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CD-ROM nutrient analysis database assists self-monitoring behavior of active duty Air Force personnel receiving nutrition counseling for weight loss

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ABSTRACT

This study observed the effect of using a computerized vs manual method of self-monitoring among Air Force personnel receiving nutrition counseling for weight loss. Subjects who enrolled during the first 2 weeks of the 4-week recruitment period completed food records for 6 weeks using a CD-ROM nutrient database (intervention group) whereas those who enrolled during the last 2 weeks used a food record booklet (comparison group). Of the 42 subjects (n = 23 intervention group and n = 19 comparison group), only 13 intervention and 11 comparison group subjects (57% of study enrollees) submitted at least 1 food record during the study and were included in the analysis, which included review of pre- and poststudy questionnaires, food records, and focus group data. There were no significant differences between the number of days per week documented or average number of items recorded daily. All 9 intervention as compared to 2 comparison group subjects who completed a poststudy questionnaire searched for lower-energy and lower-fat items and reported changing their dietary intake as a result. All intervention group subjects who participated in a focus group (n=6) had favorable comments about using the CD-ROM for monitoring and changing eating habits, indicating that it is a beneficial self-monitoring tool. Participants enjoyed the immediate dietary feedback, and computerized food records may be easier to interpret by nutrition counselors. A number of computerized nutrient databases are available to assist patients and consumers in managing nutritional concerns. *J Am Diet Assoc.* 2001;101:1041-1046.

Nutrition education is a method the US Air Force uses to reduce the prevalence of overweight in the active duty Air Force population. Recently, computer technology has become a viable means of providing nutrition information to educate and influence the public (1), and computer applications may be a feasible adjunct to traditional counseling for this group because many active duty members have computer access. However, few studies have been published regarding the effectiveness of computer applications in the area of weight management. Dennison et al (2) found clinically, but not statistically significant improvements in weight loss, energy intake, and fat intake in overweight, mostly blue-collar employees who used a computer CD-ROM in a worksite setting.

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An interesting use for the computer is to aid clients in self-monitoring, a strategy that involves systematic observation and recording of target behaviors (3). Self-monitoring has been described as 1 of the single most important predictors of successful weight loss (4-8), and is usually a primary focus in obesity treatment. A recent study (3) found that participants who consistently monitored all foods eaten lost more weight than those who inconsistently monitored. The authors proposed a target of self-monitoring all foods eaten on at least 75% of days for maximum weight loss. Another study (9) found that only 30% of participants in a weight-loss program used self-regulating techniques (such as monitoring exercise, food intake, and weekly weighing), although they perceived "calorie counting" as useful. The authors suggested a need for better techniques and innovative methods to help participants in self-monitoring.

One promising tool, the DietMate handheld microcomputer (Personal Improvement Computer Systems, Inc, Reston, Va), includes nutrition and exercise components as well as behavioral principles of goal setting, self-monitoring, stimulus control, feedback, and shaping. Preliminary results (10) document weight loss and improved clinical outcomes as a result of using the device. More studies exploring the use of technology to enhance self-monitoring behavior are needed.

The purpose of this study was to examine the affect of a computer-based nutrient analysis database on self-monitoring behavior of military personnel receiving nutrition counseling for weight loss. Three specific objectives of the study were to determine if participants who self-monitored using the CD-ROM recorded a greater number of days compared with those who recorded using a food record booklet, discover if participants who self-monitored using the CD-ROM more thoroughly recorded their food and beverage intake than those who used a food record booklet, and to gather qualitative information about participant attitudes and opinions toward self-monitoring using the computer.

METHODS

Subject Recruitment

The study procedures are outlined in Figure 1. All participants were active duty Air Force personnel serving at Lackland Air Force Base or Wilford Hall Medical Center (WHMC) in San Antonio, Texas. This study received approval from the Office of Clinical Investigation at WHMC and received exemption status from the Human Subjects Review Committee at Texas Woman's University, Denton.

Active duty Air Force personnel who attended a weight management class at the WHMC Outpatient Nutrition Clinic from February 11 through March 11, 1999, were recruited for participation in the study. The study was advertised through flyers and the base newspaper to enhance participation. Subjects were assigned to either the intervention group or the comparison group depending on date of study enrollment. Subjects were not informed of the different treatment methods. Subjects were grouped in this manner to avoid the research burden of teaching multiple CD-ROM classes (intervention group) and to streamline the enrollment process for WHMC staff. Study participant inclusion criteria were access to a Windows-based computer, >18 years of age, active duty military status, and ability to attend a CD-ROM orientation (if assigned to the intervention group).

