

# Advertising Influences Food Choices of University Students With ADHD

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Shirley Hershko<sup>1</sup> , Samuel Cortese<sup>2</sup> , Eyal Ert<sup>1</sup>, Anna Aronis<sup>1</sup>, Adina Maeir<sup>1,3</sup>, and Yehuda Pollak<sup>1</sup> 

## Abstract

**Objective:** Previous research in adults with ADHD showed high rates of obesity and unhealthy food choices. There is evidence that contextual cues, for example, advertisements, influence food choices. This study assessed the sensitivity of university students with ADHD to advertised food. **Method:** University students ( $N = 457$ ) with and without ADHD participated in a cafeteria field experiment. Food choices were examined in periods of advertising either healthy or unhealthy sandwiches. **Results:** Students with ADHD (a) chose less healthy food items, (b) were more influenced by advertising, (c) showed the same overall healthy food choices as controls when exposed to healthy advertising. **Conclusion:** Students with ADHD chose unhealthier foods at the cafeteria but were also more influenced by advertising. Healthy food advertisements raised their healthy food choices. As this population has strong association with unhealthy dietary patterns, it is important to investigate the influence of food cues on their eating habits. (*J. of Att. Dis.* XXXX; XX(X) XX-XX)

## Keywords

ADHD, food, choices, advertising, students

## Introduction

Attention deficit/hyperactivity disorder (ADHD) is the most prevalent neurodevelopmental condition, characterized by a persistent pattern of inattentive, and/or hyperactive/impulsive behaviors, leading to functional impairment (American Psychiatric Association, 2013; Faraone et al., 2015). The disorder's prevalence has been estimated at around 5.3% to 7.2% of school-aged children (Polanczyk, Willcutt, Salum, Kieling, & Rohde, 2014; Thomas, Sanders, Doust, Beller, & Glasziou, 2015) and about 2.5% of adults (Simon, Czobor, Balint, Meszaros, & Bitter, 2009) worldwide.

Decades of research consistently report strong links between ADHD and adverse life outcomes (Asherson, Buitelaar, Faraone, & Rohde, 2016; Faraone et al., 2015; Thapar & Cooper, 2016). Whereas cognitive and emotional problems are well documented in ADHD (Nigg, 2013), only in recent years was attention devoted to health impairments, such as sleep difficulties, physical injuries, hypertension, and obesity (Nigg, 2013; Spencer, Faraone, Tarko, McDermott, & Biederman, 2014). In regard, more specifically, to obesity, two recent meta analyses have shown that individuals with ADHD have significantly higher body mass index (BMI) and a higher prevalence of obesity than controls, especially in adults. The pooled prevalence of obesity was increased by about 70% in adults with ADHD and 40% in children with ADHD compared with subjects without ADHD (Cortese et al., 2016; Nigg et al., 2016). Studies show that individuals

with ADHD are 3.8 times more likely to suffer from eating disorders, especially from binge eating (Nazar et al., 2016). Excessive weight is a major risk factor for a range of preventable diseases, such as cardiovascular disease, cancer, osteoarthritis, and diabetes (World Health Organization. Office of Health Communications and Public Relations, 2006). The association between ADHD and obesity is pertinent from a clinical and public health standpoint as enormous personal, family, and social burden is associated with both obesity and ADHD (Cortese & Vincenzi, 2011).

Several studies have suggested that unhealthy dietary patterns related to ADHD may be one of the contributing factors increasing the risk of obesity in ADHD (Cortese & Vincenzi, 2012; Nigg, 2013). For instance, it has been reported that Australian adolescents with ADHD consumed foods with less nutrient density and more total fat (Howard et al., 2011); Iranian children with ADHD adhered more often to the sweet- and fast-food diet (Azadbakht & Esmailzadeh, 2012); and Korean children with higher odds of having ADHD endorsed the traditional Western pattern

<sup>1</sup>The Hebrew University of Jerusalem, Israel

<sup>2</sup>University of Southampton, UK

<sup>3</sup>Hadassah Medical Center, Jerusalem, Israel

## Corresponding Author:

Shirley Hershko, The Seymour Fox School of Education, The Hebrew University of Jerusalem, Jerusalem 9190501, Israel.

