

## **Multiple Answer Questions in Self-Administered Surveys: The Use of Check-All-That-Apply and Forced-Choice Question Formats\***

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### **ABSTRACT**

This paper reports results from a series of experimental manipulations of check-all-that-apply questions in an Internet survey. One purpose of the experiments was to determine whether reversing the order of the presentation of response options resulted in order effects, including primacy and anchoring. A second purpose was to determine the effects of converting check-all-that-apply questions to a forced choice-format (e.g. Yes/No for each item). We found that the existence of order effects in check-all-that-apply questions appears to depend on whether questions require respondents to use temporarily or chronically accessible information, as has been previously reported for items requiring selection of only one response option. The conversion to a forced/choice format increased the percentage of respondents answering affirmatively to each response option. Additionally, forced-choice formatted questions were unaffected by the use of more active answer categories (e.g. fan/not a fan) as opposed to the common yes/no format. Finally, the results from this survey of a random sample of 1503 University students, were quite similar to results from a previous mail survey experiment, suggesting that the response patterns observed in the current experiment result from self-administration in general, and not from a unique characteristic of web surveys.

Respondents to self-administered surveys are often asked to answer a question by checking only those response options that apply to them. For example, they might be instructed, "Please indicate which of the following sources of information you have used to find employment in the last month by checking all that apply." Each information source in the list would then be marked only if it had been used.

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Previous research has shown that respondents to single-answer questions in visual self-administered questionnaires are subject to primacy effects, or the disproportionate selection of items appearing early in the list of response options (Krosnick and Alwin, 1987). This response order effect has been attributed to respondents' satisficing behavior, whereby respondents limit their processing effort by selecting the first reasonable response option they come to in the list (Krosnick 1991; 1999). In addition, whether respondents must retrieve temporary or chronically accessible information when answering a question has been shown to affect the extent to which response order and/or question order effects occur in single-answer questions (Sudman, Bradburn, and Schwarz 1996; Schwarz 1996). Due to the occurrence of order effects in check-all-that-apply questions (Israel and Taylor 1990), some researchers have suggested that converting such questions to a series of forced-choice items, as is normally done in interview surveys, may improve the quality of responses (Dillman 2000; Sudman and Bradburn 1982). However, the existence of order effects and ways to mitigate those effects in forced-choice questions has not been well researched.

Our purpose in this paper is threefold. First check-all-that-apply questions (in Internet surveys) that require respondents to retrieve different types of information are tested for response option order effects. Second, we assess the effects of changing question formats from check-all-that-apply to a series of forced-choice items and whether order effects occur in forced-choice formats. Third, limited comparisons with experimental results from a mail survey are reported in order to provide insight into the extent to which observed effects exist in different types of self-administered surveys. Finally, the implications are discussed for deciding whether to use forced-choice (e.g. yes/no) items as replacements for check-all-that-apply items. These issues are

examined using up to four variations for each of four substantively different questions in random sample surveys of Washington State University (WSU) undergraduates.

## THEORETICAL BACKGROUND

### *Does the Ordering of Response Options Affect Answers to Self-Administered Questionnaires?*

Although very little research has been done specifically on check-all-that-apply question formats, considerable research on other question formats suggests that answers will be influenced by the order in which items are presented to respondents. The theoretical background undergirding that research suggests that we should expect order effects to occur and those effects will be different depending upon the content of the questions.

Krosnick (1991; 1999) has argued that many respondents satisfice when answering survey questions by not expending the effort required for providing an optimal answer. Whereas some respondents, described as weak satisficers, adopt a strategy of choosing the first response option (or options) they can reasonably justify, other respondents, strong satisficers, limit their thinking about a question, failing to go through the comprehension and retrieval stages described by Tourangeau, Rips, and Rasinski (2000). It is useful to think of a continuum of all forms of respondent strategies for responding to survey questions, with optimizing being located at one end, strong satisficing at the other end, and weak satisficing in the middle (Krosnick 1991; 1999). As Krosnick points out, the more difficult the question or the task of answering is, the more likely the respondent is to move towards the strong satisficing end of the continuum.

In earlier work Krosnick and Alwin (1987) have argued that in visual self-administered surveys, respondents are more likely to choose an answer from among the first listed response options rather than from among those listed last. They argue that when respondents control the processing of information, as is the case with self-administered questionnaires, early items are

subject to deeper processing and/or may become a standard of comparison for later items resulting in greater selection of early items. Krosnick's theory and related work suggest an explanation for the appearance of response order effects; however, research on satisficing has not been extended from single-answer questions to multiple-answer questions. Further, as discussed below, there is reason to believe that the appearance of response order effects may also depend on the substance of the particular questions.

Sudman, Bradburn, and Schwarz (1996) and Schwarz (1996) argue that individuals utilize both temporarily accessible information and chronically accessible information to formulate answers to questions and the substance of the question will determine what type of information should be retrieved. Further, question order effects increase as the availability of temporarily accessible information increases, as the extremity of the temporarily accessible information increases, and/or as chronically accessible information availability decreases. This is because respondents' temporarily accessible information is influenced by the context and content of the questions whereas their chronically available information is more stable and based on a wider degree of experiences and respondent characteristics.

Importantly, it is the *inclusion* or *exclusion* of the information in mental representations of the target (i.e. the item or phenomenon being inquired about) or in comparison referents that determines which order effects are likely to result. Information that is brought to mind and included in the mental representation of the target will result in assimilation effects. If the information brought to mind is positive, the judgment will likely be more positive whereas if it is negative the judgment will likely be more negative. Information that comes to mind, but is excluded from the mental representation of the target results in contrast effects. There are two main types of contrast effects: subtraction effects and comparison-based contrast effects.

Subtraction occurs with respect to *question order* when respondents exclude certain considerations relevant to a question because it follows another question for which the same considerations provided the basis for answering. This type of question order effect has been observed in multiple studies (Schuman and Presser 1981; Schwarz, Strack, and Mai 1991; Tourangeau, Rasinski, and Bradburn 1991; Mason, Carlson and Tourangeau 1994); however, to our knowledge subtraction effects have not been extended as an explanation for how the order in which response options are presented affects respondents' answers. In extending subtraction effects as an explanation for response order effects, it is useful to understand respondents as cooperative communicators who follow the "maxim of quantity" (Schwarz 1996). The Maxim of quantity specifies that one's contribution to conversation is to be "as informative as is required for the current purposes of the exchange," but not more informative than is required (Schwarz 1996: 9-10). This maxim directs those communicating to provide all relevant information, but to avoid redundancy. If survey respondents follow the rules of conversation as Schwarz (1996) argues then they will assume the researcher wants them to provide new information and try to avoid being repetitive by excluding pieces of information that they used in prior, similar judgments. In a check-all-that-apply format, they may be less likely to mark a specific response option if they feel that it has been included in an option that they have already marked. Thus, multiple-answer questions with response options that lack mutual exclusivity, or can be perceived to lack mutual exclusivity, may be prone to subtraction effects.

Comparison-based contrast effects occur when respondents exclude information from the mental representation but include it in the comparison referent that they form for the target. One example of this is the cognitive process of anchoring. Similarly to subtraction effects, anchoring is discussed almost exclusively with respect to *question content and ordering* (Schwarz 1996;

Tourangeau, Rips, and Rasinski 2000; for an exception see Wanke, Schwarz, and Noelle Neumann 1995); however, it can be extended to the response choices of multiple-answer questions. Anchoring in response options occurs when the early items in a long list of answer choices help develop a cognitive framework or standard of comparison, which is used to evaluate subsequent items. Thus, respondents may check a different number of response options if they are presented with different initial options. Therefore, in addition to differences in the selection of individual categories, the mean number of response options checked may change, as the result of anchoring, when different options are placed early in the list.

