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10-1-2018

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This is the peer reviewed version of the following article:

Chyung, S.Y., Kennedy, M., & Campbell, I. (2018). Evidence-Based Survey Design: The Use of Ascending or Descending Order of Likert-Type Response Options. *Performance Improvement*, 57(9), 9-16.

which has been published in final form at doi: [10.1002/pfi.21800](https://doi.org/10.1002/pfi.21800). This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Self-Archiving.

Evidence-Based Survey Design: The Use of Ascending or Descending Order of Likert-Type Response Options

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Abstract

Survey designers should be aware of response order effects associated with left-side selection bias, acquiescence bias, and satisficing. A sufficient amount of research has shown that descending-ordered response scales generate more positive responses from respondents than ascending-ordered scales. A simple solution to the inflated data obtained from descending-ordered scales is to present response scales in ascending order. Otherwise, descending-ordered scales should be used with strategies for reducing response order effects.

Survey questionnaires can be designed to be structured or unstructured. *Structured* survey questionnaires consist of closed-ended questions, whereas *unstructured* survey questionnaires use open-ended questions. A closed-ended question provides preset response options such as the Likert scale, and survey respondents are asked to choose one from the given response options. Conversely, an open-ended question does not provide response options, and survey respondents answer the question in their own words. Performance improvement practitioners and researchers often use structured survey questionnaires in their evaluations, needs assessments, and other performance improvement contexts to collect quantitative data.

To obtain valid and reliable data from survey questionnaires, the survey instruments must be designed to minimize the negative effects of various potential response biases. The survey instrument's validity and reliability can be influenced by the following design factors:

- Whether to use positively-worded survey items only or a mix of positively- and negatively-worded survey items
- Whether to use discrete rating scales such as Likert-type scales or continuous rating scales with sliders
- Whether to use a midpoint or no midpoint on Likert-type scales
- Whether to use ascending or descending order when listing response options

These seemingly simple decisions, however, require a substantial amount of knowledge in survey design and research-proven practices. When practitioners and researchers design survey instruments based on their own preference rather than research-based evidence, they may get less than optimal data, often influenced by the various factors listed in the bullet points above. There is a vast amount of research conducted on these topics, and teams of researchers from the Organizational Performance and Workplace Learning department at Boise State University have been reviewing several research articles to develop evidence-based recommendations for developing structured survey questionnaires. The teams of researchers have published a series of articles on the following topics: the use of positively- and negatively-worded statements (Chyung, Barkin, & Shamsy, 2018), the use of discrete and continuous rating scales (Chyung, Swanson, Roberts, & Hankinson, 2018), and the use of a midpoint in the Likert scale (Chyung, Roberts, Swanson, & Hankinson, 2017).

This article is another one in the series of articles addressing the issue of using ascending or descending order of Likert response options. The ascending order of Likert response options is: *Strongly disagree*, *Disagree*, *Neutral*, *Agree*, and *Strongly agree*, whereas the descending order is: *Strongly agree*, *Agree*, *Neutral*, *Disagree*, and *Strongly disagree*. The purpose of this article is twofold: 1) describe issues to be aware of when using ascending or descending order of Likert-type response options and 2) present research-based evidence and recommendations regarding the use of the order of Likert-type response options in structured survey instruments.

Response Biases Associated with Response Order Effects

Practitioners, as well as researchers, often need to make data-driven decisions as part of their evidence-based practices. They collect data through various methods including structured survey questionnaires, and often become survey designers. When designing and administering structured survey questionnaires, it is important to understand the four steps that survey respondents execute while answering each individual closed-ended survey item (Holbrook, Krosnick, Moore, & Tourangeau, 2007; Tourangeau, 1984):

1. Interpret the question
2. Retrieve information from their memory
3. Integrate the information
4. Select one of the given response options

Under optimal condition, survey respondents would submit truthful answers. However, when survey items are designed with bias or because respondents can have some biased tendencies in responding to closed-ended survey items, the collected data could be biased. To prevent response biases, survey designers should be aware of psychological phenomena associated with those biases. For example, survey respondents may select different options when the response options are ordered in ascending or descending order—"the order in which response alternatives are presented to respondents may have a significant influence upon their selections" (Krosnick & Alwin, 1987, p. 202). This phenomenon found in surveys is known as *response order effects*.

