

THE EPIDEMIC OF OBESITY AND TYPE 2 DIABETES AMONG CHILDREN**Fran Kaufman, MD, Children's Hospital of Los Angeles and President, American Diabetes Association, USA**

The percentage of children and youth categorized as overweight (body mass index (BMI) >95th percentile for age and gender) has dramatically increased to approximately 20% of the pediatric population. Concomitantly, there has been an increase in the incidence of pediatric type 2 diabetes which has paralleled the 33% increase in diabetes prevalence among adults during the last decade. Prior to the 1990s, it was rare for most pediatric centers to have patients with type 2 diabetes. By 1994, type 2 patients represented up to 16% of new cases of diabetes in children in urban areas, and by 1999, depending on geographic location, the range of percent of new cases due to type 2 was between 8-45%. These cases of type 2 diabetes occurred mainly in ethnic minorities including African American, Mexican American, Native American and Asian American children and youth.

Type 2 diabetes is due to the combination of insulin resistance and a relative beta-cell secretory failure. There appear to be many genetic and environmental risks for insulin resistance and limited beta-cell reserve, including family history of type 2 diabetes, ethnicity, pubertal augmentation of growth hormone/IGF secretory dynamics, intrauterine exposure to maternal diabetes, low birth weight, sedentary lifestyle and female gender in association with hyperandrogenism. Prior to the development of frank diabetes, there is a period of prediabetes that children experience which can be defined as either elevated fasting glucose or impaired glucose tolerance.

Few studies have addressed the most effective prevention regimens, such as primary prevention for obesity, to reverse prediabetes or to improve glycemic outcome in those who have progressed to frank diabetes. The role of physical activity and nutrition must be rigorously investigated in the general pediatric population, as well as in the groups that span the spectrum from obesity, to prediabetes and diabetes.

SCHOOL-BASED DIABETES PREVENTION: POPULATION VERSUS AT RISK APPROACHES**Ken Resnicow, PhD, Emory University, USA**

Schools represent a logical channel to deliver Type II diabetes and obesity prevention programs to youth. Since the late 1970's numerous school-based disease prevention programs have been developed and tested in this country and abroad. Some exclusively addressed obesity; others addressed obesity within the context of disease prevention, most commonly cardiovascular disease (e.g., Know Your Body, CATCH). No large-scale studies have addressed Type II diabetes exclusively. This presentation will address major school-based obesity prevention trials and synthesize results through semiquantitative meta-evaluation. We divide studies into first and second generation, with the latter comprised of studies with more rigorous experimental designs and methodology and interventions clearly rooted in extant theory. Although most first and second generation studies have yielded weak or null results, a handful of studies (mostly second generation) that emphasized decreasing sedentariness have shown promise. Future directions for school-based obesity and diabetes prevention studies will be discussed.

WHAT DOSE OF PHYSICAL ACTIVITY AFFECTS DISEASE RISK FACTORS AMONG CHILDREN & ADOLESCENTS?**Russell Jago and Tom Baranowski, Baylor College of Medicine, USA**

This presentation reviews available literature on the effects of different training intensities, durations, and frequencies on the components of the metabolic syndrome (body composition, lipid, insulin and glucose levels) of both normal weight and obese children and adolescents. Methods: A literature search (PubMed, 1980-2002) was undertaken using key words to identify studies that examined the effect of monitored physical training. Results: The effect of physical training on risk profile was dependent on the subject's adiposity level. Vigorous, moderate, and resistance training all had positive effects on some (but not all) aspects of the risk profile of overweight youth. Only vigorous and resistance training consistently influenced the risk profile of normal weight youth. There is a lack of research on the effects of moderate and resistance training on the risk profile of obese children and vigorous training on the risk profile of obese adolescents. Conclusion: While almost any training positively affected some elements of obese youths' risk profile; only vigorous and resistance training were consistently effective with normal weight youth. However, research is needed to examine the effect of vigorous training on obese adolescents, the effect of moderate to vigorous training on body composition, insulin and glucose levels of normal weight children and adolescents and the effects of resistance training on the insulin and glucose levels of normal weight children and adolescents.

CAN WE GET MORE PA CHANGE FROM ENVIRONMENTAL OR BEHAVIORAL APPROACHES?**Joanne Harrell, PhD, RN, University of North Carolina at Chapel Hill, USA**

Studies among children indicate that frequent reasons for not being physically active are lack of time and lack of appropriate or safe places to be active. Children and adolescents may not like to exercise, but all kids like to play. If we are going to be successful in our efforts to increase their activity levels, we must help them increase play activities, such as participating in sports, playing "pick-up" games of basketball or soccer, riding bikes, swimming, skateboarding, and skating. Schools are important because they offer physical education programs that provide a potentially safe environment and if properly constructed offer children the opportunity to be active with fun activities. Several studies have promoted physical activity (PA) among children in schools by changing PE alone (an environmental change). Others have promoted PA among children by behavior change procedures. This literature will be reviewed for elementary and middle school students separately, and by gender, to determine the following: How much change in PA has been obtained from PE change alone? Is the success of these programs dependent on the type of activity (e.g. play they select and enjoy versus group activities imposed upon them) promoted? Is there evidence of increased or decreased PA outside of school from PE alone programs? How much PA change has been obtained from behavior change programs? Is there evidence of a synergistic effect from combining PE and behavior change programs? An integration will be presented that suggests optimal strategies for promoting PA among children.

CAN SCHOOL ENVIRONMENTAL CAFETERIA INTERVENTIONS PROMOTE DIETARY CHANGE?

Karen W. Cullen, DrPH, RD, LD, Baylor College of Medicine, Houston, USA

The school cafeteria provides opportunities for students to practice new eating behaviors and can support behavior change. A review of recent school-based interventions determined the impact of the environmental cafeteria component on dietary change. Thirteen of 14 published programs included cafeteria modifications that supported intervention outcomes, in addition to classroom and/or parent intervention components. In the 13 with a cafeteria component, significant positive changes in student consumption were reported in 12 studies. Unfortunately, six of the 13 studies only reported total daily intake rather than school meal specific intake, thereby precluding assessing the contribution of school cafeteria. Three studies reported increased sales of 1% milk (from 25 to 57% of milk sales), low fat entrees served (increase of 4%), and numbers of healthful food choices made by the students at lunch. Four studies reported total daily intake and some measures reflecting lunch changes. In two of these studies lunch observations were conducted with one finding increased lunch fruit consumption (0.30 serving), along with increased total daily fruit consumption (0.60 serving) and a 1.8% decrease in the % kilocalories (kcal) from fat. No change in lunch consumption was noted in the other observation study, but increased daily consumption of fruit and vegetables was reported (1.3 serving). The final two studies both reported decreased fat in the school lunch as served (from 40 to 35% and 39 to 32% of kcal), plus improvements in student daily fat consumption. Only one study reported improvements in fat grams (\downarrow 14%), kcal (-17) and % kcal from fat (from 38 to 34%) in lunches consumed by students in the intervention schools who reported eating school lunch meal or lunches from home. These data suggest that the cafeteria environment is an important component of school-based interventions. Future school-based research should identify targeted meal specific changes in consumption, and specify procedures that led to the changes.

CONCURRENT SYMPOSIA

Symposium 3 — Tracking of behaviours nutrition/Physical activity

Suzor-Côté

OVERVIEW

Theresa Nicklas, Baylor College of Medicine, Houston, USA

THE RELATIONSHIP BETWEEN ADOLESCENT LIFESTYLE AND ADULT HEALTH: RESULTS FROM THE AMSTERDAM LONGITUDINAL GROWTH AND HEALTH STUDY

Willem van Mechelen, Jos Twisk, Lando Koppes, Han Kemper, VU University Medical Center, The Netherlands

In western society cardiovascular disease (CVD) are the leading cause of mortality. Epidemiological research has contributed to the identification of major risk factors for the development of CVD and also to the identification of risk factors for many other chronic diseases associated with modern western lifestyle. Amongst the life style risk factors identified are smoking, physical inactivity, excessive alcohol consumption and unfavorable dietary habits. Most of the evidence on the relation between life style and disease comes from prospective cohort studies in adults. In order to set an agenda for effective prevention it is necessary to identify potential risk factors already at an early age. However, only few studies have been carried out that have assessed both life style and disease risk factors already from an early age onwards over considerably longer periods of time. One such study is the Amsterdam Growth and Health Study (AGHS). This study was started in 1977 in about 600 high school children aged 13 at the start of the study. They were measured at least once during adolescence, and re-measured at least 3 times in 1981, 1985, 1991/1993, 1996 and/or 2000 covering a 24 year follow-up period. Using data from this study in principle 3 different types of analysis have been made: 1. describing tracking of life style (i.e. physical activity, nutrition, smoking, alcohol intake) and biological (i.e. body fat, body fat distribution, blood pressure, maximal oxygen uptake, BMI, serum lipids, resting heart rate) risk factors for chronic disease; 2. analyzing the longitudinal relationships between lifestyle and biological risk factors for chronic disease; 3. predicting adult health status from life style behaviors earlier in life.

