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Short communication

# Osteoporosis health beliefs and knowledge in college students: The role of dietary restraint

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ABSTRACT

This study investigated the relationship between dietary restraint (DR) and osteoporosis-related knowledge and beliefs in college women and men. A total of 517 university students completed measures of osteoporosis knowledge, perceived susceptibility to and severity of osteoporosis, barriers to and benefits of calcium and exercise, health motivation, exercise and calcium self-efficacy, and DR. Two MANOVAs were conducted to examine differences between high and low dietary restrainers on osteoporosis beliefs and knowledge. For women, HR scored higher on perceived susceptibility to, and severity of, osteoporosis, calcium barriers, and health motivation; for men, HR scored lower on exercise benefits. These results suggest that DR may be related to osteoporosis beliefs and knowledge differently for men and women.



## 1. Introduction

Osteoporosis (OP) is a disease of low bone mass, which increases the risk for fractures (National Institutes of Health [NIH], 2007). It is estimated that 1 in 2 women and 1 in 4 men over age 50 will experience an osteoporotic-related fracture (NIH, 2007). Attainment of peak bone mass is critical for the prevention of OP, with lifestyle factors such as exercise and calcium consumption identified as important modifiable factors for osteoporosis prevention (NIH, 2007).

One theoretical model which explains engagement in preventive behaviors is the Health Belief Model (HBM; Rosenstock, Strecher, & Becker, 1988). The HBM predicts that beliefs about specific illnesses and their preventive health behaviors impact the likelihood of performing these behaviors. These beliefs include: perceived threat (a function of perceived susceptibility to and perceived severity of the condition); relative cost of the behavior (difference between perceived barriers to and perceived benefits of performing the behavior); and modifying factors including demographic, psychosocial, and structural (e.g., knowledge) variables. Self-efficacy and general health motivation have been added to the original model (Rosenstock et al., 1988).

Research examining exercise and/or calcium consumption using the HBM has been equivocal (Ali, 1996; Kasper, Peterson, Allegrante, Galsworthy, & Gutin, 1994; Wallace, 2002). When support for theoretical suppositions has been found, the strongest predictor of calcium consumption and exercise has been self-efficacy, with barriers to calcium intake and exercise also predicting behavior in college women (Ali, 1996; Wallace, 2002). By contrast, perceived susceptibility and severity have received little support as predictors of these behaviors in college women (Wallace, 2002), and these beliefs have not been examined in young men despite calls for increased bone health research in men (NIH, 2007). Given these limitations, it is important to investigate variables that may influence these relationships, such as dietary restraint.

Dietary restraint (DR) refers to the use of cognitive, rather than physiological, cues to either lose or maintain weight (Herman & Mack, 1975). DR has been positively associated with exercise behavior (McLean & Barr, 2003). Further, males and females classified as high dietary restrainers (HR) consume fewer calories than low dietary restrainers (LR), but report higher BMIs (Klesges, Isbell, & Klesges, 1992). HR also report greater food awareness and healthier diets (Klesges et al., 1992; McLean & Barr, 2003; Tepper, Trail, & Shaffer, 1996) than LR. However, the relationship between DR and OP beliefs and knowledge has not been investigated. Therefore, the purpose of the present study was to examine differences in health beliefs and knowledge related to OP between HR and LR. Consistent with research on other health variables (e.g., Klesges et al., 1992) it was hypothesized that HR would score higher on all measures.