Two common types of response order effects are primacy and recency effects (Holbrook, 2008b). A *primacy effect* refers to the survey respondents' tendency to select the options that are presented at the beginning of the response option list. A *recency effect* is the opposite; the tendency that survey respondents select the options that they see at the end of the response option list. The primacy effect is expected when options are presented visually—for example, people tend to choose among the first-presented categories in self-administered written survey questionnaires. Conversely, the recency effect is expected when options are presented orally (Holbrook, et al., 2007). For example, during interviews, people tend to choose from the last-offered options (Dillman & Christian, 2005; Krosnick & Alwin, 1987; Schwarz & Oyserman, 2001). Since this article addresses the design of written survey questionnaires to be self-administered, we will focus on the primacy effect.

Applying the primacy effect to the survey respondents who are accustomed to reading text from left to right, they would likely select from the options that are presented on the left. This phenomenon is described as *left-side selection bias*. The *satisficing* theory also supports the primacy effect. Simon's (1957) satisficing principle explains that "people usually seek solutions that are simply satisfactory or acceptable in order to minimize psychological costs" (as cited in Krosnick & Alwin, 1987, p. 203). Various forms of satisficing can be observed in respondent behavior. Respondents may select the first option that seems to be reasonable enough, choose to agree with the question, select "I don't know" instead of reporting a true opinion, or randomly select one from the options provided (Krosnick, 1991).

Survey respondents are also known to show acquiescence bias and social desirability bias. *Acquiescence bias* is the tendency for respondents to agree with the statement provided—a.k.a. yea-saying bias. One explanation for acquiescence bias is the social norm to be polite (Holbrook, 2008a). This is explained as *social desirability bias*, the tendency for respondents to select among the options that they think are more socially acceptable or desirable instead of their true response (Callegaro, 2008). In surveys, selecting a positive response (e.g., *Strongly agree* or *Agree*) is perceived to be more socially desirable. Therefore, after the four steps that survey respondents follow when answering survey questions (interpret, retrieve, integrate, and select), they may add the fifth step, "editing the answer for reasons of social desirability" (Schwarz & Oyserman, 2001).

The primacy effect, left-side selection bias, satisficing, acquiescence bias, and social desirability bias are psychological phenomena that survey respondents bring to the table, whereas the survey design is an environmental factor controlled by the designer. These response biases, coupled with the way the response options are presented (in ascending or descending order), could influence the overall survey results. When the response options are presented in descending order (*Strongly agree, Agree, Neutral, Disagree, Strongly disagree*), respondents would see a positive option immediately on the left side of the response scale and perceive it to be socially desirable and satisfactory, resulting in their decision to select it without having to spend more time to choose a true response. However, the same effects may or may not happen when the response options are presented in ascending order (*Strongly disagree, Disagree, Neutral, Agree, Strongly agree*).

What has research shown about the effects of using ascending or descending order of response options in structured survey questionnaires? What strategies can be used to minimize the response order effects? In the following section, we will discuss evidence from the past several decades of research.

Research Findings on the Use of Ascending or Descending Order

Many Studies Show Left-Side Selection Bias from Ascending Order Scales, Generating Higher Mean Scores

One of the early investigations on response order effects was Belson's (1966) study. In his study, two groups of respondents in London from 16 to 70 years of age completed a 36-item questionnaire in a test room condition. A group of 167 used a verbal rating scale in descending order (i.e., positive items first) and another group of 165 participants used a verbal rating scale in ascending order (i.e., negative items first). Belson found that whichever end (positive or negative) was provided first was more prone to order effects. If the positive option was presented first on the left side, respondents were more likely to select it, and if the negative option was presented first, the respondents were also more likely to select it. This indicated a left side selection bias, or primacy effect, in response order selection.

Friedman, Herskovitz, and Pollock (1993) also found left side selection bias from their study with 208 college students in the US. The researchers asked students to rate their attitudes towards college on a 10-item survey with a 5-point Likert scale presented in either ascending or descending response order. Unlike Belson's findings, the left side selection bias was only found when response options were presented in descending order (*Strongly agree* on the far-left side). As a result, students' ratings from the descending order scale were higher than the ones from the ascending order scale. This indicates acquiescence bias may have been in effect; however, this bias was only present for positively worded survey items. For negatively worded items, the response order did not affect the respondents' selection. This shift towards positive responses is likely a result of satisficing leading to a primacy effect and left-side bias, selecting the satisfactory option presented first when they were presented on the left side rather than on the right side of the scale.

Similarly, Chan (1991) studied the response order effect with 102 senior high school students in Taipei. These students completed a five-item personal distress scale translated into Mandarin with descending response order options (e.g., "*describes me very well*," "*describes me quite well*," "*describes me well*," "*describes me slightly well*," and "*does not describe me well*"). Five weeks later, they took the same survey but with the response options switched to ascending order. The results of this study also showed a significantly higher mean from the descending-ordered scale. The researcher interpreted that the students were influenced by the primacy effect and chose positive options more often when they were presented first. Based on the findings, the researcher advised against using both ascending and descending-ordered scales in the same survey. He also advised against the practice of reverse-coding data from negatively worded items because the reverse-coded scores would vary from the raw score.

