University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Sociology Department, Faculty Publications | Sociology, Department of

2016

Effects of Smiley Face Scales on Visual Processing of Satisfaction Questions in Web Surveys

Mathew Stange
Mathematica Policy Research, Ann Arbor, MI, mstange@mathematica-mpr.com

Amanda Barry
Nielsen, amanda.barry@nielsen.com

Jolene Smyth
University of Nebraska–Lincoln, jsmyth2@unl.edu

Kristen M. Olson
University of Nebraska–Lincoln, kolson5@unl.edu

Follow this and additional works at: http://digitalcommons.unl.edu/sociologyfacpub

 Part of the Family, Life Course, and Society Commons, and the Social Psychology and Interaction Commons

Stange, Mathew; Barry, Amanda; Smyth, Jolene; and Olson, Kristen M., "Effects of Smiley Face Scales on Visual Processing of Satisfaction Questions in Web Surveys" (2016). *Sociology Department, Faculty Publications*. 337.
http://digitalcommons.unl.edu/sociologyfacpub/337

This Article is brought to you for free and open access by the Sociology, Department of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Sociology Department, Faculty Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Nebraska UNIVERSITY OF Lincoln
digitalcommons.unl.edu

Published in *Social Science Computer Review* (October 2016), pp. 1–11; doi: 10.1177/0894439316674166
Copyright © 2016 Mathew Stange, Amanda Barry, Jolene Smyth, and Kristen Olson. Used by permission.
Published online October 26, 2016.

Effects of Smiley Face Scales on Visual Processing of Satisfaction Questions in Web Surveys

Mathew Stange,[1] Amanda Barry,[2] Jolene Smyth,[3] and Kristen Olson[3]

1. Mathematica Policy Research, Ann Arbor, Michigan, USA
2. Nielsen, San Francisco, California, USA
3. University of Nebraska–Lincoln, Lincoln, Nebraska, USA

Corresponding author – Mathew Stange, Mathematica Policy Research, 220 East Huron Street, Suite 300, Ann Arbor, MI 48104, USA; email mstange@mathematica-mpr.com

Abstract

Web surveys permit researchers to use graphic or symbolic elements alongside the text of response options to help respondents process the categories. Smiley faces are one example used to communicate positive and negative domains. How respondents visually process these smiley faces, including whether they detract from the question's text, is understudied. We report the results of two eye-tracking experiments in which satisfaction questions were asked with and without smiley faces. Respondents to the questions with smiley faces spent less time reading the question stem and response option text than respondents to the questions without smiley faces, but the response distributions did not differ by version. We also find support that lower literacy respondents rely more on the smiley faces than higher literacy respondents.

Keywords: web surveys, eye tracking, visual design, smiley faces

Researchers use graphic and symbolic elements in questionnaires to convey information and help respondents with their response tasks (Christian & Dillman, 2004; Christian, Dillman, & Smyth, 2007; Couper, Kennedy, Conrad, & Tourangeau, 2011; Tourangeau, Couper, & Conrad, 2004, 2007). For example, researchers use smiley face response scales to survey

children (de Leeuw, Borgers, & Smits, 2004; Reynolds-Keefer & Johnson, 2011), to measure pain levels (Chambers, Giesbrecht, Craig, Bennett, & Huntsman, 1999), and to supplement or replace text response options (e.g., satisfaction scales) in surveys of adults (Elfering & Grebner, 2010; Hox, de Leeuw, & Chang, 2012; Kunin, 1998).

The advantage of smiley face scales is that the scales convey levels of a particular affective domain such as satisfaction without requiring respondents to read and understand verbal text scales. Thus, some argue these scales help low-literacy individuals answer questions (Reynolds-Keefer, Johnson, Dickenson, & McFadden, 2009). Smiley face scales are also a way to make surveys more enjoyable (Emde & Fuchs, 2012). Yet how respondents of various literacy levels process questions with and without smiley face scales and whether the scales influence answers are understudied. Possible disadvantages are that respondents who process only smiley face scales may interpret scales differently from those who also process verbal scale labels. Potentially, adding smiley faces may influence the meaning of a scale compared to text labels alone. In this article, we use eye-tracking data and a response option experiment to answer five questions:

1. Do web survey respondents look at *question stems* for less time when a smiley face scale is present than when it is not?
2. Do web survey respondents look at *response options* for less time when a smiley face scale is present than when it is not?
3. Do survey responses differ between questions with and without smiley face scales?
4. Does the processing of smiley faces differ between the first and second time they appear in surveys?
5. Does the use of smiley face scales operate differently for respondents with higher versus lower literacy levels?

