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The Effectiveness of a "None of the Above" Answer Option in Multiple Choice Grammar Tests

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THE EFFECTIVENESS OF A “NONE OF THE ABOVE” ANSWER OPTION IN MULTIPLE CHOICE GRAMMAR TESTS

A Thesis
Presented to
The Faculty of the Department of Psychology
Western Kentucky University
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Master of Arts

By
Andrea B. Sides

May 2008
THE EFFECTIVENESS OF A NONE OF THE ABOVE ANSWER OPTION IN MULTIPLE CHOICE GRAMMAR TESTS

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Dean, Graduate Studies and Research Date
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THE EFFECTIVENESS OF A "NONE OF THE ABOVE" ANSWER OPTION IN MULTIPLE CHOICE GRAMMAR TESTS

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May, 2008

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This study examines the use of “none of the above” (NOTA) as an answer option in a multiple-choice grammar test. Results from previous research on this topic have been mixed. Two forms of a grammar test, one without a NOTA option and one with a NOTA option, were developed and administered to a sample of 160 undergraduate students. Differences between the forms in item difficulty and discrimination were examined. Analysis revealed no differences in item discrimination or item difficulty between items without a NOTA option and items with a NOTA option. A discussion of the results, limitations, and suggestions for future research is provided.
Introduction

The multiple choice format is a popular method of testing that dates to a proposal by Buckingham in 1926 (Cizek & O'Day, 1994). This format is commonly used to evaluate achievement in learning (Shank, 2006) and is used extensively in academic settings (Tozoglu, Tozoglu, Gurses, & Dogar, 2004). It is also favored because items can be written to evaluate a variety of knowledge areas (Cantor, 1987) and because it allows evaluation of higher order cognitive processing (Hoepfl, 1994).

To provide the reader with general knowledge of this topic, issues concerning multiple choice testing, item construction, guidelines for writing items, the pros and cons of multiple choice testing, use of a “none of the above” answer option, item difficulty and discrimination, and grammar testing are reviewed.

Multiple Choice Test Items

According to Cantor (1987), a multiple choice item consists of a stem and a set of responses. Each stem asks a question, presents a problem or situation, or involves an incomplete sentence. Although these are all correct formats, the question form is the most popular for item writing because it helps prevent cueing the test taker to the correct response.

Item construction for tests involves a calculated effort which entails a thorough understanding of the topic matter and constructs being measured. The reading and vocabulary level of the test taker as well as the process in which the information was learned must also be considered. Finally, response style and format must be considered when choosing the optimal design (Tozoglu et al., 2004). When writing items, it is
important to first choose the type of information that will be covered in the test. When creating the stem of the item (regardless of whether it is a question, situation, or incomplete sentence), it is essential that each stem only evaluate one central idea or theme. It is also important that response options be grammatically correct and plausible as an answer (Cantor, 1987).

Shank (2006) suggested some guidelines for stem writing: provision of clear directions, inclusion of all possible information into the stem, use of clear-cut language without grammatical errors, avoidance of technical language (unless the knowledge of technical language is being tested), and avoidance of negatives unless they are capitalized or underlined. In writing the responses, Shank suggested that each item should have a single unambiguous correct response, plausible distractors, and responses free from synonymous distractors. Hoepfl (1994) also suggested writing items at a level appropriate to the test takers.

The multiple choice format has many desirable qualities including easy scoring, objective scoring by a scanner, and test taker comprehension (Roediger & Marsh, 2005). Shank (2006) also noted that if test items are well constructed, it is possible to evaluate different levels of complexity for the desired information.

A type of item analysis, called distractor analysis, can also contribute to the creation and retention of good items (Hoepfl 1994). Distractors should be plausible and appear to be reasonable as a valid response. If a distractor appears so unlikely that almost no test taker will choose it, the distractor is not contributing to the performance of the item. Additionally, if one or more implausible distractors appear in a multiple choice item, the chances that one can obtain the correct answer by guessing increases.
Furthermore, a distractor analysis informs the item writer if one distractor is used more often than the others. Items with such a profile of responses are likely in need of better distractors.

