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ABSTRACT

Item response changing as a function of test anxiety was investigated. Seventy graduate students enrolled in a basic statistics course completed 73 multiple-choice items on the course content and the Test Anxiety Scale (TAS). The TAS consisted of 25 items that students indicated were descriptive (true) or not descriptive (false) of themselves. Students were classified as high, moderate, or low-anxious based on their TAS scores. Changed answers on the multiple-choice items were identified by inspection of the tests as well as marksense sheets and were classified as correct changes (wrong-to-right), incorrect changes (right-to-wrong), and neutral changes (wrong-to-wrong). Students were unaware of the nature of the research project when taking the tests. Data supported the hypothesis that high test anxious students make more item response changes than low test anxious students. Results also suggested that both high and low anxious students profit to a similar extent proportionally from answer changing. It was further found that more responses were changed on difficult than on easy items for both high and low anxious students. Test anxiety is suggested as a factor forming test-taking style. (Author/RL)

ITEM RESPONSE CHANGES ON MULTIPLE-CHOICE TESTS - AS A FUNCTION OF TEST ANXIETY

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Abstract

Item response changing as a function of test anxiety was investigated. Seventy graduate students completed the Test Anxiety Scale 73 multiple-choice items during the quarter. The data supported the hypothesis that high test anxious students make more item response changes than low test anxious students. Results also suggested that both high and low anxious students profit to a similar extent proportionally from answer changing. It was further found that more responses were changed on difficult than on easy items for both high and low anxious students. Test anxiety is suggested as a factor forming test-taking style.

Many studies have shown the advantage of changing answers on objective examinations (e.g., 2) and that a stable misconception exists among students regarding the hazards of answer-changing (e.g., 8). However, little data are available concerning the relationship between item response changes and personality characteristics. Mueller and Shwedel (4) suggested that "personality variables such as impulsivity or anxiety may correlate with the incidence and effectiveness of answer-changing behavior". McMorris and Leonard (3) examined the relationship of several personality variables, including impulsivity and anxiety, to item response changes, and found contradictory relationships with item response-changing across four groups of subjects. In one group, for example, those who profited from changes were low anxious while in another group those profiting from changes were high anxious. However, the number of subjects in each group was small (ranging from 17 to 50), and the measure of anxiety used was a generalized index rather than a test-specific anxiety scale. The present study employed a larger sample as well as a test-specific measure of anxiety. It was hypothesized that students with higher scores on the Test Anxiety Scale (TAS)(6) would change more item responses than low anxious students but that the ratio of correct to total number of changes would be lower for high than for low anxious students. The primary concern of this study was whether in administering achievement tests, teachers should advise all students, regardless of test-anxiety level, to change responses if they feel their initial answer might be incorrect. Based on past research, counselors and teachers who attempt to provide advice or pretest practice in test-taking may wish to encourage their students to change answers. However, past research has not specifically addressed possible differences in benefits from answer-changing for students of different anxiety levels. It was unclear, then, whether teachers' advice should be uniform for all students or whether

teachers should tailor their recommendations based on perceptions of their students' personalities.

Numerous studies suggest that achievement is negatively correlated with test anxiety. Several studies have investigated the relationship between total test score and points gained by changing answers and have found higher scoring students tending to gain more from response changes that lower scoring students. (e.g., 4). These reported relationships may be spuriously high because gained points have been added into total test score. Smith et al. (7) eliminated this problem by calculating pre- and post-change scores, the former reflecting the score that would have been achieved had no answer been changed and the latter reflecting scores after accounting for changes in answers. If high anxious students receive lower scores, the relationship between performance and rate of item response change confounds the relationship between anxiety and rate of item response change. The present study employed pre- and post-change scores as control variables in examining the relationship between anxiety and gains that are due to changing answers.

Another aspect of item response changes examined in this study was the relationship between number of responses changed, item difficulty, and test anxiety. Beck (1) found that although difficult items elicited more response changes, point gains occured more frequently with items of low or moderate difficulty than with high difficulty items. Mueller and Wasser (5) point out that the relationship is confounded since changed answers alter item difficulties. To eliminate this problem, both pre- and post-change item difficulties were computed.

METHOD

Participants in this study were 70 graduate students enrolled in a basic statistics course at the University of Washington during the winter quarter of 1980. The TAS was administered during class time. The TAS consists of 25 items that students indicate are either descriptive of themselves (true) or

(false). It is a test-specific measure of anxiety and is described in further detail in Sarason (6). Although completion of the form was voluntary, approximately 90% of the class completed the TAS within the 15 minutes allowed. Students were classified as high- (12-20), moderate-(7-11), or low-anxious (0-6) based on their TAS scores.

Students completed three separate multiple-choice tests during the quarter on the course content presented in lectures and the text. A total of 73 items were available for analysis. For each test, students recorded their answers on marksense sheets. Students were encouraged also to record their answers on the test itself which was to be returned later. Changed answers were identified by inspection of the tests as well as the marksense sheets and were classified as correct changes (wrong-to-right), incorrect changes (right-to-wrong), and neutral changes (wrong-to-wrong). Students were unaware of the nature of the research project when taking the tests.

RESULTS

Table 1 presents the means and standard deviations for total number of item response changes, number of correct, incorrect, and neutral changes and for the ratio of correct to total number of changes by anxiety group. A one-way analysis of variance of total number of changes (Table 2) yielded a significant ($p<.05$) main effect for anxiety group. When total test score (calculated both for pre- and post-change) was used as a covariate, the main effect of anxiety group was again significant at $p<.05$.

