

Nutrition and Diet Research Progress

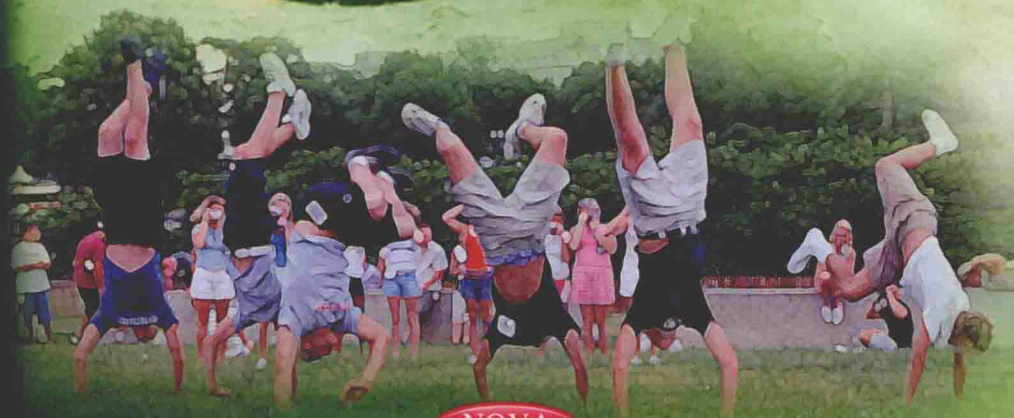


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NUTRITIONAL *and* PHYSICAL EDUCATION

JASON S. BUCHANAN
EDITOR



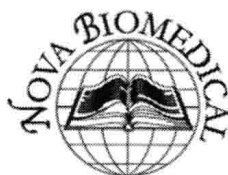
NOVA

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Preface

This new book presents current research in the study of nutritional and physical education. Topics discussed include nutritional education in the workplace; physical activity and obesity; nutritional game design by kids for kids; providing nutritional education to community-dwelling older persons, maternal nutritional education before and during pregnancy, and a discussion of the link between the endocrine system and obesity. (Imprint: Nova Biomedical Press)

Chapter I – Obesity is a major health problem [1, 2] and it is considered a chronic disease by the World Health Organization [3]. The definitions of overweight and obesity are based on body mass index [BMI], the bodyweight in kilograms divided by the squared length in meters. In adults, overweight is defined as a BMI of 25.0 to 29.9 kg/m², and obesity is defined as a BMI of 30.0 or higher. Obesity is further subdivided into grade 1 [$30 \leq \text{BMI} < 35$], grade 2 [$35 \leq \text{BMI} < 40$] and grade 3 [$\text{BMI} \geq 40$], the latter also referred to as morbid obesity [4, 5]. Both a reduction of food intake and an increase of physical activity are advantageous to reduce body weight.

In this chapter, the authors outline the pervasiveness and impact of the obesity epidemic and provide a summary of the common treatment of obesity and specifically of the role of physical activity as a treatment option. Furthermore, having outlined the influence of psychosocial factors in obesity treatment, an overview of possible physical exercise interventions will be given. Finally, the importance of motivation in physical exercise education in obesity and some practical tools will be offered.

Chapter II – The number of individuals in the United States and across the globe who are overweight or obese has reached epidemic proportions. The science and health care surrounding the study of obesity has expanded

significantly in the past 20 years. Researchers use animal and human investigations to describe biological processes associated with nutrition and the regulation of the body's intake, utilization, and storage of excess nutrient energy as fat. The endocrine system plays a major role in the regulatory mechanisms of energy supply and demand. Endocrine signals responsible for hunger and satiety such as leptin, adiponectin, and ghrelin are produced from adipose tissue and from the intestine. These signals are integrated in the hypothalamus and other areas of the central nervous system influencing eating behavior. The non-exercise energy thermogenesis (NEAT) required for routine daily living may play an important role in understanding obesity and the struggle for weight control. Obesity is the result of dysfunction of this complex, energy regulatory system. The mechanisms which evolved over thousands of years to assure a sufficient energy supply during times of famine and competition for a limited food supply, are now overwhelmed by the abundance of high energy, easily and inexpensively obtained food; marketplace pressures on eating such foods; and an ever increasing sedentary lifestyle decreasing energy utilization. The result is an epidemic of obesity and its attendant co-morbidities of cardiovascular disease, metabolic syndrome, diabetes mellitus, musculoskeletal disorders, and cancer which threaten to undo many of the medical advances of the past 50 years which have increased healthy longevity. The purpose of the chapter is to describe the relationship of the endocrine system and critical hormones which play a role in developing the author's understanding of the obesity health problem.

