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ABSTRACT

The Body Awareness Resource Network (BARN) is a system of interactive computer programs designed to provide adolescents with confidential, nonjudgmental health information, behavior change strategies, and sources of referral. These programs cover five adolescent health areas: alcohol and other drugs, human sexuality, smoking prevention and cessation, stress management, and body management. Made available for 5500 adolescents in Madison (Wisconsin) in October 1982, the system was evaluated in the spring of 1984 through questionnaires answered by 383 seventh, 392 ninth, and 253 eleventh graders. Results showed that the use of BARN was related to certain social and psychological characteristics and provided support for the motives in getting adolescents on the BARN system. Seventh graders reported heavy use of BARN (once a month), ninth graders less use, and eleventh graders less still. The BARN example provides encouragement for computer programmers and information campaigners interested in reaching children and adolescents through interactive computer programs. While the adolescents initially come to the programs for a wide variety of reasons, what keeps them on the system is that it meets their information needs. (Tables of findings are included.) (EL)

Why Adolescents Use a Computer-Based Health Information System

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Why Adolescents Use a Computer-Based Health Informatin System

Abstract

Although computerized education and information systems are becoming more and more common, and are heavily used, we do not know whether children and adolescents are using them: 1) to gain information, 2) because the medium is structurally preferable to other media where the same information is available, or 3) simply because the systems are on computers or because of computer graphics and sound effects. After two school years of implementation, students at schools having the Body Awareness Resource Network were surveyed in April, 1984. Adolescents who used the BARN system were somewhat distinguishable from those who did not on the basis of a number of social and psychological characteristics. These provided support for all three motives in getting adolescents on the BARN system, but other variables contributed as well. Once adolescents had used the system, however, the amount of their use was more predictable using the same variables, and information-seeking predominated. When direct self-reports of the three motives are added, substantial variance in amount of use can be predicted, and the information-seeking motive again dominates.

Why Adolescents Use a Computer-Based Health Information System

Now that so many educational and informational computer programs are available for use by children and adolescents, and reported demand for computers is far beyond the abilities of most school districts to purchase enough computers, we should begin to ask why students use these new resources. What motivational and situational factors get students on the computers in the first place, and what keeps them coming back for more? Some use is mandatory, of course, but even in such cases some students will make minimum use while others will use the computers as much as possible. If self-selection is possible from the start, the disparities will be even greater. What is particularly interesting and problematic with computerized information systems is that the reasons for self-selection may be highly variable, and may have little relation to the goals of the system.

Students may turn to these systems because of the content they contain, that is, to seek information. Or, computer use may be a result of finding the computer an easier, more accessible source of information already desired but previously unavailable or only available at too great a cost in time and effort. Computer users may be attracted by the "bells and whistles" attached to many programs: the games, sound effects and graphics designed to make learning fun and make one program outsell another. Finally, since computers are still relative novelties, the computer as a medium may have a lure of its own independent of all of the above.

If the goals that get adolescents to computers and keep them there are quite different from those intended by the programmers, the implications would be unclear but potentially important. Extreme differences in use could contribute to existing knowledge gaps or produce new and quite different ones. Use for different reasons could even produce very different impacts from use of the same programs. But these questions must wait. The first step must necessarily be descriptive: why do adolescents turn to computer-based information systems?

This paper explores this issue of who uses computerized information systems and why they use them in the example of one particular computer system designed to provide health information to adolescents, the Body Awareness Resource Network (BARN).

The Problem

Public information and behavior change campaigns have a rocky history. Typically, we have a more systematic idea of why they fail (e.g., Hyman and Sheatsley, 1947) than how to make sure they succeed (Mendelsohn, 1973). When they do succeed (e.g., Maccoby, et al., 1977), it is only by intensive efforts combining a broad range of theory and experience. But even with extensive preparation and care, a nagging concern is that campaigns are still not reaching enough people, or the right people, or with sufficient impact.

This may be particularly true in health communication, because of its unique circumstances. People probably need help translating their general concerns about their health into specific questions. There are areas of health concern that individuals may be unaware of, and stimulating awareness may lead to many additional questions. Answering questions is also not simply a matter of regurgitating facts from the medical literature, but requires translation -- not just into familiar language, but to speak to the specific situation and needs of the individual. Furthermore, the whole process of questioning and answering must be made as easy and accessible to the individual as possible, avoiding unfamiliar and inhibiting situations and cues ("the doctor is very busy right now").

Further problems arise in trying to meet the health information needs of adolescents. Adolescence is a critical time for exposure to a variety of health risks (tobacco and alcohol use, unwanted pregnancy or sexually-transmitted diseases, automobile accidents, etc.), and for the formation of both

positive and negative health behavior patterns with potentially life-long consequences. While we favor the view that risk-taking experimentation is a normal part of maturation (Baumrind, n.d.; see Jessor & Jessor, 1977, for a contrasting view), it may thus be very difficult to intervene to ward off either short- or long-term negative consequences of such behavior.

