Use of a Computer-Based Health Risk Appraisal by Older Adults

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Background. A health risk appraisal (HRA) is a tool for health promotion. Conversational microcomputer-based HRAs may be more cost effective than other HRA formats. The acceptability of conversational HRAs, however, has not been demonstrated for older adults.

Methods. We studied the acceptability of a conversational microcomputer-based HRA in a sample of 247 adults at the Minnesota State Fair and the Senior Options Exposition. All users were offered the appraisal via mouse or keyboard interface. Acceptability was measured in terms of user-reported helpfulness, intent to change, time of use, and willingness to view HRA health recommendations. Data on completion time and willingness to view HRA recommendations were collected for Senior Exposition users only. Regression analyses were used to examine the combined impact of interface (mouse or keyboard), location (State Fair or Senior Exposition), age, and sex on user acceptability.

Results. Interface and location had no effect on helpfulness or change ratings. Older users rated the appraisal more helpful ($P < .007$). Both older and female users reported more intent to change behavior ($P = .016$, both). Time to use the appraisal was related to interface, age, and sex. Mouse users ($P < .0001$), older users ($P < .0001$) and female users ($P < .05$) took significantly longer to use the appraisal. Significantly more mouse users declined to see recommendations ($P < .02$).

Conclusions. Older users can derive as much or more value from conversational health risk appraisals as younger users; however, a mouse interface may be less effective for this age group.

Key words. Health status indicators, aged; user-computer interface.
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A health risk appraisal (HRA) is a tool for health promotion. The HRA estimates a person's risk of dying within a given period of time based on his or her age, self-reported health behaviors, and health risk history. There are several different types of HRA; the method used here draws on "survival advantage" estimates by the US Public Health Service. These relate individual risks to the life expectancy for an age- and sex-matched population. The Public Health Service estimates draw on the Framingham and other epidemiological studies for the level of risk to attribute to particular factors.

The HRA is based on several assumptions[1]:

1. Given the age, sex, and race of an individual, it is possible to determine from mortality statistics the probable causes of death for that individual over the next 10 years, and the risks (probabilities) of dying from each one.

2. Epidemiological studies have shown that certain risk factors have a quantifiable effect on the risk of dying of particular causes. Using these data, and additional information about an individual's risk factors such as personal habits and physiological measures, one can recalculate an individual's risk of dying in the next 10 years, compute a new total mortality, and determine a "health risk age" (age that corresponds to this new mortality estimate).

3. Knowing the relation between each risk factor and each cause of death, the effect of eliminating a changeable risk factor is calculated, and a new "achievable health risk age" is determined. These calculations permit numeric mortality values to be assigned to each risk for each disease.

In the late 1970s, John Raines developed University of Minnesota Health Risk Appraisal (UM-HRA) for the microcomputer.[2,3] This conversational computer pro-

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gram asks questions of the user and provides immediate feedback based on the answers to those questions, as if the computer and user were conducting a dialogue. The UM-HRA may ask up to 33 questions of a user, emphasizing modifiable risk factors such as smoking, alcohol consumption, wearing seat belts, and use of screening procedures, for example, Papanicolaou smears and mammography. It offers recommendations both on the computer screen as the questions are asked and in a printed report produced at the end of the session.

The latest update to HRA algorithms was released by the Carter Center of Emory University in 1988, as part of their Healthier People Project.[4] The current version of the conversational UM-HRA[5] has been revised based on the questions and algorithms of the 1988 HRA update and can be obtained from the University of Minnesota.* An example of a printed report from the current version of the UM-HRA is shown in Figure 1.

Health risk appraisals have been criticized on a number of grounds primarily related to the validity of using the underlying epidemiologic data to provide personalized risk estimates and the statistical method for risk computation. However, HRAs are among the few ways to document personal threats to an individual's health and are increasingly popular tools in health education and patient counseling. More work is needed on how to maximize the effectiveness of this new technology.[6]

The most appropriate target population for an HRA has not been determined. The Carter Center of Emory University recommends its use most highly for persons 20 to 60 years old. It is of limited use for young adults; a 19-year-old does not necessarily wish to achieve a health risk age of 12 years. Older adults, however, may be unnecessarily excluded. Kemper[7] notes that health promotion for seniors is probably more rewarding and more cost-effective than for any other age group. Older adults make health a high-priority aspect of their lives, and often appear more receptive to educational services. Since older adults have three times the per capita health care expenditure of people under 65 years, a 10% reduction in health care costs for a senior is equivalent to a 30% reduction in costs for the average nonsenior.[7] Thus, health promotion efforts, including health risk appraisals, may be very valuable for older adults.

Given that older adults may benefit from a health risk appraisal, the acceptability of computerized, conversational HRAs by an aged population was studied. Acceptability was measured in terms of user-reported helpfulness of the appraisal, intent to change behavior based on the appraisal, time of use, and willingness to see HRA health recommendations.

