Innovation in Nutrition Monitoring: NuMo a User Friendly Mobile App for Consumers

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NuMo is a newly developed mobile Nutritional Monitoring App that allows consumers to more easily keep track of key nutritional components in their diet, using the United States Department of Agriculture (USDA) Food Composition Databases (USDA, 2017a). The NuMo App provides consumers with information about their intakes of macronutrients (carbohydrate, protein and fat), essential fatty acids, sugars, and micronutrients (minerals and vitamins) by amount (i.e. micrograms) and also as a percent of the Dietary Reference Intakes (DRI), as published by the National Academies of Engineering, Science and Medicine (2011). Special consideration is given to nutrients that are highly associated with excessive inflammation, chronic diseases and cognitive function. NuMo runs on Apple and Android devices.

Health and brain function disparities are associated with the unbalanced intake of Omega-6 (n-6) and Omega-3 (n-3) fatty acids (Food and Agriculture Organization of the United Nations, 2010) and low levels of other essential nutrients such as Vitamin D (Kerr et al., 2015), zinc (Sensi et al., 2011), and selenium (Pasco et al., 2012) in the diet. Contemporary American diets have shown a 20-fold increase in the ratio of n-6/n-3 fatty acids in the last 100 years which is strongly implicated in excess inflammation and increases in a wide range of chronic diseases (Blasbalg, Hibbeln, Ramsden, Majchrzak, & Rawlings, 2011; Simopoulos, 2004). Low levels of n-3 have been linked specifically to impaired cognitive function, increased depression, anxiety, deficits in learning and memory, maladaptive behavioral changes and suicide attempts (Kuratko, Barrett, Nelson, & Salem, 2013; Lewis et al., 2011; Su, Matsuoka, & Pae, 2015; Zhang, Yanfeng, & Torres, 2005).

Development of the NuMo App exemplifies the benefits of transdisciplinary team work. The development team is comprised of seniors in computer science (to ensure state-of-the art programming) and seniors in business (to assess marketability) as well as biochemistry and consumer economics faculty (to ensure scientific robustness) and staff from Montana State University's Blackstone/LaunchPad Entrepreneurship Center (to ensure business feasibility).

Results from the development of the App have been surprising. Through a systematic review of competing apps, we identified significant deficits in popular nutrition apps currently available in the market place. Most of the apps available focus on calories and weight loss rather than nutrient content. Consumers should be aware that many of the most popular apps (i.e., My Fitness Pal) provide nutrient information that is user generated and sometimes inaccurate (My Fitness Pal, 2017). Perhaps even more disconcerting we found that even some of the most respected nutrition databases (including the most current USDA Food Composition Database (USDA, 2017a) contained incorrect fatty acid information (publications by Dratz and Hunts are in preparation) that could lead to consumers making ill-informed choices. Beta testers have often been surprised at the large amounts of sugar that they have been consuming in their diets. The NuMo app is superior in its ability to provide consumers with key nutrition information, especially about nutrients related to cognitive function, but is somewhat limited (as are all nutritional analysis tools) by the availability of accurate nutrient databases. NuMo has the capability to add corrections to the output provided to the consumer as corrections to the USDA database are discovered.

We are confident that the NuMo app will be of great benefit to consumers, by giving them the tools to more easily and accurately evaluate the nutritional value of their diets, based on scientific evidence. The most important conclusion we have drawn is that there is a great deal of additional work needed to provide consumers with the "most valuable" information they need. Below are three examples of consumer nutrition information that can be misleading:

First, the nutritional content of foods is based on chemical "assays" which identify a variety of proteins, fats, carbohydrates, vitamins, minerals and phytochemicals. However, what can be identified in chemical assays and what is bioavailable to humans is not necessarily the same. For example, grain products are often high in minerals including zinc and iron, but those minerals tend to be trapped by a substance in grain kernels called phytic acid, making them unavailable to humans when ingested. For example, per the USDA Food Composition Database (2017b), wheat germ is high in zinc, but little to no zinc is available to humans if they ingest wheat germ (Xue, Xia, McGrath, Shewry, & Zhao, 2015). Nutrition labels in this sense are quite misleading to the consumer, and we plan to enhance NuMo in the future to include some information on bioavailability.

Secondly, labels are required by law to give information about the product "as is" – even if "as is" is not a way in which consumers are expected to consume the product. For example, the nutrients in raw chicken are listed "as is" – although no one would expect the consumer to eat raw chicken. Raw and cooked chicken contain monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA) and saturated fatty acids (SFA). However, the fatty acid profile differs significantly across brands of chicken (Gibbs, Rymer, & Givens, 2013) and the effect of cooking at different temperatures can significantly change the fatty acid profile (Cortinas et al., 2004). This means that cooked chicken (depending on the temperature of cooking) may contains more SFA than the raw chicken label would imply. NuMo allows consumers to see the nutritional content of both raw and cooked animal proteins.

Thirdly, labeling laws have loop holes that can put consumers' health at risk. Many people try to avoid monosodium glutamate (MSG) as it is a known "excitotoxin" that can worsen symptoms of a variety of chronic diseases including arthritis and fibromyalgia (Holton, Taren, Thomson, Bennett, & Jones, 2012), metabolic syndrome (Insawang et al., 2012) and migraine headaches (Shimada, 2013). The common federal code Foods; Labeling of spices, flavorings, colorings and chemical preservatives (2016) requires that "Any monosodium glutamate used as an ingredient in food shall be declared by its common or usual "m or usual name "moor usual name "monosodium glutamate."" However, if the product has added hydrolyzed vegetable protein (which is about 15% MSG) then the label does not need to state that it contains MSG (although it cannot claim that it is MSG free) (United States Food and Drug Administration, 2012). Future versions of NuMo will provide consumers with detailed information about excitotoxins that are present in foods.

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