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Comparação entre *softwares* de cálculo nutricional de dietas

Comparison of *softwares* for nutritional calculation of diets

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Abstract

The choice of the ideal software is essential to assist the development of the specific conduct. So this study evaluates the agreement of three softwares for nutritional calculation of diets, by comparing the nutritional composition of 100 24-hour recalls and the functional characteristics evaluated in the three programs. Observational study, which analyzed the characteristics and tools available in three calculation programs: DietWin Professional Plus® - version 2.0 Avanutri Online® and WorldFood Dietary Assessment System®. From the diets calculated in the three programs, it was possible to compare the characteristics of functionality, reliability, usability, efficiency and portability. There was similarity in the functional characteristics of the national programs, as opposed to the American one, which presented different differences and absence of a great number of characteristics analyzed. The study shows that the programs presented differences in their tools and characteristics. However the intention of the research work was not to make inference about their qualities, but only to help the professional in choosing the one that best identifies with his professional practice.

Keywords: Diet. Nutrition Surveys. Nutrients. Software. Observational Study as topic.

Resumo

A escolha do *software* ideal é essencial para auxiliar o desenvolvimento da conduta específica. A partir disso, este estudo avalia a concordância de três *softwares* de cálculo nutricional de dietas, por meio da comparação da composição nutricional de 100 recordatórios de 24 horas e das características funcionais avaliadas nos três programas. Estudo observacional, que analisou as características e ferramentas disponíveis em três programas de cálculo: DietWin Profissional Plus® - versão 2.0 Avanutri Online® e WorldFood Dietary Assessment System®. A partir das dietas calculadas nos três programas, foi possível comparar as características de funcionalidade, confiabilidade, usabilidade, eficiência e portabilidade. Verificou-se semelhança nas características funcionais dos programas nacionais, ao contrário do norte-americano, que apresentou diferenças discrepantes e ausência de grande número das características analisadas. O estudo mostra que os programas apresentavam diferenças em suas ferramentas e características. No entanto, a intenção da pesquisa não foi fazer inferência sobre suas qualidades, mas apenas auxiliar o profissional na escolha daquele que melhor se identifica com sua prática profissional.

Palavras-chave: Dieta. Inquéritos Nutricionais. Software. Estudos observacionais como assunto.

Introduction

The evaluation of food consumption plays an important role in nutrition research.[1] In nutritional epidemiology, food consumption data are collected to estimate the adequacy of dietary intake, relate it to health and nutritional status of individuals, and to evaluate the actions of education and nutritional intervention.[2]

The most used food consumption research methods are the 24-hour recall (24HR), the food record (FR) and the food frequency questionnaire (FFQ). These instruments, even with their peculiarities and limitations, are able to collect detailed information on food consumed and quantities ingested.[3-6] After collecting information in order to obtain the amounts of nutrients consumed, it is necessary to calculate the values of food composition tables.[7-9] However, with technological advances, nutrition softwares have been used as a quick and safe way to analyze diets by providing convenience to researchers. Among the advantages of using a computerized system, the reliability of calculations, time saving, ease of finding information, storage for future reference and also the possibility of changing the analysis must be emphasized.[10]

In the market, there are Brazilian and international softwares being used in research of food consumption. This diversity of available programs, each with its particular tools, nutrient database and calculation formulas may result in differences in the estimated food consumption.[11] Therefore, it is necessary to investigate the characteristics of each program and evaluate the most appropriate for each use.[12]

Standards for qualified evaluation software are developed and frequently enhanced by professionals from the computing area with expertise in software engineering. Some of the standards developed by the International Organization for Standardization (ISO)[13] and the International Electrotechnical Commission (IEC)[14] stand out, for they include qualifying features for software in general. However, in the literature quanti-qualitative evaluation studies in the area of nutrition softwares were not found.

Given the lack of studies of this nature and the importance of an evaluation of effective and reliable food consumption,we proposed to carry out this study. The aim of this study was to describe and compare the characteristics and tools available of three dietary analysis softwares and their efficiency.

