GIRL SCOUTS EMPOWER OTHER GIRL SCOUTS TO CONSUME 3-A-DAY™ OF DAIRY

DANIELLE ELIZABETH PARRA

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Sharon M. Nickols-Richardson Ph.D., R.D., Committee Chair
Elena L. Serrano, Ph.D.
Kerry J. Redican, Ph.D.

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KEYWORDS: CALCIUM INTAKE, CHILDREN, DAIRY, GIRL SCOUTS, PEER EDUCATION, OSTEOPOROSIS INTERVENTION
Girl Scouts Empower Other Girl Scouts to Consume 3-A-Day™ of Dairy

Danielle Elizabeth Parra

Abstract

Osteoporosis affects half of all women over the age of fifty, but can be prevented through proper nutrition and exercise early in life. Few studies have been conducted that document positive gains in knowledge about osteoporosis prevention in young girls and no research has been completed in which osteoporosis education is delivered by peers in children. A 3-A-Day™ of dairy peer education program was developed by local Girl Scouts with the purpose of teaching other Girl Scouts about the importance of calcium intake and weight-bearing activities in the prevention of osteoporosis, overweight, and hypertension. Peer educators had significant increases in their overall knowledge of dairy ($p<0.001$) and self-efficacy related to 3-A-Day™ ($p<0.05$) after teaching peer education programs. Program participants had significant improvements in knowledge of calcium-rich foods ($p<0.001$) and weight-bearing activities ($p<0.001$). Participants were able to identify the recommended number of dairy servings per day ($p<0.01$). Although parents indicated that their daughters’ knowledge increased after participation in the peer education program, parents’ ratings of knowledge were not significantly related with daughters’ ratings. Qualitative evaluation indicated that these Girl Scouts enjoyed serving as peer educators. This research supports the importance of osteoporosis education in young girls and demonstrates positive outcomes of peer education for both educators and program participants. KEYWORDS: CALCIUM INTAKE, CHILDREN, DAIRY, GIRL SCOUTS, PEER EDUCATION, OSTEOPOROSIS INTERVENTION
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Chapter I
Introduction

For many years, dietary calcium intake has been much lower than the recommended intake level for all ages (Chan, Hoffman, & McMurry, 1995; Ruiz, Mandel, & Garabedian, 1995). In 2004, the average number of servings of dairy foods consumed by females, aged 6-11 years, was 1.9 servings per day, with only 39% reaching the recommended three servings to achieve a dietary calcium intake of 1300 mg (Cook, Friday, & Subar, 2004). Inadequate dietary calcium intake has been linked to many diseases including osteoporosis, obesity, and hypertension (Lee & Reicks, 2003). Osteoporosis is a skeletal disease characterized by low bone mineral density and affects one in every two women over the age of 50 years (National Center for Health Statistics, 1994). Osteoporosis alone contributes to 1.5 million bone fractures each year and results in an estimated loss of $10 billion each year through direct medical costs. Health care and societal costs from obesity and hypertension related to poor dietary intake, including inadequate dietary calcium intake, adds additional financial burdens (French, Fulkerson, & Story, 2000). Such statistics associated with chronic diseases are alarming. Fortunately, interventions that target modifiable risk factors for diseases, such as diet and exercise, may be developed and implemented to change health behaviors.

More than 40% of the body’s total bone mass is developed during late childhood and early adolescence (Cummings, Kelsey, Nevitt, & O’Dowd, 1985). Moreover, bone mass accumulation plays an important role in preventing bone fractures across the lifespan. Dietary calcium intake is positively related to bone mass, notably during childhood and adolescence (Goulding, Cannan, Williams, Gold, Taylor, & Lewis-Barned,
Obesity has also been linked to dietary calcium. An inverse relationship between dietary calcium intake and weight status has been documented in several recent studies (Barba, Troiano, Russo, Venezia, & Siani, 2005; Skinner, Bounds, Carruth & Ziegler, 2003; Zemel, 2002). Childhood overweight and obesity has risen over the past decade to epidemic proportions, with some countries reporting 25% of children being overweight (Lobstein & Baur, 2004). Yet, placing children on “diets” to lose weight in childhood and adolescence is controversial due to the need for nutrients for optimal growth and development (Amador, Ramos, Morono, & Hermelo, 1990). Overweight and obesity in childhood and adolescence has also been associated with early hypertension. Adequate dietary calcium intake as part of a diet that includes low-fat dairy foods, fresh fruits and vegetables, and whole grain foods have been shown to modify blood pressure (Appel et al., 1997). Improvements in dietary calcium intake may decrease the incidence of three prevalent and costly diseases (i.e. osteoporosis, obesity, and hypertension) among a cohort of young individuals.

A simple health behavior intervention designed to impact daily dairy food intake, and thereby calcium intake, may be useful in a group of young persons. In fact, previous intervention programs have increased weight-bearing activities and dietary calcium intake in children and adolescents (French et al., 2000). Although there is an abundant body of research related to health behaviors and dietary calcium intake, there is currently a lack of research involving dietary calcium intake interventions that use a peer education model with girls. A peer education program may increase knowledge and consumption of dairy foods to meet the National Dairy Council’s recommended goal of 3-A-Day™. Peer education has been useful in several other health-related areas but has not been tested
with a dairy food intervention program. Because females are at higher risk for developing osteoporosis compared to males and consume less fluid milk during the adolescent years (Briefel & Johnson, 2004), it is important to target girls to provide them with accurate information regarding the importance of dietary calcium intake and weight-bearing activity to increase their knowledge and change behaviors that will prevent osteoporosis, obesity, and hypertension. The objective of this research was to apply the peer education model to educate young girls on the importance of dietary calcium intake, using the National Dairy Council’s 3-A-Day™ concept, and weight-bearing physical activity. The current research was designed to: (1) determine if peer educators had a significant increase in knowledge after teaching others Girl Scouts and (2) determine if participants of a peer education model program had significant gains in knowledge after participating in a three-hour program. Researchers found that Girl Scouts who participated as peer educators and participants of an educational program had significant increases in knowledge of calcium-containing foods and weight-bearing activities. Participants also increased ratings of self-efficacy related to 3-A-Day™ of dairy.

References:


Chapter II

Review of Literature

Educating individuals at an early age about the importance of healthy eating and physical activity is important in prevention of chronic diseases. The 3-A-Day™ concept was designed by the National Dairy Council to promote dairy intake and to support prevention of osteoporosis (National Dairy Council, 2006). Proper calcium intake and weight-bearing activity is important in reducing the risk of osteoporosis. According to the Healthy People 2010 objectives, only 46% of individuals over the age of two years meet calcium recommendations, while the target is 75% (National Center for Health Statistics, 1994). Although education does not always change behavior, peer education has been shown to be effective in various settings (Botvin, Baker, Renick, Filazzola, & Botvin, 1984; Emmons et al., 2005; Enyart, 1984; Jackson, 1986; Neilan, 1985; Stephenson et al., 2003; Stephenson et al., 2004). It is important to understand the importance of calcium intake and osteoporosis prevention in developing a proper intervention program.

**Calcium:**

Estimated daily dietary calcium intakes are below the recommended levels for all age groups and both sexes (Cook, Friday, Subar, 2004). This is a concern because adequate dietary calcium intake may assist in the prevention of several chronic diseases. Preadolescents and adolescents need 1300 mg of dietary calcium per day to achieve maximum bone mineralization, and those who do not obtain this level may never reach peak bone mass. In order to properly absorb calcium, adequate vitamin D is required. A dietary intake of five micrograms (mcg) per day of vitamin D is needed, if exposure to
the sun is not acquired (Institute of Medicine, Food and Nutrition Board, 1997). Calcium absorption efficiency is highest during puberty when rapid bone mineralization also occurs (Bailey, Martin, McKay, Whiting, & Mirwald, 2000). Researchers have found that adolescents consume about 700-1000 mg of calcium each day, with males falling in the upper end of this range. Harel and colleagues (1998) completed a study with ninth graders and found that only 8% of girls and 14% of boys consumed adequate dietary calcium. On average, the girls and boys consumed 536 mg and 681 mg of dietary calcium each day, respectively. Calcium intake was significantly higher in individuals who knew about bone health as well as those who knew the Adequate Intake (AI) level (Harel, Riggs, Vaz, White, & Menzies, 1998). One possible reason for inadequate dietary calcium intake in all age groups is the notion that dairy foods are fattening (Institute of Medicine, Food and Nutrition Board, 1997).

Approximately 99% of the body’s total calcium is found in the skeleton. Calcium is required for many functions, but the primary role is to support bone mineralization (Institute of Medicine, Food and Nutrition Board, 1997). Wyshak and Frisch (1994) were one of the first groups of researchers to report that high calcium intake was associated with a lower risk of bone fractures in adolescence. More than 40% of the body’s total bone mass is accrued during late childhood and early adolescence; thus, it is important to educate children at an early age about the necessity of optimal dietary calcium intake for disease prevention (Cummings, Kelsey, Nevitt, & O’Dowd, 1985). One study with children found that supplementation of calcium in either food or non-food forms significantly increased the percentage in bone mass gains (French, Fulkerson, & Story, 2000). In contrast, another study found that children 10 to 12 years of age accrued more
cortical bone when diets were augmented with cheese compared to a calcium supplement (Cheng et al., 2005).

Previous studies have been conducted with the goal of increasing awareness to prevent osteoporosis; however, no published studies have addressed osteoporosis and other chronic diseases, such as obesity and hypertension, collectively. Many interventions have been oriented for pre- and post-menopausal women, and although calcium intake in these groups is important, the impact of adequate calcium intake is even more important in young girls. According to a study completed by Martin and colleagues (2004), adolescents have limited knowledge of osteoporosis causes and preventive measures. Participants knew of the importance of calcium and activity in prevention of osteoporosis but were unable to identify non-dairy foods with calcium or weight-bearing activities as key behaviors in prevention (Martin, Coviak, Gendler, Kim, Cooper, & Rodrigues-Fisher, 2004). Although it is encouraging to know that adolescents have some knowledge of certain aspects of osteoporosis prevention, it is important to strengthen their knowledge base as this time period is crucial in maximizing bone mineral density (BMD). Moreover, because adolescents who have a greater understanding and knowledge of the importance of calcium intake and bone health consume more dietary calcium than those without this knowledge (Harel et al., 1998), programs that target this age group may have high impact. Therefore, more research must be conducted regarding educational programs of calcium intake and chronic disease prevention for preadolescents.

Osteoporosis:
Osteoporosis, a skeletal disease in which bones are brittle and structurally unsound, affects one of every two women over the age of 50 years, and although it is present in both men and women, over 80% of diagnosed cases are in women (Lypaczewski, Lappe, & Stubby, 2002) and smoking. Poor bone health in childhood and adolescence may result in osteoporosis and fracture risks later in life. Modifiable risk factors for osteoporosis include nutrition, especially dietary calcium intake (Heaney, Abrams, Dawson-Hughes, Looker, Marcus, & Matkovic, 2000), as well as weight-bearing physical activity (Lypaczewski et al., 2002). Non-modifiable risk factors include gender, heredity, hormones and family/personal history and race. Heredity is estimated to account for 60 to 80% of peak bone mass attained in individuals. Although heredity plays a large role in peak bone mass, body weight, menopause, nutrition, physical activity, medicine and chronic illnesses are also significant factors (Cormier, 1994).

Poor dietary calcium intake across the lifespan is associated with osteoporosis; inadequate dietary calcium intake in childhood and adolescence sets the stage for osteoporosis. Fractures have been reported in young children as a result of poor bone health (Goulding, Cannan, Williams, Gold, Taylor, & Lewis-Barned, 1998). The primary dietary factor related to peak bone mass formation and maintenance is calcium (Heaney et al., 2000). Weight-bearing physical activity also plays a vital role in bone development and maintenance (Lypaczewski et al., 2002). With the growing rise in sedentary lifestyles among children and adolescents, osteoporosis risk may rise. Although genetics play a predominant role in bone health, lifestyle factors are responsible for 20 to 30% of peak bone mass (Krall & Dawson-Hughes, 1993). There is some debate over the timing of peak bone mass, but most agree that childhood and adolescence are
critical time periods for bone mineralization. Before puberty occurs, boys and girls have steady increases in bone mass, but during adolescence this changes (Nichols, Bonnick, & Sanborn, 2000). The largest gain in bone mass occurs between the ages of 11 and 14 years (Theintz et al., 1992). This magnifies the need for prevention and awareness interventions to begin at a young age. Without a cure for osteoporosis, it is extremely important to prevent this disease.