## 2. Methods

### 2.1. Participants and procedures

Clearance was received from the university's research ethics board. Participants completed informed consent and a series of

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**Table 1**
Means (SD) for osteoporosis knowledge and beliefs, calcium and exercise self-efficacy, and DR for entire sample by gender

| Measure | Women ($n$=351) | Men ($n$=176) |
|---|---|---|
| Knowledge | 14.73 (2.82) | 13.82 (3.00) |
| Susceptibility | 2.42 (.91) | 1.69 (.73) |
| Severity | 3.35 (.84) | 3.06 (.94) |
| Calcium barriers | 2.14 (.86) | 1.76 (.71) |
| Calcium benefits | 4.23 (.56) | 4.18 (.67) |
| Exercise barriers | 2.56 (.85) | 2.43 (.98) |
| Exercise benefits | 3.97 (.62) | 3.97 (.76) |
| Health motivation | 3.76 (.75) | 3.93 (.90) |
| Exercise self-efficacy | 77.82 (15.08) | 84.51 (13.90) |
| Calcium self-efficacy | 73.49 (18.32) | 75.44 (18.99) |
| Dietary restraint | 2.49 (.82) | 1.80 (.69) |

*Note.* Knowledge ranges from 0–24; Exercise and calcium self-efficacy range from 0–100; all other subscales range from 0–5.

questionnaires in classroom settings. A total of 517 university students (346 females, 171 males) ranging in age from 17–21 years participated in the study. The majority of the sample consumed caffeine (99%) and alcohol (88.2%), did not smoke (93.1%), and was not currently dieting (91/7%).

### 2.2. Measures

In addition to demographic information, participants completed the Osteoporosis Knowledge Test (OKT; Kim, Horan, & Gendler, 1991), a 24-item multiple choice test about risk factors in OP. A revised 21-item version of the Osteoporosis Health Beliefs Scale (OHBS; Mack, Gammage, & Klentrou, 2006) was used to assess the HBM variables, as it has demonstrated improved factor validity in a college sample. The 21-item Osteoporosis Self-efficacy Scale (OSES; Horan, Kim, Gendler, Froman, & Patel, 1998) was used to assess confidence for exercise and calcium intake. Finally, the DR subscale of the Dutch Eating Behavior Questionnaire (DEBQ-DR; Van Strien, Frijters, Berger, & Defares, 1986) was used to assess participants' frequency of restrained eating behaviors. Cronbach's alpha's for all measures were adequate.

## 3. Results

Descriptive statistics for the entire sample by gender for the HBM variables and DR are presented in Table 1. Because no cut-offs for the DR scale exist to determine restraint status, men and women were each split into quartiles based on their DR score. Those scoring in the highest 25% (women: DR>3, $n$=92; men: DR>2.2, $n$=48) were labelled HR and in the lowest 25% (women: DR<1.9, $n$=93; men: DR<1.25, $n$=44) were labelled LR. Separate independent samples $t$-tests indicated that those classified as HR scored significantly higher on the DEBQ-DR than LR (women: $t(183)=-36.21$, $p<.0001$; men: $t(89)=-22.47$, $p<.0001$).

Means and standard deviations for HBM variables for HR and LR by gender are displayed in Table 2. Two separate MANOVAs were conducted to examine differences between HR and LR on these variables. For women, the MANOVA was significant ($F(10, 174)=2.54$, $p=.007$, $\eta^2=.13$), with HR scoring significantly higher than LR on four variables: susceptibility ($F(1, 183)=7.12$, $p=.008$, $\eta^2=.04$), severity ($F(1, 183)=4.26$, $p=.004$, $\eta^2=.02$), calcium barriers ($F(1, 183)=5.67$, $p=.018$, $\eta^2=.03$), and health motivation ($F(1, 183)=5.13$, $p=.025$, $\eta^2=.03$). For men, the MANOVA was significant ($F(10, 80)=2.01$, $p=.04$, $\eta^2=.20$), with HR scoring significantly lower on exercise benefits ($F(1, 89)=7.20$, $p=.009$, $\eta^2=.08$).