Eye Tracking and Surveys

Measuring respondents' eye movements as they answer surveys shows *how long* respondents read or look at different areas of survey screens, if at all (i.e., fixation time), and *the path* of their eye movements (i.e., gaze trails) as they respond. These data indicate the level of effort respondents make to read parts of surveys and the order in which they process information (Lenzer, Kaczmirek, & Galesic, 2011). Researchers have used these data to examine respondent processing of visual elements in surveys to understand questionnaire design better (Bristol, Bergstrom, & Link, 2014; Galesic & Yan, 2011; Neuert & Lenzner, 2015; Olmsted-Hawala & Nichols, 2014). For example, eye-tracking data indicated respondents spend more time fixating on the first few options in response option lists, corroborating theoretical explanations of primacy effects (i.e., respondents tend to select options that appear first simply because of their position irrespective of content; Galesic, Tourangeau, Couper, & Conrad, 2008). Eye tracking similarly allows researchers to examine how respondents process graphic and symbolic elements in surveys like smiley face scales.

Graphic and Symbolic Elements in Surveys

Elements in scenes stand out visually (i.e., attract attention) when they differ from other elements in the scene—in color, orientation, size, motion, and stereoscopic depth—because people notice these properties early in visual processing (Ware, 2008). Because smiley face scales are visually distinct from the text that comprises the rest of a web survey's visual scene, we expect respondents will visually process questions with and without smiley faces differently. We anticipate smiley faces will draw the eye away from other features because they are visually distinctive and therefore more noticeable (Ware, 2008) and because the eye is drawn to faces above other stimuli, including text (Cerf, Frady, & Koch, 2009). Due to this visual dominance, we hypothesize that *fixation times on question stems will be shorter when the response options contain smiley faces with the text labels compared to text-only response options*. Likewise, we hypothesize that *fixation time will be shorter for the text portion of the response options that includes a smiley face scale than text-only response options*.

We also anticipate a learning curve for respondents because the first time visual stimuli are presented, they are typically processed more deeply—for a longer time—than later presentations of the same stimuli (Maljkovic & Nakayama, 1994). Thus, we hypothesize that *fixation time will be longer the first time the smiley face scale is presented than the second time*.

Finally, previous research shows graphic and symbolic elements in questionnaires can affect responses. For example, symbols and the graphic design of answer spaces communicate to respondents how they should answer open-ended questions that ask for narrative or numeric responses, like dates (Christian et al., 2007; Couper et al., 2011; Dillman, Smyth, & Christian, 2014). One study suggests responses differ between text-only and smiley face-only scales but not between text-only scales and scales with smiley faces and text together (Emde & Fuchs, 2012). This effect is likely because the smiley faces simply repeat the meaning of the text categories differently (i.e., symbolic); the faces do not add or clarify the question's meaning nor do they provide information about how to map responses to answer spaces. Thus, *we hypothesize that response distributions will not differ across the treatments with and without smiley faces*.

Graphic and Symbolic Elements and Literacy

As powerful forms of communication that have shared meanings for most audiences (Ware, 2008), symbols communicate a lot of information without words. Some researchers argue symbols, including smiley face scales, can replace or compliment survey text for low-literacy individuals (Shea et al., 2008; Weiner et al., 2004). Because low-literacy individuals are present in any self-administered survey of the general population (only 28% of U.S. adults had a basic literacy level in 2003; Kutner et al., 2007), the use of symbols in surveys might be advantageous.

Little research, however, exists about whether smiley face scales help low-literacy respondents. Because smiley face scales supplement or replace response options, we expect there will be *no differences in fixation time on the question stem between low- and high-literacy respondents when the smiley faces are present*. However, we do expect fixation time on smiley face and text-only response options to differ. Among low-literacy respondents, we hypothesize that *fixation time will be shorter for response options that include a smiley face scale than a text-only scale* because the symbols will be easier to process than text.