Purpose of this presentation is to give an overview of the outcomes of the AGHS, with an emphasis on the significance of a adolescent physical activity and nutrition for adult health.

TRACKING OF PHYSICAL ACTIVITY, FITNESS AND DIET FROM ADOLESCENCE TO YOUNG ADULTHOOD: THE YOUNG HEARTS PROJECT, NORTHERN IRELAND

C. Boreham¹, A.M. Gallagher, P.J. Robson, G.W. Cran, J.J. Strain, L.J. Murray, and J.M. Savage

¹. University of Ulster at Jordanstown, Ireland

The assumption that lifestyles formed early in life track into adulthood has been cited as the rationale for targeting physical activity and healthy eating programmes in children and adolescents. The aim of the current study was to determine the extent to which physical activity, aerobic fitness and intakes of energy and macronutrients track between adolescence and young adulthood, as part of the ongoing "Young Hearts Study" in Northern Ireland. In the original baseline studies, a random sample of 15 year-old boys (n=245) and girls (n=231) underwent assessments of aerobic fitness (20 metre shuttle run), physical activity (self-report questionnaire) and food intake (diet history method). Testing was repeated in young adulthood (22[SD 1.6 years]). To assess tracking, participants at both time points were split into tertiles for all outcome measures. A 3x3 matrix was then constructed from the numbers in each tertile at both time points, and the weighted kappa (κ) determined as a tracking coefficient and interpreted according to Altman (1991).

Results For energy and all macronutrient intakes, tracking coefficients were poor in both sexes ($\kappa < 0.25$), indicating substantial drift of subjects between the low, medium and high classes of intake with increasing age. For fitness, κ values were higher for males (n=222: $\kappa = 0.20$, 95% CI 0.10, 0.30) than females (n=209: $\kappa = 0.08$, 95% CI -0.03, 0.18), but both denoted a poor degree of tracking. Physical activity, on the other hand, tracked reasonably well in males (n=240: $\kappa = 0.34$, 95% CI 0.25, 0.43), but very poorly in females (n=209: $\kappa = 0.08$, 95% CI -0.03, 0.18).

Conclusion The generally poor tracking of fitness, dietary intakes and (for females) physical activity in the present cohort,

suggests that these aspects of adolescent lifestyle are unlikely to be predictive of young adult patterns. The exception seems to be adolescent male physical activity, which showed fair tracking into young adulthood.

TRACKING AND IMPLICATIONS OF TRACKING ON HEALTH IN YOUTH AND ADULTS

Lars Bo Andersen, Institute for Exercise and Sport Sciences, University of Copenhagen, Denmark

CVD is usually caused by high levels in many risk factors at the same time risk factors over many years. Therefore, it is of great interest to study if subjects stay within rank order over time in both the biological risk factors and the behaviour that influences these risk factors. Many studies have described stability in single risk factors, physical activity or fitness, especially in children, where hard endpoint are lacking, but few have analysed the impact on future disease or mortality (study 1), and few have studied the stability of combined risk factors (study 2).

Methods: Study 1: Subjects (n=138) participated in two examinations 8 years apart. First time they were 16-19 years of age. They were each time ranked into quartiles by sex in four CVD risk factors all related to the metabolic syndrome. Risk factors were the ratio between total cholesterol and HDL, triglyceride, systolic BP and body fat. The upper quintile was defined as being at risk, and if a subject had two or more risk factors, he/she was defined as a case (~15% of the subjects). Odds ratio (OR) for being a case at the first examination was calculated between quartiles of fitness, and the same analysis was performed at the second examination. The stability of combined risk factors was calculated as the OR between cases and non-cases at the first examination to be a case at the second examination.

Study 2: This study was a prospective study where physical activity was used as a predictor of future mortality. Physical activity was assessed in 28,000 subjects and assessed twice using the same questionnaire in 17,499 subjects, with 3-16 years between measurements. As the number of subjects who changed behaviour, and therefore were not exposed during the whole period, is known, it was possible to calculate the effect of changes in exposure on the estimated relative risk, and mortality rates could be calculated in each group of the cross tabulation of physical activity levels at the two examinations. Further, it was possible to calculate the relative risk between subjects, who stayed in the same activity group at both examinations.

Results: Study 1: At the first examination, OR between quartiles of fitness for having 2 or more risk factors were 3.1 (95% CI: 1.0-9.3), 3.8 (95% CI: 1.3-11.2) and 4.9 (95% CI: 1.7-14.2) for quartiles two to four, respectively. At the second examination, OR were 0.7 (95% CI: 0.1-4.3), 3.5 (95% CI: 0.9-14.5), and 4.9 (95% CI: 1.2-19.7), respectively. The chance for "a case" at the first examination to be "a case" at the second was 6.0 (95% CI: 2.1-16.9).

Study 2: When changes in exposure was taken into account, RR increased from 1.56 to 1.98 in men and from 1.80 to 2.56 in women compared to calculation, when only baseline data were used. The relative risk between physical activity groups, which had a stable activity pattern, with the sedentary as reference group, were 0.57, 0.52 and 0.24, respectively, for increasing activity level. In other words, we found a relative risk of 4 when we analysed stable behaviours compared to about 2 when only baseline measurements were used.

Conclusions: Study 1: The relationship between an exposure like physical fitness and CVD risk factors is much stronger when clustering of risk factors are analysed compared to the relationship to single risk factors. Also, the stability over time in multiple risk factors analysed together is strong with an OR of 6 for having 2 or more risk factors 8 years after in those who were at risk at the first examination. This relationship should be seen in the light of moderate or weak tracking of single risk factors, and is a strong evidence for a benefit of early intervention in children where risk factors cluster.

Study 2: The effect of changes in exposure levels (physical activity) during the follow-up in a prospective study is a dilution of the estimate. Most prospective studies include a follow-up time of ten years, where many subjects change behaviour, and they only use one baseline assessment of exposure level. Therefore, the real benefit of being stable physically active is strongly underestimated.

SPORT INVOLVEMENT, DAILY PHYSICAL ACTIVITY AND PHYSICAL FITNESS FROM ADOLESCENCE TO ADULTHOOD : THE LEUVEN LONGITUDINAL STUDY ON LIFESTYLE, FITNESS AND HEALTH

Lefevre J, Philippaerts R, Vanreusel B, Thomis M, Claessens AL, Renson R, Vanden Eynde B, Beunen G, The Study Centre for Physical Development, Belgium

The purposes of this study are (1) to examine the tracking or stability of physical activity levels and physical fitness; (2) to study the effects of a low-activity or high activity level on physical fitness, in Flemish males from 18 to 40 years of age. The data were collected in the Leuven Longitudinal Study on Lifestyle, Fitness and Health, a multidisciplinary research project. The project, started in 1969, is a follow-up study of a sample of men from 12 to 40 years of age and it is still continuing. Sport involvement was measured (questionnaire) by time spent on sport activities. Physical activity was estimated (at adult ages) using an adapted version of the Tecumseh Community Health questionnaire. Physical fitness measures included both health and performance-related fitness components. Tracking was analysed by percentage distributions, Pearson inter-age correlations and by simplex model. Manova for repeated measurements was used to look for the effects of activity level on physical fitness. Tracking from 18 years of age to adulthood appears to be higher for physical inactivity than for physical activity. Simplex models showed higher stability coefficients than Pearson correlations, and stability of physical fitness was higher than stability of physical activity. Highest stability was found in flexibility (correlation coefficients > .90). Physical activity showed the highest stability during work (r between 0.70 and 0.98 for 5-year intervals). Results from manova indicated that contrasting activity groups based on daily physical activity (during work and leisure time) in adults revealed differences in fitness components which are, in general, health related: adiposity, balance, flexibility, trunk muscle strength, static strength, and cardiorespiratory fitness. The high-active subjects were more fit than their low-active peers. These results indicate that physical activity has to be considered as an important factor for physical fitness at later ages.