Empirical work by Wanke, Schwarz, and Noelle-Neumann (1995) provides evidence of anchoring effects. They found that when German college students were asked to compare their high school teachers in terms of whether female or male teachers were more empathetic, their responses were affected by the order in which the comparison was presented to them in the query. Specifically, respondents evaluated their female teachers more positively when they were asked to compare their female teachers to their male teachers than when they were asked to compare their male teachers to their female teachers. In an additional experiment, Wanke, Schwarz, and Noelle-Neumann (1995) found that tennis was evaluated as less exciting than soccer when the order of *response options* was such that tennis was presented before soccer than when soccer was presented before tennis. Wanke, Schwarz, and Noelle-Neumann (1995) conclude:

Respondents who are asked to compare X to Y focus on the features of X and check to see if these features are also present in Y. In doing so, they are likely to take more of the unique features of X into account than they would if they compared Y to X. Moreover, they are likely to neglect features of Y that are not brought to mind by the features of X. As a result, comparisons of X to Y are based on a different selection of features than comparisons of Y to X, resulting in different evaluations. (P. 365)

Israel and Taylor (1990) carried out the one known study that explicitly addresses response order effects in multiple answer questions. They found that beef producers in Florida were significantly more likely to select “native range” as a type of forage used on their farm when it was first on the list of options (69.7%) as opposed to fourth on the list (30.4 %). A subtraction effect is a likely explanation for this primacy effect. When native range was first on the list it is likely that respondents chose it and then avoided choosing “winter pasture” or “deferred grazing” because they saw these options as specific types of the more general native range. Thus, they avoided redundancy. However, when native range was moved to fourth on the list, below silage, deferred grazing, and winter pasture, more respondents chose deferred grazing and winter pasture and fewer chose native range because they were not subtracting deferred grazing and winter pasture from a previous answer (Dillman 2000).

As the literature reviewed indicates the substance or topic of questions help determine whether order effects appear. For instance, a question about a topic on which the respondent possess stable, chronically accessible information seems less likely to produce response order effects. Examples of this type of question include: “At which of the following grocery stores do you shop? Please check all that apply” or “Which of the following of your grandparents are still alive today?” On the other hand, questions about topics for which the respondent does not possess considerable chronically accessible information, such as questions about unformed beliefs (Which of the following describe the town you live in?), should be more prone to order effects. Depending on the content and context of the question, these order effects could be the result of anchoring or subtraction based contrast effects. Alternatively, they could be the result of assimilation effects.

In this paper we evaluate the effects of response order in three substantively different check-all-that-apply questions. The first question is about whether or not the respondent feels that 10 different attributes describe Washington State University (WSU). Because it asks for assessment of items that respondents are unlikely to have thought much about prior to this survey (especially at the level of specificity conveyed by the various descriptors), we expect this question to require respondents to draw on a considerable amount of temporarily accessible information, resulting in significant order effects. Specifically, we expect this question to yield primacy effects due to satisficing (i.e. differences in how often items are selected when located early vs. late in the listing). We also expect anchoring effects (i.e. differences in the mean number of response options checked between the original order and the reverse order versions).

The second question asks about respondents' past behavior – whether they have used or not used each of 10 university resources. Because it asks about specific behavior(s) we expect this question to require respondents to draw somewhat more on chronically accessible information than the first question. However, it may also require drawing upon temporarily accessible information because the response options require respondents to organize their behavior somewhat differently than the way it may have been stored in their minds. Therefore, we expect this question to produce patterns of primacy across individual response options. Further, this question has the potential to produce significant subtraction effects because some of the information the respondent may retrieve for answering an early option (“libraries”) may appear to be required to answer a later option (“library instruction”). Although “libraries” and “library instruction” are separate departments in the university, respondents may perceive them as not mutually exclusive. In this respect, this question is modeled after the question and findings reported by Israel and Taylor (1990) for which subtraction effects were observed.

The third item, which asks whether the respondent is a fan or not of each of the women's and men's varsity sports at WSU, is expected to require the use of chronically accessible information more so than each of the preceding items. Although defining the meaning of "fan/not a fan" may require temporarily accessible information, the overall reliance on such information seems to be less for this question than those already discussed because most respondents will have pre-formed opinions about sports prior to being asked about them. As a result, in this question we expect to find the fewest differences in means across versions and no patterns of primacy across individual items. Further, because each sport (e.g. women's golf and men's baseball) provides a mutually exclusive response option, the likelihood of subtraction effects seems small.

*The Forced-Choice Question Format as an Alternative to the Check-All-That-Apply Format*

More than 20 years ago Sudman and Bradburn (1982) advocated the use of a forced-choice format for multiple answer questions because it requires the respondent to consider and respond to each response option. They also pointed out that the response choices that are left blank are more easily interpreted as missing data or the respondent was undecided. Sudman and Bradburn further note that a forced-choice format, as opposed to a check-all-that-apply format, demands more cognitive processing by the respondent. Others see the increased cognitive demand on the respondent as potentially producing a benefit that may outweigh its costs. An important benefit to forced-choice formats is that requiring the respondent to deliberately consider each response option brings visual survey modes in line with interview modes where respondents already have to consider each option and satisficing is less likely to occur (Dillman 2000).

Nevertheless, because the response task for forced-choice questions is quite different than the response task for check-all-that-apply questions, it is unclear whether or not a forced-choice formatted question should be used to replace a check-all-that-apply formatted question. In a check-all-that-apply format the respondent may satisfice by selecting the first few answers and not comparing all the responses before answering. On the other hand, in a forced-choice format the task that is expected of the respondent – to look at each response option individually and come to a judgment about it – is much more explicit and therefore likely to be followed. These two different response tasks could lead to very different responses, especially in optimizing respondents.

Schuman and Presser (1981) suggest that respondents are likely to invoke an agreeing response bias when answering various types of questions. Krosnick (1991) has also discussed this as an acquiescence bias. Acquiescence or agreeing response bias suggests that respondents have an aversion to answering questions negatively or outright rejecting response options. Agreeing response bias could lead to differences in the way respondents answer questions requiring different response tasks. For example, on a check-all-that-apply question, a respondent could *purposely* not check the box for two reasons – 1) the response does not apply to them or 2) they are neutral about that particular response option. However, when forced to answer “yes” or “no” for each response option those who are neutral may be more likely to check “yes” than to check “no” because their tendency is to avoid the outright rejection that the “no” answer choice implies. Leaving a check box blank on a check-all-that-apply question does not carry the negative connotation that is implied by checking “no” on a forced-choice item. Thus, the agreeing response bias would lead us to expect more positive answers on forced-choice question formats.

In the only experiment we are aware of that tested the differences between the check-all-that-apply format and the forced-choice format, Rasinski, Mingay, and Bradburn (1994) embedded three different questions in a paper questionnaire field test of the National Educational Longitudinal Study of 1988. Half of the respondents were asked to check all that apply and the other half were instructed to mark “yes” or “no” for each response option. Across the three questions included in the experiment, the average number of positive responses for the check-all-that-apply format was 4.04. Alternatively, the across-questions average for positive answers in the yes/no version was 4.60. These significant ( $p = .001$ ) results were not driven by one individual question; rather, each question produced significantly more positive answers on the yes/no version than on the check-all-that-apply version. These findings demonstrate that in paper surveys the forced-choice format produces a higher number of affirmative responses than the number of responses marked in the check-all-that-apply format.

In this paper we examine the effects of switching from a check-all-that-apply format to a forced-choice format for three questions. Two of the questions are ones for which the effect of order reversal in the check-all-that-apply format are also examined—which varsity sports is one a fan of and which of the University resources have been used. In addition a new question on the types of student groups that respondents had participated in is assessed. On all three questions we expect the forced-choice format to yield higher mean numbers of items checked affirmatively than the check-all-that-apply format.

We also assess the impact of using alternative verbal labels in the forced-choice format. In the first two questions two forced-choice formats were used (on different versions of the survey), the traditional yes/no format and a format utilizing more active verbal labels. When alternative verbal labels were used these questions were appropriately rephrased with the

respondents being asked to indicate respectively, whether they were a fan or not a fan of the Cougar sports and had participated or not participated in each student group. (See Appendix A). We are aware of no previous research that has addressed how these changes in wording affect responses to forced-choice questions.

Following exploration of the effects of alternative verbal labels, we test one item formatted as a forced-choice question for order effects. This item, the resource use at WSU question, was presented in one version in the original order and in another version in the reverse order. We expect order effects – primacy, anchoring, and subtraction – to appear in forced-choice questions just as they do in check-all-that-apply questions. Therefore, in this question we expect subtraction effects similar to those found in the check-all-that-apply version.

#### *Mail Survey Comparison*

Because both mail and Internet surveys are self-administered modes, we expect similar responses when compared across these two modes. Additionally, the visual nature of both modes suggests responses will be similar. However, the types of specific actions required in completing a mail survey are somewhat different from those required to complete an Internet survey, which suggests that some differences in responses may arise. To provide insights as to whether similar response patterns occur across mail and Internet surveys we include the results, from a mail survey, of two of the previously discussed questions, one order question (descriptors of the university) and one check-all-that-apply vs. yes/no question (sports fan). We expect both the mail and Internet modes to produce similar order effects and increased means when converting a check-all-that-apply to a forced-choice format as discussed previously.

