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OSTEOPOROSIS KNOWLEDGE, HEALTH COMMUNICATION, AND PREVENTION BEHAVIORS AMONG COLLEGE STUDENTS: A CROSS-SECTIONAL STUDY AMONG MALE AND FEMALE COLLEGE STUDENTS

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OSTEOPOROSIS KNOWLEDGE, HEALTH COMMUNICATION, AND PREVENTION BEHAVIORS AMONG COLLEGE STUDENTS: A CROSS-SECTIONAL STUDY AMONG MALE AND FEMALE COLLEGE STUDENTS

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ABSTRACT

Osteoporosis is a chronic degenerative bone disease affecting roughly 53 million Americans. Attainment of peak bone mass during young adulthood plays an essential role in osteoporosis prevention, and specific behaviors affecting the achievement of peak bone mass include adequate intake of dietary calcium and participation in weight-bearing physical activity. Prior research has established the links between knowledge and health communication, particularly parental communication, with engaging in healthy behaviors such as adequate calcium intake and physical activity among college students, less is known about how these relationships manifest in this population for osteoporosis prevention. Exploring additional factors such as self-efficacy that may moderate these relationships is vital to bridging the gap between health education and health behavior. The purpose of the study was to assess the relationships between health communication, osteoporosis knowledge, and osteoporosis prevention behaviors (i.e., calcium intake and physical activity) while examining the moderating role of self-efficacy on these associations. Utilizing a cross-sectional design, a panel of undergraduate students were invited to complete an online survey that included the Osteoporosis Knowledge Test (OKT), the Osteoporosis Self-efficacy Scale (OSES), the National Osteoporosis Foundation's *Generations of Strength* Survey, and the Short Calcium Questionnaire. The survey was administered using the online survey software Qualtrics. Logistic regression models were used to assess the associations between predictor and outcome variables, and an interaction variable was included to explore the potentially moderating effects of self-efficacy. Linear regressions were calculated to assess the associations between osteoporosis knowledge, health communication habits and weight bearing exercise. Furthermore, logistic regressions were calculated to assess associations between health communication, osteoporosis knowledge and engagement in weight bearing exercise. The results suggested the predictor variables were not significant predictors of the outcome variables. However, when regression models were controlled for race, the results suggested Non-Hispanic whites were less likely to meet dietary calcium requirements. We conducted a moderation to assess the influence of self-efficacy on the previously mentioned associations. Osteoporosis self-efficacy did not prove to be a statistically significant moderator. Evidently, the results suggests that osteoporosis knowledge and health communication habits are not significant predictors of engagement in preventive behaviors.

Keywords: osteoporosis, self-efficacy, knowledge, prevention

DEDICATION

This thesis is dedicated to my family.

FREQUENTLY USED TERMS

BMD- Bone Mineral Density: A measurement of the amount of minerals contained in a curtained volume of bone.

CDC- Centers for Disease Control: The United States Centers for Disease Control and Prevention is the national public health agency of the United States. It is a United States federal agency, under the Department of Health and Human Services

DEXA- Dual energy X-ray Absorptiometry: Dual energy X-ray absorptiometry is a test that measure the density of bones.

HCS- Health Communications Survey: a survey developed by the National Osteoporosis Foundation to assess mothers' and daughters' concerns for Osteoporosis.

NIH- National Institutes of Health: Major health agency responsible for biomedical and public health research.

NOF- National Osteoporosis Foundation: Leading health organization dedicated to preventing osteoporosis and broken bones, promoting strong bones for life and reducing human suffering through programs of public and clinician awareness, education, advocacy and research.

OKT- Osteoporosis Knowledge Test: a comprehensive survey assessing the osteoporosis knowledge of adults.

OSES-Osteoporosis Self Efficacy Scale: 21-item scale developed to measure of self-efficacy, or confidence, for behaviors related to physical activity and calcium intake.

PBM- Peak Bone Mass: the amount of bony tissue present at the end of skeleton maturation. Important for identify osteoporosis.

WHO- World Health Organization: Specialized agency responsible for international public health.

YAM- Young Adult Mean: Used to provide a point of comparison for t-scores.

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CHAPTER I:
INTRODUCTION

Outcomes

In the United States, roughly 54 million people are believed to have osteoporosis (NOF, 2020). The risk of hospitalization burden of osteoporosis and cost exceeds that of myocardial infarctions, stroke, and breast cancer (Singer et al., 2015). Although osteoporosis can affect both men and women, postmenopausal women are at greatest risk for osteoporotic fractures. Recent studies suggest one in two women and one in four men over the age of 50 will break a bone due to osteoporosis (Mayo Clinic, 2019). A chronic degenerative metabolic disease (National Institute of Health, 2019), it is characterized by low bone mass, degeneration of bone microarchitecture, and increased bone fragility. Osteoporosis is often referred to as a "silent disease" as many cases will go undiagnosed until a fracture occurs. (NIH, 2019). This has become a public health concern as all disease traits contribute to heightened fracture risk (Sözen et al., 2017).

The risk Osteoporosis holds for fractures is similar to the risk hypertension poses for the likelihood of a stroke (Sözen et al., 2017). The occurrence of an osteoporotic fracture tends to be a precursor of disability, loss of independence, and premature death (Morin et al., 2012). An osteoporosis-related hip fracture is one of the more debilitating consequences of the disease. Once a hip fracture has occurred, the individual's risk of morbidity and mortality, including loss of independence, increases drastically (Black et al., 2018). Despite the fact that many individuals

with low bone densities will suffer from an osteoporotic fracture in their old age, there are major deficiencies in both the proactive and follow-up bone mineral density screening practices (Black et al., 2018). Although there are many risk factors for low bone densities and osteoporosis, early identification has not been made a priority. Furthermore, bone density screenings typically only take place once a person presents with multiple risk factors or a fragility fracture has occurred (Kling et al., 2014).

Prevention is critical for mitigating the risk as well as the severity of the disease. Much like many other chronic diseases, osteoporosis is preventable through factors such as diet and weight bearing exercise. Attaining peak bone mass in early adulthood is a critical factor in minimizing bone loss that occurs naturally with aging but is also expedited by the disease process of osteoporosis. Health behaviors adopted early in life can be crucial for bone accrual. Engaging in bone accretion promoting behaviors is important for attaining optimal peak bone mass (PBM), which is essential for the mitigation of disease risk (Zulfarina et al., 2016). Thus, it is important to focus prevention not only among older populations, but young populations as well.

A study by Harris (2017) identified poor eating habits as a staple characteristic of adjusting to the college lifestyle experienced in post-secondary education settings. Unhealthy eating habits are known to increase as a student transitions from living away from home (Harris, 2017). Unhealthy eating habits among college students are often characterized by a decrease in consumption of healthful foods, irregular meal consumption, and an increase of unhealthy food consumption (Deforche, et al., 2015). The behaviors established in young adulthood typically impacts the individuals' practices and behaviors across adulthood (Larson et al., 2009). As young adults' transition from high school to college, dietary calcium intake typically decreases (Larson

et al., 2009). In general, college students do not achieve the recommended daily allowances for calcium (Rose et al., 2018) further suggesting that this population is engaging in dietary habits that may contribute to the development of bone related diseases. Cormick et al., (2019) highlighted calcium deficiencies are prevalent among low-income countries, similarly, when high income countries were assessed, deficiencies were found among specific populations, one of which was young adults. It is important to have a deeper understanding of bone related diseases and the possible dietary prevention as increasing dietary calcium intake is one potential modifiable mechanism to improve bone health.

A lack of Osteoporosis knowledge in college students has previously been documented (Edmonds et al., 2012), additionally there is evidence of deficits in perceived Osteoporosis risk among college students. Glaring misconceptions and concerns, in relation to osteoporosis, have been previously reported among college-aged populations (des Bordes et al., 2020). Furthermore, their results reveal a general shortfall in knowledge for many variables assessed in relation to Osteoporosis knowledge, attitudes, and beliefs, with perceived seriousness being among one of the misconceptions observed (des Bordes et al., 2020).

Parents and guardians have previously been identified as an important influence over their child's health behaviors. Carver et al. (2016) highlighted the importance of establishing parent-child connectedness which was further defined as the ability of the parent and child to discuss a range of subjects from general topics to more sensitive issues. Previous research has investigated the potential role of parent-child communication on various health related behaviors, however, the implications for osteoporosis and bone-related health has yet to be researched. These discussions have shown that parents engaging in conversations have more positive health-related outcomes. Luk et al. (2010) found that these conversations can have a positive influence

on the substance use behaviors of children. The influence these conversations can have on health outcomes and behaviors should not be undermined.

Self-efficacy has been identified as a powerful predictor of health behaviors and, previously suggested as an important psychosocial construct that can be important for the translation of knowledge to behavioral actions (Isa et al., 2017)**.** Bandura (1991) emphasized the importance of self-efficacy in establishing behaviors. He defined self-efficacy as the belief in one's ability to carry out specific tasks. Prior research has highlighted the role self-efficacy can hold in the development and establishment of health-related behaviors. Enhancing self-efficacy has previously been supported to enhance an individual's engagement in physical activity (Joseph et al., 2014). A critical component of behavior development is the enhancement of individual self-efficacy. Osteoporosis self-efficacy is crucial for the adoption of osteoporosis preventive behaviors.

Glaring misconceptions and concerns, in relation to osteoporosis, have been previously reported among college-aged populations (des Bordes et al., 2020). Furthermore, their results reveal a general shortfall in knowledge for many variables assessed in relation to osteoporosis knowledge, attitudes and beliefs, with perceived seriousness being among one of the misconceptions observed (des Bordes et al., 2020).

Although prior research has been conducted regarding osteoporosis knowledge, there is currently a need for assessments among college student populations and American populations specifically. Additionally, many studies assessing the implications of parent-child health communication habits have been conducted, however, studies focusing on osteoporosis parent-child health communications have yet to be investigated. In order to address the gaps in the literature, we attempted to assess the association between Osteoporosis knowledge and

engagement in preventive behaviors. We also assessed the association between health communication habits and engagement in preventive behaviors. Lastly, we examined the moderating effects of Osteoporosis self-efficacy on the two previously mentioned associations.