However, Barnette (2000) discussed a benefit of using bidirectional response options. He tested six study conditions in a 2 x 3 framework: (1) the survey items being all positively worded or mixed with positively and negatively worded items, and (2) Likert-scale response options being ascending, descending, or mixed with both. A total of 915 adults in the U.S. were assigned to one of the six conditions and asked to complete a 20-item survey. The highest reliability was found in the survey design with only positively worded items and the bidirectional response options (half with ascending order and the other half with descending order). The researcher proposed that this design option would help guard against acquiescence or response set bias.

Compared to the use of bidirectional response options, Nicholls, Orr, Okubo, and Loftus (2006) recommended a similar yet different approach based on their study with 292 college students in Australia. Participants completed a 22-item survey with a 5-point Likert scale; half of them received the survey with responses in ascending order (from *Definitely disagree* to *Definitely agree*) and the other half in descending order (from *Definitely agree* to *Definitely disagree*). The results of this study again demonstrated higher scores from the group that completed the survey with a descending-ordered scale. The researchers cautioned about the left side selection bias, especially when survey instruments are used to make absolute judgments (e.g., it is satisfactory if the mean score is above a certain score), as opposed to relative judgments (e.g., how Group A's satisfaction scores compared with Group B's satisfaction scores). To control the left side selection bias effectively, the researchers recommended a method where half of the respondents complete a survey with an ascending-ordered scale, and the other half use a descending-ordered scale.

As the web became a popular survey tool, researchers studied response order effects in web-based surveys. For example, Hartley and Betts (2010) asked 465 academic writers, reviewers, and information scientists to rate an abstract using an 11-point scale. Each participant was randomly assigned to one of four conditions created by using different directions of worded labels (*Clear to Unclear*, or *Unclear to Clear*) and different directions of numeric ratings (10 to 0, vs. 0 to 10), as shown below:

1. Clear 10 9 8 7 6 5 4 3 2 1 0 Unclear
2. Clear 0 1 2 3 4 5 6 7 8 9 10 Unclear
3. Unclear 10 9 8 7 6 5 4 3 2 1 0 Clear
4. Unclear 0 1 2 3 4 5 6 7 8 9 10 Clear

The researchers found that the first type, the scale starting with a positively worded label (*Clear*) and a highest numerical value (10), resulted in significantly higher ratings in comparison to the other three response options.

To expand their understanding of this topic, Betts and Hartley (2012) administered a paper-based survey to children. They surveyed 187 children of ages 9 to 11 from five British schools and administered a 6-item survey using four types of 6-point scales (e.g., *Very much* 6 5 4 3 2 1 *Not at all*, *Very much* 1 2 3 4 5 6 *Not at all*, etc.), randomized for each child. In this study, the children leaned towards the positively worded label, whether it be on the left or right side, but did not necessarily orient to the numeric ratings. This was different when compared to their 2010 web-based study with adults who oriented towards both the positively worded label and the descending numeric order.

More recently, Maeda (2015) tested response order effects using a web-based, 15-item survey given to 1,693 respondents, all over 18 years of age and residing in the U.S. In this research, he went further than just ascending and descending order differences and studied the effects of vertical and horizontal presentations of Likert scale response options. He found no significant difference between horizontal and vertical layouts of response options; however, the horizontal layout of response options resulted in left side selection bias. From these findings, Maeda (2015) favored the use of vertical layout of Likert scale response options over Barnette's (2000) suggestion of using both ascending and descending-ordered scales in the same survey instrument and Nicholls et al.'s (2006) recommendation of randomly assigning half respondents to ascending order and the other half to descending order.

In another recent study, Liu and Keusch (2017) compared response order effects in self-administered surveys and orally presented surveys. The researchers reviewed data obtained from an adult American population during the 2012 American National Election Studies. The survey questions measured respondents' attitudes towards traditionalism, position of Blacks in society, and attitudes towards egalitarianism. The respondents were randomly assigned to use a 5-point Likert scale in ascending (*Disagree strongly*, *Disagree somewhat*, *Neither agree nor disagree*, *Agree somewhat*, *Agree strongly*) or descending order, on either a web-based survey or a face-to-face interview. The researchers found significant acquiescent bias present in responses from the group that used descending response order in the web-based survey, but not in the face-to-face survey (interview). The researchers attributed the lack of response direction effect in the face-to-face setting to the use of both visual and auditory communication during the interview.

