A Picture Is Worth a Thousand Words: Results from Cognitive Testing of Graphic Show Cards

Anne M. Hartman[1], Jennifer Crafts[2], Amy Yaroch[1], Susie McNutt[2], Tracey Summerall[2], and Gordon Willis[1]
Division of Cancer Control & Population Sciences, National Cancer Institute[1]
Westat[2]

Abstract

The 2005 National Health Interview Survey Cancer Control Supplement (NHIS-CCS) contains question items that assess sun protection. In particular, two question items asked about wearing hats for sun protection. Previous cognitive testing of the NHIS-CCS suggested item wording alone was insufficient to convey to survey respondents which types of hats provide complete protection from the sun. Respondents often inappropriately include commonly worn hats such as baseball caps and sun visors in their responses. The research question was whether showing pictures of the types of "caps" (baseball caps and sun visors) and "hats" (hats which provide full sun protection shading the ears, face and neck) to consider would lead to more accurate reporting, make it easier for respondents to understand and respond to the questions, and require less response time. In preparation for fielding the 2005 NHIS-CCS, three respondent show cards were developed that contained 3, 4, and 5 pictures each of a range of "hats" commonly worn outdoors to protect the face, ears and neck from the sun. A lead-in question about wearing of baseball caps and sun visors was also developed along with a 2-picture show card to determine whether asking about cap use first would lead respondents to more accurately report hat use. Nine respondents over 18 years old with a mix of demographic characteristics were recruited for cognitive testing. All respondents were given all versions of the graphics and questions, but in different orders. Most preferred the five picture version of the hat card because it made them think of all types of sun-protective hats; triggered memory, thus reducing respondent burden; and allowed more accurate reporting. Regarding caps, all respondents understood the two distinct types when asked the question without using a graphic card but some thought a card might help others. The hat pictures were designed to be viewed generally (not focusing on details) to represent a range of appropriate hats. However, respondents tended to interpret the hat card specifically (rather than generally) when preceded by a cap picture card. Implications of selecting graphic versus 'text only' approaches to question design are discussed.

Keywords: Questionnaire Design, Graphic Show Cards, Cognitive Testing, Sun Protection, Hats

1. Introduction

In preparation for the fielding of the 2005 National Health Interview Survey Cancer Control Supplement (NHIS-CCS), Westat, under contract to the National Cancer Institute (NCI), tested the use of show cards for two question items related to wearing hats for sun protection. NCI wished to test whether respondents could understand and respond accurately to word-only versions of the "cap" (baseball cap and sun visor) and "hat" (hats which provide full sun protection shading the ears, face and neck) items or would need to view graphic show cards to ensure accurate reporting of hat wearing when outdoors in the sun. The major research question was whether showing picture examples of the types of caps and hats to consider would lead to more accurate reporting, make it easier for respondents to understand and respond to the questions, and require less response time. More specifically, NCI was interested in determining if a graphic cap show card was needed and/or a graphic hat show card was needed. If the hat show card was needed, how many hats were needed on the card? We predicted that use of graphic show cards would reduce inclusion of caps in the estimate of hat wearing and that hat wearing estimates would include a broad range of fully protective hats.

Previous rounds of cognitive testing 'text only' versions of the sun protection NHIS-CCS questions by NCI and the National Center for Health Statistics determined that order of items mattered. In our situation, this consisted of asking respondents about cap wearing (e.g., baseball caps and sun visors) first, followed by asking about wearing hats that fully protect the ears, face and neck from the sun such as a wide brimmed hat. Even when responding about cap use before hat use, it was evident that some people still included baseball caps that did not provide full sun protection. Protective hat use was thus potentially "over-estimated" However, we also determined that fully sun protective hat use was "under-estimated." Several types of "correct" hats were omitted. Many thought of very wide-brimmed hats, e.g., ladies hats from the 1960's or sombreros, but did not think about more modern styles that accomplish similar protection. Many also didn't think of including legionnaire hats (that look like a baseball cap at the top and front but have a wide and long flap draping over the neck and ears from the back and sides of the cap; see figure 2, item c). This paper reports the results of the testing of the cap and hat items and illustrates some of the advantages and disadvantages of the use of graphic show cards in questionnaire design.

