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Exploring the impact of response option sequences/order on survey rating scale responses

Hamed Taherdoost

University Canada West, Vancouver, BC V6B 1V9, Canada; hamed.taherdoost@gmail.com

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ABSTRACT: In the realm of survey data quality, inaccuracies and nonresponses pose significant challenges. One significant factor affecting this is the order in which response options are presented, leading to what is known as response order effects. This research delves into the extensive studies conducted on how the sequence of answer options influences respondents' ratings in survey questions. Specifically, we focus on analyzing previous research to understand how the arrangement of scale points on a rating scale impacts the cognitive processes and reaction strategies of respondents. By synthesizing existing studies, this investigation aims to provide insights into the critical role that presentation sequence plays in shaping survey outcomes, thereby offering valuable perspectives for enhancing data quality in future survey designs.

KEYWORDS: response order effects; rating scale; data quality; response option sequences; cognitive processes

1. Introduction

Attitudes may be measured directly (i.e., the subject knows their attitude is being examined) using several rating scales[1]. Likert scaling is a psychometric concept often used in survey research to collect data from respondents using guiding questions that need replies on scales[2]. The area of social science, including fields like psychology and education, extensively uses this scale. It is a Likert-type scale where the only possible answers are no or yes[3]. Rensis Likert, a psychologist, developed this rating scale in 1932 to better describe people's attitudes and the factors that shape them[4]. Likert designed this device, which still bears his name. This scale could be used as a rating system[5].

Measurement inaccuracy and nonresponse may contribute to the data quality issue in surveys[6]. The presentation of a Likert-type scale is important for gauging the attitudes and views of respondents[7]. Studies on the cognitive process of answering ordinal-scale survey questions have shown that this visual design element significantly affects participants' actions. People were contended to utilize several heuristics to determine a question's meaning. The heuristics hold that people give more weight to the items on the left side of a horizontal list and the items at the top of a vertical list. As a result, people are more likely to choose early-listed choices (a phenomenon known as the "primacy effect")[8].

New rating tools have recently been created due to technical improvements, providing a precise means of tracking the rating process from its inception to the final rating result[9]. Due to this, these methodologies, as opposed to typical rating tools, enable researchers to gather a larger range of participant data, including the temporal unfolding of ratings and choice uncertainty[10]. As various academics have noted, decision uncertainty may be referred to as a subject-specific cognitive element of the rating process that aims to create a coherent mental image of the assessed topic[11]. It represents the subjective interaction of the decisional and emotional factors that go into the final rating response in this

way[12]. This kind of within-subject variation may thus disclose more about evaluations than conventional crisp replies when used properly. It is well known that rating data often lack accuracy for a variety of reasons, including breaches of rating norms[13], response style[14], personality[15], forgery[16], and social desirability[17].

Researchers may display the response choices in a random sequence to avoid various types of bias and give respondents time to consider their alternatives before making an honest decision. This study aims to collect and evaluate prior research on the effects of respondents' answer alternatives being given in a certain order on the ratings they provided in response to survey rating questions. Building upon prior studies that have predominantly focused on the primacy effect and acquiescence bias, this research seeks to advance our understanding by exploring the nuanced relationships between response order, cultural heuristics, and demographic characteristics in shaping respondents' behaviors during survey ratings. The following research questions (RQs) guide this study:

RQ1: How does response order influence the primacy effect in survey ratings?

RQ2: Does response option order affect respondents' acquiescence bias in survey statements?

RQ3: How do cultural and visual factors interact with demographics in shaping the impact of response order on rating scale questions in surveys?

2. Background of the study

The graphic design feature has significantly influenced respondents' behavior in the cognitive process of answering questions on ordinal scales in surveys in several studies[18]. It has been proposed that responders use many heuristics when interpreting a question[19]. Weigold et al.[20] looked at four types of items: vertical radio buttons, drop-down menus, text boxes, and horizontal radio buttons. They found that all four formats were the same in quality and quantity. So, let us have a look at some of the possible psychological issues that might affect survey participants (**Figure 1**):

1) Primacy effect: Survey respondents tend to choose the alternatives offered (written) first[21].
2) Acquiescence bias (yea-saying bias): Those who participate in surveys are likelier to agree with a statement than disagree with it[22].
3) Selection bias toward the left: It has been shown that those who read text from left to right are more likely to choose options from the left side of a choice list in a survey[21].
4) Recency bias: Recency bias describes the tendency for individuals to choose the most recent available option when given many potential answers (easier to keep in mind while the responder makes their choice)[23].
5) Social desirability bias: Survey respondents prefer a socially acceptable (presumably good) choice over one not socially desirable[24].

