted that precision teaching has brought about a kind of reconciliation between applied and basic behavioral research, with data-based learning in the classroom providing an impetus for discovery similar to, though speedier than, the impetus provided by learning observed in the laboratory (Lindsley, 1992a, 1996). Since precision teachers are guided by the actual learning progress of their students when designing and trying new instruction, precision teachers are rewarded not just for increased student learning but also for the discovery of new, more effective instructional practices. Precision teaching offers teachers a new yet integrated role: *discoverer of better teaching*. By adapting the rudiments of repeated measures behavioral research to the everyday classroom, precision teachers teach better; the same process enables them to discover better ways of teaching at the same time.

Using classrooms as research laboratories has led to expanded behavioral curricula. These have, as a major component, daily self-recorded progress data with charting for shared instructional decision making. The *Morningside Model of Generative Instruction* (Johnson & Layng, 1994) incorporates the foundational practices of precision teaching into a comprehensive school-based effective learning system. Implemented at the Morningside Academy in Seattle, WA, as well as at Malcolm X College in Chicago, IL, the Morningside Model is well known for its successes, backed by its money back guarantees of exemplary student achievement, guaranteeing that students will progress “two grade levels per school year or... parents will receive a tuition refund in proportion to the shortfall” (Johnson & Layng, 1994, p. 174).

Common Methodological Elements of Life-style Management Interventions

It was the precision teaching precedent of creative and successful data-based instructional innovations that led to the adaptation of precision teaching techniques to on-line, computer-based instruction for client-centered life-style management. While this paper introduces on-line instructional systems for weight control, smoking control, and study skills, certain methodological elements are common to all three systems:

✧ *Client-countable dependent variables.* The first iterations of the instructional system were explicitly designed for client-countable behaviors. Exercising, smoking and study skills were pinpointed for each client, making a daily count of a rate of response (or response-product) feasible and convenient.

✧ *Daily data reporting, using E-mail.* Clients were asked to report daily data from their self-count regimens in an E-mail document at or near bedtime each evening. Clients mailed the daily self-report to the instructor's E-mail address.

✧ *Client-centered collaborative design of a personalized data collection and reportage regimen based on repeated-measures research designs.* The first weeks of the course focused on achieving reliable, client-customized data collection of the pinpointed behavior or product, as well as reliable daily E-mail reporting. Clients agreed to work with the instructor to construct a personalized data-collection and reporting system during this initial phase of the on-line course, and to defer any systematic attempt to modify the targeted behavior until later phases of the course. This initial "start-up" phase corresponded to a baseline phase in a repeated measures research design, in which clients are measuring their targeted dependent variable(s) but not introducing any condition designed to modify the targeted variable(s).

The baseline phase involved training clients to measure their pinpointed behaviors during the course of their day, resulting in data collection procedures based on client preferences, settings, behavior of concern, and other factors. Once a suitable start-up data collection regimen was designed via on-line seminar discussions (see chat rooms, below), the client began collecting her/his data and reporting those data each day via E-mail.

Subsequently, the start-up processes of data collection and E-mail reporting tend to shape client participation in the evolving system. This results in a client-centered, instructor-guided measurement and reporting regimen, which was convenient, accurate and reliable. (Certain methodological questions—the extreme of which might be "How do you know your clients are not making it all up, that is, lying?"—were fundamentally addressed, at this early point in the research on this delivery system, in two related ways: [a] No information ever came to light that might indicate that any client might have lied. Also, [b] creating and reporting—and discussing with the instructor—false data that seemed reasonable would seem to require far more effort than observing, reporting, and discussing real data would require. Hence, at this point in this research, parsimony would require the experimenter to presume that clients are honest. Such questions can and will be confronted in additional ways in future research.) Often, clients began the baseline phase with a rudimentary data reporting regimen, only to add more elements based on client curiosity or instructor recommendations. For example, a client may begin the baseline phase by agreeing to write a one-sentence self-count

each day, such as “I smoked 28 cigarettes today, 3 January 1995,” sending such data via E-mail each day. Then, as daily data continues to be collected and reported by the client in this manner, the client (or instructor) may suggest that “the time at which each cigarette was smoked” could be collected and reported as well. The client can choose to accept such additional tasks, and if so, they are added to the start-up data collection and reporting regimen.

✦ *E-mail reports as small instructor-client discussions of current course procedures.* Clients were asked to note, in a few sentences, any problems, concerns, or issues which arose in the daily process of data collection. As clients described problems or made suggestions as an addendum to the daily E-mail data report, such discussions of the data collection regimen could evolve in the context of the actual incoming data. This was construed as a “daily journal” in which the client reflected on her/his data collection regimen or the emerging data picture.

In this way, daily E-mail served not only as a means to report data, but also as a small writing assignment used to generate client interest and participation in the on-line course. Short daily client feedback (e.g., “I’d rather report my data twice a week instead of every day” or “I’d like to record the time at which I smoke each cigarette”) was used to generate “amendments” to the initial data collection regimen. Such ongoing, mutual feedback, suggestions, and amendments served to balance client preferences for convenience versus instructor preferences for accurate, valid transduction of behavioral data, since the instructor’s preferences tend to be more task-laden and thus extract more response-cost from the client. The daily E-mail discussion also adds a convenient, conversational forum for praising correct E-mail reportage of data, for celebrating successive days of correct E-mail reportage, or for remediation concerning errors of omission or commission.

✦ *Baseline data reporting regimen mastered before graduating to an intervention phase.* The baseline phase was designed to bring about accurate daily data collection and reporting. To facilitate this, all clients were told that their baseline system needed to be mastered before entering the intervention phase, in which a systematic attempt could be made to modify the behavior of concern. A mastery criterion was established: “14 successive days of E-mail reportage of correct, complete self-counts.” After two successive weeks of errorless participation, the client “graduated” and was eligible to begin collaboration on an intervention phase for the on-line course. Since all previous baseline procedures would continue concurrently with any intervention element, it was crucial that the client had mastered the daily data collection and reportage regimen, since incoming data served as evidence of the effect (and utility) of any intervention.

✦ *Chat Rooms used for hour long “on-line seminar” meeting each week to review progress data while discussing instructional amendments.* Clients agreed to schedule an hour long meeting, once per week, in which the client and instructor could “meet” in an on-line chat environment using a commercial on-line service. Such meetings were called on-line seminars.

“Chat” telecommunications involves synchronous, real-time exchanges of text between two or more writers. This is similar to an oral classroom conversation between two people, but with the interchange being textual rather than oral. Writer A composes a text sentence, then “sends” it to the chat room. The speed of the textual transmission is immediate; as soon as a sentence is sent, it is seen in the chat room area by both participants, generally in less than one second. Writer B’s response appears underneath

Writer A's initial sentence in the scrolling archives of the chat room. Additional textual responses are composed, sent, and responded to by each writer. The interchange is fluent enough so as to simulate an oral conversation in reading and writing media. Such real-time textual exchanges can be called *conversational writing*. The weight control client used on-line seminars on a weekly basis. The first smoking control client began with weekly seminars which became less frequent. The second smoking control client had seminars as they were needed. The final client, working with college-level study, did not use on-line seminar chat at all, that tool being unavailable in her setting.

✦ *Collaborative, client driven interventions.* Interventions were developed based on client suggestions, remarks, and self-examination of incoming data pictures. As well, interventions were begun at the client's pace (if at all), and could be adopted or abandoned via the on-line seminar discussion. During the collaborative design process for interventions, on-line seminar meetings typically addressed at least three considerations, as listed here: (a) *Program progress from the prior week.* Since both client and instructor were apprised of the client's daily data, part of each on-line seminar hour was spent reviewing the client's progress from the prior week. Discussion of the prior week's data set the stage for clients to remark on their own progress, and to suggest course amendments, new interventions, etc. (b) *Amendments to the course.* Instructor and client discussed how the data-collection system worked, reasons for each procedure, and how the client's current system of recording and reporting data could be made more efficient or effective. After the client had mastered the start-up data reporting system and had chosen to begin an intervention, this portion of the on-line hour focused on collaborative intervention design and planning. (c) *Accepting or rejecting amendments to the course.* The typical attitude during the on-line seminar was one of client-centeredness and brainstorming; the client was urged to generate ideas and suggestions, and to propose amendments to the system based on data-based self-evaluation and personal curiosity. In this sense, the on-line course was an exercise in training a client to conduct "self-research" on the targeted life-style concern.

However, not all amendments were of equal value with respect to maintaining a data-based, research oriented self-management program. To maintain both high-quality data reporting and the client-centered emphasis in instruction, all proposed amendments to the course procedures were discussed in a process of instructional consensus (wherein the instructor added expertise to the client's creativity) and "ratified." That is, both client and instructor had to agree to a course amendment before the suggested procedure could be adopted into the on-line course. When a suggestion was made by the client (such as "I'd like to report data two times per week instead of once per day"), the instructor described advantages and disadvantages to the suggestion, and could accept or "veto" it. Similarly, when the instructor suggested a course amendment (such as "I suggest you start an intervention next week"), the client could evaluate the reasonableness of the suggestion, and could accept or "veto" it. By the end of the hour-long on-line seminar, any proposed changes to the current course procedures were either vetoed (by the client, the instructor, or both), or accepted unanimously. Discussion and unanimous acceptance of a course amendment during the hour-long on-line seminar set the stage for the adoption of the new procedure into the client's course regimen for the coming week.

The "unanimous acceptance" procedure worked in practice. For instance, after mastering the baseline phase, the client could choose when to begin an intervention

phase. The instructor explained to the client that she/he could remain at the baseline phase, collecting data and reviewing progress, until she/he saw fit to start the first intervention phase. The client could also end an intervention phase after an on-line seminar, either replacing it with a new intervention or returning to baseline phase procedures. Since each adoption or abandonment of an intervention required unanimous acceptance during the weekly on-line seminar, each intervention lasted for at least seven days, longer in cases where clients did not engage in weekly on-line seminars.

Client-driven collaboration on the design and pace of interventions resulted in personalized course arrangements and innovative research designs. In the case of the first smoking control client, the start-up procedures were in effect for 61 days (almost half of the 18 week course) before the client elected to implement her first intervention phase. In the case of the weight control client, no systematic intervention phase was implemented; the start-up conditions obtained from the outset of the course, serving as a modified treatment-only design (Hawkins & Hursh, 1992).

✧ *Client determines duration of client's participation in on-line course.* Each client was apprised that there was no set date when the on-line course would end; the client was welcome to participate for as long as she/he chose. In the case of the weight control client, the end of the course was determined by the goals set by the client. In all other cases, resignation from the course was left open ended.

✧ *All on-line interactions archived by both client and instructor as electronic files.* Since all client-instructor interactions occurred via writing (either in e-mail or on-line seminar), both participants could easily archive all course materials, data, and seminars as electronic files. The client was urged to review the archives of past on-line seminars in the event that the current weekly baseline or intervention regimen, agreed upon in the previous week, became confusing.

✧ *Course delivered to clients for research purposes at no cost.* All clients reported here participated in on-line courses at no cost. Also, all agreed to have their data and archives used for educational research.

Interventions in Three Life-Style Management Areas

Experimental interventions were undertaken in three different life-style management areas. One area, smoking control, involved helping clients change their environments to bring about decreases in target behaviors while the second and third areas, weight control and college-level study, focused on increasing target behaviors. While various behavioral education procedures were used, the basic principles guiding the design of the on-line educational process were those of precision teaching.

For the purpose of this report, which is to introduce the concept and some early outcomes of on-line interventions, data will be presented for only one client in each of the weight control and college-level studying areas. For the area of smoking control, data for two clients will be presented. The experiments are reported here in the chronological order in which they were developed.

Weight Control

The client whose data will exemplify on-line interventions for weight control was a 33 year old woman living several states away, who was the fiancée of the instructor.