In a study by Tozoglu et al. (2004), student perceptions of multiple choice and essay testing were investigated. For the majority of the dimensions measured, results showed that students had a more positive perception toward multiple choice testing as opposed to the essay format. Participants also considered the multiple choice format to be less tricky, less complicated, less difficult, and more fair than essay tests. Students also reported that the multiple choice format was less ambiguous and took less time and effort to complete than the essay format.

In contrast to the positive side of multiple choice testing, there are also some less than ideal qualities. One example is test wiseness, which is an examinee's ability to choose the correct answer option through content cues within the exam (Smith, 1982; Strang, 2001). Shank (2006) proposed that the format of the test items themselves cues test wise individuals to the correct answer, ultimately leading to higher scores through correct guessing. For example, a sentence completion item that ends with a versus an could cue a test wise individual to the correct answer (which would not start with a vowel) without knowing the correct response. Additionally, a true/false problem which contains the word always in the stem can cue test wise individuals to choose false even if they did not know the answer simply because test wise individuals are aware that very few things are always true. In summary, although the multiple choice format has some desirable properties (not the least of which is quick, easy, and reliable scoring), the format is not without its problems.
None of the Above

The focus of the present study is the use of “none of the above” (NOTA) as an answer option. A test item with a NOTA answer option offers a number of possible answers (one of which may be correct) followed by a final option indicating that none of the previously listed options are correct. Previous research has found only intermittent support for the use of a NOTA option in testing. In a meta-analysis by Haladyna and Downing (1989), 19 of 34 experiments did not support using the NOTA option. Frary (1991) disregards the notion that NOTA should be avoided as an answer option, rather he suggested that items should be examined by the individual creating the test for compatibility with the learning environment.

In determining whether to use this option, most studies have focused on differences in item discrimination (as measured by coefficient alpha) and difficulty for items with and without a NOTA option. Discrimination would be improved by reducing correct guessing, which increases the correlation among items measuring the same construct (i.e., without correct guessing, a low ability test taker now misses more items, a more consistent pattern of responses for that test taker). For example, Crehan and Haladyna (1991) found significant differences in item difficulty but not with item discrimination when using the NOTA answer option. In an analysis based on 13 studies, Crehan, Haladyna, and Brewer (1993) reported that the use of a NOTA answer option increased item difficulty and discrimination.

In support of the NOTA option, Oosterhof and Coats (1984) found that when the NOTA option was used as a correct answer option, items were more difficult. Knowles and Welch (1992) found increased item difficulty and discrimination when NOTA was
used as a distractor (and as a correct response) as compared to not using NOTA as an answer option. Tollefson and Tripp (1983) found significant mean discrimination with items using the NOTA as the correct answer option versus those items with NOTA as a distractor item. On the contrary, Wesman and Bennett (1946, as cited by Knowles & Welch, 1992) found no difference in test difficulty when the NOTA answer option was used. In a series of studies done by Williamson and Hopkins (1967), results showed that two of the four studies using the NOTA option revealed a significant difference in difficulty. Rimland (1960) also found a small but significant increase in difficulty when the NOTA option was used. Finally, Tollefson (1987) compared item difficulty and discrimination between three multiple choice formats consisting of 73 items. Response options included using NOTA as the correct answer, the incorrect answer, or no NOTA. Results showed that using NOTA as the correct answer produced the highest level of difficulty. No differences in item discrimination were found between the three answer options.

Grammar Testing

The present study will evaluate the effectiveness of the NOTA answer option in a grammar test. Although there are many formats available for grammar testing (e.g., error correction, sentence completion, sentence arrangement), error correction is a common format used in multiple choice grammar testing (e.g., the ACT). The error correction format involves providing a sentence that includes one grammatical error with several response options marked with corresponding letters. The test taker must decide which letter represents the correct answer. Sentences with no grammatical errors may also be
included, with a NOTA answer option indicating such. The error correction format will be used to evaluate grammar knowledge in the present study.