Methods

This is an observational study that used secondary data of food consumption of a main research work. Data were collected by trained interviewers applying one hundred 24-hour food recalls to mothers or caretakers, from September 2011 to October 2012.

In this study, the sample consisted of simple random drawing of one hundred questionnaires about children from two to four years of age, of both sexes, the survey matrix participants. The researchers entered the food recalls data into the three programs: DietWin Plus® Professional version 2.0 (DietWin®),[15] Avanutri Online® (Avanutri®),[16] Brazilian, and the Worldfood Dietary Assessment System®, American.[17]

The characteristics of this software were analyzed in two ways. Firstly, the specific characteristics of nutrition software related to the items – food composition table, registered foods, anthropometric measurements, estimates of anthropometric measurements, registered nutrients and amount of versions -, all were evaluated numerically. Quantity update was assessed by frequency, since the remaining items were evaluated by the absence or presence, and such characteristics of the software have been divided into: diet composition; clinical evaluation; nutritional assessment; dietary prescription; clinical outcomes and available resources. All of them directly influence the quality and practicality of clinical and nutritional assessment.

The programs have also been classified as "high", while presenting all or most of the evaluated items, or "low", while presenting no item presented or in a small amount. The items evaluated in the characteristic "clinical course", namely, monitoring reports and patient's evolution chart, differ by the first reference to the monitoring of the patient's development and its objectives evaluated over the returns, and the second assesses how the patient progresses during the follow-up period, through graphics.

The errors of the programs are evaluated considering the occurrence of time errors emergence of less than or equal to 30 minutes of work, in which the interrupted activity was not recovered.

In the second aspect, the characteristics of the softwares were compared with regard to items described by the International Organization for Standardization (ISO)[13] and the International Electrotechnical Commission (IEC)[14] in ISO/IEC 9126-1 (Table 1), in order to check their quality. Recently, however, such a rule suffered compilation with ISO/IEC 14598 standard, forming the ISO/IEC 25000, which in general provides guidance for the use of new series of international standards, called Systems and Quality Software Requirements and Evaluation (SquaRE).[18] Within the ISO/IEC 25000, the most identified with the evaluation of quality are ISO/IEC 25012 and ISO/IEC 25010.

However, in this study, to better fit in the pattern and purpose of the quanti-qualitative analysis of the software, only the following standards were evaluated:

- Functionality: Fulfillment of what is proposed (it was assessed to verify if the program performed the functions assigned and provided results that matched reality); security access to data (presence or not of passwords already stored in the software for data access).
- Reliability: Emergence frequency of failures / errors (defined by the authors as "high" as they appeared in shorter or equal to 30 minutes and "low" when over 30 minutes of continuous use); Data recovery capacity after failures (yes or no).
- Usability: Ease of handling and understanding the interface and visuals (visual elements were evaluated by appearance, being described by the presence / absence of visually full screens, screen color, size of letters, interface and software allowing understand the data).
- Efficiency: Function Runtime (assessed by time spent while using the program); Sufficient resources / screens to perform necessary functions, without interfering however with the usability during the calculation of the recalls.

- Maintainability: It refers to software quality, ease to be modified to correct defects, adapt to new requirements, increase technical support or suit a new environment new -yet it was not possible to evaluate, for this item relates to an aspect of appropriate evaluation only to the specific professional area of computing, with expertise in software engineering and the use of specific tools.
- Portability: Easy to install on other systems.

The project was approved by the Research Ethics Committee of the University Federal of Goias (protocol 074/11) and all caretakers of study children signed the consent form. Importantly, the user's support of both national programs were contacted by the researchers through e-mails and calls in an attempt to clarify questions that have arisen in the development of this study. As for the American software, no means of contact, including online and telephone, was founded, which made the solution of doubts impossible.