OVERVIEW

Deanna M. Hoelscher, University of Texas, USA

THE GENE-ENVIRONMENT INTERACTION CONCEPT: A CORNERSTONE IN THE GENETICS OF OBESITY

Angelo Tremblay, Ph.D., Université Laval, Québec, Canada

The study of monozygotic twins under conditions of either overfeeding or energy deficit has allowed a clear demonstration of gene-environment interaction effects on energy expenditure and balance. From a clinical standpoint, this suggests that some individuals are more susceptible to body weight changes than others because of genetic particularities. This provides a new perspective in the field of predictive medicine from which health professionals expect the realisation of early diagnosis of individuals at risk to develop metabolic problems on the long term. With respect to the prevention and treatment of obesity, this concept also raises the possibility to identify low and good responders to a clinical intervention towards obesity. However, before predictive medicine be part of the habitual procedures in a clinical setting, an enormous amount of work has to be done to identify all genotypes and environmental factors which have the potential to interact each other. In this regard, our first attempt to identify genotypes conferring a greater risk to gain weight over time seems to have been fruitful since our preliminary data suggest that genetic variation in the glucocorticoid receptor is associated with variation in body fat gain in young women experiencing the transition between adolescence and adulthood.

GENE-NUTRITION AND GENE PHYSICAL ACTIVITY INTERACTIONS

Bouchard C, PhD, Pennington Biomedical Research Center, Baton Rouge, Louisiana, USA

Purpose: The purpose of this presentation is to review the evidence from human studies on the role of genetic differences in the response to long-term nutritional challenges or to regular physical activity. Background: Considerable individual differences are observed when people are exposed to standardized and fully controlled dietary interventions or regular physical activity programs. Animal studies suggest that these individual differences are associated in part with genetic variation. A series of studies performed with pairs of identical twins or with nuclear families was undertaken to verify if this heterogeneity in responsiveness was explained by genetic factors. Key findings: Experimental protocols conducted with pairs of identical twins have shown that brothers of the same pair are significantly more alike in their adaptation to long-term overfeeding or long-term negative energy balance conditions than unrelated individuals. This identical twin pair resemblance was observed for body mass, body composition, fat topography, glucose and insulin metabolism, lipid and lipoprotein, resting metabolic rate and other phenotype changes. Similarly, twin studies and the HERITAGE Family Study have revealed that there are family lines in the ability to benefit from regular exercise in terms of improvement in cardiorespiratory endurance, body composition, fat topography, blood pressure, insulin sensitivity, plasma triglyceride and HDL cholesterol. The latter observations have been made in families of black and white ancestry. Conclusions: This research program indicates that gene-nutrition and gene-physical activity interaction effects are ubiquitous in the population. It should be possible eventually to design individually defined dietary and perhaps physical activity recommendations to maximize health benefits.

GENETICS OF RESPONSE TO OBESITY INTERVENTIONS

Molly S. Bray, PhD, University of Texas, USA

Public health prevention programs designed to reduce the risk and occurrence of cardiovascular disease, obesity, diabetes, and other common, chronic diseases frequently focus on modifiable environments and behaviors such as diet and physical activity, with varied results among individuals. Pharmacological interventions also produce a wide range of response. This heterogeneity in response to disease interventions is at least in part of genetic origin. Though short-term treatment efficacy of weight control via the use of lifestyle changes focused on physical activity and healthy eating has dramatically improved over the past 20 years, long-term success has been elusive. Pharmacological interventions have also proven efficacious in the short term but most patients experience weight re-gain once the therapy is removed. Identifying genetic factors that influence both response and long term success may help to improve the efficacy of these treatment strategies. While it is widely accepted that genes play a role in the determination of body composition, lipid and energy metabolism, cardiovascular function, and other physiological factors, how genetic variation may influence response to dietary and exercise interventions is not well known. Enzymatic deficiencies such as glucose-6-phosphate dehydrogenase deficiency or phenylketonuria provide classic examples that alterations in diet can influence genetic predisposition for disease. Several studies have documented the role of genes, such as the apolipoproteins E, A-I, A-IV, B, C-III and lipoprotein lipase genes, in plasma lipid responsiveness to dietary fat and cholesterol restriction. This presentation will address the role of genetic variation in the response to diet and exercise interventions.

CONCURRENT PAPER SESSIONS

Session 5 — Youth: Physical activity and nutrition

Suzor-Côté

1:30

DETERMINANTS OF MAINTENANCE OF PARTICIPATION IN PHYSICAL ACTIVITY AMONG ADOLESCENTS

Anderson, D., Godin, G., Lambert, L.D., Desharnais, R. Université Laval, Québec, Canada

Purpose: To identify factors associated with maintenance of participation in physical activity among adolescents (aged 12 to 16 years).

Methods: A cohort of 316 students who were active at baseline was followed over a period of two years. Independent variables include psychosocial, environmental, and sociodemographic variables. The dependent variable was defined as being physically active at least three times per week at each measurement period.

Results: The proportion of adolescents who became inactive at two year follow-up was most pronounced in those students

who moved from grade seven to grade eight (age 12 to 14). Generalised estimating equations retained six variables as determinants of physical activity maintenance. Determinants of maintenance were: intention to participate (OR = 10.31; CI 95%: 6.09, 17.44); satisfaction with activity (OR = 3.16; CI 95%: 1.63, 6.10); participation in an organised sport (OR = 2.80; CI 95%: 1.87, 4.43) perceived behavioural control (OR = 2.19; CI 95%: 1.31, 3.65);, perceived social support (OR = 1.81; CI 95%: 1.02, 3.20); self-esteem (OR = 1.79; CI 95%: 1.15, 2.76) and being male (OR = 1.64; CI 95%: 1.03, 2.61).

Conclusions: The results suggests that interventions aimed at maintaining physical activity during adolescence should focus on reinforcing intention and providing easy access to opportunities to participate in organized leisure time sports. Health professionals, involved in youth sport, should consider participant's level of satisfaction with the activity practiced. Perceived social support may be enhanced by providing opportunities for older adolescents to participate in leisure time activities with peers. Enhancing participant self-esteem should be a goal of organized activities. As such, promotion programs should be developed to appeal to adolescent girls as well as younger adolescents aged 12 to 14 years.

1:45

THE ATHLETIC IDENTITY QUESTIONNAIRE FOR CHILDREN: INITIAL VALIDATION AMONG HISPANIC 5TH GRADE CHILDREN

Anderson, C.B., Baylor College of Medicine, Houston, TX; Coleman, K.J., San Diego State University Graduate School of Public Health, San Diego, CA, USA

Physical activity (PA) over years likely reflects a core aspect of the self as a physically active person initiated in childhood. Athletic identity was conceptualized as a subset of physical self-concept specific to exercise, sports, and PA, and as a relatively stable, but potentially changeable attribute. The model postulates 4 correlated dimensions: athletic appearance, competence in exercise/sports/PA, importance of exercise/sports/PA, and encouragement from others (parents, best friends, teachers). **PURPOSE:** This was the first of two studies to develop and validate a measure of athletic identity for children. **METHODS:** The 75-item Athletic Identity Questionnaire for Adolescents (Anderson, 2003) was modified for children. The scale was administered to 504 5th graders in the El Paso, TX CATCH Program (256 boys, 242 girls, mean age = 10.6 yrs, 3.4% White non-Hispanic, 95.4% Hispanic, 0.8% African-American, 0.4% Other). **RESULT:** Using LISREL 8.51, the 4-factor measurement model represented a good fit, $\chi^2(45, N=489)=149.70, p=0.0, RMSEA=.070$ (90% CI=0.058-0.083), CFI=.97. In a 6-factor measurement model that included fitness and body composition, fitness (9-min run from Grades 4 & 5) correlated significantly with appearance ($r=.45$), competence ($r=.36$), importance ($r=.30$), and encouragement ($r=.14$), and body composition (Grade 5 triceps, subscapular skinfolds, waist circumference) correlated significantly with appearance ($r= -.40$). This 6-factor measurement model represented a good fit ($RMSEA=.047$). **CONCLUSION:** Results provide evidence of construct validity for the Athletic Identity Questionnaire for Children, a measure potentially useful in evaluation of athletic identity and behavioral change following PA interventions, and in the identification of children at risk for inactivity.