Grammar is taught and tested in schools through instruction of nouns, verbs, adjectives, adverbs, dependent clauses, and independent clauses (Fearn & Farnan, 2007). Traditionally, grammar instruction is given in English class but students may experience grammar through reading and writing in a literature class. Grammar testing is a valuable tool in predicting college performance, as shown with standardized tests such as the ACT. The ACT includes an English portion of the exam, which evaluates punctuation, grammar, sentence structure, organization, and style. Specifically, the grammar portion of the English section involves “agreement between subject and verb, pronoun and antecedent, and modifiers and the word modified; verb formation; pronoun case; formation of comparative and superlative adjectives and adverbs; and idiomatic usage” (ACT, Inc., 2008, ¶ 3).

Proper grammar is important in areas other than educational settings. For example, correct grammar usage is vital to successful communication in the workplace (Craig, 2001). Employees need to possess proficient skills in vocabulary, proofreading, grammar, content organization, punctuation, sentence structure and spelling to be effective on the job (West, 1983).

The Present Study

Due to the inconsistent results of previous research of the NOTA answer option in multiple choice tests, the effectiveness of the NOTA answer option will be further examined. In contrast to previous NOTA studies which examined knowledge in a content area (e.g., biology), the present study will examine error correction in a grammar test. To
investigate the differences in answer options with or without the NOTA option, item
discrimination and item difficulty will be explored within a multiple choice grammar test.
Two forms of multiple choice items will be used. Each version of the test will contain the
same items with the same grammatical mistakes. The only difference between the two
forms will be the removal of one of the answer options and the addition of the NOTA
option. The NOTA option will serve as the incorrect answer for 80% of the items, and the
correct answer for the rest. The placement of the NOTA option will be assigned
randomly. Logically, error corrections should be more difficult when there is a chance
that the sentence does not contain any errors. That is, instead of choosing the option
associated with the most suspicious wording, test takers presented with a NOTA option
must decide whether the suspect wording is actually an error. In short, NOTA may force
test takers to make two decisions when answering the items. Therefore, it is hypothesized
that items with the NOTA option will have higher item difficulty and discrimination than
those without the NOTA option.

Hypothesis 1: Items with NOTA as an answer option will be more difficult than
will those items without the NOTA option.

Hypothesis 2: Items with NOTA as an answer option will exhibit better item
discrimination (i.e., higher coefficient alpha) than will those items without the NOTA
option.
Method

Participants

One hundred and sixty four students from a large, Southeastern university completed a grammar test. Students were recruited through the psychology department’s study board. Participants were from undergraduate psychology courses and participated as part of a course requirement in Introductory Psychology or in exchange for course credit in other psychology courses. All participation was voluntary and alternative routes to credit were available to all participants. Demographic data were collected from 135 of the 164 participants. Due to an oversight, demographic data were not collected from the first experimental session. Approximately 72% of participants were female, 85% were ages between 18 and 20, 71% were freshman in college, and 89% were Caucasian. Time to complete the study averaged 15 minutes.

Instrument

The items in this instrument consisted of single sentence statements with one grammar error in each sentence. Each sentence had five response options with a total of 25 written items. One version of the test included distractors without a NOTA option (standard form; see Appendix A). The second version of the grammar test included a NOTA response option (NOTA form) as a replacement of one response chosen at random (see Appendix B). For this second form, NOTA was the correct response for 5 of the 25 items. In order to make the two test forms as comparable as possible, one response option was randomly replaced with the NOTA option instead of the previous practice (e.g., Crehan et al., 1993) of using the distractor with the lowest item discrimination index. Aside from the five items on the NOTA form in which the error in the sentence was fixed
in order to allow NOTA to be the correct answer, each test version had the same 25 sentences with the presence of a NOTA option as the only variation in the stimulus.