Chapter III— Sufficient muscle strength is one of the essential components for normal movement production and control, and is determined by many factors such as muscle cross-sectional areas, muscle fiber type compositions and muscle architectures. This chapter focuses on three other aspects that influence the strength performance of subjects with or without injury. Firstly, the strength will be influenced by anthropometric variables, especial the fat composition. Evidence shows that the strength difference between genders is largely affected by the difference in fat composition. While the fat composition covariate is controlled, the effects of gender on strength then become not significant. Secondly, the strength measurement results will be misleading if the measuring method is unreliable. In studies of investigating the reliability of isokinetic knee strength and the isometric hip and knee strength by handheld dynamometer, it was found consistently that the testing position is crucial to improve the reliability; changing the testing position from the traditional prone to prone-standing for hip extensor strength could effectively improves the strength measurement reliability. With the provision

the relative and absolute reliability, the authors could also know which measurement methods are reliable, and more clinically useful, how much the strength increasing could indicate a real improvement for a single individual. Finally, the recovery of strength deficits after incidents such as ACL rupture or reconstruction should be carefully monitored, as evidence shows bilateral weakness may exist after an unilateral injury, and the weakness of the affected knees may even exacerbate early after the reconstruction procedures. Evidence also shows part of the strength insufficiency could be explained by muscle recruitment failure. Therefore, a holistic investigation upon strength performance including understanding the body composition, measuring the extent of weakness and voluntary activation, with carefully selected procedures, should be necessary for designing an effective strengthening program.

Chapter IV – *Objective*: to identify the relationship of demographic, socioeconomic and obstetric variables and perceived stress on physical health among Macao Chinese pregnant women. *Design*: a cross-sectional and exploratory quantitative study. *Settings*: an antenatal clinic of a university-affiliated regional public hospital in Macao. *Participants*: a community-based sample (n=717) pregnant women in the second trimester. *Measurements*: perceived stress was measured by the Perceived Stress Scale (PSS), and Physical Health was measured by the standard SF-12 Health Survey (SF-12). *Findings*: a multiple linear regression analysis revealed that pregnant women who were secondary or lower education attainment ($\beta = .105$, $p = 0.013$), had better interpersonal relationship with family members ($\beta = 0.108$, $p = 0.014$) who lived in bigger residence size ($\beta = 0.085$, $p = 0.041$) without obstetric complications ($\beta = 0.085$, $p = 0.026$) and perceived lower stress level ($\beta = -0.096$, $p = 0.017$) had better physical health among Macao pregnant women. *Conclusion*: preliminary information was provided about Macao Pregnant women who had better physical health during pregnancy that was associated with the demographic, socioeconomic, obstetric, and perceived stress variables. *Implications for practice*: the development of a checklist or structured questions was necessary for clinical situations and tailor-made a program of enhancement of physical health during pregnancy.

Chapter V – The growing interest of children in games has promoted educators to employ computer games for pedagogical purposes. The purpose of this book chapter is to describe how 5th graders designed educational computer games about nutrition for younger children. As a part of class-wide project, the students were asked to design educational games that would teach first graders about nutrition. This chapter explored students' knowledge about

nutrition concepts. Children used the software *GameMaker* to design their games. This chapter describes how children took on the roles of user, tester, and designers of games and learned while taking these roles. The authors examined the representations of the nutrition concepts in the games, characteristics of the games, design strategies, and collaboration among students in the author's research. Results from three separate student cases are presented.

