Candy Consumption Patterns, Effects on Health, and Behavioral Strategies to Promote Moderation: Summary Report of a Roundtable Discussion[1,2]

Roberta L Duyff,[3]* Leann L Birch,[4] Carol Byrd-Bredbenner,[5] Susan L Johnson,[6] Richard D Mattes,[7] Mary M Murphy,[8] Theresa A Nicklas,[9] Brandi Y Rollins,[10] and Brian Wansink[11]

[3]Duyff Associates, St. Louis, MO; [4]University of Georgia, Athens, GA; [5]Rutgers University, Piscataway Township, NJ; [6]University of Colorado, Denver, CO; [7]Purdue University, West Lafayette, IN; [8]Exponent, Inc., Washington, DC; [9]Baylor College of Medicine, Houston, TX; [10]Pennsylvania State University, State College, PA; and [11]Cornell University, Ithaca, NY

ABSTRACT

Nearly all Americans (97%) report eating candy at least once per year; yet, on a given day, only approximately one-fourth of the US population aged ≥2 y consumes candy. Among all Americans, candy contributes a relatively small proportion of calories, added sugars, and saturated fat to the total diet, and recent research suggests that current levels of candy consumption are not associated with risk of weight gain and cardiovascular disease in children and adults. Providing guidance for the consumption of candy in moderation requires an understanding of various behavioral health-related factors that influence candy consumption. A roundtable of behavioral nutrition experts, researchers, and nutrition educators met to discuss recent data on intakes of candy, health outcomes associated with usual candy intake, and the impact of behavioral strategies, including restriction, education, and environmental awareness, on modifying eating behaviors to achieve moderate intakes of candy. Restricting access to palatable foods, whether self-imposed or by parental control, may have potentially negative consequences. Techniques and insight into how to adopt "moderation" in candy consumption, from effective parental practices to environmental strategies that facilitate behavior change without a high degree of effort, were identified as important next steps toward sustainable dietary guidance related to the role of candy and other treats in a healthy lifestyle. *Adv Nutr* 2015;6:139S–146S.

Keywords: candy, confections, chocolate, moderation, restriction, behavioral nutrition

Introduction

Candy has played an important role in cultural traditions and celebrations for thousands of years and continues to be enjoyed by most people as an occasional treat. Frequency data indicate that 97% of Americans report candy consumption at least once per year (1). Behavioral nutrition research strategies provide insight into how individuals can enjoy treats, such as candy, in moderation in the context of an overall healthful eating plan. Evidence suggests that moderation through portion control may be more effective than elimination or restriction of a highly palatable food in relation to weight management and improved dietary health (2–6). A definition of moderation proposed for candy intake is an amount equivalent of up to an average of 50–100 kcal/d for adults, to fit within a range of energy needs when nutrient-dense foods are chosen first (1). This amount of candy is equivalent to 20–30% of the maximum daily allowance for solid fats and added sugars in diets, ranging from 1800 to 3000 kcal/d.

Behavioral nutrition, which can be described as the study of how the mind and body interact to influence what, when, and how much people eat, has received increasing attention over the past decade. This includes understanding how environmental, psychosocial, demographic (e.g., education, age, gender), and cultural factors affect eating behaviors. Behavior change and its role in improving food intake can have a significant impact on the health of consumers (7, 8). The 2015 Dietary Guidelines Advisory Committee, Subcommittee 3 on Diet and Physical Activity Behavior Change, evaluated research that assessed behavioral strategies for improving overall diet and health outcomes, such as body weight and risk factors for specific diseases, to build on

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* To whom correspondence should be addressed. E-mail: rduyff@duyff.com.

advice for behavioral strategies noted in the 2010 *Dietary Guidelines for Americans* (9). For example, MyPlate tips derived from the 2010 *Dietary Guidelines for Americans* include advice recognizing that it is not necessary to eliminate small treats, such as candy, and provide behavioral strategies for consuming small portions (10).

Recent research examining the role and contributions of candy in the diet and its possible effects on biomarkers of health challenges the view that candy may be associated with increasing rates of obesity and health risks. A panel of experts in behavioral nutrition, nutrition science, and nutrition education engaged in a facilitated roundtable discussion to examine links between usual intake of candy and health outcomes; factors affecting candy intake, including potential negative consequences of restriction; and effective strategies for promoting moderate consumption of candy. The discussion also identified gaps in the existing research, as well as future research and education opportunities in the area of behavioral nutrition.