It is the responsibility of the survey designer to ensure that respondents are not influenced in any way and to construct a survey that yields open and honest feedback instead[25]. A less-than-ideal response rate will result in less-than-ideal response data[26]. It needs to go through several tried-and-true methods for keeping your survey free of unintentional bias. One prominent cause of survey bias is how the answers are presented[27]. Due to the nature of multiple-choice questions, it is important to recognize and avoid response option order bias[28]. One approach may be to mix up the order in which question answers are presented[29]. While some prior studies found a correlation between scale orientation and respondent performance on self-administered surveys[30,31], others failed to replicate these findings[32,33]. The current

comparative study focuses on the influence of response choice order on the result correctness to enrich this existing body of research.

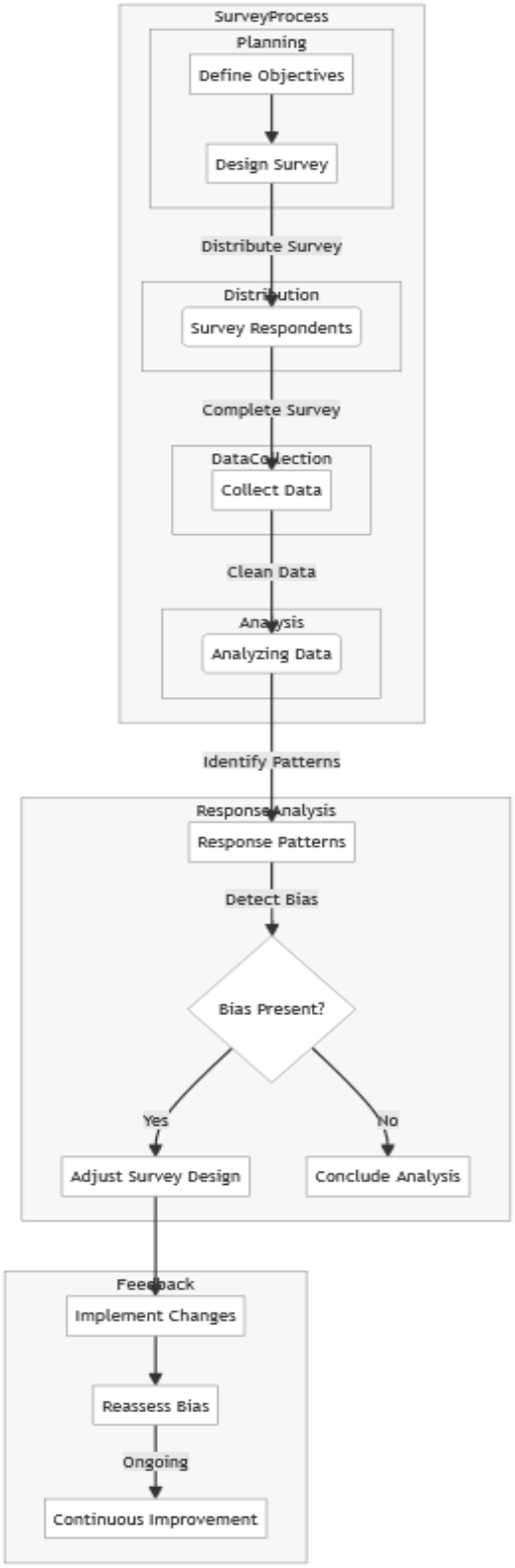

Figure 1. Response bias in surveys.

While the history of understanding the effects of item order goes back further, the first studies that

contributed to the field's canon were conducted in the 1980s. Since then, most studies examining the option sequence effect in self-reports have focused on illustrating how different option sequences affect the quality of information gathered from participants. Studies contrasting the effectiveness of introducing information with specific vs general comments about the topic initially have found considerable support in the relevant academic literature[34–37]. Since the conventional way to evaluate the item sequence impact is to administer two forms with different orderings to two groups with comparable demographic features[34], most research has been conducted using this method. However, a literature review suggests the need for research on the impact of option sequence on the psychometric aspects of self-reports, notably the factorial structure.