Regarding a learning curve across survey items, we hypothesize that there will be no difference across literacy levels in the expected shortening of fixation time from the first to the second item that appears with smiley faces in the survey.

Although research with highly educated populations suggests smiley face scales do not influence responses (Emde & Fuchs, 2012), they may influence low-literacy respondents' responses. High-literacy individuals who can process the text and smiley faces jointly are likely to interpret the smiley faces' meaning in the context of the text labels, so that the text and faces reinforce one another—the smiley faces do not add new or different information than the text alone. Conversely, low-literacy individuals likely are less able to use the textual information leaving them without the text label's context when determining the smiley faces' meaning. Low-literacy respondents, thus, may infer meanings other than those intended by the researcher. Accordingly, *we expect differences in responses across the text-only and text plus smiley faces versions for low-literacy respondents but not in any specific direction*.

Method

We conducted two laboratory-based eye-tracking studies to investigate how respondents process satisfaction questions with and without smiley face scales. For both studies, we recruited general population participants from a Midwestern city who were aged 19 years or older, born in the United States, spoke English as their first language, and did not wear bifocals. We used Craigslist advertisements and posted flyers in locations targeting people with varying age, education, and literacy levels. Participants received US$20 for their time and US$2 for the costs of transportation to the lab.

Respondents first completed a face-to-face survey that collected background information, followed by the wide-range achievement test (WRAT; Wilkinson & Robertson, 2006) to measure literacy. Participants then completed one of the two randomly assigned versions of a web survey while having their eye movements tracked. Study 1 had $n = 67$ respondents and Study 2 had $n = 120$ respondents. We report eye-tracking results of $n = 59$ respondents for Study 1 ($n = 29$ no smiley face, $n = 30$ with smiley face) and $n = 103$ respondents for Study 2 ($n = 51$ no smiley face, $n = 52$ with smiley face) because technical difficulties prevented collecting eye-tracking data for some respondents. Respondents were demographically similar in both studies and across the treatments (Table 1). Using the WRAT's reading composite percentile rank, literacy level ranged from the 1st to 94th percentile in Study 1 and from the 1st to 98th percentile in Study 2. Average literacy did not significantly differ by treatment in either study.

Table 1. Participants' Demographic Characteristics

	Study 1 (n = 62)			Study 2 (n = 103)		
Characteristic	Mean/%	Minimum	Maximum	Mean/%	Minimum	Maximum
Sex						
Male	53.23%			61.00%		
Female	46.77%			39.00%		
Age	31.39	19	64	31.29	19	65
Hispanic	6.67%			3.96%		
Race						
White	83.87%			86.14%		
Non-White	16.13%			13.86%		
Education						
High school or less	27.42%			24.75%		
Some college	51.61%			52.48%		
BA+	20.97%			22.77%		
Income						
$39,999 or less	77.42%			82.50%		
US$40,000–79,999	12.90%			10.83%		
US$80,000+	9.68%			6.67%		
WRAT reading composite score						
< 50th percentile	43.55%			46.60%		
50th Percentile+	56.45%			53.40%		

Note: WRAT = wide-range achievement test

Eye-Tracking Equipment

For Study 1, we used EyeLinkII's head mounted video eye-tracking equipment (SR Research). The EyeLinkII equipment tracked at 500 Hz (i.e., 500 frames per second) and recorded a fixation as a gaze held for 60 ms. For Study 2, we used Applied Science Laboratory's (ASL) D6 high-speed eye tracker, which uses cameras placed under the computer's monitor to record eye movements. The ASL D6 equipment tracks at 120 Hz and recorded a fixation as a gaze held for at least 60 ms. Although survey methodology-based eye-tracking studies define a fixation as a gaze of 100 ms (e.g., Galesic et al., 2008; Galesic & Yan, 2011), vision sciences research uses a gaze of 60 ms because people often perceive information at a much faster rate than 100 ms, which can meaningfully affect their processing of information (Brunel & Ninio, 1997; Sperling, 1960).