Results

As for the softwares characteristics, evaluated according to the ISO / IEC Standard 25000, it was observed that concerning the item "functionality", both Brazilian programs perform the activities assigned and comply with the features expected in a nutritional calculation program (Table 1), the similarly offering security in data access. By contrast, in the WorldFood® calculation program, it was not observed the expected performance in the proposed activities according to ISO/IEC 25000 and most of the features described in Tables 1 and 2. However, there was a lack in this software secure access to archived data, due to missing user and password to access the program.

Table 1. Specific characteristics evaluated in the diet calculation software, following ISO and IEC guidelines.

Characteristic	Assessed items	*Avanutri*®	*Dietwin*®	*Worldfood*®
Functionality	Fulfillment of what is proposed	High Performed the proposed function	High Performed the proposed function	High Performed the proposed function
	Security access to data	High To access the data the administrator had to contain login and password	High Permission is required by the company	High You should download it to the computer in use
Reliability	Emergence frequency of failures / errors	Alto Alta frequência de falhas durante a digitação de dados	Baixo O programa apresentou baixa frequência de falhas	Alto Alta frequência de falhas durante a digitação de dados
	Data recovery capacity after failures	Baixo Os dados não são recuperados se houver alguma falha	Alto Os dados são recuperados pelo programa	Alto O trabalho realizado foi salvo automaticamente em caso de falha
Usability	Ease of handling and understanding of the interface and visuals	High Easy-to-understand design	High Easy-to-understand design	Low Difficult to see in every way
	Appearance	High	High	Low Unpleasant appearance
	Visually full screens	High Different view screens	High Different view screens	Low Small and tiring screen
	Screen color	High White screen background	High White screen background	Low Dark screen background
	Size of letters	High	High	Low Small letters
	Interface	High User-friendly overall interfac	High User-friendly overall interface	Low No user-friendly overall interface
	Software allowed understand the data	Low Some doubts about usability of the program have not been remedied	Low However, it presents an easy-to-access help manual	Low No way of communicating with the company was found to solve the doubts

continue

Characteristic	Assessed items	*Avanutri®*	*Dietwin®*	*Worldfood®*
Efficiency	Function Runtime	Low Time spent in use was increased by constant failures without data storage	High Adequate	High In spite of the failures, time spent using the program was normal
	Sufficient resources / screens to perform necessary functions	High Different screens for each proposed function	High Different screens for each proposed function	Low Only one screen for use
Maintainability	Easy to be modified to correct defects	High	High	Low
	Adapt to new requirements	Impossible to evaluate	Impossible to evaluate	Impossible to evaluate
Portability	Easy to install on other systems	High Online program, no installation required	High After the "permission" by the company, easy installation. However it can only be used on a single computer	High Easy installation, just by download. No need to contact the company

While using Avanutri Online®, constant errors in the system, often considered high, were noted. As in WorldFood® the frequency of errors was also considered high, however, the work already done remained stored, and it is possible to refer to it later.

Negative points regarding the usability of Avanutri Online®, DietWin Profissional® and WorldFood® must be pointed. After contact with the companies, we obtained the necessary information only in relation to Avanutri®. DietWin Profissional® provided accessible instruction manual, answering questions that may arise on the user. The contact email of the international software was not found.

WorldFood® was considered "low" in relation to the visual and design aspects. These were negative factors, as they cause visual fatigue in the user after long periods and hinder visibility of the work, due to the small size for viewing, strong and dark shades, the absence of figures in the main items and compacted disposal. The national programs performed satisfactorily, as theyr showed practicality and agility in their updating, as well as the item "portability", in which they were easily installed in other systems.

Table 2. Specific tools evaluated in the diet calculation software.