CHAPTER II:
LITERATURE REVIEW

Osteoporosis occurs when there are alterations in the bone microarchitecture that may lead to low bone mineral density increasing the risk for fragility fractures (Porter et al., 2020). Osteoporosis is characterized by the deterioration of bone structure; this occurs when there is an imbalance in bone metabolism. When bone resorption exceeds bone formation osteoporosis ensues. The imbalance in metabolism leads to a porous bone appearance. The hips, shoulders, wrists, and spine are all areas that are commonly affected by osteoporosis (Mostafa et al., 2016). Approximately 25% of women and 5% of men are affected by the deteriorative disease (CDC, 2020). Furthermore, there are roughly 54 million Americans with osteoporosis or low bone mineral densities predisposing them to osteoporotic fractures (National Osteoporosis Foundation (NOF), 2020). The disease poses a great threat to an individual's independence as it is known to have numerous negative outcomes that hinder quality of life, increase morbidity, and disability (Sözen et al., 2017).

Outcomes

In the United States, 54 million individuals have osteoporosis or low bone density (NOF, 2021). Moreover, 20% of individuals who undergo a hip fracture will die within the following year as a result of the surgery or from further complications with the injury (NOF, 2020). The NOF (2020) estimates a total of $25.3 billion will be spent on osteoporosis-related health care costs annually by 2025. Roughly 20% of individuals who experience a fracture will have to be

admitted to a long-term care facility. Some of the major consequences of the fracture include the toll placed on their independence (NIH, 2001). Osteoporosis prevention is beneficial to the individual and the general public. Prevention specifically targeting osteoporosis would have significant implications for the cost of health care associated with the disease while also diminishing its prevalence and seriousness. Osteoporosis prevention is key for preventing the commonly observed reductions in bone mineral density occurring with the typical aging process.

Risk Factors

Osteoporosis, similar to other chronic diseases, has known modifiable risk factors. Non-modifiable risk factors include being: a female, menopausal, and a family history of osteoporosis. . Modifiable risk factors include but are not limited to: inadequate dietary intake of calcium and/or vitamin D, insufficient fruit and vegetable intake, physical inactivity, excessive alcohol consumption, and smoking (Zhou & Zheng, 2021**)**. Nutrition is a critical modifiable factor for maintaining bone health (Ahmadieh & Arabi, 2011). If osteoporosis were approached similarly to various other chronic diseases, specifically in terms of preventive lifestyles and focusing on modifiable risk factors, the prevalence of the disease would likely be on the decline. The previously mentioned risk factors contribute to the disordered physiological processes contributing to the onset of the disease.

Nutrition

It is typically recommended that a healthy female adult consumes anywhere from 1,600 to 2,400 calories per day while healthy male adults consume 2,000 to 3,000 calories. Daily caloric recommendations vary based on several factors, some of which include age, sex, height,

weight, and physical activity habits (CDC, 2021). The role nutrition plays in fostering general health is typically agreed upon, however, it is important to emphasize the impact of proper nutrition habits for many chronic diseases. Osteoporosis is a disease that can be positively influenced by a proper, well-balanced diet (Higgs et al., 2017). Nutrition has the potential to benefit mechanisms influencing bone metabolism, the homeostasis of calcium and providing vitamins and minerals that are vital for normal physiological function (Cashman, 2007). Vitamin D and calcium have been consistently emphasized when discussing bone health and bone-related diseases such as osteoporosis. Although, there are a variety of food components that are needed from the diet when diets are not providing adequate levels of a nutrient, the individual risks a nutritional deficiency (Cashman et al., 2007). There are two deficiencies that are often linked to bone related conditions: calcium and vitamin D deficiencies.

Nutritional Deficiencies

Nutritional deficiencies are detrimental to the prevention of osteoporosis and general bone health. However, many necessary components required for the development of metabolic functions of bone need to be supplied through diet (Ross et al., 2011). When a deficiency is present, it can speed up the pathogenesis of osteoporosis. The most commonly discussed deficiencies include vitamin D and calcium. Although the exact role of vitamin D for osteoporosis is controversial, some researchers report that vitamin D deficiencies are often considered a risk factor for osteoporosis (Christodoulou et al., 2013). Deficiencies have previously been linked to reduced calcium absorption and enhanced osteoclast activity (Sunyecz, 2008). Additionally, there is concern that calcium deficiencies negatively affect bone metabolism and bone architecture (Sunyecz et al., 2008). Although, sufficient dietary intake is

often emphasized, it has been suggested that many young adults in high income countries report having insufficient dietary intakes of calcium (Cormick & Belizán, 2019).

Dietary Calcium

Calcium is known for the crucial roles it plays in numerous physiological processes. In terms of the skeletal system, calcium is essential for mineralization (Vannucci et al., 2018). Most calcium in the body is stored as calcium-phosphate complexes, however, it can also be found in the blood, extracellular fluids, and muscles (Vannucci et al., 2018). Calcitropic hormones rely heavily on a feedback mechanism to maintain calcium homeostasis (Vannucci et al., 2018). Bone mass is influenced by a variety of factors (Zhu & Zheng, 2021). However, adequate dietary intake of nutrients would be the one of the major factors affecting accretion (Rizzoli, 2014). Dietary supplements are known to be viable low-cost strategies for the maintenance of healthy bones while also contributing to the prevention of osteoporosis (Solimeo et al., 2019). Larsen et al. (2004) identified the importance of vitamin D and calcium intake for the prevention of osteoporotic fractures. Inadequate dietary calcium intake can be detrimental for bone health, however, supplementation to meet adequate levels has proven to be useful (Chiodini & Bolland, 2018). The NIH recommends healthy adults between the ages of 19 and 30 consume 1000mg/day (2018). Calcium is critical for bone health, while also providing rigidity to the skeleton. The importance of lifelong adequate calcium intake is critical for the achievement of peak bone mass and the maintenance of bone health during adulthood (Beto et al., 2015). Adequate exogenous calcium is essential for preventing excessive bone resorption, dietary intake of calcium is a key factor for maintaining serum calcium levels (Ross et al., 2011). Evidently inadequate dietary calcium is an important modifiable factor for bone health.

Physical Activity

Physical activity is known for having significant impacts on bone status (Kopiczko et al., 2020). It is generally agreed upon that weight-bearing exercise and resistance training are believed to be especially beneficial for improving bone mineral density (BMD) (McMillan et al., 2017). The American College of Sports Medicine recommends the incorporation of a combination of resistance exercises 3 to 5 days per week for a minimum of 30minutes targeting the major muscle groups (Thompson, 2010). It is generally believed that the mechanical stimuli provided by strength and resistance-based exercises are beneficial for bone accretion and the maintenance of bone metabolism (Guadalupe-Grau et al., 2009). Physical activity and exercise is critical for improving peak bone mass (PBM), this is accomplished by increasing bone mineral density levels during the adolescent years (Min et al., 2019). Participation in high-impact physical activity throughout childhood, adolescent, and college years are critical for achieving optimal PBM (Hervás et al., 2019). Furthermore, Cheung & Giangregorio (2012) highlighted the role of physical activity and exercise in bone health for healthy aging . The osteogenic capacities of physical activity impact bone accretion and ultimately delay the onset of osteoporosis (Lau, et al., 2017).

Weight-Bearing Exercise

Although physical activity is sometimes broadly promoted to improve BMD, in recent years there has been growing focus on weight-bearing exercise. Gunter et al. (2012) highlighted that vigorous physical activity was ideal for improvements in BMD and bone strength. Weight-bearing exercise that includes jumping has been supported to provide the osteogenic stimulus needed for improvements in BMD (Turner et al., 2015). The association between aerobic

endurance exercise and BMD are unclear. Prior research found both negative and positive effects on bone (Min et al., 2019). The exercise type and intensity likely influence the osteogenic effects of exercise. When swimmers were compared to a general control group, they were found to have significantly lower BMDs (Agostinete et al., 2017). Furthermore, Russo et al. (2009) suggested that the prescription of swimming and walking should be avoided by clinicians as they do not elicit enhanced osteogenesis. The potential negative effects of participating in non-weight-bearing, such as running, swimming, or cycling, were highlighted by Min et al. (2019). When individuals are trying to improve their BMD, it is important to be intentional about the exercise modality, types, and intensities selected as weight-bearing exercise seems to be the most effective form of exercise when it comes to enhancing BMD.

Knowledge

An individual's knowledge regarding a disease is often influenced by a multitude of factors such as education level, socioeconomic status, and language barriers (Wright et al., 2019). A general inadequacy is apparent when assessing osteoporosis knowledge (de Bordes et al., 2020). In a qualitative study, Backett-Milburn, et al. (2000) revealed that unless an individual has experiential knowledge of the disease, they had a general disinterest in osteoporosis due to the lack of perceived risk of the disease. A lack of knowledge has been found in the areas of prevention, risk factors, treatments, and outcomes of the disease (Werner et al., 2005). The importance of establishing preventive behaviors early in life should not be undervalued. By maximizing knowledge of osteoporosis risk factors, students may be able to minimize the risk for developing osteoporosis. It has previously been suggested that young adults should engage in preventive behaviors as early as possible to attain PBM and reduce the risk of osteoporosis

related fractures from occurring (Larsen et al., 2004), however, when knowledge is lacking engagement in preventive behaviors is unlikely. Werner et al. (2005) emphasized the importance of general nutritional knowledge as well as calcium and vitamin D specific knowledge for the prevention of osteoporosis. Additionally, Ford et al. (2007) highlighted the importance of increasing awareness of not only the risk factors for the disease but also bringing attention to the severity of the disease. Furthermore, they highlighted the importance of enhancing disease knowledge and the adoption of preventive behaviors across the lifespan.

Parent-Child Health Communication

Parents can have a critical role on their child's behaviors, specifically their health behaviors. Prior studies have supported the use of parents as "educators" for health-related topics; Flores et al. (2017) highlighted the role they can play as sex educators. Furthermore, Widman et al. (2016) found that sexual communication with parents can play a small protective role in safer sex behaviors. Luk et al. (2010) highlighted the implications of parental communications on the substance use behaviors of their child, the results suggested that father communications was protective against marijuana use while maternal communication was protective against tobacco use. Previous research has highlighted the protective role of parent-child communications on child substance use and misuse behavior during the adolescent years (Carver et al., 2016). Parent-child communication is a critical component of parent-child connectedness that refers to the ability of the parent and child to discuss a range of topics from general to more sensitive issues (Carver et al., 2016). Parents can have a crucial influence on their child's behaviors; pre-emptive conversations regarding health-related topics are important for the adoption of good health habits and health preventive behaviors.