Intervention Tools

The intervention tool used in this study, Executive Diet Helper (EDH) (1997, Ohio Distinctive Software, Inc, Columbus, Ohio), is a multimedia nutrient database on CD-ROM that contains approximately 5,000 foods including fast foods, frozen dinners, and diet foods. The program allows users to enter and analyze food and meals for a variety of nutrients and add their own foods to the database. The program also recommends lower-energy substitute foods and provides a comparative analysis of those foods (ie, total energy; milligrams cholesterol; and grams carbohydrate, protein, and fat and the percentage of energy attributable to each).

Subjects were also requested to fill out questionnaires developed by the investigator and validated for content and readability by 5 graduate students in nutrition or food science. They were assessed to be at the Flesch-Kincaid 7th-grade reading level. The prestudy questionnaire included demographic and computer usage information. The poststudy questionnaire included questions pertaining to attitudes and opinions on self-monitoring and was completed upon submission of the final food record booklet or printouts.

Weight Management Class

The weight management program consisted of one 90-minute class that reviewed weight loss principles, US Dietary Guidelines for Americans, the Food Guide Pyramid, food portion sizes (using food models), basic behavior modification techniques for weight loss, and exercise information. Food and activity documentation using food record forms was emphasized and reviewed. At the end of the weight management class session, the instructor (a diet therapy technician) used a prepared script to invite study participation. Participants completed the prestudy questionnaire followed by a 24-hour dietary recall.

Comparison group members were then provided study instructions, a food record booklet for the initial week of the study, and an energy, fat, and cholesterol counter (11) to aid in self-monitoring. The investigator performed nutrient analysis on 24-hour dietary recalls using the EDH CD-ROM, and individual reports including handwritten suggestions for improving food choices and enhancing completeness of documentation were sent to participants within 2 weeks of attending the weight management class.

Intervention group participants attended a 90-minute orientation session within 2 weeks of attending the weight management class. Each participant received a copy of the EDH CD-ROM with instructions for installation and use. Participants completed a sample printout using their 24-hour recall and were taught how to interpret resulting energy and nutrient values. Each participant received envelopes, instructions, and dates (weekly for 6 weeks) for returning printouts to the nutrition clinic. To enhance return rate, small incentives were given weekly to all participants who submitted food records.

Focus Group Sessions for the Intervention Group

During the EDH CD-ROM orientation, intervention group members were invited to attend a 2-hour poststudy focus group session. The purpose of the focus group was to acquire additional qualitative data regarding self-monitoring using the EDH CD-ROM. Eight questions developed by the investigator were reviewed by 5 nutrition and food science graduate students for content and comprehension (Figure 2). During the focus group session, participants were asked to respond in turn

