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University of California, Davis, Department of Nutrition and the Center for Nutrition in Schools

Physical Activity Labeling May Reduce Number of Calories Selected and Consumed

Over the last few years, there has been increasing interest in different ways to display information on packaging or menus to encourage consumers to make healthier choices. One method being explored by researchers is physical activity calorie equivalents (PACE) labeling. These labels reflect the number of minutes of physical activity a person would need to engage in to burn the equivalent of the calories in the food or beverage; for example, "the [calories] in this chocolate bar requires 55 minutes of walking to burn off" (1). By providing a recognizable reference activity such as walking, consumers may be better able to translate the more abstract concept of calories into information they can relate to their own lives. The labels can also serve as a reminder of the importance of regular physical activity, particularly with respect to balancing calorie intake with calorie expenditures.

While interest in PACE labeling has grown, evidence of the effectiveness of this type of labeling in changing behavior is needed. A recent systematic review and meta-analysis aimed to synthesize the available literature.

In order to be included in the systematic review, studies needed to assess the impact of PACE labeling on selection, purchase, or consumption of a food or drink and include a comparison group. The researchers identified 15 studies that met the inclusion criteria and were included in the review and the meta-analysis.

When looking at all the data together, the researchers found that PACE labeling compared to calorie-only or

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By providing a recognizable reference activity such as walking, consumers may be better able to translate the more abstract concept of calories into information they can relate to their own lives.

no labeling reduced the number of calories selected by 65 as well as reduced the likelihood of purchasing a sugar-sweetened beverage by 50 percent. The inclusion of PACE labeling also resulted in decreases in the number of calories consumed by about 110 calories.

While the results should be interpreted with caution, the authors note that small changes at individual level could result in large changes at a population level. Decreases in calorie consumption by as little as 100 calories per day may be able to prevent population obesity (2).

A major drawback of many of the studies included in the systematic review was that they were conducted in laboratory settings or involved hypothetical scenarios. As a result, the findings may not apply to real-world situations, or the effects may vary depending on the setting (such as grocery store versus restaurant). More research is needed in a variety of settings to further elaborate the effectiveness of PACE labeling on calorie consumption as well as physical activity.

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Vitamin D Supplementation and Bone Density and Bone Strength

While vitamin D can be produced in the skin with sun exposure, food sources of vitamin D are an important contributor to healthy vitamin D status.

Vitamin D is an important nutrient for bone health, but it is only found in a few foods and deficiency is fairly common (1). Vitamin D supplementation has been associated with increased bone mineral density and decreased fracture rates (2). However, supplementing with too much vitamin D (10,000 to 40,000 IU/day) can result in unintended weight loss, polyuria, heart arrhythmias, and increases in serum calcium, causing calcification of tissues, such as the heart and kidneys (1).

While vitamin D supplementation recommendations range from 400 IU to 2,000 IU per day, one study found that three percent of US adults were taking more than 4,000 IU per day. To learn more about the effects of high doses of vitamin D supplementation on bone mineral density and strength, a 3-year, double-blind, randomized clinical trial was conducted by researchers at the University of Calgary. The 310 participants included in the study were healthy men and women aged 55 to 70 years that were split into 3 supplementation groups with differing daily doses of vitamin D: 400, 4,000, and 10,000 IU of vitamin D. (3). If participants consumed less than 1200 mg per day of calcium, the researchers also provided calcium supplementation.

Researchers measured bone mineral density and bone strength of three areas of the body: the radius, tibia, and hip at the start of the study and again at 6, 12, 24, and 36 months. In addition, researchers tracked negative side effects that occurred during the study. Although vitamin D serum levels increased in the 4,000 and 10,000 IU groups proportionately to the doses of vitamin D, results showed a negative correlation between bone mineral density and vitamin D. Higher doses of vitamin D were associated with overall lower bone density over time. At the end of the trial, the 400 IU group had the highest levels of radius bone mineral density, while the 10,000 IU group has the lowest levels. At the tibia, the 10,000 IU group had significantly lower bone density than the 400 IU group, but there was no significant difference between the 400 and 4,000 IU groups (3). Among the negative side effects tracked by the researchers, only hypercalcemia (high blood calcium) and hypercalcuria (high urine calcium) were found to be associated with higher doses of vitamin D.

Over time, the highest dose of vitamin D, 10,000 IU, result in lower bone density.

Overall, the results of this trial did not find a benefit for bone health by supplementing with high doses of vitamin D.

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The researchers concluded that supplementing with high doses of vitamin D was associated with an accelerated decrease in bone mineral density. This outcome may be caused by suppression of parathyroid hormone (PTH), which reduces PTH-mediated bone formation. It has been recommended that more studies evaluating the dose-response relationship of vitamin D and bone health be completed. In addition, studies should be completed to assess this relationship in differing demographics and geographic locations.