Figure 1 illustrates a single respondent's eye-tracking data on one web survey question. The circles with numbers represent fixations and the lines connecting them show the gaze trail between fixations. The areas of interest, indicated by rectangles, allow us to aggregate data into summary measures to observe whether respondents looked at certain areas of the survey, how long they looked at these areas, and their path of fixation. We defined four areas of interest: question stem, answer spaces, smiley faces, and response option text.

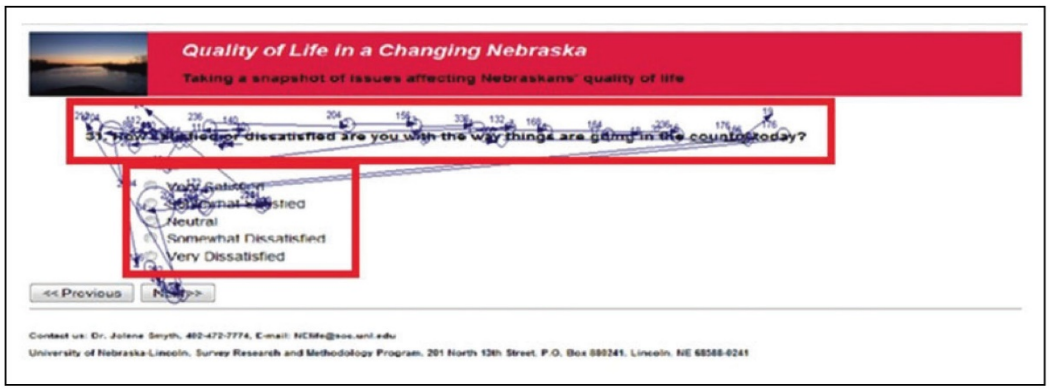

Figure 1. Areas of interest.

Experimental Treatments

Respondents in both studies were randomly assigned either to a form that included smiley face scales placed next to text categories (Face + Text) or to a form that included only the text categories (Text Only). Both studies included two questions with this experiment (Table 2, full screenshots available upon request). In Study 1, the two questions asked about satisfaction with the way things are going in the country and in Nebraska. In Study 2, the two questions asked about satisfaction with public transit options in Nebraska and the availability of taxis in Lincoln, NE. Although not identical, the smiley face scale used in both studies was similar to smiley faces used for measuring pain (Wong-Baker FACES Foundation, 2016).

Table 2. Questions and Response Options

Question Wording	Response Scale
Study 1	
How satisfied or dissatisfied are you with the way things are going in the *country* today?	*Very satisfied* *Somewhat satisfied* *Neutral* *Somewhat dissatisfied* *Very dissatisfied*
How satisfied or dissatisfied are you with the way things are going in *Nebraska* today?	
Study 2	
How satisfied or dissatisfied are you with the current public transit options in Nebraska?	*Very satisfied* *Somewhat satisfied* *Neither satisfied nor dissatisfied* *Somewhat dissatisfied* *Very dissatisfied*
How satisfied or dissatisfied are you with the availability of taxicabs in Lincoln?	

Analyses

With one-tailed *t*-tests, we first test for differences in average fixation time on the question stem and response options between the two forms. For response options, we look at the time spent on the full response options (text + radio button + smiley faces where applicable) and separate out the text + radio buttons from the smiley faces. Using one-tailed dependent

t-tests, we then examine whether time spent fixating on the smiley faces differs between the first and second time they appear in the survey. Then using χ^2 tests, we examine whether response distributions differ by question form. Finally, we use a median split of literacy to test whether these outcomes differ between low- and high-literacy respondents. To account for outliers in the data, we use a log transformation after adding 0.5 s to account for zeros.

Results

Fixation Time on Question Stems

As expected, fixation time on the question stem is significantly shorter when the response options contain smiley faces than when containing only text (Table 3). When smiley faces appeared alongside text categories, respondents spent about 0.5 s less looking at the question text than when the text response options only appeared.