For one thing, adolescents often implicitly believe in a sort of "person magic" (Hooper, 1979) or immortality, so that health consequences of their behaviors, especially long-term ones, are of little concern. Thus, adolescents may have fewer questions and be less concerned about their health than are adults. In addition, existing health services for adolescents are generally oriented to symptom treatment or crisis intervention, with much less attention given to health promotion, or to increasing the young person's ability to resist risk-taking. And even when health promotion programs are designed specifically for adolescents, existing media systems often do poorly at delivering the messages, since adolescents' use of mass media is quite different from the general population. Furthermore, while traditional personalized sources of information and assistance (specialized agencies or clinics) are difficult enough for adults to use (investment of time and effort, failures of professionals to respond to the individual), the potential for adult judgment and rebuke makes the necessary self-disclosure very difficult for adolescents. Given all this, adolescent health promotion faces all the usual problems of public information campaigns and more besides.

A Solution

Interactive computer programs may be useful both for health communication in general, and for the specific problems of adolescent health. Programming techniques, such as branching the flow of a program based on individual responses, have the potential to provide considerable personalization and flexibility. Ideally, a health information program would be so interactive and so flexible that no two users would see quite the same things, each getting answers in areas of greatest concern, tailored to fit their particular situation, without wasting time on what is already known. Or the program could build a change plan that takes into account the severity of the problem and the user's particular life stresses. The one-to-one interaction between user and program could provide information when it is wanted (and thus when it will do the most good), instead of when media time or space availability provides a chance encounter. And although providing health information through a computer program is clearly mass communication from the sender's point of view, a user might find the tailoring of information, conversational interaction, control of the interaction flow, and responsiveness to feedback all provide a sense of an interaction that is much more like interpersonal communication, with potential consequences for the results of the computer-user interaction (see Chaffee, 1982, for a discussion of the roles of mass and interpersonal communication).

Besides these general potentials, interactive computer programs seem particularly well-suited for communicating with adolescents about health. For one thing, querying a computer preserves the anonymity that may be very important to adolescents

on topics where adult judgment or retaliation is possible. Anonymity also would allow experimentation with alternate roles and situations that would be embarrassing if not impossible with live information sources. Such "playing" with the system also would allow an adolescent to build up confidence in it gradually before trusting it with his/her own problems. Second, interactive computer programs can be made more easily accessible to adolescents -- through schools, libraries, social centers, etc. -- than are conventional health agencies. Furthermore, adolescents' relative disinterest in health may be at least partially overcome by games-and-graphics features of computer programs, not to mention the lure of computers in and of themselves. These may combine to get the adolescent interacting with information he or she would ordinarily miss or ignore.

The BARN System

Since June, 1981, the W.K. Kellogg Foundation has supported the development, implementation, and evaluation of the Body Awareness Resource Network (BARN), a project of the University of Wisconsin Center for Health Systems Research and Analysis. Our goal from the outset was to produce a system of interactive computer programs that provide adolescents with confidential, nonjudgmental health information, behavior change strategies, and sources of referral -- all placed in a context of responsible decision-making in real life situations. These programs were to cover five adolescent health areas: 1) alcohol and other drugs, 2) human sexuality, 3) smoking prevention and cessation, 4) stress management, and 5) body management.

In assembling a staff to develop the programs, we emphasized health and adolescence experience, rather than previous computer expertise. We did this to ensure that the full force of that adolescent expertise came through in the programs, rather than being attenuated and standardized by expert programmers. To accommodate novices, the BARN system was programmed for the Apple II in SUPER PILOT; even so, programming was very slow and inefficient at first. On the other hand, as the five working groups consulted with national and local experts and with a wide variety of adolescents, the BARN system ended up with many different ways of communicating about health. And as a result of experimentation and negotiation among the working groups, BARNY developed a personality as well: friendly, matter-of-fact, concerned, helpful, a little playful, sympathetic but with a point of view, and always a computer who has heard a lot about humans but remains a little puzzled.

Currently, the BARN system runs on any Apple II with 64K and two drives, one of which always contains a "driver" disk, and the other of which contains the text and graphics for the interaction in progress at the moment (there are at present 16 disks in the system, totalling well over 20 hours of potential interaction). An adolescent sitting down in front of a BARN system is first welcomed by BARNY and asked to type what name he/she would like to be called while they talk. The adolescent then picks one of the five areas from a main menu screen, is told which disk to insert (disk handling instructions are optional, although a disk-handling graphic always appears), and proceeds to the menu or introduction to that topic area. The adolescent has considerable freedom of

choice of subtopics, and may stay with a topic briefly or as long as desired. In general, five different formats are used: games, information systems, interactive interviewing, practice with realistic situations, and decision aids. (see Figure 1 for a sketch of topics in the five areas.)

For example, the Body Management program is built around an adventure game in which proper diet and exercise choices allow one to conquer obstacles and continue the quest. Quiz games in the Alcohol and Other Drugs, Smoking, and Human Sexuality programs provide positive feedback for correct answers and corrections or additional information as appropriate. BARNY also gives itself points gleefully when the user is incorrect. . Straight-forward information is available in a variety of formats, but always placed in a life context, as with BARNY's responses to "Dear BARNY" letters on various topics about dating and sexuality, or brief stories about people's reactions to various situations.

Decision aids include such things as evaluating various smoking cessation techniques against a particular adolescent's situation, laying out a behavior change contract, and helping an adolescent work through a step by step decision process. Practice with situations the adolescent might experience occurs in some of the games, and also when the adolescent must decide what should happen next in short "soap operas." Interactive interviewing appears many places in the system, with BARNY branching through series of questions, storing responses, and calculating paths and responses based on the results.

A final characteristic of the BARN system is its emphasis on other sources of help -- referrals and social support systems.