It is commonly known that respondents may experience a "response sequence effect" if they answer many items in a survey in a certain order[38]. Some researchers only saw the scale direction effect as a specific primacy effect observed for unsorted answer choices in survey modes with visual display[39] and resorted to satisficing when attempting to explain it[30]. When people do not want to or cannot retrieve material from their memories and adjust it to match survey answer possibilities, they take a mental shortcut by choosing the first acceptable or satisfactory answer instead of the best solution that expresses their genuine feelings[40]. Several works have proven that satisficing results in answer order effects for questions with unordered response categories[41]. However, rating scales vary from answer categories that are not ordered. Unlike a list of unordered answer options, which may stimulate the same cognitive processes and reaction strategies, rating scales give scale points on a continuum that follows an internal sequence. There are three reasons one would conclude that the satisficing hypothesis does not provide a sufficient explanation for the answer order effect in rating scales. Initially, survey items were put after the questionnaire[42]. Secondly, conditions that encourage satisficing did not reveal a scale direction impact[43], and the rating scale primacy effect was identified in aural administration surveys[42]. Thirdly, Yan and Keusch[42] provide empirical evidence that respondents' adoption of anchoring-and-adjustment heuristics results in scale direction effects.

3. Discussion

Several studies have confirmed the existence of a primacy effect in self-report surveys, including self-rated health[44] and political opinion[45]. In recent years, there has been an upsurge in the study on the item sequence effect as a feature of self-report surveys[36,37,46,47]. Using data from self-reported drinking surveys, Mackinnon and Firth[48] proved primacy effects by demonstrating that respondents were likelier to choose the answer option "Strongly Agree" when it appeared first in the response list than when it appeared last. Malhotra[45] found that the magnitude of primacy effects was positively correlated with the degree to which the subjects' education levels varied. He also suggested that the time invested in the survey interacts with education level on primacy effects, implying that low-education respondents who spend less time on the study are more vulnerable to this bias.

Item order impact is particularly relevant for measuring attitudes. According to Chen[46], the first attempt to describe this phenomenon was based on recency and primacy, but the literature has now switched to adapting and anchoring. Adjusting and anchoring postulate that individuals prefer to arrive at information first supplied to them and obtain their reasonable estimates by modifying depending on this anchor[49]. Regarding item order impact, first replies to options are anchors for later answers[50]. In other words, adjusting and anchoring happens when a person's contextual memory is inadequate, resulting in earlier reactions to objects functioning as anchors that alter the answers to future things depending on these anchors[46].

Answer option order impact happens when the ordering of rating scale response choices influences the distribution or operation of a survey question. Theoretical interpretations have explained such effects, including anchor-and-adjustment[42], memory bias, and satisficing[51]. Some visual interpretative heuristics (such as "up-means-good" and "left-and-top-mean-first") may also provide insight into how the positioning of response possibilities may affect choices[52]. Most previous research on the response option order impact was undertaken in monocultural contexts[53]. Nonetheless, "cultural" influences may influence the existence and magnitude of response choice order impact in many ways[54]. The first is that "left-means-first" and other interpretive heuristics may function differently depending on the reading norms of the text (e.g., right-to-left vs. left-to-right). In addition, persons from cultures with several main languages and numerous reading norms may have distinct placement heuristics. Finally, people in different countries may have different experience levels with a particular visual design style[55].

Response sequence effects in both vertical and horizontal rating scales are investigated by Hohne et al.[38] using eye tracking to determine their causes and detect their existence. This study found that response order effects in rating scales are often small and more common in vertical than horizontal rating scales. The results of our eye-tracking study also show that respondents' attention is not uniformly distributed across all categories.

The work by Leon et al.[56] adds to what has already been done by evaluating scale direction effects in an online survey with Spanish panelists who used more than one device. In their experiment, people were randomly put into one of two groups where the scale was turned upside down (decremental vs. incremental). The results show that scale orientation affects how responses are spread out but does not affect the data quality. The purpose of the research by Höhne and Krebs[39] is to learn more about how the sequence in which items are rated affects the results. The results reveal response order effects within the Agree/Disagree but not within the Item-Specific question format.