2:00

PHYSICAL FITNESS OF CHILDREN PARTICIPATING IN THE BIENESTAR HEALTH PROGRAM

Garcia, O.A., Dempsey, L.A., Trevino, R.P., Hernandez, A.E.; Yin, Z.; Medical College of Georgia, Augusta, GA, The Social and Health Research Center, University of Texas at San Antonio, San Antonio, TX, USA

Increasing rates of obesity and associated diseases like type 2 diabetes have become an urgent public health concern. The Bienestar Health Program is a coordinated school-based social behavioral education program whose main objective is to reduce diabetes risk factors in children; its focus is on changing sedentary lifestyles and poor dietary habits. The Bienestar Program consists of parent, health class, school cafeteria and after-school programs. The purpose of this longitudinal study is to assess the effectiveness of the program in reducing risk factors in children. The population for this study was 4th grade students from 13 intervention and 14 control schools. Fitness was assessed by a modified Harvard step exercise test. The score is calculated by dividing the total time of exercise in seconds by the sum of three heart rates post exercise, with a higher score indicating better fitness. Pre and post-intervention testing was conducted in the fall of 2001 and spring of 2002. Complete data was available on 626 control and 647 intervention (1,273 total) children. The mean score for all children at baseline was 64.9, a score that is considered low average. Upon follow-up assessment, children in the intervention schools showed an increase in their fitness scores (64.1 to 65.8) compared to control (65.9 to 65.3) school children. A one-way ANOVA test of mean change scores (+1.7, -.5) was statistically significant at .005. These results show promise for coordinated school based interventions in increasing physical activity among high risk (low income, minority) children.

2:15

AN OVERVIEW OF THE TRIAL OF ACTIVITY IN ADOLESCENT GIRLS: RATIONALE AND STUDY DESIGN

Lytle, L.A., University of Minnesota, Minneapolis, MN, USA; Elder, J.P., San Diego State University, San Diego, CA, USA; Lohman, T., University of Arizona, Tucson, AZ, USA; Pate, R.R., University of South Carolina, Columbia, SC, USA; Pratt, C., National Heart, Lung, and Blood Institute, Bethesda, MD, USA; Stevens, J., University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; Webber, L.S., Tulane University, New Orleans, LA, USA; Young, D.R., University of Maryland, College Park, MD, USA

Purpose: This session will describe the rationale and study design for the Trial of Activity in Adolescent Girls (TAAG), a multi-center school and community study funded by the National Heart, Lung and Blood Institute of NIH.

Background: The transition from childhood to adolescence is associated with a 34% decline in physical activity in girls. To date, most physical activity interventions have targeted elementary-age children and have focused on school programs. The primary aim of TAAG is to determine if an intervention that links schools to community organizations reduces the age-related decline in moderate to vigorous physical activity in middle school girls.

Key Points: Thirty-six schools, randomized to intervention (18) or control (18), across six field centers in the US are participating in this intervention trial. A randomly chosen sample of 6th grade girls were recruited to participate in baseline measurements which include: CSA monitors worn for 7 days (primary outcome), a 3 day physical activity

self-report, assessment of body composition, and a survey assessing beliefs, attitudes and other potential mediators and moderators of physical activity. Environmental outcomes include change in physical education class structure, school physical activity programs, and school-community physical activity partnerships. A cross sectional sample of 8th grade girls will be recruited at two time periods (immediately following the end of the intervention activities and one-year post intervention activities) in order to examine the effectiveness and sustainability of the intervention activities. The intervention activities include both school-based and school and community linked approaches to increase girls' physical activity.

Conclusions: This large, innovative study has great potential to add to our knowledge of how to positively influence adolescent girls to be more physically active.

2:30

AN UPDATE ON ACTIVATE A CHILDHOOD OVERWEIGHT PREVENTION INITIATIVE

Richard Elder, MBA, International Food Information Council Foundation in Washington, DC, USA

Purpose: Overweight/obesity is a major public health problem, particularly among children. At ISBNPA 2002 the ACTIVATE Partnership had just launched Kidnetic.com: an interactive, innovative, educational Web site designed to help children ages 9-12 and their parents work together to begin the process of behavior change. The site provides fun, creative, credible tools to help both kids and parents move toward healthy eating and physically active lifestyles within the family, school and community settings. By ISBNPA 2003 we will have a full year of learning and will have completed a formal evaluation of the site's effectiveness.

Methods: Two and a half years of unprecedented in-depth consumer research—focus group, ethnographic, in-home interviews and quantitative—was conducted to track consumer knowledge and perceptions of the overweight problem, define appropriate audiences for messages, and develop customized program elements in order to deliver actionable advice for healthy living to children and their families via Kidnetic.com. Results/Findings: With over 560,000 visits to the site since the launch in June 2002, Kidnetic.com is effectively reaching kids and parents. The preliminary findings indicate a strong interest in the subject of physical activity and nutrition by the target audience. The average length of stay on the site is 16 minutes, during which visitors utilize many of Kidnetic.com's features.

Conclusions: The initial findings indicate that physical activity and nutrition information can be successfully delivered to kids and families through a Web site designed around their needs and interests. They also provide ideas for further research in nutrition and physical activity information delivered via a Web site.

2:45

'DISH IT UP': AN INTERACTIVE MULTI-MEDIA CD-ROM FOR THE PROMOTION OF NUTRITION EDUCATION IN SECONDARY SCHOOLCHILDREN

Livingstone, M.B.E., McKinley, M.C., Robson, P.J., Morrissey, M., Moran, A., University of Ulster, Coleraine, Northern Ireland, BT52 1SA, UK; Gittins, M., Interface New Media, London, WC1N 2LA, UK; Lewis, C., Food and Health Communications Ltd, York, YO62 6BH, UK

The aim of this project was to develop an interactive CD-ROM for the promotion of nutrition education in 12-year-old UK children. A major priority was to use positive and entertaining instructional activities in order to promote autonomy, decision-making skills and self-esteem with regard to healthy eating. Development of 'Dish it Up' was undertaken in four phases: 1. Collection of background material; 2. Development and testing of storyboards and design ideas; 3. Pilot testing and modification of the prototype CD-ROM; 4. Evaluation of the effectiveness of the CD-ROM. Each phase was carried out in collaboration with schools (n=27) using focus group discussions (pupils), structured interviews (principals and teachers) and questionnaires (pupils and parents). 'Dish it Up' takes the form of a virtual day and addresses a number of themes and issues in trying to achieve a healthy diet. The issues are discrete sections within the typical school day and include: breakfast, snacking, lunchtime and 'fast food' in a social setting. Opportunities are provided for children to self-monitor and analyse their food intake and set dietary goals. The themes include the importance of enjoying food/eating; balance and variety; self-esteem; body image; peer and media pressure; physical activity; motivations and barriers to choosing a balanced diet and misconceptions about food. Initial evaluation of the effectiveness of 'Dish it Up' showed that it did bring about highly significant improvement in nutrition knowledge scores. However, regular evaluation studies will be important to fully document its longer-term impact and success.

