LET'S TALK ABOUT THE "CORRECTION FOR GUESSING" FORMULA

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Have you ever wondered about what the correction for guessing formula is and, perhaps more important, what does it do? Well, here is a "brief" discussion about that topic.

ASSUMPTIONS

We first need to go over the assumptions.

1. It is assumed that when you come to a specific recognition item (like MC), that you either have the knowledge to answer it correctly or you don't. No inbetween ground here ... it is either yes or no.

2. It is assumed that if you have the knowledge, you will get the correct answer; but if you don't have the knowledge, you will guess.

3. Finally, it is assumed (from 1 and 2) that each incorrect response was the result of a random guess (among all options given).

HOW THE FORMULA IS DEVELOPED

Let's outline a scenario and then show how the formula is developed based on that scenario. Assume that you take a 50 item MC test, where there are 5 options for each item: 4 incorrect and 1 correct. You happen to get 38 correct .... and you missed 12.

4. It is assumed that the 12 that you missed were the result of random guesses on those items.

5. It is assumed that for EACH item, if you guessed, you had a 1/5 chance of getting it correct due to random guessing, but ... more importantly, a 4/5ths chance of getting it incorrect.

6. Because of 5, what would you expect to be your net gain in score if you guessed at 5 items? Well, you would expect to get 4 wrong from guessing BUT, YOU WOULD BE EXPECTED TO GET 1 CORRECT THROUGH THIS VERY SAME GUESSING. Thus, in this case, 4 WRONGS MAKE A RIGHT! Therefore, for 4 items that you get incorrect, it is assumed that you would have also obtained 1 correct answer. If you got 8 wrong, then it is assumed that you got 2 correct from guessing; ... and for 12 wrong, it is assumed that you would have gotten 3 correct by guessing.

7. Thus, for our scenario above, when you were observed to have obtained 38 correct and 12 incorrect, it is felt that based on the 12 wrongs you got that we assumed you guessed at, that 3 of the correct responses in your observed score of 38 were also due to guessing. Thus ... in this case, we would decrease your # correct score from 38 -----> 35.

8. 35 is the score that we believe is closer to the true number of items you got based on your knowledge ...

9. For this scenario, we have reduced your # correct score by 3 ... or, for each 4 wrongs, we decreased it by 1. For 12 wrongs, we decreased it by 3. Or, since there is a 4 times greater chance of getting it wrong by chance than correct, 1/4th of the number of wrongs are also assumed to be correct by chance. So, we reduce your score by:

   Corrected score = 38 - 3 = 35 = # correct - (# wrongs/4) = 38 - 12/4 = 38 - 3 = 35

10. Therefore, the correction formula reduces the # correct by some fraction of the # of incorrects and, how big that fraction is depends on the number of options there are: the more options, the less will be the correction. The general formula looks as follows:

    Corrected score = # correct - (# incorrect/# options - 1)

11. For a true false item, since the chance of answering both correctly or incorrectly is 1/2 ... for each incorrect response we see, we assume that you have guessed at 1 item and gotten it correct. So, the formula will be:

    Corrected score = # correct - (# incorrect/# options - 1) =
    = # correct - (# incorrect/2 - 1) = # correct - # incorrect

    If the scenario above had been based on TF items, the corrected score would have been 38 - 12 = 26 as a corrected score.

ARE THE ASSUMPTIONS CORRECT?

12. We know of course that the first assumption is NOT true. While some items you might know for sure, others you are not so sure even though you might have SOME information about the content of the item. Thus, if you had some knowledge, then you are likely able to eliminate one or more options as being incorrect ... and thus increase the odds that you will obtain the correct answer.

13. We also know that even if assumption 2 is correct, there is no guarantee that you will select the choice that is keyed as the correct choice. Why? That would assume that the items are so well constructed that the knowledgeable examinee

can see through the item and find the correct answer. But, due to ambiguity or a number of other things, this may not happen. Now, this is not as major a threat to the violation of the assumptions as the first but, none-the-less, it is such that the second assumption is not completely true.