Anne (not her real name) was employed as an office manager, owned a Macintosh computer, and subscribed to a commercial on-line service. Initial meetings and discussions about an on-line course for weight control were conducted via the commercial on-line service and telephone conversations. It was explained to Anne that this on-line course was being conducted partially to fulfill the requirements of a doctoral seminar in behavioral medicine in which the instructor was enrolled. Anne reported an historical baseline of weight maintenance or weight gain in the months preceding the course. Anne began participating on 2 March 1995. All subsequent interactions with respect to this project were conducted via the commercial on-line service.

Weight control client's instructional procedures. Anne expressed strong interest in losing weight *via the acquisition of a daily exercise regimen*, which would begin at low intensity yet increase in intensity at her own pace. The framework which emerged during the start-up phase of the project emphasized client-chosen exercises at client-chosen levels of repetition, duration, and intensity, which were easy enough to be performed for seven successive days with no avoidance or "errors of omission." Once an exercise (such as sit-ups, yoga stretches, straight leg lifts, or crunches) and its corresponding number of repetitions were chosen by Anne, she agreed to perform the exercise(s) to her chosen criteria for one week before adding exercises or reps. She was advised to begin with one exercise at low repetitions, and to aim for "errorless exercise," gradually increasing either the number of exercises or the number of reps per exercise only after errorlessly performing at lower intensity levels. In the spirit of "avoiding avoidance," special emphasis was placed on making the course procedures as personalized and aversion-free as was possible within the framework of data-based life-style management research.

Anne chose a "goal weight" of 25 pounds to be lost. She also chose a "goal date," the date at which the goal weight should be lost. Both Anne and the instructor were interested in a medically reasonable, gradual weight loss (around one pound per week). Therefore, the planned duration of the course was set at 16 weeks. Anne formally ended the course on 14 June 1995.

Anne's preferences were considered in the design of daily data collection, reporting, and instructional feedback. She counted her daily rate of repetitions of exercises, and recorded the rates of each exercise in a client-designed computer database. She used the database to record her self-measurement immediately after exercising, with each rate recorded in a field next to the exercise name in a "journal" format. If no exercise occurred, she recorded a zero. She then attached that day's database to an e-mail document, and sent it each evening to the instructor using the commercial on-line service.

Both Anne and the instructor used the same Macintosh integrated software program. Thus all course materials, client data, subsequent instructor feedback, and other electronic documents could be exchanged, opened, viewed, and edited immediately and directly, with no loss of document quality or data via telecommunication.

While measurable exercise increase was the vehicle of change, weight reduction was the desired result. However, the mechanics of weight measurement and reporting were a source of aversive emotional reactions for Anne. Managing the course procedures to minimize such aversion led to a number of small, practical innovations in weight measurement. Anne expressed a preference not to report her starting weight to the instructor, preferring instead to report how much, if any, weight had been lost. This was adopted as the standard weight measurement strategy; Anne would report only a num-

ber of pounds lost, rather than her current weight. She also reported aversive reactions to viewing her starting weight on a scale. In the interest of reducing unneeded aversives, the instructor suggested that the client use masking tape to cover the first two digits of her digital scale. The remaining digit could be reported, and accurate weight change noted, without reference to the aversive preceding digits.

Although data on exercise was reported every day, Anne did not measure and report her weight each day. The instructor advised her to weigh herself approximately once a week, recording any pounds lost in her database journal. However, there was not a requirement to do so, with Anne being urged to weigh herself at her own pace. A review of Anne's database journal shows that, using self-paced weigh-ins, she reported 12 weight measurements across the 16 weeks of the course. On average, Anne weighed in, reporting a weight-change measure in her database journal, every nine days.

In addition to daily exercise and self-paced weight measures, Anne also engaged in a weekly on-line seminar for an hour. These on-line discussions focused on revising her data reporting procedures, discussing the progress in the data, and evaluating suggestions for course changes. For example, Anne suggested adding a food diary to her daily database journal. By adding a second layout to her database, She was quickly able to add fields in which to record her food choices for each day. Such personalized, client-centered changes were easy, as well as accurately recorded, since the beginning of any new procedure is "date-stamped" automatically by the database. A review of the database shows that Anne began her daily food diary on Wednesday, 10 May 1995, the tenth week of the course. Other informal changes could be discussed in on-line seminar meetings, adopted, and subsequently tracked easily and accurately by virtue of using a computer database document to collect, record and report behavioral data.

Anne reported previous difficulty maintaining a daily exercise regimen. At her suggestion, Anne and the instructor collaborated on the design of a contingency contract element, which made a chosen activity contingent on Anne's achieving her goal weight by her goal date. This contingency contract was in effect from the start of the project until 16 April 1995, when the contingency contract element was removed based on performance data, Anne's preference, and the professional judgment of the instructor. The project continued, without the contingency contract element, until its end.

While the instructor had pre-designed an element of graphic feedback for weight loss progress, Anne expressed a preference to track "number of pounds lost" on an add/subtract graph, so that chart movement increased for each pound lost. The instructor created such a progress chart as an electronic file in the Macintosh integrated software application owned by both Anne and the instructor. The resulting progress chart listed the goal weight at the goal date, along with a minimum celeration line, illustrating graphically how much weight needed to be lost to achieve the goal weight by the goal date. This was a modification of the precision teaching procedure of establishing an aimstar (Wolery, Bailey, & Sugai, 1988, p. 132) which the instructor called a "weightstar." As Anne reported her weight measures, the instructor plotted incoming data on the electronic progress chart, with weekly on-line seminars setting the occasion for electronic chart-sharing and discussion between Anne and the instructor. Figure 1 shows Anne's data plotted on the weightstar chart. (Since many of the figures in this paper were also used to provide information to clients, the figures are often presented here as clients would have seen them, at "screen resolution" and with all their parts.)

Weight control client's results and discussion. This study could be considered an informal version of a treatment-only instructional design (Moxley, 1995, 1996), with the treatment conditions present at the start of measurement. During the contingency contract, the client lost an average of 0.175 pounds per day. After the removal of the contingency contract element on 16 April her weight loss slowed to a consistent 0.148 pounds per day on average. The client lost 16 pounds across the 16 weeks of the course.

The steady weight loss was correlated with systematically increasing daily levels of exercises chosen by the client. The client's database journal documents the date, number of exercises, reps for each exercise, and weight loss (if any) for each day. While those data are too extensive for detailed analysis here, a description of the first few weeks of the client's exercise regimen is illustrative. The client began with two exercises, sit-ups (20) and yoga (10 minute episode) on 2 March. On 21 March (by which time the client had lost 3 pounds), the client elected to drop yoga, adding straight leg lifts (50), crunches (50), and aerobic movements (50), as well as increasing sit-ups to 35. These four exercises continued until 4 April, when sit-ups, straight leg lifts, and crunches were dropped, and scoops (20), alternating leg lifts (20), inner leg stretches (100), biceps curls (30), and triceps curls (30), were added; aerobic movements remained.

This pattern of adding new daily exercises with repetition criteria continued throughout the course. The client chose exercises at "doable" levels of intensity, and completed them for at least seven days in succession, often without errors of omission.

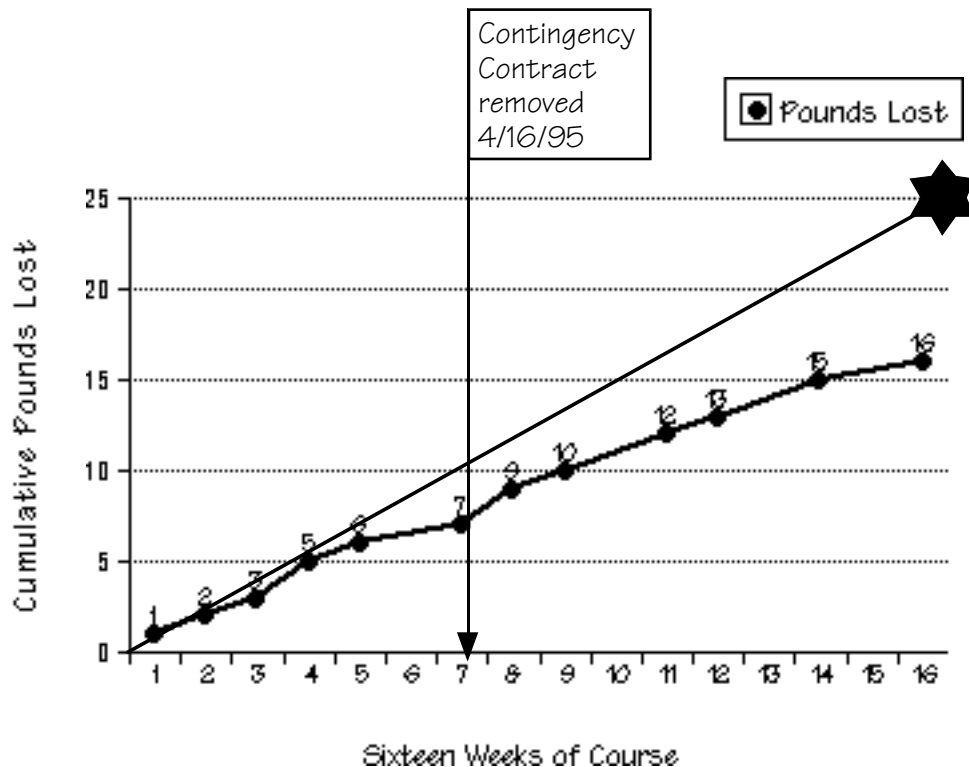


Figure 1. Weightstar chart with results of on-line weight control course.

As the course continued, and more weight loss ensued, the client added more exercises to her daily routine, often at higher reps, and continued to complete them with few errors. At most, the client was performing eleven separate exercises every day, and reporting those data, along with any weight-loss data, every evening.

After the completion of the formal course, the client composed a short essay about her participation in the course. Here are excerpts from that essay:

I have gained and lost weight many times in my life. Sometimes with a "program," and sometimes on my own. What I have found from these experiences is, when I am trying to do it by myself, I have a hard time with consistently doing the things I know I need to do. I will do well for a week or so, then have a bad day, then have another bad day, and with nothing to check me, just give up. I will tell myself it's not important, and that I will "get back" tomorrow, or next week.

On the other hand, with the other programs, I would be consistent about it, but primarily for fear of humiliation. That never worked for long. I did lose weight, twice through programs, but gained it back as soon as I was no longer being held to a specific diet....

Beginning this plan was entirely my idea, and the development of it has been totally guided by me. I wanted someone to talk to about it, without criticism... and I knew that I needed to report my progress, but on my own terms. We both reasoned that "our program" would help me through the hard times and, most importantly, keep me going.

It has worked remarkably well....

Smoking Control (Client One)

Jane (not her real name) was one of two clients who will exemplify on-line interventions for smoking control. She was a 27 year old female client living in the same city as the instructor. Jane was employed as a free-lance writer, owned a Macintosh computer, and subscribed to a commercial on-line service. She reported being fluent in the tools now used for the course, E-mail and Chat writing.

After an initial, informal face-to-face meeting in early July, 1995, Jane agreed to participate in a multi-week on-line course devoted to measuring and modifying her daily rate of smoking. She indicated in this informal meeting that she wanted to reduce or cease smoking from a current "one pack plus" per day habit. At the initial face-to-face meeting, the rudiments of the on-line research methodology were explained, along with the basics of the on-line course procedures.

Jane entered into the on-line course with the assurance that the course procedures were modifiable on the basis of her performance and preferences. The course would begin with a basic data-collection phase and, once the data collection procedures were mastered, would proceed at the her chosen pace toward intervention phases intended to slowly reduce or eliminate smoking. Once intervention was begun, she would receive customized progress charts at regular intervals showing the emerging data picture from her project. Since Jane and the instructor did not own the same software applications, uploading such progress charts would be problematic; Jane elected to receive laser-printed paper copies of her progress charts via USMAIL.