Many topic areas provide names and telephone numbers of agencies or even teachers within a school who have volunteered to talk about different concerns (this is firmly programmed in test versions of BARN, but the marketed product will include the option of adding this for new localities). In addition, all programs encourage the user to turn to others for help, and in several cases provide help in identifying and expanding their personal support network.

In using the BARN system, the adolescent has considerable choice about which parts and how much of different topics to use. But this brings up an important philosophical point. In traditional computer-assisted instruction, program flow is largely outside the control of the user, even when program branching is very responsive to variations in user responses. In contrast, information systems generally strive to give the user maximum control. But in providing health information to adolescents, we recognize the possibility that information alone may not achieve our goals, and may in some instances be injurious. For example, full user control in our programs on alcohol and other drugs might let an adolescent learn about a variety of drugs and their "highs" without getting any context on distinguishing use from abuse, skills training, or referrals.

In general, we strove to balance between an openness that gave the user choice (and allows for speed in getting where the user wants to go) and an insistence on providing context that could make BARNY seem stuffy or slow. In some places, we made the context optional, but our most effective strategy for balancing these two takes advantage of the fact that users soon perceive

BARNY as having an individual personality. Just as any human health professional would have his or her own agenda in a conversation, BARNY has one too. BARNY's reactions to user input, side comments on information or stories, and recommendations for what sections to pursue next all "push" skill building, contexts for information, and ways of applying the general to the individual's own situation. This has seemed quite successful -- the context we wanted to ensure is always present, and users do not find BARNY stuffy.

Obviously, a system of programs spread across 16 disks, five topics areas, and offering more than 20 hours of varied interaction is hard to capture in words. But the BARN system does provide a wide variety of information, motivation, and change strategies, presented in different formats and styles, and gives individual adolescents considerable flexibility in pursuing information they want when they want it. BARNY's conversational, non-judgmental tone seemed to us a good way to achieve our goals of attracting adolescents to the computer while still providing solid health information.

Implementation

Beginning in October, 1982, BARN systems were introduced into one rural and one urban high school in the Madison, Wisconsin area, and into their three associated middle schools, thus making BARN available to approximately 5500 adolescents between ages 12 and 18. (BARN was also placed in two teen health clinics, and a pilot set of programs designed for family use was tested in 4-H clubs, but we will focus on the in-school use of BARN.) After an inservice for teachers at each school, we held inservice sessions for groups of students in which we talked about the purposes of BARN, demonstrated how to use the computer and handle diskettes, and then allowed groups of 4-8 students to experiment with the programs for the remainder of a class period. These inservices seemed to be very important in the success of the BARN system, in that we had an immediate demand for the system, all students were comfortable with computer procedures, and students respected the systems and took good care of them. (In two school years, our total maintenance budget for 10 systems was only $700, and only 1 1/2 disks per school per month were taken or damaged.)

Each school chose its own location or locations for BARN systems, but most commonly they were placed in a corner of the library or IMC, and could be used either on a drop-in basis or by advance sign-up. Sites were chosen to provide visibility for the system, privacy of interaction for the user, and minimal supervision by the school staff. Students preferred to use BARN in a group of two or three friends, and this seemed to facilitate both experimentation with the programs and interpersonal interaction about health topics independent of the computer.

Why do students use BARN?

Generally speaking, we see three kinds of reasons adolescents may have had for using the BARN system. These reasons may bring quite different adolescents from quite different situations to the system. Moreover, while we will not report results bearing on the issue, different reasons may lead to very different results (Blumler, 1978). First, adolescents may use BARN because they want or need the information in its programs, which of course is what its programmers intended. In uses and gratifications terms, this would usually be called surveillance or learning about oneself or one's environment. This can of course be broken down further, as in Atkin's (1973) distinctions between various instrumental utilities in information seeking, but for our initial purposes, the general notion of information seeking as a reason for BARN use will do.

Thus, adolescents may be seeking information from BARN out of simple curiosity about its health topics, because of pressure from friends to try some behaviors, out of worry over the consequences of their or their friends' behaviors, or simply to learn more about a particular health topic.

A second possible motivation for use of computer systems such as BARN is the interactivity of the medium itself, or more properly, of certain computer programs. What we mean by interactivity encompasses several concepts. Part of it is the flexibility of the exchange between program and user, the extent to which the program responds directly to the user rather than continuing its own line of discourse: a conversation rather than a speech. A related idea is that the information presented may be

tailored to the particular needs, interests, and situation of the user instead of being generic to all users. A less profound but still important sense in which computerized information systems can be "interactive" rests on the fact that the timing and pace of these messages can be entirely in the user's control. Any or all of these aspects of interactivity could be an important part of the attraction of a computerized information system such as BARN.

Interactivity is not inherent in computerized information systems, since a computer may be programmed to present material as linearly as a book or broadcast television program. Early computer-based learning systems have been criticized for giving more attention to content than to allowing student alternatives (Montague, 1982; Papert, 1980). Although it would have to be called intermediate in interactivity compared to some programs now available -- especially "expert systems" (Duda & Shortliffe, 1983) -- BARN is considerably more interactive than alternate forms of adolescent health information. The question is whether this interactivity is important to BARN users.