#### PROCEDURES

Four variations on each of four substantive questions were tested in this experiment. The questions concerned, whether certain terms described the University (10 choices), whether the respondent was a sports fan of all existing WSU varsity sports (15 choices), what university resources had been used (10), and what types of university organizations the respondent had participated in (10 choices). On three of these questions (sports fan, resources, and organizations) response options were adopted from relevant lists that the university maintains on their web page. The four questions were embedded in a 21-question Internet survey administered from March 11 to May 9, 2003, to assess the undergraduate student experience at WSU. All of the questions included in this analysis appeared on their own page. Questions appeared in black text on a colored background with answer spaces appearing in white so as to provide contrast between the answer spaces and the background. Careful programming was done to ensure that the questions would appear similarly across different browsers and computer hardware.

To access the survey instrument, students were required to enter their own personal access code, which was provided to them in the first contact letter and all subsequent contacts. Access codes were used to control respondent entry such that only individuals in the sample could participate and no individual could participate twice.

The sample consisted of 3,004 randomly selected WSU undergraduate students who were registered for courses on the Pullman campus during the spring 2003 semester. Contact letters and follow-ups were sent using both postal mail and electronic mail. All respondents received an initial postal mail contact with a two-dollar incentive and two days later most (2043 respondents for whom email addresses were available) were contacted by email and provided their individual access code and a direct hotlink to the survey. An additional reminder was sent both by postal

letter and email about four weeks after the first postal mailing. Of the 3,004 students in the sample, 1,591 completed the survey for a response rate of 53%.

Four versions of the web survey were constructed using the same questions but varying their formats (See Appendix A). A random number generator was used to assign one of the versions to each respondent when they entered the survey. The intent was to give an equal probability of receiving any of the four versions of the survey to each respondent; however, a higher percentage of respondents completed both versions one and two. Of those who finished the survey, 27.3 percent completed version one, 27.5 percent completed version two, 23.1 percent completed version three, and 22.1 percent completed version four.

The slightly lower response to versions three and four of the questionnaire came as a surprise and an investigation was undertaken to determine the reason for these differences. Simulations with the random number generator showed no evidence that it was at fault. We then learned through a review of the server logs that a programming error resulted in a maximum size for a record set being implemented, thus limiting the amount of information the respondent could submit. By design, respondents' answers were submitted only once, after the last question was answered. The way in which the multiple experiments in this study were designed resulted in versions 3 and 4 for two types of questions (a number entry box vs. scalar boxes, and the forced/choice vs. check-all items examined here) requiring the reporting of more information than versions 1 and 2 (e.g. checking both positive and negative options in the forced-choice format rather than only positive answers in the check-all-that-apply format). In addition, one open-ended question was included in the survey and it used larger answer boxes in versions 3 and 4. This differential in size was a deliberate experimental manipulation undertaken because a finding from a previous paper experiment showed larger boxes produced longer answers

(Dillman and Christian, 2003). Although it appears that by far the greatest contributor to the final size of the record set was the open-ended question, the other questions, including the ones being investigated here, appear to have had a minor effect on record set size. However, the vast majority of respondents to the forced choice items provided an answer for each of the individual items, resulting in nearly all respondents having their record sizes increased by about the same amount. Thus, it seems very unlikely that the truncation problem affected the frequency with which the respondents responded to items affirmatively. Although, we cannot rule out an unknown effect of this technical difficulty on the current analyses, it seems likely to be quite small if it exists at all.

The paper comparison survey was administered by mail from March to April 2001, one year prior to the Internet survey, to an equivalent random sample of 1,800 Pullman undergraduate students. The items used in this analysis were embedded on pages two and four of a four-page questionnaire. The questionnaire was printed in a two-column format on 8-1/2 x 11 inch pages with a colored background that contrasted with white answer spaces. Four varying versions of the questionnaire were mailed randomly to equal subsamples of students in the sample; however, the experimental questions reported here were identical in two of the four versions. A two-dollar incentive was enclosed with the first mailing and a follow-up postcard and replacement questionnaire were mailed. The response rate on this survey was 57.9 percent (1,042).

Statistical tests made in the analyses include chi-square tests for differences between the percent of respondents who checked each response option across formats and t-tests for differences in the mean number of response options checked between formats. Significant chi-square values indicate that the individual response option was affected by the specific treatment

whereas a significant t-value indicates that there was an effect that encompassed most or all of the response options. Also, a combined p-value was calculated for each experiment. The combined p-value, based on meta-analysis techniques (Lipsey and Wilson 2001), was calculated using the individual p-values for each option and indicates the overall significance of each comparison. Additional statistics were used where appropriate and are discussed at specific points in the findings.

## FINDINGS

Table 1 shows the results of testing for order effects in all three check-all-that-apply questions from the Internet survey. For the first question about which items describe WSU, six of the nine items were selected significantly more often in the reverse order, five in the expected direction for primacy (combined p-value = .000). The response options “Farm/Agriculture school” and “Party school,” were chosen a significantly greater number of times when they were placed at the top of the list than when they were placed at the bottom ( $X^2 = 8.24$ ,  $p = .004$ ;  $X^2 = 4.92$ ,  $p = .027$ ). Moreover, when “Diverse,” “Outdoors oriented,” and “Politically charged/socially conscious” appeared early in the list they were checked a significantly greater number of times than when they were positioned at the end of the list ( $X^2 = 4.92$ ,  $p = .026$ ;  $X^2 = 11.21$ ,  $p = .001$ ;  $X^2 = 18.79$ ,  $p = .000$ ). This pattern of differences across individual results is consistent with primacy effects. Additionally, the mean number of items selected was significantly lower when response options were presented in the original order than when they were presented in the reverse order suggesting the possibility that this question was prone to anchoring effects (3.94 and 4.23 respectively,  $t = -2.25$ ,  $p = .012$ ).

In the second question, about university resource use, primacy effects also appeared. Four of the ten items were selected by a significantly greater percent of respondents when they

appeared at the top of the list (combined p-value = .002, Student Health Center  $X^2 = 12.42$ ,  $p = .000$ , Campus-Sponsored Tutoring  $X^2 = 6.02$ ,  $p = .014$ , Library Instruction  $X^2 = 95.99$ ,  $p = .000$ , and Counseling Services  $X^2 = 5.76$ ,  $p = .016$ ). The mean number of response options checked, was also statistically different across versions suggesting the presence of anchoring effects (5.37 and 5.59  $t = -2.01$ ,  $p = .022$ ). It should also be noted that the difference across versions for the response option “Library Instruction” was particularly large (20.0% vs. 51.8%) and is consistent with subtraction effects. Consequently, we recalculated the mean number of response items checked, excluding library instruction, for each version. The mean number of options checked in the original order was then 5.33 and for the reverse order it was 5.30. These means were not significantly different ( $t = .27$ ,  $p = .607$ ).

In the third question, about being a Cougar sports fan, only one of the options, men’s basketball, produced a significant difference ( $X^2 = 4.03$ ,  $p = .045$ ). However, this difference was not in the expected direction for primacy effects. Further, the mean number of response options checked was similar across versions (2.64 vs. 2.80,  $t = -0.91$ ,  $p = .180$ ). These findings indicate that this question did not produce any primacy, anchoring, or subtraction effects. Additionally, the combined p-value indicated no overall significance ( $p = .683$ )

To further evaluate the above results we calculated the correlation between the serial order, or position in the list, of each response option in the original order and the difference in the percent of respondents who chose that option across versions. This correlation allows us to judge the magnitude of the order effects in each question and to make comparisons across questions. A higher correlation indicates more response order effects overall. Consistent with our expectations, the correlation was  $-.67$  for the first question,  $-.62$  for the second question, and  $.08$  for the third question. Combined with the above findings, these correlations support our

expectations that questions requiring higher use of temporarily accessible information would produce increased order effects while those requiring higher use of chronically accessible information would not produce order effects.

Using two of the above questions plus a new item we were able to test several issues related to converting from check-all-that-apply to forced-choice formats and an initial evaluation of forced-choice questions (Table 2.1). In the first question, about being a sports fan, the forced-choice version of the question with yes/no labels produced, as expected, a significantly greater mean number of response options checked affirmatively than did the check-all-that-apply version (3.58 and 2.64 respectively,  $t = -4.43$ ,  $p = .000$ ). Fourteen of the 15 response options were marked affirmatively by a greater percent of respondents; eleven were significant and the combined p-value indicated that overall the comparison was significant ( $p = .000$ ). Changing to a more active verbal label (fan/not a fan instead of yes/no) magnified these findings with all 14 (excluding men's football) of the response options being checked affirmatively by a significantly greater percentage of respondents in the forced-choice format (combined  $p = .000$ ). However, the experimental comparison of the two forced-choice versions with different verbal labels (yes/no vs. fan/not a fan) yielded no significant difference between the means (two-tailed t-test = 1.32,  $p = .186$ ) and none of the individual items were checked by a significantly different percentage of respondents in this experiment (combined  $p = .211$ ).