Chapter VI – Cooperative learning is considered among the most effective teaching strategies in education. Yet, so far, there is limited evidence regarding its application in physical education. The present study was designed to investigate the impact of different cooperative teaching strategies on students' motivation and learning strategies. The participants were 272 high school students (age ranged from 13 to 15 years old) divided in four groups. Students in all groups were taught the same football task; in groups A and B using the teaching games for understanding approach (in group A students were divided in homogeneous groups in terms of ability and in group B in heterogeneous groups), and in groups C and D using the skill execution approach (in group C the reciprocal style was used and in group D the practice style). After the end of the teaching unit, all students completed the Situational Motivation Scale and the Motivated Strategies for Learning Questionnaire. The results of the analysis indicated that students in the reciprocal style group reported higher scores in help-seeking compared to those in the practice style group. The findings of the present study provide useful information regarding the application of cooperative learning strategies in physical education.

Chapter VII – *Aims* To help community-dwelling older persons increase their knowledge and awareness of nutrition intake in daily living and engage with their health status through six consecutive weeks of a Nutrition and Lifestyle Program (NLP) in elderly community centers. *Background.* In Hong Kong, older persons aged 65 or above comprised 13.0% of the total population in 2010; this is expected to increase to 28% of the total population by 2039 (Census and Statistics Department, 2010). Because of the growing number of older persons, the healthcare system may be better focused on prevention than treatment. According to a report from the Census and Statistics Department (2008), about 90% of older persons (85,571 out of 852,796) were living in domestic households, and the rest were living in institutions with residential care in 2006. The ageing population is increasing worldwide. Nutritional education is necessary for community-dwelling older persons since they are at high nutritional risk due to functional and cognitive decline in the aging process, diet-related chronic illness and poverty. According to the food policy

in Hong Kong, nutritional labeling was commenced on 1st July 2010; older persons may require basic knowledge in food choices and adequate food to maintain optimal nutritional status. *Methods and Intervention.* The Nutrition and Lifestyle Program (NLP) was conducted in association with the elderly center in the community. Twenty-five community-dwelling older people from the elderly centre were invited to join the 6-week NLP, which covered nutrition and common chronic illness among the elderly, the food pyramid of basic nutritional needs, identifying healthy and unhealthy snacks and food (e.g. those high in cholesterol, saturated fat, and salt), meal planning, nutritional labeling, and encouraging physical activity. The NLP started with collecting demographic data (age, gender, health condition, educational level, financial situation and religion), in addition to information related to diet and exercise habit, basic nutritional assessment including calculation of Body Mass Index (BMI), measurement of mid-arm circumference, and collection of data in regard to food preferences. *Outcomes and Conclusion.* As expected, results showed that older persons can enhance their nutritional knowledge. They can empower themselves with such knowledge in their daily living, thus reducing their nutritional risk and achieving better disease management through diet therapy. After the NLP, the older people had significantly increased their meat and fluid intake ($p < 0.05$). In addition, there was an increase in their consumption of fruits and vegetables, although the improvement was not significant. Besides the improved nutritional intake, physical exercise was significantly increased too ($p < 0.05$). It seems that at last it is possible for the elderly to retain their health and enjoy their life in the community rather than in the care of an institution.

Chapter VIII – Traditional nutrition education programs that target obesity often focus on educating participants on meal planning, appropriate food choices, and reasonable portion sizes. While these are three important factors related to the education of healthy eating and weight management, instruction to consumers on the application of this knowledge with the development of the skills necessary for preparing healthy, appealing foods needs reinforcement. Nutrition education programs that focus on culinary skill development have been shown to be effective methods for improving the nutrition behavior of program participants. This chapter walks you through the complete process from designing to developing and finally implementing an engaging and unique culinary nutrition education program. Cooking with a Chef (CWC) has been delivered to a wide range of audiences and is used as an illustration of a well-executed program that utilizes key components, such as the pairing of a

professional chef and a nutrition educator for delivery of the program, hands-on cooking activities, and an interactive learning environment.