Worthy of discussion is the issue of whether the items on the NOTA form of the grammar test in the present study actually have NOTA options. One issue is that the words "none of the above" are not found on the NOTA form in this study. Instead, the words "no error" are used. Aside from a mere labeling issue, the processes involved in a true NOTA item may be different than the processes involved in NOTA items used in the present study. In a multiple choice test of knowledge of a content domain, a true NOTA option implies that there is a correct answer to the question, but the correct answer is not listed among the alternatives. In an error correction grammar test, "no error" indicates that there is no error in the sentence. A true NOTA error correction grammar item would still have an error in the sentence, but the error is not one of the underlined words or passages. This study employs the "no error" option rather than the true NOTA for two reasons. First, the "no error" option is the traditional format for error correction grammar items (e.g., the ACT). Second, as mentioned earlier, forcing the test taker to determine if there is an error in the sentence adds a second decision to the item. The test taker must identify which part of the sentence is the most likely location of an error and then determine whether it is actually an error. This double decision process has the potential for increases in item difficulty. In summary, although the format used in the present study is not the exact match to the typical NOTA test format, the differences are not substantial, and the "no error" format is likely the optimal format for grammar tests that deal with error correction.
Procedure

Participants were given standardized instructions for the grammar test (see Appendix C for script of the experimental session). Participants were randomly assigned to one of two test forms. Participants completed each test individually and brought the test and completed scantron to the instructor when finished. All responses were made anonymously.
Results

Data were collected from 164 participants, 81 for the standard form and 83 for the NOTA form. The data from three participants who completed the standard form were excluded due to the presence of multiple responses on the same line on the scantron sheet, followed by one or more blank responses, indicating that numbering may have been off. The responses from one participant in the NOTA condition were also excluded because the last seven questions were unanswered, suggesting that the participant gave up. After these exclusions, there were a total of 78 participants for the standard form and 82 participants for the NOTA form, yielding a total sample size of 160 participants. Items were scored so that the correct response was given a point and all other responses, including non-responses, were awarded no points.

The percent of respondents answering an item correctly ($p$-values) are listed below in Table 1. As indicated by the correlation between responses on the NOTA and standard form, $r = .81, p < .01$, the most difficult items on the standard form were also the most difficult items on the NOTA form. Item 11 demonstrated the greatest change in difficulty. Item 11 changed from being the most difficult item on the standard form (4% correct) to a moderately easy item (60% correct) on the NOTA form.

The change in Item 11 is likely due to a combination of the item content and the change to having NOTA as the correct answer. As to item content, Items 11 and 25 (Item 25 was the second hardest item on the standard form) were the only items written to address anthropomorphism, a grammatical error that is markedly different from the other grammatical errors (e.g. errors in punctuation, subject verb agreement, and pronoun
Table 1

*p*-values for Standard and NOTA test forms

<table>
<thead>
<tr>
<th>Item number</th>
<th>Standard form (p)-value</th>
<th>NOTA form (p)-value</th>
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<tbody>
<tr>
<td>1</td>
<td>.77</td>
<td>.73</td>
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<tr>
<td>2</td>
<td>.72</td>
<td>.55</td>
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<tr>
<td>3</td>
<td>.74</td>
<td>.76</td>
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<tr>
<td>4</td>
<td>.09</td>
<td>.13</td>
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<tr>
<td>5</td>
<td>.81</td>
<td>.85</td>
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<tr>
<td>6</td>
<td>.88</td>
<td>.84</td>
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<td>7</td>
<td>.60</td>
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<td>.60</td>
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<td>12</td>
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<td>24</td>
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<td>.49</td>
</tr>
<tr>
<td>25</td>
<td>.09</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Note.* \(N = 78\) (Standard form) \(N = 82\) (NOTA form)

agreement). It is likely that the difficulty of Item 11 changed due to the correction of an error that was of a different type, rare, and thus, abstruse.