Osteoporosis Health Communications

It has previously been noted that interventions driven by parents and/or guardians are beneficial for improving many health risks and establishing protective behaviors in adolescents (Burrus et al., 2012). A 2011 National Osteoporosis Foundation study investigated the health communication habits between mother and daughter pairs. The results suggest that a majority of mother daughter pairs (94%) claimed they were not concerned with the risk osteoporosis held for their health (NOF, 2011). Additionally, 80% of respondents claimed they discussed family history; however, they did not discuss family history of osteoporosis in their conversations (NOF, 2011). Health communication can be a critical component of breaking the disease cycle of osteoporosis. A 2017 study by Gordon and colleagues investigated health communication and risky tanning behaviors. The results suggest that not only are a mother's behaviors influential on the daughter's behaviors, earlier conversations with adolescents are essential for the establishment of risk prevention practices (Gordon et al., 2017). When assessing the sexual health behaviors followed by adolescents, Kirby et al. (2005) found the implications of improving parent and youth communications led to increased reach and improved health outcomes. Parent-child communication is extremely influential regarding adopting healthy preventive behaviors for diet, exercise and sexual activity, (Baiocchi-Wagner & Tally, 2013; Guilamo-Ramos et al., 2012). Therefore, if similar conversations occur in the household between parents and their children regarding osteoporosis, health outcomes and engagement in preventive health behaviors may be more prominent. Although previous studies have focused on the college student population, no published study assessed the health communication habits specifically targeting osteoporosis between the individual and their parent or guardian.

Self-Efficacy

Self-efficacy refers to an individual's belief in their ability to perform a specific behavior (Bandura et al., 1991). Individuals demonstrating higher levels of self-efficacy have a higher likelihood of eliciting the necessary efforts to attain a desirable outcome, regardless of any obstacles they may face (Bandura, 2004). Past research has highlighted that prior experiences and knowledge play key roles in the improvement of self-efficacy (Resnick, 2004). Research has highlighted the importance of self-efficacy on certain dietary-related outcomes. Cha et al. (2015) highlighted that eating behavior self-efficacy can increase food label use behavior. A recent study examined the relationship between physical activity and quality of life in young adults. Although their results did not reveal a significant relationship between self-efficacy and quality of life in young adults, they revealed a direct relationship between physical activity and exercise self-efficacy (Joseph et al., 2014). Previous research has highlighted the importance of social support from parents for their child's self-efficacy for leading a healthy life. This highlights a potential moderating role of self-efficacy for engaging in healthy behaviors (Ievers-Landis et al., 2003). Gender differences in exercise self-efficacy have been reported in previous research. Pauline et al. (2013) found that female college students reported significantly lower levels of exercise self-efficacy differed by gender but not by academic classification.

To address the current gaps in the literature, we examined the relationship between health communication habits, osteoporosis knowledge, and osteoporosis preventive behaviors among college students and the moderating role of self-efficacy in each of the relationships.

CHAPTER III:
METHODS

The purpose of the study was to investigate the associations between osteoporosis knowledge, health communication, and prevention behaviors among college students. The chapter is divided into the following sections: (1) specific aims, (2) hypotheses, (3) participants, (4) measures, and (5) statistical analysis.

Part 1: Specific Aims:

Aim #:1

Explore the association between osteoporosis knowledge, health communication, and osteoporosis prevention behaviors, dietary calcium intake and engagement in weight bearing exercise among college students.

***Aim #2*:**

Assess the moderating effects of self-efficacy on the relationships between osteoporosis knowledge, health communication, and osteoporosis prevention behaviors among college students.

Part 2: Purpose and hypotheses

The relationship between osteoporosis knowledge and dietary calcium intake has previously been assessed (Ford et al., 2007; Ford et al., 2011; Edmonds et al., 2012). Additionally, assessments of osteoporosis knowledge and osteoporosis self-efficacy have been investigated. However, parent-child health communication habits are an area of osteoporosis prevention that has yet to be investigated. Although the relationship between osteoporosis

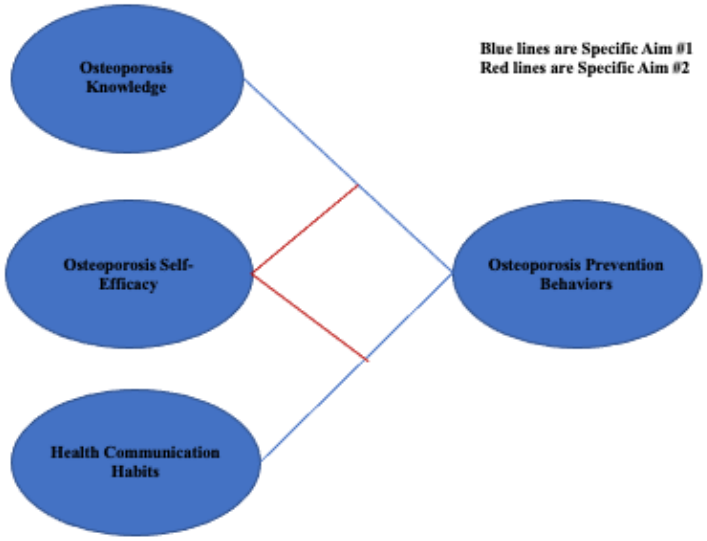
knowledge and osteoporosis self-efficacy has been investigated, the moderating effects of self-efficacy on the relationship between osteoporosis knowledge and health communication habits and osteoporosis preventive behaviors are not clear. Therefore, the purpose of the study was to examine the relationship between health communication habits, osteoporosis knowledge, and osteoporosis preventive behaviors among college students and the potential moderating role of self-efficacy in each of the relationships.

Hypotheses

For our first aim, we hypothesized a positive association between osteoporosis knowledge and engagement in osteoporosis prevention behaviors. Second, we hypothesized there would be a positive association between frequency and quality of health communication and engagement in osteoporosis prevention behaviors. For our second aim, we hypothesized self-efficacy would strengthen the positive association between osteoporosis knowledge and likelihood of engaging in osteoporosis prevention behaviors. We further hypothesized that self-efficacy would strengthen the positive association between frequency/quality of health communication and engagement in osteoporosis prevention behaviors.

Part 3: Participants

Participants included college males and females between the ages of 18-30 years. Inclusion criteria for the study included individuals currently enrolled in an undergraduate program at the University of Mississippi or the University of Arkansas. Each participant provided consent to participate (Appendix) before beginning the survey. Multiple campuses were



selected to provide a larger sample size for greater external validity and to increase the statistical power. The specific institutions selected were due to similar populations and campus sizes.

Part 4: Measures

The survey was administered through Qualtrics, an online survey software program. Approval from Institutional Review Boards at the University of Mississippi and the University of Arkansas was obtained. Email communication was sent to a panel of 5000 students enrolled at each of the Universities in the spring semester of 2021**.** An email announcement was sent outlining the study, ensuring anonymity of responders, and requesting their participation with a provided link to the survey. Participants were informed that there would be an option to enter into a draw for gift cards upon completion of the survey. The survey remained open for 3 weeks and weekly email reminders were sent out.

General Demographics

The first section of the survey included general demographic questions such as age, sex, race, and class ranking. If participants did not meet the age criteria (18-30 years) or classification (undergraduate student), the survey was terminated. However, if all criteria were met, they continued to the Osteoporosis Knowledge Test section (OKT) of the survey.

Osteoporosis Knowledge

To measure Osteoporosis knowledge, we implemented the Osteoporosis Knowledge Test (OKT). The OKT was developed in 1991 by Kim and colleagues. Gendler et al. (2015) revised and validated a new OKT which will be used for the present study. The revised version of the OKT was modified based on recent guideline changes and suggestions from various researchers in the field with experience using the original OKT. Gendler et al. (2015) supported the content validity of the revised OKT (2012). This assessment can be divided into three sections: (1) general aspects of osteoporosis, (2) non-modifiable and modifiable risk factors of osteoporosis, and (3) identification of calcium rich foods. The general osteoporosis knowledge scale consists of nine items. The subject identifies the likelihood the item has for contributing to osteoporosis. The 11-items are rated using the following 4-point scale: ML= more likely, NT= neutral, LL= less likely, and DK=don't know. An example of the general knowledge items is "eating a diet high in dark green leafy vegetables". An example of an exercise subscale item is "which of the following activities is ideal for reducing a person's likelihood of developing osteoporosis?" An example of a dietary calcium subscale item is "which of the following is the recommended amount of calcium intake for an adult?" The tool served as the independent variable of knowledge. Items 1-11 of the OKT, all responses of "neutral" and "don't know" were incorrect. All correct answers were coded as "1" and all incorrect answers were coded as "0". Total scores

for the OKT range from 0-32. Total scores were calculated based on the number of correct responses provided.

Health Communication

To assess health communication habits, we utilized NOF's health communication habits survey. This tool was developed for the *Generations of Strength* campaign seeking facts about a mother and her child's concerns regarding the disease. The Health Communications survey assesses an individual's participation in discussing health issues, specifically the conversations occurring between parent and child through a 21-item tool. Example questions include "how easy is it to have conversations with your parent?" and "which of the following health issues, if any, have you ever discussed with your parent? (Select all that apply)" Each question was scored and totaled. The higher the score an individual received, indicated stronger health communication habits. This survey was successfully implemented by Haskins et al. (2016). The *Generations of Strength Survey* also pinpointed the average age that osteoporosis conversations begin between a parent and their child. This instrument serves to assess the comfort level of the participants in having these conversations with their mother or child. For the purpose of the proposed study, the verbiage of the questions will be modified to include a more inclusive term. The questions addressed an individual's habits with the parent or guardian they speak to most frequently. The health communication questions were dichotomized. Ease of parental health communications was coded as "very easy" being 1 and all other response options coded as "0".