Table 3. Average Fixation Time (Seconds and Log Seconds) on Question Stems by Treatment

	Seconds			Log Seconds		
Question	Face + Text	Text Only	Form *t*-Test	Face + Text	Text Only	Form *t*-Test
Study 1						
Direction of the country	2.64	3.14	1.36†	1.03	1.21	1.46†
Direction of Nebraska	1.49	1.93	2.06**	0.60	0.83	2.24**
Study 2						
Public Transit	1.11	1.49	1.57y	0.23	0.47	1.70*
Lincoln Taxis	0.88	1.44	2.75**	0.13	0.45	2.43**

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (one tailed)

Fixation Time on Response Options

Across both studies, there is no consistent direction or significant difference in the time respondents spent fixating on the entire set of response options—both the faces and text—between the faces + text and text-only treatments (Table 4). Respondents spent slightly less time on the faces and text together than the text-only response options on all of the questions except for the "direction of the country" question in Study 1 (3.99 s vs. 3.15 s, $p < .10$). Thus, there is limited but inconsistent evidence that the smiley faces speed up processing of the response options overall.

Table 4. Average Fixation Time (Seconds and Log Seconds) on Response Options by Treatment

	Smiley Face Form			Faces + Text (A1) Versus Text Only (B)		Text (A2) Versus Text (B)	
Question	Faces + Text (A1)	Text (A2)	Text-Only Form (B)	Diff.	*t*-Test	Diff.	*t*-Test
Study 1							
Direction of the country							
Seconds	3.99	2.10	3.15	.84	–1.60†	–1.05	2.41**
Log seconds	1.36	0.80	1.16	.20	–1.30†	–0.36	2.41**
Direction of Nebraska							
Seconds	2.49	1.10	3.11	–.62	1.24	–2.01	4.70***
Log seconds	0.95	0.34	1.14	–.19	1.29†	–0.80	5.75***
Study 2							
Public transit							
Seconds	2.21	1.12	2.25	–.04	0.10	–1.13	3.43***
Log seconds	0.64	0.20	0.78	–.14	0.89	–0.58	4.00***
Lincoln taxis							
Seconds	1.32	0.63	1.92	–.60	2.12*	–1.29	5.02***
Log seconds	0.38	–0.06	0.63	–.25	1.73*	–0.69	5.10***

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (one tailed)

Differences in processing the response options appear when separating the symbolic and textual elements in the smiley face treatment (Table 4). Providing smiley face labels in addition to text labels reduces the amount of time respondents spend reading the text categories. Respondents for whom faces were visible split their time about evenly between processing the text and smiley faces (e.g., 2.21 s processing the faces, text, and radio buttons together, with 1.12 s on the text alone in the public transit question in Study 2). Overall, we found respondents spent significantly less time—an average across all items of about 1.4 s less—fixating on the text labels in the smiley face treatment than the same text labels in the text-only treatment ($p < .05$).

Consistent with the expected learning curve, respondents spent significantly less time looking at the smiley face scales the second time they appeared in both studies (Study 1: Time 1 = 1.83 s, Time 2 = 1.34 s, $t = 2.72$, $p < .01$; Study 2: Time 1 = 0.78 s, Time 2 = 0.43 s, t = 3.01, $p < .01$).

Survey Responses

As expected, we found little evidence that the smiley faces influenced respondents' answers. Response distributions did not significantly differ between the treatments for any question (Table 5).

Table 5. Response Distributions (Percentages) by Treatment

Question and Responses	Smiley Faces	Text Only	Form χ^2 (p Value)
Study 1			
Direction of country			
Very satisfied	3.23	0.00	2.26 (.69)
Somewhat satisfied	16.13	21.88	
Neutral	25.81	21.88	
Somewhat dissatisfied	38.71	31.25	
Very dissatisfied	16.13	25.00	
Direction of Nebraska			
Very satisfied	3.33	3.33	2.73 (.60)
Somewhat satisfied	43.33	33.33	
Neutral	23.33	40.00	
Somewhat dissatisfied	26.67	16.67	
Very dissatisfied	3.33	6.67	
Study 2			
Public transit			
Very satisfied	10.34	10.00	3.14 (.54)
Somewhat satisfied	18.97	31.67	
Neither satisfied nor dissatisfied	37.93	31.67	
Somewhat dissatisfied	20.69	20.00	
Very dissatisfied	12.07	6.67	
Taxi cabs			
Very satisfied	5.08	1.67	4.37 (.36)
Somewhat satisfied	28.81	20.00	
Neither satisfied nor dissatisfied	47.46	63.33	
Somewhat dissatisfied	13.56	13.33	
Very dissatisfied	5.08	1.67	

