

## **Jump Start Your Bones©: A School-based Osteoporosis Prevention Program**

**Kathleen Klotzbach-Shimomura**  
**Debra Palmer Keenan**

### **Abstract**

Attaining peak bone mass during adolescence is a key determinant in reducing the risk of osteoporosis in later years. Educating adolescents as to the importance of consuming at least four calcium rich foods daily and participating in physical activity for at least one hour each day can greatly advance osteoporosis prevention. Rutgers Cooperative Extension responded by developing a school-based curriculum, called Jump Start Your Bones©, targeted to seventh- and eighth-grade youth. The curriculum contains a total of 12 lessons, designed to be used in Family and Consumer Sciences, Health, Physical Education, and Life Science classrooms, three lessons per discipline. This osteoporosis curriculum uses hands-on activities to increase knowledge and change behavior in youth aimed toward increasing accumulation of peak bone mass density.

### **Rationale for Program**

Osteoporosis, a bone thinning disease, is often referred to as "a pediatric disease with a geriatric outcome." Osteoporosis is of growing interest in the research, public health, and health consumer-lay communities. Effective prevention strategies are critical to decreasing the morbidity and mortality of the disease, as well as the crippling increases in our national healthcare expenditures. Peak bone mass, obtained during childhood and adolescent growth, is one of the major determinants for the risk of developing osteoporosis and fracture (Stallings 1997). Adequate calcium consumption and weight-bearing exercise are the primary means of strengthening bones of adolescents to ward off this disease in later life (Ruiz et al. 1995). Adolescence is the best time for this type of intervention, as this is when most bone growth occurs, and children are at an age where they are able to enjoy relative control over their diet and exercise patterns. Active promotion of educational programming directed toward adolescents on the effects of diet and exercise on bone health and attaining peak bone mass is necessary.

Studies provide evidence that dietary calcium influences the bone mass of children and adolescents, and suggest that calcium dietary intake below 1,000 mg/day before and during puberty may have deleterious consequences on vertebral (spine) and possibly femoral (hip) bone mass (Ruiz et al. 1995). Unfortunately, during this time of tremendous calcium need, most adolescents eat a diet that is very deficient in calcium. Girls are twice as likely to be deficient in calcium consumption as boys (85 percent vs. 43 percent) (Key and Key 1994). The National Academy of Sciences recommends that youth between 9 and 18 years of age consume at least 1,300 mg of calcium per day.

### **The Program**

*Jump Start Your Bones*© is a school-based osteoporosis prevention curriculum developed to target adolescents in seventh and eighth grade. Each lesson addresses specific knowledge and behavioral objectives. Program goals aim to increase the amount of calcium adolescents consume, as well as their physical activity levels toward the attainment of peak bone mass during the adolescent "peak" window of opportunity. Students are taught health promotion and disease prevention concepts throughout the curriculum, focusing on associated diet and exercise behaviors that build stronger bones. The focus of the lessons is on both the immediate health benefits, as well as long-term benefits that they will experience from increased calcium nutrition and physical activity.

This curriculum is highly interactive. *Jump Start Your Bones*© offers lessons for these four disciplines: Family and Consumer Sciences, Life Science, Physical Education, and Health. Three lessons were developed for each discipline. In our formative research, teachers indicated that three was the number of lessons they would be able to use, considering the many other topics that they were required to teach. Lessons are designed to be appropriate for multi-cultural audiences, that include minority groups who experience both high and low incidences of osteoporosis, as well as cultures with a high incidence of lactose intolerance. Teacher background information includes statistics on the growing incidence of osteoporosis in African American, Asian, and Hispanic populations. Pictures, character names, and physical activities featured in the lessons reflect this diversity, as does a repeated focus on non-dairy calcium food sources.

Focus groups done with the teachers and students determined the educational program most suitable to teachers' needs and students' desires. The curriculum was developed in accordance with current teaching standards, i.e., Core Curriculum Content Standards from New Jersey's Department of Education, taking into account the teachers' and students' recommendations. Teachers wanted lessons that fit into the core curriculum, were relevant to the students, generated enthusiasm, contained "hands-on" activities, and "catchy" worksheets, as well as Internet or World Wide Web activities. Teachers also wanted lessons that did not need to be taught in

sequence, so they could fit them in whenever they had a day or two to spare between educational units on which a higher priority was placed by their school district, or when they were unable to perform lessons they had previously planned. For example, physical education teachers wanted the Physical Education lessons to contain multiple physical activities that could be done indoors when the weather was inclement outside. Teachers also indicated that they would prefer the provided handouts and worksheets to be in black and white, rather than color, so that they would photocopy well.