A third and final factor that may attract adolescents to BARN could stem from the simple fact that BARN is on a computer. This could be a transitory phenomenon of the early 1980s, or it could represent a preference for the games, sound effects, graphics and other gimmicks used by many programmers (including BARN's) to make their programs more appealing, easy to use, and fun. This appeal has nothing to do with a need for health information, or even a preference for interactive sources of information, but would probably be linked to the form of the computer medium or even to the glamor of the medium itself.

Besides these three possible answers to why adolescents use BARN, there seem to be two alternate meanings for use that are potentially different. Most obviously, with a self-selected computer system, we can ask why some adolescents use this system and others do not. Is it one or more of these reasons, and what other characteristics of the adolescents and their life situations lead them to BARN? However, once adolescents try BARN, some of them never come back, others use it only a few times per year, and others use the system incessantly, trying to beat the games, checking all the branches, or experimenting with other social roles. Anecdotes and interviews suggested two very different explanations for the extremely heavy use of BARN by some adolescents. Some reports told us that these were game players and computer "junkies;" others told us that the heaviest users were social outcasts and health risk takers. Distinguishing between these two explanations has practical significance for BARN and other projects that want to structure their delivery efficiently, in addition to the more general question of what appeals to adolescents about computers.

Method

A lengthy survey of 383 7th, 392 9th and 253 11th graders in spring, 1984 (after BARN had been in test schools almost two full school years) was administered to classroom-sized groups in two separate sessions (because of the 350-item length). The questionnaires covered knowledge, attitudes and behaviors in each of the topic areas, as well as a wide variety of questions tapping

other behaviors, family and peer context, and other psychological characteristics of the adolescent. For our purposes, we will use only the adolescents' self-reports of use of the BARN system, their agreement with various reasons for using BARN, and a variety of social and psychological context variables described below.

BARN Use: On the survey, students marked how many times they used each BARN program for each of three different lengths of time (1-14 minutes, 15-29 minutes, and 30-50 minutes) chosen based on interviews and observations as representing different typical experiences with BARN. Answering these questions was difficult and required considerable thought by the students, but asking about number of times used BARN in 15 separate questions (five topics by three lengths of use) allows measures of total use in which we have more confidence than we would in an overall estimate by the adolescents. Since measures of length of time each program was used were redundant with the simple number of occasions (correlations greater than .96), we will use the simpler measure of occasions here.

Reactions to BARN: Students who used BARN responded on a 4-point scale of "not at all important" to "very important," to five reasons for using BARN:

1. Curiosity/interest in BARN's health information.
2. To play the games.
3. To help a friend or family member.
4. To help myself.
5. To get a specific piece of information.

They also agreed or disagreed on a 4-point Likert scale with the following six statements:

1. When I used the BARN program, I felt I had a lot of control over what happened next.

2. The BARN programs were easier to use than a book or magazine.

3. I'd rather use the BARN program than see a movie or television show about the same topic.

4. I used BARN because it was on a computer.

5. I used BARN because I like the pictures on the computer screen.

6. I liked BARN because I could use it with my friends.

Media Use Variables: Respondents, selected from 10 categories of amounts of time, how long on an average school day they spent with: television, radio, listening to music, reading newspapers, and doing homework.

Home Technologies: Respondents indicated whether their family owned or received each of the following: cable television, extra cable services, videocassette or disk player, video games, or home computer or terminal.

Friendship: Respondents reported how many "really close friends" they had, and also marked one of four ordinal categories for, "During the past 12 months, how serious a problem or worry has it been for you to find friends you can really feel close to?"

Family Communication Patterns: Based on the 1982 pretest using many of the same respondents, we used the six strongest items from the McLeod and Chaffee work on family communication patterns (c.f., McLeod and Chaffee, 1973). As usual, these items divided into two factors for which we formed factor scores. These are socio-orientation, or the degree to which the parents emphasize harmony and hierarchy in family communication, and concept-orientation, the degree to which they emphasize individual opinion formation and free expression of those opinions.

Other Sources of Health Information: For five different health and behavior topics (alcohol & drugs, sex, tobacco, diet, and laws), respondents indicated which of eight interpersonal, institutional, or media sources was their most important source of information on that topic. We coded two variables from these responses: number of topics for which 1) mass media, and 2) peers or siblings, were the main source of information.

Likelihood of risk: Respondents chose one of five responses ranging from "definitely will not" to "definitely will" to estimate how likely they would be during the next year to do each of the following: smoke cigarettes, chew tobacco, drink alcohol, get drunk, use marijuana or other drugs, and have intercourse.

Perceived Social Pressures: For each of eight behaviors, respondents could nominate one of six persons or groups as the one from who they felt the most pressure to do that behavior (they could also respond that they felt no pressure to do that

behavior). From this we produced eight dichotomous variables indicating whether they felt pressure to: smoke cigarettes, chew tobacco, drink alcohol, use marijuana or other drugs, be popular, have sex, achieve an ideal weight, and get good grades.

RESULTS

Table 1 shows how many times students of different ages and genders used each of the BARN programs. Seventh graders report very heavy use of BARN, with use less frequent for 9th and less still for 11th graders. To place this in context, seventh graders are reporting using BARN an average of once a month over the two school years of the project.

Boys used BARN more than girls at all ages, with the disparity very lopsided at 9th grade and minor at 11th. The Human Sexuality and Alcohol and Other Drugs (AODA) programs are most heavily used overall, although the dramatic difference between them and use of Stress or Smoking shrinks by 11th grade. Use of the Body game is the exception to the slow decline in use with age for the other programs; Body is used even more than AODA at 7th grade, but least of all by 11th graders.

