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ORIGINAL ARTICLE

Comparability of a Computer-Assisted Versus Written Method for Collecting Health Behavior Information From Adolescent Patients

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Purpose: **To investigate the comparability of health behavior data obtained from adolescents via notebook computer versus those obtained via written questionnaire.**

Methods: **We interviewed adolescent patients (ages 13–20 years) receiving services at community adolescent health clinics. Participants anonymously completed either a computer-assisted self-interview (CASI) or a self-administered questionnaire (SAQ), both assessing health-protective behaviors, substance use (i.e., tobacco, alcohol, marijuana) and sexual behaviors. From a pool of 671 adolescent participants (348 completing CASI, 323 completing SAQ), we matched 194 SAQ participants with 194 CASI participants on the basis of gender and race. We could not match individually on the basis of age, but were able to match each gender–race subgroup by mean age.**

Results: **Across the majority of health behaviors (i.e., all health-protective behaviors, tobacco use, sexual behaviors), mode of administration made no significant difference in the reporting of information by adolescents. However, girls reported a greater frequency of alcohol use and marijuana use on CASI than on SAQ, whereas boys reported a lower frequency of alcohol use and marijuana use on CASI than on SAQ.**

Conclusions: **The findings of this study suggest that there may be gender-related differences between modes of anonymous collection of specific adolescent health behaviors such as alcohol and marijuana use. Future studies should incorporate direct questions regarding adolescents' attitude and comfort levels toward completing different modes of data collection.** © ***Society for Adolescent Medicine, 1999***

KEY WORDS:
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Over the past several years, there has been increasing use of computer-assisted self-interviews (CASI) for data collection in health-related research (1–11). Advantages of CASI over self-administered questionnaires (SAQ) include: (a) avoidance of data entry errors by automatically compiling responses into a database, (b) reduction of confusion because only one item is presented at a time, (c) conditional branching requiring no effort on the part of the respondent because it can be programmed into CASI, and (d) greater protection of confidentiality and conservation of resources because no written record exists. In addition, a number of studies with adults and adolescents have indicated that many participants enjoy CASI more than SAQ (6,12–15).

An unresolved issue is the comparability of data derived from CASI versus SAQ. CASI consistently results in greater reporting of sensitive behaviors compared to face-to-face techniques, suggesting minimization of social desirability bias with CASI (9–11). However, as CASI and SAQ are both self-adminis-

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tered techniques, systematic comparisons between them must be conducted to specifically assess the differential rates in the reporting of sensitive behaviors by participants.

For research investigating the use of CASI with adolescent samples, it has generally been found that respondents prefer the CASI over the SAQ (12–15). For example, in a survey of sexual behaviors, Millstein and Irwin (13) randomly assigned a sample of adolescent girls to either a CASI condition, an SAQ condition, or a face-to-face interview. They found that subjects preferred CASI and that subjects in the CASI group denied sexual activity less frequently than participants in other conditions. In addition, two more recent studies indicate increased reporting of some sensitive behaviors (i.e., certain kinds of drug use and sexual behaviors) on CASI compared to SAQ techniques (15,16).

Although these studies provide data regarding the acceptability and reliability of CASI in the assessment of some health behaviors of adolescent subjects, current information is limited in several ways. First, some studies have not compared computer-assisted interviews with other self-administered techniques (12). Second, other studies have only included adolescent girls reporting sexual behaviors (13). Only a limited number of investigations have included a significant number of adolescent boys in the subject sample (15,16). Finally, computer technology has advanced over the past 15 years since the Millstein and Irwin study (13) which used computerized methods that are primitive by today's standards (i.e., cathode ray tube terminal, similar in appearance to a television screen) and the research was conducted at a time when computers were novel to the general public. With computer technology now likely to be more familiar to adolescents, the use of a notebook computer in the present study represents a current technologic advance. To date, only one study has systematically compared current methods for anonymously collecting data about a wide range of specific adolescent health behaviors (16).

Therefore, the purpose of our study was to investigate the comparability of a wide range of health behavior data obtained via notebook computer versus data obtained via written questionnaire from adolescent patients at urban health care clinics.