2. Background NHIS – CCS

The NHIS is an annual nationwide in person interviewer administered survey of 36,000 households conducted by the National Center for Health Statistics and administered by the U.S. Census Bureau. In 1987, 1992, and 2000, Cancer Control Supplement (CCS) were administered as part of the NHIS to adults aged 18 and older to determine knowledge, attitudes, and practices concerning cancer-related health behaviors and cancer screening modalities (http://appliedresearch.cancer.gov/surveys/nhis/). The 2005

NHIS-CCS includes questions on cancer risk factors such as diet, physical activity, sun protection behaviors and use of indoor tanning (artificial exposure to UV light), use of vitamins and other supplements and medicines (e.g., use of non-steroidal anti-inflammatory medications), tobacco use, alcohol consumption and family history of cancer. In 2005 the CCS makes use of the NHIS basic design of also interviewing a responsible adult about a sample child's health habits. The 2005 CCS asks questions about the sample child's indoor tanning device use for children ages 14-17. The 2005 CCS also includes questions on cancer screening, and is used by the Division of Cancer Control and Population Science, NCI and others to monitor national levels, trends, and determinants for use of these preventive services.

3. Methods

3.1 Demographic Profile of Respondents

Nine individuals 18 years and older with a mix of demographic characteristics were recruited for the testing (Table 1). The sample consisted of five females and four males that were between 18 and 77 years old (although there was no representation in the 30-49 age range). All participants had a high school education and four had graduate degrees. Two were of Latino descent and two were black, providing some variation in possible sun-protective behaviors.

3.2 Materials

The testing materials included a moderator script, consent form, short demographic questionnaire, and set of moderator probes. NCI provided the text versions of the questions to be tested. The text only version of the cap item question wording was:

When you go outside on a warm sunny day for MORE than one hour, how often do you wear a baseball cap or sun visor (such as one of these)? Would you say …

[*Hand Show Card with responses 1-5 & Read Them]*

1. Always
2. Most of the time
3. Sometimes
4. Rarely
5. Never

The phrase "such as one of these" was inserted when asking the question with a graphic show card.

The hat item question was:

"**When you go outside on a warm sunny day for MORE than one hour, how often do you wear a hat that shades your face, ears AND neck such as … a hat with a wide brim all around / one of these? Would you say...**

[*Hand Show Card with responses 1-5 & Read Them]*

Read if necessary*: Do not include visors, baseball caps, or hats that do not shade the face, ears and neck. Include legionnaire hats.*

1. Always
2. Most of the time
3. Sometimes
4. Rarely
5. Never

The phrase "a hat with a wide brim all around" was inserted when asking the question without a graphic show card and the phrase "one of these" was used when showing a graphic show card.

Together NCI and Westat developed four graphic show cards. The single cap version had a picture of a baseball cap and a sun visor on one card (see figure 1). The three separate hat card versions shown in Figures 2 – 4 were:

- three hats: a wide brimmed hat, a bucket hat, and a legionnaire hat;
- four hats: same three hats plus a western style hat;
- and five hats: same previous four hats plus a stiffer wide brimmed style hat with the ends rolled up slightly).

The hats were drawn and selected to be unisex so that both male and female respondents could relate to them. The hats chosen as prototypes came from a pool of hats identified from various sun protective hat internet sites (some of which were suggested by global members of the U.S. Environmental Protection Agency administrated sun protection listserve). A fact sheet for Australian schools (The Cancer Council South Australia) was particularly useful for prototyping the first three hats.

3.3 Cognitive Testing Procedure

We used a standard cognitive testing procedure (Willis GB 2005, Beatty P 2004, DeMaio TJ & Rothgeb JM 1996, Royston PN 1989, and Willis G 2004) to study the comprehension, recall, decisions and judgment, and response processes the respondents used to answer the survey questions being tested. We asked respondents to talk aloud while responding, i.e., to explain as much as possible what they were thinking as they came up with their answers.

To start each session, the moderator introduced the purpose of the testing and the respondent's role. The respondent signed a consent form and agreed to be audio taped. Because the NHIS is interviewer-administered, the moderator took the role

of the interviewer, and read the questions aloud to each participant. The participant was asked to choose an answer from among those presented on the cards. (These items all had frequency response categories presented on cards).