Table 2 presents factor loadings on three factor for the 11 items we used to assess reasons for using BARN and reactions to it. Since the first factor was comprised primarily of items having to do with using BARN for specific information or to get help, we labeled it as information seeking. The second factor contained two items of preferring BARN over books, magazines, movies, or television, and another agreeing that BARN was used because of the control it gave the user. We labeled this factor as Prefer Medium/Control for use in subsequent analyses. The final factor came primarily from reporting using BARN because of its graphics or simply because it was on a computer, although surprisingly, using BARN to play the games was not particularly

associated with any of the three factors. For each of the three factors, we constructed a factor score for further analyses.

Table 3 presents the zero-order correlations between these three factor scores of reasons for BARN use and the amount of use of the individual BARN programs, as well as overall BARN use (this table necessarily excludes the half of the sample who did not use BARN at all). With all three grades combined, information seeking is moderately related to the use of all BARN programs: those for whom information seeking reasons were more important made heavier use of BARN. A positive relationship also exists for preferring the BARN medium and the control it provides, although this is much weaker and more sporadic across the individual topics. There is no relationship between simply liking computers and the amount of BARN use.

By and large, these correlations are quite similar for all three grades, with the exceptions of the Prefer Medium/Control factor. Here the weak overall correlations appear to be entirely due to stronger correlations for 9th graders. Ninth graders who prefer the BARN medium make heavier use of the three most-used programs, Human Sexuality, Alcohol and Other Drugs, and Body Management. Thus, from Table 3 it is clear that reasons for using BARN have some relation to how much adolescents used BARN.

To go beyond this to the more basic question of why adolescents used BARN, and why some used it more than others, we need to look at a wide variety of characteristics. Since use of the five different BARN programs was similarly related to the factor scores in Table 3, and in fact add little to the tables below, we will simplify them by reporting only overall BARN use.

Table 4 shows zero-order correlations between a variety of context variables and use vs. non-use of any BARN programs. There are scattered, weak-to-moderate correlations for use of various other mass media or presence of new media technologies in the home, and those who believe computers are fun and easy to use are more likely to use BARN. Family, friendship patterns, and numbers of media or peer sources of information similarly were only occasionally related to adolescents using or not using BARN.

Perceiving oneself as likely to do any of a number of risk behaviors in the next year generally did not predict using BARN, although there were scattered relationships between feeling pressure to do various behaviors and using BARN at 7th and 9th grade. Overall, then, relatively few of these social and psychological context variables are individually significantly related to whether or not adolescents use BARN.

The zero-order correlations between these variables and the amount of BARN use show more significant relationship, even though they are based on fewer adolescents, especially at 11th grade (Table 5). Here the correlations with other media use variables are positive, especially at 11th grade, while opposite relations to the presence of new technologies occur at 9th and 11th grade. Eleventh graders who report thinking while watching television use BARN less, and family, friend, and other source variables are generally unrelated. Unlike use vs. non-use of BARN, likelihood of risk behaviors in the next year are strongly related to the amount of use, especially at 9th grade. Relationships to perceived pressure were weak and scattered.

Going beyond these zero-order correlations (which may overlap each other's variance) to get an overall sense of what predicts Barn use and how well we can predict BARN use requires multiple regression. However, rather than perform two multiple regressions using all the variables in Tables 4 and 5, we reduced that set in two ways. First, there appeared to be considerable redundancy in the likelihood and pressure variables, given their correlations in these tables and to use of specific BARN programs (not shown). We therefore factor analyzed these items and found three very clean factors using principal components and varimax rotation. A first factor, labeled "Likely," contained all items tapping likelihood of risk behavior in the next year, with the exception of chewing tobacco, which was spread across the three factors. The second factor, "Smoke/Drugs," contained five questions indicating that the respondent felt pressure to use tobacco, alcohol, drugs, or have intercourse. The third factor, "Popularity," was composed of the variables indicating the respondent felt pressure to be popular, achieve an ideal weight and get good grades. Factor scores were constructed and used in place of the variables in the regressions.

The second method of shortening the regression equations was that only those variables that had been significantly related for one or more of the grade levels were included in the final equations. In the regression equations of both Tables 6 and 7, these variables were entered in a stepwise procedure. In Table 7, where the dependent variable is <u>amount</u> of BARN use for those adolescents who made some use of BARN, all these variables were entered in a block, and the variance for this block is thus

comparable to Table 6. But in Table 7, we then added the three factors of reasons for using BARN to the equation to see if they could account for additional variance above that predicted by context.

Thus, Table 6 shows that social and psychological context variables account for a significant proportion of variance in whether or not the adolescents use BARN, although this proportion declines from 12% at grade 7 to 4% at 11th grade. At seventh grade, users of BARN tend to feel pressure to be popular, feel computers are fun, and do not turn to mass media for health information. They also come from socio-oriented and not from concept-oriented families.

Ninth grade BARN users have cable television at home, find computers fun and easy to use, and feel pressure to take health risks. At eleventh grade, none of the individual variables has a significant simultaneous partial with use vs. non-use of BARN, although jointly they account for 4% of the variance.

The amount of BARN use by BARN users is predicted rather differently, as Table 7 shows. The context variables do not predict a significant amount of variance at 7th grade, whereas they were strongest at 7th grade in Table 6. Context variables predict 16% of the variance for 9th grade and 19% of the variance at 11th grade, although this result is not statistically significant at 11th grade because of the small number of BARN users.