Smoking client one's instructional procedures. Jane expressed an interest in reducing smoking slowly so that she could be smoking "two cigarettes per week" by Janu-

ary 1996. She was skeptical about her ability to quit “cold turkey,” but felt that a slow decrease to just a few cigarettes per week would be feasible. On 6 July 1995, she began the course by counting and recording the number of cigarettes smoked per day, making a written mark on paper after each cigarette during the course of her day, and adding the totals before bed (e.g., “Thursday, 7/16: 30 cigarettes”). Jane would then copy her self-count sentence into E-mail and send the self-count to the instructor before bed, so that subsequent smoking would not tend to occur after that day’s E-mail. When late-night smoking did occur after a nightly E-mail, those cigarette counts were noted in the next E-mail data report.

Any day in which an E-mail self-count was not received was treated as an error; data for that day was not applicable to the project. Missing, incomplete, or incorrect data meant that Jane would have to achieve 14 more, errorless days of data reportage to be eligible to begin an intervention. She did have five “errors of omission” days; these were days in which data were not reported. She missed no other days of data reporting during the course.

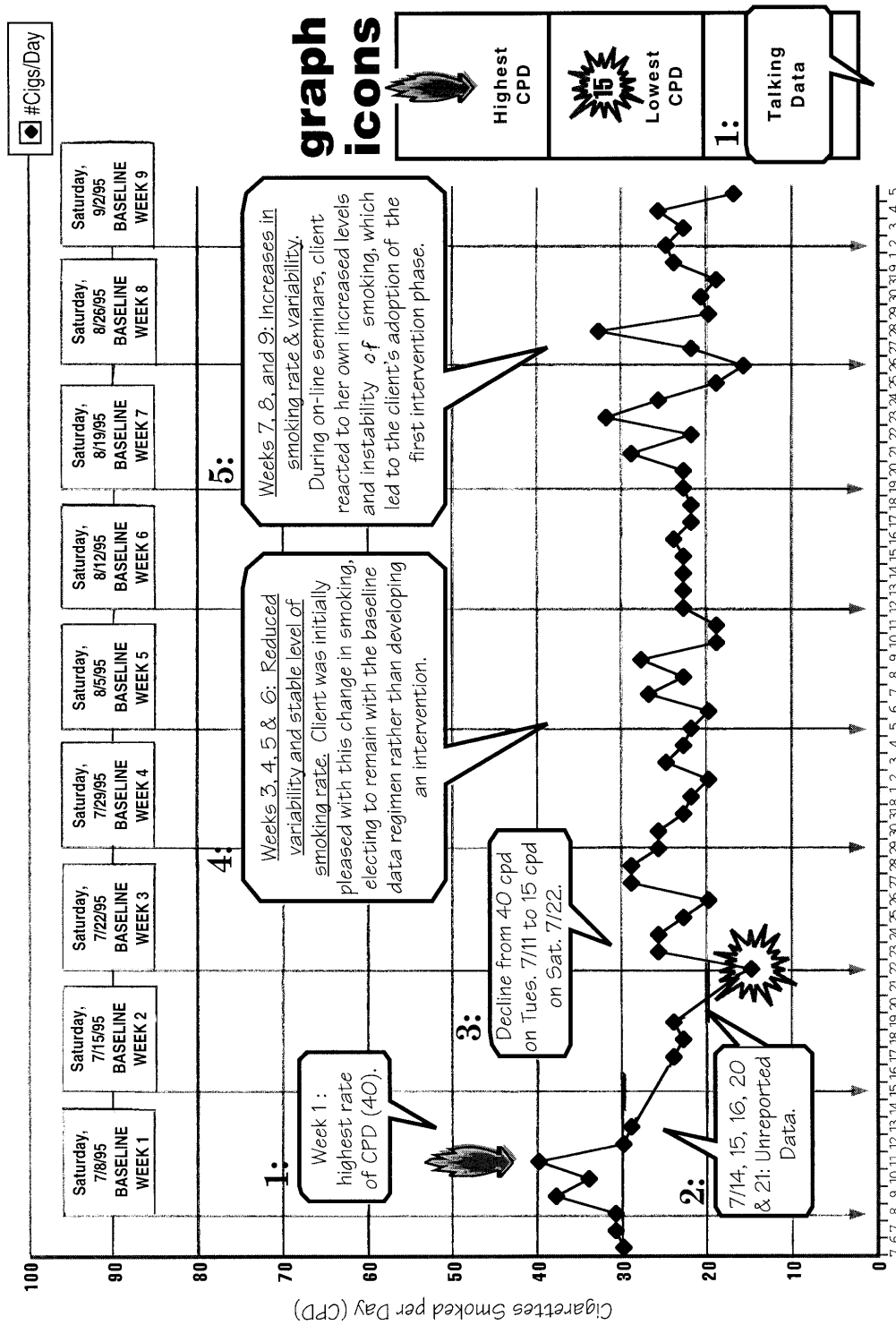
Jane began on-line, hour-long seminar discussions starting on 10 August 1995. These meetings were conducted weekly until 18 September 1995, at which time she elected to schedule further seminars “on demand,” at her own pace. She subsequently scheduled five more on-line seminars before her resignation from the course on 9 November 1995 for a total of 12 on-line seminars across the entire course.

On-line seminar discussions in the presence of her graphed data set the stage for Jane to personalize her data collection regimen during the baseline phase of the course, and to move toward an intervention. Figure 2 shows the progress chart derived from data she provided, to which Jane was responding.

Jane’s personalization of data collection expanded her task load. She reported her daily data count of cigarettes smoked from the start of the course until the third on-line seminar on 21 August 1995. During that discussion, she suggested that she would like to collect more data, specifically the time of each cigarette, who (if anyone) was with her during each cigarette, and where each cigarette was smoked. The instructor supported Jane’s curiosity, and suggested that Jane supply her “basic” one-sentence report each day, and send in her “expanded” data once per week as a text document. Table 1 provides an example of one of Jane’s expanded data reports.

Jane reported summary data in this form weekly, while continuing to send the smaller daily E-mail report each day. This daily/weekly data collection system was adopted on 22 August 1995 and continued until the end of the course. (Methodologically, the increase in the effort of such data reporting is one of the natural constraints against client faking of data. Errors aside, this level of writing and self-measurement tasks would seem to make deliberate faking of data contain a higher level of response cost than the simple count for the ordinary E-mail report. As well, the extent of the subtasks needed, in the more comprehensive data recording process, to arrive at a daily total of cigarettes smoked means that the risk of being discovered as a fake is commensurately higher. The more complex process means more chances for a deliberate faker to be caught. These two, the complexity of tasks and the likelihood of being discovered, would provide some automatic deterrent to data faking.)

Jane implemented the first of several interventions on 6 September 1995. She had been “eligible” to begin an intervention for several weeks, but she elected to continue refining her daily smoking measurement and reporting system until then. During this



Baseline Phase for Client One: 7/6/95 to 9/5/95

Figure 2. Data chart of client one's on-line smoking control course baseline.

time, the instructor began to format progress charts and send them to Jane via USMAIL approximately every two weeks. Figure 3 shows her data during these interventions.

Jane's first intervention consisted of an agreement to smoke one less cigarette per day ("CPD" in the figures) starting from 23 cigarettes per day (which was her average rate during baseline). This intervention was termed a "daily decrease smoking cap," since each day carried a limit or "cap" on the number of cigarettes to be smoked that day. This intervention continued until 19 September 1995.

During an on-line seminar discussion on 18 September 1995, Jane reported aversive withdrawal symptoms as she approached ten cigarettes per day. She suggested adding a reward system, begun the next day, in which she would earn one point per day for smoking no more than ten cigarettes per day. This intervention was termed "point reward for cap maintenance." When she earned three successive points (for three succes-

<i>Cigarette #</i>	<i>Tuesday 22 August</i>		
	<i>Where</i>	<i>With Whom</i>	<i>Time of Day</i>
1	Home	Alone	10:20 A.M.
2	Home	Alone	10:40
3	Home	Alone	11:00
4	Home	Alone	11:15
5	Home	Alone	11:55
6	Walking street	Alone	1:55 P.M.
7	Walking street	Alone	2:15
8	Coming out of store	Alone	2:55
9	Coming out of store	Alone	3:20
10	Home TV	Alone	3:45
11	Home desk	Alone	3:55
12	Home desk	Alone	4:20
13	Home desk	Alone	5:15
14	Home desk	Alone	5:35
15	Home desk	Alone	5:56
16	Standing in street	Alone	8:02
17	In restaurant 1	Alone	9:00
18	In restaurant 2	Jack	9:10
19	Outside resting	Jack	11:00
20	Home	Joe	11:35
21	Home	Joe	11:50
22	Home	Joe	12:30 A.M.

Table 1. One of client one's expanded data reports.

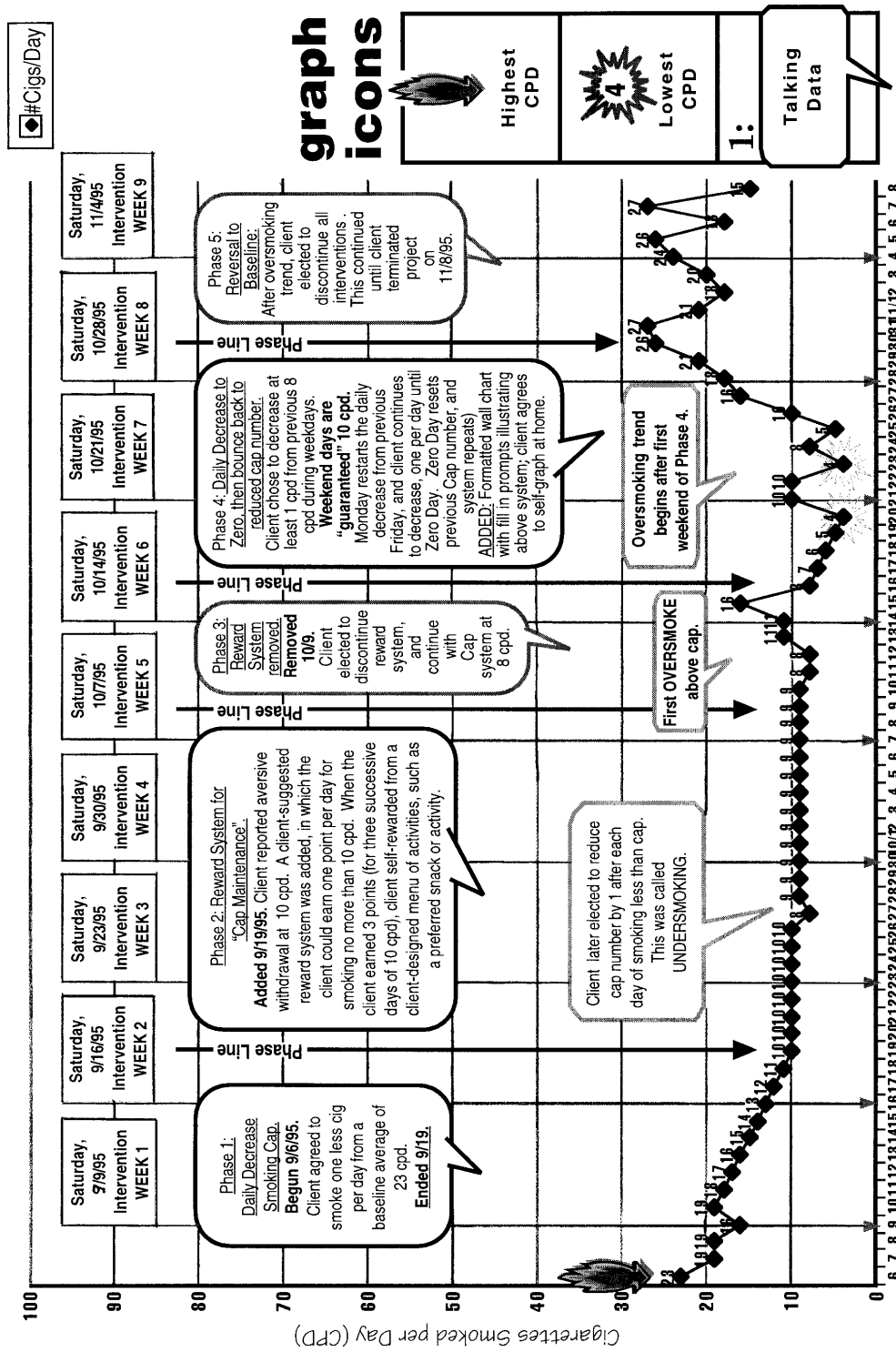


Figure 3. Results of client one's on-line smoking control interventions.