To set the context for the cap and hat items, the moderator first administered several items related to sun exposure, then administered the cap and hat items. If a participant expressed some confusion or showed some hesitation, we probed generally to reveal the cause of that confusion. Moderators followed up with specific probes where respondents appeared to have or expressed having some difficulty. They used specific probes to explore understanding and preference such as: "What kind of hats were you thinking about when you answered?"-- "Describe the hats that you wear?"-- "Which version of the question with or without graphics do you think takes less time to answer?"-- and "Which version do you prefer?"

Item presentation order was the same for all participants: cap versions followed by hat versions. All participants responded to all versions of both the cap and hat items. To be able to evaluate the reactions to the two different versions of the items (card vs. no card), we administered the versions of the cap and hat items in different orders (see Table 2). We discovered during the first few sessions that seeing a card and then answering the no card version was somewhat artificial, so we did change the protocol such that more of the later session participants responded to the no card version first.

4. Results

Based on their discussion, the older participants tended to be generally more aware of sun protection, and the use of hats for providing protection The younger participants tended to wear hats and caps more for fashion or for shading the face while doing sports or going to the beach.

4.1 Need for a Card

For the **cap item**, graphics were not necessary to understand intended caps. However, participant preferences were split for card versus no card. Two participants preferred the no card version, saying they didn't really need to see pictures because they clearly understood what the two distinct types were. Two additional participants said that they did not need the card to supply an accurate answer, but that the pictures might help others. Even though about half of the participants said they preferred the card because they are "visual" people, all said they knew what visors and baseball caps were without needing to see a picture.

Almost all participants said they would prefer to see pictures rather than hear the word-only versions of the **hat** items. Participants said that seeing pictures aided them in considering the broad variety of sun-protective hats. More than half of the participants stated that they were "visual" people and preferred having visual cues in most circumstances. A few participants thought that the no-card version wording "wide brim all around" was adequate to convey the meaning of the item, but still preferred to see the pictures.

As for interpretation, participants tended to interpret hat graphics specifically rather than generally. Seeing the cap item graphics first increased this tendency.

4.2 Number of Pictures on Hat Card

For the hat item, there was unanimous support for use of the card with five hat pictures. Seeing more hats made the respondents think about a broader range of hats not only for their own use but to trigger memory for others answering the question as well. Most felt that the five pictures covered the spectrum of hat types adequately. As the number of hats increased the tendency to interpret specifically rather than generally decreased.

Many expressed surprise at the variety of types of hats shown; their memory seemed to be limited to the types of hats they wore themselves or considered to be most common from their own perspective, e.g., bucket hats for younger participants and men, broad or rolled brim hats for women. Additional participant comments focused on whether both sexes wore the different hat varieties and the degree of sun protection they provided.

4.3 Perceived Time To Respond to the Item

Although we did not collect actual time data, we did ask participants whether they would answer the items faster with or without graphics. More participants said **cap** graphics might trigger memory for "others," reducing processing time. Several thought that cap graphics would take more time since most people would understand baseball cap and sun visor. As for the **hat** graphics, most said graphics triggered memory, reducing processing time. One person said it took an equal amount of time to respond to card and no card versions. One person said that although it took slightly longer to view pictures and respond, that approach would provide more accurate data; she questioned "Wasn't that what the survey was trying to collect?' When asked why graphics aided response, participants used phrases such as "It requires less processing time," "It cuts out one cognitive step," "It's shorter because you don't have to search through your memory," etc. Essentially, they thought that the pictures triggered memory, reducing response burden.

4.4 Perceived Accuracy of Response

All but one respondent gave the same response to both versions of the **cap item**, showing no difference in understanding by using the show card. (The one exception was one constant hat-wearing male who hesitated in deciding between Always and Sometimes when he had no cap card first and the cap card second.)

When asked whether having a **hat** card vs. no card affected response accuracy, most participants indicated that pictures helped to convey the item meaning. Several indicated that having five pictures would make people think more broadly and generically of all types of hats, and with a better memory trigger, they would report more accurately.

5. Discussion

Use of graphics was intended to make concepts clearer, avoid misclassification of caps as hats, and broaden the range of hats considered to be "fully" protective. Use of the five hat graphic did appear to accomplish this goal. However, use of a cap graphic didn't seem to help. The cap graphic had a negative impact on interpretation of the later hat choices. This phenomenon of context where a previous question can affect the response to a subsequent question is seen quite commonly in questionnaire design testing (Tourangeau R, Rips LJ and Rasinski K 2000). The hat graphics with **only** a **few** hats was counter-productive since it restricted the subjects' thinking to those examples. This can possibly lead to under-reporting of hat use.