The studies presented above cautioned survey designers to be aware of response order effects associated with left-side selection bias, acquiescence bias, or satisficing when using paper- or web-based surveys. A sufficient amount of research has shown that descending-ordered response scales generate more positive responses from respondents than ascending-ordered scales.

Some Research Shows Lack of Significant Impact from Response Order Orientation

Not all research studies have supported response order effects in self-administered surveys, paper- or web-based. For example, Dillman et al. (1995) analyzed data collected from thousands of people in seven states of the U.S. The participants were asked to respond to energy and natural resource issues by selecting one of multiple discrete or ordinal categories. Upon the review of data collected from 33 experimental questions included in mailed surveys, the researchers found only four experiments resulting in significant primacy effects and two experiments showing significant recency effects. The remaining 27 experiments (82%) did not reveal significant response order effects. Thus, the researchers found little support to conclude that a response order effect occurred in mailed surveys.

Earlier, we discussed Chan's (1991) study with a Taiwanese sample that showed left-side bias resulting in higher mean scores. Another Taiwanese sample showed lack of impact from different directions of response order. In Weng and Cheng's (2000) study, the researchers administered a paper-based, self-administered questionnaire written in Mandarin [used in Chan's (1991) study] to 368 junior high and 490 college students in Taiwan to measure their personal distress. The students completed the survey twice—once with a response scale in either ascending or descending order, and a week later using a response scale in either the same response order or the opposite order. The researchers found that students' responses to the questions were not impacted significantly when given varying response orders, leading them to conclude that changing scale order did not impact responses. They explained that their sample groups were highly motivated to complete the survey and less likely to succumb to satisficing, which contributed to the lack of response order effects in their findings. In addition, they pointed out the importance of using clear question wording and keeping respondents motivated to complete their survey.

Lack of response order effects has been found in web-based surveys as well. In the study by Christian, Parsons, and Dillman (2009) involving over 3,000 college students in the U.S., half the participants were issued 10 questions using 5-point Likert-type scales with response options presented in descending order (e.g., from *Very satisfied* to *Very dissatisfied*) and the other half given the same questions with response options in reverse order. Their study also failed to yield significant differences between the two survey conditions to conclude that the response order affected how respondents chose their options. The researchers did find, however, that respondents selected their options more quickly when using descending-ordered scales.

In another web-based study with a non-English-speaking sample, Hofmans et al. (2007) asked 156 mostly college-educated Dutch-speaking Belgians to complete a web-based survey with a 5-point Likert scale (*Fully agree, Rather agree, Neutral, Rather disagree, Fully disagree*), where some questions were repeated in another section of the same survey, using the 5-point Likert scale in the opposite direction. The researchers found some minor differences in data distribution between the repeated questions with different ordered scales—the most positive option, *Fully agree*, was selected more often when it appeared on the far left side (descending order) than when it was on the far right side (ascending order). However, it was not sufficient to make a significant difference in the average scores. Nonetheless, the researchers emphasized the importance of being aware of the potential impact of response order orientation.

Summary

Practitioners, as well as researchers, often develop their own survey instruments. When designing structured survey items with response scales, it is important to be aware of the impact that the response order may make to the data to be collected.

Many studies revealed response order effects in self-administered surveys, especially the primacy effect, associated with left-side selection bias, acquiescence bias, and satisficing. The response order effects have been shown in both paper- and web-based surveys, with adults and children respondents, speaking English and other languages. In addition, many studies showed more positive average scores from descending-ordered scales. Based on the research evidence, it seems obvious to us that a simple solution to the inflated data obtained from descending-ordered scales is to present response scales in ascending order. The ascending order orientation is also aligned with a number line showing negative numbers on the left side, positive numbers on the right side, and zero in the middle (e.g., -2, -1, 0, +1, +2), which is often changed to 1, 2, 3, 4, and 5 when codifying the data for statistical analysis:

Strongly disagree (1) *Disagree* (2) *Neutral* (3) *Agree* (4) *Strongly agree* (5)

If descending-ordered scales need to be used, some strategies can be employed to reduce the response order effects:

- Keep respondents motivated to complete the survey with their accurate answers.
- Present half of survey items with descending-ordered scales and the other half with ascending-ordered scales.
- Assign half of participants to use descending-ordered scales and the other half to use ascending-ordered scales.
- Present response options vertically rather than horizontally.

Table 1 provides a summary of the research evidence used in generating our recommendations.