**Calcium and disease risk:**

It is well accepted that adequate calcium intake may prevent osteoporosis later in life; interesting research is surfacing regarding the connection between calcium and other chronic diseases. Obesity is a risk factor for many diseases, such as hypertension, coronary artery disease, and type 2 diabetes mellitus. Studies have shown a relationship between calcium intake and weight status in adults (Zemel, 2002; Zemel, 2003; Zemel & Miller, 2004), although data supporting this association in children are lacking. Davies et al. (2000) found similar results when reanalyzing data from previous studies, but this may have been due to confounding factors. A recent study noted an inverse relationship between body mass and milk consumption in children. Italian children who consumed more whole milk had a lower body mass than those who drank less (Barba, Troiano, Russo, Venezia, & Siani, 2005). Skinner and colleagues (2003) found a similar relationship in children in an eight-year study. Children who consumed less dietary calcium were more likely to have higher fat mass than those children who consumed more (Skinner, Bounds, Carruth, & Ziegler, 2003). They concluded that children who consumed 8 ounces of skim milk or yogurt per day reduced their total body fat by 0.4% (Skinner et al., 2003). Although a mechanism was not proposed in this study, inadequate
dairy consumption may be a modifiable risk factor for overweight. Zemel et al. (2000) proposed a theory for the mechanism which suggests that the interaction is at the cellular level where components of dairy foods assist with fat breakdown. Lorenzen and colleagues (2006) also found that habitual daily dietary calcium intake was inversely associated with body fat, but calcium supplementation was not in young girls. This may be a result of unknown interactions of components of dairy products or of other foods.

Another study found the opposite results, however, as children who consumed more milk had larger body mass index (BMI) (Berkey, Rockett, Willett, & Colditz, 2005). Higher BMI was attributed to the added kilocalories that children consumed and not the dairy fat. The biggest predictor of weight gain in this study was energy intake and not calcium, dairy fat or milk, when adjusted for energy intake (Berkey et al., 2005). A study conducted in North Dakota in preschool children found no relationship between weight change and dairy intake (Newby, Peterson, Berkey, Leppert, Willet, & Colditz, 2004), and another study of girls aged 8 to 12 years also found no association between dairy or calcium intake and body fat (Phillips, Bandini, Cyr, Colclough-Douglas, Naumova, & Must, 2003). Although there is conflicting research on the relationship of calcium intake and weight status, the benefits of calcium intake out-weigh the risk of a negative relationship.

In the, “Dietary Approaches to Stop Hypertension (DASH)” study, a diet rich in low-fat dairy foods and fruits and vegetables was found to lower blood pressure (Appell et al., 1997). The DASH study included 450 adults with high blood pressure. Participants were fed three different diets, a control (typical American diet) and two modified diets (one with high amounts of fruits and vegetables and one high in fruits,
vegetables and low-fat dairy). Effects of various eating patterns on lowering blood pressure were investigated. Of the three diets, the “DASH” diet, which included high amounts of fruits, vegetables and low-fat dairy, resulted in the greatest decrease in blood pressure (Appel et al., 1997). These findings, from a large clinical trial, demonstrate that a combination diet with adequate dietary calcium intake, decreases blood pressure (McCarron & Reusser, 1999).

**Osteoporosis intervention:**

Osteoporosis can be prevented most effectively during childhood and adolescence, because this is the time period in which rapid bone accumulation occurs. Although this is the case, only a few osteoporosis intervention studies with children and adolescents have been completed. A study by Brown and Schoenly (2004) designed for young girls (n=347) found that a 20-minute intervention session significantly increased osteoporosis prevention knowledge by 10.7%, whereas the control group (n=346) increased by 2.3%. In this study, high school students were randomly assigned to groups and given pre- and post-tests to assess knowledge before and after the intervention, respectively (Brown & Schoenly, 2004). In another study, Girl Scouts (n=167) who underwent a 3-month, 6-session educational intervention significantly maintained or increased calcium intake compared to Girl Scouts (n=80) who did not participate in this intervention (Ievers-Landis et al., 2005). These findings are important because studies have shown that as children age, calcium intake decreases (Ievers-Landis et al., 2005). Even if an intervention helps girls to maintain dietary calcium intake, this is a positive outcome. In a separate osteoporosis prevention program designed for Girl Scouts (n=50) and their mothers (n=50), participants engaged in a 2-hour educational session on bone
health, calcium intake, and general nutrition. These girls and their mothers participated in hands-on activities at multiple stations to learn about bone health and nutrition. Girls increased their osteoporosis prevention knowledge by an average of 22%, with only three girls not showing an increase in knowledge score (Lypaczewski et al., 2002). To date, no research has been completed that examines calcium and dairy interventions in osteoporosis prevention in a broader sense. Osteoporosis prevention is important in young children, especially girls, but prevention of other chronic diseases through dietary calcium intake should also be studied. Many programs are in place for children to increase fruit and vegetable intakes, as well as, general food guide pyramid education, but dairy education has not been as widespread.

**Peer education:**

Peer education is one method of observational learning that may be applied to health behavior intervention programs. Peer education has been used in many different settings including sex education, breastfeeding promotion, and cigarette smoking cessation, but has not been widely used in nutrition education. The Expanded Food and Nutrition Education Program (EFNEP), a federally funded program administered through land-grant institutions, uses peer education as a mode of information dissemination and has been found to be very successful (Enyart, 1984; Jackson, 1986; Neilan, 1985). Although EFNEP has been effective, few nutrition programs for other audiences have utilized the peer education model.

**Nutrition:**

Peer education has not been widely reported among nutrition education programs, but could be extremely beneficial. EFNEP was one of the first nutrition programs to use...
a peer education model to teach limited resource audiences about proper nutrition and assist in changing behavior. EFNEP began as a 5-year pilot study in Alabama, and after much success expanded to all 50 states. EFNEP consists of a series of 10 to 12 educational lessons given by paraprofessionals and volunteers, who live in the area in which they work. Studies have shown that participation in EFNEP improves nutritional intake as well as helps households manage their food resources better than those who do not participate. After participation in the EFNEP program, participants saved an average of $124 to $234 on food each year (Burney & Haughton, 2002). Overall, EFNEP has not only educated and changed the behavior of many participants, but has demonstrated cost-savings and high benefits.

A recent church-based program, which used peer educators, showed a significant weight loss for participants in both group and individual settings (Kennedy, 2005). Researchers also found that individuals who participated in group sessions experienced the same weight loss and health gains as those in the individual setting. The project had a retention rate of 90%, which could be a direct result of the peer education model (Kennedy, 2005). Peer education appears to be an effective method for educating individuals in nutrition and health, but few programs have documented this method of education.

Sex education and disease prevention:

High school pupil-led sex education has been shown to be effective in lowering the number of students participating in sexual acts and number of unintended pregnancies (Stephenson et al., 2003; Stephenson et al., 2004). One study comparing peer-led versus adult-led sex education showed that peer-led education was more effective in establishing
attitudes and conservative norms but that adult-led intervention was more beneficial in delivering accurate information (Mellanby, Newcombe, Rees, & Tripp, 2001). Caron et al. (2004) conducted a study regarding sex education with high school juniors and seniors and found that both juniors and seniors who served in the control group (adult-led education) did not have the same positive outcomes as students in the intervention group (peer-led education). Students in the intervention group had significantly more positive changes in attitude, perceived behavior control, self-efficacy, and knowledge related to sexual activities and unintended pregnancies (Caron, Godin, Otis, & Lanbert, 2004). Students in the peer education groups not only gained more knowledge, but also reported enjoying peer-led classes more than adult-led classes (Stephenson et al., 2003; Stephenson et al., 2004). A study conducted with students in Belize also confirmed this. Students in the intervention group had greater gains in knowledge and were more likely to change their behavior than those in the control group (Stephenson et al., 2004). The “RIPPLE” study conducted in England, recruited 16- to 17-year-olds to serve as peer-educators to 13 to 14-year-old students at the same school. After two years, the girls who participated in the peer-led groups had significantly lower reports of sexual intercourse than girls in the control group. The boys had similar trends, but there was no significance (Kinsler, Sneed, Morisky, & Ang, 2004).

Jordheim (1976) conducted a study among college students on venereal disease prevention and found that a peer-led group exhibited significantly greater improvements in knowledge and attitude compared to an adult-led group (Jordheim, 1976). High school students participating in a student-led Human Immunodeficiency Virus (HIV) prevention program also saw significantly higher gains in knowledge than those participating in an
adult-led program (Borgia, Marinacci, Schifano, & Perucci, 2005). Although neither
group resulted in significant behavior change, knowledge was significantly higher in the
peer-led group (Borgia et al., 2005). Knowledge does not equal behavior, but without the
knowledge, there can be no change in behavior. Thus, this could be considered a step in
the right direction. Peer-led Acquired Immunodeficiency Syndrome (AIDS) prevention
programs have been shown to be effective in high-risk populations (Center for Disease
Control and Prevention, 1996). Although student-led education is still controversial for
certain issues, peers are more able to redefine and communicate social norms to their
peers (Kirby, Korpi, Adivi, & Weissman, 1999).

**Smoking cessation/prevention:**

Smoking cessation and prevention education has also been used to show the
effectiveness of peer education in middle and high schools. Numerous studies have been
conducted that show that peer-led interventions are significantly better than adult-led
interventions in changing targeted behavior (Botvin et al., 1984; Emmons et al., 2005;
Murray, Richards, Luepecker, & Johnson, 1987). A study by Kirby et al. (1999), showed
that peer-led education succeeded in delaying the onset of smoking in middle school
students (Kirby et al., 1999). Another study also found that peer-led participants had a
lower onset of smoking after 2 years (Murray et al., 1987). Childhood cancer survivors
have a slightly lower smoking rate than the general population; thus, a prevention study
was conducted to determine if peer-counseling calls would increase cessation of cigarette
smoking compared to a self-help group. Individuals in the peer-counseling group had
significantly higher cessation rates than those of the self-help group (Malchodi, Oncken,
Dornelas, Caramanica, Gregonis, & Curry, 2003). Pregnant smokers that experienced
peer-led counseling decreased the number of cigarettes smoked, but this intervention did not change cigarette cessation rates (Anderson-Loftin, Barnett, Bunn, Sullivan, Hussey, & Tavakoli, 2005). Smoking cessation and prevention studies show that peer-led education is beneficial in adolescents as well as adults, and may make a larger impact on individuals than other interventions.

**Disease prevention:**

Various disease prevention interventions are used today, and peer-educators are utilized for some of these programs. An adult group of type 2 diabetics experienced an intervention where peer-professionals facilitated discussions and education. Researchers found that there were significant changes in BMI and dietary fat intake among participants in the experimental group (Telch, Miller, Killen, Cooke, & Maccoby, 1990). Another study conducted among Latina women, found that women who received peer-counseling had a trend for significant increases in breast cancer screening compared to women who received only educational pamphlets (Welsh, Sauaia, Jacobellis, Min, & Byers, 2005). Only one study reviewed, involving testicular cancer prevention, showed that students in an adult-led education program gained more knowledge than students in a peer-led education program (Best, Davis, Vaz, & Kaiser, 1996). In this particular study, male college-aged students were used as peer educators for 10th grade students. Although, they were closer in age than “adults,” this may not have been a good indicator of what “true” peer education outcomes would have been (Best et al., 1996). In all other studies, peer-led groups gained as much knowledge or more than adult-led groups.

**Breastfeeding promotion:**
Another popular subject which utilizes peer education is breastfeeding. Peer-counseling has been shown to be effective in breastfeeding initiation, exclusivity, and duration (Dennis, Hodnett, Gallop, & Chalmers, 2002). In the United States, the *Health and Human Services Blueprint for Action and Breastfeeding* recommends the use of peer-educators as a form of education and a means to improve breastfeeding rates (US Department of Health and Human Services, 2000). Numerous studies have been conducted and found that peer counseling increases initiation and duration of breastfeeding in low-income populations (Caulfield et al., 1998; Grummer-Strawn, Rice, Dugas, Clark, & Benton-Davis, 1997; Haider, Ashworth, Kabir, & Huttly, 2000; Humphreys, Thompson, & Miner, 1998; Long, Funk-Archuleta, Geiger, Mozar, & Heins, 1995; Morrow et al., 1999; Schafer, Vogel, Viegas, & Hausafus, 1998). An observational study suggested that peer education positively influenced women’s choices to breastfeed and breastfeeding duration (Kistin, Abramson, & Dublin, 1994). Peer counseling has been shown to be effective among low-income Latina mothers in the United States (Chapman, Damio, Young, & Perez-Escamilla, 2004). A separate study conducted with low-income Latina mothers, also found that peer-counseling was more effective than conventional support. Mothers who were exposed to peer-counseling were more likely to initiate breastfeeding and exclusively breastfeed longer (Anderson, Damio, Young, Chapman, & Perez-Escamilla, 2005). Peers assist the new mother with breastfeeding and often provide her with emotional support that may be difficult for someone who is not considered a peer.