Methods

Procedures and Sample

We surveyed lower-socioeconomic-status adolescents receiving services at adolescent health clinics located in urban neighborhoods. Participants (ages 13–20 years) were recruited at the time of scheduled clinic visits by a research associate. The ability to read English was a criterion for participation in the study. However, no subjects had to be excluded owing to an inability to read. Data collection occurred between January 1995 and May 1996. Written informed consent was obtained from each adolescent. Parental consent was not required since the majority of adolescents use the clinics for confidential health care. The study was approved by the university's institutional review board.

Participants completed either a CASI (via notebook computer) or an SAQ. The participants were not randomly assigned to mode of administration because only one notebook computer was available and several participants completed surveys at each clinic session. During data gathering, a participant was assigned to a CASI if the notebook computer was available. If the notebook computer was in use by another participant, newly recruited participants were assigned to SAQ.

Measures

Computer-assisted self-interview was developed through the utilization of the Sawtooth Software's system for Advanced Computer Interviewing (Ci3) (17). Survey items measured health-protective behaviors, substance use, and sexual behaviors and were identical across modes of administration. These items were adapted from an established large-scale survey research study of adolescents (18,19).

Health-protective behaviors that were assessed included seat belt use, physical activity, and attention paid to eating habits. Seat belt use was assessed with two items measuring the frequency of use while going short distances and during highway driving (1 = "Never" to 5 = "Always"). This subscale yielded an alpha of .88, which is an indicator of good reliability. Physical activity level was measured with two items addressing physical fitness and ability to play at active sports (1 = "strongly Disagree" to 6 = "strongly Agree"). This subscale revealed an alpha of .69, which indicates adequate reliability. Attention to eating habits was evaluated with three items measuring the amount of attention paid to eating fresh vegetables and limiting the amounts of salt and fat consumed (1 = "none" to 3 = "a lot"). This subscale revealed an alpha of .60, which indicates adequate reliability for a three-item subscale. Substance use was measured by five items addressing alcohol and marijuana use. Alcohol use was assessed by three

items which measured the frequency of drinking over the past 3 months (1 = "Not at all" to 5 = "Every day"), quantity usually consumed during each episode of drinking over the past 3 months (1 = "I didn't drink at all"; 2 = "One can of beer, glass of wine or drink of liquor"; to 5 = "Six or more cans"), and frequency of high-volume drinking of beer, wine, or liquor (five or more drinks per episode; 1 = "Never"/"I didn't drink at all" to 4 = "Once a week or more"). Marijuana use was measured by two items which assessed the frequency of marijuana use over the subject's lifetime (1 = "Never" to 5 = "Very often") and frequency of marijuana use over the past 3 months (1 = "Never" to 5 =1 "About every day"). The five-item substance use scale had very good reliability ($\alpha = .84$). Cigarette use was measured by one item which assessed the amount of cigarettes smoked on an average day (1 = "None" to 5 = "Two packs a day or more"). Sexual behaviors were assessed by two items which measured participation in sexual intercourse (1 = "Yes"; 2 = "No") and condom use over the past 3 months (1 = "Never" to 5 = "Always"). Condom use was only evaluated for those subjects who reported that they had engaged in sexual intercourse.

Of 681 subjects recruited, 671 (98%) agreed to participate (348 completing CASIs, 323 completing written surveys). We matched 194 written survey participants with 194 CASI participants on the basis of gender and race. We could not match individually on the basis of age, but were able to match each gender–race subgroup by mean age.

Statistical Analysis

Data analyses were conducted using SPSS for Windows (20). The principal analytic method was multivariate analysis of variance (MANOVA). Since we were interested in patterns of findings across domains, each domain of items was analyzed by a four-way MANOVA: Administration Mode (CASI, written) × Gender (male, female) × Race (non-Hispanic white, African-American) × Age group (13–16 years old, 17–20 years old). Although we matched the administration groups on gender, race, and mean age, they were included in the MANOVAs to evaluate potential interaction effects (e.g., Gender × Age). Four domains of dependent variables were evaluated: substance use (five items measuring alcohol and marijuana use), seat belt use (two items), physical activity (two items), and eating habits (three items). If overall multivariate analyses were found to be significant, we report also the significant univariate analyses. Cigarette smoking was analyzed by a four-way ANOVA rather than a MANOVA because it was measured by a single item. The two dichotomous items (participation in sexual intercourse and condom use at last intercourse) were analyzed by Chi-square tests. Twelve Chi-square tests were conducted, investigating both modes of administration across each of the two levels of the other three independent variables (Gender, Race, and Age group).