The students indicated that they might be motivated to eat healthier or exercise more often, if the teacher could show before and after pictures of people, and focus on what happens in the future to create "worry" or concern. They preferred lessons with group activities in which they could choose their own groups. They also indicated that they enjoyed discussion, role-playing, highly visual lessons, and lab activities. They did not want to be read to or lectured. Students wanted activities that included pictures, diagrams, or posters.

In the three Family and Consumer Sciences lessons, students

- "Create and Sell a Smoothie," by following a recipe, using kitchen equipment, and applying marketing skills. They experiment with making smoothies, adding interesting ingredients, and giving them creative, catchy names. Most importantly they taste-test their own (and each others) creations.
- Become a "Calcium Detective" by examining the amount of calcium contained in common recipes, such as nachos. Students explore how they can make dishes higher in calcium. They receive points for each additional milligram of calcium that they add to their recipe, which they prepare and eat.
- Review realistic scenarios about teens' busy lives, and use self-assessment and problem-solving skills to determine how they can add more calcium into their lifestyles.

In the Life Science lessons, the students gain problem-solving, decision-making and inquiry skills. In these lessons, students

- Formulate hypotheses, plan an experiment, and conduct observations in a lab activity designed to show the weakness of bones from lack of calcium nutrition and physical activity.
- Participate in an Internet activity in which they design an exercise plan to maintain bone density for astronauts faced with zero gravity while on a space mission.

- Follow the calcium from their food to their bones as they explore how the body absorbs nutrients and send them where they need to go. This lesson concludes with a fun game of "Calcium Pursuit."

The Health lessons encourage students to use their writing skills, interactive group skills, creative and decision-making skills, and group interaction. They do so by

- Developing a magazine, where as the magazine "editors" they create their magazine to inform peers, friends, or family how important it is to consume at least four calcium-rich foods a day and to do at least one hour of physical activity daily.
- Creating their own "Contract to Move" by designing an exercise log and identifying a coach to encourage them to engage in physical activity.
- Showing how "Teens Take Over," by working in groups to develop lessons and prepare skits to demonstrate how teens can increase their calcium intake via lunch, snacks, drinks, or dessert.

In the Physical Education lessons, adolescents develop creative exercise routines by

- Identifying weights they can use at home and exploring what physical activities they can do with the weights they have made. Students are guided through safe, appropriate exercises utilizing their small weights.
- Using jumping, balance, fine motor coordination, team work skills to develop their own jump rope rhymes about the strengthening effect that physical activity has on their bones.
- Experiencing "New Twists on Turns" as they build on previously learned skills, cooperation skills, and qualitative learning assessment by rotating from one gymnastic activity station to another. The focus of the lesson is on what bones they work in each activity and what makes each of the activities weight bearing. It is important for students to understand why they are doing weight-bearing activities and how these activities will help them in the future.

### **Lesson Guide**

In each packet teachers receive background information on osteoporosis, nutrition, and physical activity. The lessons define topics and teaching standards covered, the time required to teach the lesson, and a materials list. All necessary handouts are provided. Each lesson outlines the

knowledge and behavior objectives, skills used, and new terms. The lesson plan defines each step, while providing suggestions for the teacher.

### **Impact Results**

This curriculum was created as a result of examining the most current literature on osteoporosis prevention, and conducting formative research with teachers and students. It was subjected to an expert review and both pilot and field-testing. A repeated measures analysis of variance (ANOVA) of the field test results (control group n=543; experimental group n=451) showed that the differences between the control group and experimental group, who received between 1-9 lessons, pre- to post-intervention were statistically significant. The research regarding the development of this curriculum is extensive, and beyond the scope of this manuscript. Results are explicitly discussed in another manuscript that is currently in preparation.

It is the belief of the creators that this program is a success because of its strong research-base, which considered the needs and desires of both teachers and students throughout the development process. Success demonstrated thus far has been in the classroom setting; however, it is anticipated that the curriculum would be equally as successful when used in other areas of youth education, such as 4-H youth development or after-care programs.

Funding for the development and pilot testing of this project was provided by the New Jersey Department of Health and Senior Services through a grant subcontracted through a local school district. Grants from the Osteoporosis Business Coalition and the New Jersey Food Stamp Education Program were used to field-test the curriculum. The curriculum is now available for use in schools and other educational venues.

### **References**

Bonjour, J.P., A.L. Carrie, S. Ferrari, H. Clavier, D. Slosman, G. Thientz, and R. Rizzoli. 1997. Calcium-enriched foods and bone mass growth in prepubertal girls: a randomized, double blind, placebo-controlled trial. *J Clin Invest.* 99(6):1287-1294.

Chan, G.M., K. Hoffman, and M. McMurry. 1995. Effects of dairy products on bone and body composition in pubertal girls. *J Pediatr.* 126:551-556.