Hypothesis 1 stated that items with NOTA as an answer option \((M = 13.21, SD = 4.66)\) would be more difficult than those without the NOTA option \((M = 12.41, SD = 4.03)\). An independent samples *t*-test was used to test the hypothesis. Significant
differences were not found between the test forms, $t(158) = -1.15, p > .05$, indicating that there were no differences in test difficulty when using NOTA as an answer option versus not using NOTA as an answer option.

Hypothesis 2 stated that items with NOTA as an answer option would exhibit better item discrimination (i.e., higher coefficient alpha) than those without the NOTA option. This hypothesis was also not supported. The coefficient alpha for items without a NOTA option was .75. The coefficient alpha for items with a NOTA option was .80. A $z$-test for difference between correlations was not significant, $z = .09, p > .05$.

Post Hoc Analyses

To investigate differences in total variance between the two forms, a post hoc analysis of the differences in variance was performed between the standard ($S_x^2 = 16.25$) and NOTA ($S_x^2 = 21.75$) forms. No significant differences in test variance were found, $F(81, 77) = 1.34, p > .05$.

Additionally, a post hoc analysis was performed to explore the five items (Items 2, 10, 11, 22, and 24) on the NOTA form for which NOTA was the correct answer versus those same five items without a NOTA option. An independent samples $t$-test was used, and items with NOTA as the correct answer ($M = 2.99, SD = 1.33$) were found to be significantly easier, $t(158) = 2.21, p < .05$, than items without a NOTA option ($M = 2.55, SD = 1.16$). This analysis, however, includes the previously discussed problematic Item 11. A reanalysis of NOTA as the correct answer excluding Item 11 indicated a non significant difference, $t(158) = .638, p > .05$, between participants completing the NOTA form ($M = 2.39, SD = 1.26$) and the standard form ($M = 2.51, SD = 1.16$).
A final re-analysis of Hypothesis 1 and Hypothesis 2 without Items 11 and 25 (which, as discussed, were the only anthropomorphism items) revealed no changes in the results. In summary, all analyses failed to find differences between items on the NOTA and standard forms. Moreover, the post hoc exploratory analysis of the five items for which NOTA was the correct answer showed no differences once the anthropomorphization item (Item 11) was removed.
Discussion

Hypothesis 1, which stated that items with NOTA as an answer option would be more difficult than those without the NOTA option, was not supported by the data. These findings are similar to the findings of the meta-analysis by Haladyna and Downing (1989), in which 19 out of the 34 experiments did not find significantly greater item difficulty using the NOTA option, and Tollefson (1987), who found no differences in item discrimination between response options. Hypothesis 2 stated that items with NOTA as an answer option will exhibit better item discrimination (i.e., higher coefficient alpha) than those without the NOTA option. This finding was also not supported by the data. Similarly, the variance between the standard and NOTA forms was not found to be different. Additionally, analysis of just the five items that had NOTA as the correct answer on the NOTA form resulted in significantly higher scores (i.e., easier) for the NOTA form.

An inspection of Table 1 shows that Item 11 performed very differently on the two versions of the test. In the standard format, the correct answer rate was slightly worse than that of chance, $p = .04$. In the NOTA format, the response rate became slightly easier than average, $p = .60$. Because Item 11 was one of only two items (Items 11 and 25) that dealt with anthropomorphization, and was the only item to display a large change in correct response rates, it was excluded from analyses to investigate its effect. Results of all subsequent analyses, including those that focused on the items for which NOTA was the correct answer, indicated nonsignificant differences. The performance of the other anthropomorphization item (Item 25, which was not corrected in the NOTA form) was nearly identical between the two versions of the test. The difference between the results
of Items 11 and 25 can be attributed to the correction of the anthropomorphism error in Item 11 only. For Item 11, the error in the sentence (the anthropomorphization of the subject) was fixed and the NOTA option was correct. For Item 25, the error in the sentence (again being the anthropomorphization of the subject) was not corrected, and thus NOTA was not the correct option.