In the second question (Table 2.2), about participation in student groups, the comparison between the check-all-that-apply format and the forced-choice format with yes/no labels also yielded significantly different mean numbers of response options checked affirmatively (forced-choice mean = 2.58 check-all-that-apply mean = 1.94,  $t = -5.01$ ,  $p = .000$ ). All of the response options were marked affirmatively by a greater percentage of respondents in the forced-choice

format with five being significantly greater (combined  $p = .000$ ). Comparing the check-all-that-apply format to the forced-choice format with more active verbal labels (participated/have not participated) generated similar results with the forced-choice format yielding a significantly greater mean number of response options marked affirmatively (2.41 vs. 1.94,  $t = -3.67$ ,  $p = .000$ ), all but one of the ten response options being marked affirmatively by a greater percentage of respondents, and three of the ten being significantly greater (combined  $p = .008$ ). Again, comparison of the two forced-choice formats with different verbal labels yielded no significant difference in means ( $t = -1.14$ ,  $p = .255$ ) and only one significant item, “fraternity or sorority” (combined  $p = .573$ ).

Treatments in the final question (about the use of university resources) used to evaluate the forced-choice format differed from the first two. This question did not include a forced-choice format with yes/no labels. Instead, alternative verbal labels (used/not used) were used in all forced-choice treatments and the order of response options was reversed in one treatment. Results from this question can be seen in Table 2.3. As with previous questions, a significant difference in the mean number of response options marked affirmatively in the original order was found with respondents checking a mean of 5.37 response options in the check-all-that-apply format and 5.59 in the forced-choice format ( $t = -3.41$ ,  $p = .000$ ). Seven of the ten response options were marked affirmatively by a greater percent of respondents in the forced-choice format and four of them were significantly greater resulting in a combined  $p$ -value of .001. When the order of response options was reversed in both the check-all-that-apply and the forced-choice versions, on average respondents checked a significantly greater number of options affirmatively in the forced-choice format ( $t$ -test =  $-5.43$ ,  $p = .000$ ). In addition, all ten of the

response options were selected by a greater percent of respondents in the forced-choice format; five were significant (combined  $p = .000$ ).

Findings on all three questions that were used to compare the forced-choice format to the check-all-that-apply format are unequivocal. In all of the comparisons the forced-choice format yielded a greater mean number of response options checked affirmatively than the check-all-that-apply format. These findings are consistent with our expectations based on respondents' agreeing response bias or acquiescence. Three additional tests showed that changing to more active verbal labels made little difference in the results.

The different treatments of the final question allowed us to test for order effects in the forced-choice format (Table 2.3). Comparison of the used/not used format to the used/not used reverse order format reveals that four of the ten response options were significantly different across versions (combined  $p = .000$ ), three in directions consistent with primacy effects (Computer Labs  $X^2 = 4.14$ ,  $p = .042$ ; Library Instruction  $X^2 = 60.06$ ,  $p = .000$ ; Counseling Services  $X^2 = 8.27$ ,  $p = .004$ ). Additionally the used/not used format with response options in the original order produced significantly fewer options marked affirmatively on average than did the used/not used format with response options in reverse order ( $t$ -test =  $-4.0838$ ,  $p = .000$ ). As in the check-all-that-apply format, the unusually large difference for the option "library instruction" (34.3% vs. 63.2%) is consistent with a pattern of subtraction effects. As a result, we recalculated the means excluding the option library instruction. The mean number of options checked in the original order was then 5.59 and in the reverse order it was 5.85. A  $t$ -test indicates that these means are still significantly different suggesting that both anchoring effects and subtraction effects played a strong role in this question ( $t = -2.37$ ,  $p = .009$ ). Moreover, the correlation between the serial order position of responses and differences in the percent of respondents

marking each option affirmatively across versions is -.58 providing additional support for the extension of order effects into the forced-choice format.

Concerns that some respondents may treat the forced-choice formatted questions as check-all-that-apply questions by checking only affirmative responses, thus increasing item non-response, led to further analyses. Table 3 indicates that between two and ten percent of respondents appeared to treat the forced-choice questions as check-all-that-apply questions (i.e. left all of the “no” choices unmarked); however, the difference across versions was significant for only one question. On the university resources question, the response options in reverse order produced significantly fewer respondents that treated the forced-choice question as a check-all-that-apply than did the original order (3.7% and 10.9% respectively,  $X^2 = 13.59$ ,  $p = .000$ ). Further analysis indicated that 95 percent of respondents who received the original order version marked the first option affirmatively while only 29 percent of those who received the reverse order version marked the first response option affirmatively. These findings confirm our suspicion that some respondents treat forced-choice questions as check-all-that-apply questions, but they also suggest that this tendency may be influenced by whether the answer to the first response option is likely to be affirmative or negative.

Finally, the mail/internet survey comparisons can be seen in Tables 4 and 5. The first of these comparisons looked at the occurrence of order effects by comparing the descriptions of the WSU question across modes. On the mail survey all of the response options were selected by a smaller percentage of respondents in the original order and eight of the differences were significant. A primacy effect was apparent in the reverse order, but was not apparent in the original order. In both modes the reverse order versions yielded higher mean numbers of checked responses and the means were very similar suggesting the possibility of anchoring

effects in both modes (Internet – one-sided t-test = -2.25,  $p = .012$ ; Paper one-sided t-test = -7.39,  $p = .000$ ). The correlation between the serial position of the response option in the original order and the difference in the percent of respondents who checked the option across versions for the mail comparison was -.16 (versus -.67 as reported above for this question in the Internet survey). These findings suggest that although anchoring effects are similar across modes, primacy effects were somewhat stronger in the Internet survey. The findings should, however, be interpreted with caution because of the time lag between the surveys.

The second comparison across modes used the sports fan question to compare results between the check-all-that-apply and the yes/no, forced-choice format. Both modes yielded strikingly similar means with increased mean numbers of response options marked affirmatively in the forced-choice formatted questions (Internet 2.64 and 3.58, t-test = -4.4250,  $p = .000$ ; Paper 2.64 and 3.75, t-test = -6.954,  $p = .000$ ). Both modes also revealed the same pattern of differences throughout the individual items, with all but men's football receiving more affirmative responses in the forced-choice format. These findings suggest that both mail and Internet modes yield similar inconsistencies between forced-choice and check-all-that-apply formats. Analyses also indicated a difference across modes in the number of individuals who treated the forced-choice question as a check-all-that-apply question. On the Internet survey 6.5 percent of respondents checked only affirmative answers on the yes/no version of the forced-choice question whereas in the mail survey 11.3 percent of respondents checked only affirmative answers on the yes/no forced-choice format ( $X^2 = 13.31$ ,  $p = .000$ ).

In summary, we found that response order effects in the form of primacy, anchoring, and subtraction occurred in two check-all-that-apply questions. Not unexpectedly, there were no response order effects in the third question. When converting check-all-that-apply questions to

forced-choice questions we found that the forced-choice question yielded a significantly greater mean number of response options marked affirmatively. Further evaluation of forced-choice questions indicated that alternative verbal labels did not make a difference in responses and that order effects do occur in forced-choice questions. Additionally, we found that some respondents appeared to treat forced-choice questions as check-all-that-apply questions and that they are more likely to do so if the first response option is answered affirmatively. Finally, in comparing mail and Internet surveys we found similarities between the modes both in terms of response order effects in check-all-that-apply questions and in terms of the effects of converting to a forced-choice format.

## DISCUSSION AND CONCLUSIONS

The use of check-all-that-apply questions is common in self-administered surveys. This paper has addressed several concerns related to understanding how this question format influences survey responses. Previous theoretical work in survey methodology has focused mostly on understanding how question order and response option order affect respondents' answers when only one response option is to be selected. We have extended these concepts to understand how the order of response options affects answers in check-all-that-apply questions. In addition, this paper discusses the implications of converting check-all-that-apply questions to different forced-choice formats and addresses whether order effects occur in forced-choice formats.

We found that the response options listed first in check-all-that-apply questions were more likely to be selected when respondents needed to rely more on temporarily accessible information (10 university description and use of 10 university resources) for responding. In addition, we found that the number of response categories selected varied as a result of reversing

the listing of categories on such questions. In contrast, neither primacy nor order effects due to anchoring occurred when the order of response option presentation was reversed for a question that appeared to require the use of more chronically accessible information (fan of 15 university sports).

