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ABSTRACT

Development and determination of the construct validity of a scale designed to assess aversion to computers are described. Based on a social learning model emphasizing efficacy, outcome, and reinforcement, the Computer AVersion Scale (CAVS) was developed for use with mental health clients who were high school age and older, as well as mental health professionals. The original CAVS item pool consisted of 45 true/false items. The CAVS produces four scores: (1) efficacy expectations (one's ability to perform behaviors required to operate a computer); (2) outcome expectations (one's knowledge of the required behaviors); (3) reinforcement expectations (whether outcomes produced by computer use meet one's goals); and (4) a total score, reflecting the cumulative effects of goals. A fourth summary score reflects the cumulative effects of the other three scores. Two groups of subjects were employed to reduce the 45-item CAVS to a 31-item instrument, which was then administered to 270 undergraduates enrolled in a large northeastern university. The Attitudes Toward Computers Scale was also administered to 78 subjects who completed the CAVS. The CAVS was also compared with other instruments designed to measure negative affect, including two instruments for use in diagnosing feelings about computers, as well as an instrument for assessing levels of computer experience. Results, which cover such variables as gender and educational background, indicate that the CAVS is a reliable and valid measure of computer aversion. Seven data tables, a 23-item list of references, and the CAVS are included. (TJH)

Construct Validity of an Instrument to Measure Computer Aversion

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<u>Note</u>: Portions of the following are based on data from Meier (1988) and Meier and Lambert (1990).

Construct Validity of an Instrument to Measure Computer Aversion

Labels such as computer phobia, computer anxiety and computer aversion have been employed to describe negative psychological reactions to computers. Reports in the popular press of these states have increased in the past 10-15 years along with widespread introduction of the microcomputer. Reports in the professional literature have also appeared linking computer discomfort, for example, to professionals' resistance to computer use.

Although many of the reports about computer aversion have been primarily anecdotal or descriptive, a number of researchers have developed scales to measure these states. Table 1 describes 13 studies assessing reactions to computers and their accompanying measures. Reliabilities of the scales consistently exceeds .80. The scales also behave in expected ways, e.g., negative reactions to computers appears to be associated with amount of computer experience and gender (although some differing findings exist, particularly on the latter variable). None of the scales appears to be theoretically based, leading to ambiguity concerning the direction for future research and intervention.

Insert Table 1 About Here

Study 1: Development of a Theoretically-Based Scale

I developed a social learning model to begin to examine factors that may account for individuals' negative reactions to computers. Based on the work of Bandura and Rotter, the model emphasizes three types of expectations: efficacy, outcome and reinforcement. Efficacy expectations are anticipations of personal competence for executing behavior required to produce desired outcomes (Bandura, 1977). Bandura (1977) defined outcome expectations as anticipations about which behaviors will lead to desired outcomes. Reinforcement expectations (Meier, 1983) are anticipations concerning whether certain outcomes will meet one's goals. emphasizes three types of expectations. The sum of these three expectancy types should provide an overall index of a person's discomfort with computers. Elevations in expectancy subscale scores may provide a basis for suggesting interventions specific to certain expectations for computers (Meier, 1985).

Scale Development. Because of the potential influence of computer aversion in such diverse areas as psychological testing and acceptance of computer applications in mental health, the Computer AVersion Scale (CAVS) was developed for use with mental health clients (high school age and older) as well as mental health professionals. Heterogeneous samples were employed during initial scale construction to provide for the greatest generalizability of results.

The original CAVS item pool consisted of 45 true-false items, derived from the model of computer aversion, with 3 subscales of 15 items each. The CAVS produces four scores: (a) Efficacy Expectations for Computers, a sum of items assessing beliefs about whether one can perform the behaviors required to operate a computer; (b) Outcome Expectations for Computers, a sum of items assessing beliefs about whether one knows what behaviors are required to operate a computer; (c) Reinforcement Expectations for Computers, a sum of items assessing beliefs about whether outcomes produced by computer use meet one's goals; and (d) Total Score, a sum of all items reflecting the cumulative effects of reinforcement, outcome, and efficacy expectations for computers.

Item analysis. An item analysis strategy was pursued which would increase scale reliability and decrease the number of items per scale, thereby minimizing the amount of time necessary to complete the CAVS. Following Jackson's (1970) sequential system for scale development, items were eliminated if they met any of the following criteria: (a) low response rate, i.e., an item was marked true or false less than 20 per cent of the time; (b) low item-subscale correlation, i.e., an item correlated with its theoretical subscale less than .20; and (c) low item-total correlation, i.e., an item correlated with the total score at less than .20.