*Theoretical base:*
Social Cognitive Theory (SCT) is a health behavior model that encompasses psychosocial and environmental factors that drive health behaviors as well as avenues for affecting behavioral change (Bandura, 1976; Bandura, 1986). The SCT has been used to explain and change eating behavior patterns in adolescents (Mellanby, Rees, & Tripp, 2000; Baranowski et al., 1993). Psychosocial factors that influence behavior include knowledge, skill, self-efficacy, and observational learning among others (Bandura, 1976; Bandura, 1986). Peer education is one method of observational learning that may be applied to health behavior intervention programs. Peer education has been used in many different settings including sex education, breastfeeding promotion and cigarette smoking cessation, but has not been widely used in nutrition education. Peer education encompasses the notion that young persons seek advice from their friends and acquaintances and adopt behaviors of their peers (Bandura, 1976; Bandura, 1986). The term “peer educator” is defined as a person/group who delivers an educational program to other people who are of similar age or slightly younger (Mellanby et al., 2000). Peer-led educational interventions have been shown to increase knowledge, skills, and self-efficacy (Bernard 1991; Cowie, 1999; Turner, 1999). The key benefit of peer education is the ability of peers to relate to one another and provide information in a more appealing manner (Stephenson et al., 2003; Stephenson et al., 2004). Previous studies support the fact that children are eager to learn and enjoy being with friends; thus, peer education may be a highly effective means of affecting health behaviors (Lypaczewski et al., 2002). This study will address three key variables of the SCT, personal factors, environment, and behavior.
Few studies have been published that assess the outcomes of peer education models in nutrition education, and none have specifically examined dietary calcium and chronic disease prevention. Peer education has been shown to be effective in increasing knowledge for other health behaviors, and more interventions are needed for preadolescents related to calcium intake and chronic disease. It would be appropriate to apply a peer education model to a 3-A-Day™ program. Such an intervention based on the SCT, using peer educators may be beneficial to increase knowledge, skill, and self-efficacy for dietary calcium intake and chronic disease prevention. Peer education is beneficial to children and adults, because of the internal desire to fit in and be with their friends. Children and adults alike are eager to learn new skills with friends. Peer education is also beneficial because younger children often consider slightly older children to be their role models. Peer education has been shown to be beneficial across a variety of topics and involving a wide range of demographics.

3-A-Day™ of dairy nutrition education:

3-A-Day™ of dairy program was launched by the American Dairy Association/National Dairy Council in January 2003 to help individuals and families easily remember to consume 3 servings of dairy each day. The nutrition education program was designed to help children adopt healthy lifestyles that would track into
adulthood (National Dairy Council, 2006). In conjunction with the goals of 3-A-Day™, the “Strong Bones, Strong Girls” patch was developed by the Girl Scouts of the United States of America, National Dairy Council, National Osteoporosis Foundation, Centers for Disease Control and Prevention, Department of Health and Human Services’ Office on Women’s Health and the National Arthritis Foundation, collectively. The goal of this patch program is to educate Girl Scouts on osteoporosis prevention, through nutrition and physical activity. The patch program includes information on bone health, calcium, physical activity and dairy foods.

**National Girl Scout program and mission:**

In 1912, the Girl Scouts of the United States of America was founded by Juliette Gordon Low to model the Boy Scouts of America. The purpose of Girl Scouts is to inspire “girls with the highest ideals of character, conduct, patriotism and service that they may become happy and resourceful citizens.” Girl Scouts is open to any girl aged 5 to 17 years and has 3.6 million members world-wide. Girls are divided into age-appropriate groups, including Daisy Girl Scouts (ages 5-6 years), Brownie Girl Scouts (ages 6-8 years), Junior Girl Scouts (ages 8-11 years), Studio 2B (ages 11-17), and Cadets (ages 11-17 years). Girl Scouts represent a diverse group of individuals, including those living in 80 different countries. The girls are rewarded for their accomplishments and work through patches, badges, and pins (Girl Scouts of the USA, 2004). Girl Scout participation has been shown to significantly increase self-esteem (Royse, 1998). Girl Scouts is designed to help girls develop the leadership skills and character to become better citizens.

**References**


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Neilan AM (1985). Evaluating the Effectiveness of Small Group Methods in Nutrition Education for Young Mothers Receiving Public Food Assistance. Virginia Polytechnic Institute and State University, Blacksburg, VA.


Girl Scouts (Peer Educators) Knowledge Before and After Teaching a Peer Education Program on 3-A-Day™ of Dairy

To be submitted to Journal of the American Dietetic Association.
Abstract

OBJECTIVE: To determine if peer educators increased and retained their knowledge upon completion of a peer education program.

DESIGN: A troop of 13 Junior Girl Scouts (mean age = 9.09 ± 0.28 years) were extensively trained regarding the importance of calcium intake, weight-bearing activity, and dairy major nutrients in preventing chronic diseases and then served as peer educators. Peer educators completed pre-tests before teaching any programs and post-tests at the conclusion of all programs.

RESULTS: Peer educators significantly increased overall knowledge of 3-A-Day™ of dairy ($p=0.001$) and self-efficacy toward 3-A-Day™ ($p=0.048$). Significant changes in other areas including behavior, attitude toward dairy foods, and identification of weight-bearing activities and calcium-rich foods were not found.

CONCLUSION: This research supports the importance of osteoporosis education among young girls and demonstrates that a nutrition education program is effective at increasing and retaining knowledge and self-efficacy in peer youth educators.

KEYWORDS: CALCIUM INTAKE, CHILDREN, DAIRY, GIRL SCOUTS, PEER EDUCATION, PEER EDUCATORS

Introduction

Adequate intake of calcium in the United States has been below recommended levels for many years (1, 2). Over the past few decades, children’s intakes of dairy products have drastically declined, while juices and sodas have significantly increased (3). According to a recent report, only 39% of females, aged 6 to 11 years, consume the recommended 3 servings per day of dairy products, and the average intake is 1.9 servings
per day (4). This is of concern as inadequate dietary calcium intake has been linked to many diseases including osteoporosis, obesity, and hypertension (5).

Peer-led educational interventions have been shown to increase knowledge, skills, and self-efficacy (6-8). A program based on the Social Cognitive Theory, using the peer education model may help increase knowledge and self-efficacy for dietary calcium intake and chronic disease prevention. The term “peer educator” is a person or group who delivers an educational program to other people who are of similar age or slightly younger (9). Peer education encompasses the notion that young persons seek advice from their friends and acquaintances and adopt behaviors of their peers (10, 11).

A peer education program may increase knowledge and consumption of dairy foods to meet the recommended goal of 3-A-Day™ of dairy. Because females are at higher risk of developing osteoporosis compared to males, it is important to target girls and to provide them with proper information to increase their knowledge of the importance of dietary calcium intake and weight-bearing activity and to change behaviors to prevent osteoporosis, obesity, and hypertension. The objective of this research was to use the National Dairy Council’s 3-A-Day™ of dairy goal to educate Girl Scouts on the importance of dietary calcium intake and weight-bearing physical activity and have these girls serve as peer educators. The hypothesis was that peer educators would increase and retain knowledge about dairy foods and weight-bearing activity for osteoporosis prevention after carrying out 3-A-Day™ of dairy programs with their peers.
Materials and Methods

Study participants

Thirteen Junior Girl Scouts (100% of members) of the Virginia Skyline Council (Troop #771), aged 9 to 10 years, were recruited to participate in this investigation related to peer education of the National Dairy Council’s 3-A-Day™ of dairy program. These girls are referred to as peer educators.

This research project was approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University. Prior to participating in the study, each peer educator and a guardian read an informed consent form and provided written informed consent.

Procedures

Peer educators were extensively trained by the investigators on the National Dairy Council’s 3-A-Day™ of dairy goal and in the area of bone health, including calcium and weight-bearing physical activities in order to educate other girls about calcium intake and prevention of chronic diseases. The “Strong Bones, Strong Girls” and “Bone Builders” patch program curricula and materials developed by the Girl Scouts of the United States of America, National Dairy Council, National Osteoporosis Foundation, Centers for Disease Control and Prevention, Department of Health and Human Services’ Office on Women’s Health and the National Arthritis Foundation were used to educate troop members. Upon completion of the education and training, the peer educators completed a pre-test (see page 37) on their knowledge of the importance of calcium-rich foods, weight-bearing activities, nutrients in dairy foods, preventable diseases, and their like or dislike for dairy products. Upon completion of the education and training, peer
educators’ parents completed questionnaires regarding their perceptions of their daughters’ knowledge gains, as well as their own behaviors. All data were collected between September 2004 and November 2005. Thirteen peer educators and their parents completed all testing procedures and were included in analyses. Completion of training resulted in receipt of the program patches by these Girl Scouts.

**Peer education events**

After the training, the Girl Scouts of Troop #771 developed a 3-hour “event” for other Girl Scouts that focused on 3-A-Day™ of dairy. Six activities were developed to present during events. These activities were based on the age and level of Girl Scouts targeted for each event (Daisy=5 to 6 years of age; Brownie=6 to 9 years of age; or Junior= 9 to 11 years of age). Activities were designed for small groups of approximately 10 girls. The peer educators developed and delivered all parts of each event. A total of 57 girls, aged 5 to 11 years, participated in these programs (hereafter referred to as participants). Participants were members of local Daisy, Brownie and Junior Girl Scout Troops and were recruited through emails distributed to their Girl Scout leaders. Each participant had a signed parental permission form on file before participation in the event and study.

As participants arrived at an event, the peer educators randomly assigned participants to groups by dairy-food shaped name tags (i.e., cheese, milk, etc.). These name tags distinguished groups from each other. Each participant was given a pre-test to assess knowledge before participation in the event. Peer educators, who were guided on how to administer these surveys, paired-up with each participant (or a small group) to help guide them through the pre-test and to assist with reading of survey questions. After
all participants were given pre-tests, they engaged in the 3-hour event. Peer educators welcomed participants, gave a short description of the event and its purpose, explained the importance of dairy intake, and gave participants directions on how to split into groups. Upon completion of the opening, participants were directed to their first stations based on the shapes of their name tags. Each station lasted approximately 20 minutes, during which the peer educators taught their assigned/chosen lessons and activities. Two to three peer educators were at each station. At the conclusion of the 20-minute session, a cow bell was rung to indicate to each station that it was time to rotate. After rotating through all six stations, participants were gathered together in one large group. Peer educators lead participants in a review, using various songs and skits, and thanked participants for completing the event. At the conclusion of the program, participants were given a post-test to assess any change in knowledge during the course of the program. The post-test was given in the same way as the pre-test, with the peer educators assisting the participants with reading of the survey questions.

An investigator-designed questionnaire was mailed to the attention of the parents at the home address of each peer educator regarding their daughter’s knowledge of dairy nutrition and related diseases. Responses for knowledge questions ranged from “very low” = 1 to “very high” = 7. This survey was used to determine parents’ perceptions of their daughters’ change in knowledge, attitude and behaviors after completion of the event.

As a reward for delivering the peer education program, the peer educators earned their Bronze Awards. The Bronze Award is the highest award a Junior Girl Scout can receive and is awarded to girls who show a commitment to their community and to
themselves. Upon completion of all five events, the peer educators completed a post-test to determine any change in knowledge after teaching the program for one year.