Intervention Phases for Client One: 9/6/95 to 11/8/95

sive days of no more than ten cigarettes per day), she rewarded herself with a preferred snack or activity selected from a menu of rewards she had constructed. Point-tracking was added to Jane's daily and weekly data reports; when a reward was earned, she described what reward she had chosen in that evening's e-mail report.

Nine days into this intervention, Jane managed to smoke less than her daily cap number. So she elected to add a new rule to this intervention. She would reduce her daily cap number by one cigarette per day after each day of smoking less than cap. Smoking less than the daily cap limit was called *undersmoking*. For example, Figure 3 shows that on 27 September 1995 Jane smoked eight cigarettes per day, two below her allotted cap of ten cigarettes. According to her new rule, her daily cap number would drop to nine cigarettes per day, since she had undersmoked on the previous day. Jane expressed confidence that such a rule would allow her to maintain (and acclimate to) her present daily cap of cigarettes per day, while still allowing her to gradually reduce if she found herself able to smoke less.

The third intervention phase involved the removal, on 9 October 1995, of the point system for maintenance. While Jane was successful with the system, never failing to earn her reward for three successive days of cap maintenance, she considered the point system to be too task-intensive, and judged it unnecessary in order for her to maintain control of the rate of her smoking. As further data would address the accuracy of this judgement, the reward system regimen was removed after discussion in an on-line seminar. Jane elected to continue on with a daily cap of eight cigarettes per day.

The fourth intervention phase sprang from an on-line seminar discussion on 16 October 1995 in which Jane expressed an interest in attempting to stop smoking completely. Noting that weekday smoking rates were easier to manage than weekends, she thought that reducing to zero cigarettes per day during a weekday might be possible, if she could summarily return to a higher rate of cigarettes per day during the weekends. With these preferences in mind, the instructor designed the fourth intervention, which was termed "daily decrease to zero, then bounce back to reduced cap number." Jane agreed to decrease at least one cigarettes per day (from her current eight cigarettes per day) during Monday through Friday. Weekend days would allow a "guaranteed" cap of ten cigarettes per day; that is, no matter what cigarettes per day cap resulted on a Friday, Jane could smoke ten cigarettes per day on Saturday and Sunday. On Monday, the decreasing cap would begin again, from the level established on the previous Friday. Jane would continue to decrease during weekdays until she finished one day of no smoking. After her day of zero cigarettes, the cap would "reset" to her previous cap number, minus one, and the cycle would begin again. For example, Jane might progress from eight cigarettes per day on Monday to seven on Tuesday, six on Wednesday, five on Thursday, and four on Friday. On Saturday and Sunday, she could smoke ten cigarettes per day. Come Monday, Jane would "cap" at three cigarettes per day, with two on Tuesday, one on Wednesday, and zero cigarettes per day—no smoking—on Thursday. If Jane completed her zero smoking day, she would reset her cap to "one less cigarette than last time," in this case, seven, and begin another daily decrease to another zero smoking day (with weekends still reserved for ten cigarettes per day).

Since this "precision smoking schedule" was complex, the instructor formatted a programmed data collection booklet with a matching graphic wall chart for Jane to use at home. The booklet was a daily smoking diary which had a page for each day of the intervention, listing the programmed cap number for each day. Jane could use the

booklet to record her daily data and be reminded of her cap schedule. The wall chart consisted of a graph with hollow points corresponding to each day's cap number. She could see each dot at its corresponding cap number (such as "eight cigarettes per day for Monday") and could see the decreasing patterns, weekend increases, approaching zero days, and resets. She agreed to fill in each dot to chart her own progress at home during intervention four.

The fifth and final phase of the course was a reversal to baseline measurement procedures, begun on 31 October 1995, after an on-line seminar the previous day. This phase continued until Jane resigned from the course on 9 November 1995.

Smoking client one's results and discussion. The use of client-driven collaborative design and pacing of baseline and intervention elements results in personalized, unique versions of repeated measures research designs. For this client the changing-criterion design (Wolery, Bailey, & Sugai, 1988, p. 158) would seem to be the closest analogue. While the first intervention reduced the daily smoking criteria by one cigarette per day, the second intervention added a reward system for maintenance of a target level of smoking rate, although the client could bring about a change in the criterion by undersmoking her daily cigarettes per day cap. Intervention three reinstated the changing criterion design of intervention one, while intervention four was a more precise, programmed version of a changing criterion design with supplemental workbook and home graph. The final phase was a reversal to the baseline conditions.

The baseline phase lasted for 61 days. During baseline, the client ranged from 40 cigarettes per day to 15 cigarettes per day with a mean of 23 cigarettes per day. During baseline weeks one and two, the client reduced her smoking rate considerably, reaching the lowest daily rate of the entire baseline, 15 cigarettes per day, on 22 July.

During weeks three, four, five, and six, the client's daily rate of smoking stabilized between the 20–30 cigarettes per day level, with the range between points slowly narrowing through week six. However, this pattern did not persist during the last three weeks of baseline, as shown in Figure 2. It was this "loss of control," as the client described it, that set the stage for the client to collaborate on the design and implementation of her first intervention.

As Figure 3 shows, the first intervention systematically reduced the client's daily rate of smoking from 23 cigarettes per day on 6 September to ten cigarettes per day on 19 September. Variability from the client-chosen changing criteria existed only insofar as the client smoked less than her daily cap, as she did on 7, 8, and 9 September. On every other day of intervention one, the client smoked every cigarette allowed by her cap.

During intervention two, the client either maintained her stable daily smoking cap of ten cigarettes per day, or undersmoked. This intervention involved a reward for maintaining her smoking cap for three successive days; the client earned every possible reward for this intervention. On 27 September the client undersmoked her daily cigarettes per day cap. This resulted in a changed criterion to nine cigarettes per day, which the client maintained up to the end of this intervention on 9 October.

Intervention three was a reversal to the changing criterion of intervention one. The client experienced both new lows of eight cigarettes per day, and her first oversmoking days (consumption of more cigarettes than her daily cap) on the weekend of 13, 14, and 15 October. This bout of oversmoking led the client to request, on 16 October, an on-line session in which intervention four was designed and implemented.

Early in intervention four, the client resumed her downward trajectory according to criteria and continued to her lowest cigarettes per day rates of the entire course. During this week, the programmed criteria of intervention four can be seen in the systematic one-per-day reduction from six cigarettes per day on Monday 16 October to two cigarettes per day on Friday 20 October. As per the programmed criteria, the cigarettes per day for Saturday and Sunday was ten cigarettes per day, which the client met. However, according to the programmed workbook and home graph, the criteria on Monday 23 October was one cigarette per day; the client oversmoked at four cigarettes. While the programmed criteria were scheduled to decrease to zero cigarettes per day on Tuesday 24 October, the client continued to oversmoke her daily criteria. Within a few days, the client's smoking rate had shot up to baseline levels.

In an on-line seminar meeting on 31 October, the client expressed her frustration with the complexity of intervention four, as well as the amount of writing required to submit data both daily and in a weekly summary. After discussion, she elected to continue reporting daily and weekly data, but to abandon all interventions. During this phase, her smoking returned to near-baseline level and variability, with a range from 15 to 27 cigarettes per day and a mean of 21.6 cigarettes per day.

While the client considered the course a success, she was disheartened by her "blowing it" during intervention four, and continued to echo her disappointment with her performance through the end of the course. The client also considered her data collection regimen to be too labor-intensive to result in her preferred levels of smoking by 1 January 1996. For these reasons the client elected to resign from the course on 9 November 1995. (For an hour-long, on-line follow-up interview in April 1996, the client collected smoking data for one day. She had smoked 28 cigarettes.)

Smoking Control (Client Two)

Jim (not his real name) was the second of the two clients involved in on-line interventions for smoking control. He was a 40 year old male living in the same city as the instructor. Jim was employed in marketing, owned a Macintosh computer, and subscribed to a commercial on-line service. He reported being fluent in the tools used for the course, e-mail and Chat writing. Jim also reported fluency in using a commercial spreadsheet software program, which soon became his preferred method for recording and reporting his course data.

After an initial, informal on-line meeting on Sunday 17 March 1996, Jim agreed to participate in a multi-week on-line course devoted to measuring and modifying his daily rate of smoking. He indicated in this informal meeting that he was a "binge" smoker on top of showing a typically very high rate of smoking. He also indicated that he enjoyed smoking very much, but had worries about his health and the impact of smoking on his life-style. Jim expressed skepticism about his ability to modify his smoking rate, but indicated curiosity about the course, specifically the process of counting each cigarette each day.

Jim entered into the on-line course with the assurance that the course procedures were modifiable on the basis of his performance and preferences. The course would begin with a basic data-collection phase and, once the data collection procedures were mastered, would proceed at his chosen pace toward intervention phases intended to slowly reduce smoking.

Once intervention was begun, Jim would receive customized progress charts at regular intervals showing the emerging data picture from his project. Since the instructor and client did not own the same software applications, uploading such progress charts would be problematic; Jim elected to receive laser-printed paper copies of his progress charts via USMAIL. He also expressed an interest in viewing his progress charts using the World Wide Web; so his progress charts were also posted to a web page designed by the instructor, the address of which was given to Jim for his perusal.

Smoking client two's instructional procedures. In the initial on-line seminar, the rudiments of the on-line research methodology were explained, along with the basics of the on-line course procedures. As well, Jim was asked to compose a 1000 word essay in which he described his smoking, his history of smoking, the settings in which he smoked, and his personal goals for the course. Along with the essay, he was asked to turn in a simple smoking count for one day in order to begin to contact the idiosyncrasies of the data-collection process. He understood that he could formally begin the course after he provided the completed essay and data assignment via E-mail. Within 24 hours, Jim had returned not only his first daily data count but also a 998 word essay detailing his smoking history and various concerns and goals for the project. (Methodologically, this procedure of assigning an introductory expressive essay and free-form data count was valuable both in getting information from clients, about themselves, and as a method of screening out—at this stage of the research—those potential clients who were unlikely to complete the extensive writing and self-count tasks which the evolving on-line methodology required. Clients who expressed an early interest in an on-line course, yet were unable to accept or complete such an introductory assignment would self-select themselves out of consideration for participation in the course. This reduces “false starts” and course dropouts as well as helping clients to acclimate to expressive, criterion-based writing tasks. How to help those so screened out is on the agenda for future research.)

In his introductory essay assignment, and in later discussions, Jim expressed an interest in reducing smoking, but considered the prospect very difficult due to his self-described “binge” smoking patterns. He also expressed some aversion to the process of reducing smoking because he felt he would experience strong withdrawal and eventual failure. Nevertheless, Jim expressed his willingness to participate, saying “I’m giving this my best shot.”

