Using Touch Screen Audio-CASI to Obtain Data on Sensitive Topics

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Abstract

This paper describes a new interview data collection system that uses a laptop personal computer equipped with a touch-sensitive video monitor. The touch-screen-based audio computer-assisted self-interviewing system, or touch screen audio-CASI, enhances the ease of use of conventional audio CASI systems while simultaneously providing the privacy of self-administered questionnaires. We describe touch screen audio-CASI design features and operational characteristics. In addition, we present data from a recent clinic-based experiment indicating that the touch audio-CASI system is stable, robust, and suitable for administering relatively long and complex questionnaires on sensitive topics, including drug use and sexual behaviors associated with HIV and other sexually transmitted diseases.

1. Introduction

In recent years, the technologies available for conducting interviews about sexual behavior, illicit drug use, and other sensitive subjects have been changing rapidly. These new technologies appear to reduce reporting bias, which can have a substantial effect on people's willingness to report activities that are embarrassing, stigmatizing, or illegal. What people may not be willing to admit to a human interviewer, they appear much more likely to report in a more private setting, such as a self-administered questionnaire). However, the depth of information that is required to assess certain high-risk behaviors can make a self-administered questionnaire extremely complex and difficult to complete. Moreover, many individuals who engage in high-risk behaviors have limited literacy skills, which may preclude them from accurately responding to the questions being presented.

An audio computer-assisted self-interviewing, or audio-CASI, system has been developed to address the inadequacies of interviewer-administered or self-administered questionnaires and to increase truthful reporting of sensitive behaviors. Versions of this computer-based system have been implemented in several large-scale surveys. This paper will focus on the most recent version of the system, which uses a touch sensitive video monitor to input responses.

2. Advantages of the Audio-CASI System

Traditionally, written self-administered questionnaires have been the standard interviewing technique for collecting data on drug use, sexual behavior, and other sensitive behaviors. Self-administered questionnaires eliminate the need for respondents to disclose sensitive and possibly incriminating information about themselves to an interviewer. Studies of self-

reported drug use, for example, have found that respondents are more likely to report these behaviors in SAQs than in less private interview modes, such as in-person interviewer-administered questionnaires (Turner, Lessler, and Devore, 1992).

Recent advances in survey technology provide new interview tools to collect data under private conditions, thus making them suitable for studies of sensitive topics, such as sexual behavior, drug use, and violence. One of the first technologies developed was the audio-CASI system. In audio-CASI, respondents listen to digitally recorded questions and response categories through a set of headphones and enter their answers using the computer keyboard (O'Reilly, Hubbard, Lessler, Biemer, Turner, 1994; Turner, Lessler, and Gfroerer, 1992). In addition to providing privacy, this new technology offers a number of important methodological advantages:

- Audio-CASI can be used with any respondent who can hear. The audio component eliminates the requirement that respondents be literate.

- Audio-CASI can be programmed in any spoken language and has been used in multilingual surveys administered by monolingual interviewers (Hendershot, Rogers, et. al., 1996; Turner, Rogers, et al., 1996).

- Audio-CASI standardizes the presentation of questionnaire items; every respondent hears the questions in exactly the same manner.

- Similar to other computer-assisted interview technologies, audio-CASI provides automated skip patterns and branching to guide respondents through complex questionnaire designs. In addition, it provides automated consistency and range checks, and produces clean data files.

These advantages have prompted researchers to use audio-CASI in several recent national surveys, including the National Survey of Family Growth and the National Survey of Adolescent Males. Randomized experiments embedded within these large-scale surveys, and other studies of specialized populations, indicate that audio-CASI elicits more complete reporting of sensitive and illegal behaviors than interviewer-administered or self-administered questionnaires (Miller et al., 1999; Turner, Ku, et al., 1998).

3. Design Features of the Touch Screen Audio-CASI

Architecturally, our touch screen audio-CASI system is a direct outgrowth of the conventional keyboard audio-CASI system. We specifically sought to preserve the traditional audio-CASI design features in the touch screen audio-CASI system. Such features include the aural and visual presentation of the questions and response categories, the use of keys or buttons to enter responses, programming of questionnaires to support automatic execution of skip patterns, as well as range and other data edit checks. The touch screen audio-CASI system is based on the same 32-bit application used in conventional audio-CASI to program the questionnaire.

Operationally, the laptop keyboard used in the audio-CASI system is replaced by the laptop's monitor/screen. Responses are given by pressing the box containing the appropriate answer on the computer screen. There are three types of questions that are supported by the touch screen audio-CASI system: questions requiring a yes/no response, questions requiring a categorical response, and questions requiring a numeric response. For the most part, touch screen audio-CASI questions are associated with a finite number of response categories. The question appears in a box at the top of the screen and the boxes containing the response categories appear below it. The current limit for the number of response categories is ten. This is due to the limitations imposed on the system by the size of the screen. Questions

requiring a yes/no response follow the same format; respondents press one box for `yes' and another for a `no' response.