Two groups of subjects (total n = 273) were employed to reduce the 45-item CAVs to a 34-item, and finally, a 31-item version. The initial subject sample was composed of 62 undergraduate psychology students (72% female, 28% male) at a large midwestern university and 54 graduate journalism students at a large southern university (n = 116). Applying Jackson's criteria reduced the original scale to 34 items, and alpha coefficients were calculated for Total Score (.87), Reinforcement Expectations (.71), Outcome Expectations (.80), and Efficacy Expectations (.75). These reliability estimates were deemed adequate for further study of the 34-item CAVS.

The 34-item CAVS was then administered to two groups of undergraduate students (n = 17 and 79, respectively) and a group of faculty members and spouses (n = 61) who attended an educational workshop (n = 157). The group of 17 subjects were enrolled in a statistics course at a small midwestern college, were predominantly female (88%), and had a mean age of 24.24 years. The group of 79 subjects were enrolled in a personality course at a large midwestern university, were predominantly female (69%), and had a variety of majors, including psychology, aviation, theology, nursing, and journalism. The faculty members and spouses had a mean age of 47.75 years and were 48% female and 52% male.

Data collected along with the 34-item version provided initial validity estimates for the CAVS. The instrument's

Total Score correlated significantly with years of education ($r = -.28$, $p < .03$), indicating that as education increased, computer aversion scores decreased. T-tests revealed significant differences in the CAVS' Total Score for computer ownership ($t(57) = -3.13$, $p < .003$) and computer use at work ($t(57) = -9.27$, $p < .001$). These results indicate that men were more comfortable with the machines than women and that owning a computer was related to greater computer comfort.

Three additional items were eliminated when Jackson's guidelines were applied to subject responses on the 34-item version. The 31-item CAVS, with scoring key, is located in the Appendix.

Sample. The 31-item CAVS was administered to a homogeneous sample of 270 undergraduate students enrolled at a large northeastern university. With majors in the human services such as psychology and social work, this group of students is likely to be representative of the mental health professionals who will increasingly employ computer applications in their work. Sixty percent of this sample was female with a mean age of 22.27 years.

Factor Analysis. A principal components factor analysis with varimax rotation was calculated to assess the validity of the three-factor computer aversion model. Forty one percent of the total variation was accounted for with a three-factor solution. The eigenvalues of the first three factors from the principal component analysis were 7.65, 3.16, and 1.79, respectively.

Rotated factor loadings above .30 are underlined in Table 2. Factor I contains items from both the Efficacy Expectations and Outcome Expectations for Computers subscales; these items relate to self-perceptions of competence for computer use. Factor II corresponds to the theoretical subscale of Reinforcement Expectations for Computers. However, this factor contains items from both the Reinforcement Expectations and Efficacy Expectations subscales and might be more appropriately named Negative Feelings for Computers since these items emphasize feelings of fear, avoidance and frustration for computers. Factor III contains items predominantly from the Outcome Expectations for Computers subscale.

Insert Table 2 About Here

Concurrent Validity. Rosen et al.'s (1987) Attitudes Toward Computers Scale (ATCS) was also administered to 78 subjects who completed the CAVS. A Pearson product-moment correlation calculated for the two scales' total scores was significant ($r = -.53$, $p < .001$) and indicated that higher computer aversion was associated with more negative attitudes towards computers.

Reliability. Alpha coefficients were found to be .89 for Total Score, .80 for Efficacy Expectations for Computers, .81 for Outcome Expectations for Computers, and .74 for Reinforcement Expectations for Computers. Means and standard deviations are reported in Table 3.

Insert Table 3 About Here

Social Desirability. To assess a possible self-presentation response bias, 103 undergraduate students also completed the Social Desirability Scale (SD; Crowne & Marlowe, 1964). The SD scale is a 33-item true-false test designed to assess respondents' attempts to present themselves in a socially desirable manner (Crowne & Marlowe, 1964). Social desirability reflects error variance in that subjects with a strong desire to present themselves well may not respond honestly to test items. Crowne and Marlowe reported an internal consistency score of .88 and a test-retest score of .88 (one-month interval) for the SD scale. The correlation between the 31-item CAVS and the SD scale equaled .06 ($p = .54$), indicating a small relationship between the measures of computer aversion and social desirability.