Differences by Respondent Literacy Level

We found no consistent significant differences in the effects of the smiley faces on time spent processing the question stem for high- versus low-literacy respondents or for the response distributions (results available upon request). There were significant differences for time spent on the response options with and without smiley faces for both high- and low-literacy respondents (Table 6). Additionally, the effect is concentrated on the difference in the time spent on the text part of the response options rather than the full response options. Moreover, the magnitude of the difference between the design with and without the smiley faces is greater for low-literacy respondents than high-literacy respondents. Across the 4 items, high-literacy respondents spent about 0.94 s longer on the text of the response options when they were text only, but low-literacy respondents spent 1.90 s longer on the text-only response options (log-transformed data had identical results). Thus, as hypothesized, the smiley faces speed up processing, but they really help lower literacy respondents. Additionally, both high- and low-literacy respondents spent more time on the first appearance of the smiley faces than in the second appearance.

Table 6. Average Fixation Time (Seconds) on Response Options by Treatment and Literacy

Question and Literacy Level	Smiley Face Form: Faces + Text (A1) Mean	Smiley Face Form: Text (A2) Mean	Text-Only Form (B) Mean	Faces + Text Versus Text Only (A1 vs. B) Diff.	Faces + Text Versus Text Only (A1 vs. B) *t*-Test	Text Versus Text (A2 vs. B) Diff.	Text Versus Text (A2 vs. B) *t*-Test
Study 1							
Direction of the country							
High literacy	4.32	2.39	2.81	1.51	–2.20*	–0.42	0.71
Low literacy	3.66	1.80	3.67	–0.01	0.02	–1.87	2.89**
Direction of Nebraska							
High literacy	2.72	1.25	2.62	0.10	–0.14	–1.37	2.40**
Low literacy	2.26	0.95	3.88	–1.62	2.32**	–2.93	4.68***
Study 2							
Public transit							
High literacy	2.18	1.13	2.24	–0.06	0.09	–1.11	2.30*
Low literacy	2.26	1.12	2.26	0.00	0.01	–1.14	2.46**
Lincoln taxis							
High literacy	1.25	0.56	1.43	–0.18	0.56	–0.87	3.83***
Low literacy	1.42	0.67	2.32	–0.90	1.83*	–1.65	2.90***

*$p < .05$; **$p < .01$; ***$p < .001$ (one tailed)

Conclusion

In this study, providing a smiley face scale alongside response options for satisfaction questions changed the amount of time that respondents spent processing the questions and response options. Respondents spent less time fixating on the question stem and on the text of the response options when the smiley faces appeared alongside the response options. The symbolic element drew respondents' attention away from the text of the questions. The trend was consistent for high- and low-literacy respondents, but lower-literacy respondents spent even less time processing the response option text when the smiley faces appeared. Even with these differences, answers to the questions did not differ between the text-only and smiley face treatments overall or for low- or high-literacy respondents. We also found respondents spent significantly less time fixating on the smiley face scale for the second question in both studies.

These findings indicate web survey designers can use smiley face scales in addition to text labels in response options for bipolar scales when the symbols compliment the text labels' meaning. The faces do not slow down—and may speed up—processing of questions, especially for low-literacy respondents, suggesting smiley face scales are one way to aid low-literacy respondents in their task of responding to satisfaction questions in self-administered surveys. It is unclear, though, whether faster processing means the question was cognitively easier to process or respondents took processing shortcuts (Olson & Parkhurst, 2013; Yan & Olson, 2013). It is also unclear whether spending less time on the question stem means respondents comprehend questions less completely. Generally, though, we show including symbolic elements that complement the meaning of questions

may be beneficial for lower literacy respondents for whom reading text-only questions might be challenging.

Nevertheless, our study was a laboratory experiment with small sample sizes. A study with a larger sample could give a fuller picture of the differences in the response process across literacy groups and other subgroups. Respondents in a lab setting may also be more attentive to design features than they would have been in real-world survey settings. In both studies, though, the items we examined appeared late in the questionnaires (Questions 31 and 32 in Study 1 and Questions 41 and 43 in Study 2), meaning much of the initial lab effect likely wore off. Additionally, the smiley faces supplemented the text response options, and we did not test a treatment with only smiley faces. Future research should investigate how people visually process symbol-only response scales and examine if our findings extend to unipolar scales, sensitive topics, smartphone surveys, and questions for which symbolic elements do not map clearly onto the question's content.