The University of Minnesota Health Risk Appraisal

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University of Minnesota
Division of Health Computer Sciences
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The risk of an average 55 year old male
during the next 10 years compared to you, Frank:

Cause of death                  Average   You

Heart Attack.................     4720 12301
Lung Cancer..................     1951  3883
Stroke.......................      649  1926
Emphysema/Bronchitis.........      513   672
Cirrhosis of Liver...........      488   488
Colon Cancer.................      384   384
Artery Disease...............      244   244
Pancreas Disease.............      242   242
Diabetes Mellitus............      242   242
Hypertensive Disease.........      236   236
All other causes                 6091  6091
                                 -----  -----
         Deaths per 100,000     15760 26711

Your actual age is   55
and your appraised age is  62 .
Your health risk is above average.

Suggestions for reducing your risks:

Action...                          Reduction

Stopping smoking cigarettes.....   10950
Decreasing blood pressure.......    1613
Decreasing cholesterol level....     695
Stopping alcohol use............     244

If you just want to try changing one of
these at a time, begin with the ones
with the biggest numbers.

If you followed all of the above suggestions,
your new appraised age would be  53 .

     Good Habits

          Good Physical Activity Level
          Excellent Self-Reported Health
          Low Violence Risk

     Discuss this appraisal with a health person
for more information on good habits and health risks.
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Figure 1. Printed report generated by the University of Minnesota Health Risk Appraisal for Frank, a hypothetical 55-year-old male user who smokes cigarettes, drinks alcoholic beverages, and has hypertension and hypercholesterolemia.

Methods

Subjects and Sites

The revised UM-HRA (version 2.0) was made available in two locations. At both, the appraisal was available to participants at no charge, and no one was required to use it. One location was the Senior Options Exposition in October 1989, where the UM-HRA was available for 10

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Table 1. Age and Sex of UM-HRA Users at the Two Study Sites

	Age Group (y)					Median
	<20	20–39	40–59	≥60	Total	Age (y)
Number	19	49	71	108	247	56
% Female	63	61	62	68	64	—

UM-HRA denotes University of Minnesota Health Risk Appraisal computer program.

hours on each of 2 days. In preparation for the Senior Options Exposition, the system was tested at the University of Minnesota exhibit in the Education Building of the Minnesota State Fair in August 1989, for 4 hours on each of 3 days.

Procedures

The UM-HRA was available on an IBM PC (input only from keyboard) and a Macintosh Plus computer (input only from mouse), each with an impact printer, at both study sites. Users queued in one line to use the UM-HRA, and were directed to the first available machine.

All users entered their own data into the computer. The UM-HRA was customized to collect individual user demographic information (age, sex), and the user's answers to one helpfulness question ("How helpful was this appraisal for you?") and one intent-to-change question ("Will you change any living habits based on this appraisal?"). In addition, start time, whether the user opted to see recommendations, and time up to the recommendation choice question, were collected on each individual in the Senior Options Exposition sample.

The impact of user interface (keyboard or mouse), study site, subject age, and subject sex on self-reported helpfulness was analyzed using multiple linear logistic regression for ordinal responses (SAS/PC [Statistical Analysis System, SAS Institute, Cary, NC]). The impact of these variables on self-reported intent to change and time to complete the appraisal were analyzed using multiple regression (SPSS/PC [Statistical Package for Social Sciences, SPSS, Inc, Chicago]). Adequacy of the regression models was confirmed by graphic techniques (multiple regression) and by the score test statistic (logistic regression). Willingness to view recommendations was analyzed using chi-square tests (SPSS/PC). Results were considered statistically significant at $P < .05$.

Results

The study population (Table 1) consisted of 247 adults who used the UM-HRA, version 2.0, at two study sites: the Senior Options Exposition (n = 142) and the Minnesota State Fair (n = 105). The overall population had a median age of 56 years and was 64% female. Senior Exposition users had a median age of 66 years and were predominantly (71%) female. At the Minnesota State Fair, in contrast, the user sample had a median age of 36 years and were about equally divided between male and female participants (56% female).

Table 2. 'How Helpful Was This Appraisal for You?'

Response	Age ≥ 60 y No. (%)	Age < 60 y No. (%)
1. Not helpful	2 (2)	3 (2)
2. Slightly	7 (6)	27 (20)
3. Moderately	27 (25)	52 (37)
4. Very helpful	72 (67)	57 (41)
Total	108 (100)	139 (100)

$\chi^2 = 18.0$, df = 3; P < .0001; consistent with multiple logistic regression analysis.

The helpfulness and intent-to-change responses are shown in Tables 2 and 3 for older (≥60 years old) and younger (<60 years old) users. User interface, sex, and study site were not related to helpfulness. The appraisal was rated significantly more helpful by older users ($P = .007$). Both older users and female users were more likely to intend to change behavior ($P = .016$, both). Overall, however, the four variables, user interface, subject age, subject sex, and study site, accounted for only 8% of the observed variability of intent to change, suggesting that other factors have more importance for this response.

