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Obesity and Metabolic Parameters in Adolescents: A School-Based Intervention Program in French Polynesia

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ABSTRACT

Purpose: The prevalence of overweight/obesity among French Polynesian adolescents is alarming. This study aims to prevent rises in obesity by modifying school food and the physical environment of French Polynesian adolescents.

Methods: During the 5-month study, 240 adolescents from a Tubuai island college (in French Polynesia) received a balanced diet based almost exclusively on local agricultural products and fishing by the island community. They were divided into three subgroups according to their college attendance status: external (n = 14), half residents (n = 155), and residents (n = 71). To increase energy expenditure, weekly physical activity was augmented by 2–4 hours of training in Polynesian Va'a canoes. Anthropometric parameters were recorded, and blood samples collected at baseline and after 5 months. Collegians from Rurutu, a neighboring island, were considered as controls (N = 90).

Results: At baseline, overweight/obesity prevalence was 60% (with 28% obesity) in the intervention group. After 5 months, adjusted weight gain was -0.76 kg for residents (95% confidence interval [CI], -1.59 to $.08$), 1.34 kg for half residents (95% CI, $.84$ – 1.83), 1.82 kg for externs (95% CI, $.66$ – 2.97), and 4.2 kg (95% CI, 3.4 – 5.0) in the controls. Our results indicate that the more adolescents were subjected to food and physical activity commitments, the higher was the rate among those who lost weight. We noted that the weight change magnitude predicted insulin, glucose, and visceral obesity modifications.

Conclusions: This 5-month school-based intervention slowed weight gain and improved the health of Polynesian collegians. The implementation of longer school-based interventions deserves evaluation.

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IMPLICATIONS AND CONTRIBUTION

This study indicates that a school-based intervention with community participation can be effective in preventing excess weight gain among adolescents.

Childhood and adolescent obesity is a major public health concern [1]. Excess weight at a young age affects children's health [2], increases obesity-related chronic diseases at an early

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¹ Passed away on June 17, 2014. He is deeply missed by everyone and will not be forgotten.

age, predicts overweight/obesity risk in adulthood [3,4], and could be a heavy burden on health care services in the future [1]. Causes of obesity are numerous, but unhealthy diets, physical inactivity, and poor sleep are the main established risk factors [5]. Some blame obesogenic or obesity-promoting environments as the most significant contributor to the obesity epidemic in many countries [6]. In this regard, Popkin [7,8] incriminated nutritional transition (or “westernized” behavior) for the global rise of obesity, particularly in developing countries or countries in rapid transition. Obesity prevention is multilevel and

multidisciplinary [9]. Schools are commonplace in promoting healthy eating and physical activity policies [1] but are also ideal environments for such interventions [10]. Schools are part of the environmental influence on obesity [10,11].

Indigenous people of French Polynesia traditionally rely on ocean products for their subsistence [12]. Like other isolated communities, they share many problems specific to populations in rapid transition [8]. Profound changes occurred in French Polynesia after construction of the Faa'a International Airport (in the 1960s). They translated into a swift move away from locally produced or gathered foods to more processed and imported foods, which represented 80% of available foods in 1995 and as much as 90% in 2009 [13].

Studies indicate that the obesity rate is among the highest in American adolescents [1]. According to Centers for Disease Control and Prevention criteria (body mass index [BMI] for age and gender) [14], 32.6% of American children (aged 12–19 years old) were overweight (BMI \geq 85th percentile) in 2009–2010, and 17.1% were obese (BMI \geq 95th percentile) [15]. However, the 2007 health survey “Dietary and epidemiologic transition in French Polynesia” showed alarming signs of excess weight among adolescents (N = 112; age, 12–17 years) [16]; overweight/obesity was prevalent in 52.7% and obesity in 25%.

Observations over the last few years in French Polynesia suggest that ongoing nutritional transition points toward an increase of chronic conditions. This phenomenon impacts young people more than older generations who still live according to traditional practices. Adolescent obesity prevention in French Polynesia is a public health imperative, but it is also important for the implementation of intervention programs to be inexpensive and easily reproducible. Among French Polynesian college students, we conducted a school-based intervention that aimed to promote healthy lifestyle environments through increased availability of healthy local foods and physical activity facilities. We examined if this 5-month school-based intervention was able to slow obesity growth and improve the health of collegians.

