

Matreshka in Aphasiology: Less Is More

Robert T. Wertz

In *Waiting for the End of the World*, Madison Smartt Bell (1986) said one should not complain about the quality of one's demons. Certainly, I am not complaining about the quality of mine. They seem small and insignificant, not first-class demons. I would, however, like to share one. It is a concern about where technology is taking aphasiology and whether we can keep up. Specifically, I will be discussing the tendency in technology for less to be more, the efficacy of computerized treatment, and how advances in technology tend to run away from the data.

LESS IS MORE

Have you seen those Russian dolls called "matreshka"? Twist the doll's head off and inside is another doll just like the first but smaller. If you open up the second doll, you'll find a smaller replica inside. This continues down to the tiniest doll, whose head you cannot twist off. The dolls are a wonderful way to frustrate children and adults. Like a child I keep hoping there might be something different inside, but there never is. However, advances in computer technology seem to be fulfilling my expectations in a way the dolls never did. The smaller computers get, the more they can do. Computer technology has advanced to a stage that confounds semantics: less is more.

Stanford University recently announced that it will be retiring several of its mainframe computers and replacing them with personal computers and workstations. Four of the mainframes—named Othello, Hamlet, Lear, and MacBeth—are on their way to Sun City for the circuitry set. I suspect Othello is now really jealous; Hamlet is not to be; Lear has been done in by what he sired; and, the result of MacBeth's being bewitched is being switched.

We have experienced a similar situation in our shop. About seven years ago, we designed a system to provide services for brain-damaged patients who lived in remote areas. The technology of the time permitted us to use computer-controlled video laserdiscs over the telephone.

In a simulation study, a UNIX-based computer system was used to connect by telephone a clinician in one location with a patient in another location. Appraisal and treatment stimuli were mastered on a video laserdisc and played on a video laserdisc recorder with a microprocessor that permitted access to any of 50,000 frames of stimuli within 3.5 seconds. Stimuli from the laserdisc were displayed on a video monitor that allowed the patient to respond by touching the screen. Responses were sent over the telephone to the clinician's screen and were scored by the clinician and by a program in the UNIX-based computer system. Verbal stimuli and responses between the patient and clinician were transmitted by a speaker phone in each location. Written responses between patient and clinician were transmitted by a telenote transceiver in each setting. The clinician could interact with the laserdisc in the patient's location with a CRT to select stimuli for presentation on the patient's video monitor.

The system allowed a battery of appraisal measures such as the *Porch Index of Communicative Ability* (PICA [Porch, 1981]), *Western Aphasia Battery* (WAB [Kertesz, 1982]), *Mayo Clinic Procedures for Language Evaluation*, *A Motor Speech Evaluation* (Darley, Aronson, & Brown, 1975), *Token Test* (DeRenzi & Vignolo, 1962), *Coloured Progressive Matrices* (Raven, 1965) and several thousand stimuli to be utilized in treatment. Comparison of patient performance in the computer-controlled study with traditional face-to-face patient performance indicated significant agreement in diagnosis and no significant differences in response to treatment. These results suggest computer-controlled video laserdiscs are an acceptable substitute for providing services for patients who reside in remote areas. An existing treatment center could be connected with several remote settings by telephone to serve an unserved clientele.

Based on the evidence from the simulation study, field-testing of the system and methods was begun in an actual remote setting where services did not exist. However, during the four-year simulation study, technology advanced to permit some improvements to the system. For example, the system being used in the patient's setting in the field test employs a video laserdisc, a video monitor containing a touchscreen, and a bit pad for sending, writing, and drawing responses. An operator's headset with wand microphone permits auditory and verbal communication between the patient and clinician. In the clinician's setting, similar equipment exists—CRT with monitor to select stimuli from the laserdisc and see patient responses from the touchscreen, and a headset for auditory and verbal communication. The patient's writing and drawing from the bit pad appear on the clinician's video monitor and a hard copy is printed in the clinician's setting.

Advances in technology are grand; less is definitely more—perhaps. The fact is we do not know. Because the systems in the two studies differ the data collected in the simulation study only permit inference about application in the field test. The field test is being done to find out if the data will differ. During the three years the field test has been conducted, technology has advanced. Currently, the UNIX-based operating system could be replaced with a personal computer in each setting—patient's and clinician's. In addition, increased capacity in hard discs permits sufficient storage for appraisal and treatment stimuli to eliminate the video laserdisc. It is not known whether these implied *improvements* are improvements or whether they are differences. Less is more only after it has been demonstrated to be more.

EFFICACY OF COMPUTERIZED TREATMENT FOR APHASIA

It was 13 years ago that Rosenbek (1978) introduced the concept of “wrinkled feet.” He reviewed many of aphasiology's cherished beliefs about treatment and observed that most were untested. His suggestion to clinicians was to stand in the stream of clinical change long enough to find out what works and what does not. Having done this, clinicians would recognize one another by their wrinkled feet.

During the past 13 years, most clinicians have continued to be hydrophobic and to embrace what's new rather than pause to ponder what is not known. Certainly, this tendency to travel has been evident in the lack of data on the efficacy of computerized treatment for aphasia. The advent of computers in aphasiology has resulted in a proliferation of programs but a dearth of data.