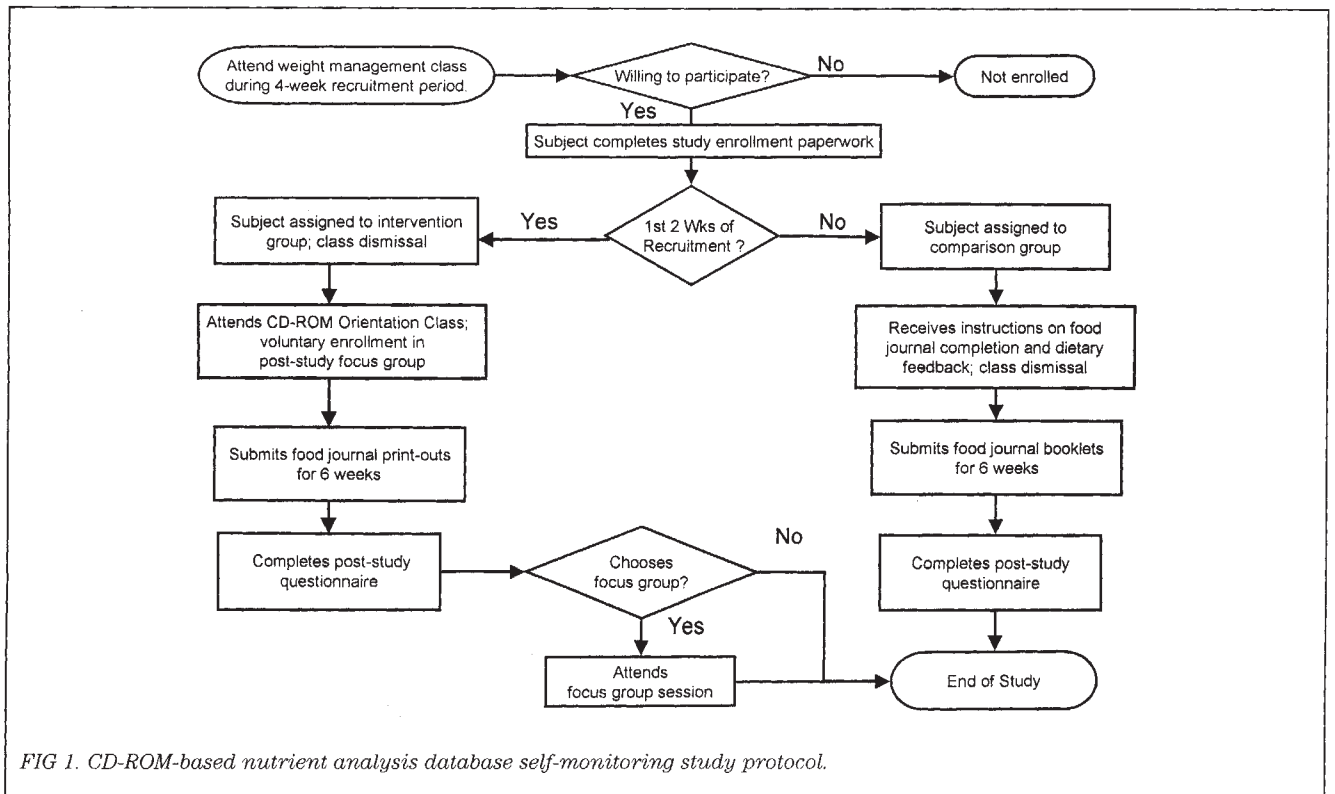


FIG 1. CD-ROM-based nutrient analysis database self-monitoring study protocol.

to each question read aloud by the investigator. The session was audiotaped and then transcribed and analyzed using Hyper Research for Windows (version 1.5, 1994, ResearchWare, Inc, Randolph, Mass).

STATISTICAL ANALYSES

Self-monitoring outcomes included the number of days recorded and the quality of self-monitoring records. Between-group comparison of the percentage of study days recorded, median number of days per week recorded, and attrition rates were calculated using the Mann-Whitney *U* test. Quality of self-monitoring was defined as the average daily number of food and beverage items recorded and was compared between groups using the Mann-Whitney *U* test. Descriptive or categorical data from questionnaires were analyzed primarily using χ^2 and Fisher exact tests. The Mann-Whitney *U* test was used to compare the number of minutes spent recording each day between the two groups.

RESULTS

Participant Characteristics

Forty-two men and women (comparison group *n* = 19, intervention group *n* = 23) from 8 weight management classes completed the prestudy questionnaire. Those who submitted no food records during the study were considered dropouts and were excluded from data analysis. The number of dropouts (10 and 8 for the intervention and comparison groups, respectively) was not significant between groups. Of prestudy dropouts (*n*=18), age and education were significant factors (using Fisher exact and χ^2 tests, respectively). Those who were younger and had no post-high school education were more

likely to drop out (*P* = .001 and *P* = .007, respectively). There was no significant difference between the remaining 11 comparison and 13 intervention group participants for age, gender, military rank, or education.

Food Record Completion Rates

Thirteen participants in the intervention and 11 participants in the comparison group completed food records during the study. Although not statistically significant, more intervention group participants submitted food records for all 6 weeks and recorded a greater number of study days. Sixty nine percent (*n*=9) of intervention and 46% (*n*=5) of comparison group subjects completed food records for all 6 weeks of the study. Similarly, 69% (*n*=9) of intervention and 46% (*n*=5) of comparison group subjects recorded on at least 75% of study days. The median percentage of study days recorded by participants was 100% for intervention group (*n*=13) and 50% for comparison group participants (*n*=11) (see Table). Overall, there was no significant difference in the average number of days per week documented between the two groups (number of days recorded over number of weeks when records were submitted).