On Monday 18 March 1996, Jim began the course by counting and recording the number of cigarettes smoked per day, and reporting that number in his essay assignment. Based on subsequent on-line seminar discussions, he constructed a spreadsheet document which allowed him to track the number of cigarettes per day. The document used columns of his daily weekday and weekend activities to record how many cigarettes were smoked during these routine activities. He listed subtotals during weekday activities, with weekday totals. The same procedures were applied to typical weekend activities. Table 2 shows the information from a typical week under this procedure.

Jim mailed an updated version of his data spreadsheet every evening via E-mail. Any day in which an E-mail self-count was not received would be treated as an error and that data would not be applicable to the project. Jim had no such errors during the 15 weeks of the course.

While Jim began the course with two on-line seminars during week one, he expressed his inability to schedule on-line seminars on any regular basis, because he was

	A	B	C	D	E	F	G	H	I	J
1	WEEK 5	Mon 4/15	Tue 4/16	Wed 4/17	Thu 4/18	Fri 4/19	WEEKEND	Sat 4/20	WEEKEND	Sun 4/21
2	am Home	6	4	4	3	4	am Home	5	am Home	8
3	2 Sub	1	1	1	1	1			Afternoon	13
4	2 Off	1	2	1	1	1	Errands	1	Late Afternoon	7
5	Mid am	3	3	2	2	2	Mid am	5	Evening	20
6	Pre Lunch	3	4	6	4	2	2 Subway	1	Late Night	16
7	Post Lunch	3	3	3	3	4	2 Class (1:30)	1		
8	Mid Day	2	0	0	0	2	Walking	7		
9	Late Afternoon	0	4	4	4	2	Back Home	8		
10	2 Sub	1	3	1	3	3	Evening	16		
11	2 Class (6:45)	0	0	1	0	0	2 Sub	1		
12	2 Sub	0	0	1	0	0	2 Bar	1		
13	2 Store	0	0	0	0	0	At Bar	10		
14	2 Home	0	0	0	0	0	pm (am) Home	7		
15	pm Home	30	26	22	23	22				
16	Total Day	50	50	46	44	43	Total Day	63	Total Day	64
17	\$ Spent	\$5.09	\$5.09	\$4.68	\$4.48	\$4.38	\$ Spent	\$6.41	\$ Spent	\$6.51

Table 2. Smoking data from week five of client two's data spreadsheet.

enrolled in night classes several evenings each week. For this reason, the majority of interactions between him and the instructor occurred via e-mail, with on-line sessions occurring infrequently. Jim scheduled and completed only six on-line seminars during the 15 weeks of his participation. This resulted in fewer opportunities for adoptions/abandonments of intervention phases.

As was the case with other clients, on-line seminar discussions set the stage for Jim to collaborate on interventions as well as daily self-measurement. During the third on-line seminar on Tuesday 9 April 1996, Jim was told that he was eligible to begin collaborating on an intervention. During this particular discussion, Jim articulated several ideas about self-control strategies (such as “substitution,” “denial,” and “delay”) as being possible, but difficult. He expressed reservations about interventions being “the hard part.” An excerpt from the transcript of on-line seminar three illustrates directly the collaborative writing process of this type of intervention design. (On-line sessions involve active but occasionally incorrect conversational writing. For this excerpt grammar, punctuation and spelling have been partially corrected, and sentence format and writer labels have been added.) Here is the transcript excerpt:

Instructor: First of all... congrats! You have graduated to “Intervention-hood.” Hurrah!

Instructor: Your data taking consistency, and formatting, are really coming on line, so to speak.

Client Two: Yea! I think.

Instructor: Why “I think?” Are you reticent about continuing?

Client Two: No. It's just that it sounds like the hard part is about to begin.

Instructor: Well, perhaps. Perhaps not. We need not begin anything, if you'd rather. In fact, a few more weeks of detailed data collection is fine with me!

Instructor: However, you have graduated. What that means is... when you're ready, you're ready!

Client Two: Intervene away!

Instructor: Well, we have more to discuss before any intervention is tried. But, we can start talking about interventions—and you can start writing about them! Fun!

Client Two: OK.

Instructor: Any rate, I planned to talk about your data collection “ways,” but we can skip that, since that is what that optional writing assignment covered. Make sense?

Client Two: YES!

Client Two: Didn't mean to shout.

Instructor: Do you have anything else you'd like to say before I continue? Please feel free to talk at any time.

Client Two: I'm with you. Keep going.

Instructor: All right...

Instructor: When you feel like doing some intervening, we need to think about intervention type procedures. We can continue refining data taking, but we need to shift toward the “control” aspect of smoking control. Questions?

Client Two: The self control aspect?

Instructor: Yes. Discovering how you can control your daily rate of cigarette smoking.

Client Two: Since there is no one to physically intervene, do you mean “substitution?”

Instructor: This will be a discovery process... you need to understand that. When you try some intervention, you don't “fail”... you just keep looking for another way.

Client Two: OK.

Instructor: What do you mean when you say “substitution?” Explain your usage, and I will try to cast an intervention in those terms...

Client Two: Substitute an action or prop for a particular urge for a smoke.

Instructor: Pragmatically, the intervention can be anything you feel might work. If by substitution you mean “competing activities” for cigarette smoking...

Client Two: Sounds like what I was thinking.

Instructor: Well, hmmm. When you think of things that may result in less smoking, does substitution seem like a good workable procedure you can deal with?

Client Two: Yes.

Client Two: And there is always “denial” or “delay.”

Instructor: I am looking to you, Jim, to actively conceptualize your own intervention. Don't copy what you think I may want to hear... Express what you think you want to try, in practical terms.

Client Two: OK, we've got substitution, denial, and delay.

Instructor: Now you're talking. What else?

Client Two: I really can't think of anything else at the moment. All of the above are pretty challenging.

Jim expressed an interest in beginning an intervention as soon as possible, so he was given the option of either developing an original intervention over the course of subsequent weekly on-line discussions, or choosing from a list of pre-designed intervention plans from an “intervention menu” and beginning immediately. During subsequent discussion in the same on-line seminar, Jim elected to begin an intervention with two strategic elements.

Jim began his first intervention phase on Wednesday 10 April 1996 with the first strategy of adding calculation cells to his data spreadsheet. The total dollar cost for smoking would now be displayed for each day, as would the total dollar cost per week (see Table 2). Other cells located elsewhere calculated Jim's *average* dollar cost per week. The contingencies of adding new subtotals of smoking per day were such that, for each cigarette Jim entered, his daily, weekly and average weekly cost per cigarette was updated immediately and automatically! This literally demonstrated the dollar cost to Jim after each cigarette number entry. Table 2 shows that Jim generally entered smoking rate subtotals from five to fourteen times per day, with each increment in rate being consequted with a precisely incrementing dollar cost measurement of 10.17 cents per cigarette. While the cost calculation element was not begun until week three, Jim calculated his cost per cigarette data retroactively to the start of the course as part of intervention one. Jim's data spreadsheet, including updated cost per cigarette data, continued to be attached to an e-mail document and submitted daily.

The second strategy of intervention one was the use of bimonthly customized progress charts which were begun at the same time as the first strategy. The client agreed that a new, updated chart would be mailed contingent on two weeks of error-

less data reportage. The instructor's continuing work with digital data processing, customized graphing, and client-driven instruction led to the development of an experimental "dual-scale" progress chart, using an interval scale to present Jim's first few weeks of course data, and a semi-logarithmic scale to present later weeks of his baseline data, on the same page. The semi-log graph aspect was the closest convenient approximation of Lindsley's Standard Behavior Chart, usually called the Standard Celeration Chart (Pennypacker, Koenig, & Lindsley, 1972). In recent research, the Standard Celeration Chart has been integrated into data-based smoking control training programs for adult smokers (Abba & McLaughlin, 1995). Figure 4 shows this dual-scale data for the early weeks of Jim's course. (Since the first few days were an incomplete week, the chart starts with "week zero.")

The dual-scale progress chart was designed to convey both conventional and semi-log data pictures. Jim could easily discriminate between the two charting styles, and could then choose the style that helped him the most. As well, the use of the add/subtract scale for the first few weeks of the course emphasized each incremental change in smoking with a larger chart movement. It was reasoned that Jim (or any smoking reduction client) would profit most at the beginning of the course by seeing small incremental changes in smoking rate as large chart movements; decreases would look larger, as would increases. Later weeks rendered in the semi log style showed less incremental chart movement for each increment of change in rate; the lines were more flat. This was designed to demonstrate that the client needed to reduce his smoking rate by a larger increment if he wanted to "see as much chart movement" as in earlier weeks.

Intervention one obtained from the start of week four until the start of week 13. This was due both to Jim's inability to schedule on-line seminar discussions and to his satisfaction with his weekly smoking progress during intervention one. However, by week 12, Jim was eager to begin a new intervention which he felt might enhance his weekly smoking control; the new intervention being discussed was a changing-criterion system with programmed graphing worksheets to be used at home. As he stated during on-line seminar five on 4 June 1996,

A month ago my goal was to become comfortable as a pack-a-day smoker. I'm nearly there. I'm a comfortable pack-and-a-quarter-a-day smoker. I'm hoping that the home graphing tools will help get below the pack-a-day threshold."

The second intervention phase, a "daily decrease by minus one cigarette" rule with programmed graphing worksheets, was implemented after on-line session six on Tuesday, 11 June 1996. Jim and the instructor discussed a starting rate from which to decrease, and settled on 35 cigarettes per day; a number which was purposefully higher than the Jim's average daily smoking rate during intervention one. This was based on his expressed apprehension that he could not keep his daily rate under 30 cigarettes per day for an entire week. Jim chose to begin "ratcheting down" from the retroactive date of Monday, 10 June 1996.

By starting with a "cap" of 35 cigarettes per day on 10 June 1996 and decreasing by at least one cigarette per day, Jim would be limited to 30 cigarettes per day by 15 June, 25 cigarettes per day by 20 June, and 20 cigarettes per day by 25 June. Because of their procedural and graphic acquaintance with Jim's daily smoking data, both Jim and the instructor realized that such a "ratcheting down" of his smoking would be, by 27 June, a real challenge. To smoke 20 cigarettes per day consistently for an entire week would