Chapter IX – Maternal nutritional status before and during pregnancy constitutes one of the most important determinants for fetal growth. Inadequate body weight before conception and low maternal weight gain are associated with adverse perinatal outcomes. The fetal origins hypothesis proposes that inadequate maternal nutrition and a low infant birth weight can predispose the child to diseases such as, diabetes and cardiovascular disease later in life. Pregnancy can be an opportune time to improve nutrition, and presents an ideal time for health promotion activities. However, many women of childbearing age do not maintain good nutritional status before and during pregnancy. They do not have an opportunity to get adequate and appropriate nutrition education in antenatal care. Most of them expect advice on general dietary improvements, with the remainder seeking advice on helping to promote their quality and quantity of nutritional intake. All women of reproductive age should be encouraged to follow the Government recommendation and eat a well-balanced diet. Health care providers need to ensure pregnant women know the positive and negative effect of poor maternal nutrition status, including the need for additional folate, at each physical check-up. An individualized approach is likely to have better outcomes than a standard intervention that is given to all pregnant women. A critical goal to achieve is for women to make behavior changes for good nutritional status before, during, and after conception, which may lead to improved birth outcomes.

Chapter X – Nutrition education programs have been implemented in the workplace in an effort to improve the diet and lifestyle of employees and, therefore, reduce the incidence of many chronic diseases linked to overweight and obesity including, diabetes, cardiovascular disease and cancer. Despite the importance of this outcome, the success of these programs has varied. This chapter uses a qualitative, narrative approach to review research conducted over the past 10 years on nutrition programs in the workplace and attempts to identify those aspects associated with successful behaviour change among employees. This approach enables us to include a variety of methods of intervention and data collection and thereby allows identification of promising intervention approaches that might not be identified in review approaches that are based on quantitative meta-analyses.

The chapter reviews the evidence for both the efficacy and the effectiveness of nutrition education programs in the workplace (i.e., whether an intervention works under ideal, well controlled conditions, versus whether

the intervention works in the “uncontrolled” real-world work place) (Spraycar, 1995). In addition, the characteristics of efficacious and effective programs are described including the duration of the nutrition education programs, the type of programs offered to employees, and the settings in which the programs were implemented. The results of the review suggest the workplace is a viable context for delivery of programs designed to change food intake behaviours, and overweight and obesity prevalence, although the challenge is to achieve sustained change on these outcomes after the intervention concludes. The results of this review should be taken into account when planning future work-based education programs on nutrition.

Contents

Preface		vii
Chapter I	Physical Activity in Obesity <i>Eveline J. M. Wouters and Rinie Geenen</i>	1
Chapter II	The Endocrine System and Obesity <i>Millie Jorge, Philip George and Daniel Riddick</i>	25
Chapter III	Consideration for Muscle Strength Measurement <i>Yi-Jing Lu and Shih-Fen Hsiao</i>	47
Chapter IV	Determinants of Physical Health among Pregnant Women in Macao, China <i>Ying Lau</i>	65
Chapter V	Cooperative Learning in Physical Education <i>Vassilis Barkoukis, Kondilena Katsani, and Haralambos Tsorbatzoudis</i>	85
Chapter VI	Providing Nutrition Education to Community-Dwelling Older Persons <i>Mimi M. Y. Tse, Vanessa T. C. Wan, Rose S. M. Heung, and Iris F. F. Benzie</i>	101
Chapter VII	CWC: Design, Development and Implementation <i>Margaret Condrasky</i>	119
Chapter VIII	Maternal Nutritional Education before and during Pregnancy <i>Hiroko Watanabe</i>	139

Chapter IX	Nutrition Education in the Workplace: Impact on Diet and Health <i>A. D. Hutchinson, B. Wilson and C. Wilson</i>	155
Index		195

Chapter I

Physical Activity in Obesity

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Introduction

Obesity is a major health problem [1, 2] and it is considered a chronic disease by the World Health Organization [3]. The definitions of overweight and obesity are based on body mass index [BMI], the bodyweight in kilograms divided by the squared length in meters. In adults, overweight is defined as a BMI of 25.0 to 29.9 kg/m², and obesity is defined as a BMI of 30.0 or higher. Obesity is further subdivided into grade 1 [$30 \leq \text{BMI} < 35$], grade 2 [$35 \leq \text{BMI} < 40$] and grade 3 [$\text{BMI} \geq 40$], the latter also referred to as morbid obesity [4, 5]. Both a reduction of food intake and an increase of physical activity are advantageous to reduce body weight.