## 4. Discussion

The present study examined differences in HBM variables related to OP based on DR in college men and women. OP knowledge was relatively low in the current sample, consistent with previous research (Wallace, 2002). For women, HR scored higher on OP susceptibility and severity compared to LR. These differences suggest that those who use cognitive cues to restrict their diets to lose or maintain weight recognize that their dietary choices could increase their risk for OP. Further, HR reported higher calcium barriers than LR. One reason for this difference may be due to the belief by many women that dairy products, generally thought of as the best source of dietary calcium, are high in fat and calories (French, Moore, Vernace-Inserra, & Hawker, 2005). The perception of these foods as high in fat and calories would likely be a significant barrier to their consumption, especially for those trying to lose or maintain weight (i.e., HR). Finally, HR also had greater overall health motivation, which has been a predictor of calcium consumption and exercise in past research (Wallace, 2002). Because HR may pay more attention to behaviours designed to control their weight (i.e., exercise and diet), they may be more concerned with their overall health.

For men, only exercise benefits differentiated the DR groups. Very little research has examined osteoporosis beliefs in college-aged men. The items used to assess exercise benefits were associated with OP protection (e.g., stronger bones, prevent problems from OP). It may be that, for men who cognitively restrain their diets, these benefits of exercise are not relevant compared to the weight loss benefits. These beliefs should be investigated further in men.

The differences in findings between men and women may be attributed to the fact that OP is seen as a 'women's' disease, or to gender differences in DR. DR scores tend to be lower in men (e.g., Klesges et al., 1992), likely because while women generally want to lose weight to achieve a thinner ideal, men are more equally divided between wanting to lose and gain weight to achieve a bigger, more muscular ideal.

Although this study examined OP-related beliefs and cognitions from a novel perspective, some limitations must be acknowledged. First, the measures used to assess OP knowledge and beliefs have only limited evidence of validity in college students and in men. Secondly, neither of the HR groups was truly 'high', in particular for the men. Finally, the cross-sectional nature of the study does not allow causal conclusions to be drawn. Despite these limitations, this study has provided some important information. First, the low knowledge scores suggest that greater OP education is necessary. Second, information related to calcium barriers, particularly in female HR should be emphasized. A better understanding of how DR may interact with OP-related beliefs and behaviors will allow targeted preventive interventions be developed.

**Table 2**
Means (SD) for osteoporosis knowledge and beliefs, and calcium and exercise self-efficacy, by gender and restraint group

| Measure | Women | | Men | |
|---|---|---|---|---|
| | LR ($n$=93) | HR ($n$=92) | LR ($n$=44) | HR ($n$=47) |
| Knowledge | 14.61 (2.38) | 14.54 (3.37) | 13.68 (3.23) | 14.30 (3.48) |
| Susceptibility | 2.21 (.74)$_a$ | 2.54 (.96)$_b$ | 1.54 (.64) | 1.79 (.78) |
| Severity | 3.19 (.84)$_a$ | 3.46 (.93)$_b$ | 2.83 (1.02) | 3.09 (.85) |
| Calcium barriers | 2.02 (.71) | 2.30 (.89) | 1.59 (.67) | 1.84 (.69) |
| Calcium benefits | 4.24 (.47)$_a$ | 4.24 (.57)$_b$ | 4.36 (.64) | 4.14 (.68) |
| Exercise barriers | 2.48 (.86) | 2.50 (.96) | 2.38 (1.09)$_c$ | 2.60 (.88)$_d$ |
| Exercise benefits | 3.96 (.67) | 4.04 (.67) | 4.28 (.62) | 3.89 (.75) |
| Health motivation | 3.70 (.83)$_a$ | 3.95 (.66)$_b$ | 3.78 (1.01) | 3.94 (.87) |
| Exercise self-efficacy | 78.39 (16.71) | 80.53 (12.72) | 82.79 (16.96) | 84.20 (11.58) |
| Calcium self-efficacy | 76.50 (16.31) | 73.41 (18.40) | 70.78 (22.69) | 77.24 (15.96) |

*Note.* Knowledge ranges from 0–24; Exercise and calcium self-efficacy range from 0–100; all other subscales range from 0–5. Within each gender, significant differences by DR group indicated by different subscripts. LR = low dietary restrainer; HR = high dietary restrainer.