Email: shirleyhershko@gmail.com

(Woo, Shin, & Kim, 2014) more often compared with controls. Furthermore, a large sample study revealed significant associations between ADHD and both the number of overeating episodes and unhealthy food consumption in children (Kim et al., 2014). Ríos-Hernández, Alda, Farran-Codina, Ferreira-García, and Izquierdo-Pulido (2017) showed that children and adolescents with ADHD demonstrated reduced intake of vegetables and fruits, and increased intake of sugar, candies, soft drinks, and fast food. More recently, Chou et al. (2018) have found that children with ADHD consumed lower proportions of dairy, calcium, and vitamin B-2. In another recent study, Hershko, Aronis, Maier, and Pollak (2018) found that university students with ADHD reported eating similar amounts of calories and food servings to controls, yet the composition of those calories included more unhealthy food for the ADHD group. The unhealthy eating patterns described in these studies are likely to increase the risk of obesity and other related diseases, urging the development of preventive interventions.

The dramatic increase in obesity rates suggests that there have been environmental changes that may affect this trend. Examples include the increased accessibility of foods, the increase in portion sizes, the decline in the relative price of food, and the improvement in marketing and advertising (Cohen, 2008). In the same manner, it has been found that environmental factors can influence food choices (Wansink, Cheney, & Chan, 2003). An effective intervention for changing food choices involved making healthy choices more convenient (to see, pick up and consume) and more attractive (beautiful package, outstanding label, or good price) (Wansink, 2015). For example, children ate 70% more apples when they were sliced than when they were served as a whole (Wansink, Just, Hanks, & Smith, 2013), and placing the apples near a cash register increased their sales by 35% (van Kleef, Otten, & van Trijp, 2012). People respond both consciously and unconsciously to such environmental cues while they are making food choices (Wilson, Buckley, Buckley, & Bogomolova, 2016). For instance, putting fruit in a nice bowl led children to take more of it, and putting garnish near a sandwich made people rate the sandwich as tastier even though the garnish was not consumed (Hanks, Just, Smith, & Wansink, 2012).

To our knowledge, the effect of these contextual cues has never been specifically assessed with people with ADHD. Given the well established alterations in reward sensitivity in ADHD (Luman, Tripp, & Scheres, 2010), the specific response to contextual cues found in individuals with ADHD may differ from those reported in people without this condition. To fill this gap, the current study was designed to examine whether adults with ADHD are sensitive to contextual food cues while making actual food choices in real-life situations. We hypothesized that they would be more sensitive to the contextual food cues than the controls.

## Method

### Participants

Five hundred and fifty-three university students were screened at the cafeteria, of whom 126 bought exclusively coffee. Therefore, the analyses of food choices focused on 427 participants that arrived at the cafeteria to buy meals (172 males, 255 females; 234 controls, 193 diagnosed with ADHD, of whom 54 reported using ADHD-related medications).

### Diagnostic Assessment

ADHD diagnosis was affirmed by asking the students to report if they were recognized by the university authorities as having ADHD (they were diagnosed before the current study was conducted). To endorse this recognition, students have to go through a two-step procedure. First, they are diagnosed for ADHD at the diagnostic center of the Hebrew University of Jerusalem. The diagnostic center uses the “MATAL” system (an acronym in the Hebrew language standing for “system for learning functions”). This system comprised of standard tests and questionnaires developed for diagnosing learning disabilities—dyslexia, dyscalculia, and dysgraphia—and assessing the likelihood of ADHD in adults. “MATAL” was developed by the Israeli National Center for Testing and Evaluation with the assistance of learning disability experts. The “MATAL” was validated on a large-scale sample of students with various learning disabilities and ADHD, and national performance norms were collected for all tools (Ben-Simon, Beyth-Marom, Inbar-Weiss, & Cohen, 2008). With regard to ADHD, the “MATAL” includes a background interview collecting of systematic information, two questionnaires and computerized attention tests. The likelihood of the diagnosis of ADHD is established by a trained diagnostician based on these measures. Second, the students undergo a follow-up evaluation that includes a clinical interview by a neurologist or psychiatrist. This follow-up is aimed to confirm the diagnosis of ADHD and to assess for comorbid disorders according to the *Diagnostic and statistical manual of mental disorders* (5th ed.; *DSM-5*) criteria.