1:30

PERCEPTIONS OF THE LOCAL NEIGHBOURHOOD AND WALKING AND CYCLING AMONG CHILDREN

Timperio, A., Telford, A., Crawford, D., Salmon, J., Deakin University, Melbourne, Australia

Few studies have examined environmental influences on children's physical activity. This study examined associations between perceptions of the local neighbourhood and children's walking and cycling. Children aged 5-6 (n=291) and 10-12 (n=919) years were recruited from 19 primary schools in high and low socio-economic areas of Melbourne. Parents provided proxy-reports of their child's usual walking or cycling to local destinations and were asked their perceptions of their neighbourhood (traffic, strangers, road safety, lights/crossings, sport facilities, location of play areas). Children aged 10-12 years were asked about their perceptions of traffic, strangers, road safety and sporting venues in their neighbourhood, and their parent's views on these issues. Multivariate logistic regression analyses were performed,

adjusting for maternal education. Among 5-6 year-old children, boys whose parents believed there is heavy traffic in their local streets were 2.7 times more likely than other boys (95%CI=1.1-6.7), and girls whose family owned >1 car were 70% less likely than other girls (95%CI=0.1-0.9), to walk or cycle >=3 times/week. Among 10-12 year-old children, boys whose parents believed there are no lights or crossings were 60% less likely than other boys to walk or cycle (95%CI=0.2-0.7). Among girls, parent's belief that their child needs to cross several roads to reach play areas (OR=0.4, 95%CI=0.3-0.7) and child's belief that there are no parks or sports grounds near home (OR=0.5, 95%CI=0.3-0.8) were associated with a lower likelihood of walking or cycling >=3 times/week. Conclusions: It may be important to consider the local neighbourhood when developing strategies to increase children's physical activity.

1:45

MEASURING INCREASES IN INCIDENTAL PHYSICAL ACTIVITY IN A POPULATION USING PEDOMETERS AND A HABITUAL ACTIVITY INSTRUMENT

Billie Giles-Corti(1), Gavin McCormack(1), Rex Milligan(2), Trevor Shilton(3) and other Member of Evaluation and Monitoring Working Group (EMWG)(4)

1. The University of Western Australia; 2. Health Department of WA; 3. NHF (WA Division); 4. Premier's Physical Activity Taskforce, Perth, Australia

Purpose: The Western Australian Premier's Physical Activity Taskforce was established to increase the proportion of the population who are sufficiently physically active by 5% by 2011. As one focus of the Taskforce activity is to increase incidental physical activity, the EMWG recommended that the baseline data collection include objective and self-reported measurement of physical activity behaviour, as well an instrument measuring habitual incidental activity.

Methods: Test-retest reliability of a habitual incidental activity tool developed for the Taskforce was assessed prior to the main study (n=84). Overall, 3200 randomly selected respondents participated in a telephone survey conducted in November 2002 (response rate 65.4%). 600 of these respondents were invited to participate in a pedometer study in which they were required to complete an activity diary and wear a pedometer for 7 days.

Results: Intraclass correlations indicated that items measuring frequency of incidental behaviors were more reliable than those measuring duration. Kappa coefficients for items measuring participation in habitual incidental physical activity behaviours showed moderate-to-high reliability, while measures of sedentary behaviours showed high test-retest reliability. The pedometer study proved popular with respondents. Of those who agreed to participate, 93% of these respondents returned their pedometer and activity diary. The presentation will include a discussion of incentives and follow-up used to maximise the return of the pedometers and a comparison of the pedometer and self-report data.

Conclusion: Our study demonstrates that objective data can be incorporated into baseline measurements of physical activity for interventions with relative ease.

2:00

PHYSICAL ENVIRONMENTAL CORRELATES OF WALKING NEAR HOME

Terri Pikora, Billie Giles-Corti, Fiona Bull, Konrad Jamrozik, Matthew Knuiiman, Rob Donovan, Jo Clarkson, The University of Western Australia, Perth, Australia

Purpose: To examine the relationship between the physical environment and walking for recreation and for transport.

Methods: A hierarchical conceptual framework that included three levels was developed. It included features (overall environmental factors that influence physical activity), elements (that are components of features) and items (that have the potential to be changed to improve an element). An audit tool was used to collect data in neighbourhoods within a 400m radius of 1678 randomly selected respondents living within a 408 km² area of metropolitan Perth, Western Australia. The data were aggregated to provide neighborhood scores for each respondent.

Results: Four features were identified as influencing walking near home: functional (e.g., sidewalks), safety, aesthetics, and destinations. After adjustment, functional features (OR 1.62; 95% CI 1.20-2.19) appeared more important for walking for recreation near home than safety (OR 1.20; 95% CI 0.92-1.57), aesthetic (OR 1.20; 95% CI 0.84-1.73) or destination (OR 0.99; 95% CI 0.71-1.36) features. These included the presence of well-maintained, continuous sidewalk systems; street design; and traffic volume, speed and traffic calming devices. A different set of factors was related to walking for transport near home. After adjustment, access to destinations (OR 1.80; 95% CI 1.33-2.45) were more important for walking for transport near home than functional (OR 1.30; 95% CI 0.97-1.73), safety (OR 1.12; 95% CI 0.85-1.46) or aesthetic (OR 0.90; 95% CI 0.66-1.22) features.

Conclusion: Neighbourhood factors that influence walking for recreation and transport may differ. Environmental items that influenced the overall results will be discussed.

2:15

ENCOURAGEMENT FROM FAMILY AND FRIENDS EXPLAINS APPROXIMATELY 40 PERCENT OF THE VARIANCE IN ADOLESCENTS' PHYSICAL ACTIVITY

Davison, K.K., The Pennsylvania State University, University Park, USA

Levels of physical activity decline as youth transition through adolescence. Reasons for this decline and methods to prevent its occurrence have not been identified. In this study, a comprehensive self-report measure of parental, sibling, general familial and peer support of adolescents' physical activity (ACTS: Activity Support scale) was designed and used to predict levels of physical activity among 201 white rural adolescent girls and boys aged 12-14 years. Scores on three self-report measures of physical activity were combined to create a summary activity score. Initial analyses revealed that the ACTS exhibited good reliability and validity; all but 3 (out of 34) items on the ACTS loaded clearly onto the anticipated factor and internal consistencies for each source of influence were high ranging from a = .71 to .78. Significant positive associations were identified between adolescents' physical activity and maternal logistic support (e.g., driving child to and from sporting events)(boys r=.23), maternal modeling (girls r=.23), paternal logistic support (girls r=.39; boys r=.38), paternal modeling (girls r=.21; boys r=.22), general familial support (e.g., using sport as a form of family recreation) (girls r=.38; boys r=.20), and sibling (girls r=.35; boys r=.37) and peer (girls r=.35; boys r=.51) support. All

sources of support collectively explained 41% and 33% of the variance in girls' and boys' physical activity, respectively. Results from this study indicate that promoting encouragement of activity by family and friends may have a substantial positive impact on levels of physical activity among youth at a crucial time in development.

2:30

THE TRADITIONAL INUIT FOOD AND STORE-BOUGHT FOOD CHOICES OF A CANADIAN ARCTIC POPULATION: A TEST OF DIFFERENT SOCIAL COGNITION THEORIES

Bernier, Susie(1), Furgal, Christopher M.(1), Godin, Gaston(2), Grondin, Jacques(1), & Dewailly, Éric(1)

1. Public Health Research Unit, CHUQ (CHUL), Canada, 2. Research Group on Behaviours in the Field of Health, Université Laval, Canada

Purpose: The objectives of the study were to explain the intention to eat traditional Inuit food (TIF) and store-bought food (SBF) and to test the applicability of different social cognition theories among a Canadian Inuit population

Methods: 250 Inuit residents of Kuujuaq, Nunavik (Canada) were randomly selected and asked to complete a questionnaire assessing psychosocial variables derived from the theories of Ajzen and Triandis. The questionnaires were available in both English and Inuktitut (the local language).

Results: Multiple regression analyses showed that the theories of Ajzen and Triandis yielded significant results (both at $p < .0001$). However, a combination of the constructs provided a more efficient explanation of intention. The determinants in the combined model explained 49% of the variance in intention to eat TIF and 63% of the variance in intention to eat SBF. Perceived behavioural control ($\beta = .40, p < .0001$) was the strongest predictor of intention to eat TIF three times a week or more. Personal normative belief ($\beta = .31, p < .0001$), affect ($\beta = .27, p < .0001$) and perceived behavioural control ($\beta = .26, p < .0001$) were the best predictors of intention to eat SBF every day.

Conclusion: This study provides strong support for the applicability of social cognition theories in the Arctic population. Furthermore, this approach to quantifying dietary behaviour based on the study population's perspective is helping us better understand the dynamics underlying food consumption changes in the North and to tailor more appropriate interventions in health promotion.