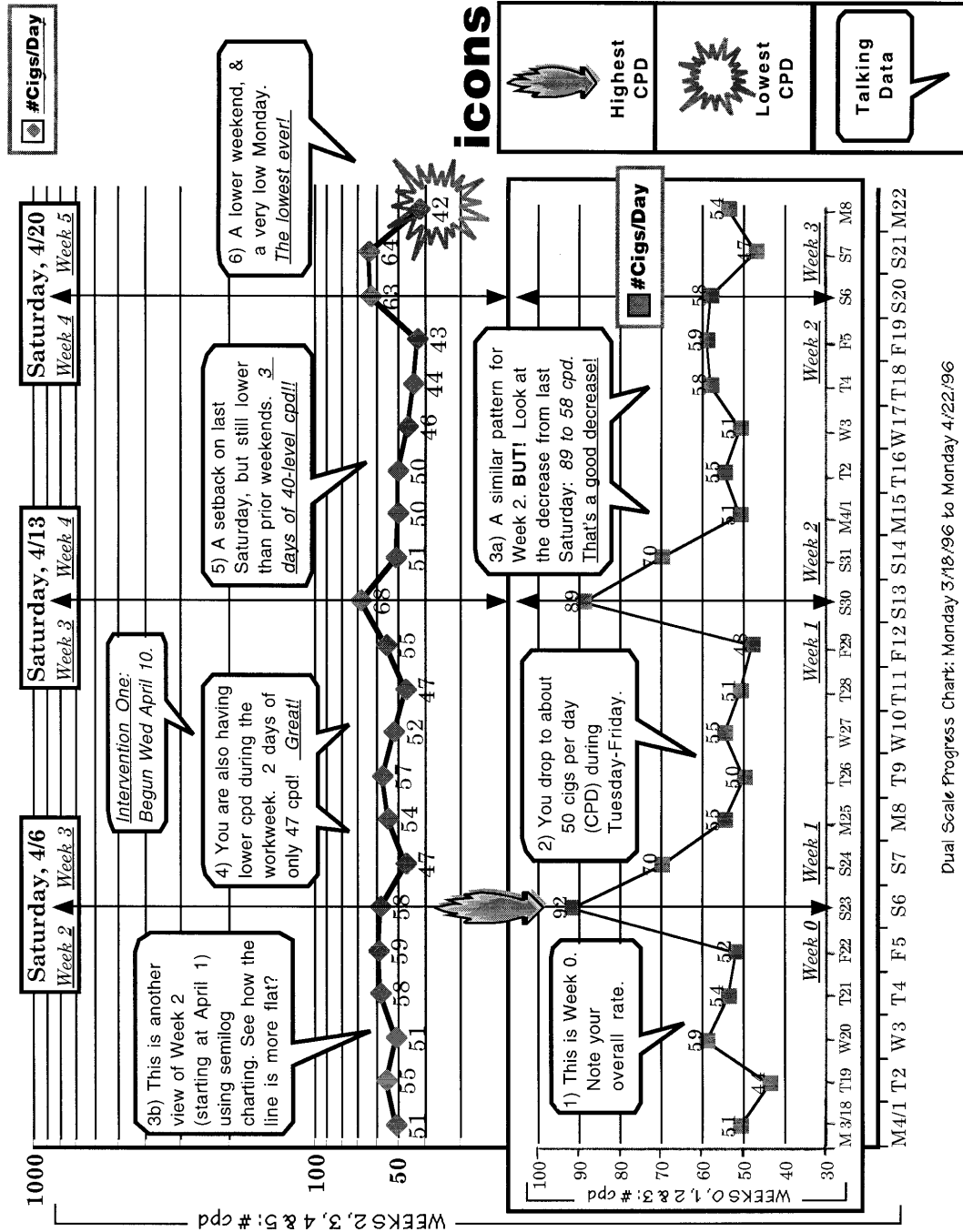


Figure 4. "Dual-scale" progress chart with data from weeks 1-5 of client two's on-line smoking control course.

be an additional challenge, especially during the weekend. Jim agreed to maintain his cap at 20 cigarettes per day if possible.

The second element of intervention two was to involve programmed worksheets. On these Jim could pencil in his daily rates, daily costs, weekly average, and cost for each week in a small formatted table.

Jim was provided with worksheets formatted for use through week 18, and he agreed to fill in the home graphing materials and turn them in to the instructor via USMAIL when completed. Intervention two lasted from 12 June 1996 until the end of the course, which occurred 19 days later.

Jim resigned from the course on 1 July 1996 after a job change during week 15 which decreased his available time to complete tasks for the course. Also, he found the home graphing worksheets difficult to complete; while he said he completed the first worksheet, he never turned any in. He considered the course a success, but reflected that perhaps he had decreased his smoking as much as was possible.

Smoking client two's results and discussion. Like client one, work with this client involved a personalized changing-criterion element, but in an A-B-C sequence of (a) baseline, (b) cost analysis with graphic progress charts, and (c) a changing criterion rule with home charting worksheets. Figure 5 shows client two's data (daily smoking level) and dates throughout the project.

The baseline phase lasted 23 days. The client smoked a mean of 57.83 cigarettes per day, with a range between 92 and 44 cigarettes per day. The client smoked a total of 1,330 cigarettes during baseline, for which he paid \$135.26, making a mean of \$5.88 spent per day for cigarettes.

During weeks one through three, the client showed high peaks on an otherwise fairly level smoking rate, with the peaks in smoking occurring on weekends. This pattern of large incremental increases during weekends would recur. The overall level of weekday smoking remained in the high 40s to 60 cigarettes per day range throughout the baseline phase. What is most notable is the large reduction in weekend smoking rate during week three. Based on discussions of incoming data, both client and instructor soon began to talk about, then explicitly plan for, "weekend rates" as opposed to just weekday smoking rates.

During intervention one, which began on Wednesday 10 April, the client experienced gradual reductions in the level of his weekday smoking rate, with weekend rates remaining higher than weekday rates but decreasing in comparison with prior weekends. Intervention one lasted 77 days, in which the client smoked a mean of 30.6 cigarettes per day. The range of smoking was from 15 to 68 cigarettes per day, with the client smoking a total of 2,361 cigarettes at a cost of \$240.11. The client spent a mean of \$3.12 per day on cigarettes during intervention one. This was a decrease of \$2.76 per day from the baseline level mean.

During on-line seminars, the client expressed his satisfaction with his smoking performance during intervention one. He noted in an on-line seminar that he had saved \$212.52 during intervention one alone, by reducing his daily consumption of cigarettes. He felt that the cost analysis was particularly effective at reducing his smoking rate by directly equating each cigarette with a visibly increasing cost measurement. He also felt that the progress charts were useful, since he was able to see previously numerical data in the form of levels, trends, and "weekend" jumps. He expressed no difficulty in understanding the progress charts, the dual-scale format, or the progression of weekly

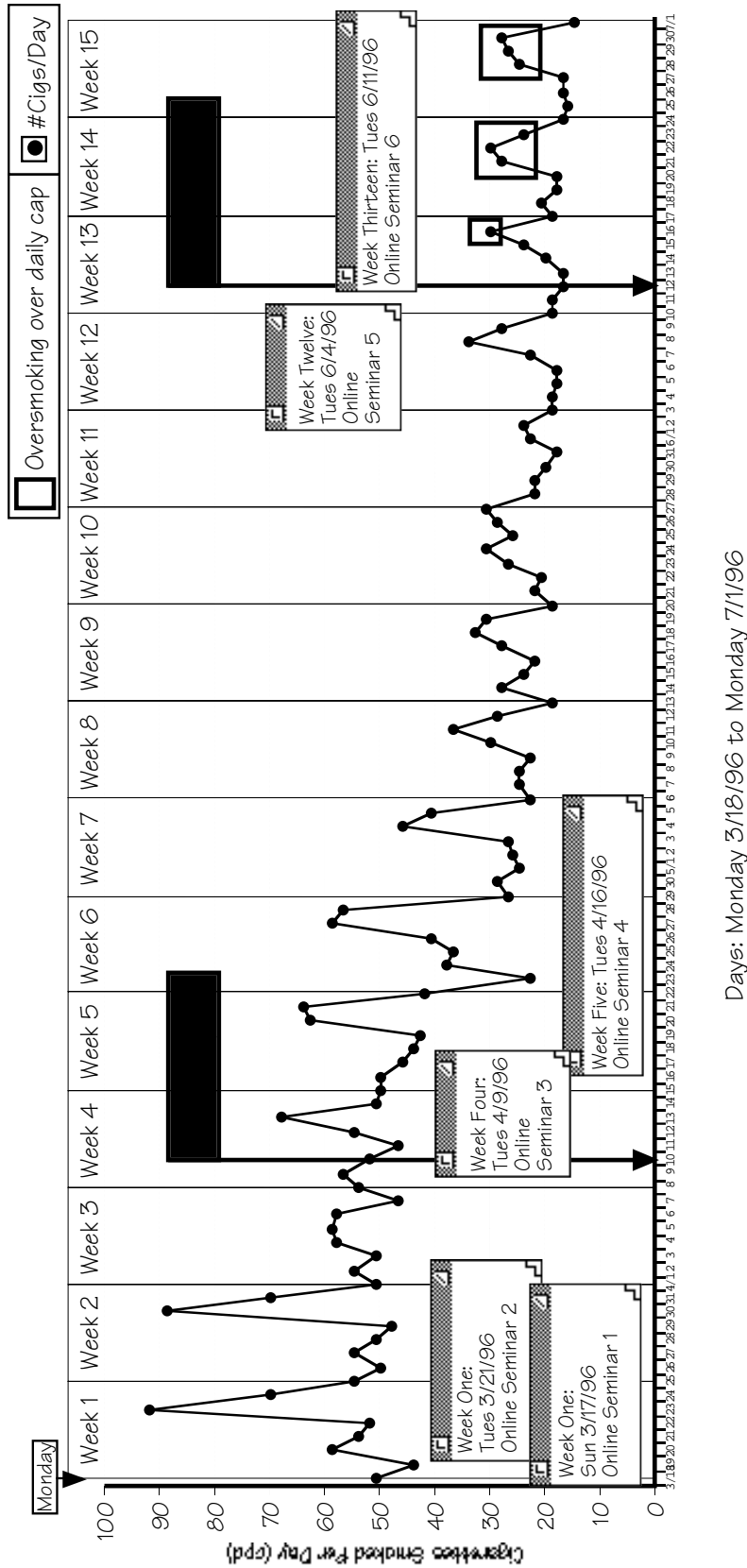


Figure 5. Client two's project data, intervention dates, and on-line seminar dates.

data. And he explicitly mentioned the “talking data” speech balloons as adding motivating, easy-to-understand information (e.g., see Figure 4).

However, by week eleven, the client seemed to reach, with respect to the then-current contingencies, a “smoking floor,” both for weekday rates (from 17 to 23 cigarettes per day) as well as weekend rates (from 25 to 30 cigarettes per day). During week 12, the last week of intervention one, the client had experienced his first serious “uptick” in smoking rates, with a visible increase in weekend smoking. As was the case with client one, the onset of incremental and highly variable smoking rates after periods of consistent decrease (“loss of control”) was a motivating factor in client two’s pursuit of an intervention to enhance his downward smoking trajectory; it led him to discuss and adopt intervention two.

Intervention two, a daily decrease smoking cap with home charting worksheet, continued for only three weeks before the client resigned from the course. During the 20 days of intervention two, the client smoked a total of 428 cigarettes for an average of 21.4 cigarettes per day. The total cost for cigarettes was \$43.53, with a mean cost per day of \$2.18. This constitutes a further decrease in costs—and hence an increase in savings—compared to the level of costs and savings in intervention one, which itself was better than the level in baseline.

While the client continued to make progress during intervention two, in terms of reducing his daily smoking rate from previous weeks, he was not successful in matching his daily rate to the stated decreasing cap number. As Figure 5 shows, his weekend smoking rates for weeks 13, 14, and 15 exceeded the given cap numbers, resulting in oversmoking. He oversmoked for six of the 20 days of intervention two, with each day of oversmoking being either a Friday, Saturday, or Sunday. He seemed to take this oversmoking as proof of his assertion that the increased task load of home graphing was not worthwhile; he felt he had reached the personal bottom of his smoking rate.

The results from this client illustrate that high rates of “binge” smoking can be systematically and sizably reduced via the use of on-line life-style intervention methodology. While the end of the course resulted in some disappointment, the client considered the course very successful overall.

Also of interest is the relative infrequency of on-line seminars for client two in relation to the effects obtained. Further research is needed to determine to what degree on-line chat seminars are essential ingredients in the on-line intervention process, especially in light of client two’s dramatic reduction in smoking rate over several successive weeks without on-line seminar contact.

During the practical stewardship of the course, the applicability of cost measurements of daily smoking rates as an intervention became apparent. Cost measurements seem to provide especially powerful behavior changing stimuli when arranged in the manner of intervention one. Cost measurements may transfer to each cigarette an additional, verbally mediated response—cost. In one on-line seminar, the client remarked that “I thought about how much I was spending when I smoked... I thought about how much I was saving when I smoked less.” Such verbal descriptions of costs per cigarette (and savings per decrement) can be effectively delivered to (and echoed by) the client in an on-line seminar, as well as by the mechanics of daily data reporting, and thus contribute to reducing the smoking rate.