Cadogan, J., R. Eastell, N. Jones, and M. Barker. 1997. Milk intake and bone mineral acquisition in adolescent girls: randomized controlled intervention trial. *Bone Mineral Journal.* 315:1255-1260.

Gunnes, M., and E.H. Lehmann. 1996. Physical Activity and Dietary Constituents as Predictors of Forearm Cortical and Trabecular Bone Gain in Healthy Children and Adolescents: a Prospective Study. *Acta Paediatr.* 85(1):19-25.

Key, J.D., and L.L. Key. 1994. Calcium Needs of Adolescents. *Curr Opin Pediatr.* 6(4):379-82.

Matkovic, V. 1992. Calcium and Peak Bone Mass. *J Int. Med.* 231:151-160.

Ruiz, J.C., C. Mandel, and M. Garabedian. 1995. Influence of Spontaneous Calcium Intake and Physical Exercise on the Vertebral and Femoral Bone Mineral Density of Children and Adolescents. *Journal of Bone & Mineral Research.* 10(5):675-682.

Sallis, J.F., and K. Patrick. 1994. Physical Activity guidelines for adolescents: consensus statement. *Pediatric Exercise Science.* 6:302-14.

Sandler, R.B., C.W. Slemenda, R.E. LaPorte, J.A. Cauley, M.M. Schramm, M.L. Barresi, and A.M. Kriska. 1985. Postmenopausal bone density and milk consumption in childhood and adolescence. *Am J Clin Nutr.* 42:270-274.

Stallings, V.A. 1997. Calcium and bone health in children: a review. *Am J Ther.* 4(7-8):259-73.

Tsukahara, N., K. Sato, and I. Ezawa. 1997. Effects of Physical Characteristics and Dietary Habits on Bone Mineral Density in Adolescent Girls. *Journal of Nutritional Science & Vitaminology.* 43(6): 643-655.

Turner, J.G., N.L. Gilchrist, E.M. Ayling, A.J. Hassall, E.A. Hooke, and W.A. Sadler. 1992. Factors Affecting Bone Mineral Density in High School Girls. *NZ Med J.* 25;105(930):95-6.

U. S. Department of Health and Human Services. 2000. Healthy people 2010: understanding and improving health. Washington, DC: U.S. Department of Health and Human Services, Government Printing Office.

U.S. Department of Agriculture and U. S. Department of Health and Human Services. 2000. Nutrition and your health: dietary guidelines for Americans (5th ed). Washington, DC: U. S. Department of Agriculture and U. S. Department of Health and Human Services, Government Printing Office.

Physical inactivity is the second problem that threatens to increase the incidence of osteoporosis in older adult years. Physical activity is an essential factor in bone health. The skeletal benefits of exercise have been demonstrated throughout the lifecycle. Exercise can positively affect peak

bone mass in children and adolescents. Since by age 18, skeletal growth is nearly complete, the amount of peak bone mass adolescents achieve and their subsequent rate of bone loss are the key risk factors related to their bone density later in life. There is substantial evidence that exercise plays an important role in acquisition of bone mass in youth. (Turner et al. 1992; Gunnes 1996; and Tsukahara 1997). The International Consensus Conference on Physical Activity Guidelines for Adolescents issued the following recommendations:

- All adolescents should be physically active daily, or nearly every day, as part of play, games, sports, work, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities.
- Adolescents should engage in three or more sessions per week of activities that last 20 minutes or more at a time and that require moderate to vigorous levels of exertion (Sallis, Patrick 1994).

Healthy People 2010 encourages cardio-respiratory fitness three or more days per week for 20 or more minutes per occasion (Healthy People 2010). The Dietary Guidelines states that children and teens are advised to aim for at least 60 minutes of moderate physical activity most days of the week, preferably daily (Dietary Guidelines For Americans, 5th ed.).

*Jump Start Your Bones*© lessons are designed to help students develop the knowledge, attitudes, skills, behaviors and confidence to adopt and maintain physically active lifestyles, while providing opportunities for enjoyable physical activity.

To order *Jump Start Your Bones*© contact:

Publications Distribution Center

Cook College

Rutgers, The State University

57 Dudley Road

New Brunswick, NJ 08901-8520

Phone: 732-932-9762

fax: 732-932-5023

Price: \$60.00 (subject to change without notice)

### **Authors**

Kathleen Klotzbach-Shimomura, M.Ed., DTR, Rutgers, The State University of New Jersey, Rutgers Cooperative Extension, Flemington, New Jersey.

Debra Palmer Keenan, Ph.D., Rutgers, The State University of New Jersey, Department of Nutritional Sciences, New Brunswick, New Jersey.

**Cite this article:**

Klotzbach-Shimomura, Kathleen and Debra Palmer Keenan. 2001. Jump Start Your Bones: A school-based osteoporosis prevention program. *The Forum for Family and Consumer Issues* 6(3).