There were three major limitations to the present study. First, the study used a composed entirely of university students. A more diverse sample (including race, national origin, gender and age) could be used to create a more generalizable sample. For example, participant response on demographic data collection indicated that 72% of participants were female and 89% were Caucasian. Future research should include a sample of participants with more diverse backgrounds.

Second, variability in the NOTA form ($S_x = 4.66$) and the Standard format ($S_x = 4.03$) from this sample was limited. Blind guessing on the present grammar test would have resulted in approximately five correct answers. The average correct response rate for the NOTA format was 12.41, and the average correct response rate for Standard format was 13.21. Given that the means are somewhat low (less than half the distance between the expected score that could be obtained from guessing and the maximum possible score), it is possible that the NOTA scores were not any lower than the standard scores because the standard form was already too difficult for the target population.

The final and perhaps most important limitation to this study concerns participant motivation. Participants did not receive course credit for correct answers; they only received credit for participation. Thus, it is possible that some participants stopped working once the items became more difficult than they desired. As mentioned, both
versions of the test were somewhat difficult. Perhaps if this test was given in a class for a
grade, motivation would likely have been higher and participants would persevere even
when they encountered difficult items, potentially yielding results different from those
reported here.

In conclusion, the results from this study failed to support any claims that the use
of a NOTA option affects the difficulty or discrimination of a grammar test. Use of
NOTA as an answer option does not appear to be a psychometric issue and can be
decided on the basis of other considerations.
References


Appendix A

Standard Form
SB Grammar Identification Test

Directions

This test is designed to measure English grammar (incorrect word choice and punctuation). Please answer every item and make an educated guess if you are unsure. This test is not designed to measure spelling (or capitalization). This test is also not designed to identify merely awkward wording.

On some sentences you will see the spaces between words underlined. The underlined space indicates a place where punctuation may be needed.

Two examples are given below.

1. We all know how to think and reason
   A B C D E
   The error in the above sentence is in part E. The period is missing from the end of the sentence. Note how the space after the last word (reason) is underlined. An underlined space indicates an area where punctuation may be missing.

2. I and Jim know how to break into banks.
   A B C D E
   The error in the above sentence is in part A. The subjects (I and Jim) in the beginning of the sentence are out of order.

Thank you for your participation. Good luck.
1. Movies and games are fun. Entertainment, however, is not the primary goal of education. Nevertheless, children are entertained when playing games and watching movies.

2. Prairie dogs have been known to construct complicated shelters. Cheetah's run quickly through the forest to catch a rabbit.

3. Our studies of response patterns reveal many interesting trends. Many destructive and negative outcomes result from defensive behavior.

4. We may all feel better about our lives at the end of the meal. As we enjoy our food, let us take turns describing what we are thankful for.

5. Rebecca, Sarah, and Elizabeth thought their science project was due next week, but it was actually due yesterday.

6. It's difficult to imagine every possible situation a college student could encounter. Nevertheless, we must write a comprehensive student handbook.

7. The girls adored Carter due to his southern charm and quick wit. Carter, in turn, adored them. There are no other credible explanations.

8. The communication-oriented behaviors of a person influence subsequent opinions of the perceived disagreement. The degree of influence is irrespective of the magnitude of conflict expressed by the behaviors.

9. Ellis had reached his limit. He sped off on his motorcycle, leaving her and all of her ways behind him.
10. My dog is only ten months old and two feet high. I do not know how he does it, but he can run faster than I.

11. The school was persuaded to improve the content of the curriculum, which had been labeled by the steering committee as "severely deficient" in most areas.

12. Rachel and I decided that we were too tired to pursue further exploration of the great, uncharted lands that lay before us.