Methods

Study design

This Ressources Alimentaires et Santé aux Australes (RASA) study was conducted between February and June 2011 among adolescents (aged 10–18 years) attending college at Mataura (Tubuai Island, Australes Archipelago, French Polynesia). “College” in French-speaking countries does not mean the same as “college” in other parts of the world. Hereafter, college refers to the definition in French-speaking countries, that is, students ranging in age from 10 to 18 years. Medical reasons or refusal to participate were the only exclusion criteria of the RASA program. Two of 242 collegians from the RASA intervention group were excluded. Only one adolescent refused to participate, and one was excluded for medical reasons. At baseline, the RASA intervention group included 240 collegians divided into three subgroups according to their college attendance status. External collegians (n = 14; 6%) were those who never ate in the school canteen and slept at home, half residents (n = 155; 64.5%) were those who ate in the school canteen (lunch only, every day from Monday to Friday) and slept at home, whereas residents (n = 71; 29.5%) were those who ate in the school canteen (3 meals/day, every day) and slept at school (except during holidays). In the 240 collegians from the RASA intervention group, eight (3.3%)

quit college during the school year and were then considered as lost to follow-up.

Collegians (N = 90, aged 10–18 years) from the college at Rurutu (Rurutu Island, Australes Archipelago, French Polynesia) served as the controls, that is, where the RASA program was not implemented. In the control group, 16 participants (17.7%) quit during the school year and were lost to follow-up. Cost (staff, travel, and so forth) is a major limitation on remote islands such as Tubuai and Rurutu. Complete anthropometric measurements and clinical biochemistry were undertaken only on Tubuai (intervention group), but some information (name, age, sex, weight, and height) was obtained by the Rurutu College nurse. Moreover, college attendance status on Rurutu was not comparable with Tubuai. Therefore, the control group might be viewed as a convenience group rather than real controls. Comparisons of the intervention and control groups are presented in [Supplemental materials](#). Parental/guardian consent was required for minor children. The study was approved by the French Polynesia Ethics Committee and the CHU de Québec Research Ethics Committee.

Intervention

The 5-month RASA intervention included two major components: a school nutrition program and a physical activity facility. The primary goal of the school nutrition program was to offer healthier foods in the school canteen that had to come, as much as possible, from local produce. We elaborated five cycle menus, which took into account dietary rules tailored to teenagers' needs (as recommended by the Department of Health of French Polynesia) and the availability of fruits, vegetables, and fish on the island. To achieve that, we brought together farmers and fishermen to determine the seasonal availability of food resources on the island. Canteen staff received recommendations for food preparation (cooking, processing, seasoning, and so forth) to reduce salt, sugar, and fat consumption. Every farmer and fisherman signed an employment contract, which included a delivery schedule for the program's entire duration. Moreover, the manager of the main store on Tubuai Island agreed to be an intermediary between suppliers and the college. This allowed fishermen and farmers to be paid promptly, which was previously identified as a major obstacle. Because collegians were free to eat whatever they wanted during breaks and meals eaten at home, we also added food access guidelines and community sensitization to the RASA program. Before the study started, each participant received documentation on healthy lifestyles. Each month, volunteers from the community came to classes to remember these tips. Moreover, food sellers surrounding the college were sensitized to the promotion of fruit, water, and diet drink sales. Because resident collegians received weekly packages (mainly foodstuffs) from their parents, we proposed recommendations for parents to ration their quantities and to limit foodstuffs rich in fat and sugar. Finally, we scheduled several information sessions before, during, and after the program to advise parents about the benefits of healthy lifestyles.

To increase energy expenditure among collegians, weekly physical activity volume was enhanced by the addition of 2–4 hours of training in Polynesian Va'a canoes. The choice of Va'a activity was based on considerable attractiveness of this sport among young Polynesians, identified by collegians' answers in the 2007 health study [16]. Thus, six Va'a (with six places each) were built for the occasion. Mataura College physical education teachers and volunteers belonging to the Island's Va'a club

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