2:45

LIMITED AVAILABILITY IN STORES IN THE LOWER MISSISSIPPI DELTA IMPACTS POTENTIAL FOR NUTRITIONAL BEHAVIORAL CHANGE

Hall, R.A., Simpson, P.M., Goolsby, S., Groves, D., Arkansas Children's Hospital Research Institute, University of Arkansas for Medical Sciences, Little Rock, AR, USA; Yadrick, M.K., Beardshall, A.H., Connell, C.; The University of Southern Mississippi, Hattiesburg, MS, USA; McGee, B.B., Thornton, A., Southern University and A&M College, Baton Rouge, LA, USA; Hyman, E., University of Arkansas at Pine Bluff, Pine Bluff, AR, USA; Stuff, J., USDA, ARS Children's Nutrition Research Center, Houston, TX, USA; Kramer, T.R., Bogle, M.L., USDA, ARS, Little Rock, AR, USA

Purpose: Food stores were surveyed as one component of a community assessment to provide data for planning sustainable nutritional interventions in the Lower Mississippi Delta (LMD). The purpose of the Food Store Survey (FSS) was to assess the access in food stores to an inclusive list of nutritional foods.

Methods: A stratified, random sample of 228 stores (63 supermarkets, 79 medium grocery stores, and 86 convenience stores) was taken from 18 counties in the LMD of Arkansas, Louisiana, and Mississippi. The FSS assessed food store characteristics, food availability, styles and package types, food quality, and food prices of 102 food items, including 67 food items from the USDA Thrifty Food Plan (TFP).

Results: On average, only $51.9 \pm 0.4\%$ of these items were available in the LMD. Supermarkets in the LMD had $96.2 \pm 0.6\%$ of the TFP fruits and vegetables available. However, five counties (27.8%) had only one or two supermarkets. In medium grocery stores and convenience stores, availability was exceptionally poor ($43.4 \pm 0.9\%$ and $15.6 \pm 0.8\%$). Overall, quality of fresh and frozen fruits, vegetables, and meats rated as inadequate. Only dairy was adequate in quality. Merely $49.3 \pm 1.5\%$ of medium grocery stores and $22.7 \pm 1.0\%$ of convenience stores were considered to have at least adequate overall quality. **Conclusions:** The lack of variety and poor quality of nutritional foods in the LMD limits this population's ability to practice recommended dietary behaviors and to improve their nutritional health. Sustainable interventions must combine improved access to nutritious foods with behavior modifications.

1:30

DIETARY PATTERNS AND THEIR RELATIONSHIP TO BODY MASS INDEX (BMI) IN ADULTS: THE PEEL NUTRITION AND HEART HEALTH SURVEY

Shubair, M. M., McCoil, R. S., Hanning, R. M., University of Waterloo, Waterloo, Ontario, Canada

To determine whether the Mediterranean (M) dietary pattern might be associated with reduced risk of overweight and obesity, dietary patterns were examined in a randomly selected population of 759 adults 18-65 years residing in Peel Region, a multiethnic community near Toronto. A cross-sectional telephone survey was used to collect frequency data on consumption of 60 food categories over the previous month. The results showed that 40.1% of the population studied were overweight or obese ($BMI > 25 \text{ kg/m}^2$), and 26.7% were at significant health risk due to being obese ($BMI \geq 27 \text{ kg/m}^2$). The principal components factorial analysis showed that food items aggregated into six low-order dietary factors and two high-order dietary patterns. The M pattern reflected higher consumption of fruits and vegetables, olive oil and garlic, and fish and shellfish. The non-M pattern reflected fatty junk foods, meats and poultry, and sweet junk foods. A higher M-score was positively associated with female gender, higher family income, higher education attainment, and advanced age ($p < 0.001$), which together explained 9.1% of the variance (R^2) in the M-score. The influence of the M pattern on self-reported BMI was investigated by multiple regression analysis. Adjusting for antecedent sociodemographic factors

(gender, education, family income, and marital status), a higher M-score significantly predicted a lower BMI only in the 40-49 year age group ($p = 0.011$). Given the health risks associated with overweight in adulthood, this study supports the Mediterranean diet as a prudent pattern.

1:45

MAIL AND PHONE INTERVENTIONS FOR WEIGHT LOSS IN A MANAGED CARE SETTING: WEIGH-TO-BE ONE-YEAR OUTCOMES

Robert W. Jeffery PhD, Nancy E. Sherwood PhD and Kerrin Brelje RD MPH, University of Minnesota, Nicolaas P Pronk PhD, Raymond Boyle PhD, Jackie L Boucher MS RD and Kirsten Hase, HealthPartners, Minneapolis, Minnesota, USA

This paper reports 6- and 12-month results of a randomized trial evaluating phone-based and mail-based interventions for weight loss in a managed care setting. Eighteen hundred two (1801) overweight adult members of a managed care organization were assigned to mail intervention, phone intervention or usual care control conditions. Significantly more individuals in the mail intervention started treatment (88%) than in the phone intervention (69%). However, a much higher percentage of those who started phone treatment completed it (54%) compared to the mail intervention (9%). Weight losses averaged 2.32 kg, 3.04 kg and 1.74 kg at 6 months and 2.92 kg, 2.74 kg and 2.32 kg at one year for the mail, phone and usual care treatments, respectively. Between group differences were statistically significant at 6 months only, at which point phone intervention was significantly superior to usual care. Variables significantly associated with better response to treatment independent of treatment group were male gender, older age, no prior experience in formal weight loss programs, lower absolute body weight and no concurrent treatment for depression. Overall, the treatments tested in this trial were successful in reaching large numbers of managed care members at a reasonable cost. but more work is needed to increase treatment potency and population outreach.

2:00

BARRIERS TO PHYSICAL ACTIVITY AMONG CANADIAN YOUTH: A NATIONAL SURVEY

Allison, K.R., Irving, H.M., University of Toronto, Toronto, Canada; Dwyer, J.J.M., University of Guelph, Guelph, Canada; Dixon, L., Yoshida, K.K., University of Toronto, Toronto, Canada; Rootman, I., University of Victoria, Victoria, Canada

The purpose of this presentation is to summarize findings from a national survey of barriers to physical activity among Canadian youth. The survey is part of a comprehensive study of barriers that includes three additional components (focus groups, in-depth interviews, and key informant study). Computer-Assisted Telephone Interviewing (CATI) was used in the survey of a national probability sample of 1718 youth, aged 13-18. The response rate was 70.1%. Self-reported participation in moderate and vigorous physical activity was used as the outcome variable. Participants were also asked to indicate the importance of a large number of potential barriers to engaging in physical activity. In this summary of the findings, we will report on levels of moderate and physical activity by age and gender, as well as the hierarchy of barriers reported by males and females. Results of one-way ANOVAs indicate that males were significantly more active than females, both for vigorous and moderate activity. Also, younger adolescents were significantly more active than older adolescents in vigorous physical activity. The most frequent barriers to physical activity for the overall sample included: having a busy social life, having other interests, having too much school work, feeling too tired, and feeling stress about schoolwork. Differences by age and gender will be summarized in the presentation. These findings have implications both for further analysis of the data, further research, and for the promotion of physical activity among youth.

2:15

EXERCISE SELF-EFFICACY AND STAGE OF EXERCISE BEHAVIOR CHANGE FOR INACTIVE OVERWEIGHT AND NORMAL WEIGHT ADULTS

Miller WC, Birch M. Exercise Science Programs, George Washington University Medical Center, Washington, DC, USA

Approximately 65% of the US population is overweight while less than 20% exercises. Although exercise is a key to health, we do not know how to get the population exercising. The purpose of this study is (1) to find out whether normal weight (NW) or overweight (OW) inactive adults are more self-efficacious towards exercise, (2) to compare the stage of behavior change for exercise between NW and OW adults, and (3) to determine if there is a significant relationship between exercise self-efficacy and stage of exercise behavior change in NW and OW inactive adults. 20 NW (BMI < 25) and 20 OW (BMI > 25) subjects completed the 18-item Self-Efficacy for Exercise questionnaire and the 5-item Stage of Behavior Change for Exercise survey. Exercise self-efficacy and stage of exercise behavior change scores were compared between groups with a t-test for independent samples. The correlation coefficient between exercise self-efficacy scores and the stage of exercise behavior change scores within each group was calculated with a Pearson product-moment correlation. There were no significant differences between groups for exercise self-efficacy (2.15 ± 0.19 , NW vs. 2.20 ± 0.16 , OW) or state of behavior change for exercise (45.0 ± 3.0 , NW vs 51.3 ± 3.2 , OW). Exercise self-efficacy was significantly related to state of exercise behavior change for the OW group ($r=0.59$, $p<0.005$) but not for the NW group ($r=0.36$). These data suggest that before overweight people can change their exercise behaviors, they need to raise their self-efficacy relevant to exercise.