Tools	Assessed items	*Avanutri®*	*Dietwin®*	*Worldfood®*
Diet composition	Number of food composition tables	3	6	7
	Registered food	9000	>3500	1800
	Register for tool income / food	Yes	Yes	No
	Photographic record of portion sizes	No	No	No
	Nutritional interactions (foods and foods-medicines)	Yes	Yes	No
	Nutrient adequacy graphics and energy from the usual diet	No	No	No
Clinical evaluation	Description of pathologies	Yes	Yes	No
	Clinical signs	Yes	Yes	No
	Laboratory tests	Yes	Yes	No
	Medicines used	Yes	Yes	No
	Pipelines	Yes	Yes	No
Nutritional assessment	Number of anthropometric measurements	24	28	0
	Number of estimation of anthropometric measurements	4	5	0
	% fat calculation	Yes	Yes	No
	Energy calculation	Yes	Yes	No
	Energy expenditure in physical activity	Yes	Yes	No
	Profile anthropometric classification	Yes	Yes	No

continue

Tools	Assessed items	*Avanutri*®	*Dietwin*®	*Worldfood*®
Diet prescription	Anamnesis food	Yes	Yes	No
	Calculation of total energy value (TEV)	Yes	Yes	No
	Dietary recommendations table	Yes	Yes	No
	List of food equivalent	Yes	Yes	No
	Number of registered nutrients	35	143	54
	Food given for diseases	Yes	Yes	No
	Nutrient adequacy graphics and energy prescribed diet	No	No	No
Clinical outcome	Monitoring reports	Yes	Yes	No
	Evolution chart of patients	Yes	Yes	No
Resources	Number of versions	6	8	2
	Number of updates	Yearly	-	-
	Data storage	Yes	Yes	Yes
	Ability to export data to other applications	Yes	Yes	Yes
	Online version	Yes	No	No

Analyzing the food composition tables provided by the programs, it was observed that Avanutri Online® shows three food composition tables (TACO, IBGE and the Tabela de Composição Nutricional: suporte para decisão nutricional) as well as nutritional information provided by the manufacturers for some products. WorldFood® has its owns table called "The International Minilist (IML)", a total of 195 foods considered "staples", i.e., they are consumed across the world and besides, presents six specific tables by countries: Egypt, Kenya, Mexico, Senegal, India and Indonesia. As reference tables, DietWin Profissional® uses the same table, result of a compilation of data from main tables of food composition (TACO, IBGE, USDA, CENEXA, German, General Directory of Food and Datasheets revenue) and information from food manufacturers / products (Table 2).

As the tool for registration of income / food, Avanutri Online® and DietWin Profissional® present it directly in the program, while in WorldFood® it is only possible to register a food using an adjacent, with Microsoft OfficeExcel® program to create a new database. Both national programs allowed easy use of this tool, and made it possible to include such items, nutrients, energy, amount in grams of whether or not adding sugar yield, among others. Already observing the clinical evaluations, it was verified the presence of pathologies fill field and their descriptions, symptoms, clinical signs, reference tables as laboratory tests, ducts and medicines to fill in the fields only in Avanutri Online® and DietWin Profissional®.

The presence of the calculation of energy expenditure, considering the basal metabolic rate; energy expenditure on physical activity and anthropometric classification according to patient age in both national programs as well as the presence of space for registration of anthropometric measurements have been verified, especially by DietWin Profissional® mostly. With regard to the anthropometric needs and calculations, the WorldFood® program does not calculate energy expenditure and has no anthropometric measurement or classification.

As for diet prescription and the history subsection, national programs are similar, presenting history from nutritional assessment to food indicated to pathologies, while WorldFood® does not present any of these items, with only a basic registration, stating the identity of the patient name, age, weight, sex, if pregnant or nursing infant in the first or second half and level of physical activity (light, moderate or heavy); any kind of food inquiry is absent. None of the programs provide graphic adequacy of nutrients and energy of the prescribed diet.