Osteoporosis Self-Efficacy

Osteoporosis self-efficacy was measured with the implementation of the Osteoporosis Self-Efficacy scale (OSE). The OSE scale was developed by Horan et al. (1998). This measurement tool was developed to assess an individual's self-efficacy for engaging in behaviors relating to physical activity and calcium intake. The tool considers initiation, maintenance, and persistence of an individual's engagement in osteoporosis-preventive behaviors. Although the initial scale consisted of 21-items, Edmonds et al. (2012) revised and condensed the scale components and format. The reliability of the tool proposed by Edmonds et al. (2012) was 90. Additionally, the internal consistency of the tool was assessed by a Cronbach's alpha test which was 0.96 (Edmonds et al., 2012). The OSE Exercise scale and OSE Calcium scale both consist of 6 items, respectively. The OSE Exercise scale asks questions regarding an individual's confidence for different stages of an exercise programming. The stages include initiation, progression, and maintenance. An example of a question on the scale would be "I could begin a new or different exercise program". The new version of the tool consists of a 5-point Likert scale, in which the individual indicates if they "strongly agree," "agree," "neutral," "disagree," or "strongly disagree" with the statements presented. The scale was summed with "strongly agree" being coded as "4" and "strongly disagree" coded as "0"

Dietary Calcium Intake

In order to assess dietary calcium intake, we implemented the Short Calcium Questionnaire. The tool has previously been validated among college students by Sebring et al. (2007). The tool consists of 25 items that consider multiple calcium sources and includes the consumption of calcium supplements. Magarey et al. (2014) completed an evaluation of tools

commonly used to assess dietary calcium intake. The tool developed by Sebring et al. (2007) was identified as being within the top five assessment tools for assessing calcium intake (Magarey et al. 2014). The tool consists of asking an individual how many servings of a calcium-containing food they consume per week. Each food is assigned a portion size and the food items are broken into four groups based on their calcium content. The number of servings per week for each group are multiplied by their calcium content. The value obtained for each grouping is summed to provide a "total daily calcium intake" value. This tool adds an extra 200mg of calcium to the final number in order to account for the miscellaneous calcium an individual is likely unintentionally consuming on a daily basis. The NOF recommends a minimum consumption of 1,000mg per day. Thus, the results from the assessment will be assessed as a dichotomous outcome, in which an individual is rated as either consuming adequate dietary calcium (>1000mg) or not consuming adequate dietary calcium (<1000mg).

Weight-Bearing Exercise

To assess engagement in weight-bearing exercise, we implemented a portion of the Osteoporosis Preventing Behaviors Survey (OPBS). The survey was developed by Doheny & Sedlak (1995) to address osteoporosis preventing behaviors. Previous studies have implemented the OPBS to assess engagement in preventive behaviors (Edmonds et al., 2012; Akinpetide et al., 2014). We will implement the physical activity assessment component into our survey. The two questions relating to exercise will ask for frequency and duration of weight bearing and non-weight bearing exercise. Response options will include: (1) less than 10 minutes per week, (2) 10 to 15 minutes, 1 to 2 times per week, (3) 10 to 15 minutes, 3 to 4 times per week, (4) 10 to 15 minutes, 5 to 7 times per week, (5) 20 to 30 minutes, 1 to 2 times per week, (6) 20 to 30 minutes,

3 to 4 times per week, (7) 20 to 30 minutes, 5 to 7 times per week, (8) more than 30 minutes per day. This survey was selected because the questions differentiate weight-bearing exercise and non-weight bearing exercise. Weight-bearing exercise is crucial for bone metabolism. Non-weight bearing exercise, although beneficial for cardiovascular health, is not ideal for bone health as is does not promote osteogenesis. This measure was converted to a continuous variable, the individuals will be classified as either meeting recommendations or not meeting recommendations.

Part 5: Statistical Analysis

The statistical analyses were conducted with SPSS version 27.0 (SPSS Inc, Chicago, IL). The study population was described using means and standard deviations for continuous variables and proportions was used for the categorical variables. The control variables considered were age, sex, race, and class ranking. The predictor variables were osteoporosis knowledge and health communication habits. The outcome variables include osteoporosis preventive behaviors which included calcium intake and exercise behavior. The engagement in preventive behaviors was classified as adequate or inadequate based on their self-reported engagement. Osteoporosis self-efficacy was addressed in aim #2 to assess its moderating effects on the associations between the independent and dependent variables. Model 1 assessed the association between knowledge and dietary calcium intake. Model 2 assessed the association between knowledge and engagement in weight bearing exercise. Model 3 examined the association between ease of parental communication and dietary calcium intake. Model 4 assessed the association between ease of parental communication and engagement in weight bearing exercise. Model 5 addressed the association between the individual with whom they are

most comfortable engagement in health conversations and dietary calcium intake. Model 6 assessed the association between the individual with whom they are most comfortable engaging in health communication and engagement in weight-bearing exercise.

Aim #1: Explore the association between osteoporosis knowledge, health communication, and osteoporosis prevention behaviors among college students. To address the first aim, logistic regression models were used to assess the associations between predictor and outcome variables.

Aim #2: Assess the moderating effects of self-efficacy on the relationships between osteoporosis knowledge, health communication, and osteoporosis prevention behaviors among college students. To address the second aim, an interaction variable was included to explore the potentially moderating effects of self-efficacy.

CHAPTER IV:
RESULTS

The purpose of the study was to examine the relationship between health communication habits, osteoporosis knowledge, and osteoporosis preventive behaviors among college students. Additionally, this study examined the potential moderating role of self-efficacy the relationships between osteoporosis knowledge, health communication, and osteoporosis prevention behaviors among college students.

This chapter provides a description of the study sample and descriptive statistics of

Table 1. Demographic Characteristics

Demographic	**Total sample, N = 417**
Age, *M* ± *SD*	20.6 ± 1.5
Race	
African American/Black, %	10.8
American Indian/Alaskan Native, %	1.4
Asian American/Asian, %	5.0
Hispanic/Latin(x), %	3.8
Middle Eastern/Arab/Arab American, %	1.0
Native Hawaiian/Pacific Islander, %	0.2
Non-Hispanic White, %	81.8
Class Standing	
Freshman, %	9.1
Sophomore, %	21.3
Junior, %	5.0
Senior, %	37.9
Sex	
Male, %	23.0
Female, %	77.0

variables examined. Multiple regressions were calculated to the association between the predictor and outcome variables. A moderation was used to determine the role of self-efficacy on the association between variables.

Study Sample

Demographic characteristics can be found in Table 1. The initial sample consisted of 566 male and female students between the ages of 18 and 30. There were forty-one participants eliminated due to ineligibility and one hundred participants removed from the sample due to survey incompletion, in which outcome variable measures were not completed for these removed cases. After these exclusions, the analytic sample included 417 participants. The mean age of the sample was 20.6 $\pm$ 1.5 years. The sample breakdown was 23.1% male, 76.9% female and 81.8% non-Hispanic White.

Table 2. Association between Osteoporosis Knowledge and Prevention Behaviors

Characteristic	Calcium AOR (95% CI)	*p*-value	Weight-Bearing Exercise AOR (β)	*p*-value
Age	1.00 (0.75-1.32)	0.98	0.04 (0.11)	0.73
Race				
Non-Hispanic White	Reference	--	Reference	--
Other	2.9 (1.29-6.5)	0.01	0.46 (0.32)	0.15
Sex				
Male	Reference	--	Reference	--
Female	0.87 (0.35-2.17)	0.76	-0.23 (0.29)	0.43
Class Standing				
Freshman	Reference	--	Reference	--
Sophomore	0.71 (0.17-2.95)	0.64	0.30 (0.49)	0.54
Junior	0.78 (0.18-3.32)	0.74	-0.13 (0.49)	0.79
Senior	1.01 (0.22-4.66)	0.99	0.01 (0.52)	0.99

Abbreviations: AOR= adjusted odds ratio; CI= confidence interval; SE= standard error.
Estimates are adjusted for age, race, gender and classification.
Bold indicates where *p*-value is significant at the $p < 0.05$ level.

Osteoporosis Knowledge Test

The Osteoporosis Knowledge Test (OKT) results can be found in Table 2. The OKT assesses knowledge about osteoporosis risk prevention. The first portion of the test assesses an individual's perception of certain factors and whether it would increase or decrease their risk for osteoporosis. The other components of the scale focus on nutrition, exercise, and various sources of calcium. When asked whether consuming a diet low in dairy products would increase an individual's risk of developing the disease, 241 respondents (57.8%) correctly believed this. Only 200 respondents (48%) knew that being in menopause would increase an individual's risk of developing the disease. There was also a low percentage of the sample, 113 (27%), who were able to identify that being a white or Asian woman would increase disease risk.

The impact of having ovaries surgically removed on risk of disease development was also underestimated, in which only 84 respondents (20.1%) felt this would increase one's risk. Nearly one-third of respondents (30.7%) indicated that consuming more than 2 alcoholic beverages would increase their disease risk. When asked questions regarding calcium consumption, 39 (9.4%) of the sample were able to correctly identify an individual would need to consume 3+ glasses of milk per day to meet the adult calcium requirement. When asked to select the ideal source of Vitamin D, only 15.6% of respondents were able to correctly identify salmon. Identifying adolescence as the ideal time to build strong bones proved to be difficult for a majority of the sample as only 21.6% was able to correctly identify that adolescence is the best time to build strong bones.

Health Communication

Questions selected for analysis were those that fit conversation quality most effectively. Questions addressed ease of conversation and the individual with whom they are most likely to discuss their health with. When asked, "How easy is it to have conversations with the parent or guardian you speak to most frequently?" roughly half (50.4%) of the population reported it was extremely easy, 38.1% found it somewhat easy, 7.7% indicated it was not very easy, and 3.8% indicated it was not easy at all. When asked, "Who would you be most likely to talk to about

Table 3 Association between ease of health communication habits and prevention behaviors

Characteristic	Calcium AOR (95%)	*p*-value	Weight-Bearing Exercise AOR (β)	*p*-value
Ease of Conversation				
Very Easy	Reference	--	Reference	--
Somewhat Easy	1.34 (.11, 16.80)	.82	.49 (.26)	.81
Not Easy	1.02 (.120, 8.77)	.98	-.84 (.47)	.08
Not Easy at all	1.02 (.09, 5.79)	.74	.15 (.63)	.06
Age	.90 (.98, .75)	.90	.01(.11)	.93
Race				
Non-Hispanic White	Reference	--	Reference	--
Other	2.68 (1.24, 5.71)*	.01	.49 (.32)	.17
Sex				
Male	Reference	--	Reference	--
Female	.70 (.29, 1.69)	.43	-.25 (.29)	.36
Class				
Freshman	Reference	--	Reference	--
Sophomore	.63 (.16, 2.49)	.51	.38 (.48)	.44
Junior	.78 (.19, 3.13)	.72	-.09 (.49)	.99
Senior	.99 (.23, 4.26)	.99	.18 (.52)	.74

Note. SE= standard error; AOR= adjusted odds ratio; CI= confidence interval. Estimates are adjusted for age, race, gender and classification, * $p<0.05$.

concerns regarding your health?", 60.4% will of the sample reported they were more likely to discuss their health with the parent or guardian, whereas 39.6% reported they were more likely to discuss health related concerns with their family physician.

Association between Osteoporosis Knowledge and Calcium Intake

The Short Calcium Questionnaire was used to provide daily estimates of each individual's calcium intake. The scores were calculated based on the responses provided and then coded into a dichotomous variable, 0= failing to meet dietary requirements and 1= meeting dietary guidelines, to determine whether they were meeting the daily intake requirements. A small percentage (9.4%) of the sample was considered to be insufficient in their dietary calcium intake based on their reported values.