2:30

STAGES OF CHANGE FOR MODERATE-INTENSITY PHYSICAL ACTIVITY IN DEPRIVED NEIGHBORHOODS: IDENTIFYING FACTORS OF FORWARD STAGE TRANSITION

GC Kloek(1), FJ van Lenthe(1), PWM van Nierop(2), JP Mackenbach(1)

1. Erasmus MC, Department of Public Health, Rotterdam, The Netherlands; 2. Municipal Health Service, Eindhoven, The Netherlands

According to recent studies less than 50% of Dutch adults met the moderate-intensity physical activity recommendations. Of particular concern, people in lower socio-economic groups are more likely to be sedentary than the general population. In order to develop effective interventions to stimulate physical activity, it is important to understand factors that promote behavioural change. This paper describes the association of external and psychosocial factors on the stages of change for moderate physical activity among individuals with generally low socio-economic positions.

We used data from a self-administered questionnaire among individuals aged 18-65 years (response rate 60%, n=2,781) which included questions on physical activity, stages of change, health, and psychosocial and socio-demographic factors. Data were collected as part of a baseline measurement of a community-based intervention to improve health related behavior in deprived neighborhoods. To identify factors of forward stage transition an ordinal logistic regression model was used to analyze the data.

Results indicate that individuals who are older, lower educated, with low health locus of control, without knowledge of physical activity related topics, and displaying risk behaviors were less likely to move from one stage to another and therefore were more likely to be in a lower stage of change category. A positive attitude, high self-efficacy expectations, perceiving the physical activity level of others as high, and much social support were associated with forward stage transition.

The results allow us to distinguish target groups, which should receive more attention in future health promotion campaigns, and to identify factors to be addressed in those programs.

2:45

SOCIO-DEMOGRAPHIC AND GEOGRAPHIC CORRELATES OF MEETING PHYSICAL ACTIVITY RECOMMENDATIONS IN MIDDLE-AGED FRENCH ADULTS (THE SU.VI.MAX STUDY)

Bertrais, S., Preziosi, P., Mennen, L., Galan, P., Hercberg, S., INSERM U 557; Oppert, J-M, Nutrition Department, Hôtel-Dieu Hospital, University Paris 6; Paris, France

PURPOSE: To investigate, in French adults, correlates of meeting current recommendations for physical activity, i.e. at least (5x30 min 3-6 MET or 3x20 min > 6 MET)/week. **METHODS:** Past-year leisure-time physical activity was assessed cross-sectionally using the Modifiable Activity Questionnaire in 3404 men and 4000 women over 45 y from all over France included in the French Supplementation with Antioxidants and Minerals (SUVIMAX) Study. Four categories of place of residence were defined based on zip codes, according to the French National Institute of Statistics and Economic Studies: 1) urban poles: urban units (one or more municipalities) which offer at least 5,000 jobs ;2) peri-urban zones: municipalities surrounding an urban pole; 3) multipolarized areas: municipalities located outside an urban unit, in which at least 40 % of the resident population work in an urban area; 4) rural municipalities: all other municipalities. Multivariate logistic regression models were used. **RESULTS:** 62 % of men and 52 % of women achieved recommended levels. The likelihood to meet recommended levels was higher in subjects > 60 y compared to those aged 45-50 y (OR [95%CI]: 1.98 [1.48-2.66] in men, 1.81 [1.46-2.26] in women), in women with a university level compared to those with primary education (1.21 [1.00-1.47]), in women living in rural municipalities compared to those living in urban poles (1.39 [1.15-1.68]), and was lower in current smokers compared to never smokers. **CONCLUSIONS:** Whereas urban residential location has been associated with higher physical activity in the US, the situation may be different in other countries.

Session 8 — Biological factors affecting physical activity and nutritional status

Pilot

1:30

CAFFEINE IS RELATED TO STRESS-INDUCED CHANGES IN DIASTOLIC BLOOD PRESSURE AMONG AFRICAN AMERICAN ADOLESCENTS

Savoca M.R., Evans C.D., Wilson M.E., Ludwig D.A., Harshfield G.A., Department of Pediatrics, Georgia Prevention Institute, Medical College of Georgia, Augusta, Georgia, 30912, USA

Blood pressure (BP) changes in response to competitive stress among African American adolescents with differing intakes of caffeine-containing foods were examined. For three days prior to testing, 146 African American youths (80 females, 66 males) ate foods they selected from an experimentally controlled diet. The stress protocol consisted of a one hour video game challenge in which BP change was calculated from a resting baseline. Subjects were categorized into four groups based on caffeine intake/day and caffeine intake/kg of body weight. BP change resulting from the protocol was compared across groups. For the diet period, caffeine intake ranged from 0 to 207 mg/day and 0 to 2.5mg/ kg of body weight. Average daily caffeine for the highest intake group was equivalent to approximately 3.5 cans of cola (42oz). Linear dose-response relationships were found between changes in diastolic BP and caffeine/day ($F(1,142) = 6.34, P = .0129$) as well as caffeine/kg ($F(1,142) = 9.23, P = 0.0028$). Stress induced changes in diastolic BP ranged from 2.5 mm Hg for those who did not consume caffeine to 7.8 mm Hg for those consuming the equivalent of 3.5 cans of cola. Observed DBP differences were unchanged after statistical correction for sodium intake, body mass index, and gender. No differential effects (i.e., interactions) of these covariates with caffeine consumption were found, nor were differences found for systolic BP. The consumption of caffeine-containing drinks may influence the hemodynamic response to competitive stress in African American adolescents. Recommendations to reduce hypertension risk among African American adolescents may need to include limiting caffeine-containing foods.

1:45

EFFECTS OF THE COCAINE- AND- AMPHETAMINE-REGULATED TRANSCRIPT GENE ON ENERGY AND MACRONUTRIENT INTAKES IN THE QUEBEC FAMILY STUDY (QFS)

G. Dolley, Y. C. Chagnon, Centre de recherche Université Laval Robert-Giffard, A. Tremblay, Université Laval, Québec, Canada; C. Bouchard, Pennington Biomedical Research Center, Baton Rouge, USA; P. Mauriège, L. Pérusse, Université Laval, Québec, Canada

BACKGROUND: Cocaine-and-amphetamine-regulated-transcript (CART) is a neuropeptide expressed in hypothalamic nuclei and implicated in the regulation of nutrition behaviour. CART is up-regulated by leptin and inhibits food intake.

OBJECTIVE: We tested the hypothesis that polymorphisms in the CART gene would be associated with differences in energy and macronutrient intake.

METHODS: Two polymorphisms located in the 3'-flanking region of the CART gene (deletion of A at position 1457 and A→G substitution at position 1475) were genotyped in 846 adult subjects from QFS. Total caloric intake as well as carbohydrate (CHO), lipid (LIP) and protein (PROT) intakes were measured using a 3-day dietary record. Percent energy (%) derived from CHO, LIP and PROT was also computed. Association between CART polymorphisms and nutrient intakes was tested by ANCOVA using age and sex as covariables. **RESULTS :** The A1475G polymorphism was found to be associated with macronutrient intake. The G/G homozygous (n=16) were the only subjects to have a reduced intake of carbohydrate (p= 0.0001 for CHO; p= 0.02 for %CHO) and an increase in the amount of energy derived from lipids (p= 0.04) and protein (p= 0.01) compared to the A/G heterozygous (n=118) and A/A homozygous (712) subjects. No association was observed for total energy intake as well as for macronutrient intakes and CART A1457 deletion polymorphism. **CONCLUSION:** These results suggest a role for the CART gene in the modulation of macronutrient preferences in humans. However, the gene seems to have no effect on total caloric intake.