However, some questions require numeric responses. Surveys on sexual behavior, for example, may include a question on the respondent's number of sex partners in the past year. To implement responses to numeric questions, a numeric keypad is simulated on the monitor. In addition to the ten number keys, a "backspace" key to handle incorrect key presses and an "ENTER" key are included as part of the simulated keypad. In touch screen audio-CASI, the "ENTER" key is used to delimit numeric responses. After entering the number of sexual partners, the respondent is instructed to press the box on the laptop screen labeled "ENTER", the program recognizes the "ENTER" signal as a terminator for a numeric response field, and the next question is presented to the respondent.

Once the respondent touches an area on the screen to indicate a response, the touch screen audio-CASI system automatically executes a validity check to ensure that the response satisfies any edit logic specified in the programmed questionnaire. The system also checks for skip patterns to ensure that the next appropriate question is presented to the respondent.

In conventional keyboard audio-CASI, several function keys (labeled as F keys) are programmed to perform specific tasks, such as backing up to the previous question, replaying the current question, and indicating a "Don't Know" or a "Refuse to Answer" response. Although the computer keypad is not used in touch screen audio-CASI, these functions are still available to the respondent. Boxes (i.e. standard Window's Button controls) labeled "BACKUP", "DON'T KNOW", "REFUSE", and "REPLAY" appear at the top of the computer screen. Touching a box allows respondents to backup to the previous question, replay the question, or specify a "Don't Know" or "Refuse to Answer" response to the question. These buttons appear across the top of the screen for each question and answer sequence.

The touch screen audio-CASI system also provides the option to suspend the interview. If the "SUSPEND" option is selected, the system writes the data to a temporary data file and suspends the interview. When the interviewer or the respondent is ready to resume the interview, he/she enters the same identification number used in the suspended interview, the system retrieves the file associated with that ID, and the interview begins at the question where it was suspended. This feature, while rarely utilized during actual interviews, provides a design feature that is attractive to certain research protocols.

In summary, we have extended our audio-CASI technology by adding a touch sensitive screen to the existing laptop hardware and modifying the platform of the executable. However, many issues remain about how to best harness this technology to provide an unambiguous user interface for eliciting the correct response category from respondents. Some of these issues are addressed in the remaining sections of this manuscript.

4. Advantages and Disadvantages of Touch Screen audio-CASI

Touch screen audio-CASI shares most of the advantages provided by conventional audio-CASI systems. However, by replacing the keyboard with a touch sensitive video monitor, touch screen audio-CASI has the potential to enhance data quality in three fundamental ways.

First, strike-area for entering responses is enlarged, thus reducing the likelihood of keying errors by the respondent. In conventional keyboard-based audio-CASI, the size of the key to be pressed approximates the tip of a normal adult's index finger. In the touch screen platform, the striking area for recording a response is 3 times larger than the size of a key on

the computer's keypad for questions with numeric responses and 7 times larger for categorical questions.

Second, under touch screen audio-CASI, response categories for categorical questions are controlled by the researcher and displayed on the computer screen, thus eliminating the need for specification of range checks. An example of a categorical question implemented in a touch screen audio-CASI platform is shown in Figure 1. Range check specifications for categorical responses are implied by the set of responses displayed on the computer's screen. It is not possible to enter an out-of range response because only valid responses are included for display on the screen. However, range checks are still required for questions with numeric responses.

Third, in the touch-screen environment, the respondent presses a box labeled with the appropriate answer rather than keying in a number proxy as in the conventional keyboard audio-CASI system. This feature reduces undetectable keying errors by eliminating incorrect associations between the intended response and the numerical proxy for that response. For example, in the traditional keyboard audio-CASI, the responses to a marital status question could be:

- Press 1 if single,
- Press 2 if widowed,
- Press 3 if married,
- etc.

Using traditional audio-CASI, the respondent could inadvertently press the `3' key for the "widowed" response. This type of error is impossible to detect because `3' is a valid response. However, in a touch screen audio-CASI platform, each response occupies a separate disjoint area of the monitor and answers to categorical questions are recorded by touching this area of the touch sensitive monitor. It is also possible to color code responses, and/or highlight the response area on the screen as the individual response categories are aurally presented to the respondent. These techniques enable a direct association between the intended response category and the area on the touch screen associated with that response category. For example, the audio presentation of keyboard based audio-CASI, "Press 1 if YES, Press 9 if NO", could be replaced by, "Press the GREEN box if YES, Press the RED box if NO" in touch screen audio-CASI. It is also possible to highlight the GREEN box as the respondent hears, "Press the GREEN box if YES".