These findings suggest that the primacy effects described by Krosnick and Alwin (1987) for single-answer questions also occur in questions that provide the opportunity to select multiple answers, but only under certain conditions. In addition, the distinction between temporary and chronically accessible information described by Sudman, Bradburn and Schwarz (1996) appears to be helpful in identifying which questions are prone to such order effects and which are not. Further, the finding of a dramatic change in the selection of library instruction (20.0% vs. 51.8%) depending upon whether it followed or preceded the choice libraries, provides evidence of subtraction effects as suggested by Schwarz's (1996) theory of cooperative communication, as well as confirming previous findings of such an effect by Israel and Taylor (1990). Together these findings provide strong evidence that order effects in check-all questions vary by question content and that they also appear to vary in predictable ways.

Survey methodologists have proposed the use of a forced-choice format as an alternative to check-all-that-apply questions. The findings presented here suggest that the two question formats produce differences in respondents' answers. All of the conversions from a check-all-that-apply to a forced-choice format (all the web and one mail) resulted in a greater number of affirmative responses selected on the forced-choice format as reflected in the larger means. These results confirm prior results reported by Rasinski, Mingay, and Bradburn (1994) and suggest that the forced-choice format encourages greater cognitive processing and/or agreeing response bias or acquiescence, the tendency to select a greater number of categories affirmatively

(Krosnick 1991, Schuman and Presser 1981). The research presented here also extends our understanding of forced-choice formats by evaluating the use of alternative verbal labels. Our findings suggest that changing to a more active verbal label (i.e. from a yes/no to fan/not a fan) had no significant effect on responses and, as found on the yes/no versions, consistently produced a greater mean number of responses selected affirmatively than in the check-all-that-apply format.

One of the reasons for replacing a check-all-that-apply format with a forced-choice format was to see if order effects would be reduced when the respondent was asked to select an answer for each item. If order effects are the result of satisficing we would expect evidence of order effects to decrease in the forced-choice format. Our test of one item (university resources) in reverse order in both the check-all-that-apply and forced-choice formats showed that order effects similar to those observed on the check-all-that-apply format persisted in the forced-choice (used/not used) format. Thus, there is no evidence to support the idea that converting questions from a check-all-that-apply format to a forced/choice format will eliminate order effects. However, since only one experimental comparison was included, further testing is needed on questions requiring the retrieval of both temporarily and chronically accessible information.

Another concern with the forced-choice format is that some respondents will not complete the response task as requested. Between 2 and 10% of respondents answered the forced-choice questions in unintended ways by treating them as check-all-that-apply questions, introducing higher item nonresponse. Thus, in analyzing responses from the forced-choice format, it appears that researchers must determine how to handle respondents who treat the question as a check-all-that-apply. Additionally, the likelihood that respondents treated forced-choice questions as a check-all-that-apply questions increased when respondents answered the

first response option affirmatively, suggesting that respondents were then more likely to ignore the column of negative (“no,” “not a fan,” etc) responses.

Our comparison of Internet and paper survey results was limited to one test of response option order reversal and one of converting a check-all-that-apply to a forced-choice question. These comparisons are potentially affected by asking the questions one year apart in surveys that included different questions, which may have introduced unknown content or question order effects. However, the findings are quite similar, across the two surveys, with primacy and mean differences in choices being observed for the check-all-that-apply question (university description) in both surveys, and an increase in mentions being registered in responses for the forced-choice vs. check-all-that apply format question (sports fan). Together these comparisons suggest considerable similarity in how check/all questions perform in Internet and mail questionnaires.

As discussed earlier researchers have argued that replacing check-all-that-apply questions with forced-choice questions will result in more complete information as well as reduced response order effects (Dillman 2000; Sudman and Bradburn 1982). Although the forced-choice format allows us to distinguish between those respondents who mean “no” and those who leave an option blank, our findings suggest that these two formats produce dramatically different results in the mean number of responses marked affirmatively. In addition, order effects occur in both formats suggesting the need for further understanding of how these effects influence responses. Thus, the research presented here suggests that forced-choice formats cannot simply replace check-all-that-apply formats and decisions about which format to use should be evaluated for each individual survey and question.

Since order effects occur in both formats, further research is needed on how to decrease the occurrence of these effects, especially when it is necessary to use temporarily accessible information to respond to the question. Many researchers try to avoid systematic order effects by reversing the order of response categories for one half of the sample; however, the research here suggests that order effects cannot be eliminated using this approach. Primacy effects may be dispersed, but the reversal of response options may actually introduce the presence of anchoring or subtraction effects. On Internet surveys, it is possible to present response options to respondents in random orders, thus randomizing the order effects, but doing so comes at the cost of increasing error variance. To the extent possible, it is also important to use response options that are mutually exclusive to avoid subtraction effects. However, differences in the way some respondents (and the researcher) interpret response options may be difficult to avoid. Additionally, it may be difficult to use mutually exclusive response options in all instances. In some instances surveyors may wish to develop a set of response options that reflect the exact choices presented to respondents in a real-world setting. In this study, for example, we were faced with using the exact choices of university resources listed on the University web page, and therefore, could not make the options mutually exclusive. At a minimum there is a need to thoroughly pretest, through such means as cognitive interviews, the likelihood of subtraction effects occurring before including response options that may not be mutually exclusive in surveys.

In addition to the practical implications discussed with regards to questionnaire construction, this research provides insight into the utility of various theoretical concepts in understanding how answers to multiple-answer questions are formulated. At a theoretical level, it appears that a potentially complicated set of factors – primacy, satisficing, anchoring,

subtraction, acquiescence, and type of information (temporary vs. chronic) being requested may converge to affect the process of how respondents answer different types of questions. The research here confirms other findings on multiple-answer questions and the effects found bear similarity to effects previously observed for selection of answers in single-answer questions. Additional investigations of these question formats on different populations with different levels of cognitive ability, and different question topics, using fewer as well as more categories than included in our test questions is needed for a more complete understanding of response effects in check-all-that-apply and forced-choice formats. One key benefit to a forced-choice format is that it may bring self-administered modes more in line with the stimulus received in aural modes. However, additional comparisons of forced-choice items across aural and self-administered modes are necessary to determine whether mode differences occur.

**Table 1: Effects of Reversing the Order of Answer Categories on Web Surveys.**

**Q4:** Which of the following descriptions do you feel describe Washington State University? Check all that apply.

	Order at Left	Reverse Order	Diff.	X <sup>2</sup>	p
(n)	435	438			
Farm/Agriculture school	63.4	53.9	9.50	8.24	.004*
Party school	58.2	50.7	7.50	4.92	.027*
Electronic or “wired” university	58.2	66.0	-7.80	5.67	.017*
Competitive in Pac 10 sports	63.0	59.6	3.40	1.06	.303
Conservative university	14.7	18.9	-4.20	2.80	.094
Politically charged/socially conscious	23.9	37.4	-13.5	18.79	.000*
Religious	6.4	6.6	-0.20	.01	.912
Outdoors oriented	26.4	37.0	-10.6	11.21	.001*
World class university	37.9	43.8	-5.90	3.15	.076
Diverse	41.6	49.1	-7.50	4.92	.026*
<b>Mean</b>	<b>3.94</b>	<b>4.23</b>			

**Diff. of Means t-test = -2.25, p = .012**

**Q11:** Which of the following resources have you used at WSU? Please check all that apply.

	Order at Left	Reverse Order	Diff.	X <sup>2</sup>	p
(n)	435	438			
Libraries	94.9	93.4	1.50	.97	.325
Computer Labs	69.4	67.4	2.00	.43	.510
Student Health Center	66.7	55.0	11.70	12.42	.000*
Academic Advising	69.9	71.0	-1.10	.13	.717
Student Recreation Center	88.3	88.1	0.20	.01	.946
Internet/e-Mail Access	85.7	87.2	-1.50	.40	.526
Career Services	27.4	24.4	3.00	.98	.324
Campus-sponsored Tutoring	14.3	20.5	-6.20	6.02	.014*
Library Instruction	20.0	51.8	-31.8	95.99	.000*
Counseling Services	16.8	23.3	-6.50	5.76	.016*
<b>Mean</b>	<b>5.37</b>	<b>5.59</b>			

**Diff. of Means t-test = -2.01, p = .022**

**Q13:** Which of the following Cougar varsity sports would you consider yourself to be a fan of? Please Check all that apply.