Table 1. Research Evidence for the Use of Ascending or Descending Order of Likert-Type Response Options

Focus	Authors (Year)	Research Findings and Recommendations
Ascending order significantly affects survey results	Barnette (2000)	<ul style="list-style-type: none"> • Using positively worded items with bidirectional response scales (half <i>SD</i> to <i>SA</i>, and half <i>SA</i> to <i>SD</i>) produced the higher level of reliability. • A way to reduce acquiescence or response set bias without mixing positively and negatively stated items is to use only positively worded items with bidirectional response scales (half <i>SD</i> to <i>SA</i>, and half <i>SA</i> to <i>SD</i>). Also, keep language simple and questionnaires short.
	Belson (1966)	<ul style="list-style-type: none"> • In a test-room situation, the first presented items tended to get greater endorsement than when presented last, regardless of whether they were positive or negative items. • Since the response order effects were found in the test-room situation, more studies would be needed to show response order effects in actual survey conditions.
	Betts and Hartley (2012)	<ul style="list-style-type: none"> • Children were biased toward positively wording on the left side, regardless of the numbers associated with the words (<i>Very much</i> 6 ... 1 <i>Not at all</i>; <i>Very much</i> 1 ... 6 <i>Not at all</i>). • Take into consideration how children orient toward wording (but not numbers) when designing surveys for children.
	Chan (1991)	<ul style="list-style-type: none"> • Evidence supporting the primacy effect was found in the surveys administered with a Taiwanese sample. • Researchers should be aware that reverse-coded scores may differ from the raw scores.
	Friedman et al. (1993)	<ul style="list-style-type: none"> • Positively stated items with descending-ordered scales resulted in a greater degree of agreement (left-side selection effect), but the same effect did not occur in negatively stated items with descending-ordered scales. • Response scales in ascending order can keep respondents more attentive to the scales and reduce acquiescence bias and satisficing.
	Hartley and Betts (2010)	<ul style="list-style-type: none"> • Adults were biased toward positive wording associated with higher numbers presented on the left side of the scale (<i>Clear</i> 10 ... 0 <i>Unclear</i>), resulting in higher ratings. • Be aware that the formatting of response scales can influence respondents to give different ratings.
	Liu and Keusch (2017)	<ul style="list-style-type: none"> • In the web setting, response scales presented in descending order significantly increased acquiescent responses, likely due to satisficing. • Be aware that seemingly trivial survey design features such as response order can influence responses.
	Maeda (2015)	<ul style="list-style-type: none"> • With evidence of left-side selection bias, horizontally presented descending-ordered response scales showed higher ratings. This effect did not occur in vertically presented response scales.

		<ul style="list-style-type: none"> • Use vertically presented response scales for making absolute judgments; horizontally presented response scales can be used when making relative judgments.
	Nicolls et al. (2006)	<ul style="list-style-type: none"> • Descending-ordered response scales generate higher satisfaction levels. • To control left-side selection bias, create two survey forms; have half of respondents use a survey with all ascending-ordered response scales and another half use a survey with all descending-ordered response scales.
No significant response order effects	Christian et al. (2009)	<ul style="list-style-type: none"> • Ascending-ordered scales did not influence respondents' selection of options. However, visual layouts of response scales affected response time. Participants were quicker to respond to items when their layouts were as expected. • Accordingly, consider responder burdens such as response time when designing the formats of response scales.
	Dillman et al. (1995)	<ul style="list-style-type: none"> • Little evidence was found to support primacy effects in mailed surveys and recency effects in verbal surveys. • Despite survey mode, be aware that social desirability bias could influence the primacy effect if socially desirable options are presented first.
	Hofmans et al. (2007)	<ul style="list-style-type: none"> • No significant differences were found in average scores, whether ascending- or descending-ordered scales were used. However, the <i>Fully Agree</i> option was selected more often when it was presented on the far left side, compared to the far right side. • Therefore, it is important to be aware of the impact of response order orientation.
	Weng and Cheng (2000)	<ul style="list-style-type: none"> • Response order had no substantial effects on participant responses. • To minimize response order effects, use clear unambiguous wording and motivate participants.

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Biography

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Megan Kennedy is a graduate assistant of the Department of Organization Performance and Workplace Learning in the College of Engineering at Boise State University. She has been working with Dr. Chyung to study evidence-based recommendations for survey design. Megan is also a student working on her MS in the Department of Organization Performance and Workplace Learning in the College of Engineering at Boise State University.

Ingrid Campbell is a technology tool specialist with the Online Programs Department in the Chapman Graduate School of Business at Florida International University. She holds a master's degree in Industrial/Organizational Psychology and is currently a student working toward the completion of a Graduate Certificate in Workplace Instructional Design at Boise State University.