Time to use the appraisal was measured at the Senior Options Exposition study site (n = 142). The average time from start to the option of viewing the health recommendations was 8.8 minutes for the 61 keyboard users and 11.8 minutes for the 81 mouse users. Multiple regression analysis was used to model time with adjustment for age and sex of the users. The user interface was highly significant ($P < .0001$). Increased age was also associated with longer times ($P < .0001$), as was female sex ($P < .05$). These three variables (user interface, subject age, and subject sex) accounted for 31% of the variability of the time to use an appraisal. Significantly

Table 3. 'Will You Change Any Living Habits Because of This Appraisal?'

Response	Age ≥ 60 y No. (%)	Age < 60 y No. (%)
1. Definitely not	6 (6)	7 (5)
2. Probably not	30 (28)	53 (38)
3. Perhaps	22 (20)	49 (35)
4. Probably yes	36 (33)	19 (14)
5. Definitely yes	14 (13)	11 (8)
Total	108 (100)	139 (100)

$\chi^2 = 18.7$, df = 4; P < .0001; consistent with multiple logistic regression analysis.

more mouse users (9.8%) than keyboard users (1.2%) declined to see the suggested recommendations (chi-square test, $P < .02$).

Discussion

When the first UM-HRA was introduced 10 years ago, perhaps some were attracted to it more for its novelty than its educational purpose. In the intervening years it has become an accepted health education tool, eligible for reimbursement by third-party payers. The UM-HRA has been shown to increase patient health knowledge in a family practice setting (unpublished data, P. Greenwood, L. B. M. Ellis, C. R. Gross, July 1991).

The UM-HRA's helpfulness or intent-to-change ratings have remained strong based on reports from similar samples in 1980 and 1989.[2,8] These reports were on working-age people, however, and these findings cannot necessarily be generalized for older adults. Indeed, little has been reported on health risk appraisal for older adults. This may be due in part to ageism. As Somers et al[9] have noted, little attention has been paid to health promotion for the elderly because of attitudes shared by the public and professionals that, for people over 65 years, it is "too late," and that the elderly should enjoy what little time they have left without any outside intervention to change their lifestyle or behavior. Acknowledging that public attitudes are changing, these authors advocate initiating health promotion and preventive services specifically for the elderly.[9]

Consistent with this call for increased health promotion for the elderly, we found that computerized, conversational HRA use by older adults was a positive experience. The older subjects in this study found the process helpful and reported intent to change behavior after directly entering data into and receiving output from a health risk appraisal program. The UM-HRA appears to be most helpful to older women, and they also report a higher intent to change behavior based on the appraisal.

Despite the proliferation of computer input devices, much work remains to sort out which devices are best for particular tasks and users.[10] The usual wisdom is that a pointing device such as a mouse is faster than a keyboard, but this depends on the task involved and the dexterity and hand-and-eye coordination of the user. In this study we noted that individuals with hand tremors had more difficulty using a mouse than a keyboard. Muscular strain is low for keyboards.[10] The mouse may not be an improvement over the keyboard for our application.

Older users made more effective use of the appraisal when the user interface was a keyboard rather than a mouse. Their time to complete the appraisal was significantly faster, and significantly more of them took the time needed to view optional recommendations at the end of the appraisal session. Mouse users on occasion chose to end their already lengthy interaction by declining to view these recommendations. Thus, the potential for positive educational impact was greater when the keyboard interface was used.

A touchscreen version of the UM-HRA may eliminate many of the interface problems found with the mouse, and deserves consideration for older users. A recent conversational computerized questionnaire on the intake of high fat foods was evaluated comparing mouse and touchscreen versions.[11] Subjects using the touchscreen completed the questions significantly more quickly (3.2 vs 4.1 min, $P < .0001$) and rated the ease of use significantly higher ($P < .0001$). The touchscreen also eliminated the significant correlation between age and completion time found with mouse use.

Conclusions

Health risk appraisals are an interesting tool for the physician or other health care provider concerned with preventive care. When offered in a conversational format, HRAs are rated helpful and can increase the user's intent to change behavior. Exactly how they are best used in different populations to motivate change and to exert an impact on knowledge and behavior is still under active investigation.

When studying HRA use with older adults, it is important to remember that the elderly are changing. As Dychtwald[12] notes, "With each passing day, the average older American grows healthier, better educated, more politically savvy, more accustomed to life-style change, more mobile, more youthful in appearance, more comfortable with technology, and more outspoken." Thus, the new technology of health risk appraisals becomes relevant to more older users every day.

Conversational health risk appraisal programs that require users to enter their own data are often thought of as especially suitable for younger users. This study indicates that older users can derive as much or more value from such appraisals, especially if given an appropriate user interface.

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