Finally, there was no significant difference in the average daily number of items recorded or time spent recording between groups (see Table). Only food items containing greater than 25 kcal were counted.

Poststudy Questionnaire Results

After completing 6 weeks of the study, 9 participants in the intervention group and 5 participants in the comparison group filled out the poststudy questionnaire. Because of the small number of respondents, statistical data are not reported. All 9

In 2 words, about how successful were you in changing your eating habits for weight loss during this study? Would you say that you were "more successful," "less successful," "the same," or "not sure" as compared to previous efforts?

How, exactly, did this software add to your awareness or knowledge about your eating habits?

How, exactly, did this software help you to improve your food choices for weight loss?

What further assistance, if any, from a dietitian or diet therapist would have better helped you to understand or to change your eating habits while using this software?

What did you like most about this software?

What did you like least about this software?

If you could change one thing to make the software better, what would you change?

FIG 2. Questions presented to intervention group members to acquire additional qualitative data regarding self-monitoring.

intervention vs 2 comparison group participants reported reviewing their printouts or food records at least once per week. Similarly, all 9 intervention group members reported changing their eating habits based on available information about their food choices compared with 1 comparison group participant.

DISCUSSION

This was the first study, to the researchers' knowledge, to observe the effect of implementing a new technology on self-monitoring behavior. Computer users tended to record a greater percentage of study days; however, perhaps the intervention group members were more "ready" to lose weight, responding to study flyers by signing up immediately for the first classes where they were assigned to the intervention group. If this was the case, these persons might have adhered equally well to manual self-monitoring. Random assignment of participants into groups would have avoided this potential bias. Finally, the additional face-to-face involvement with intervention group participants during the EDH CD-ROM orientation may have improved study adherence.

Attrition has been explored in weight-loss programs. Mattfeldt-Beman et al (9) found that older participants (> 50 years) were more likely to attend weight-loss program sessions. In this study, initial dropouts (who submitted no food records during the study) were younger and less educated (no post-high school education) than those who completed the study. Reasons for attrition and participation have been reviewed elsewhere (12,13). Cognitive-behavioral aspects of self-monitoring (including barriers) should be explored to determine characteristics of consistent self-monitors.

Interestingly, many participants misperceived the relationship between self-monitoring and weight loss. Four intervention participants and 1 comparison group participant incorrectly agreed with the statement: "Self-monitoring is an effective way to lose weight even if I don't change my diet and exercise habits." Subjective review of food records for both groups revealed multiple high-fat food choices daily for many persons. This led researchers to question whether participants believed self-monitoring had a "magical" effect, replacing the adoption of healthful lifestyle changes for weight loss. Boutelle and Kirschenbaum (3) caution that self-monitoring is not the causal agent in weight loss but may reflect general motivation such as commitment to losing weight, better coping skills, or other dispositional characteristics (5).

Computerized self-monitoring may improve quality of food record documentation. Energy and nutrient information were available for 100% of food items on printouts compared with often incomplete and ambiguous documentation of items for handwritten food records. For example, instead of "cake...1 piece," the computer program forces the user to enter a specific portion size. Moreover, the software often included detailed information such as the name brand and cooking method, which greatly assisted the nutrition counselor in interpreting items, energy, and nutrients consumed.

Focus Group Results and Additional Qualitative Data

Six of 9 participants scheduled attended the focus group session. Participants were enthusiastic about the software. The majority perceived that they were more successful changing eating habits using software compared to previous weight-loss efforts. Respondents stated that they enjoyed the software's immediate feedback in terms of auto-calculation of energy and

Table

Food record documentation by active duty Air Force personnel participating in self-monitoring for weight loss study

	Comparison group ^a			Intervention group ^b			P ^c
	n	Median	Range	n	Median	Range	
Percentage of study days recorded by participants (out of 42 possible study days)	11	50	12-100	13	100	17-100	.264
Average number days per week recorded by participant	11	7.0	5.0-7.0	13	7.0	6.5-7.0	.755
Average daily number of items recorded	11	7.8	4.8-13.3	13	8.2	4.0-12.8	.664
Daily average number of minutes spent recording ^d (poststudy questionnaire)	5	12.5	4.0-15.0	9	11.0	5.0-20.0	.682