A multiple logistic regression model was used to predict calcium intake based on osteoporosis knowledge, sex, and classification. The results suggested that the predictor variable (OKT), did not significantly predict calcium intake ($p > 0.05$). Race proved to be the only significant control variable considered in the model. The results indicated that the odds of having satisfactory calcium intake was 2.89 times greater for those identifying as non-Hispanic white compared to those who were classified as "other race/ethnicity" ($p = 0.01$).

Association between Health Communication Habits and Calcium Intake

A multiple logistic regression model was used to predict calcium intake based on the ease of health communication with the parent/guardian the individual speaks to most frequently. The results revealed no statistical significance for most predictor variables and covariates. The only variable significantly associated with calcium intake in this model was race ($p = 0.01$). As compared to non-Hispanic white students, those who identified as "other" were about 2.7 times more likely to meet dietary calcium intake. A third multiple logistic regression was used to predict calcium intake based on the individual they are most likely to engage in health-related conversation with. Similar to the other models, race was the only variable that proved to be a

Table 4 Association between health communication habits and prevention behaviors

Characteristic	Calcium AOR (95%)	*p*-value	Weight Bearing Exercise AOR (β)	*p*-value
HCDPS				
Parent	Reference	--	Reference	--
Other	.85 (.40, 1.80)	.67	.48(.25)	.072
Age	.97 (.74, 1.25)	.77	.04 (.10)	.72
Race				
Non-Hispanic White	Reference	--	Reference	--
Other	2.56 (1.20, 5.49)*	.016	.49 (.32)	.12
Sex				
Male	Reference	--	Reference	--
Female	.70 (.29, 1.68)	.44	-.25 (.29)	.38
Class Standing				
Freshman	Reference	--	Reference	--
Sophomore	.65 (.17, 2.55)	.54	.34 (.48)	.48
Junior	.81 (.20, 3.28)	.77	-.09 (.49)	.86
Senior	1.04 (.24, 4.45)	.96	.10 (.52)	.84

Note. SE= standard error; AOR= adjusted odds ratio; CI= confidence interval. Estimates are adjusted for age, race, gender and classification, * $p<0.05$.

significant determinant of calcium intake ($p = 0.02$), as those who identified as non-Hispanic white were 2.60 times more likely to meet the dietary requirements of calcium.

Association between Osteoporosis Knowledge and Weight Bearing Exercise

When asked questions regarding participation in weight-bearing exercise (WBE), 17.7% of the sample reported they participated in more the 30 minutes of WBE every day of the week, whereas 14.1% of the sample reported engaging in less than 10 minutes of WBE per week. A linear regression model was calculated to predict engagement in weight-bearing exercise based on osteoporosis knowledge. The results suggest osteoporosis knowledge was not a statistically significant predictor of engagement in weight-bearing exercise ($p > 0.05$).

Association between Health Communication Habits and Weight Bearing Exercise

To address the association between ease of parent/guardian communication and participation in weight-bearing exercise, a linear regression model was calculated. The results did not reveal a statistical significance between the predictor and outcome variables (p>0.05). A third linear regression model was used to assess the predictability of engaging in weight-bearing exercise based on the individual with which they are most likely to engage in health-related conversations. This model revealed the predictor, easy of health communication, did not elicit a statistically significant influence on the outcome variable.

Osteoporosis Self-Efficacy as a Moderator between Predictor and Outcome Variables

Osteoporosis self-efficacy was assessed as an potential moderator in the logistic regression models. Osteoporosis self-efficacy did not significantly moderate on the associations between osteoporosis knowledge, ease of parental communications and calcium intake. Additionally, the individual they are most likely to engage in health-related communications with did not significantly moderate the association. Osteoporosis self-efficacy was assessed as an interaction for the linear regression models. The results suggest osteoporosis did not significantly strengthen the associations between osteoporosis knowledge and the individual with which they are most likely to engage in health-related communications and participation in weight-bearing exercise.

CHAPTER V:
DISCUSSION

The purpose of the study was to assess the correlation between osteoporosis knowledge, health communication habits and engagement in preventive behaviors. The secondary aim of the study was to assess the moderating effects of self-efficacy on the association between the predictor and outcome variables of interest. Discussion of the results, limitations, conclusions and suggestions for future research are presented in this chapter. The demographic data is reflected in Table 1. The mean age of the sample was 20.6 ±1.5 years. A majority of the sample (81.6%) was non-Hispanic white. The gender breakdown of the population was 76.8% female. The sample descriptives are representative of the population selected. Prior studies have revealed low levels of osteoporosis knowledge among college students (Ford et al. 2007; Edmonds et al. 2011). Our results are in support of the two previously highlighted studies. The results revealed osteoporosis knowledge was relatively low among the sample studied the mean of the sample being 14.04±4.5 (54%).

Hypothesis 1 stated that there would be a significant association between osteoporosis knowledge and engagement in preventive behaviors. The preventive behaviors being adequate dietary calcium intake and weight-bearing exercise. The results of the regression analyses supported the null hypothesis. Table 2 reflects the results of the regression models. Our results are in support of prior research investigating the influence of educational interventions on osteoporosis knowledge, self-efficacy and dietary intakes of calcium and vitamin D. Evenson, et al. (2016) found that increases in osteoporosis knowledge did not result in significant increase

in vitamin D and calcium intake A study by Ford et al. (2007) found that osteoporosis knowledge was not significantly associated with dietary calcium intake. Furthermore, our results suggest osteoporosis knowledge and health communication habits were not predictive of engagement in preventive behaviors.

Although hypothesis 1 suggested higher levels of knowledge would result in more participation in prevention behaviors, prior studies have highlighted that knowledge may not be a sufficient predictor for behavior. Research has highlighted that knowledge should be accompanied by belief and understanding of the importance of the prevention behaviors (Moodi et al. 2011). A lack of association between osteoporosis knowledge and participation in prevention behaviors has been reported previously (Hernandez-Rauda & Martinez-Garcia, 2004), our results are in support of these findings. Perhaps other factors not addressed in the present study can better predict engagement in osteoporosis preventive behaviors.

Hypothesis 2 stated health communication would be positively associated with engagement in prevention behaviors. Prior research has highlighted the implications of parental communication regarding various health topics, however, to date, no study has assessed osteoporosis-specific health communications Contrary to our hypothesis, health communication habits were not associated with more frequent engagement in osteoporosis prevention behaviors. Contrary to more recent studies examining dietary calcium intake among adults, more than half of the sample met dietary recommendations based on their self-reported values.

Prior research has highlighted the implication of poor health communication from parental figures. Parent-adolescent sexual and reproductive health communication was investigated, the results suggested that those who reported having poor communication regarding sexual health were more likely to implement similar attitudes regarding sexual and reproductive

health (Dessie et al. 2015). Prior work by Gordon et al. (2017) highlighted the importance of health communication for preventing engagement in risky tanning behaviors, however, the results of our study suggest health communication habits were not a significant predictor of dietary calcium intake or participation in weight bearing exercise.

Hypothesis 3 suggested self-efficacy would strengthen the association between osteoporosis knowledge, health communication and engagement in prevention behaviors. Previous studies have suggested a high level of self-efficacy is a powerful predictor of engagement in preventive behaviors. Hasani et al. (2011) highlighted the key role self-efficacy plays in breast cancer prevention behaviors. However, research specifically looking at the effects of self-efficacy for predicting prevention behaviors for osteoporosis has revealed no significant effect of self-efficacy for predicting engagement in the behavior (Anderson et al. 2005).

Prior research has highlighted the importance of high levels of self-efficacy in order to actively adopt preventive behaviors (Bandura, 1997). Our results lineup with those of Anderson et al. (2005) as self-efficacy did not significantly strengthen the relationship between osteoporosis knowledge and engagement in prevention behaviors. Further, when engagement in osteoporosis prevention behaviors was examined by Wallace et al. (2002), the results indicated a clear correlation between higher levels of self-efficacy and prevention behaviors. Our results do not support our hypothesis as we hypothesized self-efficacy would strengthen the relationship between predictor variables and outcome variables. The results of the study suggest other variables may be more important for strengthening the relationship between the predictor and outcome variables. Moreover, it was hypothesized that the association between health communication and engagement in preventive behaviors would be strengthened by self-efficacy. Hemati et al. (2020) found a direct correlation between an adolescent's self-efficacy for a certain

behavior and parental communication habits. However, our results revealed self-efficacy was not a significant contributor to the association between health communication and outcome variables. Prior to assessing the effects of self-efficacy, there was no statistically significant association between the predictor and outcome variables. Although self-efficacy has previously been supported to play an important role in the associations between predictor and outcome variables, prior research has suggested that self-efficacy does not elicit significant influences and is not a pre-requisite for engagement in preventive behaviors. Prior research has suggested there are more important factors to be considered. McCaul et al., (2010) conducted a study examining the value of the theory of planned behavior, perceived control and self-efficacy for engagement in health protective behaviors. The results of this study suggested perceived control was a more predictive for engagement in preventive behaviors. Therefore, perceived control may be a more important for strengthening the relationship between the predictor and outcome variables examined in the study.

Our results suggest osteoporosis knowledge and health communication habits are not significant predictors of dietary calcium intake and participation in weight-bearing exercise. This may be a result of the outcome variables selected. The outcome variables of calcium intake and weight-bearing exercise are broad outcomes that may not need to be done intentionally in order to meet requirements suggested by various health organizations. Future research should consider alternative factors related to intentional behaviors for osteoporosis prevention in order to have a better understanding of the relationship between knowledge, health communication and potential moderating role of self-efficacy. These may include control, awareness and perceived susceptibility or seriousness of osteoporosis.

Theoretical Implications

This study provides contribution to the theoretical study of chronic disease prevention among college students. The study offers a more recent investigation of osteoporosis knowledge among college students highlighting that lower or higher levels of knowledge are not necessarily associated with meeting dietary calcium intake recommendations. Moreover, having more positive health communication habits were not directly related with dietary calcium intake. This suggests that factors not addressed in this study may be more important for predicting engagement in osteoporosis prevention behaviors. The study also explored a new way of implementing the SCQ, Sebring et al. (2007) developed a new calcium assessment which had not been implemented in survey format to date. The assessment could be implemented in future studies as a more convenient method of assessing calcium intake. However, future research should be conducted to validate the tool in an online format.