13. Neither the hamsters or the mice were able to complete the maze in the required time. In addition, both animals showed signs of fatigue and frustration.

14. Appearances are important. Brush with smooth, even strokes, to preserve the look when polishing silver.

15. Our current problem is not the most interesting but is the most pressing. Whose going to fill in for the president of the wine club while he is in rehab?

16. There is no second chance for successful communication. The class of students are going to influence the direction of a conflict.

17. There are no patterns or trends with automobiles. I can't recall two cars that have ever shown the same repair history. Each car has its own problems.

18. People that are unlikely to pay attention to details should avoid potentially dangerous situations. Careful people are the survivors and are the only ones able to share advice.
19. Every afternoon, as the summer sun slowly moves across the sky, we watched with great amusement as people of all kinds walked out of the casino dead broke.

20. Our side has shown incredible resolve. However, their not going to stop until we drop our demand for an equal share of the revenue.

21. Each student in my class should select their favorite animated movie and prepare a discussion for the next meeting. Discussion should center on themes of loss and betrayal.

22. We listened as the old geezer told us his idea. His plan, which was the strangest one yet, appealed to Charlie and myself for reasons that were unknown to us.

23. The training course lasted for four weeks. Dogs who completed the training were given a diploma and a giant newspaper chew toy.

24. Each supervisor should name the employee whom failed the test of loyalty and employee dedication. These policies may sound harsh, but they are for your own protection.

25. We should never submit. We should never acquiesce to the demands of the enemy, regardless of the possibility of a temporary peace. Their guns always study us, searching for weakness.
Appendix B

NOTA Form
SB Grammar Identification Test

Directions

This test is designed to measure English grammar (incorrect word choice and punctuation). Please answer every item and make an educated guess if you are unsure. This test is not designed to measure spelling (or capitalization). This test is also not designed to identify merely awkward wording.

On some sentences you will see the spaces between words underlined. The underlined space indicates a place where punctuation may be needed. Choose "no error" if the sentence is without grammatical errors.

Two examples are given below.

1. We all know how to think and reason, no error
   A    B    C    D    E

   The error in the above sentence is in part D. The period is missing from the end of the sentence. Note how the space after the last word (reason) is underlined. An underlined space indicates an area where punctuation may be missing.

2. I and Jim know how to break into banks, no error
   A    B    C    D    E

   The error in the above sentence is in part A. The subjects (I and Jim) in the beginning of the sentence are out of order.

3. It is easy to write a correct sentence. no error
   A    B    C    D    E

   The above sentence has no grammatical error. The correct answer is E.

Thank you for your participation. Good luck.
1. Movies and games are fun. Entertainment, however, is not the primary goal of education.

   A

   Nevertheless, children are entertained when playing games, and watching movies. no error

   B   C   D   E

2. Prairie dogs have been known to construct complicated shelters. Cheetahs run quickly through the forest to catch a rabbit. no error

   A   B   C   D   E

3. Our studies of response patterns reveal many interesting trends. Many destructive and negative

   A

   outcomes results from defensive behavior. no error

   B   C   D   E

4. We may all feel better about our lives at the end of the meal. As we enjoy our food, let us take turns describing what we are thankful for. no error

   A   B   C   D   E

5. Rebecca, Sarah, and Elizabeth thought they’re science project was due next week, but it was actually due yesterday. no error

   A   B   C   D   E

6. It is difficult to imagine every possible situation a college student could encounter. Nevertheless, we must write a comprehensive student handbook. no error

   A   B   C   D   E

7. The girls adored Carter due to his southern charm and quick wit. Carter, in turn, adored them. There are no other credible explanation. no error

   A   B   C   D   E

8. The communication oriented behaviors of a person influences subsequent opinions of the perceived disagreement.

   A   B

   The degree of influence is irrespective of the magnitude of conflict expressed by the behaviors. no error