It was also noticed that the programs had different amounts of nutrients registered, as follows: Avanutri Online®, 35 nutrients; DietWin Profissional®, 143; and WorldFood®, 54. However, the latter is distinguished by containing some nutrients that do not appear in other Brazilian software, such as the amount of energy animal origin, amount of protein of vegetable origin, vitamin A of animal origin, quantity of iron to prevent anemia, among others. Regarding the clinical course and its items, it was observed that printing of monitoring reports on the progress of the patient are available in DietWin Profissional® and Avanutri Online®, with complete items in both. In contrast, WorldFood® provides printed report only of the nutrients and list of calculated foods. The graphic evolution of patients was highlighted only in the national programs.

The timing and number of each version updates have only been ascertained for the Avanutri Online®, which is annually and automatically updated by the program system.Although there have been several updates since 2007, year of release, even after being in contact with the company, the amount of updates was not specified. It was no possible to determine the frequency of DietWin® and WorldFood® updates. Regarding the number of versions, DietWin® stands among the three to be higher, totaling eight versions; Avanutri® has six; and there were only two for WorldFood®.

The three programs have analyzed data storage features and the ability to export data to other applications. National programs generate and store on the computer, nutrient evaluation table separated from the menu and their quantities with practicality. Yet WorldFood® program has the ability to export data to other applications, but it is not as practical as the data and diet archiving. This requires following several steps, which give access to the menus of nutrient calculation file, where all entries, instead of being nominal, are called "ID".

Discussion

This study assessed diet calculation softwares based on the Standard 25000 quality model, referring to the items functionality, reliability, usability, efficiency and portability.[18-21] It can be considered a different assessment, because it was not found in the literature and this is the first study to evaluate such softwares.

Overall, it was found that Avanutri Online® and DietWin Profissional® were similar regarding the functional features, including registration for tool recipes / foods, nutritional interactions, nutrient adequacy graphics and energy from the usual diet, pathology description, clinical signs, laboratory tests, medications used, pipelines, calculation of % fat, energy calculation, energy expenditure on physical activity, anthropometric classification, food history, calculation of the total energy value (TEV) of dietary recommendations table, equivalent list of foods, foods indicated for pathologies, graphics adequacy of nutrients and energy from the diet prescribed, monitoring reports, evolution chart of patients, storage and capacity of export data to other applications. This data was also demonstrated by Lourenço et al.[22] in a comparative study of three computer programs, by Quadros et al.[3] and by Coelho et al.[12] in their studies on functional analyses of Brazilian softwares. In contrast, WorldFood® showed differences in the features found in other programs, which also makes a difference because we did not find studies reporting advantages or disadvantages of the use of its functions. It can be verified that the Brazilian programs were able to satisfy the criteria of the item "functionality", as opposed to the American software.

The wide range of functions found in the national software contributes to the improvement of the general care professional. However, the American software was considered lower, showing few functions and low-skilled to assist with personalized customer service and enhanced. As it has no nutritional assessment, calculations and classifications, the WorldFood® does not allow the fulfillment of nutritional analysis of the history and patient profile. Therefore, it is inefficient for the nutritional management, making it necessary to use other calculation methods or other programs to determine the needs of individuals, which may require a longer time to assess dietary requirements. In the evaluation of the safe access to data, the national softwares stood out, as they provide password, what makes them safer;on the contrary, the foreigndoes not require password to access the patients' data.

The reliability in the frequency of fault occurrence was considered high in Avanutri Online® and there was no possibility of recovering the interrupted activity, making the completion of the professional's work more difficult and time-consuming, a disadvantage of the software. The demand for work completion is higher for professional, one downside of the software. When looking at the usability of the programs, we noticed the presence of an instruction manual, accessible in DietWin Profissional®. This fact gives advantage to the software because it is the only one that contains an embedded manual in the program itself, giving the most professional security and speed in solving the doubts generated by use. As for the other, it was necessary to contact by phone and / or e-mail in an attempt to solve the doubts arisen during use, and only Avanutri Online® provided an answer. The ease of handling and understanding of the interface and visual elements are difficult to understand in WorldFood®, so it was characterized at this point as "low".