Robertson (1990) summarized the situation in his paper, *Does Computerized Cognitive Rehabilitation Work? A Review*. He observed that there are essentially no data to demonstrate the efficacy of computerized language treatment for aphasia, and where what he calls “tantalizing hints of possible effective developments” exist, it is not known whether computers are more effective than traditional methods. Fortunately, there are at least two current efforts designed to support or refute Robertson's conclusions.

In the early days of computers in aphasiology it was believed that having a computer would be like having an additional clinician. The promised two Cs—computer and client—in practice were really three Cs—computer, client, and clinician. Clinicians also implied that more could be done for patients with computers than without them. That's a reasonable hypothesis, and a hypothesis can be tested. Few have tested this one.

Loverso, Prescott, Selinger, and Riley (1989) did test this hypothesis and they continue to do so. They asked a straightforward question: Can a

computer and clinician accomplish as much or more in aphasia treatment as a clinician alone? In a series of alternating treatment designs, Loverso et al. have been collecting data to answer the question. Loverso et al. have "wrinkled feet."

The question about computer treatment's efficacy requires a classical, clinical trial. Katz, Wertz, Lewis, Esparza, and Goldojarb (1991) have been doing this. Using random assignment of patients who meet selection criteria to three groups (computer language treatment, nonlanguage computer stimulation, and no treatment) they are working on answers about the efficacy of computer language treatment, and also about whether improvement results from the language content of the computer program or simply from the stimulation provided by using a computer. Katz et al.'s feet are not wrinkled yet, but they are beginning to pucker.

The efforts by Loverso et al. (1989) and Katz et al. (1991) are exactly what need to be done to compare any treatment with another and to test a treatment's efficacy. Robertson (1990) is correct. "There is so little evidence." Until evidence is provided, his conclusion must be accepted: ". . . distribution or sale of language rehabilitation programmes is premature."

TECHNOLOGY RUNS AWAY FROM THE DATA

Are we up to keeping up? It's not easy since technology has a tendency to develop faster than we can determine its usefulness. Because technology tends to run away from the data, it is necessary to be cautious in assumptions about what appear to be improvements. Evidence from an earlier development cannot be used to support the effectiveness of the latest development.

Steele, Weinrich, Kleczewska, Wertz, and Carlson (1987); Steele, Weinrich, Wertz, Kleczewska, and Carlson (1989); and Weinrich, Steele, Carlson, Kleczewska, Wertz, and Baker (1989) took an essentially untested concept, visual communication in aphasia (VIC), developed by Gardner, Zurif, Berry, and Baker (1976) and forged C-VIC, a computerized visual-communication system that ran on the Macintosh Plus computer. C-VIC was an apparent improvement over the earlier VIC system which used index cards. The C-VIC system maintained the card metaphor by storing a variety of stimuli (e.g., nouns, verbs, prepositions) in computer stacks. These stimuli could be opened with the Mac mouse by clicking on a stack to display the alternatives. Using the mouse, the clinician or the patient could move a symbol and place it on a storyboard. A series of the symbols could be arranged in C-VIC syntax to represent statements, questions, or responses from the patient. In a series of single subject designs, Steele et al.

(1987, 1989) and Weinrich et al. (1989) demonstrated global and severely Broca's aphasic individuals could communicate vastly better with C-VIC than with natural language. Thus, the improvements promised by C-VIC were apparent and real.

During the past two years, Steele et al. (1989) has expanded C-VIC and renamed it Lingraphica. The software now runs on the Macintosh portable computer and contains many improvements. These improvements include an enormous increase in vocabulary; animated verbs; situations that can be opened to display alternatives; two storyboards for editing, promoting usage, composing, and communicating; expanded syntax; and features that allow the user to have sound, to have printed text, and to retrace previous steps. Lingraphica is to C-VIC as wonder drugs are to bloodletting.

Again, the technology has run away from the data. There is evidence that C-VIC worked. Data are necessary to demonstrate how well Lingraphica works, but it is expected to surpass the results obtained with C-VIC. Steele and his colleagues are working to collect the empirical evidence necessary to make Lingraphica's promise a fact. Less is more? A paucity of data to demonstrate the efficacy of computerized treatment! Advances in technology running away from the meager existing data!

THIS IS THE WAY THE WORLD ENDS

Thomas Hardy wrote in his diary in 1882, "We live in a world where nothing bears out in practice what it promises incipiently." This was insightful considering the limited technology that buffeted Hardy's world. It is not known whether our technology will bear out in practice what it promises incipiently, however we have ways of finding out. Time must be taken to collect the empirical evidence to support or refute assumptions. Permanent tentativeness is a complex notion. That something—some idea, some technology—may be always in motion, constantly changing, presents major conceptual problems for some. For others, it spurs them to be up to keeping up.

Aphasiology's glory is that it is moving forward; there is always something new and something more to learn. Today's problems urge greater effort. Aphasiology's triumph is its victory over limited language. Its failure is the inability to appreciate, to deal intelligently with, and to test assumptions. Technology does not come with a will, but clinicians do.

So how might the world end? Not with a bang, or a whimper, or a byte. I suspect it will end without a will.

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