No individual variables have significant partials at 7th grade, but amount of use by 9th graders is particularly related to the risk factors. Heavy 9th grade BARN users see themselves as

more likely to do risk behavior and feel more pressure to do them, and feel less pressure to be popular or get good grades. They also report having had a harder time finding friends. Heavier users of BARN at 11th grade tended not to have cable television, did not think while watching television, and felt less pressure to be popular.

When the three factor scores of reasons for using BARN are added, the variance accounted for increases greatly at all grades, but more as respondents get older. By 11th grade, even though the sample is small, 42% of the variance can be accounted for, 19% by the context variables and an additional 23% by the reasons for using BARN. Using BARN for information predicted heavy use at all three grades, while preferring BARN as a medium for health information also contributed at 9th grade.

DISCUSSION

Returning to our original question: Why do adolescents use BARN? To begin with, we think there are answers to be found in the relationship of the social and psychological context variables to use and amount of use of BARN. A number of these seem to us indirect measures of the same reasons for use discussed earlier and indexed by the three factor scores. For example, when likelihood of risk behaviors or pressure to do these behaviors is positively related to BARN use, an information-seeking motive seems much more plausible than preferring the computer medium or liking the graphics. Use of BARN by these adolescents would seem to be an information-seeking response to their situation.

Similarly, use of BARN by those who have trouble finding friends may also reflect a variant of information-seeking, in that BARN may compensate for the lack of social interaction or of what would otherwise be a likely source for health discussion and information.

Using because the adolescent just likes computers or their fun and games attributes could be inferred if the attitude question, "computers are fun and easy to use" is positively related to use, or if use of BARN is related to use of primarily entertainment mass media (although one could predict this latter relationship as either positive or negative, depending on whether one predicts that functionally equivalent media compete with or compliment each other). The preference for the computer medium with its greater user control is more difficult to infer from the context variables we have available, although finding more BARN use by respondents with new technologies at home would be a start, especially if these were video games and home computers. With some stretching, one could then argue that experience with new technologies might lead to preferences. One could also argue that the active approach of those who think while watching television might welcome the interactive nature of a computer program, so that a positive relationship here would also indicate the presence of this motive.

So, from the zero-order correlations and the regression of which adolescents use BARN and which do not, there is indirect evidence of information seeking in the relationship to pressure at 9th grade, but more evidence of BARN use as just turning to a medium believed to be fun and easy at 7th and 9th grades. There

is also a hint of preferring the technology at 9th grade, but the fact that this is only for cable television weakens the argument. However, even on this motive, there is little or no relationship to media use variables. In fact, while there is some indication that what gets adolescents to BARN may have to do with the fun of computers and perhaps a little with information seeking, most of the predictors here are difficult to categorize as implying any of these three reasons: family communication patterns, pressure to be popular, and using mass media for health information. And put another way, while fun contributes to getting 7th and 9th graders on BARN and information-seeking adds some at 9th grade, we don't really know why 11th graders use BARN.

For how much adolescents use BARN the picture is somewhat different. Although many 7th graders use BARN, and vary considerably in how much, we cannot predict the amount of their use with social and psychological context variables. For 9th graders, information-seeking looks the most important, since likelihood of and pressure to do risk behaviors are both significant predictors, along with difficulty finding friends. The picture at 11th grade is less clear, partly because the small sample size produces many relatively large partials, although only a few are statistically significant. The negative relations to thinking while viewing TV and to having cable TV at home are both surprising, although they could be interpreted as implying a fun and games motive for heavy BARN use.

When we added the three factors derived from explicit questions about reasons for use, self-reported information seeking was a substantial predictor of the amount of BARN use at all three

grade levels. At 9th grade, preferring BARN as a medium and its controllability over other media was an even better predictor. It could be that 9th grade heavy users particularly liked the control and interactivity of the BARN programs. We would suggest that future studies carefully decompose the characteristics of any computer-based system, asking users to compare the computer system on a number of dimensions to other possible sources of the same information.

Given the self-selection of users only in the amount-of-use equation, which limits both the sample size and the variance in the dependent variable, the proportion of variance accounted for using the three reasons for use is substantial, especially at 9th and 11th grades. For 11th graders, about half of the 42% total is accounted for by the single information-seeking factor. The contribution of this factor is less dramatic but still substantial at 9th grade, and appear even more important in that this is added variance after that accounted for by a set of context variables also apparently dominated by characteristics that seem to give reasons for information seeking. Given this, it is clear that what accounts for heavy use of BARN (as opposed to light use) is continued information seeking by the heavy users, and not just game-playing as we had feared.

Although we were able to predict significant proportions of variance in who uses BARN or not, these proportions were less for 9th and 11th grades than in the amount-of-use analysis. Furthermore, while information seeking as a motive has something to do with getting adolescents to BARN in the first place, it is hardly the dominant motive it was for determining heavy use. The

fun and games aspect of computers and perhaps their relative controllability also contributed. In fact, other characteristics of the adolescent and his/her situation that we cannot readily link to these motives were at least as important in bringing adolescents to BARN.

The one set of variables that is most surprising in its lack of relationship is the media use variables. With a few exceptions, the amount of use of various other mass media do not account for significant amounts of unique variance. Although computers are often conceptualized as the newest electronic medium, these results generally show no evidence that computer programs fill the same function as other electronic media, either by positive correlations or by competitive tradeoffs.