Cost per cigarette measurements were also easily projected into future savings based on current rate reductions. For example, were this client to smoke for one year at his

baseline rate of consumption, he would spend \$2,146.20 per year on cigarettes. In contrast, if he continued to smoke at the reduced rate demonstrated during intervention two, he would spend \$795.70 per year on cigarettes, a savings of \$1,350.50, compounded yearly. It remains for future research to ascertain if such cost per cigarette calculations, linking dollar savings to each decrement in smoking, may be generally effective; the practical results of this study support more investigation.

College Study Skills

An on-line course to enhance college study skills extends the range of on-line applications of behavioral methodology. Peg (not her real name) was a 19 year old female enrolled as a third-semester sophomore at the State University of New York (SUNY) campus in Oswego. She was a full-time college student who had access to E-mail via a computer and modem installed in her dorm room by the University. She reported being fluent in using E-mail, which was the sole tool available for use in the course; chat tools were not available at her terminal. Since Peg was not fluent in other software or computer applications, all instruction was delivered via the university PINE E-mail system. It should be noted that she was the niece of the instructor, and had asked for "study help" in a phone conversation.

After an initial E-mail correspondence on 17 September 1996, Peg agreed to participate in a study skills course based on E-mail. She related that her freshman year grade point average was 3.0, and that she had never attained an A level grade on any college exam or for any college course. Peg was enrolled in four college courses, plus she worked as a work-study student. She indicated at the start of the course that she desired help with studying and time management, as well as with test anxiety.

Study skill client's instructional procedures. Since she was a psychology major, Peg elected to apply her work for the on-line course to studying for a 300-level course in abnormal psychology. Her class met every Tuesday and Thursday morning for an hour and a half. She wrote out her schedule of classes in an E-mail essay, along with her abnormal psych course exam schedule. Her first exam was scheduled for 3 October 1996. Because Peg's first exam was rapidly approaching, her previous lack of A grades was accepted as a documentable baseline, and the first intervention arrangements were implemented at the start of the course on 17 September 1996.

The first intervention arrangements were for Peg to review her notes from class by typing a short synopsis of her class notes, questions, etc., into an E-mail document. Along with her synopsis, she volunteered to locate the "key terms" listed at the end of each chapter covered in exam one, and to write the key terms and their definitions into the same E-mail. She was also asked to concentrate on writing out her questions and comments about the material while writing her daily E-mail "study journal." Peg was asked to schedule 15-30 minutes per day for these activities, sending one E-mail per day to the on-line instructor's E-mail address. She was also advised to ask her college professor the questions she generated when she next went to class.

Peg did well at these tasks, generating class synopses, lists of key terms, and questions on a daily (or twice daily) basis. However, by 25 September 1996, she needed almost an hour per evening to complete these tasks. Both client and instructor felt that, while allowing for extensive writing coverage of the material, the initial intervention was too task-intensive. This gave it too much potential to become aversive, which

could lead to quitting. In her E-mail of concern, sent on 26 September 1996 (and partially reformatted, etc.) Peg said,

I got a review sheet today for the exam next Thursday. We have some multiple choice, matching, and three short answers. She gave us questions to look over and she will ask five, of which we can choose three to answer.

Fifteen questions followed, after which she added,

I feel very frustrated seeing these questions because I feel like I don't know what the answers are already. I read and study and will get to the test and do badly. I should know these answers after all this work but I feel like I don't.—Peg

As a result, the instructor sent E-mail to Peg detailing a change to another “study style,” which would be intervention two. This style would be a SAFMEDS (“Say All Fast [one] Minute Each Day Shuffled”) flashcard fluency-building procedure (Lindsley, 1995). The SAFMEDS element was a conspicuous attempt to focus Peg’s writing work into making flashcards, then changing from daily E-mail writing to daily flashcard practice. (The instructor also provided Peg with a short exercise in “imagery,” a concept in which she had evinced considerable interest, to help her with her test anxiety.)

Peg began intervention two on 27 September 1996. Instead of writing key terms from the chapter into an E-mail document, she located the answers for the 15 questions from her review sheet for exam one and copied each question, with its corresponding answer, in flashcard format, into an E-mail document. Concurrently, she made actual 3x5 flashcards of the same material. Once the flashcards had been copied textually into E-mail, she sent the E-mail to the instructor. The instructor then explained how to practice with the flashcards. Peg agreed to practice with the flashcards in the SAFMEDS procedure, and to report her fluency data with the cards (rate per minute of corrects/incorrects in a card practice session) via E-mail.

The instructions for how to work with the flashcards included several steps: Peg was to assemble all the cards with the question-side up and read the question side of the first card, preferably out loud. Then she would attempt to answer the question, as speedily as possible (in the typical one-minute SAFMEDS manner), after which she would turn the card over, read the correct answer, and evaluate whether or not her answer had been right. If she could not answer (or answered incorrectly), she placed that card in a pile of incorrect cards which were called “not-yets.” If she answered the question correctly, the card went into a “correct” pile. After working through all cards, Peg would have generated a number of corrects and a number of not-yets. She would then record her rates of corrects and incorrects (not-yets) for each iteration of the cards, and report her practice data via E-mail. Before each practice, she would shuffle the cards.

Peg completed her 15 flashcards, as well as her E-mail version of the flashcard material on 29 September 1996. On 3 October 1996, in the morning before her first exam, Peg reported the data from her subsequent flashcard practice. She took her first abnormal psychology exam after her morning flashcard practice session.

The typical one-minute timing procedure used with SAFMEDS was quickly becoming aversive to Peg. Based on her preferences and performance data, the SAFMEDS procedure was modified into intervention three. Now she recorded not a rate per minute of corrects/incorrects, but a number of corrects/incorrects over the total time for each iteration of the cards.

Peg was also urged to reduce the amount of text on each flashcard, so that each card would take less time to answer. In the case of questions which had multiple answers,

she was urged to make two or three cards covering that question. These changes in procedure, which constituted intervention three, were implemented on 4 October 1996 in preparation for Peg's second exam on 23 October 1996.

Between 4 October and 17 October 1996, Peg constructed 46 flashcards based on the key terms of the chapters covered on her second exam. From 17 October to 23 October 1996, she practiced with the flashcards but did not regularly report flashcard data via E-mail. She took her second exam on 23 October 1996.

Peg made 50 new flashcards based on the new content for her third exam, which was scheduled for 14 November 1996. She sent the flashcard content to the instructor via E-mail. However, she continued to experience a low correct rate using the flashcards, and continued to practice less than once per day, while she also continued to study the cards in a non-SAFMEDS manner. As well, Peg continued to E-mail her frustration with the evolving flashcard system.

The instructor advised Peg to practice each set of cards at least five times, so that she could see her rate of corrects go up, and her rate of "not yet's" go down. Peg was also urged to practice at least once per day, sending in her flashcard data after the practice.

Peg practiced with her cards and reported her data more frequently, missing only one day of practice between 31 October and 14 November 1996, the day of her third abnormal psych exam. While her rate of flashcard practice and reporting had increased to a daily basis, she was still voicing, a few days before that exam, considerable frustration about her consistently high number of incorrects during each practice. Peg worried that her consistently high rate of incorrects was slowing her progress through the material, as well as making her more anxious about being tested over the material that she was not answering correctly. She considered her inability to reduce her rate of incorrects to be a "mind block," and felt that the flashcard program was becoming aversive. Still, she agreed to continue with her current system for those few days that remained before her third exam.

Meanwhile, in those few days and the few days after that exam, intervention four was discussed and designed. Intervention four was a further modification of the SAFMEDS flashcard procedures. Via E-mail the instructor explained the concepts of "behavior chains" and "task analysis." Peg was then asked to describe her typical process of calling the cards, making a rudimentary task analysis of her flashcard procedure into a short E-mail essay, which she completed and returned on 13 November 1996.

In the evening of 15 November 1996, Peg began making new flashcards for the new content of her fourth exam. Based on her task analysis essay and flashcard data, four changes were made to Peg's flashcard routine:

- ✧ Peg would discontinue timing her flashcard routine. She was urged to pay no attention to how long any flashcard iteration took.
- ✧ It was revealed in her task analysis that she had been initially practicing with all the cards in a set, but subsequently practicing with only the cards in the "not yet" pile, leaving the "correct" cards out of subsequent practices. She was instructed to repractice her typical way but with *all* the cards.
- ✧ She was also instructed to not bother shuffling the cards. She could now practice until she completed all the cards in a set, and keep the cards in the same order for each practice.

✦ And she was urged to practice with her new cards using the new system at least twice per day.

By 21 November 1996, Peg had completed 21 new flashcards. The new changes of intervention four were sent to her in written form via E-mail, and repeated to her in a follow-up phone conversation over Thanksgiving break. However, she did not practice with her new flashcard routine until returning to her campus on 2 December 1996. In her E-mail that evening, (partially reformatted, etc.) she wrote:

Hi. I have been practicing and I feel a lot better about everything already. I made a bunch of cards over break, and I have been through half of them today, three times.

These are my results: The first time I went through them I got four out of 21. The second time I had eight out of 21. And the third time I had 15 out of 21. Sounds better, huh?!

From 2 December 1996 until the end of her on-line course (for this term) after her final exam, Peg consistently practiced with her new flashcard system, E-mailing her data daily or every two days. Importantly to Peg, her rates of correct completion of the cards started increasing with every practice. During intervention four, Peg constructed 57 new flashcards; her highest rate, as of 9 December 1996, was 42 correct of 57. She reported being much more satisfied with her current flashcard procedures than any previous system, and she continued to work in the intervention four manner. Her fourth exam was on 12 December 1996, and her final exam was on 17 December 1996.

Study skill client's results and discussion. The on-line course procedures resulted in 85 E-mail documents exchanged between the client and the instructor from 17 September to 9 December, a period of 84 days. A text document archiving the contents of all the client-instructor E-mail messages amounted to 31,814 words, though this is not a highly accurate gauge of words written.

The system initially increased the client's daily amount of writing with respect to the content of her abnormal psych course. Having her write about the content of the class and restate the key terms of each chapter into regular E-mail documents were the basic elements of intervention one, with which the course started.

During intervention two, which began on 27 September before the client's first exam, the E-mail based writing was used to make and practice with flashcards in a SAFMEDS system. The client found and copied key chapter terms into E-mail, and onto 3x5 cards which were used in the typical one-minute SAFMEDS manner. This process further increased the client's exposure to the text material by virtue of the writing involved in making the flashcards. Also, practice with the cards introduced a fluency training element over the text content of the chapters. This was the intervention which obtained up to the client's first exam on 3 October.

Figure 6 shows all the client's abnormal psych exam scores for the semester. (All scores are percentage scores.) That initial exam score was a solid A, the very first A she had earned in her college career.

Intervention three was begun on 4 October, the day after the client's first exam. (For each exam, several days usually passed before she learned what score she had earned). Intervention three modified the SAFMEDS flashcard fluency procedure by removing the one-minute time constraint; the client was asked only to record her total time to finish her routine. This intervention obtained until 15 November, the day after exam three. As Figure 6 shows, intervention three was correlated with two successive

reductions in exam score. While exam two was an A level grade, exam three was several points below A level.

Intervention four, begun on 15 November, was a further refinement of the SAFMEDS fluency training procedure as a result of the client's task analysis of the steps she had actually been taking. This intervention extended through both exam four and the client's final exam. The client received a score of 89 on exam four, an increase to just one point away from A level. She received a score of 96 on her final exam! During intervention four not only did the client's rate of flashcard practice increase but her rate of corrects increased as well.

The client accomplished a mean score of 90.4 for the five exams of her abnormal psych course. However, she reported that under her professor's policy, the lowest score from the first four exams would be dropped; so her 84 was dropped. This results in a mean score of 92 for the remaining four exams (three regular exams and the final exam). As a consequence, she received an A for her final grade. These A scores and grade were the first such marks she had ever earned in her college career. She plans to continue these study practices in the next semester.