   C   D   E

9. Ellis had reached his limit. He sped off on his motorcycle leaving her and all of her ways behind him. no error

   A   B   C   D   E
10. My dog is only ten months old and two feet high. I do not know how he does it, but he can run faster than me. no error

11. The staff of the school was persuaded to improve the content of the curriculum, which had been labeled by the steering committee as "severely deficient" in most areas. no error

12. Rachel and I decided that we were too tired to pursue further exploration of the great, uncharted lands that lay before us. no error

13. Neither the hamsters or the mice were able to complete the maze in the required time. In addition, both animals showed signs of fatigue and frustration. no error

14. Appearances are important. Brush with smooth, even strokes, to preserve the look when polishing silver. no error

15. Our current problem is not the most interesting but is the most pressing. Whose going to fill in for the president of the wine club while he is in rehab? no error

16. There is no second chance for successful communication. The class of students are going to influence the direction of a conflict. no error

17. There are no patterns or trends with automobiles. I can't recall two cars that have ever shown the same repair history. Each car has its own problems. no error

18. People that are unlikely to pay attention to details should avoid potentially dangerous situations. Careful people are the survivors and are the only ones able to share advice. no error
19. Every afternoon, as the summer sun slowly moves across the sky, we watched with great amusement as people of all kinds walked out of the casino dead broke. no error

20. Our side has shown incredible resolve. However, their not going to stop until we drop our demand for an equal share of the revenue. no error

21. Each student in my class should select their favorite animated movie and prepare a discussion for the next meeting. Discussion should center on themes of loss and betrayal. no error

22. We listened as the old geezer told us his idea. His plan, which was the strangest one yet, appealed to Charlie and me for reasons that were unknown to us. no error

23. The training course lasted for four weeks. Dogs who completed the training were given a diploma and a giant newspaper chew toy. no error

24. Each supervisor should name the employee who failed the test of loyalty and employee dedication. These policies may sound harsh, but they are for your own protection. no error

25. We should never submit. We should never acquiesce to the demands of the enemy, regardless of the possibility of a temporary peace. Their guns always study us, searching for weakness. no error
Appendix C

Script Instructions
Study instructions to thesis participants:

Hello. My name is Andrea Sides and I am an Industrial/Organizational Psychology graduate student. You are here today to complete a grammar test that will contribute to my thesis study. The purpose of this study is to investigate different ways of measuring grammar knowledge and the effectiveness of response options in multiple choice testing. Thank you for participation.

I will now pass around this sheet of paper. Please print your name and class for which you would like to receive credit for your participation through the study board.

(Pass sheet around)

I will now distribute and collect the informed consent document. Participation is voluntary and you are free to withdraw at any point without penalty. Please sign your name and date the form. I will be your witness.

(Pass out and collect informed consent documents)

The test consists of 25 short sentences. Please answer to the best of your ability and if you don’t know the answer, make an educated guess like you would on a test for class credit. Accuracy is important for this study. You will be given a test, a scantron, and a demographics form. Please insure that each label on the forms match (either A or B). I do not need your name, university ID, or any other identifying information on any form. Please bring all forms to the front when you are finished. Are there any other questions before we begin? Thank you again for your participation.

(Pass out test, scantron, and demographics form)
Appendix D

HSRB Approval Letter
Dear Andrea:

Your revision to your research project, “An Investigation of the Effectiveness of Response Options in Multiple Choice Testing,” was reviewed by the HSRB and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects’ welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is required; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data. (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

This project is therefore approved at the Expedited Review Level until May 15, 2008.

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Sponsored Programs at the above address. Please report any changes to this approved protocol to this office. Also, please use the stamped Informed Consent documents that are included with this letter. A Continuing Review protocol will be sent to you in the future to determine the status of the project.

Sincerely,

Sean Rubino, M.P.A.
Compliance Manager
Office of Sponsored Programs
Western Kentucky University

cc: HS file number Sides HS08-119