In this chapter, the authors outline the pervasiveness and impact of the obesity epidemic and provide a summary of the common treatment of obesity and specifically of the role of physical activity as a treatment option. Furthermore, having outlined the influence of psychosocial factors in obesity

treatment, an overview of possible physical exercise interventions will be given. Finally, the importance of motivation in physical exercise education in obesity and some practical tools will be offered.

The Obesity Epidemic

Currently at least 400 million adults worldwide are obese [3]. Obesity is especially, though not exclusively, prevalent in wealthy countries [6]. Even between wealthy countries, the prevalence of obesity differs considerably [7]. In the Netherlands, about half of the adult population is overweight [including obesity], and 10-12% is obese [8]. In the United States, the most recent estimate of the prevalence of obesity was 34%, and the combined prevalence of overweight and obesity was 68% [9]. Also within nations disparities exist: in wealthy countries the prevalence of obesity is higher in people with a lower socio-economic status [10, 11] and there are consistent racial differences [12-14]. Obesity is a relatively recent public health problem and there is no evidence that it will have reached its maximum in the near future [15]. Moreover, the increase in overweight and obesity during their lifetime seems to become more prominent in younger, as compared to older generations [16, 17].

The increase of the BMI goes with a concomitant increase in physical, psychological, and social health problems. Obesity is a risk factor for diabetes, cardiovascular disease and several other complications of the metabolic syndrome, including sleep apnea, gall bladder problems, poly-cystic ovarian syndrome, fatty liver, gout, as well as for several types of cancer, diseases with orthopedic complications -especially osteoarthritis [18]-, and overall morbidity and mortality [19-21]. In general, there is an excess of unhealthy years lived in obesity, as compared to persons with a normal weight. Not only obesity, but also lack of physical activity is an important independent risk factor for several co-morbidities [22, 23]. The percentage of adults that meets the level of healthy physical activity is less than 40%, and even lower in persons with overweight or obesity [24-26]. The combination of overweight and low physical activity results in a higher increased health risk than the risk exclusively caused by overweight or low physical activity alone.

Although the majority of obese persons has no overt psychiatric disorders [27, 28], obesity is associated with mental problems such as depressed mood and low self-esteem [29, 30]. The relationship between depression and obesity is especially strong in higher educated women, persons seeking obesity

treatment, and in binge eating disorder [BED] [27, 31], which is characterized by incontrollable eating of unusually large quantities of food in a relatively short period of time, and a depressed and guilty feeling afterwards [32].

In addition to psychological problems, obese people may experience social problems such as reduced chances for education and to find a job, but also bullying, stigmatization and discrimination, often from a young age onward and [33, 34]. Obesity is often perceived by the non-obese as something preventable and some see lack of self-discipline and motivation as the only cause of obesity [33, 35]. Even family of the obese and obesity health professionals may hold this belief toward obese persons [36-38].

Among other causes, obesity is indeed the result of a disturbed balance between energy intake and energy expenditure. However, this view over simplifies the complex etiologic mechanisms underlying obesity, and it may easily lead to considering obese persons as persons who eat too much and move too little. The far more complicated truth is that in obesity, apart from nutritional factors and physical inactivity, also genetic, hormonal, psychological, and socio-economic factors play a role [39]. Major contributors to the obesity epidemic are environmental factors. The easy access to unhealthy calorie rich food and decreased need for physical exertion, have led to an almost inevitable energy disbalance [40, 41]. Whereas those of our ancestors who had a genetic constitution that helped to store energy for periods of scarcity were at an advantage, in the contemporary calorie rich environment, these so called 'thrifty genes' are a major disadvantage [42, 43]. From an ecologic perspective, obesity should not be regarded as a problem caused by irresponsible behavior of individual persons, but as a normal response to an abnormal environment [44, 45] [see figure 1].

Physical Activity and other Treatment Options

Many obese persons do not seek medical treatment, but if they do, most of them are motivated because they suffer from co-morbidities or otherwise reduced quality of life [46, 47]. Treatment modalities are often categorized into conservative treatment and bariatric surgery.