(Tables 1 and 2 about here)

The ratios of correct to total changes were not significantly different among anxiety groups. Also, no significant differences were found among groups in the number of correct item changes. This result was not changed when total test score was used as a covariate.

Items were categoried as difficult (p=0.0-.39), moderate (p=.40-.69), or easy (p=.70-1.0) both before and after item response changes had been counted. A one-way analysis of variance on both number of correct changes and total number of changes yielded a significant main effect for item difficulty group (Tables 3 and 4). This result was the same whether pre-change or post-change item

(Tables 3 and 4 about here)

difficulty was used to classify test items. Table 5 presents the means and standard deviations for number correct and total number of changes by pre- and post-change item difficulty group. The numbers of item responses changed was

(Table 5 about here)

significantly greater for the high anxious group than for the low anxious group for easy ($t = 2.05$, $p < .05$) and moderately difficult items ($t = 2.74$, $p < .05$); the difference for difficult items was not significant. Both high and low anxious groups gained significantly more points from response changes on difficult items than on easy items when items were classified by pre-change difficulties. When post-change difficulties were used to classify items, the difference in points gained between difficult and easy items was no longer significant. However, the ratio of correct to total number of changes was significantly lower for difficult than for easy items when either pre- or post-change score was used to classify items (Table 6).

(Table 6 about here)

DISCUSSION

The data support the hypothesis that high test anxious students make more item response changes than low test anxious students. This relationship was upheld when the confounding effect of performance (total test score) was removed. Evidence was not found that the ratio of correct to total number of changes differed significantly for high and low test-anxious students. These results suggest that both high and low anxious students profit to a similar extent proportionally from answer-changing, though the net effect is a reduced score for high anxious students. These results partially support those found by McMorris and Leonard (3) and are consistent with the position expressed by Mueller and Shwedel (4). Based on these studies and the present one, teachers should recommend to both high and low test-anxious students that answers should be changed if it is felt that the initial response was incorrect.

The finding that more responses were changed on difficult than on easy items supports Beck's (1) results. Difficult items elicited the most changes with the least success for both high and low anxious students. Low anxious students changed fewer responses to easy and moderately difficult items than did high anxious students.

The method of detecting changes used in this study is imprecise: erasures may have indicated clerical errors rather than reconsiderations and all erasures may not have been detected. However, generalizability across common testing conditions was considered to be of greater importance than some degree of imprecision in the dependent measure.

The results of this study suggest that test anxisty level is one of the factors forming a "personality style of test taking". Further research is required to investigate other personality variables relevant to item response changes. The item response-changing behavior of high anxious subjects may reflect

dealing with a subset of the information available in an item rather than the total information. Upon a second reading, the subset of cues attended to may change and thus the integration of information-to-answer might change. Specification and contrast of the differences between the cognitive processes of high and low anxious students who are uncertain of an item response would clearly be of interest.

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Table 1

Means and Standard Deviations on the Anxiety Scale and Item Response Changes by Anxiety Group

	Anxiety Group			
Anxiety	Low	Moderate	High	Total
Mean	3.90	8.42	14.94	9.04
SD	1.5	1.4	2.2	5.0
Correct Changes				
Mean	3.52	3.86	4.88	4.09
SD	2.2	1.9	2.5	2.3
Incorrect Changes				
Mean	1.28	1.81	1.83	1.63
SD	1.3	1.5	1.3	1.5
Neutral Changes				
Mean	1.04	1.10	1.92	1.36
SD	1.3	1.2	1.4	1.3
Total Changes				
Mean	5.84	6.76	8.63	7.07
SD	3.1	3.1	4.0	3.7
Ratio of Correct:Total				
Mean	.58	.59	.56	.57
SD	.27	.17	.22	.24
N	25	21	24	70

Table 2

Analysis of Variance by Anxiety Group Using Number of Item Response Changes as the Dependent Variable

Source	df	MS	F
Anxiety Groups	2	48.92	3.85*
Error	67	12.70	
Total	69		

*p<.05

Table 3

Analysis of Variance by Difficulty Group Using Number of Correct Item Response Changes as the Dependent Variable

Source	df	MS	F
Difficulty Group	2	61.12	15.52*
Error	70	3.94	
Total	72		

*p<.01

Table 4

Analysis of Variance by Difficulty Group Using Total Number of Item Response Changes as the Dependent Variable

Source	df	MS	F
Difficulty Group	2	310.98	37.12*
Error	70	8.38	
Total	72		

*p<.01

Table 5

Means and Standard Deviations of Correct Changes, Total Changes, and Ratio of Correct:Total Changes by Item Difficulty Group (Pre- and Post-Change)

Item Difficulty Group	Correct Changes Mean	SD	Total Changes Mean	SD	Ratio Mean	N Items
Pre-Change						
Difficult	5.00	2.4	10.75	3.8	.465	12
Moderate	5.38	2.1	9.15	3.1	.589	26
Easy	2.69	1.7	3.91	2.4	.688	35
Post-Change						
Difficult	4.50	2.8	11.25	4.4	.400	8
Moderate	5.45	2.1	9.41	3.1	.580	22
Easy	3.21	2.1	4.81	3.1	.670	43

Table 6

Analysis of Variance of Ratio of Correct:Total Changes by Item Difficulty Group

Source	df	MS	F
Difficulty Group	2	.3639	4.88*
Error	70	.0745	
Total	72		

*p<.05

Difficulty Group	Mean Ratio Correct:Total	SD	N items
Easy	.733	.37	35
Moderate	.586	.10	26
Difficult	.469	.18	12
Total	.637	.29	73