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New Study: Snacking on Raisins Controls Hunger, Promotes Satiety in Children

Eating Raisins Resulted in Significantly Fewer Calories Consumed as Compared to Other Popular Snacks

FRESNO, Calif., May 31, 2012 – New research recently announced at the Canadian Nutrition Society annual meeting in Vancouver, B.C., suggests eating raisins as an after-school snack prevents excessive calorie intake and increases satiety – or feeling of fullness – as compared to other commonly consumed snacks.

The study, funded by a grant from the California Raisin Marketing Board, was conducted among 26 normal-weight boys and girls ages 8 – 11 during a three-month timeframe. Study participants were randomly assigned to eat raisins or other snacks, including grapes, potato chips or chocolate chip cookies, until they were comfortably full. Additionally, each child received the same standardized breakfast, morning snack and lunch on test days. Subjective appetite was measured before and immediately after snack consumption at 15-minute intervals. Key study findings include:

- Food intake following raisin consumption was lower and satiation greater compared to the other snacks
- When eating raisins, children consumed significantly fewer calories when compared to the other snacks in the study
 - Grapes, potato chips and cookies resulted in ~ 56 percent, 70 percent and 108 percent **higher calorie intake** compared to raisins, respectively (See Figure 1 below)
- Cumulative calorie intake (breakfast + morning snack + lunch + after-school snack) was 10 percent – 19 percent lower after raisins compared to other snacks
- Although all snacks reduced subjective appetite, desire-to-eat was lowest after consuming raisins (See Figure 2 below)

The study was conducted by lead researcher, G. Harvey Anderson, Ph.D., Professor of Nutritional Sciences and Physiology, Department of Nutritional Sciences, University of Toronto and co-investigated by Nick Bellissimo, Ph.D., Assistant Professor, School of Nutrition, Ryerson University and Bohdan Luhovyy, Ph.D., Assistant Professor, Department of Applied Human Nutrition, Mount Saint Vincent University.

“To our knowledge, this is the first controlled study that looks at after-school snacking and satiety among children,” said Anderson. “We found consumption of raisins as a snack prevented excessive calorie intake, increased the feeling of fullness, and thereby may help contribute to the maintenance of a healthy weight in school-age children.”

Visit www.loveyourraisins.com for further information and summaries of California Raisins’ nutrition research.

Figure 1

Raisins Result in Significantly Fewer Calories Consumed Compared to Other Snacks

Grapes: 56% higher calorie intake compared to raisins
Potato Chips: 70% higher calorie intake compared to raisins
Chocolate Chip Cookies: 108% higher calorie intake compared to raisins