Declaration of Conflicting Interests – The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding – The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

Bristol, K., Bergstrom, J. R., & Link, M. (2014). *Eye tracking the user experience of a smartphone and web data collection tool*. Paper presented at the Annual Conference of the American Association for Public Opinion Research, Anaheim, CA.

Brunel, N., & Ninio, J. (1997). Time to detect the difference between two images presented side by side. *Cognitive Brain Research, 5*, 273–282.

Cerf, M., Frady, E. P., & Koch, C. (2009). Faces and text attract gaze independent of the task: Experimental data and computer model. *Journal of Vision, 9*, 10.

Chambers, C., Giesbrecht, K., Craig, K. D., Bennett, S., & Huntsman, E. A. (1999). Comparison of faces scales for the measurement of pediatric pain: Children's and parents' ratings. *Pain, 83*, 25–35.

Christian, L. M., & Dillman, D. A. (2004). The influence of graphical and symbolic language manipulations on responses to self-administered questions. Public Opinion Quarterly, 68, 58–81.

Christian, L. M., Dillman, D. A., & Smyth, J. D. (2007). Helping respondents get it right the first time: The influence of words, symbols, and graphics in web surveys. *Public Opinion Quarterly, 71*, 113–125.

Couper, M. P., Kennedy, C., Conrad, F., & Tourangeau, R. (2011). Designing input fields for non-narrative open-ended responses in web surveys. *Journal of Official Statistics, 27*, 65–85.

de Leeuw, E., Borgers, N., & Smits, A. (2004). Pretesting questionnaires for children and adolescents. In S. Presser, J. M. Rothgeb, M. P. Couper, J. T. Lessler, E. Martin, J. Martin, & E. Singer (Eds.), *Methods for testing and evaluating survey questionnaires* (pp. 409–429). Hoboken, NJ: John Wiley.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. Hoboken, NJ: John Wiley and Sons, Inc.

Elfering, A., & Grebner, S. (2010). A smile is just a smile: But only for men. Sex differences in meaning of Faces Scales. *Journal of Happiness Studies, 11*, 179–191.

Emde, M., & Fuchs, M. (2012). Exploring animated faces scales in web surveys: Drawbacks and prospects. *Survey Practice, 5*.

Galesic, M., Tourangeau, R., Couper, M. P., & Conrad, F. G. (2008). Eye-tracking data: New insights on response order effects and other cognitive shortcuts in survey responding. *Public Opinion Quarterly, 72*, 892–913.

Galesic, M., & Yan, T. (2011). Use of eye tracking for studying survey response processes. In M. Das, P. Ester, & L. Kaczmirek (Eds.), *Social and behavioral research and the internet: Advances in applied methods and research strategies* (pp. 349–370). New York, NY: Taylor and Francis Group.

Hox, J. J., de Leeuw, E. D., & Chang, H. T. (2012). Nonresponse versus measurement error: Are reluctant respondents worth pursuing? *Bulletin of Sociological Methodology, 113*, 5–19.

Kunin, T. (1998). The construction of a new type of attitude measure. *Personnel Psychology, 51*, 823–824.

Kutner, M., Greenberg, E., Jin, Y., Hsu, Y., Dunleavy, E., & White, S. (2007). *Literacy in everyday life: Results from the 2003 national assessment of adult literacy* (No. NCES 2007–480). Washington, DC: U.S. Department of Education.

Lenzer, T., Kaczmirek, L., & Galesic, M. (2011). Seeing through the eyes of the respondent: An eye-tracking study on survey question comprehension. *International Journal of Public Opinion Research, 23*, 361–373.

Maljkovic, V., & Nakayama, K. (1994). Priming of pop-out: I. Role of features. *Memory & Cognition, 22*, 657–672.

Neuert, C. E., & Lenzner, T. (2015). A comparison of two cognitive pretesting techniques supported by eye tracking. *Social Science Computer Review*.