5.1 Current Field Use of Revised Items

For the NHIS, the **cap item** is being asked before the hat item and without the cap show card. When the **hat item** is asked the five hat graphic show card is used. Qualitative reports from the first quarter of actual fielding suggest in general that the questions are working well. No problems were identified by unsolicited interviewer comments/complaints or directed questions to the field representatives who fielded the text only version of the hat question in the past.

5.2 Recommendations and Implications for Questionnaire Design

These results lead to the following recommendations for use of graphic show cards in questionnaire design:

- Use graphic show cards to best advantage to replace or supplement text when graphics reduce the number of words needed to convey a concept and/or reduce data collection time.
- Use graphic show cards when graphics cause a respondent to broaden their thinking or remember past behavior more easily.
- Use text only instead of show cards if that text is more broadly interpreted than the graphics.
- If graphics are intended to serve merely as examples, portray graphics as **generically** as possible.

If over-reporting is a concern, we recommend testing the effects of using a lead-in question (e.g., cap lead-in for hats in this study). Also, different item orders should be tested to determine effects on response accuracy.

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Table 1. Demographic Characteristics of Study Participants

Demographic Characteristics	Frequency
Gender	
Male	4
Female	5
Age	
18 – 20	1
21 – 29	2
30 – 39	0
40 – 49	0
50 – 59	3
60 – 69	2
> 70	1
Education Level	
High school graduate	1
Some college	0
Associate's degree	1
Bachelor's degree	2
Some post-graduate work	1
Graduate degree	4
Spanish/Hispanic/Latino	
Yes	2
No	7
Race	
Black, African American	2
White	7
American Indian or Alaska Native	0
Asian or Asian American	0
Pacific Islander	0
Some other race	0

Table 2. Item Order by Test Participant

Participant Number	Cap Item version order	Hat Item version order
1	Card, no card	No card, 3 hats, 4 hats, 5 hats
2	No card, card	3 hats, 4 hats, 5 hats, no card
3	Card, no card	4 hats, 5 hats, no card, 3 hats
4	No card, card	No card, 3 hats, 4 hats, 5 hats
5	No card, card	No card, 5 hats, 4 hats, 3 hats
6	Card, no card	*3 hats, no card, 5 hats, 4 hats
7	No card, card	*4 hats, no card, 5 hats, 3 hats
8	Card, no card	No card, 5 hats, 4 hats, 3 hats
9	No card, card	No card, 3 hats, 4 hats, 5 hats

*This order was used to focus on testing the understanding of the brim wording vs. no mention of brim with pictures.

Figure 1. Cap Graphic Show Card

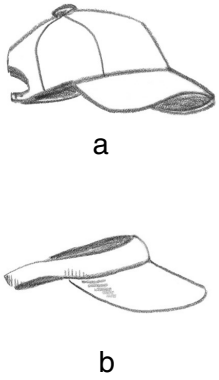

Figure 2. Three Hat Graphic Show Card

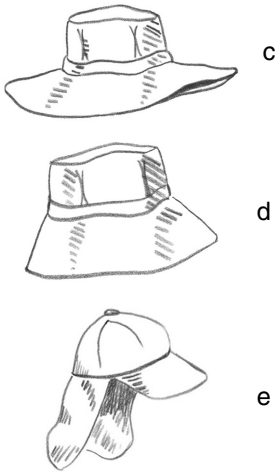

Figure 3. Four Hat Graphic Show Card

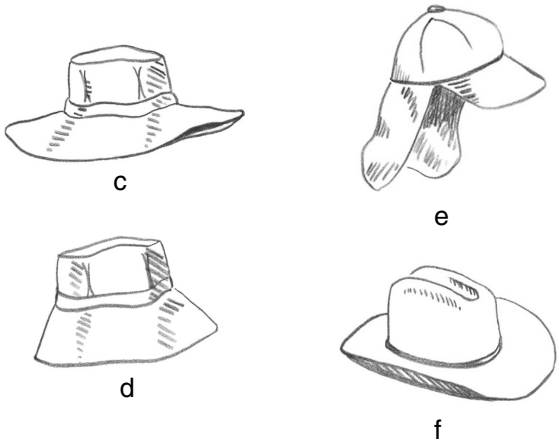

Figure 4. Five Hat Graphic Show Card