^aGroup completing food journals using manual method.^bGroup completing food journals using CD-ROM nutrient database.^cCalculated using Mann-Whitney *U* test. Statistically significant at P=.05.^dData missing for 6 persons in the comparison and 4 persons in the intervention groups due to incomplete questionnaires.

nutrients along with the substitutions list and that they consequently adjusted their food intake throughout the day. The majority believed that the software helped them to become more aware of their eating patterns, portion sizes, and the fat and energy content of specific foods. These comments were congruent with poststudy questionnaire responses indicating that significantly more intervention vs comparison group members improved their food choices.

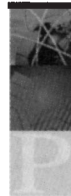
A few members who self-monitored had previously received nutrition counseling and believed this helped them use the information presented in the class. They also believed assistance from a registered dietitian or diet therapist would have been helpful for providing low-fat and low-energy options. Two participants desired more customized assistance, nutritional assessment, and additional reinforcement for dietary changes. One person in particular was unsuccessful until a diet therapy specialist identified areas for improvement and suggested more healthful food choices and behavior modification techniques.

Participants praised the ease and quickness of the software. Some focus group respondents indicated that the database was limited, although poststudy questionnaire responses indicated that the database was adequate and contained most of the food items they ate. Participants added a mean of 12.5±10.73 items to the database. Some commercial software or Internet-based databases may contain more extensive nutrient databases. The majority of participants desired a simplified search key function rather than having to search for an item by category type (eg, dairy, meat). Some reported that search field syntax was overly sensitive. Others desired the software to track their energy and nutrient intake, weight, and exercise progress over time. The fact that these persons did not perceive the software to be labor- or time-intensive is interesting as there was no difference in the time spent recording between the 2 groups. In fact, 1 person stated, "It [recording using the computer] wasn't a pain like writing everything down manually and then having to look it up in a book...If I had to do that [record] by hand, there's no way I'd be doing it." Furthermore, 5 intervention group members manually recorded items (pending computer data entry) from 2 to 7 days per week (n=3). Considering this, computerized self-monitoring may actually have required more labor and time than the manual method.

The majority of comments and attitudes toward the software were positive. The group unanimously agreed that they would be willing to purchase the software for 6 to 7 times the actual cost (retail cost = \$4 per CD-ROM).

CONCLUSION

Although quantitative aspects of self-monitoring were not statistically significant, this research generally supports the concept that the computer may be used to assist persons in successfully self-monitoring food intake for weight loss. Results of this study should not be inferred to the general population, however, due to education characteristics unique to this study group. The US Air Force population may be considered highly educated as all members must possess a minimum of a general equivalency or high school diploma before entering and most had college coursework. Also, participants in this study had computer access either at home or at their worksite, and 100% indicated a high level of experience and comfort with computers. In contrast, those in a lower socioeconomic situation may have limited access, experience, and comfort with computers. Technology is a useful and promising tool that can aid dietetics professionals and their clients in reaching nutrition goals through self-monitoring. However, more studies are needed to determine the effectiveness of computer applications for weight loss and to examine cognitive-behavioral aspects of self-monitoring consistency.



APPLICATIONS

Although this study examined use of a computerized nutrient database to self-monitor for weight loss, computer applications may be useful for clients managing a variety of nutrition concerns. These may include persons with diabetes who monitor carbohydrate intake, patients with renal disease who monitor protein intake, or generally healthy women who track calcium intake. The Ohio distinctive software used for this study was inexpensive, widely available, and tracked total energy, protein, and carbohydrate. The software was also unusually simple to use, which may be an important factor to consider. Three sophisticated Internet-based Web sites that contain more extensive nutrient databases and a wide variety of interactive tools to aid consumers in reaching nutrition goals

are Cyberdiet (www.cyberdiet.com), Dietsite (www.dietsite.com), and the Nutrient Analysis Tool (www.net.uiuc.edu). Access is free and both Web sites contain nutrition assessment tools that allow users to calculate energy needs, analyze recipes, and graph progress toward goals for weight, energy, and other nutrients.