Results

Sample Demographics

There were 194 subjects in each administration group (CASI vs. SAQ). Eighty-one percent of each group was female ($n = 158$) and 76% was African-American ($n = 147$). The mean age of the SAQ participants [mean (M) = 16.02 years; standard deviation (SD) = 1.49] was similar to the mean age of the CASI participants ($M = 16.03$ years; SD = 1.60).

Effects Involving Mode of Administration

Substance use. The MANOVA for susbtance use resulted in a significant two-way interaction between mode of administration and gender (Wilks' lambda = 0.97; $df = 5,368$; $p < .05$). Univariate analyses for each of the five items assessing frequency of alcohol use and frequency of marijuana use also yielded significant interactions between mode of administration and gender (all p's $< .05$). The pattern of findings was consistent across analyses. Girls reported a greater frequency of alcohol use and marijuana use on CASIs than on SAQs, whereas boys reported a lower frequency of alcohol use and marijuana use on CASIs than on SAQs. Table 1 shows mean scores on substance use items broken down by mode of administration and gender. No other statistically significant four-way, three-way, or two-way interactions were found. A significant main effect for race was obtained (Wilks' lambda = 0.93; $df = 5,368$; $p < .001$). Univariate analyses revealed a significant main effect of race on quantity of alcohol consumed over the past 3 months ($F = 10.31$; $df = 1,372$; $p < .001$). White participants reported a greater frequency of alcohol consumed over the past 3 months than African-American participants. No other statistically significant main effects were found.

There were no significant mode of administration effects for any other health behavior domains.

Table 1. Mean Scores on Substance Use Items for Male and Female Adolescents Across Administration Conditions*

	SAQ†		CASI‡	
Substance Use Items	Boys	Girls	Boys	Girls
Frequency of drinking	1.58	1.44	1.31	1.67
Quantity consumed	1.39	1.54	1.33	1.79
High-volume drinking	1.39	1.28	1.28	1.55
Marijuana use (lifetime)	2.75	2.30	1.92	2.54
Marijuana use (3 mo)	2.83	1.84	1.86	2.12

* MANOVA for substance use: Wilks' lambda = 0.97; $p < .05$.
†SAQ = written self-administered questionnaire.
‡CASI = computer-assisted self-interview.

Effects Involving Only Demographics

Seatbelt use. The MANOVA revealed a significant three-way interaction for gender, race, and age group (Wilks' lambda = 0.98; $df = 2,371$; $p < .05$). Univariate analyses revealed a statistically significant interaction of gender, race, and age group on seat belt use on the highway ($f = 6.92$; $df = 1,372$; $p < .01$). Overall, older (17–20 years old) white boys and younger (13–16 years old) white girls reported greater frequencies of seat belt use on the highway than the other groups of participants. No other significant four-way, three-way, or two-way interactions were yielded. A significant main effect for race was revealed (Wilks' lambda = 0.98; $df = 2,371$; $p < .05$). Univariate analyses indicated a significant main effect of race on seat belt use on the highway ($f = 8.02$; $df = 1,372$; $p < .005$). White participants reported a greater frequency of seat belt use on the highway than African Americans. No other statistically significant main effects were found.

Physical activity and eating habits. The MANOVA analyses revealed no statistically significant four-way, three-way, or two-way interactions, or main effects for either of these two domains.

Cigarette use. The four-way ANOVA revealed a statistically significant two-way interaction between gender and race ($f = 12.81$; $df = 1,372$; $p < .001$). A significant main effect for gender was also found ($f = 5.56$; $df = 1,372$; $p < .05$). White female participants reported a greater frequency of cigarette use than the other groups. No other statistically significant four-way, three-way, two-way interactions, or main effects were revealed.

Participation in sexual intercourse and condom use. The Chi-square tests revealed no statistically significant effects for either of these two items.