Olmsted-Hawala, E., Holland, T., & Nichols, E. (2014). Answers for self and proxy–using eye tracking to uncover respondent burden and usability issues in online questionnaires. In C. Stephanidis & M. Antona (Eds.), *Universal access in human-computer interaction. Design for all and accessibility practice* (Vol. 8516, pp. 590–600). New York, NY: Springer International.

Olson, K., & Parkhurst, B. (2013). Collecting paradata for measurement error evaluations. In F. Kreuter (Ed.), *Improving surveys with paradata: Analytic uses of process information* (pp. 43–72). Hoboken, NJ: John Wiley.

Reynolds-Keefer, L., & Johnson, R. (2011). Is a picture worth a thousand words? Creating effective questionnaires with pictures. *Practical Assessment, Research & Evaluation, 16*.

Reynolds-Keefer, L., Johnson, R., Dickenson, T., & McFadden, L. (2009). Validity issues in the use of pictorial Likert scales. *Studies in Learning Evaluation Innovation and Development, 6*, 15–24.

Shea, J. A., Guerra, C. E., Weiner, J., Aguirre, A. C., Ravenell, K. L., & Asch, D. A. (2008). Adapting a patient satisfaction instrument for low literate and Spanish-speaking populations: Comparison of three formats. *Patient Education and Counseling, 73*, 132–140.

Sperling, G. (1960). The information available in brief visual presentations. *Psychological Monographs, 74* (11, Whole No. 498).

SR Research. EyeLink II. Retrieved from http://www.sr-research.com/EL_II.html

Tourangeau, R., Couper, M., & Conrad, F. (2004). Spacing, position, and order: Interpretive heuristics for visual features of survey questions. *Public Opinion Quarterly, 68*, 368–393.

Tourangeau, R., Couper, M., & Conrad, F. (2007). Color, labels, and interpretive heuristics for response scales. *Public Opinion Quarterly, 71*, 91–112.

Ware, C. (2008). *Visual thinking for design*. Burlington, MA: Morgan Kaufmann.

Weiner, J., Aguirre, A., Ravenell, K., Kovath, K., McDevit, L., Murphy, J., . . . Shea, J. A. (2004). Designing an illustrated patient satisfaction instrument for low-literacy populations. *American Journal of Managed Care, 10*, 853–860.

Wilkinson, G. S., & Robertson, G. J. (2006). *WRAT4 Wide Range Achievement Test Professional Manual*. Lutz, FL: Psychological Assessment Resources.

Wong-Baker FACES Foundation. (2016). *Wong-Baker FACES1 Pain Rating Scale*. Retrieved from http://www.WongBakerFACES.org

Yan, T., & Olson, K. (2013). Analyzing paradata to investigate measurement error. In F. Kreuter (Ed.), *Improving surveys with paradata: Analytic uses of process information* (pp. 73–96). Hoboken, NJ: John Wiley.

Author Biographies

Mathew Stange is a survey researcher at Mathematica Policy Research, where he works on design and implementation of data collection for survey and qualitative studies. He has a PhD in survey research and methodology from the University of Nebraska–Lincoln. Email mstange@mathematica-mpr.com

Amanda Barry is a research methodologist at Nielsen, where her focus is on designing data collection methods for audience panel studies, including computer and mobile research. She has an MS in survey research and methodology from the University of Nebraska–Lincoln. Email amanda.barry@nielsen.com

Jolene Smyth is an associate professor of sociology and the director of the Bureau of Sociological Research at the University of Nebraska–Lincoln. Her research focuses on survey nonresponse and measurement issues and has been published in *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method* and journals including *Public Opinion Quarterly*, *Journal of Survey Statistics and Methodology*, *Field Methods*, *Social Science Research*, and *Survey Research Methods*. Email jsmyth2@unl.edu

Kristen Olson is an associate professor of sociology at the University of Nebraska–Lincoln. Her research interests span many issues in survey methodology, including nonresponse, paradata, interviewer effects, mode preference, and within-household selection methods in mail surveys. Her work has appeared in journals including *Public Opinion Quarterly*, *Journal of Official Statistics*, and *Journal of Survey Statistics and Methodology*. Email kolson5@unl.edu