	Order at Left	Reverse Order	Diff.	X <sup>2</sup>	p
(n)	435	438			
Men’s baseball	28.7	28.1	0.60	.046	.831
Women’s basketball	11.7	14.8	-3.10	1.84	.175
Men’s basketball	30.3	36.8	-6.50	4.03	.045*
Women’s cross-country	4.4	3.9	0.50	.13	.718
Men’s cross-country	3.4	4.8	-1.40	1.00	.317
Men’s football	80.7	79.2	1.50	.29	.589
Women’s golf	3.4	3.4	0.00	.00	.985
Men’s golf	5.3	5.7	-0.40	.07	.785
Women’s rowing	7.8	8.7	-0.90	.21	.644
Women’s soccer	23.2	21.9	1.30	.21	.646
Women’s swimming	5.1	6.4	-1.30	.72	.396
Women’s tennis	5.3	6.2	-0.90	.31	.577
Women’s track and field	10.3	12.3	-2.00	.854	.355
Men’s track and field	11.5	15.3	-3.80	2.72	.099
Women’s volleyball	32.6	32.2	0.40	.02	.887
<b>Mean</b>	<b>2.64</b>	<b>2.80</b>			

**Diff. of Means t-test = -0.91, p = .180**

**Table 2.1: Effects of Changing from a Check-All-That-Apply Format to a Forced-Choice Format.**

*Q13: Which of the following Cougar varsity sports would you consider yourself to be a fan of? Please check all that apply.*

	Check-All Format				Fan/Not a Fan Format			Checked vs. Yes		Checked vs. Fan		Yes vs. Fan	
	Checked	Yes	No	Blank*	Fan	Not a Fan	Blank**	X <sup>2</sup>	p	X <sup>2</sup>	p	X <sup>2</sup>	p
(n)	<b>435</b>	<b>351</b>			<b>367</b>								
Men's baseball	28.7	32.8	61.8	5.4	37.1	57.5	5.4	1.49	.223	6.28	.012*	1.46	.228
Women's basketball	11.7	14.5	79.8	5.7	19.9	72.8	7.4	1.35	.245	10.16	.001*	3.61	.057
Men's basketball	30.3	35.6	60.1	4.3	37.9	55.6	6.5	2.45	.118	5.05	.025*	0.40	.530
Women's cross-country	4.4	7.7	86.6	5.7	9.2	82.0	8.7	3.90	.048*	7.73	.005*	0.57	.450
Men's cross-country	3.4	8.3	85.5	6.3	10.4	81.5	8.2	8.52	.004*	15.38	.000*	0.93	.335
Men's football	80.7	78.9	19.4	1.7	80.4	16.1	3.5	.38	.538	.012	.913	0.24	.626
Women's golf	3.4	10.0	84.0	6.0	9.3	81.7	9.0	13.88	.000*	11.74	.001*	0.10	.748
Men's golf	5.3	13.7	80.3	6.0	12.8	79.0	8.2	16.63	.000*	14.13	.000*	0.12	.731
Women's rowing	7.8	17.1	77.2	5.7	16.9	74.4	8.7	15.88	.000*	15.57	.000*	0.01	.943
Women's soccer	23.2	35.0	60.7	4.3	34.6	58.0	7.4	13.33	.000*	12.68	.000*	0.02	.902
Women's swimming	5.1	11.4	83.2	5.4	15.5	75.5	9.0	10.74	.001*	24.59	.000*	2.63	.105
Women's tennis	5.3	10.5	83.5	6.0	15.3	76.3	8.4	7.61	.006*	22.29	.000*	3.54	.060
Women's track and field	10.3	19.9	74.6	5.4	22.9	69.8	7.4	14.33	.000*	23.20	.000*	0.92	.336
Men's track and field	11.5	22.5	72.4	5.1	27.2	65.7	7.1	17.17	.000*	32.49	.000*	2.16	.142
Women's volleyball	32.6	39.9	55.8	4.3	43.6	49.3	7.1	4.43	.035*	10.17	.001*	1.02	.314
<b>Didn't Check Any</b>	<b>14.5</b>	<b>16.0</b>	<b>7.7</b>		<b>13.1</b>	<b>12.5</b>		<b>Diff. of Means t =</b>		<b>Diff. of Means t =</b>		<b>Diff. of Means t =</b>	
<b>Mean</b>	<b>2.64</b>	<b>3.58</b>		<b>0.77</b>	<b>3.93</b>		<b>1.11</b>	<b>-4.43, p = .000</b>		<b>-5.87, p = .000</b>		<b>= 1.32, p = .186</b>	

\* The "blank" column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn't check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 1.4 and 2.0 percent of respondents left each option blank.

\*\* The "blank" column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn't check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 1.9 and 3.0 percent of respondents left each option blank.

**Table 2.2: Effects of Changing from a Check-All-That-Apply Format to a Forced-Choice Format.**

*Q16: What types of Student groups, if any, have you participated in while a student at WSU?*

	<u>Check-All Format</u>				<u>Participated/Not Participated Format</u>			<u>Checked vs. Yes</u>		<u>Checked vs. Participated</u>		<u>Yes vs. Part.</u>	
	<u>Checked</u>	<u>Yes/No Format</u>		<u>Blank*</u>	<u>Not Participated</u>		<u>X<sup>2</sup></u>	<u>p</u>	<u>X<sup>2</sup></u>	<u>p</u>	<u>X<sup>2</sup></u>	<u>p</u>	
		<u>Yes</u>	<u>No</u>		<u>Part.</u>	<u>Part.</u>							<u>Blank**</u>
<b>(n)</b>	<b>438</b>	<b>351</b>		<b>367</b>									
Academic Orgs.	35.4	39.3	58.4	2.3	39.8	56.7	3.5	1.29	.256	1.65	.199	0.02	.898
Community Service Orgs.	27.9	38.5	59.5	2.0	36.2	58.9	4.9	9.98	.002*	6.49	.011*	0.38	.538
Entertainment and Social Orgs.	18.5	38.2	59.3	2.6	38.4	57.8	3.8	38.08	.000*	39.70	.000*	0.00	.947
Ethnic and Cultural Orgs.	8.9	15.4	81.5	3.1	17.4	77.7	4.9	7.87	.005*	13.04	.000*	0.55	.458
Fraternity or Sorority	17.4	25.1	73.2	1.7	18.5	76.6	4.9	7.05	.008*	1.88	.664	4.52	.034*
Intramural and Rec. Sports Clubs	43.4	51.3	47.3	1.4	44.4	51.5	4.1	4.89	.027*	0.09	.768	3.39	.066
Performing and Fine Arts Groups	8.4	11.4	85.5	3.1	12.0	82.3	5.7	1.92	.165	2.77	.096	0.06	.805
Religious Orgs.	18.3	19.4	77.5	3.1	17.2	77.4	5.4	0.16	.692	.17	.685	0.59	.444
Student Gov. and Political Orgs.	12.1	14.2	82.9	2.8	12.5	82.3	5.2	0.79	.347	.04	.852	0.45	.501
Women's and Sexuality Orgs.	3.4	4.8	91.7	3.4	4.1	90.2	5.7	1.01	.315	.24	.621	0.24	.624
None of the Above	20.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Didn't Check Any</b>	<b>21.2</b>	<b>16.8</b>	<b>3.1</b>		<b>19.1</b>	<b>5.4</b>		<b>Diff. of Means t</b>		<b>Diff. of Means t =</b>		<b>Diff. of Means t</b>	
<b>Mean</b>	<b>1.94</b>	<b>2.58</b>			<b>2.41</b>			<b>= -5.01, p = .000</b>		<b>-3.67, p = .000</b>		<b>= -1.14, p = .255</b>	

\* The “blank” column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn’t check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 1.1 and 1.4 percent of respondents left each option blank.

\*\* The “blank” column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn’t check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 2.5 and 2.7 percent of respondents left each option blank.