Discussion

For the majority of health behaviors assessed, including sexual behaviors, we found that mode of administration of questionnaire had no significant effect on adolescents' responses. The principal finding of this study, therefore, is that the use of CASI compared to SAQ did not increase accuracy of self-report for most health behaviors. This finding is consistent with prior research (13–16). However, for some sensitive health behaviors (i.e., alcohol use, marijuana use), gender-related differences were found between the assessment conditions. Specifically, adolescent boys tended to report a greater frequency of alcohol and marijuana use on written surveys than on CASIs; in contrast, adolescent girls tended to report a greater frequency of alcohol and marijuana use on CASIs than on written surveys. This particular set of findings contrasts with the results of a study conducted by Paperny and colleagues (15), which revealed that adolescent boys reported a significantly greater frequency of alcohol and marijuana use on CASIs than on written surveys, whereas the frequency of reported alcohol and marijuana use by adolescent girls did not significantly differ across mode of administration. However, the design of Paperny and colleagues' study included adolescent subjects who were directed to share the results of their reporting of sensitive health behaviors with clinicians. In addition, there were socioeconomic differences between subjects in these studies. Only about 10% of the families of adolescents in the study by Paperny et al. were receiving public assistance (15) compared with 50% of those in our study. Attitudes about CASI methodology may vary on the basis of economic status, which may be reflective of experience with computers. Further research will be necessary to clarify whether our findings can be substantiated in other settings and subject populations.

Turner et al. compared adolescents' reports of

health behaviors on SAQ compared to audio-CASI (A-CASI), a technique in which the computerized survey is further enhanced by enabling respondents to hear digitally recorded questions and response choices over headphones, thus minimizing the negative effects of literacy problems (16). A-CASI resulted in significant increases in the reporting of only the most sensitive health behaviors, such as male–male sexual contact and injection drug use. As in our study, mode of administration had no overall effect on the reporting of sexual intercourse, condom use, alcohol consumption, or marijuana use.

One possible explanation for the gender-related differences between the administration conditions for assessment of alcohol and marijuana use is that the reporting of increased levels of substance use may imply greater accuracy across gender. The findings would suggest that the female adolescents may have been more honest on CASIs and male adolescents may have been more honest on written surveys. For example, some male participants completing CASIs for the present study spontaneously asked about linkages to the Internet, possibly indicating some suspiciousness about this computerized method of data collection. However, this speculation can only be tested through direct questioning of attitudes and comfort level toward the collection of data via CASIs.

An alternative explanation for the gender-specific effects is based on the assumption that CASIs minimize the social desirability bias across gender. In this case, the findings would suggest that boys may be over-reporting alcohol/marijuana use and girls under-reporting these behaviors on the written surveys. Therefore, across gender, CASIs may be a more accurate method of gathering sensitive health behavior data. Further research focusing on adolescents' attitudes and beliefs about CASI methods may help to clarify which of these explanations is correct.

Although sexual behavior questions have also been identified as more sensitive topic areas, along with alcohol use and marijuana use (13–15), our results did not reveal the same gender-based effects. However, the majority of adolescents in our study were attending the health clinics for sexuality-related services (e.g., diagnosis and treatment of sexually transmitted disease and contraceptive services). As a result, inquiries about sexual behaviors may not have been perceived as sensitive questions. Therefore, the finding that mode of administration had no significant differential effect on the reporting of sexual behaviors is not surprising.

There are several limitations to this study. First, A-CASI was not employed in this investigation. More research, similar to the work of Turner et al. (16), is needed to evaluate A-CASI in the collection of adolescents' health behavior information to determine its effect on the reporting of health behaviors. Second, we used no random assignment procedure in placing study participants into either the CASI or the written survey group. Potential demographic biases were controlled by matching on gender, race and mean age. However, it is possible that some inadvertent biases were introduced during subject recruitment that may have influenced the results. Further research may help to clarify this issue. Also, we did not compare two methods with each subject acting as his or her own control. Finally, the generalizability of the present study's findings to other adolescent populations is limited owing to the sample consisting of a specific subset of urban adolescents in midwestern adolescent health clinics having appointments for issues related to sexual behaviors.

Given the increasing use of computers as research tools, the findings of the current study suggest that it will be important to continue to investigate adolescents' attitudes about revealing sensitive information on computer-based surveys. Future research should integrate direct questions regarding adolescents' attitudes and comfort levels toward completing different modes of administration (i.e., computer-based surveys vs. written surveys). These questions could be focused upon both the technology and the security of computer-acquired data (e.g., Internet issues). Such research conducted with other adolescent populations will be necessary to facilitate the generalizability of the present study's findings.

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