Age and sex. The correlation between Total Score and age was nonsignificant ($r = .00$, $n = 81$). T-tests revealed sex differences on all variables except Reinforcement Expectations for Computers: (a) for Total Score, $t(208) = -2.39$, $p < .02$ (M for women = 13.27, M for men = 10.88); (b) for Outcome Expectations for Computers, $t(204) = -3.26$, $p < .002$; (c) for Efficacy Expectations for Computers, $t(204) = -2.22$, $p < .03$; (d) for Revised Outcome Expectations for Computers, $t(204) = -2.18$, $p < .04$; and (e) for Negative Feelings toward Computers, $t(204) = -2.15$, $p < .04$.

Individual Differences on Computer-Based Tests and Tasks

Two additional studies are summarized below that provide evidence concerning the behavioral effects of computer aversion. The first, a study by Wood (1985), demonstrates the ability of computer aversion to depress mathematics and verbal skills scores. The second study shows how computer aversion can influence the relationship between variables assessed by computer.

Computer-Based Assessment. Using a slightly modified version of the original 45-item CAVS, Wood (1985) assessed the CAVS' reliability and the possible effects of computer aversion on computer-based test performance. Using 92 adults who were not college students (mean age was 34, mean years of education was 14), Wood found moderate to high reliability estimates: *alpha* equaled .90 for Total Score, .76 for Reinforcement Expectations, .78 for Outcome Expectations, and .83 for Efficacy Expectations.

Comparing performance on computer-based and paper-and-pencil tests of cognitive ability (items assessing math and verbal skills in a multiple choice format), Wood found that persons scoring higher on the CAVS demonstrated lower performance on the computer-based version. Computer-based test scores, intended to reflect cognitive ability, were biased against persons with high computer aversion scores. Wood noted that had the cognitive ability tests been employed to screen for such personnel purposes as training or advancement, a large number of potentially competent persons might have been excluded because of their computer aversion, not their abilities.

Computer aversion was significantly related to performance only on computer-based tests and only when those tests preceded the paper-and-pencil tests. This latter effect, demonstrating the importance of order of presentation, suggests that one way to decrease the effects of computer aversion on computer-based test performance is to present first a paper-and-pencil version of the test material.

Study 2: Discriminant Validity

In Study 2 I examined the correlation between the CAVS and four measures of negative affect. Some authors have suggested that factors such as neuroticism or negative affect may have a pervasive contaminating effect on many self-report measures (e.g., Schroeder & Costa, 1984).

Subjects were 170 undergraduate students who completed the study as part of a course research requirement. Measures were completed in a mass testing as part of a study on occupational stress (Meier, in press). Measures are described below.

Maslach Burnout Inventory (MBI). The original MBI (Maslach & Jackson, 1981) was designed to assess three dimensions of burnout: emotional exhaustion, depersonalization, and personal accomplishment. Meier and Schmeck (1985) adapted this scale to produce a total stress score for students. The resulting 16-item scale had an alpha of .83 and correlated significantly with the Meier Burnout Assessment (Meier & Schmeck, 1985). Sample items include "I feel emotionally drained from school" and

"Working at school all day is really a strain for me." Research with the original MBI indicated that burnout scores were significantly related to observers' ratings of emotional exhaustion, heavy job demands, and job dissatisfaction (Maslach & Jackson, 1981).

Meier Burnout Assessment (MBA). The MBA is a 23-item true-false test that assesses respondents' cognitions and expectations related to burnout. Developed according to Jackson's (1970) sequential system of scale development, the MBA is based on social learning theory. Meier and Schmeck (1985) reported an *alpha* of .79 for a sample of 368 undergraduate students. Correlation of the MBA with the student version of the Maslach Burnout Inventory was $r = .58$ ($p < .001$). Sample items include "I tend to worry a lot about new classes and material" and "Whenever I experience failure at school, I start to feel as if I am a failure at everything."