**Table 2.3: Effects of Changing from a Check-All-That-Apply Format to a Forced-Choice Format.**

*Q11: Which of the following resources have you used at WSU? Please check all that apply.*

	Check- All Format	Check-All Format Rev. Order	Used/Not Used Format			Used/Not Used Format – Reverse Order			Checked vs. Used		Checked (rev. order) vs. Used (rev. order)		Used vs. Used (Reverse Order)		Diff. ***
	Checked	Checked	Used	Not Used	Blank*	Used	Not Used	Blank**	X <sup>2</sup>	p	X <sup>2</sup>	p	X <sup>2</sup>	p	
	(n)	435	438	367		351									
Libraries	94.9	93.4	95.3	4.1	0.5	97.4	2.6	0.0	.08	.780	7.00	.008*	2.20	.138	-2.1
Computer Labs	69.4	67.4	75.2	22.6	2.2	68.4	30.2	1.4	3.30	.069	.09	.760	4.14	.042*	6.8
Student Health Center	66.7	55.0	61.9	33.8	4.4	70.4	27.9	1.7	2.01	.156	19.45	.000*	5.80	.016*	-8.5
Academic Advising	69.9	71.0	82.3	15.0	2.7	82.9	15.7	1.4	16.59	.000*	15.26	.000*	.05	.827	-0.6
Student Recreation Center	88.3	88.1	88.0	9.5	2.5	91.5	8.3	0.3	.01	.908	2.31	.128	2.30	.129	-3.5
Internet/e-Mail Access	85.7	87.2	90.7	7.4	1.9	92.0	7.4	0.6	4.70	.030*	4.74	.030*	.38	.539	-1.3
Career Services	27.4	24.4	26.4	65.7	7.9	29.9	67.5	2.6	.09	.768	2.98	.084	1.08	.299	-3.5
Campus-sponsored Tutoring	14.3	20.5	20.4	70.3	9.3	24.2	72.9	2.8	5.37	.020*	1.52	.218	1.48	.224	-3.8
Library Instruction	20.0	51.8	34.3	58.0	7.6	63.2	35.9	0.9	20.64	.000*	10.37	.001*	60.06	.000*	-28.9
Counseling Services	16.8	23.3	19.3	71.9	8.7	28.5	69.8	1.7	.89	.346	2.77	.096	8.27	.004*	-9.2
<b>Didn't Check Any</b>	<b>00.3</b>	<b>00.2</b>	<b>00.5</b>	<b>13.4</b>		<b>00.0</b>	<b>6.0</b>		<b>Diff. of Means t</b>		<b>Diff. of Means t</b>		<b>Diff. of Means t = -</b>		
<b>Mean</b>	<b>5.37</b>	<b>5.59</b>	<b>5.75</b>		<b>0.48</b>	<b>6.20</b>		<b>0.13</b>	<b>= -3.41, p = .000</b>		<b>= -5.43, p = .000</b>		<b>4.08, p = .000</b>		

\* The “blank” column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn’t check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 0.5 and 1.4 percent of respondents left each option blank.

\*\* The “blank” column contains individuals who treated the forced-choice version as a check-all-that-apply question and didn’t check particular options as well as those individuals who simply did not respond to a particular option. When those respondents who treated the forced-choice question as a check-all-that-apply question are removed from the analysis only between 0.0 and 0.6 percent of respondents left each option blank.

\*\*\* The “diff.” column contains the difference in the percent of respondents who marked each response option affirmatively in the used/not used format and the percent of respondents who marked each response option affirmatively in the used/not used *reverse order* format.

**Table 3: Treatment of Forced-Choice Formats as Check-All-That-Apply Formats**

*Q13: Do you consider yourself to be a fan of each of the following Cougar Varsity Sports?*

	INTERNET SURVEY				PAPER COMPARISON	
	Fan	Not a Fan	Yes	No	Yes	No
Marked all options as . . .	4.1	11.2	1.9	14.2	4.0	12.2
Treated question as a check-all-that-apply	6.5	----	4.3	----	11.3	----
	<b>Fan/Not a fan vs. Yes/No –</b>				<b>Yes/No vs. Yes/No –</b>	
	<b><math>X^2 = 1.79, p = .181</math></b>				<b><math>X^2 = 13.31, p = .000</math></b>	

*Q16: Have you participated in each of the following student groups at WSU?*

	Not			
	Participated	Participated	Yes	No
Marked all options as . . .	0.0	16.6	0.0	15.7
Treated question as a check-all-that-apply	3.0	----	2.0	----
	<b>Participated/Not participated vs. Yes/No</b>			
	<b><math>X^2 = 1.81, p = .178</math></b>			

*Q11: Have you used or not used each of the following resources offered at WSU?*

			Used	Not Used
	Used	Not Used	(Reverse Order)	(Reverse Order)
Marked all options as . . .	1.9	0.0	2.3	0.0
Treated question as a check-all-that-apply	10.9	----	3.7	----
	<b>Used/Not used vs. Used/Not used (reverse order)</b>			
	<b><math>X^2 = 13.59, p = .000</math></b>			

**Table 4: Paper Comparison of Response Order Effects**

*Q4: Which of the following descriptions do you feel describe Washington State University? Check all that apply.*

	<i>INTERNET SURVEY</i>					<i>PAPER COMPARISON</i>					
	(n)	Order at Left	Reverse Order	Diff.	X <sup>2</sup>	p	Order at Left	Reverse Order	Diff.	X <sup>2</sup>	p
		<b>435</b>	<b>438</b>				<b>519</b>	<b>523</b>			
Farm/Agriculture school		63.4	53.9	9.50	8.24	.004*	53.0	54.3	-1.30	.18	.670
Party school		58.2	50.7	7.50	4.92	.027*	49.7	52.8	-3.10	.98	.323
Electronic or “wired” university		58.2	66.0	-7.80	5.67	.017*	53.0	73.2	-20.2	45.0	.000*
Competitive in Pac 10 sports		63.0	59.6	3.40	1.06	.303	39.3	51.4	-12.1	15.4	.000*
Conservative university		14.7	18.9	-4.20	2.80	.094	14.1	19.1	-5.00	4.8	.029*
Politically charged/socially conscious		23.9	37.4	-13.5	18.79	.000*	17.9	30.2	-12.3	21.1	.000*
Religious		6.4	6.6	-0.20	.01	.912	5.6	9.2	-3.60	4.8	.028*
Outdoors oriented		26.4	37.0	-10.6	11.21	.001*	24.7	40.2	-15.5	28.1	.000*
World class university		37.9	43.8	-5.90	3.15	.076	26.0	33.8	-7.8	7.6	.006*
Diverse		41.6	49.1	-7.50	4.92	.026*	40.9	49.0	-8.10	6.9	.009*
<b>Mean</b>		<b>3.94</b>	<b>4.23</b>				<b>3.24</b>	<b>4.13</b>			
<b>Diff. of Means t-test = -2.25, p = .012</b>							<b>Diff. of Means t-test = -7.39, p = .000</b>				

**Table 5: Paper Comparison of Check-All-That-Apply and Forced-Choice Formats**

*Q13: Which of the following Cougar varsity sports would you consider yourself to be a fan of? Please check all that apply.*

	<i>INTERNET SURVEY</i>						<i>PAPER COMPARISON</i>							
	<u>Check-All Format</u>		<u>Yes/No Format</u>			Checked vs. Yes $X^2$	p	<u>Check-All Format</u>		<u>Yes/No Format</u>			Checked vs. Yes $X^2$	p
	Checked	Yes	No	Blank	Checked			Yes	No	Blank				
(n)	<b>435</b>	<b>351</b>					<b>519</b>	<b>523</b>						
Men's baseball	28.7	32.8	61.8	5.4	1.49	.223	33.8	42.6	48.9	9.2	7.33	.007*		
Women's basketball	11.7	14.5	79.8	5.7	1.35	.245	8.8	18.7	69.4	12.6	20.63	.000*		
Men's basketball	30.3	35.6	60.1	4.3	2.45	.118	33.3	43.7	48.7	8.2	10.74	.001*		
Women's cross-country	4.4	7.7	86.6	5.7	3.90	.048*	3.8	9.1	77.8	13.8	11.41	.001*		
Men's cross-country	3.4	8.3	85.5	6.3	8.52	.004*	3.6	9.6	77.5	13.6	14.66	.000*		
Men's football	80.7	78.9	19.4	1.7	.38	.538	79.9	80.3	17.7	2.8	0.11	.744		
Women's golf	3.4	10.0	84.0	6.0	13.88	.000*	2.5	6.6	80.7	13.4	9.66	.002*		
Men's golf	5.3	13.7	80.3	6.0	16.63	.000*	5.4	10.2	77.5	13.0	8.16	.004*		
Women's rowing	7.8	17.1	77.2	5.7	15.88	.000*	5.4	17.5	69.9	13.2	37.11	.000*		
Women's soccer	23.2	35.0	60.7	4.3	13.33	.000*	19.5	33.7	55.1	11.9	25.45	.000*		
Women's swimming	5.1	11.4	83.2	5.4	10.74	.001*	6.1	14.8	72.8	13.0	20.37	.000*		
Women's tennis	5.3	10.5	83.5	6.0	7.61	.006*	5.7	12.3	75.3	13.0	13.23	.000*		
Women's track and field	10.3	19.9	74.6	5.4	14.33	.000*	11.9	18.5	69.5	12.6	8.32	.004*		
Men's track and field	11.5	22.5	72.4	5.1	17.17	.000*	12.4	22.5	66.1	12.0	17.52	.000*		
Women's volleyball	32.6	39.9	55.8	4.3	4.43	.035*	30.2	37.5	53.4	9.8	5.44	.020*		
<b>Mean</b>	<b>2.64</b>	<b>3.58</b>	<b>10.64</b>	<b>0.77</b>			<b>2.64</b>	<b>3.75</b>	<b>9.53</b>	<b>1.72</b>				
<b>Diff. of Means t-test = -4.43, p = .000</b>							<b>Diff. of Means t-test = -5.94, p = .000</b>							