Practical Applications

The results of the study can be used to help guide future osteoporosis education interventions. There are specific areas on the OKT that indicate further education may be warranted. Further education is recommended specifically in regard to the severity and risk of the disease. Many individuals failed to accurately indicate what might predispose them to the disease and risk associated with the disease. Further efforts should be made to help portray the severity and long-term implications of the osteoporosis. The results of the study also suggest it may be of benefit to develop educational tools or resources for specific components of the osteoporosis knowledge test. The results revealed there was difficulty answering calcium knowledge and vitamin D questions, as well as identifying ideal times for bone growth,

diagnostic measures and exercise recommendations. Therefore, it may be of benefit to focus attention on these areas when developing educational programming for young adults.

Limitations

This study has several notable limitations. A potential limitation of the study is the use of convenience sampling, we implemented convenience sampling by using the students available at the institution. This also restricts the ability to generalize the findings of the study. The SCCQ was originally developed to be delivered in person and not electronically, it is possible there may have been user error or difficulty understanding the questions asked. There may have also been difficulty with memory of past behaviors. This could have potentially led to recall bias. Data was collected from two universities and results may not be generalizable to students at other universities with various institutional traits as well as locations. Additionally, the study sample might not reflect the campus population, as it only included undergraduate student and was also made up of a high proportion of female students. The racial breakdown of the sample makes it difficult to determine whether any true significant differences occurred as 81.8% of the population identified as “non-Hispanic white”. Further, the cross-sectional study design did not allow for establishing causation.

Future Research

Future studies should consider the validation of the health communication survey tool. Interventions enhancing prevention efforts during the pre-collegiate years could be extremely beneficial for the achievement of peak bone mass. It would also be of importance to rectify the belief that osteoporosis is an aging bone disease while highlighting the importance of engaging

in bone positive behaviors early in life. Perhaps future research should aim to target individuals of adolescent age for osteoporosis preventive efforts, prior research has highlighted that these years are critical for bone mass development. Research targeting prevention behaviors with more direct implications for osteoporosis prevention may be warranted. Furthermore, a valid and reliable assessment for calcium intake young adults is needed for further research in this population.

Conclusions

Evidently osteoporosis knowledge is lacking among college students. Although the study findings did not support the hypothesis that knowledge and health communication habits predict engagement in prevention behaviors, other factors not addressed in the present study may be more relevant for enhancing engagement in more prevention behaviors. Achieving high peak bone mass is an important component of bone health and preventing bone related diseases. Finding ways to ensure young adults are engaging in behaviors that contribute to higher peak bone masses will be beneficial for preventing the onset of chronic bone-related diseases and mitigating the cost associated with osteoporosis.

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LIST OF APPENDICES

APPENDIX A:
CONSENT FORM

CONSENT TO PARTICIPATE IN RESEARCH

Title: Osteoporosis knowledge, health communication habits and Osteoporosis preventive behaviors: A cross-sectional study among male and female college studentPrincipal Investigator

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Description

We are inviting you to participate in this research project because you are currently enrolled as an undergraduate student at the University of Mississippi. The purpose of this research is to improve our understanding of the relationship between health communication habits, osteoporosis knowledge and dietary calcium intake among college students. You will be asked to complete an anonymous online survey that asks about individual characteristics, health communication habits, osteoporosis knowledge, dietary calcium knowledge, exercise knowledge and self-efficacy for engaging in osteoporosis preventive behaviors.

Cost and Payments

The survey should take about 10 minutes to complete. You may choose to provide your name and email address to be entered into a draw to win one of 8 $25 Amazon gift cards for participating in this study. Students will be randomly selected to receive an incentive.

Risks and Benefits

We do not anticipate any major risks or discomforts involved in participating in this research study, however there may be some discomfort when answering questions about your health communication habits. It is important to know that all responses will not be linked to any identifying information, and you may choose to skip any question you are not comfortable answering. There are no direct benefits to participating in this study.

Confidentiality

Your responses will be anonymous. You will be assigned a unique ID number, and all data will be stored using password-protected files on a password-protected computer. No one but the research team will have access to collected data, and once all survey responses have been collected and downloaded to a computer, all online responses will be deleted. If we write reports or articles about the findings from this project, your identity will be protected to the maximum extent possible. Your contact information will be collected from you if you choose to enter a raffle to receive an incentive. This information will not be linked in any way to the responses you provide on the survey.

Right to Withdraw
Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the principal investigator:

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IRB Approval
This study has been reviewed by The University of Mississippi's Institutional Review Board (IRB). If you have any questions, concerns, or reports regarding your rights as a participant of research, please contact the IRB at (662) 915-7482 or irb@olemiss.edu.

Your consent indicates that you are at least 18 years of age, you have read this consent form or have had it read to you, your questions have been answered to your satisfaction, and you voluntarily agree to participate in this research study. If you agree to participate, please indicate so by answering the question below.

I have reviewed the informed consent information and consent to participate in this study.

- Yes, I agree/consent to participate
- No, I do NOT agree/consent to participate

APPENDIX B:
EMAIL INVITATION

Osteoporosis knowledge, health communication habits and osteoporosis preventive behaviors: A cross-sectional study among male and female college students

Email Invitation

Subject Line: Participate in a Brief Survey on Osteoporosis knowledge, health communication habits and Osteoporosis preventive behaviors.

Dear Student,

As part of a research project on better understanding the relationships between Osteoporosis knowledge, health communication habits and Osteoporosis preventive behaviors, you are invited to participate in a brief, one-time online survey that should take about 10-15 minutes to complete.

Participation is voluntary, and all of your responses will be kept completely anonymous. As a thank you for participating, you will have the chance to enter into a raffle to win ***one of our 8 $25 Amazon gift cards.*** Data collection will close on [two weeks from today], so be sure to click this link now to start the survey!

[INSERT SURVEY LINK]

This research has been reviewed by the University of Mississippi Institutional Review Board. If you have any questions about participation in this study, please contact the principal investigator:

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Thank you for taking the time to participate!

Best,
Kaitlyn Armstrong

APPENDIX C:
EMAIL REMINDER

-

Osteoporosis knowledge, health communication habits and osteoporosis preventive behaviors: A cross-sectional study among male and female college students

Reminder Email

Subject Line: Reminder: Participate in a Brief Survey on Osteoporosis knowledge, health communication habits and Osteoporosis Preventive Behaviors

Dear UM Student,

There's still time to participate in a brief, one-time online survey on better understanding the relationships between Osteoporosis knowledge, health communication habits and Osteoporosis preventive behaviors, you are invited to participate in a brief, one-time online survey that should take about 10-15 minutes to complete.

Participation is voluntary, and all of your responses will be kept completely anonymous. As a thank you for participating, you will have the chance to enter into a raffle to win ***one of our 8 $25 Amazon gift cards.*** Data collection will close on [two weeks from today], so be sure to click this link now to start the survey!

[INSERT SURVEY LINK]

This research has been reviewed by the University of Mississippi Institutional Review Board. If you have any questions about participation in this study, please contact the principal investigator:

Kaitlyn Armstrong, BS
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Thank you for taking the time to participate!

Best,
Kaitlyn Armstrong

APPENDIX D:
OSTEOPOROSIS KNOWLEDGE TEST

1. *The following list contains things which may or may not affect a person's chance of getting osteoporosis. After reading each one, indicate if you think the person is MORE LIKELY TO GET OSTEOPOROSIS, LESS LIKELY OSTEOPOROSIS TO GET OSTEOPOROSIS, IT HAS NOTHING TO DO WITH GETTING OSTEOPOROSIS or DON'T KNOW.*

	More likely to get Osteoporosis (1)	Less likely to get Osteoporosis (2)	It has nothing to do with getting Osteoporosis (3)	Don't Know (4)
Eating a diet LOW in dairy products (1)	○	○	○	○
Being menopausal; "change of life" (2)	○	○	○	○
Having a parent or grandparent who has osteoporosis (3)	○	○	○	○
Being a White or Asian woman (4)	○	○	○	○
Being an elderly man (5)	○	○	○	○
Having ovaries surgically removed (6)	○	○	○	○
Taking cortisone (steroids e.g. Prednisone) for a long time (7)	○	○	○	○
Being overweight (8)	○	○	○	○
Having an eating disorder (9)	○	○	○	○
Consuming more than 2 alcoholic drinks per day (10)	○	○	○	○
Smoking on a daily basis (11)	○	○	○	○

12. To strengthen bones, an individual should exercise at a moderately intense level for a minimum of 30 minutes a day for how many days per week?

a. 3 days a week

b. 4 days a week

c. 5 days a week

d. Don't know

13. Exercise makes bones strong, but it must be hard enough to make breathing:

a. Just a little faster

b. Much faster, but talking is possible

c. So fast that talking is not possible

d. Don't know

14. Which of the following activities is the best way to reduce a person's likelihood of developing Osteoporosis?

a. Swimming

b. Walking briskly

c. Doing kitchen chores, such as washing dishes or cooking

d. Don't know

15. Which of the following activities is the best way to reduce a person's likelihood of developing Osteoporosis?

a. Bicycling

b. Yoga

c. House cleaning

d. Don't know

16. Which of the following activities is the best way to reduce a person's likelihood of developing Osteoporosis?

a. Jogging or running

b. Golfing using a golf cart

c. Gardening

d. Don't know

17. Which of the following activities is the best way to reduce a person's likelihood of developing Osteoporosis?

a. Bowling

b. Doing laundry

c. Aerobic dancing

d. Don't know

Calcium is one of the nutrients our body needs to keep bones strong.