During the break between the fall and spring semesters, the instructor had occasion to meet with the client and her family. After an impromptu discussion, the client offered the instructor original copies of each exam along with her original flashcards. The presentation of these materials, before a request could be made for them, provides some validation both for the *in vivo* participation of on-line clients and for the reasonableness of the presumption of honesty on the part of clients.

As the weight and smoking control courses seemed to contribute to those clients' successes, this on-line course seemed to make a contribution to this client's success. More importantly, however, this study was valuable in delineating the idiosyncratic

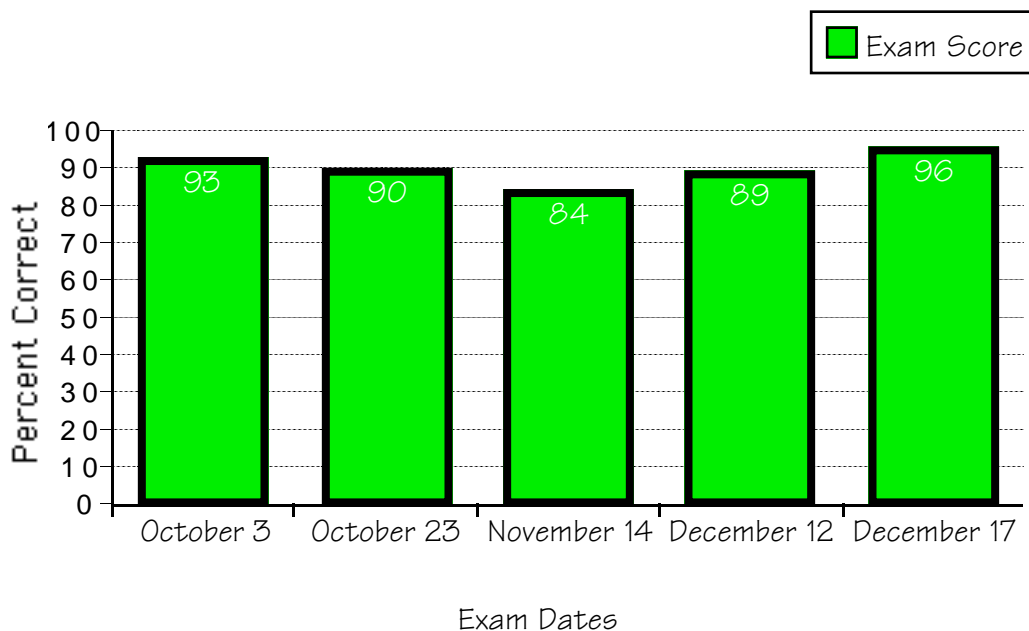


Figure 6. Exam scores for study skill client's abnormal psychology course.

contingencies involved in applying on-line educational methodology to (a) the skills which encompass studying such as reading, writing, and fluency practice, (b) a sole reliance on e-mail as the vehicle of communication, instruction, and data-based feedback, with (c) a college student contemporaneously studying for a full roster of college courses. It points to the value of using on-line resources not only to deliver new educational materials, but also to arrange more successful contingencies for reading, writing, and practicing with conventional college course materials.

General Discussion

In his paper "Why aren't effective teaching tools widely adopted?" Ogden Lindsley (1992b) posed this significant "what if" question:

Think over the following "what if?" Suppose Sesame Street had been developed by effective educators, from Montessori, through Dewey, Skinner, Keller, to Engelmann... Sesame Street would sell a \$199.95 Sesame Street Learning-Remote that plugs into the wall and the TV, and a modem that plugs into the telephone during program transmission. Now Sesame Street would collect learning results from its viewers across the country. With these results, more effective learning programs could have been experimentally designed. The interactive excitement and dollars now squandered on Nintendo® might have been invested in academic learning. (p. 24)

In essence, Sesame Street would have been on-line, and measuring behavior daily to improve itself. The pilot studies reported here support the feasibility and value of adapting daily, repeated measures of behavior to learning activities conducted via on-line communication. While other aspects of behaviorological research and practice were implemented with these clients (e.g., behavioral contracts, changing criteria, token economy, even covert conditioning), the fundamental rudiment of daily, repeated measures of rates of behavior must be considered the most valuable, most salient component in the emergence of measurably effective on-line behavior-change technology.

Like many experiments, these studies raise profitable questions for further research. These questions include:

- ✧ What may be the value of either synchronous, real time conversational writing (chat) or asynchronous e-mail exchange? Is one or the other unnecessary?
- ✧ What are the advantages (if any) of "live" instructor-client verbal exchanges via e-mail or chat tools, versus the preprogrammed, "canned" machine-client interactions typical of distributed learning software?
- ✧ What are the advantages (if any) of each instructor-client verbalization occurring in a written medium? Does the fact that each verbalization is archived as a durable text file lead to a "behavioral contractualization" of the entire interaction?

The various methodological, professional, and cultural issues raised by adapting single-subject behaviorological methods to an on-line learning environment might remain esoteric, were it not for the current "gold rush" on the part of educational and therapy practitioners toward using novel on-line communications tools for distance

education and on-line therapy and psychotherapy endeavors. Dozens of universities and colleges have begun to offer college credit courses via on-line learning; Florida's Walden University, along with Thomas Edison State College in New Jersey, are famous for offering master and doctoral level degrees attainable virtually on-line. Other schools such as Boise State University, Brown University, California State University System, Indiana University School of Continuing Education Studies, Kansas State University, New School for Social Research in New York City, State University of New York Empire State College, Union Institute of Cincinnati, University of California at Berkeley Extension, University of California at Los Angeles Extension, and the University of Chicago all offer undergraduate and graduate credit courses via on-line interactions (Newman, 1996). Distance education has moved rapidly toward professionalization, with specialized teacher training programs, guidelines, journals, and e-mail listservers devoted to remote learning practices, a subset of which is on-line education.

On-line psychotherapy, while less professionalized than distance education, is a rapidly developing, pre-professional endeavor which has garnered serious notice from internet print journalists (e.g., see Zgodzinski, 1996) as well as licensing bodies such as the American Psychological Association (APA). According to Sleek (1995, on-line) the APA Board of Directors asked several APA committees to consider "the issue of online psychotherapy services. In fact, APA's Board of Professional Affairs (BPA) will be exploring a wide range of issues concerning the increased use of technology by psychologists."

The APA's ethical concerns about psychologists providing services via the internet may be of significant importance to psychologists. This author finds such concerns interesting in their own right. However, the work described in this paper does not involve psychotherapy. The noted psychologist Dr. Leonard Holmes (personal communication, 1 February 1997) addressed this fact concisely; after reviewing this author's web site, which espouses on-line behavior change, he e-mailed back:

...behavior.com [now, "onlearn.com"] is interesting! The approach of "on-line writing courses in behavioral self-management of smoking, weight control, or study skills" is a novel one which avoids many of the issues involved in "on-line therapy."

In any case, the procedures reported in this paper are applications of the independent *natural* science of behavior which some, including this author, call behaviorology (and which others call behavior analysis); these procedures are not applications of the *social* science of behavior which is known as psychology. As such, only fully and properly trained behaviorological scientists and practitioners should use these procedures, which are subject to the ethical controls laid down by their own discipline rather than the ethical control laid down by psychologists.

A recent search conducted by this author (available upon request) found more than 50 on-line therapy and psychotherapy practitioners on the World Wide Web. Credentials ranged from masters-level counseling psychologists and social workers through MD psychiatrists. Fees ranged from free to \$50 dollars per e-mail question, with different fee structures for on-line chat interactions, even per-minute charges for off-line reading of e-mailed client questions.

On-line learning practices, either for education or therapy, will continue to be developed within their respective marketplaces. On-line learning practices which make client or student learning more measurable, accountable, or effective would seem to have generic importance to either distance education or "distance therapy," since the

value of any educational or therapeutic intervention is the changed behavior of the student or client. However, this author could not find any other on-line educator, therapist, or psychotherapist who featured daily, repeated measures of student or client behavior. Furthermore, no other educator, therapist, or psychotherapist displayed any data related to the effectiveness of her/his practices. The basic reliance on daily repeated measures of student or client behavior, as rudimentary as these are in the studies reported in this paper, may be unprecedented. This should not come as a surprise. On-line educators and therapists practice primarily from within the aforementioned *presentation model* identified by Vargas. However, behaviorological scientists and practitioners generally eschew that model in favor of the *shaping model* (Vargas, 1996).

These pilot studies inaugurate the application of the shaping model to on-line therapeutic education. The first iterations of this application delineate basic methodological priorities, such as the daily measurement of client-counted rates of a target behavior or response product. Other priorities, such as use of chat room technology, collaborative self-pacing, electronic sharing of chart data, etc., may or may not have been necessary to the success shown by each client. These studies do demonstrate that effective education techniques based on behaviorological science can be adapted to on-line communication, and that elements of the techniques, together or separately, correlated with movement toward each client's explicit goals: weight was lost, smoking was reduced, grades were improved.

A gold rush does not imply gold. Internet education and therapy practitioners may ignore shaping-model practices and still produce behavior change, prestige, and profit (though the behavior change may be adventitious; see the first appendix in Ledoux, 1997c). On-line consumers of behavior-change practices in education and therapy may not yet be in a position to demand measurably more effective on-line learning, even if such practices were more widely disseminated. And, on the other hand, financial interests may deter current distance therapists from adopting *daily* repeated measures of behavior; their current prices per e-mail would be exorbitantly expensive for a client interested in the effective behavior change that would come through the daily interactions required by a repeated measures process of on-line therapy. At their current prices, one would be justified in demanding and receiving evidence of therapeutic effectiveness before paying anything. Is this financial concern among any reasons why some practitioners are against on-line intervention?

The concept of "measurably more effective" on-line education or therapy will hopefully catch on. Without reliable, daily measurement of behavior, claims of effectiveness for on-line education or therapy will continue to rest on mere credentials and personal testimonials—ranging from the gee-whiz exhortations of technophiles to the current anti-on-line stance of some psychologists (reference available from author); on-line interventions without repeated measures methodology will continue to produce more hyperbole than behavior change.☺

Endnotes

Parts of this work were presented at meetings of various behaviorological science groups in the New York City area during 1994–1996, including Walden Fellowship, at Columbia University, and Young Adult Institute, Inc., in Manhattan. The work was then re-

vised for presentation both at the ninth annual convention of The International Behaviorology Association in Plymouth, MA, March 1997, and at the twenty-third annual convention of the Association for Behavior Analysis in Chicago, IL, May 1997, as well as for inclusion in *Origins and Components of Behaviorology* (Ledoux, 1997a).

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...Skinner and his followers never had a chance of making over psychology by demonstrating that practices informed by their natural science were more effective... Should accumulating evidence force a traditional psychologist to the brink of either abandoning mysticism or discounting valid and reliable evidence, the typical traditional psychologist treats the dilemma as a Hobson's choice—there is no real option. Any science that contradicts the fundamental mystical assumptions is abandoned. People who got into science in the first place in order to shed some scholarly light on the details of their deepest philosophical assumptions (including, especially, those of a religious nature) are not going to abandon those foundations if that science starts causing trouble. Instead, they abandon the science, which at that point is merely an intellectual tool that initially looked helpful, but has proven to cause more difficulties than it is worth. (pp. 128–129)

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*From a longer quote of L.E. Fraley in chapter 5 of Fraley, L.E. & Ledoux, S.F. (1997). *Origins, status, and mission of behaviorology*. In S.F. Ledoux. *Origins and Components of Behaviorology*. Canton, NY: ABCs.

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...[The next paper, Glenn Latham's paper on his visit to China] nicely rounds out this collection of components of behaviorology by providing readers with a continuously timely reminder that the continuation of any science owes as much to reaching out to others, through dissemination, as to conceptualization, experimentation, application, and organization. (p. xxii)

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*From the 1997 preface to *Origins and Components of Behaviorology* (Ledoux, S.F. Canton, NY: ABCs).