Activities and stations

Stations consisted of activities designed by the peer educators and included one dairy food taste-testing station (cheese figures station, ice cream making station, or ice cream sundae station), two weight-bearing physical activities (dancing or red light/green light), one bone physiology station (skeleton figures), and two activities related to dietary calcium intake (calcium food placemats, key chains, jewelry making, or apron making). To teach participants the importance of dietary calcium intake, peer educators designed age-appropriate stations. During programs with younger participants, girls made placemats in which participants cut-out dairy food items, colored them, and glued them to mats. Aprons were also made, in which girls used pre-cut dairy food shaped sponges to decorate kid-sized aprons. With older girls, the peer educators facilitated jewelry and key chain designs with dairy food slogans (e.g. Got Milk?, 3-A-Day™, etc.). With some events, peer educators traced the participants’ bodies on paper so that participants could cut-out and paste paper bones onto the correct places to teach skeletal anatomy. For weight-bearing activity promotion, peer educators designed a dancing station where they taught the girls a dance and also allowed them to free dance. A red light/green light game was also developed to promote weight-bearing activity, in addition to practicing the identification of calcium-containing foods. If foods contained calcium, girls were allowed to Go! (green light), and if foods contained no calcium they had to Stop! (red light). To allow participants to taste and experiment with calcium-rich foods, peer educators chose to make ice cream using a simple recipe. Ultimately, the peer educators
found that this station did not work well and decided to replace this station in future events. In later events, peer educators chose to make “Brownie” sundaes, as they were working with Brownie Girl Scouts. Another station the girls designed was a cheese shape/animal making station. Participants were given different types of cheese (i.e. American slices, string cheese, etc.) and allowed to make shapes with the cheese, after which they ate their cheese. The purpose of these activities was to give participants needed knowledge to increase dietary calcium intake and weight-bearing physical activity for prevention of chronic diseases.

**Questionnaires**

All survey instruments were coded based on the number of correct answers for knowledge. Overall 3-A-Day™ knowledge included identification of low-fat and fat-free dairy foods; recommended number of servings per day for dairy; the three major nutrients found in dairy foods; and three health problems or chronic diseases that dairy foods may help to prevent. If all parts were identified correctly, a maximum score of 10 could be obtained (three points for foods; one point for servings; three points for nutrients; and three points for diseases). Attitude of dairy foods and program evaluation were measured using Hedonic scales (like = 2, somewhat like = 1, do not like = 0). Identification of calcium-rich foods included 12 pairs of foods; girls were instructed to circle the one found in the pair with more calcium. Scores were based on number of correct choices, with 12 as the highest possible score. Identification of weight-bearing activities included 8 activity pairs; girls were instructed to circle the one weight-bearing activity from each pair, with 8 as the highest possible score. Self-efficacy was measured using a Hedonic scale (yes = 2, not sure = 1, no = 0), in girls were asked to circle responses to statements
(e.g. “I can play hard at recess,” etc.). Girls also indicated that number of adults and friends that they would tell about dairy foods (0 to 6 people); this score was coded as the number they indicated.

**Statistical analyses**

Means and standard deviations (SD) were computed for each variable. The pre-tests and post-tests were scored using the number of correct answers out of the total possible. For Hedonic scale ratings, scores ranged from 0 to 2, with 0 = dislike, 1 = somewhat like, and 2 = like. Paired $t$-tests were used to determine statistical significance of knowledge, behavior and attitude change, with a p-value of <0.05 set as significant. Spearman correlations were conducted to examine the relationship between a peer educator’s change in knowledge and her parent’s perceived change in daughter’s knowledge. A scale from 0 to 2 was used, with a decrease in knowledge = 0, no change = 1, and increase = 2.
Pre-test and post-test

1. Circle the three pictures of low-fat and fat-free dairy foods.

   Whole Milk  Mozzarella  Skim Milk
   Yoghurt  Cheese  Ice Cream
   Hot Dog  Carrots  Watermelon

2. Circle the number that shows how many times you should eat or drink dairy foods or beverages each day.
   0  1  2  3  4  5  6

3. Circle the three nutrients that are found in dairy foods.
   Boron  Calcium  Chloride
   Flouride  Phosphorus  Vitamin D

4. Circle the three health problems or diseases that dairy foods can help to prevent.
   Asthma  Colds  High blood pressure
   Measles  Obesity  Osteoporosis

5. Circle the face that shows how you think dairy foods taste.
   😊  🙁  😞

6. Circle the number of adults and friends that you will tell about dairy foods.
   0  1  2  3  4  5  6

7. I thought this program was:
   😊  🙁  😞
3-A-Day of Dairy Program

For each food pair in a box, circle the food that contains more calcium. Circle only one food per box. Assume that none of the foods are fortified with extra calcium.

- Fruit juice
- Spaghetti with tomato sauce
- Cottage cheese with pears
- Cheeseburger
- Corn
- Lettuce salad
- Canned salmon with bones
- Mustard greens
- Broccoli
- Cooked spinach
- Canned tuna packed in oil
- Carrots
- Kool Aid
- Cream cheese
- Chips and Queso
- Sherbet
- Skim Milk
- String cheese
- Chips and Salsa
- Low-fat yogurt

For each activity pair in a box, circle the activity that is weight-bearing. Circle only one activity per box.

- Sleeping
- Swimming
- Kickball
- Sitting
- Football
- Gymnastics
- Computer games
- Walking
- Baseball
- Jumping Rope
- Soccer
- Reading
- Drawing
- Swinging
- Watching Sports
- Dancing

Please circle the one face that shows what you think about these statements.

I can play hard at recess.

I can be physically active 3-5 times a week.

I can eat calcium-rich foods.

I can eat 3-A-Day of Dairy foods.

What is your birth date? _____ What is your age? _____
Results

The mean (±SD) age for the 13 peer educators at the start of education was 9.09 ± 0.28 years. Peer educators showed a significant increase in overall knowledge of 3-A-Day™ of dairy after teaching this program to others. This included questions on calcium-rich foods, identifying the need for 3 servings of dairy per day, major nutrients of dairy foods, and chronic diseases that could be prevented with optimal calcium intake. The mean correct score before teaching was 7.15 ± 1.21, out of a possible 10, and was 8.69 ± 1.32 after teaching all programs (p=0.001). This test included questions on dairy foods which are low in fat, nutrients in dairy foods, and preventable diseases.

When asked to rate, using Hedonic scales, whether they could perform various tasks, the peer educators’ self-efficacy significantly (p<0.05) increased from 7.23 ± 1.01 to 7.62 ± 0.65. When asked to identify the calcium-rich food in 12 food pairs, a significant change in knowledge was not found, although a trend was observed (p=0.07). Prior to teaching any peer education programs, the girls’ average knowledge of calcium-containing foods was 10.00 ± 2.41 and upon completion of the programs was 10.92 ± 1.18. When peer educators were asked to identify the eight weight-bearing activities from paired activities, their mean score was 7.77 ± 0.83 before the program. After the year-long program, their activity knowledge was 7.92 ± 0.65. When asked to rate their like for dairy products, using a Hedonic scale, the peer educators’ score was 1.92 ± 0.28, with the highest score being 2. Twelve girls “liked” dairy foods while only one girl “somewhat liked” dairy foods. After finishing all programs, the mean attitude score was 2.00 ± 0.00. Although, these findings were not significant, this teaching program changed the attitude of the only girl who did not like dairy foods. Peer educators were
asked how many others they would tell about calcium and dairy, with 6 as the highest possible score. Before teaching they listed $3.92 \pm 2.53$ individuals, and after teaching, they indicated $4.31 \pm 2.10$ people. On a scale of 0 to 2, the peer educators ranked the overall program at $1.62 \pm 0.77$.

According to parents, daughters’ questionnaires, knowledge of low-fat and fat-free dairy foods/fluids increased by $2.58 \pm 1.04$ points; knowledge of the recommended number of daily servings of dairy foods/fluids increased by $2.74 \pm 1.43$ points; knowledge of the major nutrients contained in dairy foods/fluids increased by $2.32 \pm 1.14$ points; and knowledge of the role of dairy foods/fluids in prevention of osteoporosis and obesity increased by $2.66 \pm 1.51$ points. Eleven parents (84.6%) indicated that their daughters had discussed dairy foods/fluids with friends and/or family members after participating in the program.

Peer educators’ change in knowledge was correlated to the change that parents perceived. Data showed that parents’ and childrens’ responses were significantly correlated in relation to increased knowledge of preventable diseases and behavior.

According to peer educator questionnaires, they indicated that they would tell $4.31 \pm 2.83$ people about dairy foods, while parents noted that they told an average of $4.69 \pm 2.12$ other people ($r=0.83, p<0.001$). Eleven girls (84.6%) showed an increase in knowledge of preventable chronic diseases, while 12 parents (92%) indicated that they believed their daughters had an increase in knowledge. These two points were significantly positively correlated ($r=0.68, p<0.01$). Related to identification of calcium-rich foods, only three girls (23.1%) showed an increase and eight (61.5%) had no change after teaching the programs, while 100% of the parents thought their girls increased their knowledge.
These were not significantly correlated. Related to the identification of recommended three dairy servings needed per day, peer educators’ and parents’ responses were not significantly correlated. Twelve parents (92.3%) thought their daughters increased knowledge, while in fact, only three girls (23.1%) actually did, while all others (76.9%) remained the same. When peer educators were asked to identify the three major nutrients found in dairy foods, seven (54%) increased knowledge while the remaining did not change. Twelve parents (92.3%) indicated an increase in knowledge; thus, there was no significance. Peer educators’ and parents’ responses related to attitude towards dairy products were not significantly correlated. Only one girl increased while all others remained the same. Yet, 11 parents (84.6%) noted that attitude increased, while two parents (15.4%) indicated no change.

Discussion

No prior research has been conducted to show that peer education is beneficial in educating preadolescent girls on dietary calcium intake and prevention of chronic disease. Moreover, benefits to peer educators has not been adequately studied. These data indicate that peer educators gain a significant amount of self-efficacy while teaching others, and increase or retain knowledge over the course of the program. In a previous study, Martin and colleagues (12) found that children have limited knowledge of osteoporosis prevention, but those who do know have high calcium intakes. Participants knew of the importance of calcium and activity in prevention of osteoporosis but were unable to identify non-dairy foods with calcium or weight-bearing activity as important in prevention (12). This is significant as pre-adolescence and adolescence is an important time in bone development. Although the peer educators in this study did not significantly
increase their knowledge in all areas, simply retaining their knowledge can be considered positive. Prior to teaching any events, the peer educators underwent a three-month education program, and thus gained a great deal of knowledge. The peer educators’ biggest weakness before beginning to teach was identifying the major nutrients and chronic diseases which could be prevented; after teaching, this knowledge significantly increased. The post-test was administered after a summer hiatus from Girl Scouts and, thus, may reflect retention of knowledge.

Two studies on osteoporosis prevention have been conducted using Girl Scouts, with similar results. In one osteoporosis prevention program designed for Girl Scouts and their mothers, participants engaged in a 2-hour educational session on bone health, calcium intake, and general nutrition. These girls and their mothers participated in hands-on activities at multiple stations to learn about bone health and nutrition. Girls increased their knowledge by an average of 22%, with only three girls not showing an increase in score on the post-test (13). The study design, using stations and hands-on activities, is similar to that used in this study, but peer educators were not used, only adults. Another study in Girl Scouts showed that those who underwent an intervention significantly maintained or increased calcium intake compared to those who did not receive the intervention (14). Similar results were found in the current study as the peer educators significantly increased or maintained their knowledge.

The present study has several limitations. Peer educators were not randomly selected. An entire Girl Scout troop was selected as the peer educators for ease, instead of a mix of various troop members. Since these girls have known each other for some time, this may serve as both a strength and limitation. Many of these peer educators were
friends. Thus, there were times in which they wanted to interact with themselves during events, instead of with participants. Another limitation is the link to behavior. Knowledge does not equal behavior, and the peer educators were only tested for osteoporosis prevention knowledge; calcium and dairy intake was never calculated. Future studies should use diet recalls for pre-test information, as well as follow-up to determine if education and knowledge actually translates to behavior change. Although behavior was not determined, eleven parents (84.6%) answered “strongly agree” when asked if milk was in the home most of the time. This is important as children cannot consume dairy products if they are not present in the home. Further research is needed to assess the behavioral benefits, not just knowledge, of a peer education program.

A peer education model worked well in helping to educate peer educators in the prevention of osteoporosis and chronic disease, using the goals of the National Dairy Council’s 3-A-Day™ program. Peer educators were not only able to increase and retain knowledge regarding osteoporosis prevention, but were able to build their self-efficacy. These findings suggest that peer education, although previously found to be beneficial in those learning, also has positive benefits for the peer educators.