18. Which of these is the best source of calcium?

a. Apple (1)

b. Cheese (2)

c. Cucumber (3)

d. Don't know (4)

19. Which of these is the best source of calcium?

a. Peanut butter (1)

b. Turkey (2)

c. Canned sardines (3)

d. Don't know (4)

20. Which of these is the best source of calcium?

a. Chicken (1)

b. Broccoli (2)

c. Grapes (3)

d. Don't know (4)

21. Which of these is the best source of calcium?

a. Yogurt (1)

b. Strawberries (2)

c. Cabbage (3)

d. Don't know (4)

22. Which of these is the best source of calcium?

a. Ice cream (1)

b. Grapefruit (2)

c. Radishes (3)

d. Don't know (4)

23. Which of the following is the recommended amount of calcium intake for an adult?

a. 600-800mg daily (1)

b. 1000-1200mg daily (2)

c. 1400-1600mg daily (3)

d. Don't know (4)

24. How much milk does an adult need to drink to meet the recommended amount of calcium?

a. 1 glass daily (1)

b. 2 glasses daily (2)

c. 3 or more glasses daily (3)

d. Don't know (4)

25. Which of the following is the best reason for taking a calcium supplement?

a. If a person skips breakfast (1)

b. If a person does not get enough calcium from their diet (2)

c. If a person is over 45 years old (3)

d. Don't know (4)

26. Which vitamin is required for the absorption of calcium?

a. Vitamin A (1)

b. Vitamin C (2)

c. Vitamin D (3)

d. Don't know (4)

27. Which is the best source of the vitamin required for the absorption of calcium?

a. Carrots (1)

b. Oranges (2)

c. Sunlight (3)

d. Don't know (4)

28. Which is the best food source of the vitamin required for the absorption of calcium?

a. Spinach (1)

b. Cheese (2)

c. Salmon (3)

d. Don't know (4)

29. Which of the following is the recommended amount of the vitamin required for the absorption of calcium for an adults, 50 years or older?

a. 800-1000IU Daily

b. 1200-1400IU Daily

c. 1600-1800IU Daily

d. Don’t know

30. When is the best time to build strong bones?

a. Childhood (1)
b. Adolescence (2)
c. Young adulthood (3)
d. Don't know (4)

31. Osteoporosis can be diagnosed by:

a. Blood test (1)
b. DXA scan (2)
c. Symptoms (3)
d. Don't know (4)

32. Once you have osteoporosis:

a. There is nothing you can do about it (1)
b. You can take medication to treat it (2)
c. You must be careful lifting objects (3)
d. Don't know (4)

APPENDIX E:
OSTEOPOROSIS SELF-EFFICACY SCALE

33. If it were recommended that I do any of the following <u>this week</u>, I am confident or certain that:

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I could begin a new or different exercise program (1)	○	○	○	○	○
I could change my exercise habits (2)	○	○	○	○	○
I could put forth effort required to exercise (3)	○	○	○	○	○
I could do exercises even if they are difficult (4)	○	○	○	○	○
I could exercise for the appropriate length of time (5)	○	○	○	○	○
I could do the type of exercises that I am supposed to do (6)	○	○	○	○	○
I could increase my calcium intake (7)	○	○	○	○	○
I could change my diet to include more calcium-rich foods (8)	○	○	○	○	○
I could eat more calcium-rich foods as often as I am supposed to do (9)	○	○	○	○	○
I could select appropriate foods to increase my calcium intake (10)	○	○	○	○	○
I could stick to a diet which gives an adequate amount of calcium (11)	○	○	○	○	○
I could obtain foods that give an adequate amount of calcium even when they are not readily available (12)	○	○	○	○	○

APPENDIX F:
HEALTH COMMUNICATION SURVEY

The following questions ask about your communication habits with your parent/guardian. Please think of the parent/guardian you speak to most frequently when responding.

34. How easy is it to have conversations with your parent?

a. Extremely easy (4)

b. Somewhat easy (3)

c. Not very easy (2)

d. Not easy at all (1)

35. How often do you speak with your parent? Please think of anything ranging from phone calls, texts, Facebook messages, emails, etc.

a. Daily (1)

b. A few times a week (2)

c. Once a week (3)

d. Twice a month (4)

e. Once a month (5)

f. Occasionally (6)

g. Rarely (7)

36. Which of the following, if any, are you likely to talk about with your parent? Please select all that apply.

a. Family (1)

b. Health (2)

c. Relationships (3)

d. Finances (4)

e. Religion (5)

f. Fashion (6)

g. Body image (7)

h. Politics (8)

i. Pop culture (9)

j. Other, please specify: (10)

_____

37. About how old were you when you first talked to your parent about your health?

a. Under 5 years old (1)

b. 5-9 years old (2)

c. 10-14 years old (3)

d. 15-19 years old (4)

e. 20-29 years old (5)

f. I've never talked to my parent about my health (0)

38. Which of the following are you most likely to talk to your parent about?

a. Everyday health, such as taking vitamins or having an annual physical (0)

b. Risk for serious diseases and conditions, such as Osteoporosis or breast cancer (1)

39. Which of the following health issues, if any, have you ever discussed with your parent? Please select all that apply.

a. Weight management (1)

b. Cancer (2)

c. Mental health (3)

d. Heart-related diseases such as coronary heart disease (4)

e. Blood conditions, such as diabetes (5)

f. Stroke (6)

g. Osteoporosis (7)

h. Sexually transmitted diseases (8)

i. Infertility (9)

j. Other, please specify: (10)

_____

k. None (0)

40. Which of the following do you typically feel when talking to your parent about health? Please select all that apply.

a. Confident (1)

b. Protective (2)

c. Capable (3)

d. Nurturing (4)

e. Worried (5)

f. Stressed (6)

g. Smart (7)

h. Frustrated (8)

i. Nervous (9)

j. Tired (10)

k. Excited (11)

l. Lost (0)

m. Incapable (0)

n. Other, please specify: (0) _____

41. Which of the following health conditions concerns you the most in regards to your health?

a. Weight management (1)
b. Cancer (2)
c. Heart-related diseases such as coronary heart disease (3)
d. Blood conditions, such as diabetes (4)
e. Infertility (5)
f. Osteoporosis (6)
g. Stroke (7)
h. Addiction (8)
i. Other, please specify: (9) _____

42. Which of the following health conditions, if any, would you be at risk for because of your sex? Please select all that apply.

a. Cancer (1)
b. Osteoporosis (2)
c. Weight management (3)
d. Heart-related diseases, such as coronary heart disease (4)
e. Infertility (5)
f. Blood conditions, such as diabetes (6)
g. Stroke (7)
h. Addiction (8)
i. Other, please specify: (9)
   _____
j. None (0)

43. At about what age (in years) did you start considering the impact your family health history may have on your health?

_____

44. If you know your family health history and were to ever change your behavior, such as what you eat or how often you exercise, to help reduce your risk of developing a family health-related condition, what would you do? Please select all that apply.

a. Exercise regularly (1)
b. Eat healthy, nutritious foods (2)
c. Go on a diet (3)
d. Go to the doctor for annual physicals (4)
e. Go to the doctor for preventive care on a regular basis (5)
f. Get tested regularly for health conditions regarding my family history (6)
g. Avoid certain foods, such as fast foods or junk food (7)
h. Monitor my portions (8)
i. Other, please specify: (9) _____
j. I wouldn't change my behavior to help reduce my risk of developing a family health-related condition (10)
k. I don't know my family health history (11)

45. Who would you be most likely to talk to about concerns regarding your health?

a. Doctor (1)
b. Parent (2)
c. Significant other (3)

46. If you had to select one, which of the following health conditions affects women the most?

a. Osteoporosis (1)
b. Heart-related diseases, such as coronary heart disease (2)
c. Infertility (3)
d. Uterine cancer (4)
e. Breast cancer (5)
f. Ovarian cancer (6)
g. Stroke (7)

47. Which of the following best describes how you feel about your knowledge of how to prevent Osteoporosis?

a. I am very confident (3)

b. I am somewhat confident (2)

c. I am not very confident (1)

d. I am not confident at all (0)

48. If a family member has ever experienced a broken bone or fracture after the age of 50, was it because of Osteoporosis?

a. Yes (1)

b. No (0)

c. Don't know (0)

d. A family member has never experienced a broken bone after the age of 50 (0)

49. At about what age (in years) do women need to start thinking about their bone health? Your best guess is fine.

_____

50. Osteoporosis is caused by _____. Please select all that apply.

a. Lack of exercise (1)
b. Aging (2)
c. Being a woman (3)
d. A calcium deficiency (4)
e. Low bone mineral density (5)
f. Smoking (6)
g. Lack of Vitamin D (7)
h. Certain medical conditions (8)
i. Certain medications (9)
j. A poor diet (10)
k. Family history (11)
l. Being thin and small (12)
m. None of these (13)

51. Which of the following are possible consequences of having Osteoporosis? Please select all that apply.

a. Bone fracture (1)
b. Broken bone (2)
c. Lack of mobility (3)
d. Lack of independence (4)
e. Depression (5)
f. Low self-esteem (6)
g. Weight gain (7)
h. Insomnia (8)
i. None of these (9)

52. Which of the following are ways that women can prevent Osteoporosis? Please select all that apply.

a. Getting a bone density test (1)

b. Muscle strengthening and weight bearing exercise (2)

c. Talking to a doctor about Osteoporosis (3)

d. Monitoring calcium intake from food (4)

e. Taking calcium supplements to reach the recommended daily amount (5)

f. Monitoring Vitamin D intake (6)

g. Taking Vitamin D supplements to reach the recommended daily amount (7)

h. Other, please specify: (8)

_____

i. None of these (9)

APPENDIX G:
SHORT CALCIUM QUESTIONNAIRE

Now we are going to ask questions about your dietary calcium intake. Please consider a typical week's consumption when answering the questions.

53. For the following foods, enter the number of servings you eat in a <u>typical week</u>. If you do not eat a particular food in a typical week, please enter 0.

"Total" brand (not other brands) dry cereals (Serving Size: 1 cup) (4)

_____

Instant breakfast drinks, shakes, diet shakes, liquid supplements (Serving Size: 12 fl. oz.) (5)

_____

Milk, any kind, including on cereal, in beverages, etc. (Serving Size: 1 cup) (6)

_____

Yogurt (not frozen) (Serving Size: 1 cup) (7)

_____

Calcium-fortified orange juice (Serving Size: 1 cup) (8)

_____

54. For the following foods, enter the number of servings you eat in a <u>typical week</u>. If you do not eat a particular food in a typical week, please enter 0.

Latte, cappucino, frappucino, etc. (Serving Size: 12 fl. oz.) (4)

_____

Meal replacement or energy bar (Serving Size: 1 med) (6)

_____

Cheese: Swiss, cheddar, provolone, American, or others (including on sandwiches and burgers) (Serving Size: 1 oz./1 slice) (7)

_____

Sardines or salmon with bones (Serving Size: 3 oz.) (8)

_____

Pizza with cheese (Serving Size: 1 slice) (9)

_____

55. For the following foods, enter the number of servings you eat in a typical week. If you do not eat a particular food in a typical week, please enter 0.

Lasagna, etc. with cheese (Serving Size: 1 cup) (4)

_____

Macaroni and cheese (Serving Size: 1 cup) (5)

_____

Tacos, burritos, etc. with cheese (Serving Size: 1 each) (6)

_____

Soup made with milk (Serving Size: 1 cup) (7)

_____

Breakfast bars (Serving Size: 1 med) (8)

_____

56. For the following foods, enter the number of servings you eat in a typical week. If you do not eat a particular food in a typical week, please enter 0.