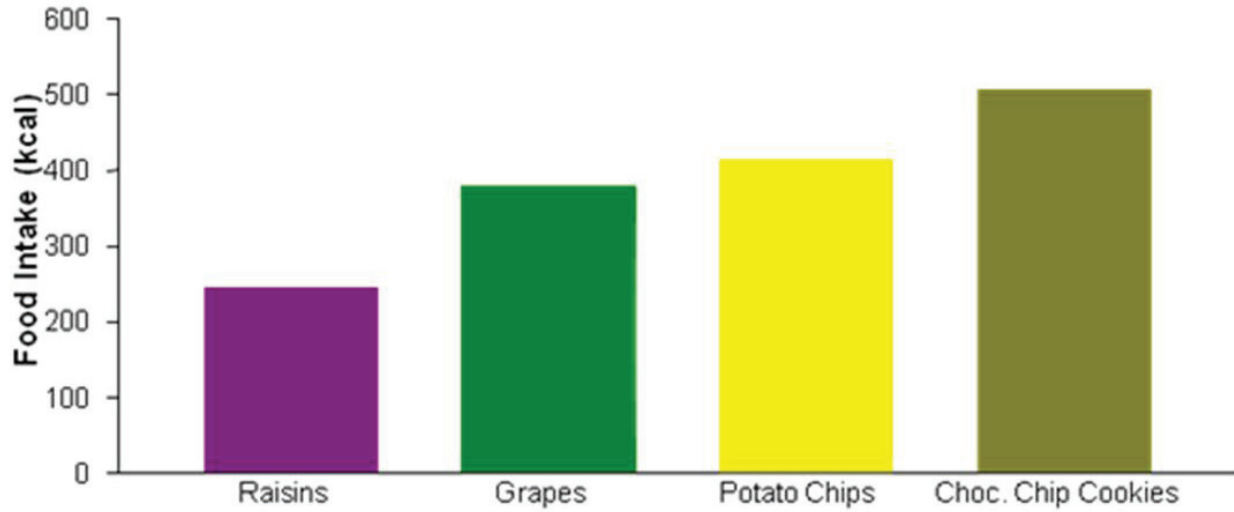
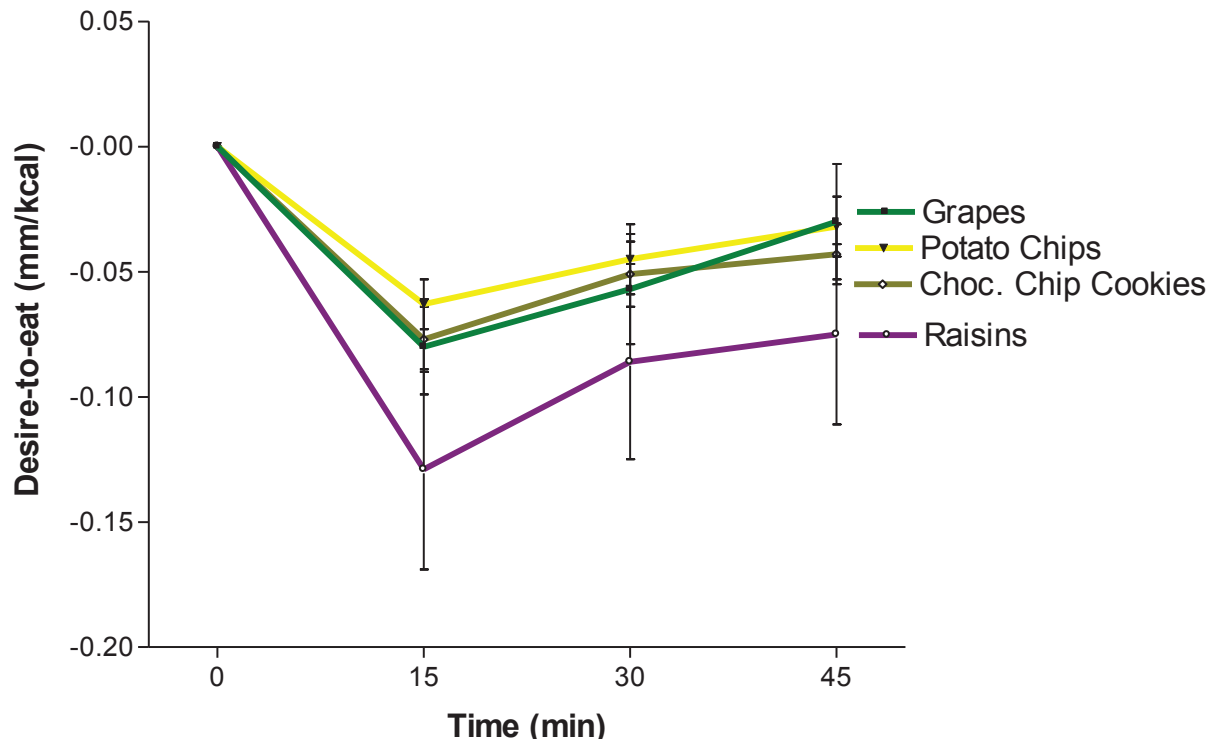


Figure 2

Compared to Other Popular Snacks, Desire-to-Eat Over Time is Lowest after Consuming Raisins



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About the California Raisin Marketing Board

A State Marketing Order in 1998 created the California Raisin Marketing Board and it is 100-percent grower funded. Its mission is to support and promote the increased use of California-grown raisins and sponsor crop production, nutrition and market research. For more information about the California Raisin Marketing Board, visit www.loveyourraisins.com.

An After-School Raisin Snack Reduces Subjective Appetite and Increases Satiety in Normal Weight Children

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Abstract

An increase in the frequency of eating occasions among school-age children is hypothesized to contribute to obesity, but this association may be confounded by the composition of the meal or snack. Therefore, it is important to identify low energy and high nutrient dense snacks that may contribute to healthier body weights by increasing satiety, controlling hunger, and reducing subsequent food intake (FI). The objective of this study was to determine the effect of an *ad libitum* after-school snack of raisins, grapes, potato chips or chocolate chip cookies on subjective appetite and FI in children. In a repeated-measures crossover design, normal weight (between the 10th-80th BMI percentile) children (n=26; 11 boys and 15 girls; age: 8-11 y) were randomly assigned to consume one of four snacks: raisins, grapes, potato chips or chocolate chip cookies until they were comfortably full within 15 min. In order to model a typical school day, children consumed a standardized breakfast (fat-free skim milk, cereal, and orange juice), morning snack (apple) and lunch (turkey sandwich and 2% milk) on test days prior to their arrival to the laboratory within 20 min of the end of the school day. FI of the *ad libitum* snacks was recorded. Subjective appetite was measured before and immediately after snack consumption, and at 15 min intervals to 45 min. Intake of raisins was significantly lower (p<0.05) compared to the other treatments. Grapes, potato chips and cookies resulted in ~56%, 70% and 108% higher energy intake compared to raisins, respectively. Cumulative energy intake (breakfast [kcal] + morning snack [kcal] + after-school snack [kcal]) was ~10%, 13% and 19% lower (p<0.05) after raisins compared to grapes, potato chips and cookies, respectively. Although all snacks reduced subjective appetite (P < 0.0001), desire-to-eat was lowest after raisins when expressed on a per kcal basis (P<0.008). In conclusion, *ad libitum* consumption of raisins as an after-school snack contributes to lower daily energy intake and subjective appetite and may promote the maintenance of healthier body weights in children.