Minnesota Multiphasic Personality Inventory--Depression Scale (MMPI-D). A short form of the MMPI-D devised by Dempsey (1964) was employed as a measure of depression. The original scale is a 60-item true-false measure of a state characterized by poor morale, moodiness, feelings of hopelessness, physical symptoms and inability to work (Mayer, 1978). Mayer (1978) noted that despite questions about the dimensionality of the scale, it "is widely considered a measure of person characteristics that are consistent with, if not identical to, depressive illness" (p. 362). Meier (1985) adapted Dempsey's form by eliminating four items with psychiatric content and then employed the resulting form with 320 faculty members. He found evidence for construct validity: (a) alpha equaled .80, indicating satisfactory reliability, and (b) the scale correlated significantly with self-ratings of depression ($r = .63$, $p < .001$). The 26-item version was employed in this study.

State Anxiety (SA). The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch & Lushene, 1970) is a Likert-scale inventory designed to measure state and trait anxiety. The State Anxiety scale contains 20 items that assess state anxiety, i.e., a transitory emotional state characterized by feelings of tension and apprehension. Spielberger et. al report good reliability and validity coefficients for these scales, with alphas ranging from .83 to .92.

Results

The CAVS correlated with the scales as follows: state anxiety, $r = .09$, $p = .32$; depression, $r = .23$, $p < .009$); MBI (occupational stress), $r = .21$, $p < .02$; MBA (occupational stress), $r = .28$, $p < .01$). Although these correlations do not match the convergent validity values seen in Study 1, they indicate that CAVS scores may be influenced by a neuroticism factor.

A neuroticism interpretation of these correlations has several interesting implications. It may be that neuroticism is an important component of computer aversion, not simply a source of error variance for scale scores. In social learning terms, neuroticism may be considered as low self-efficacy generalized across task domains (e.g., interpersonal or vocational). If we administer tests by computers to individuals who are neurotic (and who are likely to be exactly the type of persons tested in many of our clinics, private practices, counseling centers and hospitals), then we introduce a source of error that is unlikely to be present with conventional paper-and-pencil tests.

Study 3

Matthew Lambert of Texas Tech University and I had access to a large sample of undergraduate students that we employed to address several basic questions regarding the CAVS and two other computer anxiety scales, i.e., the relationship between computer anxiety and variables such as age, gender, intelligence, and computer experience.

Method

Subjects

One thousand two hundred and thirty four subjects completed instruments at the beginning of this study as part of research project in an introductory psychology course. Women comprised 51% of the sample (n = 625) and males 49% (n

= 608). Mean age was 20.10 (SD = 4.08). The sample was predominantly White (86%), followed by Hispanic (8%), Black (3%), Asian (2%), and other (1%). The majority of the sample were freshman (69%) and sophomores (20%).

Instruments

Two instruments in addition to the CAVS were employed in this study.

Attitudes Towards Computer Scale (ATC). The ATC consists of 19 bipolar semantic differential type items designed to assess general attitudes towards computers (Kjerulff & Counte, 1984). Kjerulff & Counte reported an alpha coefficient of .85 and found that the ATC predicted hospital clerical staff's acceptance of a computerized management information system and their desire for further computer training. Sample items include "Useful/Not Useful," "Frightening/Non-Threatening," and "Complicated/Not Complicated."

Computer Anxiety Rating Scale (CARS). Heinssen, Glass, & Knight (1987) describe a 19-item Likert scale designed to assess computer anxiety. Tested on a sample of 270 introductory psychology students, the CARS demonstrated good internal consistency (alpha = .87) and test-retest reliability over a four-week interval ($r = .70$, $p < .01$). The CARS was significantly related to a measure of computer experience and the Computer Attitude Scale (Loyd & Gressard, 1984). Heinssen et al. also found significant correlations between the CARS and math anxiety, test anxiety, and SAT verbal and quantitative scores. These results indicate that computer anxious individuals tended to report more math and test anxiety and to have lower SAT scores. Finally, a trend toward a significant gender difference on the CARS was found; women reported greater anxiety.

Sample items include "I look forward to using a computer on my job" and "It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key."

Computer Experience Questionnaire (CEQ). The CEQ is a newly developed scale designed to assess levels of experience with computers (Lambert & Lewis, 1989). A 90-item scale, the CEQ requests information about amount and types of previous computer experience, particularly in regards to different computer applications. A coefficient *alpha* calculated on this sample equaled .89. Sample questions include "How many hours a week do you use computers for coursework?" and "How many high school computer courses did you take?"