In summary, touch screen audio-CASI eliminates the need for specifying range-check criteria for categorical variables and has the potential to yield more accurate recording of responses compared to the conventional keyboard based audio-CASI platform. It is also possible, however, that the larger striking area for responses or the highlighting of responses may compromise the privacy of the interview. Respondents may perceive that their responses could be viewed by the interviewer or other individuals. Concerns about this possibility were one of the major factors motivating our clinic-based experiment.

5. Implementing Touch Screen Audio-CASI in a Clinic Population

We drew a convenience sample of 108 patients ages 15 to 39 years attending a STD Clinic in Baltimore, Maryland; one-half of the respondents were male, one-half were female. Anecdotal information provided by clinic staff indicated that patients often had literacy problems or problems with quantitative issues, and there was some concern whether patients could successfully complete an audio-CASI interview. Although our previous research suggests that respondents are comfortable using the audio-CASI technology and find it easy

to understand the recorded questions, we thought we might be able to make the system easier to use by eliminating the keypad and developing a touch screen audio-CASI system.

The pilot study addressed three research questions:

- What are patients' preferences for keypad versus touch screen audio-CASI?

- Do interviews conducted with touch screen audio-CASI produce the same results as those conducted using keypad audio-CASI or interviewer-administered forms?

- How do patients' perceptions of privacy, confidentiality, and response validity differ across the three interview modes?

Participants who consented to participate were administered a behavioral questionnaire that was divided into three sections of approximately equal length, using each of the three different interview modes – traditional keypad audio-CASI, touch screen audio-CASI, and interviewer administered questioning. Each participant received all three modes and all three questionnaire segments. Respondents were informed that they would receive the same questions in the same order, however, the assignment to mode sequence would vary across subjects, resulting in random assignment to one of six unique mode-segment sequences (See Figure 2). The questionnaire collected information on recent sexual activities; knowledge and history of sexually transmitted diseases and related symptoms; and alcohol and drug use.

Respondents and interviewers were matched by gender. Interviews were administered in a private location in the clinic. A `practice session' was conducted at the start of each interview, to introduce respondents to each of the three interview modes. The practice session consisted of responding to six `non-sensitive' demographic questions, with the interviewer present to provide assistance as needed. At the completion of the practice session, the remainder of the questionnaire was presented according to one of the six possible mode sequences.

In both keypad audio-CASI and touch screen audio-CASI, questions and their associated response categories were presented visually on the computer screen as well as aurally through the computer headphones. In the keypad audio-CASI mode, the appropriate response was entered by pressing the numerical proxy key on the computer keypad. In touch screen audio-CASI, the appropriate response was entered by pressing the colored box associated with that response on the computer screen. During administration of the audio-CASI modes, the interviewer moved across the room where it was not possible to view the computer screen. In the interviewer-administered mode, the interviewer read the questions and the response categories as they appeared on the computer screen, and recorded the subject's verbal responses by pressing the appropriate number key on the laptop's keypad.

Following completion of the questionnaire, the interviewer orally administered a qualitative debriefing interview to collect information on subjects' reactions to the audio-CASI and interviewer-administered procedures, the perceived privacy of the interview modes, the sensitivity of the survey questions, and mode preferences. These results are reported below.

Feasibility and Subjects' Reactions to Interview Mode

For subjects who reported a mode preference (101 of 108), 51 percent preferred the touch screen audio-CASI, compared to 26 percent who preferred the keypad audio-CASI, and 23 percent who preferred the interviewer-administered mode. When asked to compare the two computer procedures only, over two-thirds of respondents (71 of 102, or 69.6%) reported that touch screen was easier to use than the traditional keypad audio-CASI. While respondents noted the touch screen technology was more innovative and "fun" to use than

traditional audio-CASI, they also viewed it as a more private interview mode. One-half (49.1%) of respondents reported touch screen as more private, compared to 27 percent who reported traditional audio-CASI and 23 percent who reported no difference in privacy between the two computer methods.

Respondents were also asked in which mode they felt more comfortable reporting their answers – either to the interviewer or the computer – and whether they were more truthful in one procedure compared to the others. The majority of respondents (94 percent) reported that interview mode had no effect on the truthfulness of their responses. And although the majority of respondents (56%) reported that interview mode had no effect on how comfortable they felt completing the survey questions, 36 percent reported that they were more comfortable using the computer, compared to 7 percent of patients who preferred reporting to the interviewer.

The survey questionnaire administered in this pilot study was designed for completion in approximately 30 to 35 minutes. When asked what mode would be best if completing a one-hour questionnaire, 49 percent of respondents indicated the touch screen, 26 percent reported they would prefer keypad audio-CASI, and 22 percent chose interviewer-administered.