Acknowledgements

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References


Girl Scouts Empower Other Girl Scouts to Consume 3-A-Day™ of Dairy

To be submitted to Journal of the American Dietetic Association.
Abstract

OBJECTIVE: To assess the impact of a youth peer-led nutrition education program on knowledge, attitudes and behaviors of girls participating in a 3-A-Day™ of dairy program.

DESIGN: Girls from local Girl Scout troops (N=57) participated in “events” designed and taught by peer educators. Participants were given a pre-test before participating in an event and a post-test at the conclusion of an event.

RESULTS: After completing a program, participants had a significant increase in knowledge of calcium-rich foods and weight-bearing activities. These girls were also able to identify the recommended servings of dairy foods and had increases in self-efficacy related to osteoporosis.

CONCLUSION: This research demonstrates positive outcomes of peer education in teaching young girls about 3-A-Day™ of dairy to prevent osteoporosis.

KEYWORDS: CALCIUM INTAKE, CHILDREN, DAIRY, GIRL SCOUTS, OSTEOPOROSIS PREVENTION, PEER EDUCATION

Introduction

Osteoporosis is a major health problem among women, with 50% over the age of 50 years affected. Fortunately, dietary habits early in life may help to prevent this disease (1). Osteoporosis is a skeletal disease characterized by low bone mineral density, and although osteoporosis is often viewed as an older woman’s disease, researchers have found that low calcium intake is associated with bone fractures in adolescents (1, 2). Modifiable influences for peak bone mass and thus osteoporosis, include nutrition, especially dietary calcium intake (3), and weight-bearing physical activity (1). These
modifiable risk factors are easily changed with proper education and knowledge. Research has shown that lifestyle behaviors track from childhood to adulthood (4). Thus, changing behaviors, such as calcium intake, during childhood may have a positive effect in adulthood and may help to prevent osteoporotic fractures.

It is generally accepted that proper calcium intake reduces the risk of osteoporosis, but recent research has shown that calcium intake. Zemel (5-7) found an inverse relationship between weight status in adults and their dietary calcium intakes. Adults in these studies who consumed higher amounts of dairy had greater weight loss than those who consumed less dairy (5-7). Another group conducted a study among children and found similar results. Children who had higher intakes of dairy-rich foods, had a significantly lower weight than those who consumed less milk products (8). Other studies have found the opposite. One study found that as children consumed more milk, they had larger body mass indexes (9). Other studies have found no relationship between dairy consumption and weight status (10, 11).

A peer education program based on the Social Cognitive Theory may be beneficial in increasing knowledge of dairy foods to meet the 3-A-Day™ goal. The purpose of this study was to evaluate changes in knowledge, behavior, and self-efficacy of young girls who participated in a 3-A-Day™ peer education program delivered by Junior Girl Scouts. It was hypothesized that Girl Scouts who engaged in a peer education event would increase their knowledge about dairy foods and weight-bearing exercises important in osteoporosis prevention.
Materials and Methods

Study participants

Fifty-seven Girl Scouts, aged 5 to 11 years, participated in a peer education program using the National Dairy Council’s 3-A-Day™ of dairy goal. Girls were members of Daisy, Brownie and Junior Girl Scout Troops and were recruited through electronic mail notices distributed to their Girl Scout leaders.

This research project was approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University. Prior to participating in the study, a parent or guardian read an informed consent form and provided written informed consent.

Procedures

Thirteen girls of Junior Girl Scout Troop #771 were recruited and educated extensively on the National Dairy Council’s 3-A-Day™ of dairy goals and in the area of bone health, calcium and weight-bearing physical activities in order to serve as peer educators to other girls about calcium intake and prevention of chronic disease. These girls are known as peer educators. The “Strong Bones, Strong Girls” and “Bone Builders” patch program curricula and materials developed by the Girl Scouts of the United States of America, National Dairy Council, National Osteoporosis Foundation, Centers for Disease Control and Prevention, Department of Health and Human Services’ Office on Women’s Health and the National Arthritis Foundation were used to train the peer educators. Upon completion of training, these peer educators completed a test on their knowledge of the 3-A-Day™ goals to allow researchers to assess their knowledge and acceptability to teach others.
Peer-education events

All 3-A-Day™ of dairy events were prepared and delivered by the peer educators as described in Chapter 3. One event was completed with Daisy Girl Scouts, aged 5 to 6 years (n=7), three events were conducted with Brownie Girl Scouts, aged 6 to 9 years (n=33), and one program was delivered to Junior Girl Scouts, aged 9 to 11 (n=17). Events were completed between February and November 2005. Pre-test and post-test were completed with participants as described in Chapter 3. Upon completion of the event, each participant received the “Strong Bones, Strong Girls” or equivalent patch based on age level.

Activities and stations

Activities included in each station for events have been described in Chapter 3. Peer educators selected those activities and stations that were age-appropriate based on the level of Girl Scouts attending the events.

Survey

Scoring of surveys was described in Chapter 3. Scores were based on the number answered correctly.

Statistical analyses

Means and standard deviations (SD) were calculated for all variables. Pre-tests and post-tests were scored based on number of correct answers out of total possible answers. For Hedonic scales, scores ranged from 0 to 2, with 0 = dislike, 1 = somewhat like, and 2 = like. Paired $t$-tests were used to determine statistical significance in change in knowledge, behavior, and attitude scores. Statistical significance was set at $p<0.05$. 
Pre-test and post-test

1. Circle the three pictures of low-fat and fat-free dairy foods.
   - Whole Milk
   - Skim Milk
   - Yogurt
   - Cheese
   - Hot Dog
   - Carrots
   - Watermelon

2. Circle the number that shows how many times you should eat or drink dairy foods or beverages each day.
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6

3. Circle the three nutrients that are found in dairy foods.
   - Boron
   - Calcium
   - Chloride
   - Flouride
   - Phosphorus
   - Vitamin D

4. Circle the three health problems or diseases that dairy foods can help to prevent.
   - Asthma
   - Colds
   - High blood pressure
   - Measles
   - Obesity
   - Osteoporosis

5. Circle the face that shows how you think dairy foods taste.
   - 😊
   - 😐
   - 😞

6. Circle the number of adults and friends that you will tell about dairy foods.
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6

7. I thought this program was:
   - 😊
   - 😐
   - 😞
3-A-Day of Dairy Program

For each food pair in a box, circle the food that contains more calcium. Circle only one food per box. Assume that none of the foods are fortified with extra calcium.

<table>
<thead>
<tr>
<th>Fruit juice</th>
<th>Spaghetti with tomato sauce</th>
<th>Cottage cheese with pears</th>
<th>Cheeseburger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-fat milk</td>
<td>Macaroni and cheese</td>
<td>Mixed fruit</td>
<td>Hamburger</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corn Broccoli</th>
<th>Lettuce salad</th>
<th>Canned salmon with bones</th>
<th>Mustard greens</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooked spinach</td>
<td>Canned tuna packed in oil</td>
<td>Carrots</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kool Aid</th>
<th>Cream cheese</th>
<th>Chips and Queso</th>
<th>Sherbet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim Milk</td>
<td>String cheese</td>
<td>Chips and Salsa</td>
<td>Low-fat yogurt</td>
</tr>
</tbody>
</table>

For each activity pair in a box, circle the activity that is weight-bearing. Circle only one activity per box.

<table>
<thead>
<tr>
<th>Sleeping</th>
<th>Swimming</th>
<th>Kickball</th>
<th>Sitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>Gymnastics</td>
<td>Computer games</td>
<td>Walking</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseball</th>
<th>Jumping Rope</th>
<th>Soccer</th>
<th>Reading</th>
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<tbody>
<tr>
<td>Drawing</td>
<td>Swinging</td>
<td>Watching Sports</td>
<td>Dancing</td>
</tr>
</tbody>
</table>

Please circle the one face that shows what you think about these statements.

<table>
<thead>
<tr>
<th>YES</th>
<th>Not Sure</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>🎃</td>
<td>🎃</td>
<td>🎃</td>
</tr>
</tbody>
</table>

I can play hard at recess.

I can be physically active 3-5 times a week.

I can eat calcium-rich foods.

I can eat 3-A-Day of Dairy foods.

What is your birth date? ______  What is your age? ______
Results

Fifty-seven girls, aged 5 to 11 years (mean age = 7.96 ± 1.66 years), participated in 3-A-Day™ of dairy peer education programs and completed pre- and post-tests. Prior to participating in a program, these Girl Scouts were able to identify an average of 7.28 ± 2.15 calcium-rich foods correctly out of 12 pairs (see Table 1). After participating, this knowledge significantly increased ($p<0.001$) to 8.60 ± 1.87 calcium-rich foods. Participants also had a significant increase in knowledge of weight-bearing activities. When asked to identify the eight weight-bearing activities from activity pairs, these girls answered 6.53 ± 2.18 correctly before participating and 7.44 ± 1.50 after completion of the program ($p<0.001$). To examine self-efficacy, girls were asked to rate their ability in certain areas (e.g. “I can play hard at recess”). Upon completion of the peer education program, participants had a significant increase in self-efficacy (6.63 ± 1.35 vs. 7.00 ± 1.30, $p<0.01$). Overall 3-A-Day™ knowledge was tested based on a possible high score of 10. Girls had a significant increase in 3-A-Day™ knowledge. Prior to the program, these Girl Scouts had an average score of 6.23 ± 1.31, and after the program, this increased to 7.33 ± 1.30 ($p<0.001$). This knowledge score was divided into categories: (1) identifying low-fat dairy foods; (2) recommended servings; (3) major nutrients; and (4) preventable chronic disease. Significant increases in knowledge related to recommended servings and preventable diseases were found. The low-fat dairy food score increased from 2.07 ± 0.59 to 2.09 ± 0.61, but this was not significant. Recognizing the recommended number of servings of dairy increased significantly ($p<0.01$) from 0.40 ± 0.50 to 0.63 ± 0.49, with 1 being the highest possible value. Girls were also asked to identify calcium, vitamin D and phosphorus as the major nutrients in
dairy products. Participants had a small increase from 2.19 ± 0.55 to 2.28 ± 0.56, but this was not significant. To assess overall 3-A-Day™ knowledge, girls were asked to identify obesity, hypertension and osteoporosis as health problems or diseases that dairy products and calcium could help prevent. Participants answered 1.65 ± 0.74 correctly prior to the program and 2.30 ± 0.76 correctly after participating. This was a significant increase ($p<0.001$) in knowledge. There was no significant increase in attitude toward the taste of dairy foods. Participants were also asked before and after the program how many friends or family members they would tell about dairy foods; this number did not increase significantly. The program participants evaluated the program upon completion using a rating scale of 0 to 2. The mean score was 1.86 ± 0.40.
Table 1. Mean knowledge scored for participants before (pre-) and after (post-) engaging in dairy program (N=57)

<table>
<thead>
<tr>
<th>Knowledge Area (possible correct)</th>
<th>Pre-Test Score</th>
<th>Post-test Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>Identification of Calcium-rich Foods (12)</td>
<td>7.28 ± 2.15</td>
<td>8.60 ± 1.87**</td>
</tr>
<tr>
<td>Identification of Weight-bearing Activities (8)</td>
<td>6.53 ± 2.18</td>
<td>7.44 ± 1.50**</td>
</tr>
<tr>
<td>Self-Efficacy toward 3-A-Day™ (8)</td>
<td>6.63 ± 1.35</td>
<td>7.00 ± 1.30*</td>
</tr>
<tr>
<td>Identification of Low-fat Dairy Foods (3)</td>
<td>2.07 ± 0.59</td>
<td>2.09 ± 0.61</td>
</tr>
<tr>
<td>Identification of Recommended Servings (1)</td>
<td>0.40 ± 0.50</td>
<td>0.63 ± 0.49*</td>
</tr>
<tr>
<td>Nutrients (3)</td>
<td>2.19 ± 0.55</td>
<td>2.28 ± 0.56</td>
</tr>
<tr>
<td>Health problems/Diseases (3)</td>
<td>1.65 ± 0.74</td>
<td>2.30 ± 0.76**</td>
</tr>
<tr>
<td>Attitude toward Dairy Foods (2)</td>
<td>1.67 ± 0.51</td>
<td>1.70 ± 0.53</td>
</tr>
<tr>
<td>Behavior Related to Dairy Foods and Exercise (6)</td>
<td>3.47 ± 2.07</td>
<td>3.72 ± 2.00</td>
</tr>
</tbody>
</table>

*p<0.01

**p<0.001
Discussion

This study highlights the positive benefits of peer education. The results of this study indicate that participants in a peer education program not only gain a variety of knowledge but also gain a significant amount of self-efficacy. No prior research has been conducted to show that peer-led education is effective and beneficial in educating other preadolescent girls on dietary calcium intake and prevention of chronic disease. This study was designed to show a relationship between peer education and increased knowledge. Our results provide the first evidence that a peer education model may work to educate young girls on the importance of calcium intake and weight-bearing activities to prevent osteoporosis and other chronic diseases. Although future studies need to be completed to confirm these results with measurement of behavior change, the information gained in this study may help to increase bone mass and reduce fracture risk among children and long-term risks.