Using a between-subjects design, Krosnick and Alwin[51] demonstrated primacy effects by adjusting the order in which respondents answered questions on a questionnaire measuring personality traits. Furthermore, they hypothesized an interplay between cognitive and conditional sophistication, such that those with less formal education and linguistic skills tended to experience stronger primacy effects. The concept of "satisficing" is one possible explanation for primacy effects[57]. The satisficing hypothesis postulates that people would choose the "good enough" solution to a problem rather than use maximum mental effort to find the best answer[58]. The study by Terentev and Maloshonok[59] examined the effects of answer order on rating questions presented in item-by-item and grid formats. The primacy effect was predicted to be true for both types of inquiries and to vary with respondent age, level of education, and technological sophistication. Two independent experiments were conducted using data from 28 pre-course questionnaires taken by students enrolling in MOOCs (N = 22,910). Their findings suggest that respondents' impressions of the options list and their response patterns are impacted by the order in which answer alternatives are presented. The primacy effect becomes apparent when doing a query on a per-item basis. No significant impacts of age, gender, or device type on order were found. Respondents with a higher level of education experience less primacy effect for the item-by-item arrangement.

In recent research in this field, Robie et al.[60] introduced two more experimental conditions to their study: random increase or decrement and randomization throughout. Everything was handed out in a logical order. We also extended on previous studies by controlling for the false discovery rate and focusing on the size of the effects found when investigating the impact of response option order on careless responding, correlations between targeted predictors and criteria, and participant answers. They found little to no answer choice order effects on a commonly used personality assessment among 1,198 college

students, looking at measurement consistency, scale mean differences, item-level distributions, and participant answers. However, the randomized answer choice order condition varied on some careless responding indices, indicating further study options. The data of several studies that studied the response option order are summarized in **Table 1**.

Table 1. Review of research on the influence of question order on outcomes.

Methodology	Samples	Result	Reference
Structural equation modeling	858	The findings showed that response order did not significantly impact participant replies and scale features.	[33]
Experimental comparisons	810	When the conceptual and visual midpoints are aligned, respondents are unaffected by the spatial separation of the center, the "do not know" choice, or the endpoints.	[61]
Two randomized experiments	22,910	Findings show that the order of answer choices affects how respondents see option lists and how they choose answers.	[59]
Experimental	1198	The findings do not imply that the sequence of answer options should play a significant role in building evaluations.	[60]

Research suggests that characteristics like skill, time, age, and so on should be considered when deciding the order of responses in scaling questions used in surveys and questionnaires. No one can say whether the typical or the random mode is preferable. **Table 2** shows the benefits and drawbacks of both methods.

Table 2. The overview of the benefits and drawbacks of each option.

Feature	Ordered response	Randomized response
Primacy and recency	The first or last items are sometimes chosen, regarded highly, etc.	Making errors and unreliable data
Interactivity	Leading to fatigue	May more attractive
Structure	Structure/order is better than a Band-Aid.	Creating confusion
Routine	Respondents skim	Maybe more attention
Receptivity	A common method.	People quit more frequently because of "arbitrary" changes.

Recognizing biases like primacy effect and acquiescence in survey responses is vital for data accuracy. This applies across sectors—customer satisfaction surveys benefit from optimized designs, public policy surveys need to minimize bias, and various fields, including education, marketing, healthcare, and elections, benefit from mitigating biases related to response order.

4. Conclusion

This study aimed to gather research that evaluated the influence that the ordering of response choices had on respondents' responses to rating questions included in surveys. According to the study's findings, the sequence of replies in scaling questions used in surveys and questionnaires should be modified by factors such as competence, time, age, etc. It is not feasible to declare with absolute confidence which mode is superior: the regular mode or the random mode. However, each has positives and negatives to offer, as mentioned. The findings of the variations in careless answering indices between the randomized answer choice order situation and the other conditions suggest various potential options for further study, one of which is a survey.

Limitations in sample diversity and methodology warrant caution, highlighting the need for future research to explore these effects further. Further research needs to be done on the impact of demographic and social characteristics of respondents (education, age, etc.), features of questions (location in a questionnaire, the number of answer options, complexity, etc.), and various design features (user interface, labeling, a visual orientation of scale, format, etc.), the absence/presence of response sequence effects. It would be helpful to research the influence of the gadgets used to fill out surveys. Estimating the probable response-order impact enables us to evaluate the accuracy of the data obtained from online surveys and devise methods for reducing the bias caused by the graphical presentation of the various options. Designers need to use randomized response orders, consider demographics, ensure consistency, and collaborate with experts to reduce bias in survey responses.

Conflict of interest

The author declares no conflict of interest.

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