Candy Consumption in the United States

Nationwide food consumption data from What We Eat in America (WWEIA), the dietary recall component of NHANES 2007–2008 and 2009–2010, were used to estimate proportions of the US population reporting intake of candy, average intakes of candy, and per capita contributions of candy to intakes of energy, total fat, saturated fat, and sugars (total and added) (11–14). Candy containing chocolate and candy not containing chocolate (excluding chewing gum) were identified by using the corresponding WWEIA categories (15). Estimates were based on consumption of candy reported on the first day of the NHANES dietary recall and were generated for the population of all Americans aged ≥2 y, 2–18 y, and ≥19 y.

Results show that 26% of Americans aged ≥2 y consumed candy on a given day; among youth aged 2–18 y, 31% reported consuming candy on a given day (**Table 1**). On a day of candy consumption, candy consumers reported eating, on average, ~40 g of candy (176 kcal) (data not shown). Per capita candy intake, which includes both candy consumers and nonconsumers, represents typical candy intake on a given day across the total population. Per capita candy intake of all Americans was 10 g/d (Table 1), which is not significantly different from the per capita intake of 10.3 g/d in WWEIA, NHANES 2003–2006, indicating that candy intake has remained stable. On the basis of the most recent data, per capita contributions of candy to total energy intakes represented 2.2% of total calories, or 45.2 kcal, for the US population aged ≥2 y (**Table 2**). Candy contributed 2.1% (1.6 g) and 3.2% (0.8 g) to total fat and saturated fat intakes, respectively; 4.7% (5.7 g) to total sugars intake; and 6.4% (5 g) to added sugars intake.

Previous national survey data (WWEIA, NHANES 2003–2006) that included a 12-mo FFQ showed that nearly all Americans aged ≥2 y (97%) reported consuming candy over a period of 1 y (1). This equates to 0.38 eating occasions/d, which is equivalent to ~2.7 eating occasions/wk, or intake once every 2–3 d (14). Per capita intake and frequency data suggest that candy intake by the typical American is consistent with the proposed definition of moderate candy consumption (1).

TABLE 1 Percentage of consumers of candy and per capita intake of candy among Americans aged ≥2 y, WWEIA, NHANES 2007–2010[1]

	Age group		
	All ≥ 2 y (*n* = 17,571)	Children 2–18 y (*n* = 6090)	Adults ≥19 y (*n* = 11,481)
Candy consumers, %			
Candy containing chocolate	15.0 ± 0.6	13.2 ± 0.8	15.6 ± 0.6
Candy not containing chocolate	12.6 ± 0.5	21.3 ± 0.6	9.8 ± 0.5
Total candy	25.6 ± 0.8	31.3 ± 0.9	23.8 ± 0.9
Per capita candy intake, g/d			
Candy containing chocolate	5.7 ± 0.4	4.7 ± 0.4	6.1 ± 0.3
Candy not containing chocolate	4.3 ± 0.3	7.2 ± 0.4	3.4 ± 0.3
Total candy	10.0 ± 0.5	11.9 ± 0.4	9.4 ± 0.6

[1] Values are population-weighted proportions or means ± SEs. Data are from references 11 and 12. Day 1 dietary recalls were from individuals ≥2 y of age, excluding breast-feeding children. Candy categories (candy containing chocolate, candy not containing chocolate) are as defined in the What We Eat in America food categories (reference 13); chewing gum was excluded from this analysis. The sum of values for candy containing chocolate and candy not containing chocolate may not equal values for total candy due to rounding.

Candy Consumption and Health Effects

Consuming a modest amount of some types of candy, such as cocoa, dark chocolate, and chewing gum, has been associated with positive effects on weight and cardiovascular health (15). In recent years, several epidemiologic studies (cross-sectional and one longitudinal) and one pilot study investigated the potential effects of candy consumption on health risk factors in children and adults, including body weight and markers of disease risk such as blood cholesterol, blood pressure, and blood glucose (16–18). These studies questioned the view that candy consumption may be associated with weight gain and cardiovascular risk.