References

1. Miller C, Achterberg C. Construction on the information superhighway: hard hats required. *Top Clin Nutr.* 1997;12:12-20.
2. Dennison KF, Galante D, Dennison D, Golaszewski T. A one year post-program assessment of a computer-assisted instruction (CAI) weight management program for industrial employees: lessons learned. *J Health Educ.* 1996;27:38-42.
3. Boutelle KN, Kirschenbaum DS. Further support for consistent self-monitoring as a vital component of successful weight comparison. *Obes Res.* 1998;6:219-224.
4. Burke LE, Dunbar-Jacob J. Adherence to medication, diet and activity recommendations: from assessment to maintenance. *Cardiovasc Nurs.* 1995;9:62-79.
5. Baker RC, Kirschenbaum DS. Self-monitoring may be necessary for successful weight control. *Behav Ther.* 1993;24:377-394.
6. Brownell KD, Cohen LR. Adherence to dietary regimens 2: components of effective interventions. *Behav Med.* 1995;20:155-164.

7. Barnard ND, Akhtar A, Nicholson A. Factors that facilitate compliance to lower fat intake. *Arch Fam Med.* 1995;4:153-158.
8. Foreyt JP, Goodrick GK. Factors common to successful therapy for the obese patient. *Med Sci Sports Exerc.* 1991;23:292-297.
9. Mattfeldt-Beman MK, Corrigan SA, Stevens VJ, Sugars CP, Dalcin AT, Givi MJ, Copeland KC. Participants' evaluation of a weight-loss program. *J Am Diet Assoc.* 1999;99:66-71.
10. Jerome A., Frederiksen LW. DietMate: computerized self-management for weight control. *Behav Ther.* 1992;15:256-258.
11. American Heart Association. *Brand Name Fat and Cholesterol Counter.* 2nd ed. New York, NY: Times Books; 1995.
12. Hennrikus DJ, Jeffery RW. Worksite intervention for weight control: a review of the literature. *Am J Health Promot.* 1996;10:471-498.
13. Prochaska JO, Norcross JC, Fowler JL, Follick MJ, Abrams DB. Attendance and outcome in a worksite weight control program: processes and stage of change as process and predictor variables. *Addict Behav.* 1992;17:35-45.

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PRACTICE POINTS

Self-monitoring technology still requires the services of an RD

To help patients and clients avoid the misconception that nutrient analysis databases have a "magical effect" on weight loss, Kim Stote, MPH, RD, says nutritionists need to be clear about what exactly the function of that database is—to monitor calorie intake.

Stote, who has first-hand experience using CD-ROM nutrient databases, such as the Executive Diet Helper (EDH), reminds her clients that altering diet and exercise habits are the real keys to achieving weight loss goals.

Before recommending self-monitoring technology to a patient, it is important to determine their computer skill level, according to Stote.

"The general population is becoming more up-to-date [with computer technology] and most schools are now teaching students basic computer skills so I think self-monitoring tools such as the EDH will continue to attract users."

While students are becoming more and more comfortable with computers, it may still be challenging to attract pre-teens and teenagers to participate in a detail-oriented, self-monitoring program—even if it is presented in the form of computer software.

Stote suggests setting the CD-ROMs to popular music or presenting the information in the form of a video game to attract the attention of younger users.

Another way nutritionists are promoting self-monitoring technology—for all age groups—is by informing their clients of

the availability of internet-based Web sites that contain extensive nutrient databases.

"These sites are generally quite beneficial to the client, as they are often free, and because they are on the Internet, they are very accessible. But dietitians should remind users that the services of an RD are essential to help interpret and explain the results of both the nutrient databases and of the Web sites."

Stote also cautions users to be make sure that the Web sites they are using for self-monitoring clearly acknowledge their source for food and nutrient values information.

"Most of them will utilize the USDA as their source. But if that is not indicated clearly on the site's home page, I would be very wary of using that site."

As for the future of self-monitoring technology, Stote would like to see more computer applications geared towards specific populations such as pregnant mothers and athletes.

"The USDA used to provide lists of nutrition-related software programs, but according to their Web site, they are no longer updating that list. I think it would be helpful to revive that listing and perhaps establish a rating system that would help nutritionists evaluate things like the program's ease of use and how they pertain to specific needs of the client."

This article was written by Tony Peregrin, an Editor of the Journal in Chicago, Ill.