Martin and colleagues (13) found that children who have proper knowledge of the importance of calcium intake for osteoporosis prevention have higher levels of calcium intake compared to those without adequate knowledge, but overall, children have limited knowledge of osteoporosis and prevention methods. Participants knew of the importance of calcium and activity in prevention of osteoporosis, but were unable to identify non-dairy foods with calcium or weight-bearing activity as important in prevention (13). The present study shows that peer education resulted in an increase knowledge of calcium-rich foods, as well as weight-bearing activities. Participants had significant increases in all areas of osteoporosis prevention and 3-A-Day™ of dairy. Although there were no increases in identifying low-fat dairy foods, this may be explained as the girls were never
taught differences between low-fat dairy foods and dairy foods. These findings are similar to previous studies with children and show peer education to be beneficial in the learning process (14-17).

Osteoporosis preventions have also been conducted using Girl Scouts, and found similar results to those of this study (1, 18). A program designed for Girl Scouts and their mothers, showed a 22% increase in knowledge among the girls (1). The program designed for mothers and daughters used stations and hands-on activities with adults as leaders, which is similar to the design used in this study; however, peer educators were used rather than adults (1). Another study showed those who participated in an osteoporosis prevention program maintained or increased dietary calcium intake compared to Girl Scouts who did not participate in the intervention (18).

The present study has several limitations. Peer educators were not randomly selected with only one Girl Scout troop being selected to serve as peer educators. The girls were good friends and often wanted to talk amongst themselves rather than interact with participants. Another limitation is that behavior change was not addressed. Increases in knowledge give participants the ability to change, but does not mean behavior will automatically change. A third limitation is the population sample. Girls were chosen for this study because of the higher rates of osteoporosis in women, as well as, the convenience for recruitment using Girl Scout troops. Although, girls are more likely to develop osteoporosis later in life, future prevention studies should include males to ensure that they respond the same in peer education programs. The Girl Scout troops were already formed and the peer educators were able to simply go to meetings and teach. No control group was used in this study. An adult-led group used to educate girls,
would have given researchers something to compare to the peer-led group. Future studies should use diet recalls to determine if increases in knowledge translates to behavior change. Further research is needed to assess the behavioral benefits, not just knowledge, of a peer education program.

The peer education model worked well in helping educate Girl Scouts on the importance of calcium intake and weight-bearing activities in the prevention of osteoporosis and chronic disease, using the goals of the National Dairy Council’s 3-A-Day™ of dairy programs. The participants were able to increase their knowledge significantly in various areas, including recognizing the serving recommendation, identifying weight-bearing activities, calcium-rich foods, major nutrients and disease which can be prevented through proper calcium intake. The Girl Scouts also had a significant increase in self-efficacy. These findings suggest that peer education, although previously found to be beneficial in many areas, may be beneficial in nutrition education, especially in osteoporosis prevention.

Acknowledgements

This project was supported by a research grant from the National Dairy Council.

References:

Girl Scouts Empower Other Girl Scouts to Consume 3-A-Day™ of Dairy and Parent’s Interpretation of This Program
ABSTRACT

OBJECTIVE: To determine the effectiveness of the peer education model on osteoporosis prevention in young girls.

DESIGN: Nineteen Girl Scouts participated in programs designed and taught by peer educators. Participants were given pre-tests before participating in a program and post-tests at the conclusion of an event. Each participant’s parent completed a survey one month after their daughter’s participation to evaluate the parent’s perception of daughter’s knowledge.

RESULTS: These data showed significant increases in participants’ knowledge in identifying calcium-rich foods ($p=0.002$), weight-bearing activity ($p=0.014$), and in overall 3-A-Day™ knowledge ($p=0.031$). There were no significant relationships between participants’ change in knowledge and parents’ perceived change in knowledge.

CONCLUSION: A peer education program designed to promote osteoporosis prevention was beneficial in increasing knowledge of the modifiable risk factors of osteoporosis.

KEYWORDS: CALCIUM INTAKE, CHILDREN, GIRL SCOUTS, OSTEOPOROSIS INTERVENTION, PEER EDUCATION

Introduction

Dairy intake among children is very important and vital to growth. Over the years, dairy intake in children and adults has decreased significantly (1). According to published data, the average intake in young females, aged 6 to 11 years, is 1.9 servings per day of dairy products (2). Proper calcium intake has been proven over and over again to prevent osteoporosis, but new research is beginning to emerge about the possible prevention of other diseases. Researchers have shown that proper calcium intake may
moderate weight status in adults and children (3-6), although some studies have shown contrasting results (7-9). There have been studies that have shown no relationship at all, and others which show the opposite relationship, with greater intake relating to higher weight (7-9). More research is needed in this area to determine the true effects of calcium intake and weight status.

Osteoporosis is a disease in which the bones become porous and are subject to fracture. Adequate weight-bearing activity and dietary calcium intake can reduce the risk of developing osteoporosis (10, 11). Osteoporosis interventions are abundant, but have been developed mostly for women. Childhood education interventions may help reduce the risk of osteoporosis and other diseases later in life. Little information on how to improve or plan programs effectively for osteoporosis prevention in children has been proven. Peer education has been found to be useful in many settings, but there has been a lack of research in children and nutrition peer education. Most research has been completed to educate college women and older, but little has been conducted in children. Programs geared towards children may help to reduce osteoporosis and other disease later in life. Several researchers have found significant results when working with osteoporosis interventions in children (12-14). Studies have also been carried out in Girl Scouts and shown significant increases in knowledge after participation (13, 14).

The objective of this research was to use the National Dairy Council’s 3-A-Day™ goal to develop a peer education program for a local Junior Girl Scout troop to educate other Girl Scouts and to determine each parent’s interpretation of his or her daughter’s knowledge gain. It was hypothesized that Girl Scouts who participated in a peer
education program on 3-A-Day™ would have a significant increase in knowledge of dairy foods and weight-bearing activities.

Materials and Methods

Study participants

Nineteen Girl Scouts, aged 5 to 11 years, and their parents were recruited to participate in a peer education program using the National Dairy Council’s 3-A-Day™ of dairy goal. Girls were members of Daisy, Brownie and Junior Girl Scout Troops and recruited through electronic mail sent to their Girl Scout leaders.

This research project was approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University. Prior to participating in the study, a parent or guardian read an informed consent form and provided written informed consent.

Procedures

Thirteen girls of Junior Girl Scout Troop #771 were recruited and educated extensively on the National Dairy Council’s 3-A-Day™ of dairy goals and in the area of bone health, calcium and weight-bearing physical activities in order to serve as peer educators to other girls about calcium intake and prevention of chronic disease. These girls are known as peer educators. The “Strong Bones, Strong Girls” and “Bone Builders” patch program curricula and materials developed by the Girl Scouts of the United States of America, National Dairy Council, National Osteoporosis Foundation, Centers for Disease Control and Prevention, Department of Health and Human Services’ Office on Women’s Health and the National Arthritis Foundation were used to educate
the troop members. All data were collected between September 2004 and November 2005.

Peer-education events

All events were planned and delivered by the peer educators as described in Chapter 3. Pre-tests and post-tests were given to participants and a one-month follow-up survey was mailed to each parent as discussed in Chapter 3. Each participant received a “Strong Bones, Strong Girls” patch or equivalent patch based on the appropriate age level, upon completion of the program.

Activities and stations

Activities and stations included in each program were described in Chapter 3. Peer educators designed these events to be age appropriate for participants at each event.

Surveys

Each participant was given a pre- and post-test and parents completed a one month follow-up survey. All questionnaires and surveys were coded and evaluated as described in Chapter 3.

Statistical Analyses

Means and standard deviations (SD) were computed for each variable. The pre-test and post-test was scored using the number of correct answers out of the total possible. For Hedonic scale, the score ranged from 0 to 2, with the 0 = dislike, 1 = somewhat like, and 2 = like. Paired $t$-test was used to determine statistical significance of knowledge change, behavior and attitude. Statistical significance was set at $p < 0.05$. Spearman correlation test was completed to examine the relationship between participant’s actual knowledge change and parent’s perceived change in the daughter’s
knowledge change. A scale from 0 to 2 was used for this test. A decrease in knowledge = 0, no change = 1 and increase = 2.
Pre-Test and Post-Test

3-A-Day of Dairy Program

For each food pair in a box, circle the food that contains more calcium. Circle only one food per box. Assume that none of the foods are fortified with extra calcium.

- Fruit juice
  - Low-fat milk
- Spaghetti with tomato sauce
  - Macaroni and cheese
- Cottage cheese with pears
  - Mixed fruit
- Cheeseburger
  - Hamburger
- Corn
  - Broccoli
- Lettuce salad
  - Cooked spinach
- Canned salmon with bones
  - Canned tuna packed in oil
- Mustard greens
  - Carrots
- Kool Aid
  - Skim Milk
- Cream cheese
  - String cheese
- Chips and Queso
  - Chips and Salsa
- Sherbet
  - Low-fat yogurt

For each activity pair in a box, circle the activity that is weight-bearing. Circle only one activity per box.

- Sleeping
  - Football
- Swimming
  - Gymnastics
- Kickball
  - Computer games
- Sitting
  - Walking
- Baseball
  - Drawing
- Jumping Rope
  - Swinging
- Soccer
  - Watching Sports
- Reading
  - Dancing

Please circle the one face that shows what you think about these statements.

- I can play hard at recess.
- I can be physically active 3-5 times a week.
- I can eat calcium-rich foods.
- I can eat 3-A-Day of Dairy foods.

What is your birth date? _______ What is your age? _______
1. Circle the three pictures of low-fat and fat-free dairy foods.

2. Circle the number that shows how many times you should eat or drink dairy foods or beverages each day.

   0  1  2  3  4  5  6

3. Circle the three nutrients that are found in dairy foods.

   Boron  Calcium  Chloride
   Flouride  Phosphorus  Vitamin D

4. Circle the three health problems or diseases that dairy foods can help to prevent.

   Asthma  Colds  High blood pressure
   Measles  Obesity  Osteoporosis

5. Circle the face that shows how you think dairy foods taste.

   😊  😐  😞

6. Circle the number of adults and friends that you will tell about dairy foods.

   0  1  2  3  4  5  6

7. I thought this program was:

   😊  😐  😞
Results:

Nineteen girls (age = 8.05 ± 1.78) and their parents completed all parts of this study. Participants showed a significant increase in knowledge after participating in the peer education program. After the program, girls were able to identify more calcium-rich foods ($p<0.01$) and weight-bearing activities ($p<0.05$). When asked to identify from a group of pairs the item with more calcium or the weight-bearing activity, they had a significant increase in both categories, increasing from 6.79 ± 2.25 to 8.68 ± 1.64 out of 12 and 6.58 ± 1.87 to 7.63 ± 0.76 out of 8 correct responses, respectively.

The overall 3-A-Day™ knowledge also increased significantly ($p<0.05$), from 6.16 ± 1.34 to 7.00 ± 1.63. When this area was separated into different categories, there was only a significant increase in identifying the preventable chronic diseases ($p<0.05$). The girls identified 1.47 ± 0.77 diseases correctly prior to the program and 2.11 ± 0.94 after completion of the program. When participants were asked to identify three low-fat dairy foods, they had a slight decrease in knowledge from 2.16 ± 0.69 to 1.95 ± 0.62, but this was not significant. They had a slight increase in ability to identify the recommended servings of dairy foods (0.47 ± 0.51 vs. 0.53 ± 0.51); however, this was not significant. There was also a slight, but insignificant, increase in identifying the three major nutrients in dairy foods. The girls were able to identify 2.16 ± 0.60 prior to the event and 2.32 ± 0.58 after participating.