Overall, then, the BARN example provides encouragement for computer programmers and information campaigners interested in reaching children and adolescents through interactive computer programs. While the adolescents initially come to the programs for a wide variety of reasons, what keeps them on the system is that it meets their information needs.

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Figure 1

Content of the Body Awareness Resource Network Programs

Alcohol & Other Drugs (AODA)

Nature of short & long-term medical risks
* How to react to & what to do about someone's overdose
* Referral -- where to go for help
Distinguishing Use from abuse
* Moving toward dependency
* A test for dependency
* Individual differences in reactions
Facts to replace myths -- Quiz Game
Decision-Making
* Simulation of decisions at a party
* Decision Aid: How to decide on AODA

Stress Management

Definitions of chronic & episodic stress
Facts to replace myths -- Maze Game
Communication Skills
* How to end dead-end arguments
* "Straight Talk" -- How to say what's bothering you
Decision Aid: Who to talk with about stress
* Selecting someone who meets your needs
* Evaluating potential helpers
* Referrals to agencies
Blowing off steam -- the 'Dear BARNY' letter
Assessing one's stress -- self-test of symptoms & situations
Strategies for reducing stress
* Quick Tips
* Stress and Diet

Body Management

Collects user data (weight, age, ideal weight)
Menu food selections
Adventure Game
* Vitamin C Challenge
* Activity choice
* Iron challence
* Activity choice
* Sodium challenge
* Activity choice
* Summary based on success

Human Sexuality

Present survey data -- sex less important to teens than family, friends, school, etc.
Facts to replace myths -- Skunk BARNY Game
Soap Operas
* Illustrative dramas about teen sexuality situations
* Tough Choices Game -- user makes decisions for characters in soaps
Dear BARNY letters -- BARNY answers teens' questions on pregnancy, birth control, menstruation, erections, relationships, etc.
Reproductive anatomy -- pictures & text
Pregnancy/VD Resources -- describes symptoms, testing, and lists community resources
Quiz game on sexually-transmitted diseases

Smoking Prevention & Cessation

Initial assessment of user's smoking
Information -- short & long-term effects
How to resist influences to smoke
Comparing one's attitudes and values to national norms
Tips on quitting
* Description of methods tailored to user's habits
* What to expect
Helping someone else quit
* Advice & Strategies
* What to expect

TABLE 2

Varimax Rotated Factor Loadings

	FACTORS		
Input Variable	Information Seeking	Prefer Medium/ Control	Like Computers
Used BARN: to get a specific piece of information	.669	.161	.007
Used BARN: to help myself	.754	.156	-.032
Used BARN: to help a friend or family member	.644	-.007	-.031
Interested in BARN's Health Information	.353	.118	.063
Liked BARN because could use it with Friends	.103	.322	.297
With BARN had control over what happened next	.067	.406	.145
BARN easier to use than book or magazine	.104	.766	.023
Rather use BARN than see movie or TV about topic	.132	.457	.154
Used BARN because on a computer	-.077	.143	.521
Used BARN because of graphics	.014	.112	.706
Used BARN to play the games	.134	.163	.155
Proportion of Total Varience	23.5%	16.3%	10.1%

TABLE 3

Correlation of Amount of Use of BARN Programs
With Reasons for Their Use

Reasons for Using BARN

	Information Seeking				Prefer Medium/Control				Like Computers			
Use of Program	All Grades	7th	9th	11th	All Grades	7th	9th	11th	All Grades	7th	9th	11th
Sex	.27***	.25***	.26***	.35**	.11*	.09	.25**	-.23*	.07	.04	.13	.11
Alcohol & Drugs	.23***	.23***	.17*	.31**	.09*	.04	.21**	-.02	.02	.03	.01	.00
Smoking	.27***	.26***	.27***	.24*	.08	.08	.14	-.16	-.02	.00	-.05	-.06
Stress	.18***	.19**	.11	.29**	.08	.04	.14	.01	.02	.08	-.08	.05
Body	.24***	.18**	.27***	.33**	.09*	-.01	.32***	-.15	.07	.06	-.08	.16
Overall BARN Use	.29***	.28***	.26**	.41***	.11*	.06	.26**	-.15	.04	.05	.03	.07

* p<.05
** p<.01
*** p<.001

NOTE: These correlations are based on those who used BARN at least once, since those who did not use BARN had no basis for responding to the reasons for use.