A study in >15,000 US adults found a modest increase in energy, added sugar, and saturated fat intake associated with candy intake on the days it was consumed, but total candy intake was not associated with increased weight or BMI, cardiovascular risk factors, or risk of metabolic syndrome (17). A similar study in >11,000 children and adolescents ages 2–18 y found slightly higher intakes of total energy and added sugars in the candy consumers eating chocolate and nonchocolate candy and higher total and saturated fat intakes in those eating chocolate candy. However, candy consumers (chocolate or nonchocolate) were less likely to be overweight or obese than those who did not consume candy on the day of the recall, and no associations existed between candy consumption and cardiovascular risk factors (16). Parallel results were reported in a recent study in which medium to high intakes of candy, on the basis of tertile cutoffs

TABLE 2 Per capita contributions of candy to total energy, fat, and sugar intakes among Americans aged ≥2 y, WWEIA, NHANES 2007–2010[1]

	Age group		
	All ≥2 y (*n* = 17,571)	Children 2–18 y (*n* = 6090)	Adults ≥19 y (*n* = 11,481)
Total energy intake, kcal/d	2075 ± 13.8	1907 ± 17.7	2128 ± 16.9
Energy intake from candy kcal/d	45.2 ± 2.1	51.6 ± 2.0	43.2 ± 2.4
Energy intake from candy, %	2.2 ± 0.1	2.7 ± 0.1	2.0 ± 0.1
Total fat intake, g/d	77.6 ± 0.7	69.9 ± 0.8	80.0 ± 0.8
Fat intake from candy g/d	1.6 ± 0.1	1.5 ± 0.1	1.7 ± 0.1
Fat intake from candy, %	2.1 ± 0.1	2.1 ± 0.1	2.1 ± 0.1
Total saturated fat intake, g/d	25.9 ± 0.3	24.5 ± 0.3	26.4 ± 0.3
Saturated fat intake from candy g/d	0.8 ± 0.0	0.8 ± 0.1	0.8 ± 0.1
Saturated fat intake from candy, %	3.2 ± 0.2	3.2 ± 0.2	3.2 ± 0.2
Total sugars intake, g/d	120 ± 1.1	127 ± 1.2	117 ± 1.4
Sugars intake from candy g/d	5.7 ± 0.3	6.7 ± 0.3	5.3 ± 0.3
Sugars intake from candy, %	4.7 ± 0.2	5.3 ± 0.2	4.5 ± 0.3
Total added sugars intake, tsp/d	18.5 ± 0.3	19.1 ± 0.3	18.3 ± 0.4
Added sugars intake from candy, tsp eq/d	1.2 ± 0.1	1.3 ± 0.1	1.1 ± 0.1
Added sugars intake from candy, %	6.4 ± 0.3	7.0 ± 0.3	6.3 ± 0.3

[1] Values are population-weighted proportions or means ± SEs. Data are from references 11 and 12. Day 1 dietary recalls were from individuals ≥2 y of age, excluding breast-feeding children. Candy categories (candy containing chocolate, candy not containing chocolate) are as defined in the What We Eat in America food categories (reference 13); chewing gum was excluded from this analysis. 1 tsp eq of added sugars = 4.2 g sugars. tsp, teaspoons; tsp eq, teaspoon equivalent.

of 11 and 10 g/d for boys and girls, respectively, at the 33rd percentile and 25 and 20 g/d, respectively, at the 66th percentile, were associated with lower BMI scores in overweight German children (18). In a recent study in ~1500 adolescents ages 12.5–17.5 y, lower levels of fatness were seen in the top tertile of chocolate consumers (median intake: 42.6 g/d) compared with those in the lower tertile of intake (median intake: 4.7 g/d); these findings also were seen after excluding obese subjects from the analysis (19).

Conflicting results indicate that eating patterns including candy were associated with increased likelihood of weight gain in adults (20–22) and children (23) in cross-sectional studies. However, candy was categorized with other "sweets," such as desserts, sweetened beverages, or sugars, which limits the conclusions specific to candy. Other studies showed that increased consumption of sweets has no relation or an inverse relation with body weight or weight gain (24, 25).