14. Because of the invalidity of the first assumption, the third assumption cannot be true also. If for example, you have some knowledge about the item, and can eliminate say 2 options of the 5 ... then you MAY guess among the remainder of 3 but ... that's a wild guess out of 3 ... not a wild guess out of 5. In essence, you have made a 3 choice item out of a 5 choicer and, clearly, you have increased the odds of your getting it correct even though you don't have full knowledge.

The bottom line is that the assumptions that are necessary to develop the correction for guessing formula and make it valid are not true, at least not totally.

HOW DO THE VIOLATIONS IMPACT ON THE CORRECTED SCORE?

Well, if you really had been fully guessing on all items, we would expect you to get 10 correct out of 50 items where there were 5 choices each time. So, you would get 10 correct and the correction formula would take 1/4 of the 40 wrongs and subtract from 10 and get you back to 0. Afterall, under this scenario ... since you know NOTHING .... your score should be ZERO! But, because of violation of assumption 1 primarily, there will be many items where you know more than nothing but less than everything. So, in those cases, you will eliminate some options you know are incorrect ... and gain a better chance of guessing among the remainder. So, just for illustration sake, assume that on these 50 items, about 20 are ones you know enough to eliminate 3 options. Now, for these 20, assuming 1 of the remaining 2 is correct and 1 is incorrect, if you guess at all 20 ... you should get about 10 correct and miss about 10. So, in this scenario ... we would have the following:

A. For the 30 that you had no idea of, given 5 options, we would expect that you would get about 1/5 correct or 6. From that ... you would miss about 24. But, from the 20 that you were able to turn into TF kinds of items, you would get about 10 correct and 10 wrong. So, on this test, the total number of wrong would be expected to be about 24 + 10 = 34. Now, putting this into a correction for guessing formula:

Corrected score = # correct - (# wrong/# options - 1)
= 16 - 34/4 = 16 - 8.5 = **7.5**

B. In this case, we would expect your observed test score to be about 7.5 but, if you were really fully guessing at all items, we would expect your score to reduce to 0. Thus, clearly on average, the correction for guessing formula makes assumptions that would **UNDERCORRECT YOUR SCORE** compared to what it assumes to be happening in the case (like the scenario paints) that you either fully know it or don't ... with no inbetween ground possible. That is, the score you

actually get will look better than what the correction for guessing formula would assume if you don't have full knowledge on each and every item. In one sense, this is good in that the formula does not make matters worse.

WHAT ABOUT OMITTED ITEMS?

If you get to an item and don't make any response ... the correction for guessing formula is impotent to act. While we could arbitrarily call this an error, since you did not respond, we have no basis to assume that you DON'T know it. Afterall, it is possible that you simply skipped the item on the first encounter but, forgot to go back to it. Therefore, omitted items cannot be assumed to be wrong and therefore, we cannot subtract from the # correct based on omits being considered wrongs. Thus, omits play no role in using the correction for guessing formula. You might say ... WOW .... what a loophole! But, don't get overly excited ... if you don't respond ... you can't get any credit for it either!

WHAT IMPACT CAN OMITS HAVE ON THE CORRECTED SCORE?

Even though omits don't count, they can have some impact on corrected scores. Consider the following. Let's assume that in the scenario above, 2 examinees get 38 correct but ... for the remaining 12 ... which neither really knows ... one omits 4 and the other one does not. For one, we have 38 correct, and 12 wrong; for the other, we have 38 correct and 8 wrong. For the first, the corrected score would be 38 - 12/4 = 35 but for the second, the corrected score would be 38 - 8/4 = 36. In this case, there is a differential correction made and puts the two examinees in different final score positions ... one 35 and the other 36 ... so it would stand to reason that the instructor would treat them differently (ie, perhaps assign different grades) based on their different corrected scores. This is a problem when using the correction for guessing formula IF some examinees omit and some perhaps do not. Assuming the same # of correct responses, differential omitting can (assuming the same amount of remaining knowledge) can force the correction formula into placing one examinee in a different score position than another with the same amount of knowledge. So, what is done?