Tofu, firm, processed with calcium sulfate (Serving Size: 1/2 cup) (4)

_____

Broccoli, collards, turnip greens, kale, bok choy (Serving Size: 1/2 cup) (5)

_____

Beans: kidney, navy, black, baked, etc. (Serving Size: 1 cup) (6)

_____

Ice cream, frozen yogurt (Serving Size: 1/2 cup) (7)

_____

Cottage cheese (Serving Size: 3/4 cup) (8)

_____

57. For the following foods, enter the number of servings you eat in a typical week. If you do not eat a particular food in a typical week, please enter 0.

Pudding, made with milk (Serving Size: 1/2 cup) (4)

_____

Pancakes, waffles, French toast (Serving Size: 2 each) (5)

_____

Other dry cereals (not including "Total" brand) (Serving Size: 1 cup) (6)

_____

Almonds (Serving Size: 1/4 cup) (7)

_____

Other calcium-fortified drinks and juices (Serving Size: 1 cup) (8)

_____

58. Have you taken any of the following in the past month? Select all that apply.

Vitamin/mineral supplement (1)
Calcium supplement or pill (2)
Tums, Rolaids, etc. (3)
I have not taken any of the above in the past month (4)

Vitamin/Mineral Use

59. What was the name of the vitamin/mineral supplement you took in the past month?

_____

60. How much calcium (in mg) does this vitamin/mineral supplement have per dose?

_____

61. What is the average number of doses you took of this vitamin/supplement per week in the past month?

_____

Calcium Supplement Use

62. What was the name of the calcium supplement or pill you took in the past month?

_____

63. How much calcium (in mg) does this calcium supplement or pill have per dose?

_____

64. What is the average number of doses you took of this calcium supplement or pill per week in the past month?

_____

Tums, Rolaid use
65. What was the name of the other item (e.g., Tums, Rolaids) you took in the past month?

_____

66. How much calcium (in mg) does this other item (e.g., Tums, Rolaids) have per dose?

_____

67. What is the average number of doses you took of this other item (e.g., Tums, Rolaids) per week in the past month?

_____

APPENDIX H:
EXERCISE QUESTIONNAIRE

Weight Bearing Exercise

The next set of questions asks you about your exercise habits in a typical week.

68. How many times a week do you participate in weight-bearing exercise such as a walking program, jogging, aerobic dancing, resistance training, weight training, or pilates?

a. Less than 10 minutes per week (1)
b. 10 to 15 minutes, 1 to 2 times per week (2)
c. 10 to 15 minutes, 3 to 4 times per week (3)
d. 10 to 15 minutes, 5 to 7 times per week (4)
e. 20 to 30 minutes, 1 to 2 times per week (5)
f. 20 to 30 minutes, 3 to 4 times per week (6)
g. 20 to 30 minutes, 5 to 7 times per week (7)
h. More than 30 minutes per day (8)

69 . How many times a week do you participate in non-weight-bearing exercise such as swimming or biking?

a. Less than 10 minutes per week (1)
b. 10 to 15 minutes, 1 to 2 times per week (2)
c. 10 to 15 minutes, 3 to 4 times per week (3)
d. 10 to 15 minutes, 5 to 7 times per week (4)
e. 20 to 30 minutes, 1 to 2 times per week (5)
f. 20 to 30 minutes, 3 to 4 times per week (6)
g. 20 to 30 minutes, 5 to 7 times per week (7)
h. More than 30 minutes per day (8)

APPENDIX I:
ADDITIONAL QUESTIONS

Birth Control

70. Have you ever taken or used estrogen or a female hormonal birth control in any form?

a. Yes (1)

b. No (0)

71. Which form of hormonal birth control do you use or have you used? (Select all that apply).

a. Injections (1)

b. Intrauterine Device (IUD) (2)

c. Implant (3)

d. Vaginal creams (4)

e. Pill (5)

f. Other, please specify: (6) _____

72. Have you ever taken birth control pills for any reason?

a. Yes (1)

b. No (0)

73. How long altogether have you or did you take birth control pills (in years)?

_____

74. Have you ever received a Depo-Provera shot?

a. Yes (1)

b. No (0)

75. Is Depo-Provera your current form of birth control?

a. Yes (1)

b. No (2)

76. How long have you been taking the Depo-Provera shot (in years)?

_____

VITA
Kaitlyn Armstrong

EDUCATION

University of South Carolina Aiken 2019
B.S. Exercise and Sports Science

University of Mississippi 2021
M.S. Exercise Science

RESEARCH POSITIONS HELD

Keywords/Research Interests: Community health, aging and exercise recovery

Research Assistant 2016-2019
Department of Exercise and Sports
Science Advisor/Mentor: Dr. Andrew
Hatchett

- Assisted with subject preparation, data collection and research dissemination
    - The effect of a curved non-motorized treadmill on running gait length, imbalance and step angle
    - Energy expenditure for aerobic exercise on a curved, non-motorized treadmill versus a traditional motorized treadmill
    - An examination of the relationship between traditional push-ups, hand-release push-ups, and one-repetition maximum bench press performance in female athletes
    - A determination of the influence of cannabidiol oil has on attenuating delayed onset muscle soreness
    - The influence of strength and power on rowing, skierg performance
    - The influence diaphragmatic breath training has on pulmonary and cardiovascular performance
    - Energy expenditure for aerobic exercise on a curved, non-motorized treadmill versus a traditional motorized treadmill
    - The relationship between anaerobic power output and race performance during marathon canoe and kayak competition

PUBLICATIONS

PEER-REVIEWED JOURNAL ARTICLES

Hatchett, A., **Armstrong, K**., Parr, B., Crews, M., & Tant, C. (2018). The effect of a curved non- motorized treadmill on running gait length, imbalance and stride angle. Sports. 6, (58). doi: 10.3390/sports6030058

Hatchett, A., Brewer, C., **Armstrong, K.**, & Parr, B. (2018). Energy expenditure for aerobic exercise on a curved non-motorized treadmill versus a traditional motorized treadmill. *Archives of Physical Health and Sports Medicine*, *1*(1) 34-38. doi: 10.20944/preprints201806.0067.v1

Hatchett, A., & **Armstrong, K**., Hughes, B., & Tant, C. (2019). The influence of strength and power on rowing, skierg performance. *J Sports Res, 6*(1): 29-32. doi: 10.18488/journal.90.2019.61.29.32

Hatchett, A., Allen, C., **Armstrong, K.**, Hughes, B. (2019). The relationship between anaerobic power output and race performance during marathon canoe and kayak competition. *Int J Sports Exerc Med, 5*(8). doi: 10.23937/2469-5718/1510140

Hatchett, A., **Armstrong, K.**, Hughes, B., & Parr, B. (2020). The influence of cannabidiol on delayed onset muscle soreness. *Int J of Phys Educ Sports Health, 7*(2): 89-94.

Allen, H. K., Cohen-Winans, S., **Armstrong, K**., Clark, N. C., & Ford, M. A. (2021). COVID-19 Exposure and Diagnosis Among College Student Drinkers: Links to Alcohol Use Behavior, Motives and Context. *Transl Behav Med (In Progress).*

PRESENTATIONS

Southeast American College of Sports Medicine Conference 2018 2/18

- The effect of a curved non-motorized treadmill on running gait length, imbalance and step angle

University of South Carolina Aiken Scholar Showcase 2017 4/17

- An examination of the relationship between traditional push-ups, hand-release push-ups, and one-repetition maximum bench press performance in female athletes

University of South Carolina Aiken Scholar Showcase 2018 4/18

- The effect of a curved non-motorized treadmill on running gait length, imbalance and step angle

University of South Carolina Discover USC 4/18

- The effect of a curved non-motorized treadmill on running gait length, imbalance and step angle

Southeast Regional Undergraduate Research Scholarly and Creative Activity 4/18

- The effect of a curved non-motorized treadmill on running gait length, imbalance and step angle

MAPHERD Conference 2/21

- Associations between college student substance use and COVID-19 Experiences

GRANT APPLICATIONS

K. Armstrong	Graduate Student Research Award Funding Awarded: $200
S. Cohen-Winans & K. Armstrong	ACSM- Dr. Raymond A. Weiss Research Endowment (2020) Funding Requested: $1,500
K Armstrong & A Hatchett	Deluca Foundation - Delsy Prize (2018) Electromyography of muscle recruitment patterns in running gait and breathing on different treadmill styles Funding Requested: $3000
K Armstrong & B Hughes	University of South Carolina- Magellan Scholar Grant (2018) A determination of cannabidiol oil has on attenuating delayed onset muscle soreness Funding Requested: $3000

TEACHING AND PROFESSIONAL EXPERIENCE

Graduate Teaching Assistant, University of Mississippi
Department of Health, Exercise Science and Recreation Management 2019-
PresentCourses: Personal and Community Health (HP 191)
Body Contouring and Conditioning (EL 129)
Jogging (EL 156)
Weightlifting (EL 151)
Walking (EL 155)

Responsibilities: Created course syllabus; independently developed and taught lectures; developed, administered, and graded assignments, midterms and final exams; facilitated class discussions.

ACTIVITIES/SERVICE

Invited Reviewer for Peer Reviewed Journals
Journal of Physical Activity & Health

Outreach
Valeo FC Oxford Soccer Coach (2021)
MS Flood Soccer Coach (2020-2021)
USC Aiken Women's Soccer (2015-2019)
Student Government Association- Athletics Senator (2018-2019) Student Athlete Advisory Committee- Secretary (2018-2019)
Exercise and Sports Science Student Association- President (2017-2019)
Campus Intercollegiate Athletics Committee- Student Representative (2018-2019) USC Aiken Science Education Enrichment Day (2018)
SEACSM Conference AV team (2018,2019)

PROFESSIONAL AFFILIATIONS/MEMBERSHIPS

American College of Sports Medicine American Red Cross

National Strength and Conditioning Association

USA Weightlifting

EQUIPMENT UTILIZATION

Parvo Medics -TrueOne
2400 Electrocardiograph
BodPod Gold Standard
Dual-Energy X-ray
Absorptiometry Microgate
Optogait
Accelerometer
Blood Pressure
Heart Rate
Monitor Pulse
Oximeter Skin
Fold Calipers
Visual Analogue
Scale Microsoft

SPSS

HONORS AND AWARDS

- Presidential Honor Roll (2016-2018)
- USC Aiken Dean's List (2017, 2018)
- USC Aiken President's List (2018)
- Aiken Sunrise Rotary Student of the Month (November 2018)
- Peach Belt Conference All-Academic Team (2018)

REFERENCES

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