2:00

GENOME-WIDE SCAN ANALYSIS OF EATING BEHAVIORS IN THE QUÉBEC FAMILY STUDY (QFS)

Bouchard, L., Drapeau, V., Provencher, V., Université Laval, Québec, Canada; Bouchard, C., Pennington Biomedical Research Center, Baton Rouge, USA; Lemieux, S. and Pérusse, L., Université Laval, Québec, Canada

Purpose: Despite major breakthrough about obesity physiopathology, its etiology is still poorly understood. Eating behaviors may affect the development of obesity and are probably of interest when considering the rise of its prevalence. Some studies have proposed that genetic factors may influence food preferences and eating behaviors. One strategy that can be used to identify genes influencing complex traits is to genotype a set of anonymous genetic markers spanning the whole genome and test for evidence of linkage between these markers and the trait in families. This procedure known as a genome scan allows the identification of chromosomal regions harboring genes potentially linked to eating behaviors.

Methods: The Three-Factor Eating Questionnaire was administered to 648 subjects from 202 families participating in the QFS in order to evaluate their restraint, disinhibition and hunger scores. Eating behaviors scores were adjusted for age and gender effects¹ or for age, gender and obesity status (BMI) effects² and tested for linkage with 443 microsatellites and RFLPs markers spanning the 22 autosomes **Results:** Three regions of the genome provided evidence of linkage with eating behaviors. This evidence of linkage was found on chromosome 6q21.3 between HSP70 gene and hunger (1p=0.0001, 2p<0.0001), on chromosome 15q24-q25 between marker D15S206 and disinhibition (1p=0.002) and hunger (1p=0.0004, 2p=0.0005) and on chromosome 17q23.2 between marker D17S1290 and disinhibition (2p=0.009) and hunger (1p=0.001, 2p=0.02). Restraint did not display any evidence of linkage.

Conclusions: These results suggest that there are genes located on chromosomes 6, 15 and 17 influencing eating behaviors in humans.

2:15

ACTIVITIES CONTRIBUTING TO TOTAL ENERGY EXPENDITURE

Block G, Dong L, Mandel S. University of California, Berkeley, CA, USA

Physical activity is an important influence on health, but the exact nature of the activities making up total physical activity are not well understood. The purpose of this study was to determine the activities that contribute to total energy expenditure in the United States, using data from the National Human Activity Pattern Survey (NHAPS). This is the first report of sources of energy expenditure from nationally representative data. The NHAPS sampled 4,185 females and 3,330 males, aged 18 years and over. The results are weighted to be representative of the 48 contiguous United States. The nature and duration of all activities performed in the previous 24 hours were reported. This methodology is analogous to that of a 24-hour dietary recall, a method widely used by national surveys. A MET value was assigned to each activity, and a score was created for each activity, by multiplying duration and intensity for each individual and summing across individuals. Activities were then ranked according to their contribution to total population energy expenditure, for the total sample and separately for each sex, race, age, region, and season. Exclusive of sleeping, the largest contributor to the population's energy expenditure was "Driving a car", followed by "Office work" and "Watching TV". Leisure time physical activity contributed only approximately 5% of the population's total energy expenditure. Household activities accounted for 20.1% and 33.3% of energy expenditure for men and women respectively. This information may be useful in designing assessments of energy expenditure, or programs to modify these behaviors.

2:30

DOES EXERCISE ENVIRONMENT EFFECT POST-EXERCISE MOOD?

Purslow, L.R., Blundell, J.E., King, N.A., BioPsychology Group, School of Psychology, University of Leeds, UK; Hendrickx, H., Unilever Research, Bedford, UK

This study aimed to compare the degree of immediate psychological effect on mood of an acute bout of aerobic exercise in a natural, free-living and laboratory environments. 54 regularly exercising females took part in one laboratory and one free-living, exercise session. The laboratory session consisted of 40 minutes cycling and the free-living session consisted of 30 - 60 minutes aerobic exercise. Mood was measured immediately before and after exercise using the PANAS. Heart rate was measured during the laboratory session only and participants reported perceived exertion immediately following both sessions using the Borg RPE scale. Overall significant increases in positive affect and decreases in negative affect were

seen in both environments. The magnitude of change for both positive affect and negative affect was very similar in the two environments. Significant positive correlations between heart rate, RPE and positive affect were also demonstrated. Individual analysis of mood change following exercise indicated that a small group of 6 participants showed consistent decreases in positive affect in both environments. The positive psychological effects of exercise appear to be related to the physiological processes that occur during physical activity and not just to a pleasant or socially stimulating exercise environment. Following the identification of a unique population for whom exercise offers no immediate psychological reward but who continue to regularly take part in physical activity further research needs to focus on what motivates these individuals to continue to take part in an activity that appears to make them feel worse?

2:45

BMI-REFERENCED STANDARDS FOR RECOMMENDED Pedometer-DETERMINED STEPS/DAY IN CHILDREN

Tudor-Locke, C., Pangrazi, R.P. Corbin, C.B., Arizona State University, Tempe and Mesa, AZ; USA; Rutherford, W.J., Eastern Kentucky University, Richmond, Kentucky, USA; Vincent, S.D., Eastern Kentucky University, Richmond, Kentucky, USA; Raustorp, A., Karolinska Institute, Stockholm, Sweden; Tomson, L.M., Griffith University, Brisbane, Australia; Cuddihy, T.F., Queensland University of Technology, Brisbane, Queensland, Australia

PURPOSE: Recommended levels of youth physical activity (PA) should emerge from data related to important health outcomes. The purpose of the present study was to establish criterion-referenced standards for PA (using pedometer-assessed steps/day) related to healthy body composition. **METHODS:** This is a secondary analysis of an existing data set (including pedometer-assessed PA and objectively measured BMI) of 1,954 children (995 girls, 959 boys; ages 6-12 years) from the U.S.A., Australia, and Sweden. The contrasting groups method (Safrit, 1986) for establishing criterion-referenced cut points was used to identify optimal age- and sex-specific standards for steps/day related to international BMI cut points for normal weight and overweight/obesity. **RESULTS:** The selected cut points for steps/day for 6-12 year olds were 12,000 steps/day for girls and 15,000 steps/day for boys. **CONCLUSIONS:** The analytical process undertaken in this study illuminated the difference in previously used norm-referenced standards vs. criterion-referenced standards based on BMI categories. The steps/day cut points established herein, using an international sample, are higher than previously suggested normative standards but are not inconsistent with recent advances in our understanding of PA needs in youth. This analysis provides the foundation for cross-validation and evaluation of these BMI-referenced steps/day cut points in independent samples and with longitudinal study designs.

Invited lecture

Suzor-Côté/Krieghoff

ENVIRONMENTAL DETERMINANTS OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

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Ecological models of health behaviour identify the importance, within multiple levels of influence, of attitudes, intentions, self-efficacy, stages of change and proximal social factors. Ecological models particularly emphasise the proximal physical environments in which particular behaviours take place ('behaviour settings'). The adult populations of industrialized and industrializing countries spend much of their waking hours in settings for sedentary behaviour.

For physical activity, there is evidence that it is associated with objectively measured environmental attributes and with the perceived aesthetic nature of the environment, accessibility of facilities and opportunities. Prospective studies and intervention trials (where feasible) are needed to determine how likely it is that cross-sectional associations of environmental attributes with physical activity are cause-effect relationships. For sedentary behaviour (particularly television viewing time), there is evidence that it is associated with increased health risk. However, the personal, social and environmental predictors of time in sedentary behaviour are less well understood.

There may be the need to place the problem of enforced and unavoidable sedentariness, together with promoting physical activity, on the agenda of public health policy makers, city planners and employers. Research to underpin this agenda might focus on specific behaviours (walking, as opposed to being generally more active; television viewing, driving or computer use as opposed to overall sedentary time); and, on specific aspects of the environmental context of those behaviours. Innovative public-health strategies are needed in to increase adults' energy expenditures in countries like Australia, where adults' physical activity levels have begun to show recent declines.