TABLE 4

Correlations of Context Variables with Use vs. Non-use of BARN

	7th Grade	9th Grade	11th Grade
Media Use Variables			
Time spent with:			
Television	-.04	.05	.09
Radio	-.11*	-.07	-.00
Newspaper	-.00	.06	.01
Records & Tapes	-.16**	.00	.01
Movie, Concert, Plays	-.04	-.05	-.13*
Video games in Arcade	-.01	.09	.03
Family has:			
Cable TV	.09	.17***	-.08
Extra Cable Service	.07	.15**	-.08
Home Video Games	-.02	.09	-.10
Home Computer	-.13*	-.02	.02
Think While Watching TV	-.01	-.02	.04
Computers Fun and Easy to Use	.11*	.15**	.04
Friendship			
Number of Friends and Groups	-.05	.05	-.04
Finding Friends a Problem	.03	.07	.10
Family Communication Patterns			
Concept Oriented	-.04	.02	-.04
Socio-oriented	.14**	.04	-.05
Other Sources of Health Information Used			
Mass Media	-.15**	-.01	.00
Peers/Siblings	-.06	-.10	.02
Risk Variables			
In next respondent likely to:			
Smoke	.01	.00	-.09
Chew Tobacco	-.04	.12*	-.06
Drink Alcohol	-.03	-.02	.00
Get Drunk	-.02	-.01	.01
Use Marijuna	-.03	.02	-.01
Have Intercourse	.06	-.00	-.01
Feel pressure to:			
Smoke	.10	.08	.04
Chew Tobacco	.02	.16**	.04
Drink Alcohol	.07	.07	.09
Use Marijuna	.06	.13**	.06
Be Popular	.10	-.02	-.01
Have Sex	-.01	.09	.02
Achieve Ideal Weight	.05	-.03	.03
Get Good Grades	.20***	-.08	-.03
	(N=350)	(N=360)	(N=224)

* p<.05
** p<.01
*** p<.001

Note: Sample sizes shown are minimum pairwise N. N was slightly higher in some cases where there was less missing data.

TABLE 5

Correlations of Context Variables with Number of Occasions of BARN Use

	7th Grade	9th Grade	11th Grade
Media Use Variables			
Time spent with:			
Television	.01	.05	.14
Radio	.10	.10	.20*
Newspaper	.01	.01	.09
Records and Tapes	.13*	.14	.23**
Movie, Concert, Plays	.09	-.10	.13
Video Games in Arcade	.12*	.17*	.21*
Family has:			
Cable TV	.03	.12	-.19*
Extra Cable Service	.07	.17*	.03
Home Video Games	.05	.18*	.08
Home Computer	.10	.03	.10
Think While Watching TV	-.00	-.03	-.23**
Computers Fun and Easy to Use	.02	.09	-.01
Friendship			
Number of Friends and Groups	.05	.05	-.02
Finding Friends a Problem	-.08	.14*	.12
Family Communication Patterns			
Concept Oriented	-.08	.01	-.06
Socio-oriented	-.03	.12	.09
Other Sources of Health Information Used			
Mass Media	-.01	.00	.04
Peers/Siblings	.00	.02	.17
Risk Variables			
In next respondent likely to:			
Chew Tobacco	.07	.16*	.24**
Drink Alcohol	.09	.31***	.17
Get Drunk	.08	.15*	.07
Use Marijuna	.09	.17*	.09
Have Intercourse	.14**	.19**	.10
	.12*	.26***	.26**
Feel pressure to:			
Smoke	.05	.13	.09
Chew Tobacco	.14*	.21**	.06
Drink Alcohol	.10	.04	-.06
Use Marijuna	.14*	.09	-.03
Be Popular	-.06	.04	.16
Have Sex	.12*	.09	-.01
Achieve Ideal Weight	.01	.05	-.03
Get Good Grades	-.05	-.08	-.21*
Users vs Non			
Users Only	(N=287)	(N=158)	(N=91)

* p<.05
** p<.01
*** p<.001

Note: Sample sizes shown are minimum pairwise N. N was slightly higher in some cases where there was less missing data.

TABLE 6

Regression Predicting Use vs. Non-use of BARN

Variables	Partials[1] 7th Grade	9th Grade	11th Grade
Risk Factors			
Likely	.01	.01	.01
Smoke/Drugs	.07	.15**	.06
Popularity	.12*	-.08	.02
Media Use Variables			
Radio	-.08	-.06	.00
Records & Tapes	-.10	-.02	.02
Video Games	.01	.03	.05
Movies, concerts, plays	-.03	-.05	-.13
Media for Health Info	-.16**	-.02	-.01
Family Technolgoy			
Cable TV	.08	.18***	-.05
Extra Cable	.04	.03	-.06
Home Video Games	-.01	.03	-.10
Home Computer	-.07	-.05	.03
Family Communication Pattern			
Socio-oriented	.19**	.01	-.06
Concept-oriented	-.12*	.03	-.04
Individual Variables			
Computers fun & easy	.15**	.16**	.06
Hard finding friends	-.01	.10	.11
Multiple R_2	.34***	.29***	.20*
Multiple R^2	.12***	.09***	.04*

*p<.05
**p<.01
***p<.001

[1]Partials from simultaneous equation

TABLE 7

Variables	Regression predicting Amount of Use Partials[1] 7th Grade	9th Grade	11th Grade
Risk Factors			
Likely	.04	.23**	.23
Smoke/Drugs	.10	.20*	.08
Popularity	-.08	-.18*	-.31*
Media Use Variables			
Radio	.04	.01	.09
Records & Tapes	.03	.07	-.07
Video Games	.04	-.01	-.07
Family Technology			
Cable TV	.03	.01	-.30*
Extra Cable	.01	.04	.20
Home Video Games	.01	.12	.11
Home Computer	.09	-.07	.03
Individual Variables			
Think Watching TV	-.03	-.03	-.28*
Hard Finding Friends	-.08	.21*	.13
R^2 All Above Variables	.06	.16*	.19
BARN Characteristics			
Information	.26***	.25**	.53***
Prefer BARN/Control	.05	.28**	-.17
Like Computers	.11	.01	.11
Multiple R^2	.13**	.29***	.42***

*p<.05
**p<.01
***p<.001

[1] Partials from simultaneous equation