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By Alice Hsieh, Undergraduate Intern, Center for Nutrition in Schools, Department of Nutrition, University of California, Davis.

Mindfulness Intervention with Youth Improves BMI, Anxiety

Mental health and physical health are strongly linked; one of the ways in which this evident is with stress and eating behaviors such as emotional eating, mindless eating, and eating in response to external cues. To combat this, mindfulness is emerging as a promising technique to reduce stress and improve eating behaviors. Previous research has suggested that mindfulness can reduce the stress hormone cortisol, which in turn may impact hormones related to appetite, including insulin, ghrelin, and leptin (1).

Previous research has suggested that mindfulness can reduce the stress hormone cortisol, which in turn may impact hormones related to appetite.

However, there are few studies examining the effects of mindfulness on children. A recent study conducted in Mexico investigated the effectiveness of a nutrition intervention with a mindfulness component in reducing body mass index (BMI) and anxiety in children (1). The researchers recruited children with obesity and anxiety (as measured by the Spence anxiety score) to participate in the study. Participants were assigned either to a conventional nutrition intervention or to the same intervention with an additional mindfulness component. While the researchers had intended to randomly assign children to the two groups, many parents made participation contingent on their child being in the mindfulness intervention. As a result, the mindfulness group (n=33) was much larger than the conventional

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nutrition intervention (n=12).

The nutrition intervention consisted on calorie restriction based on the World Health Organization guidelines along with 30-minutes sessions for parents to problem-solve diet issues and ask questions. The mindfulness group also participated in 2-hour weekly sessions the guided the children through activities and discussion designed to teach mindfulness skills, accompanied by a weekly homework assignment that involved applying the skills in daily life. To evaluate the success of the interventions, body mass index, anxiety and perceived stress, and blood measures of insulin, cortisol, ghrelin and leptin were measured before and after the 8-week intervention and again 8 weeks later.

While both groups received the same nutrition intervention, only the group with the mindfulness component experienced decreases in BMI.

After 8 weeks, anxiety scores, BMI, and ghrelin significantly decreased in the mindfulness group. These improvements were sustained at the follow-up 8 weeks later. Certain aspects of anxiety increased in the conventional intervention group, which led the researchers to speculate that the calorie-restricted diet may have been stressful for the participants.

The mindfulness intervention incorporated meditation, breathing techniques, body awareness, and other excerises.

There are some limitations to the study that warrant caution when interpreting the results. The researchers conducted two rounds of enrollment and intervention. After the first round, the improvement in anxiety scores led the researchers would feel it would be unethical to continue to assign children to the conventional nutrition intervention and did so only when the parent or caregiver was unable to attend the mindfulness session. This combined with parents choosing only to enroll their child in the study if they were assigned to the mindfulness group may have resulted in significant differences between the groups that were not a result of the interventions themselves. While future studies with more rigorous group assignments and larger numbers of participants are needed, this study presents a promising avenue of research that should be explored further.

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By Anna M. Jones, Department of Nutrition, University of California, Davis.

Too Much Vitamin A Supplementation May Reduce Thymic Function in Infants

Vitamin A is an important micronutrient for normal vision, organ function, and a strong immune system. Previous research has shown that vitamin A supplementation for early youth at risk for deficiency reduces mortality from certain infectious diseases. One of the ways vitamin A supports a healthy immune system is in the thymus. The thymus is the organ in the immune system where immature T lymphocytes, the immune cells important for initiating immune response, are sent to mature. Vitamin A deficiency has been observed to reduce thymic function and T-cell development. However, research published in the *Journal of Nutrition* suggests that a high-dose of vitamin A within 48 hours of birth may reduce thymic function in early infancy (1).

Vitamin A is important for normal vistion, organ function, and a strong immune system.

The study, conducted in Bangladesh where maternal vitamin A deficiency is common, was a randomized controlled trial of 306 infants receiving either 50,000 IU of vitamin A or a placebo within 48 hours of birth (For comparison, the adequate intake for vitamin A is 13,333 IU for infants). The researchers then followed up with the infants regularly for the first 15 weeks of life, and again at two years of age to assess thymic Index, a measure of thymus volume, as well as naive and memory T-cells, total T-cells, and T helper cells.

After six weeks, there was a significant decrease in thymic index (7.8 percent) in the high dose vitamin A group relative to the placebo group. When the researchers assessed concentrations of different types of T-cell, there was no significant difference in individual T-cell types between the experimental and placebo group. Another measure of thymic function, concentrations of T-cell receptor excision circles (TREC), was assessed at 6 and 15 weeks, as well as 2 years of age. At 15 weeks of age, TREC concentrations were 19 percent lower in the experimental group when compared to the placebo group. However, there was no overall effect from high-dose vitamin A on the TREC concentrations when comparing the experimental and placebo groups across all ages that were measured.

While the high-dose group had lower measures of thymic function at 15 weeks of age, this was not the case at the other timepoints measured or overall.