Several cross-sectional studies examined the frequency of candy intake on health measures. One study in nearly 6000 adults found that increased frequency of candy consumption was associated with higher energy intakes but not with objective measures of obesity or select cardiovascular risk factors (26). In addition, no associations with measures of body weight status or cardiovascular risk factors were found in a post hoc analysis of the 8% of adults reporting candy intake more than once per day (26). Another study in >1000 adults without cardiovascular disease or diabetes that examined frequency and quantity of chocolate intake found, after adjusting for energy intake, physical activity, and other potential confounders, that adults consuming chocolate more frequently had a lower BMI than did those who consumed chocolate less often (27). Thus, cross-sectional research evidence challenges the view that candy consumption in children and adults is associated with risk of cardiovascular disease or obesity.

Building on the evidence from cross-sectional research, results were recently reported from the first longitudinal study examining associations between consumption of candy during childhood with health endpoints in adulthood (28). Using data from the Bogalusa Heart Study, researchers followed the dietary habits, including candy consumption (chocolate, nonchocolate candy, and chewing gum), of 355 10-y-old children from 1973 to 1984 for a period of 23 y. Results indicated that there was no association between the group's candy consumption during childhood and their BMI and cardiovascular risk factors as adults, suggesting that candy consumption in childhood was not predictive of health risks later in life (28).

A pilot study in overweight and obese premenopausal women evaluated the effects of a reduced-calorie diet, which included a daily dark chocolate snack or a nonchocolate candy snack, on body weight and body composition measures (3). Both groups experienced decreases in body weight, hip and waist circumference, fat mass, and body fat percentage, suggesting that improvements in body weight and body composition can be achieved with a reduced-calorie diet, even when a daily candy treat is included.

Chocolate and cocoa. The 2010 Dietary Guidelines Advisory Committee concluded that "moderate evidence suggests that modest consumption of dark chocolate or cocoa is associated with health benefits" (15). This conclusion was based on a review of a significant body of published research studying the effects of cocoa on cardiovascular function and health.

Observational and intervention studies have indicated that modest amounts of cocoa and chocolate are associated with a range of positive effects on cardiovascular health (29–42). Clinical trials have confirmed short-term cardiovascular effects from consumption of products rich in cocoa flavanols (43–45). Meta-analyses of intervention studies found

consistent short- and long-term improvements in insulin resistance (46), lipid profiles (47), vascular dilation (48), and multiple risk factors (49) associated with chocolate and cocoa consumption. In 2013, the European Food Safety Authority finalized approval of a claim that "cocoa flavanols help maintain endothelium-dependent vasodilation, which contributes to healthy blood flow" (50).

The effects of cocoa flavanols on improved blood flow, including to the brain, may also influence cognitive function and mood. Preliminary research suggests that regular consumption of dietary cocoa flavanols may improve cognitive function in elderly subjects with early cognitive decline, an effect believed to be mediated in part by an improvement in insulin sensitivity (51). Additional research suggests an association between cocoa flavanols and cognitive performance, including improvements in visual function and mood (52, 53). Furthermore, emerging evidence indicates that candy consumption overall may influence feelings of well-being, improve mood, reduce anxiety, and increase longevity (54–57).

Chewing gum. Chewing sugar-free gum stimulates saliva, which helps to neutralize plaque acids; increase clearance of sugars, acids, and food debris; and re-mineralize tooth enamel (58). Systematic reviews of clinical and observational studies confirmed the effects of sugar-free gum on cavity reduction (59, 60), supporting the American Dental Association's approval of sugar-free chewing gum as part of normal oral hygiene after meals. The effect of chewing gum on hunger and cravings has been studied with mixed results. Some studies suggest that chewing gum before snacking may reduce hunger, possibly leading to decreased calorie intake from snacks (61, 62). Recent experimental research found no evidence that acute or chronic gum chewing reduced hunger or energy intake (63, 64). Emerging evidence suggests that chewing gum may be associated with improved attention and alertness (65–68).

Factors Influencing Candy Consumption Behavior

Role of external factors. A substantial body of evidence demonstrates that external factors, including a food's visibility, proximity, serving container, and package size, influence estimated and actual amounts of food consumed (69–72). These environmental factors are known to affect consumption norms, or the amount of food considered to be reasonable, normal, typical, and appropriate to consume (70). The trend toward larger sizes of packaged foods and drinks, restaurant portions, and serving plates and utensils likely is influencing the greater amounts of foods that consumers believe are appropriate to eat (73–75).

