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Procedia Food Science 2 (2013) 122 – 128

Procedia Food Science

36th National Nutrient Databank Conference

Digital Food Photography: dietary surveillance and beyond

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Abstract

The method used for creating a database of approximately 20,000 digital images of multiple portion sizes of foods linked to the USDA's Food and Nutrient Database for Dietary Studies (FNDDS) is presented. The creation of this database began in 2002 and its development has spanned 10 years. Initially the images were intended to be used as a kid-friendly aid for estimating portion size in the context of a computerized 24-hour dietary recall for 8-15 year old children. In 2006, Baylor College of Medicine, Westat, and the National Cancer Institute initiated a collaboration that resulted in the expansion of this image database in preparation for the release of the web-based Automated Self-Administered 24 Hour Dietary Recall (ASA24) for adults (now also available for use by children – ASA24-Kids). Researchers in the US and overseas have capitalized on these digital images for purposes including, but not limited, to dietary assessment.

Keywords: digital images; portion size assessment; dietary surveillance; technology aided dietary assessment

1. Introduction

The Food Intake Recording Software System (FIRSSt) [1] was originally developed as a computer-based, self-assessment tool to collect dietary information on number of servings of fruit and vegetables among school-age children. The success of this program, encouraged our team of nutritionists at the Children's Nutrition Research Center (CNRC) to enhance the application by expanding the food and nutrient database and incorporating one of the top eleven technologies of the previous decade: digital photography [2] The idea was that the incorporation of digitally produced portion size images could

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doi:10.1016/j.profoo.2013.04.019

potentially facilitate children's portion size estimation. However, to produce a large number of standardized digital images with minimal effort, a standardized tool was needed and the Food Photography System (FPS) was such tool.

The FPS made it possible to produce approximately 4000 digital images representing the food types, forms and range of portion sizes frequently reported by children in the Continuing Survey of Food Intake by Individuals 1994-1996-1998 (CSFII 94-96, 98).

In February 2006, the Exposure Biology Program, one of the components of the Genes, Environment and Health Initiative (GEI) was launched, thus providing the first funding opportunity to move the food photography project forward. However, it was the partnership with the National Cancer Institute and Westat, which permitted the expansion of the digital image database to accommodate the requirements of a self-administered tool for both adults and kids, the web-based Automated Self -Administered 24 Hour Dietary Recall (ASA24) and ASA24-Kids [3].

2. Methods

2.1. Food Photography System (FPS)

The main goal of the FPS was to produce high quality, high resolution digital images with minimal technical expertise and limited budget. To achieve this goal, the system had to be able to meet the following requirements:

- Produce properly exposed images with sharp detail
- Allow to easily obtain aerial and angled (42º) exposures of the foods
- Be simple to operate: require minimal manipulation of the cameras with only sporadic calibrations by a professional photographer
- Allow for quick, "on the job" quality control of the exposures
- Allow the storage and transfer of images to and from dedicated PCs without manipulation of the secure digital card (SD)

2.2. System design and components

A front view of the main components of the FPS is shown in Figure 1 and the two angles of exposure are illustrated in Figure 2. Of the two cameras shown in Figure 2, the one at the top captures aerial views, is placed at a distance of 86.36 cm (measured from the focal point to the film plate) and is set at an angle of 5º from the vertical plane to eliminate reflections of the camera on the images. The second camera, placed on the left side, captures angled views at a distance of 91.44 cm (measured from the focal point to the film plate) and is set at an angle of 42º above the horizontal, considered to be the average angle of viewing for a subject seated at a dining table [4].