The researchers concluded that although

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there were some decreases in thymic function at 15 weeks in the experimental group, the potential negative effects are likely negligible. Additionally, effects are perhaps sub-clinical given that the magnitude of difference in thymic index was so low and that changes in T-cell concentrations were nonsignificant. However, these results indicate that thymic function may need to be evaluated in infants supplemented with high doses of vitamin A later in life to assess unintended outcomes.

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By Shaheen Emami, Undergraduate Intern, Center for Nutrition in Schools, Department of Nutrition, University of California, Davis.

Processed Meat, Red Meat, and Poultry Associated with Increased Risk of Cardiovascular Disease

Processed meat, which includes deli meat, bacon, and other cured, salted, or smoked meat, is associated with an increased risk of CVD.

A new study of existing data adds additional evidence that eating red and processed meat increases risk for cardiovascular disease (CVD) and death from any cause (1). In addition, poultry also appears to be associated with increased risk.

Researchers at Northwestern University pooled data from six studies that recruited participants between 1985 and 2002. At the start of the studies no participants had CVD. To assess the connection between meat consumption and negative outcomes, dietary intake was assessed at the beginning of each study with a food frequency questionnaire or a diet history. Cardiovascular disease and mortality outcomes were tracked until 2016.

In order to narrow down the impact of red meat, processed meat, poultry, and fish consumption, the researchers collected data on a variety of factors that might be related to both diet and cardiovascular outcomes, such as age, sex, race/ethnicity, education level, body mass index, blood pressure, and blood lipids, among others.

The researchers found that eating two servings each week of processed meat, unprocessed red meat, and poultry was linked to greater risk of developing cardiovascular disease compared to eating none. When examining the relationship between meat consumption

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This study also found that poultry consumption increased risk of developing CVD.

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and all-cause mortality, researchers found that red and processed meat increased risk, but poultry did not.

After further analyses it was evident that not everyone was affected equally. When breaking down the data further, the association between processed meat and CVD decreased with age. Among those who ate a better diet in general and those who consumed a lower-fat diet, the link between unprocessed red meat and CVD was stronger.

In those who consumed a better overall diet or a lower-fat diet, the link between red meat and CVD was stronger.

While this study adds to the research suggesting that eating less red and processed meat may be better for health, there are some weaknesses in the study design. One of the major limitations of this study is that they were only able to assess diet at the beginning of the studies. In the case of one of the studies included in the analysis, baseline data collection occurred over 30 years prior to this reanalysis. Over that period of time, dietary intake may have changed; it's unclear how changes in diet may have impacted the results and caution may be needed when interpreting the results.

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By Anna M. Jones, Department of Nutrition, University of California, Davis.

Study Finds Egg Consumption Not Associated with Increase Risk of Heart Disease

A new study that included over 177,000 people from 50 countries found no association between egg consumption and increased risk of heart disease.

Research has been mixed on the impact of eggs on heart disease, with some studies finding no link, others finding a protective effect, and some finding a negative association. A new study that included over 177,000 people from 50 countries found no association between egg consumption and increased risk (1).

The study used data from three, large prospective cohort studies that included both individuals with no history of cardiovascular disease (PURE study) as well as those with cardiovascular disease who were assigned to

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The study found egg consumption was associated with a small decrease in blood pressure.

different interventions unrelated to egg consumption (ONTARGET and TRANSCEND studies). Egg consumption was assessed using food frequency questionnaires in all three studies. The researchers were interested in the impact of egg consumption on variety of outcomes, including a composite of mortality and major cardiovascular events (such as heart attack, stroke, and heart failure), as well as blood lipids and blood pressure.

The PURE study tracked participants for over 9 years, during which the median egg intake was 3.6 eggs per week. Egg consumption was not found to be associated with any of the outcomes with the exception of lower risk of heart attack and lower blood pressure. However, while they did find an improvement in blood pressure associated with egg consumption, the differences were very small (133/84 mm Hg with less than one egg per week versus 131/83 mm Hg with seven or more eggs per week). The ONTARGET and TRANSCEND studies included over 31,000 participants that were followed for over four years; the average intake of eggs was 1.9 eggs per week. Overall, egg consumption was associated with lower blood pressure in these studies. However, the positive effects of eggs on heart attack in the PURE study was not observed in the ONTARGET or TRANSCEND studies.

Overall, the research suggests that eggs are not associated with an increased risk of cardiovascular disease, deaths from cardiovascular disease, or blood lipids. This was the case for those with a history of cardiovascular disease as well as those without. The authors note that these results are fairly consistent with the majority of past research, with the exception of a recent study conducted in the US that reported egg consumption to be associated with a higher risk of cardiovascular disease and mortality but also with lower systolic blood pressure and non-HDL cholesterol (2).

Overall, the research suggests that eggs are not associated with an increased risk of cardiovascular disease, deaths from cardiovascular disease, or blood lipids.

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