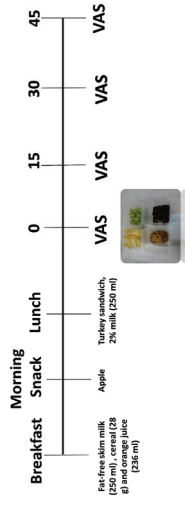
Introduction

- Children's eating patterns are important factors determining energy intake and body weight.
- Frequent snacking is often stated to contribute to overweight in children and adolescents (1).
- Low energy dense snacks (eg. fresh fruit) have more influence on satiety than dense snacks (eg. dried fruit, nuts), and therefore have greater potential to reduce energy intake (2).

Objective

- To determine the effect of an *ad libitum* after-school snack of raisins, grapes, potato chips or chocolate chip cookies on subjective appetite and FI in children.

Study Design



At time 0, 15, 30, 45 min subjective appetite measured using visual analogue scales (VAS).

Results

Table 1. Subject characteristics

All Subjects	
Age (y)	10.1 ± 0.2
Body Weight (kg)	33.1 ± 1.0
Height (m)	1.39 ± 0.01
BMI (kg/m ²)	17.0 ± 0.3
BMI percentile	51.9 ± 5.3
Fat mass (kg)*	7.4 ± 0.5
Fat mass (%)*	22.0 ± 1.2
Fat-free mass (kg)	25.7 ± 0.7
Fat-free mass (%)	78.0 ± 1.2

Data are presented as mean SEM; n = 26.
*Fat-mass determined from the sum of skinfold measurements at four points.

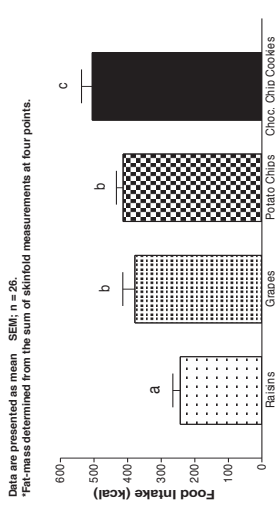


Figure 1. *Ad libitum* food intake (kcal) of test snacks within 15-min in 8-11 y old children. Means with different letters differ, p < 0.05 (Tukey), n=26

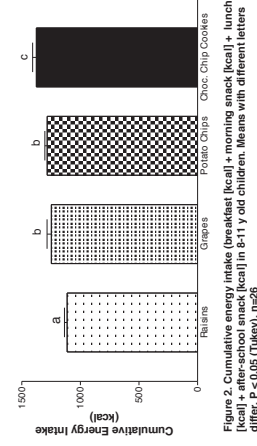


Figure 2. Cumulative energy intake (breakfast [kcal] + morning snack [kcal] + lunch [kcal] + after-school snack [kcal]) in 8-11 y old children. Means with different letters differ, P < 0.05 (Tukey), n=26

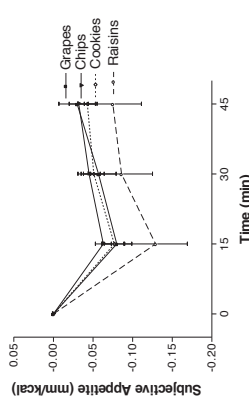


Figure 5. Desire-to-eat (mm/kcal) was affected by treatment (p < 0.008) and time (p < 0.001) in 8-11 y old children, n = 26.

Discussion / Conclusion

- Ad libitum* snack consumption was lower, and satiety greater, after raisins.
- Cumulative energy intake was lowest after raisins compared to grapes, potato chips or chocolate chips cookies.
- Water intake was reduced after grapes due to its greater moisture content.
- Motivation-to-eat was decreased after all treatments, but raisins decreased desire-to-eat on a per kcal basis to a greater extent than other snacks.
- In conclusion, *ad libitum* consumption of raisins as an after-school snack contributes to lower daily energy intake and subjective appetite and may promote the maintenance of healthier body weights in children.

References

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- Rolis BJ, Eilo-Martin JA, Tohill BC 2004 What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev* 62:1-17

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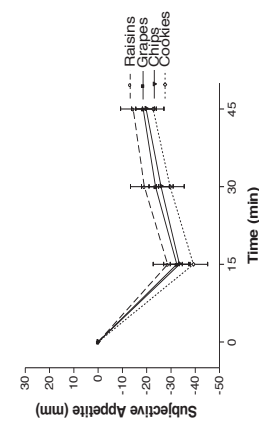


Figure 4. Changes from baseline average appetite was not affected by treatment (p = 0.17) but time (p < 0.001) was a factor in 8-11 y old children, n=26

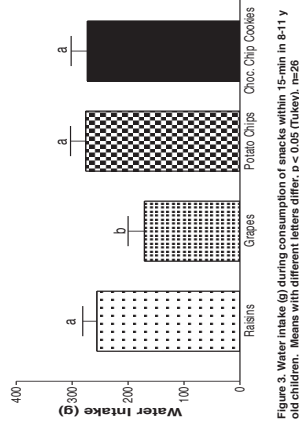


Figure 3. Water intake (g) during consumption of snacks within 15-min in 8-11 y old children. Means with different letters differ, p < 0.05 (Tukey), n=26