Reporting of Sensitive Behaviors

Given the small sample size, our measurement of differences in reporting of sensitive behaviors by mode of interview is limited. Results suggest that for certain behaviors that may be considered sensitive in this clinic population, for example, having multiple sex partners within the past 30 days, a one-night stand, or a partner who has other sex partners, higher reporting may be observed in the computer modes. For other `sensitive' behaviors, however, as well as for behaviors that may not be considered stigmatized in this population (e.g., ever use of alcohol or marijuana), patients were as likely to report those behaviors to the interviewer as in a computer mode. Furthermore, the data did not suggest differences in reporting between the two audio-CASI modes.

Results from this small experimental study of clinic patients are being used to inform the design of a larger, cross-sectional clinic-based study. The sample will include 1,800 patients ages 15 to 39. Subjects will be asked to complete a 40 to 45 minute questionnaire on sexual and other STD risk behaviors.

6. Conclusion

Touch screen audio-CASI provides several theoretical advantages to conventional keyboard based audio-CASI in obtaining more accurate answers to measures of sensitive behaviors. However, additional studies collecting data from representative populations of sufficient size and in different cultural settings, using both modes with the same instrument, are required to properly assess the potential advantages of the touch screen environment.

The results from our preliminary investigation of the feasibility of the touch screen technology within a clinic based population suggests that touch screen is preferred by a majority of clinic patients. Respondents reported that the touch screen platform is easier to use and more private than either of the alternative approaches. Our findings relevant to perceived privacy are somewhat surprising because the larger response areas on the screen that promote more accurate keying responses would also suggest that the screen may be easier to view by a non-respondent. Nonetheless, the respondents' perception of privacy holds promise for improving measurements of sensitive behaviors and hence improving the quality of behavioral research. An assessment of the magnitude of these potential benefits to

survey interviewing and the quality of the resultant data should be the focus of additional research.

Acknowledgments

REFERENCES

Cooley PC, Turner CF. Implementing audio-CASI on Windows platform. Computers In Human Behavior. 1998; 14:195–207.

Cooley PC, Miller HG, Gribble JN, Turner CF. Automating telephone surveys: using T-ACASI to obtain data on sensitive topics. Computers In Human Behavior. 2000; 16:1–11.

Duffer, AP.; Lessler, JT.; Weeks, MF.; Mosher, WD. Impact of incentives and interviewing modes: Results from the National Survey of Family Growth Cycle V pretest. In: Warnecke, R., editor. Health Survey Research Methods: Conference Proceedings. National Center for Health Statistics; Hyattsville, MD: 1996. DHHS Pub No. (PHS) 96-1013

Hendershot, TP.; Rogers, SM.; Thornberry, JP.; Miller, HG.; Turner, CF. Multilingual Audio-CASI: Using English-speaking interviewers to survey elderly Korean-speaking households. In: Warnecke, RB., editor. Health Survey Research Methods: Conference Proceedings. National Center for Health Statistics; Hyattsville, MD: 1996. DHHS Pub No. (PHS) 96-1013

Miller, HG.; Gribble, JN.; Rogers, SM.; Turner, CF. Abortion and breast cancer risk: Fact or artifact?. In: Stone, Arthur, editor. Science of Self Report. Lawrence Erlbaum Associates; Mahwah, NJ: 1999.

O'Reilly JM, Hubbard ML, Lessler JT, Biemer PP, Turner CF. Audio and video assisted self-interviewing: Preliminary test of new technologies for data collection. Journal of Official Statistics. 1994; 10:197–214.

Turner, CF.; Lessler, JT.; Devore, J. Effects of Mode of Administration and Wording on Reporting of Drug Use. In: Turner, CF.; Lessler, JT.; Gfroerer, JC., editors. Survey Measurement of Drug Use: Methodological Studies. Government Printing Office; Washington D.C.: 1992. DHHS Pub. No. ADM-92-1929

Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer survey technology. Science. 1998; 280:867–873. [PubMed: 9572724]
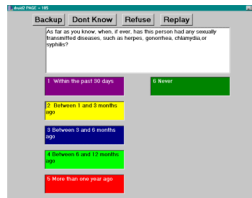
Figure 1.
Example of a categorical question implemented on a touch screen audio-CASI platform.

Sequence	Mode of Administration		
	Segment 1	Section 2	Section 3
1	Key	Interviewer	Touch
2	Key	Touch	Interviewer
3	Interviewer	Key	Touch
4	Interviewer	Touch	Key
5	Touch	Interviewer	Key
6	Touch	Key	Interviewer

Figure 2.
Sequence Matrix