External factors may make the amount of food consumed difficult to monitor and blunt the ability to recognize satiety (70). For example, an empty plate, bowl, or food package is a common visual cue for recognizing when to stop eating; however, relying on this type of cue has been shown to result in greater food intake because it tends to lessen the reliance on self-monitoring (76, 77). Several studies demonstrated the effects of a larger package and portion size on increased total energy intake with a variety of foods (78–82), whereas reductions in portion or package size led to sustained decreases in energy intake (83, 84). The size of the unit of food or package tends to set a consumption norm for consumers as an appropriate amount to consume at one time (85), with potential for an impact on the amount of food consumed (86). The introduction of 100-calorie packaging has been shown to help reduce energy intake, most notably in those who are overweight (84). Preportioned packaging not only provides a reference point for evaluating the nutrient content of a food but also serves as a marker for an appropriate amount of food to consume in one sitting.

A food's visibility and proximity also can serve as a cue for eating and may affect the amount of food consumed. This was explored in a study in which a closed container of chocolates was placed in varying locations in an office setting and amounts of candy consumed were monitored (87, 88). Visibility and proximity of chocolates significantly contributed to how much was consumed, with closer proximity having a greater effect than visibility.

Potential consequences of restriction. Restricting access to palatable foods, whether self-imposed or by parental control, is a practice with potentially negative consequences, including heightened desire for restricted foods and a tendency for subsequent overeating when restrictions are removed (5, 89). Restriction typically involves limiting or eliminating foods that provide enjoyment but are viewed as unhealthy. Applied to children, restriction refers to coercive practices that parents use to limit children's access to palatable, energy-dense, or low-nutrient foods, which may include when, how often, or how much can be consumed. There is limited research on the specific effects of candy restriction and effective strategies for promoting moderate intakes of candy; thus, the results of existing research may be extended to a variety of palatable foods, such as candy, until further research is available.

Evidence shows that restriction of desirable foods such as candy may be counterproductive, particularly in children. Restriction tends to focus children's attention on the restricted foods, increases their desire to obtain the food, and results in higher intake of the restricted food when it becomes available to eat (90–93). Longitudinal studies extended the findings from experimental research, revealing that restrictive feeding practices may diminish children's ability to self-regulate food intake, with subsequent increased risk of overeating and weight gain (94–96). Although fewer studies have been conducted in adults, an increased desire for restricted foods was reported (97, 98).

The possibility that some children may be more susceptible to negative effects of restriction has been explored. A recent study of the effects of restriction on preschool children's intake found that those with low inhibitory control, or the ability to stop a dominant response, and high levels of motivation to obtain access to food had greater increases

in intakes in response to restriction (93). Other studies extended these findings, suggesting that children with lower inhibitory control may be less able to control their intake of a forbidden food when it is made available, putting them at a greater risk of the potential negative effects of restriction, including eating in the absence of hunger and excess weight gain (96, 99). A review of the research on child feeding practices found that restriction of children's eating was frequently and consistently associated with excess weight (100). In adults, individuals who chronically restrict food intake to avoid weight gain were more susceptible to preoccupation with restricted foods and subsequent weight fluctuations (101).

Strategies to Promote Healthy Food Consumption Behaviors

Although data are lacking to indicate adverse health effects associated with typical intakes of candy, those who consume candy in greater amounts need ways to moderate their intake in the context of an overall healthful eating pattern. Research suggests that awareness alone may not improve or eliminate the effects of environmental factors on food intake (70). Existing evidence on the impact of parenting on the development of self-regulation in children suggests several promising approaches that parents and caregivers could use to promote self-regulation and healthy consumption behaviors. However, research is needed to determine whether these approaches are effective in promoting children's ability to achieve moderation in intake of foods such as candy.

Education and structure-based strategies. Educating parents and caregivers on alternatives to restriction could have important implications in reducing overeating and obesity risk. Structure-based or limit-setting strategies, such as limiting how often certain foods are brought into the home and serving small portions, without forbidden access to these foods, provide children with opportunities to develop self-regulation and autonomy in eating behaviors (96). Making temptations available while providing limits or guidelines for moderation, such as for candy, may help to support goal-directed behavior that helps children develop self-regulation skills for balancing food choices to include occasional treats while maintaining energy balance (4).