Procedure

Data on the psychometric properties and correlates of the computer anxiety scales was collected as part of a study designed to assess the utility of a computer-assisted instruction (CAI) program employed in an introductory psychology course (see Lambert, 1990). The CAI program aided students' learning by providing practice quizzes, final examinations, performance reviews, and individualized study sessions.

Subjects completed the CARS, CAVS, and ATC three times during the semester. These were weeks 1, 8, and 15 of the semester, hereafter referred to as Times 1, 2, and 3. The CEQ was completed at the beginning and end of the semester (weeks 1 and 15).

Results

Descriptive Statistics. Means, standard deviations, and coefficient alpha are presented in Table 4 Alphas ranged from .86 (ATC Time 2) to .96 (ATC Time 3).

Insert Table 4 About Here

Test-Retest Reliability. Correlations across the three time points of the study are displayed in Table 5. For the ATC, test-retest reliabilities ranged from .39 (Time 1 - Time 3) to .51 (Time 2 - Time 3). Test-retest reliabilities for the CAVS ranged from .74 (Time 1 - Time 3) to .78 (Time 2 - Time 3). For the CARS, test-retest reliabilities ranged from .47 (Time 1 - Time 3) to .51 (Time 1 - Time 2).

Insert Table 5 About Here

Convergent Validity. Table 5 also displays intercorrelations among all total scores within and between the three time points. Within each time point, the CAVS and CARS were highly correlated (r's range from .62 to .67), while the correlatiors between the ATC and the other two scales were considerably lower (r's from .14 to -.57). This pattern was maintained in the scale intercorrelations between the time points as well.

Gender and Age Differences. Analyses were conducted to search for gender differences at all three time points. At Time 1, women had significantly higher CAVS and CARS scores, $t = -5.57$, $p < .01$, and $t = -3.85$, $p < .01$, respectively. A trend for gender differences on the ATC was also evident, $t = 1.71$, $p < .09$. At Time 2, women had significantly higher CAVS scores only, $t = -3.25$, $p < .01$. At Time 3, gender differences were again evident for the ATC ($t = 2.03$, $p < .05$), the CAVS ($t = -4.71$, $p < .01$), and the CARS ($t = -2.50$, $p < .02$). All of these findings indicate that on the total scores of the computer scales, women had significantly more anxiety with computers.

Subjects' age was also correlated with the scales' total scores at all three time points. Age was significantly correlated with the CARS at Time 1 ($r = -.09$, $p < .01$), with no scales at Time 2, and with the ATC ($r = -.06$, $p < .06$), the CAVS ($r = -.08$, $p < .02$), and the CARS ($r = -.13$, $p < .01$) at Time 3. These data indicate a small, but statistically significant effect such that younger subjects possessed higher computer anxiety scores.

Relationships with Proxy IQ Measures. Relatively few studies have examined the relationship between computer anxiety and measures of intelligence. To gain some sense of this relationship, seven proxy measures were selected: SAT scores (verbal, math, and total), ACT scores (English, math, and total), and cumulative grade-point average (GPA). These correlations are shown in Table 6. Unlike the other analyses reported in this study, where the n's correspond to those shown in Table 3, n's varied across the IQ measures. The largest data set was available for GPA (n = 880 at Time 1) and the smallest for ACT English (n = 205); most n's are in the 300 to 400 range.

In general, higher intelligence scores were negatively correlated with computer anxiety measures. Math scores on the ACT and SAT correlated more highly with the computer anxiety scales than did verbal or total scores. This relationship may reflect students' greater exposure to and competence with computer applications in math and science courses. Cumulative GPA showed no significant relationship with computer anxiety.

Insert Table 6 About Here

Computer Experience. Table 7 contains the correlations between the CEQ and the computer anxiety measures. Although all three anxiety measures were consistently and significantly correlated with compute experience, the CAVS and CARS correlations consistently exceeded those of the ATC. Correlations indicate a small, but stable relationship that indicates that computer anxiety decreases with greater computer experience.

Insert Table 7 About Here

Discussion

The CAVS is a 31-item questionnaire which takes less than 10 minutes to complete. Results support use of the CAVS as a reliable and valid measure of computer aversion. Reliability values are consistently in the moderate to high range for total score and the three subscales. Analysis of CAVS data with such variables as amount of education, gender, and computer experience match theoretical expectations. The CAVS demonstrated good construct validity in its high correlation with a measure of computer attitudes and low correlation with a measure of social desirability. However, the CAVS does appear to correlate also with measures of negative affect.