RESPONDING TO ALL ITEMS

Given the above problem, what is the relationship between corrected scores when omits differentially occur and when omits don't occur? Well ... assuming there are NO omits, if we put into one column your uncorrected score, and into another column your corrected score, there will be a perfect correlation between # correct and corrected score. Try it and see for yourself! Thus, if there are no omits, there is a perfect r between # right and corrected score. But, that is not necessarily the case if there are differential omits.

But, of course, if there are no omits and the r between # right and corrected score, then what is the real reason why or benefit from using the correction formula? While the corrected scores will for sure be lower across the class of examinees, the rank order of examinees will not change. So ... ??? This is a good question and, about the only "excuses" for using the correction formula are: a) to get your score closer to the "truth"

and b) to discourage random guessing. After all, guessing adds to the "measurement error" and, that is not good for such things like reliability.

WHAT ROLES DO THE DIRECTIONS TO THE EXAMINEE PLAY?

When you take a test, there are some directions. And ... part of those directions should address the fact of whether or not the correction for guessing formula will be used. Clearly, if you don't inform students of its use, it is sort of NOT telling them the truth about how their test scores will be handled. Such practice would border on unethical behavior .... So, if it is to be used, examinees should be told of that. What should they be told in that case?

Normally, the instructions will inform examinees that they should not engage in complete random guessing on an item. That is, if they have no idea whatsoever about the right answer is ... THEN OMIT THE ITEM. However, if they are really able to eliminate one or more options as being incorrect, then go ahead and make a response since on average, you will be ahead of the game. Such a direction is only fair. But, does it really work?

RISK TAKING AND DIRECTIONS ABOUT GUESSING

If it is planned to use the correction formula, you MUST inform the examinee. But ... who will follow the directions correctly? The ones who will tend to follow the directions and NOT respond when they are not sure are those who tend not to be risk takers; ie, those who are timid about guessing and possibly getting a penalty applied. But, what about those who are risk takers? Well, they will forge "full steam ahead" and more or less ignore the directions NOT to guess if you really don't know it. What will this do? Well, we saw that the first assumption about you either know it or don't cannot possibly be true. Therefore, even on items that you are not completely sure of ... you probably do know something. In that case, if you carefully examine the item, you probably can (across many items like this on the test) can eliminate some of the incorrect response options and therefore increase the likelihood of getting the item correct. In this sense, you beat the correction formula. But, if your are timid ... you are likely to ignore and omit items which you could have perhaps gotten correct if you further considered them. So ... what tends to happen is that those who take the risk tend to gain relative to those who are timid ... BUT WHO HAVE THE SAME LEVEL OF OVERALL KNOWLEDGE! Thus, in a sense, the directions about proper response strategy to the examinee will work against those who are less takers of risks ... ie, FOLLOWING THE DIRECTIONS IS ACTUALLY NOT IN THE BEST INTERESTS OF EXAMINEES!

WRAP UP

Because of the invalidity of the assumptions that "make the correction formula work" and because of the problem that use of directions to the examinee about the application of the correction formula tends to discriminate against timid examinees, the use of the

formula is NOT generally recommended. In fact, most major testing companies that used to use the formula, do not anymore.

References

Two good references on this are:

Rowley and Traub (1977) Formula scoring, number right scoring, and test-taking strategy. Journal of Educational Measurment, Vol 14, # 1, pp 15 - 22.

Frary, Bob (1988). Formula scoring of multiple-choice tests (correction for guessing). No. 3 in the series; Instructional Topics in Educational Measurement, B. S. Plake, Editor. Educational Measurement: Issues and Practices, 7(2), 33-38.

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