There was no significant change in self-efficacy, attitude of the taste of dairy foods, or the girl’s behavior based on how many people they would tell after leaving the program. Self-efficacy prior to participating was 6.79 ± 1.23 and 7.05 ± 1.18 after finishing the program. Attitude was 1.63 ± 0.50 before the event and 1.68 ± 0.58 at the
end. The girls estimated they would tell 3.00 ± 2.21 friends or family before the program and this increased to 3.47 ± 2.07 friends or family members after the event. Upon completion of the program the girls evaluated the program a 1.84 ± 0.50 on a scale of 0 to 2.
Table 2. Mean knowledge scores for participants of dairy program (N=19)

<table>
<thead>
<tr>
<th>Knowledge Area (possible correct)</th>
<th>Pre-Test Score</th>
<th>Post-test Score</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Mean ± SD</td>
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<td>8.68 ± 1.64**</td>
</tr>
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<td>Identification of Weight-bearing Activities (8)</td>
<td>6.58 ± 1.87</td>
<td>7.63 ± 0.76*</td>
</tr>
<tr>
<td>Self-Efficacy toward 3-A-Day™ (8)</td>
<td>6.79 ± 1.87</td>
<td>7.05 ± 1.18</td>
</tr>
<tr>
<td>Identification of Low-fat Dairy Foods (3)</td>
<td>2.16 ± 0.69</td>
<td>1.95 ± 0.62</td>
</tr>
<tr>
<td>Recommended Servings (1)</td>
<td>0.47 ± 0.51</td>
<td>0.53 ± 0.51</td>
</tr>
<tr>
<td>Nutrients (3)</td>
<td>2.16 ± 0.60</td>
<td>2.32 ± 0.58</td>
</tr>
<tr>
<td>Health problems/Diseases (3)</td>
<td>1.47 ± 0.77</td>
<td>2.11 ± 0.94*</td>
</tr>
<tr>
<td>Attitude toward Dairy Foods (2)</td>
<td>1.63 ± 0.50</td>
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<tr>
<td>Behavior Related to Dairy Foods and Exercise (6)</td>
<td>3.00 ± 2.21</td>
<td>3.47 ± 2.07</td>
</tr>
</tbody>
</table>

*p<0.05

**p<0.01
Using a Likert-type scale, from zero to two, parents indicated that their daughters’ knowledge of low-fat and fat-free dairy foods/fluids increased by 1.05 ± 1.79 points; knowledge of the recommended number of daily servings of dairy foods/fluids increased by 1.21 ± 1.23 points; knowledge of the major nutrients contained in dairy foods/fluids increased by 1.26 ± 1.24 points; and knowledge of the role of dairy foods/fluids in prevention of osteoporosis and obesity increased by 1.79 ± 1.23 points. No parents believed that their daughters’ attitude towards dairy foods changed after participating in the program, and they indicated that their daughters’ told on average 2.32 ± 1.57 other people about dairy foods. Fifteen parents (78.9%) indicated that upon completion of this program, their daughters discussed dairy foods with family members and/or friends.

Spearman correlation was also completed to examine the participant’s knowledge to her parent’s perception of her knowledge. The only area in which there was a significant correlation was in how many people girls would tell about dairy. According to the daughter’s questionnaire they were going to tell 3.63 ± 1.98 people and the parents said they told an average of 2.32 ± 1.57 people. This was significantly negatively correlated with an r-value of -0.48. In the category of identifying low-fat and fat-free dairy foods, the r-value was -0.25. The r-value for the girls recognizing the recommended servings of dairy products was -0.19 and for identifying the three major nutrients was 0.15. The r-value for the participants identifying the diseases was 0.12 and for attitude change of dairy foods was 0.00. Thirteen girls (68.4%) showed an increase in knowledge of preventable chronic diseases, while 17 parents (89.4%) indicated they believed their daughter had an increase in knowledge. Identifying foods, only three girls
(15.8%) showed an increase and 12 (63.2%) had no change after teaching the programs, while 11 (57.9%) parents thought the girls increased their knowledge. These were not significantly correlated. Identifying the recommendation of three dairy servings needed per day, the groups were not significantly correlated. Eleven parents (57.9%) thought their daughter’s increased knowledge, while in fact only four girls (21.1%) actually did and 14 others (73.7%) remained the same. When the participants were asked to identify the three major nutrients found in dairy foods three (15.8%) increased knowledge and 15 (78.9%) remained the same. Although this was the case, seventeen parents (89.5%) indicated an increase in knowledge. Attitude towards dairy products were not significantly correlated. According to the questionnaires, two girls (10.5%) increased and 16 (84.2%) stayed the same. All parents said there was no change in attitude.

Discussion

This peer education program showed a significant increase in knowledge of weight-bearing activities and the importance of calcium intake in prevention of osteoporosis and other chronic diseases and health problems; however, the real challenge lies in building on that knowledge gain to influence behaviors. While these results need to be confirmed measuring behavior change, measuring knowledge is the first step. In addition, if the behavior changes track into adulthood, the participants may reduce their risk of developing osteoporosis.

The Girl Scouts who participated in this program, had an increase knowledge of calcium rich foods, weight-bearing activities, and overall 3-A-Day™ knowledge, but when asked to select low-fat and fat-free dairy foods there was a slight decrease in knowledge. The slight decrease in knowledge of low-fat dairy foods may have been due
to the fact that the peer educators did not teach them about low-fat dairy foods and only
calcium-rich foods and dairy foods. There was no stress placed on low-fat or fat-free.
There may also been some confusion, as the choices were ice cream, whole milk, skim
milk, mozzarella cheese, and low-fat yogurt. The girls often identified ice cream, which
would be expected as ice cream was served at the program.

Girls responded well to this program and their parent’s surveys expressed their
liking for the program and dairy foods alike. One parent expressed that her daughter now
enjoyed dairy foods more, because “they taste good and are good for you.” Another
parent said, “When on vacation. I insisted on milk at breakfast and dinner figuring they’d
have cheese of ice cream to make it three servings per day. My husband protested, and
our daughter defended me. He questioned where she got her information and she said
‘Girl Scouts!’.” According to the parent surveys, the girls learned a lot from this program
and applied it later. Although there was no measure for behavior change, 17 parents
(89.4%) marked “strongly agree” when asked if most days there was milk at home and
two parents (10.6%) marked “agree.” This is important as children cannot consume dairy
products if it is not present in the home.

This program was found similar results to other peer education programs (15-18).
Peer education programs have been shown to be successful with children in various
learning areas, including smoking cessation and sexual education (15-18). Mellanby and
colleagues (15) found that peer education was significantly better than adult-led
interventions in children when establishing norms, but not with giving accurate
information. Although this may be true, children are often influenced by their peers and
if we can give peer educators accurate information, this may change their knowledge and
behavior easier than with adults. Expanded Food and Nutrition Education Program (EFNEP) was the first program to teaching nutrition messages using a peer education model and has been shown to be very effective in teaching nutrition to women (19). This model was expanded for this research to be tested in children for osteoporosis prevention and found was equally successful.

There were a number of limitations in this study. First, the peer educators were not randomly selected. They were all from the same Girl Scout Troop and were good friends. Many of these girls had known each other for 3 years prior to being peer educators. This could cause problems, and as the girls were young and wanted to be around their friends. Also, the population was all girls and Girl Scouts. This is a very limited population. Membership in a group such as Girl Scouts may be related to having a healthier lifestyle. Girls were chosen because osteoporosis occurs more often in women, but boys can be affected also. The response rate for parent’s was also low (33%) which limited the size of the study greatly. Only 19 parents returned completed questionnaires out of 57. Although these girls had significant increases in knowledge, there were no data to support where there was a change in behavior. Knowledge does not mean there will be a change in behavior so it is important to address this. This study was designed to provide preliminary data to the importance of osteoporosis prevention using a peer education model, with a view to guide further research in this area. Further research is needed to objectively measure changes in behavior after participating in this type of program.

A peer education program using Girl Scouts to promote the message of osteoporosis was beneficial in increasing the knowledge of the importance of calcium
intake and weight-bearing activities to prevent osteoporosis. While there was no
correlation between what the girls learned and what their parent’s thought they learned,
many girls talked to family and friends after participating. These results indicate that a peer education program may be beneficial to children when teaching important nutrition messages.

Acknowledgements

This project was supported by a research grant from the National Dairy Council.

References:


3-A-Day™ of Dairy Peer Educators Program Evaluation and Follow-up: A Focus Group

To be submitted to Journal of the American Dietetic Association.
Abstract

OBJECTIVE: To gain insight on the feelings and attitudes of Girl Scouts, who served as peer educators.

DESIGN: Peer educators were asked open-ended questions designed by researchers to guide them through aspects of the program.

RESULTS: The girls enjoyed being peer educators. They liked being in charge and active. They disliked not being able to participate themselves in their educational programs and not having participants listen to them. These peer educators suggested more movement in future programs and longer stations.

CONCLUSION: These peer educators enjoyed serving in this role. Although they disliked some aspects of the program, they would return as peer educators as long as they had friends participating and liked the subject matter.

KEYWORDS: FOCUS GROUP, GIRL SCOUTS, OSTEOPOROSIS PREVENTION; PEER EDUCATION; PEER EDUCATORS

Introduction

Research has indicated that peer education programs are effective in teaching children, but no studies have been completed to test this in osteoporosis prevention interventions (1-4). Calcium intake has steadily decreased over the years in all age groups, but especially in young girls (5-7). This is of concern as girls compared to boys are more at risk for developing osteoporosis later in life. Osteoporosis prevention are often focused on college-aged women and adults. Although this is beneficial to these groups, it is important to offer osteoporosis prevention programs to preadolescents and adolescents, because a large proportion of bone accumulation occurs in late childhood.
As children become teenagers, more food choices are made independently, without the input of parents. At this time, youngsters begin to choose what they eat and eat away from home more often (8). There is a need to develop effective educational programs to improve calcium intake and weight-bearing activity in children.

The first nutrition education program to use a peer education model and show a significant increase in knowledge among limited resource audiences was the Expanded Food and Nutrition Education Program (EFNEP). Studies have shown that participation in EFNEP improves nutritional intake (9). Although EFNEP has been shown to be effective in promoting nutritional messages, little research has been completed using peer education models for nutrition. However, one program that used peer education showed a significant decrease in weight in participants (10). Peer education appears to be an effective method for educating individuals in nutrition and health, but few programs have utilized this method of education. Moreover, peer education has not been widely used in nutrition education programs, but may be beneficial to children.

Osteoporosis is a disease that primarily affects women over 50 years of age. Osteoporosis is characterized by very porous bones and is subject to bones being easily fractured (11). Adequate calcium intake and weight-bearing activity can help to reduce a person’s risk of developing osteoporosis (11). It is important to provide education and knowledge regarding the modifiable risk factors of osteoporosis to individuals at a young age because it can be prevented. Researchers have found that interventions in children have helped to increase knowledge and change behaviors to prevent osteoporosis (12-14). While this may be true, most research has been done conducted with women and little has targeted children.
A peer education program was completed with Junior Girl Scouts serving as peer educators. These girls taught other Girl Scouts about osteoporosis prevention. These Girl Scouts dedicated one year to training and delivery of programs to educate other girls. Participants demonstrated significant increases in knowledge of calcium-rich foods and weight-bearing exercises. The aim of this exploratory study was to gain insight regarding how these peer educators felt while teaching the programs and to evaluate different aspects of the program through a focus group session.

Materials and Methods

Study participants

Thirteen Junior Girl Scouts, aged 10 to 11 years, of the Virginia Skyline Council, Troop #771 were recruited to participate in a follow-up focus group to assess their attitudes and perceptions following a peer education program using the National Dairy Council’s 3-A-Day™ of dairy program. Girls previously served as peer educators for the program (refer to Chapter 3 for full description of program).

This research project was approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University. Prior to participating in the study, each participant and a guardian read an informed consent form and provided written informed consent.

Data collection

Focus group questions were developed by the researchers. They were designed to assess the attitudes, likes, dislikes and overall evaluation of the Girl Scouts who served as peer educators for an osteoporosis intervention program. The focus group was conducted one year after the first peer education program and 3 months after all programs were
completed. The focus group used structured open-ended questions to guide the
discussion. Prior to asking any questions, researchers explained that the session would be
tape recorded and that recordings would be kept confidential. Investigators indicated to
the girls that they were free to express any feelings they had. A facilitator and co-
facilitator were present during the focus group. The facilitator asked all questions and
guided the discussion. The co-facilitator took written notes on the participants’ responses
to serve as a back-up for audiotapes.