# Appendix A

## Experimental Treatments

**Q4. Which of the following descriptions do you feel describe Washington State University? Check all that apply.**

- Farm/Agriculture school
- Party School
- Electronic or "Wired" university
- Competitive in Pac 10 Sports
- Conservative University
- Politically charged/socially conscious
- Religious
- Outdoors oriented
- World class university
- Diverse

Next Question

**Q4. Which of the following descriptions do you feel describe Washington State University? Check all that apply.**

- Diverse
- World class university
- Outdoors oriented
- Religious
- Politically charged/socially conscious
- Conservative University
- Competitive in Pac 10 Sports
- Electronic or "Wired" university
- Party School
- Farm/Agriculture school

Next Question

**Q11. Which of the following resources have you used at WSU? Please check all that apply.**

- Libraries
- Computer Labs
- Student Health Center
- Academic Advising
- Student Recreation Center
- Internet/E-Mail Access
- Career Services
- Campus-sponsored tutoring
- Library Instruction
- Counseling Services

Next Question

**Q11. Which of the following resources have you used at WSU? Please check all that apply.**

- Counseling Services
- Library Instruction
- Campus-sponsored tutoring
- Career Services
- Internet/E-Mail Access
- Student Recreation Center
- Academic Advising
- Student Health Center
- Computer Labs
- Libraries

Next Question

**Q11. Have you used or not used each of the following resources offered at WSU?**

	Used	Not Used
Libraries	<input type="radio"/>	<input type="radio"/>
Computer Labs	<input type="radio"/>	<input type="radio"/>
Student Health Center	<input type="radio"/>	<input type="radio"/>
Academic Advising	<input type="radio"/>	<input type="radio"/>
Student Recreation Center	<input type="radio"/>	<input type="radio"/>
Internet/E-Mail Access	<input type="radio"/>	<input type="radio"/>
Career Services	<input type="radio"/>	<input type="radio"/>
Campus-sponsored tutoring	<input type="radio"/>	<input type="radio"/>
Library Instruction	<input type="radio"/>	<input type="radio"/>
Counseling Services	<input type="radio"/>	<input type="radio"/>

Next Question

**Q11. Have you used or not used each of the following resources offered at WSU?**

	Used	Not Used
Counseling Services	<input type="radio"/>	<input type="radio"/>
Library Instruction	<input type="radio"/>	<input type="radio"/>
Campus-sponsored tutoring	<input type="radio"/>	<input type="radio"/>
Career Services	<input type="radio"/>	<input type="radio"/>
Internet/E-Mail Access	<input type="radio"/>	<input type="radio"/>
Student Recreation Center	<input type="radio"/>	<input type="radio"/>
Academic Advising	<input type="radio"/>	<input type="radio"/>
Student Health Center	<input type="radio"/>	<input type="radio"/>
Computer Labs	<input type="radio"/>	<input type="radio"/>
Libraries	<input type="radio"/>	<input type="radio"/>

Next Question

**Q13. Which of the following Cougar varsity sports would you consider yourself to be a fan of? Please check all that apply.**

- Men's baseball
- Women's basketball
- Men's basketball
- Women's cross-country
- Men's cross-country
- Men's football
- Women's golf
- Men's golf
- Women's rowing
- Women's soccer
- Women's swimming
- Women's tennis
- Women's track and field
- Men's track and field
- Women's volleyball

Next Question

**Q13. Do you consider yourself to be a fan or not a fan of each of the following Cougar varsity sports?**

	Fan	Not a Fan
Men's baseball	<input type="radio"/>	<input type="radio"/>
Women's basketball	<input type="radio"/>	<input type="radio"/>
Men's basketball	<input type="radio"/>	<input type="radio"/>
Women's cross-country	<input type="radio"/>	<input type="radio"/>
Men's cross-country	<input type="radio"/>	<input type="radio"/>
Men's football	<input type="radio"/>	<input type="radio"/>
Women's golf	<input type="radio"/>	<input type="radio"/>
Men's golf	<input type="radio"/>	<input type="radio"/>
Women's rowing	<input type="radio"/>	<input type="radio"/>
Women's soccer	<input type="radio"/>	<input type="radio"/>
Women's swimming	<input type="radio"/>	<input type="radio"/>
Women's tennis	<input type="radio"/>	<input type="radio"/>
Women's track and field	<input type="radio"/>	<input type="radio"/>
Men's track and field	<input type="radio"/>	<input type="radio"/>
Women's volleyball	<input type="radio"/>	<input type="radio"/>

Next Question

**Q13. Which of the following Cougar varsity sports would you consider yourself to be a fan of? Please check all that apply.**

- Women's volleyball
- Men's track and field
- Women's track and field
- Women's tennis
- Women's swimming
- Women's soccer
- Women's rowing
- Men's golf
- Women's golf
- Men's football
- Men's cross-country
- Women's cross-country
- Men's basketball
- Women's basketball
- Men's baseball

Next Question

**Q13. Do you consider yourself to be a fan of each of the following Cougar varsity sports?**

	Yes	No
Men's baseball	<input type="radio"/>	<input type="radio"/>
Women's basketball	<input type="radio"/>	<input type="radio"/>
Men's basketball	<input type="radio"/>	<input type="radio"/>
Women's cross-country	<input type="radio"/>	<input type="radio"/>
Men's cross-country	<input type="radio"/>	<input type="radio"/>
Men's football	<input type="radio"/>	<input type="radio"/>
Women's golf	<input type="radio"/>	<input type="radio"/>
Men's golf	<input type="radio"/>	<input type="radio"/>
Women's rowing	<input type="radio"/>	<input type="radio"/>
Women's soccer	<input type="radio"/>	<input type="radio"/>
Women's swimming	<input type="radio"/>	<input type="radio"/>
Women's tennis	<input type="radio"/>	<input type="radio"/>
Women's track and field	<input type="radio"/>	<input type="radio"/>
Men's track and field	<input type="radio"/>	<input type="radio"/>
Women's volleyball	<input type="radio"/>	<input type="radio"/>

Next Question

**Q16. What types of student groups, if any, have you participated in while a student at WSU?**

- Academic Organizations
- Community Service Organizations
- Entertainment and Social Organizations
- Ethnic and Cultural Organizations
- Fraternity or Sorority
- Intramural and Recreational Sports Clubs
- Performing and Fine Arts Groups
- Religious Organizations
- Student Government and Political Organizations
- Women's and Sexuality Organizations
- None of the above

Next Question

**Q16. What types of student groups, if any, have you participated in while a student at WSU? Please check all that apply.**

- Academic Organizations
- Community Service Organizations
- Entertainment and Social Organizations
- Ethnic and Cultural Organizations
- Fraternity or Sorority
- Intramural and Recreational Sports Clubs
- Performing and Fine Arts Groups
- Religious Organizations
- Student Government and Political Organizations
- Women's and Sexuality Organizations
- None of the above

**Q16. What types of student groups, if any, have you participated in while a student at WSU? Please check all that apply.**

- Academic Organizations
- Community Service Organizations
- Entertainment and Social Organizations
- Ethnic and Cultural Organizations
- Fraternity or Sorority
- Intramural and Recreational Sports Clubs
- Performing and Fine Arts Groups
- Religious Organizations
- Student Government and Political Organizations
- Women's and Sexuality Organizations
- None of the above

**Q16. Have you participated in each of the following student groups at WSU?**

	Yes	No
Academic Organizations	<input type="radio"/>	<input type="radio"/>
Community Service Organizations	<input type="radio"/>	<input type="radio"/>
Entertainment and Social Organizations	<input type="radio"/>	<input type="radio"/>
Ethnic and Cultural Organizations	<input type="radio"/>	<input type="radio"/>
Fraternity or Sorority	<input type="radio"/>	<input type="radio"/>
Intramural and Recreational Sports Clubs	<input type="radio"/>	<input type="radio"/>
Performing and Fine Arts Groups	<input type="radio"/>	<input type="radio"/>
Religious Organizations	<input type="radio"/>	<input type="radio"/>
Student Government and Political Organizations	<input type="radio"/>	<input type="radio"/>
Women's and Sexuality Organizations	<input type="radio"/>	<input type="radio"/>

Next Question

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