Structuring the environment to encourage food options in appropriate amounts at predictable times can be a positive, covert form of control that promotes moderation. There is some evidence to suggest that structure-based feeding strategies that are practiced in the absence of restriction may be protective against overeating and excess weight gain (96). Removing the emphasis on restriction and teaching self-regulation skills for including moderate amounts of occasional treats reinforce a long-term behavioral strategy (1). Promoting self-regulation of food intake among children and adults and fostering the development of self-control offer clear advantages over the use of external control, including practices that forbid or eliminate desirable foods such as candy. However, approaches for promoting moderate intakes of palatable foods must be tailored to a child's temperament, particularly to individual differences in their self-regulation tendencies (93).

External environmental control strategies. Effective external environmental control strategies that create positive behavior changes by default, requiring less conscious effort, include using smaller bowls and plates, making tempting foods less visible, and selecting preportioned food packages to reinforce smaller consumption norms (70, 102). Innovations in food packaging may help to increase awareness and reduce amounts of food consumed. For example, resealable packages allow multiserving foods to be saved for later. Interrupters in packaging, such as individually wrapped portions or markers that separate portions, can help serve as distracters that may help increase awareness of the amount of food consumed. Packaging innovations and increased attention to calorie labeling, such as front-of-pack labeling, are potential strategies that warrant further investigation.

Internal cue control strategies. Research suggests that certain strategies may be effective in influencing internal factors and eating behaviors. A recent study examined the effects of varying portion sizes on measures of overall hunger and craving before a taste test of snack foods, immediately after, and 15 min after completing several "distracting" tasks (103). Results indicated that smaller snack portions were equally effective as larger portions in decreasing hunger and cravings and resulted in significantly fewer calories consumed. This suggests that just a few bites may be enough to satisfy hunger and desire (103). Researchers indicated that further study is needed to determine whether individuals will compensate by adjusting how much they eat later in the day.

Another recent study explored how positive and negative moods may influence preferences for indulgent and healthy foods (104). A negative mood predicted a preference for indulgent foods, whereas individuals in a positive mood preferred healthy foods over indulgent foods. Although a negative mood put more focus on immediate concerns and the affective taste and sensory experience of foods, a positive mood emphasized long-term, higher-level benefits of food choices, such as health and well-being. This research suggests that attempts to improve mood, such as listening to music or talking with friends, may be effective in improving food intake (104).

Future Directions and Recommendations

Participants in the roundtable discussed research gaps and educational needs related to candy consumption and identified several key recommendations. Further research is needed to characterize the overall diets of candy consumers, including subpopulations such as ethnic groups, pregnant women, and older adults. Although candy consumption is associated with an incremental increase in total energy, sugars, and fat intake, evidence suggests that it is not associated

with adverse health effects (16–18, 26–28). More research is needed to better understand how candy consumers may balance consumption of candy with other food and lifestyle choices. Further study of candy eating behaviors, including frequency and amounts consumed, can provide insight into when and why consumers eat candy. More longitudinal studies are needed to examine the relation between candy consumption and health outcomes, including body weight, cardiovascular disease, diabetes, and dental caries.

A greater understanding of eating patterns, factors affecting food choices and consumption, and related lifestyle choices of candy consumers may help identify effective behavioral strategies for incorporating treats in a way that supports health, cultural practices, and food preferences. Practical and realistic strategies are needed to help consumers improve their awareness of eating behaviors so they can learn to moderate their food choices and incorporate favorite foods, such as candy, in their daily diets. Strategies that incorporate mindfulness, or the awareness of hunger and satiety signals, may be a promising approach for managing intake of special treats, such as candy, and warrant further exploration (105, 106). The use of a proposed definition of moderate intake of candy offers a starting point for providing practical advice on sensible intakes of candy in the context of an overall healthful diet (1).

Education on structure-based strategies may help parents and caregivers learn how to promote moderation in a positive way while helping children develop and implement intake regulation skills for dealing with highly palatable foods in the context of a healthful diet. Furthermore, ongoing research suggests that small but meaningful strategies may allow consumers to improve their eating behaviors with less conscious effort and without feelings of deprivation. Preportioned packaging is one example of an approach that can help establish a more sensible consumption norm, allowing consumers to control their food intake. Continued research and innovation are needed to determine effective educational and environmental strategies to encourage positive changes in eating habits to achieve moderation for occasional treats such as candy.

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