Convergent validity coefficients and factor analytic results of other studies suggests that little evidence currently exists to support the discriminant validity of various computer anxiety constructs. Researchers who maintain that the constructs (and measures) of computer anxiety, computer aversion, and computer phobia differ now have the burden of proof to demonstrate that such differences exist and are meaningful in terms of assessment and intervention. More practically, researchers performing work in these areas should review all relevant literatures in terms of previous research and instrument selection.

Perhaps the most important area where these findings should generate further research concerns computer-based psychological testing. One possibility is that an interaction is occurring between types of task and testing media that influences cognitive processing during measurement. One might assume that most individuals make more effort when answering performance items, such as those assessing mathematical and verbal skills, as compared to answering simple attitudinal or opinion questions. Similarly, an unfamiliar testing medium, such as that presented by computer, may require more effort. The demand on cognitive processing, then, should be greater when persons answer effort-demanding performance items presented via computer than when they answer attitudinal questions presented via paper-and-pencil (cf. Kahneman, 1973). Past an optimum level, increased effort may generate greater variability in response, thereby decreasing estimates of tests' reliability and validity. Not only should test developers and publishers assess the equivalence of computer and traditional versions of tests, but the interaction of computer-based versions with different test populations.

Should computer aversion prove to hamper the test performance of some clients, a measure like the CAVS may be useful as a screening device. As matters now stand, clinicians have the option of allowing all clients to complete computer-based tests, hope that some clients self-select themselves out of computer-based testing, or monitor the behavior of clients as they complete computer-based tests. Some software programs, such as TEST PLUS (Krug, 1986), ask users to complete a brief pre-test, and then stop item presentation if it appears that the person is unable to properly complete the assessment. However, the immediate answer to current questions about computer-based tests is for test developers to follow the recommendations of the American Psychological Association (1986) and determine the equivalency of results from automated and conventional testing.

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Table 2

Varimax Rotated Factor Loadings for Theoretical Computer Aversion Subscales

Subscale	Item Number	Factor I	Factor II	Factor III
Reinforcement	1	00	60	20
Expectations	4	12	72	15
	7	01	38	-03
	9	-01	16	-01
	11	-03	33	16
	14	-05	13	-01
	17	02	15	-02
	20	09	05	08
	23	12	62	00
	27	06	15	07
	30	03	19	00
Outcome				
Expectations	2	63	-05	30
	3	51	-09	39
	5	22	03	57
	12	39	-01	60
	15	25	08	36
	18	08	28	22
	21	20	20	74

Table 2 continued

Subscale	Item Number	Factor I	Factor II	Factor III
	24	12	21	09
	25	71	17	-02
	31	51	23	50
Efficacy				
Expectations	6	-05	24	65
	8	34	45	01
	10	37	06	04
	13	25	54	12
	16	10	77	03
	19	65	28	14
	22	69	08	12
	26	65	02	22
	28	05	66	17
	29	45	14	19

Table 3

Means and Standard Deviations for 31-item CAVS

Scale	No. of items	M	SD
1. Total Score	31	12.62	6.72
2. Reinforcement Expectations	11	4.47	2.43
3. Outcome Expectations	10	4.78	2.98
4. Efficacy Expectations	10	3.35	2.66
5. Negative Feelings toward Computers	10	2.75	2.72

Note. This data is based on the 31-item CAVS. The two revised scales and the Negative Feelings for Computers scale are derived from the factor analysis.

Table 4

Means, Standard Deviations and Reliability for Computer Anxiety Measures

Variable	n	M	SD	Alpha
Time 1				
ATC	1234	93.69	20.30	.92
CAVS	1234	10.03	6.02	.88
CARS	1234	43.41	12.24	.87
Time 2				
ATC	671	96.68	14.33	.86
CAVS	664	9.02	5.99	.88
CARS	671	44.40	11.78	.87
Time 3				
ATC	1130	93.59	24.04	.96
CAVS	1130	8.69	6.04	.89
CARS	1130	42.84	15.40	.93

Table 5

Scale Intercorrelations

	Time 1			Time 2			Time 3		
	ATC	CAVS	CARS	ATC	CAVS	CARS	ATC	CAVS	CARS
Time 1									
ATC		-25**	-03						
CAVS			67**						
CARS									
Time 2									
ATC	50**	-47**	-38**		-57**	-55**			
CAVS	-38**	77**	45**			64**			
CARS	-37**	55**	51**						
Time 3									
ATC	39**	-29**	-21**	51**	-36**	-35**		-14**	14**
CAVS	-26**	74**	55**	-49**	79**	61**			62**
CARS	-18**	45**	47**	-37**	46**	50**			

** $p < .01$.

* $p < .05$.