As for portability and ease of installation in other systems, all programs presented easy installation, each with their peculiarity, however, all fast and practical, demonstrating that the item "portability" was satisfactory. DietWin Profissional® is different, as it is necessary to make a "request for permission" for the company, where it releases a temporary password for 30 days, or license for a year. Avanutri Online® surprised, as it is available online and does not require installation, just register and login password. In the case of WorldFood®, it is only necessary to download the program.

Concerning efficiency, in the analysis of diet composition it was observed that the presence of a specific table in DietWin® was considered a peculiarity of the program in Lourenço et al.[22] It also stands out because it contains more registered food and provides the option to determine possible food interactions. For the presence or absence of photographic record there are contradictions, and in this study were not found photographic records for homemade measures in Avanutri Online® and DietWin Profissional® software, also confirmed by the study of Lourenço et al.,[22] unlike studies with earlier versions of these programas.[12,23,24] Likewise, it was analyzed for the presence of information on nutritional interactions (between nutrients or nutrient-medicine) and it was observed that only the Brazilian programs presented drug-nutrient relationship.

The presence of photographic record for home measures would help in standardization of portions indicated in food terms, thus facilitating the understanding by the patient. In his absence, the professional must look for other forms of demonstration, in order to avoid mistakes and misunderstandings at the time of preparation of a meal.

The software contained the item "clinical evaluations", and the authors attested the presence of padding fields for diseases and their descriptions, symptoms, clinical signs, reference tables, laboratory tests, conducts and medicines to fill the field only in Avanutri Online® and DietWin Profissional®.[12,23] The presence of these field descriptions facilitate prescribing specific diets

to patient's pathologies, and optimize the search by food products indicated in these working conditions, without the need to perform a more comprehensive research or study on the subject.

In what concerns the nutritional assessment, the DietWin Profissional® program stands out because it contains higher amounts of anthropometric measures and submit a drawing of the human body, assisting the professional find the exact location of the measure. Studies conducted in 2004 and 2008 also evaluated the presence of functionality to aid carrying out nutritional status assessment. This study as well verified the presence of anthropometric measurements, nutritional status by body mass index, energy expenditure calculation in physical activity, nutritional standards for diagnosis and assessment of pregnant women and children in the Brazilian softwares.[12,23] The presence of a specific area for evaluation of pregnant women and children contribute to the development of a complete and well-developed nutritional assessment, comprising the steps of life with its different age groups and energy needs.

In addition to the items described, the study found dietary recommendation table, equivalent list of foods and registered nutrients, as well as a study conducted in 2004, in which two national software were analyzed. There was also the presence of food history, different formulas for calculation of the total energy value (VET) and presence of food suitable for conditions in DietWin Profissional®[23], assisting the professional development of individualized eating plan. When checking the amount of nutrients registered in DietWin Profissional®, a contradiction was found: Quadros et al.[23] found only 112 nutrients, against 143 of the present study, as compared to the same version of the program.

Among the characteristics of available resources, a study conducted in 2011 attested a differential of the Avanutri® software: the presence of an online version, which gives the user the possibility to access it from any computer on the internet,[22] similar to a finding of our study.

Conclusion

Diet analysis softwares are basic, practical and important tools to be used by professionals in their daily lives and in nutrition research. This study shows that programs differ as to their general characteristics, qualities of use and available tools, showing that different softwares can be used for specific public or professionals, depending on their goal.

In the use of softwares it is worth mentioning the importance of observing the program's features to achieve the professional goals, as the quality of information offered by databases interfere much in the quality of work. However, thhis research did not aim to point out the superiority of any program to justify its use by professionals or researchers in the field of nutrition, but to compare the programs, in order to assist professionals in choosing the one that best fits with their needs.

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Contributors

Peixoto MRG participated in the design and research design; Schincaglia RM, de Assunção LB and Trindade DB participated in the data collection and analysis and interpretation of data; Trindade DB, Schincaglia RM, de Assunção LB, Peixoto MRG and Lima SJA participated in manuscript critical review about the intellectual content and writing of the manuscript.

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