**Data analysis**

The focus group session was audio-recorded and transcribed verbatim. Two
investigators reviewed copies of the transcript and identified themes and major points.
These investigators then discussed major themes and points to reach consensus. Data
were qualitative in nature; thus, formal statistical tests were not applied to this study.

**Focus group questions:**

1. Please name one dairy food for me.
2. Please name one weight-bearing exercise for me.
3. Raise your hand if you think that the number of servings of dairy foods that a girl
   your age needs each day is 5.
4. What is the biggest thing that you learned from being a peer educator for the 3-A-
   Day™ of dairy program?
5. What did you like the most about the 3-A-Day™ of dairy program?
   *Probes:* Learning a new topic; being with friends; teaching other girls about
dairy; earning a patch; other
6. What did you not like about the 3-A-Day™ of dairy program?
7. What are some ways that the program could have been better?

Probes: Other activities; different topic; other

8. If you were to give advice to another troop on how to do this program, what would you say?

Probes: Practice; select fun activities; more programs; fewer programs

9. If you were asked to serve as a peer educator again, would you do this? Why or why not?

Probes: Responsibility; awkward; leadership; knowledge; fun; tiresome

10. Is there anything else that you would like to talk about the 3-A-Day™ of dairy program that we have not talked about?

Results

Eight girls (age = 10.09 ± 0.28 years) of thirteen (61.5%) participated in a focus group to discuss their attitudes and feelings about serving as peer educators for an osteoporosis intervention program. Five girls did not participate in the focus group, as three girls were unable to be contacted after numerous messages were sent through electronic mail and calls were not returned and two girls agreed to participate, but did not attend. The focus group began by each girl identifying herself and naming one dairy food and one weight-bearing activity. Three months after completion of all programs the girls were still able to identify the recommended servings of dairy and were able to name a dairy food. Also, seven of the girls were able to identify one weight-bearing activity. The only girl who was unable mentioned swimming as a weight-bearing activity.

Learned from being a peer educator
In general, the girls demonstrated positive attitudes about being peer educators. They felt that standing in front of other people was slightly embarrassing and thought it was hard to teach people their own age. Another common theme was a need to have engaging activities to keep participants interested.

Likes of the program

The girls enjoyed having the power involved with being in charge. They talked about setting rules and how to enforce them. They also mentioned that they like to be with their friends when teaching others. Inclusion of food in the peer education program was a key theme. The girls enjoyed all of the stations that involved food, including cheese animals, making ice cream, and ice cream sundaes. The peer educators also enjoyed that they were seen as “cool” by the participants.

Dislikes of the program

Another major theme that emerged was that the girls disliked “sitting around.” The girls did not like being inactive. They indicated that the program should have had more movement and less lecture-style teaching. They also did not like that they did not get to participate in the activities. The peer educators found it hard to separate themselves from being “students” and being the teachers. They wanted to actually participate in the program and not just tell others what to do. The girls also talked about how they felt the participants did not listen to them, were not having fun, or already knew everything. They were able to better sympathize with their own teachers and how easy it is to become frustrated when people do not listen or pay attention. They also learned the importance of being clear with directions, so that there was not a need to repeat directions and information.
Program improvement

The girls verbalized that future programs should involve longer stations and more movement. They would like to rotate through with their specific group in order to limit repetition, but the peer educators also realized rotating through would require them to know more. The Girl Scouts also mentioned reading the test aloud to all participants at once, instead of pairing up. They stated that it was intimidating for the participants to have the peer educators stand over their shoulders as they were answering the questions on the test. The girls also thought it would be important to establish more clearly rules and expectations of program participants.

Recommendation for others

The peer educators stressed the importance of being really prepared in every aspect of the program. They also said it was important to know everything in detail. During the focus group, they seemed to recognize the need for preparation and that they had not done so sufficiently. The peer educators also stressed the level of responsibility involved and that future educators should be aware of this before agreeing to serve as peer educators.

Future peer educators

The girls seemed to enjoy serving as peer educators and said they would do it again as long as they were able to participate with their friends and teach on subjects in which they were interested. They did realize how much responsibility was involved, but would still do it again as long as they were with their friends.
### Table 3. Major Themes Expressed

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<tr>
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<th>What is the biggest thing that you learned from being a peer educator?</th>
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<tbody>
<tr>
<td>1</td>
<td>- Hard teaching people your own age</td>
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<tr>
<td></td>
<td>- Need engaging activities</td>
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<td>- Can be embarrassing</td>
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<tr>
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<th>What did you like?</th>
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<tr>
<td>2</td>
<td>- Feeling smart</td>
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<tr>
<td></td>
<td>- Being with friends</td>
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<td></td>
<td>- Being in charge</td>
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<tr>
<td></td>
<td>- Food</td>
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<tr>
<td></td>
<td>- Participants thought they were cool</td>
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<td></td>
<td>- Movement</td>
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<table>
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<tr>
<th></th>
<th>What did you dislike?</th>
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<tr>
<td>3</td>
<td>- Sitting around/lecture style learning</td>
</tr>
<tr>
<td></td>
<td>- People not paying attention</td>
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<tr>
<td></td>
<td>- Participants not participating</td>
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<td>- Not being able to participate</td>
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<th>What are some ways it could have been better?</th>
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<tr>
<td>4</td>
<td>- Longer stations</td>
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<td></td>
<td>- Rotate with groups</td>
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<tr>
<td></td>
<td>- Prepare more/more organization</td>
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<td></td>
<td>- More movement</td>
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<td>- More clear rules</td>
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<th></th>
<th>If you were to give advice to others on how to do this program, what would you say?</th>
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<tr>
<td>5</td>
<td>- Plan and know everything</td>
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<tr>
<td></td>
<td>- A lot of responsibility</td>
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<th>If you were asked to serve as a peer educator again, would you do this?</th>
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<td>6</td>
<td>- Yes:</td>
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<td></td>
<td>-with friends</td>
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<td></td>
<td>-with interesting material</td>
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Discussion

This focus group gave insight regarding attitudes of the peer educators of a 3-A-Day™ of dairy program for prevention of osteoporosis and other chronic diseases. Peer educators were asked various open-ended questions about their participation in programs and likes and dislikes. These data can be used to develop future interventions for osteoporosis prevention as well as other nutritional messages in this age group, and to highlight areas for future study. Most of the peer educators in this study had positive attitudes about the program and serving as peer educators.

These peer educators really enjoyed working with the Brownie troops, who were slightly younger than them. They expressed difficulty working with girls who were older, the same age or much younger than themselves. The Brownie troops made them feel “cool” and “smart.” Although the Daisy Girl Scouts were also younger, they found this age range harder to work with and in which to interact. One girl stated:

“The Brownies were better than, I think, the Daisies and the Juniors, because the Juniors are our age and it sort of, they wouldn’t really listen because we might be older or younger. And then the Daisies were really hard because we had to explain everything, yeah, they were really hyper and then we had to explain everything to them over and over again.”

Data obtained in this study shows the importance of making peer educators interested in the information, as well as, the participants. These peer educators expressed the desire for more movement and participation for themselves. They wanted activities in which they could participate with the participants. One peer educator also stated that they would serve as peer educators again depending on “what we’re doing it about and
who we’re with,” while several agreed with this. This is important as the girls saw it as a way to stay connected with friends. It was a social support system for them, which is important in program development. Previous studies support the fact that children are eager to learn and enjoy being with friends (11). According to Bandura, peer education encompasses the notion that young persons seek advice from their friends and acquaintances and adopt behaviors of their peers (15, 16). This is important as these peer educators served in this role but also wanted the support of their friends.

For future studies it is important to ensure that activities covered have clear objectives, be relevant to participants, not involve too much inactivity, and most importantly be fun. Peer educators should also be made aware of the importance of preparation and that participants talking and playing is to be expected. Peer educators should also work in small groups if possible and deliver various information or stations to the same group. Peer educators appear to be more comfortable staying with one group throughout the program to better interact and bond with participants, rather than switching every rotation.

This paper has discussed and identified a number of important factors as identified by peer educators in developing a successful peer education program. These include: recognition of responsibility, proper preparation, lots of movement, a variety of activities, and ample time at each station. Although the girls expressed valid complaints and dislikes of the program, there was an overall positive attitude toward serving as a peer educator. Girls stated that they would serve as peer educators again if asked, as long as the subject matter was stimulating and they were able to be with their friends.
Acknowledgements

This project was supported by a research grant from the National Dairy Council.

References


Chapter VII

SUMMARY AND FUTURE DIRECTIONS

A 3-A-Day™ of dairy peer education program was developed to determine change in knowledge among peer educators (N=13; Chapter 3) and participants (N=57; Chapter 4). A group of Junior Girl Scouts, aged nine to ten years (age = 9.09 ± 0.28 years), served as peer educators for an osteoporosis intervention program. These peer educators showed a significant increase in overall knowledge of “3-A-Day” of dairy and self-efficacy. There was no significant increase or decrease in any other area including, behavior, attitude of dairy foods, and identifying weight-bearing activities and calcium-rich foods. These peer educators retained or increased their knowledge significantly over one year. There was no increase in knowledge after teaching the programs, but knowledge of these peer educators was of a relatively high level before teaching their programs. Fifty-seven girls from other Girl Scout troops participated in “events” designed and taught by these peer educators. After participating in an event, Girl Scouts had a significant increase in knowledge of calcium-rich foods and weight-bearing activities. Girls were also able to identify the recommended servings of dairy foods and had increases in self-efficacy.

Nineteen girls and their parents responded to follow-up surveys within one month of participation in an event (Chapter 5). A significant increase in knowledge for participants in identifying calcium-rich foods ($p=0.002$), weight-bearing activity ($p=0.014$), and in overall 3-A-Day™ knowledge ($p=0.031$) was found. There was no significant correlation in knowledge gain and parents’ perceived change in their daughters’ knowledge. While there was no correlation between what these girls learned
and what their parents thought they learned, many girls talked to family and friends after participating in events.

A focus group was conducted to gain insights on the feelings and attitudes of Girl Scouts, who served as peer educators, for the 3-A-Day™ of dairy intervention (Chapter 6). Researchers found that these girls enjoyed serving as peer educators and that they would repeat this role, while stating how hard being a peer educator can be. They expressed that the amount of responsibility required was great and that it was extremely important to be prepared and organized. Peer educators enjoyed having an authoritative role and actively engaging in events. They did not always enjoy being in the leadership role especially when they could not make crafts, dance and eat food themselves. They also indicated that it was hard to handle participants who did not listen. These peer educators wanted to be participants in the program and found it hard to serve in the role of “teacher.” Although these Girl Scouts disliked aspects of the program, they would return as peer educators as long as they had friends participating and liked the subject matter.

Our findings address the need for more studies among children for osteoporosis prevention using peer education. Further research to describe girls who engage in behaviors to reduce their risk of osteoporosis and other chronic diseases should be expanded to include other variables related to exercise and diet habits. Some variables which should be addressed are access and availability to calcium intake and weight-bearing activities. Dietary recalls and activity records could be used to assess intake of calcium and the amount of weight-bearing activity. Osteoporosis interventions also need to be expanded to young boys, as they too can develop osteoporosis later in life. Parent
knowledge of preventive behaviors should also be tested. Although this study increased knowledge to help prevent osteoporosis and other chronic diseases, this may not translate into behavior changes. Results from this study may provide guidance for the design of future prevention programs. Our results suggest that peer education interventions to increase calcium intake and weight-bearing activity should include friends, through peer education, for increased social support and self-efficacy.
Appendix 1
DATE: July 15, 2004

MEMORANDUM

TO: Sharon M. Nickols Human Nutrition, Foods, & Exercise 0430

FROM: David Moore

SUBJECT: **IRB Exempt Approval:** “Girl Scouts Empower Other Girl Scouts and Virginia Action for Healthy Kids Participants to Consume 3-A-Day of Dairy” IRB # 04-356

I have reviewed your request to the IRB for exemption for the above referenced project. I concur that the research falls within the exempt status. Approval is granted effective as of July 14, 2004.

cc: File
Department Reviewer Kathy Hosig 0430
OSP 0170
DATE: January 30, 2006

MEMORANDUM

TO: Sharon M. Nickols-Richardson Human Nutrition, Foods, & Exercise

FROM: David Moore


This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective January 30, 2006.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File
Department Reviewer: Kathy Hosig