Table 6

Relationship Between Computer Anxiety Scales and Proxy Intelligence Measures

	Time 1			Time 2			Time 3		
Variable	ATC	CAVS	CARS	ATC	CAVS	CARS	ATC	CAVS	CARS
SAT-Verbal	03	-06	02	-05	-08	-03	04	-04	02
SAT-Math	11**	-16**	-05	11*	-22**	-12*	13**	-13**	-05
SAT-Total	09*	-13**	-03	05	-18**	-10	10**	-10**	-02
ACT-English	13*	-04	05	08	-14*	-11	02	-02	-10
ACT-Math	16**	-18**	-01	07	-27**	-15*	03	-22**	-16**
ACT-Total	15**	-14**	02	07	-28**	-22**	04	-16**	-13*
GPA	06	02	01	03	-05	-03	01	-01	-04

** p < .01.

* p < .05.

Table 7

Correlations of Computer Experience and Computer Scales Variables

Variable	Computer Experience	
	Beginning of Semester	End of Semester
Time 1		
ATC	06*	15**
CAVS	-14**	-24**
CARS	-14**	-17**
Time 2		
ATC	11**	19**
CAVS	-11**	-20**
CARS	-14**	-23**
Time 3		
ATC	02	13**
CAVS	-11**	-23**
CARS	-18**	-19**

** $p < .01$.

* $p < .05$.

Appendix

Computer Attitudes Scale (Computer Aversion Scale)

In this questionnaire we'd like you to indicate your thoughts and feelings about using computers in your work. "Work" refers to your current occupation, whether that be student, teacher, psychologist, etc. Please read each item and indicate whether the statement is TRUE or FALSE for you.

1. Computers seem "anti-human" to me. (T)
2. If I were sitting before a computer, I would not know how to use it. (T)
3. I have a fair amount of computer experience. (F)
4. I would like to use a computer in my work. (F)
5. Computer terminology seems like a foreign language to me. (T)
6. At work I feel more competent with computers than most other people. (F)
7. Computers have no place in my profession. (T)
8. I'm afraid of computers. (T)
9. There are many more important tasks in mental health than creating computer applications. (T)
10. I feel incompetent when I try to use a computer. (T)
11. I find computers very frustrating. (T)
12. I know how to create computer programs. (F)
13. I avoid computers as much as possible. (T)
14. Computers can't help us solve any of the really important

problems in mental health. (T)

15. I am successfully using a computer at work. (F)

16. I dislike computers. (T)

17. The potential for computer use in mental health is tremendous. (F)

18. I waver between trying to learn about computers and avoiding them. (T)

19. I could learn to use a new type of software I hadn't seen before. (F)

20. Computers are often more enjoyable to work with than people. (F)

21. Compared to other people at work, I know very little about computers. (T)

22. I can use a computer keyboard without significant difficulty. (F)

23. I'm tired of computers and hearing about them. (T)

24. A computer modem is where the computer's permanent memory is stored. (T)

25. I could use word processing software to write a letter. (F)

26. I could create a simple data base on a computer. (F)

27. Using computers with patients could definitely be helpful for them. (F)

28. The only way I will use a computer in my work is if someone tells me I have to do it. (T)

29. I would look like a fool if I tried to use a computer. (T)

30. Patients would be turned off by using a computer as an adjunct to therapy. (T)

31. I really have very little sense of how a computer operates. (T)

Note. Scoring key follows each item in parentheses. Three theoretical subscales make up the CAVS: Reinforcement Expectations for Computers (items 1, 4, 7, 9, 11, 14, 17, 20, 23, 27, and 30), Outcome Expectations for Computers (items 2, 3, 5, 12, 15, 18, 21, 24, 25, and 31), and Efficacy Expectations for Computers (items 6, 8, 10, 13, 16, 19, 22, 26, 28, and 29). In addition, results of the factor analysis suggested a new scale, Negative Feelings for Computers (items 1, 4, 7, 8, 11, 13, 16, 18, 23, 28).