The control group included participants who reported that they had never been diagnosed with ADHD, and their adult ADHD self-report scale (ASRS) scores were below the screening cutoff.

### Setting

The study took place during the morning (8 a.m.-11 a.m.) at a university cafeteria. The cafeteria offers a variety of foods (e.g., salmon and antipasti sandwiches, pastries, and salads) and beverages (e.g., coffee, soft drinks, and bottled water).

Based on the World Health Organization Regional Office for Europe (2006) guidelines and a consultation with a nutritionist the foods were categorized to healthy items (e.g., salad, egg sandwich) and unhealthy items (e.g., pastry, high-fat cream-cheese sandwich).

The experiment included three conditions, each taking place in eight different days: (a) No advertising: no manipulation was conducted; (b) Healthy advertising: a healthy sandwich (with eggs and vegetables) was advertised and located at customer's eye level; (c) Unhealthy advertising: a unhealthy sandwich (with high-fat cream-cheese) was advertised and located at customer's eye level. Both advertisements highlighted the benefits of eating that sandwich ("the sandwiches are perfect for busy mornings"), and that it is for sale at a reduced price. The advertisements were colorful and included a picture of the sandwich filling—eggs or popular cream-cheese brand, and a short and a catchy slogan. Notably, both the egg and the cream-cheese, as well as several other sandwiches were offered for the same reduced price during the whole period of the study. The only aspects that differentiated the sandwiches on the day of manipulation were their location (at the customer's eye level) and the presence of the advertisement.

For the comparison of total healthy versus unhealthy food choices, 135 to 156 participants were observed in each of the conditions. Power analysis using G\*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that at 0.05 significance level and power of 0.8 these sample sizes should identify a small-to-moderate effect size for total healthy versus unhealthy choices of food items (Cohen's  $w = 0.22-0.24$ ). For the comparison of egg versus cheese sandwich choices, 38 to 59 participants were observed in each of the conditions. A similar power analysis revealed that these sample sizes should identify a large effect size (Cohen's  $w = 0.36-0.45$ ).

### Procedures

The study was approved by the Institutional Review Board of the Hebrew University (2018I1406). The experiment lasted for 24 days at the cafeteria of the Faculty of Agriculture, Food and Environment, of the Hebrew University of Jerusalem. Student customers at the cafeteria who bought foods or beverages were approached by a research assistant and were asked to participate in the study. The students did not know that their food choices were being scrutinized. Only after they finished purchasing, the research assistant approached and had asked them to participate in the study. Students who consented, were asked to complete the study questionnaire (fill out the ASRS questionnaire and write down whether they were recognized by the university authorities as having ADHD, what they had just bought from the cafeteria, their age, gender, and whether they use ADHD medications).

### Measures

Demographic questions were asked to elicit age, gender, and intake of medication.

The *ASRS-V1.1* (Kessler et al., 2005) was completed by the participants. It contains 18 items corresponding to the *DSM* diagnostic criteria of ADHD, of which frequency is rated from 1 (*never*) to 5 (*very often*). The questionnaire has high internal consistency ( $C\alpha = .88$ ) assessing ADHD in adults. In the present study, we used the Hebrew version of the ASRS-V1.1, which was validated by Zohar & Konfortes (2010). The internal consistency (Cronbach's  $\alpha$ ) of the ASRS in this study was .82.

### Statistical Analysis

The number of total healthy and unhealthy choices of food items from the cafeteria (e.g., salads and pastries), as well as the number of egg sandwiches and cheese sandwiches were measured as the dependent variables.

Participants with excessive missing data (>30%) were not included in the analysis. We used Chi-Square tests to examine differences between the groups. A probability level of  $p < .05$  was used to indicate statistical significance.

### Results

Five hundred and fifty-three university students with (236) and without (317) ADHD were screened at the cafeteria, of whom 126 bought only coffee. Notably, the percentage of students who bought only coffee was higher in the control group compared with the ADHD group, 26% and 18%, respectively,  $\chi^2(1) = 4.87, p < .05$ . However, no differences between groups were observed with regard to the total number of students who bought coffee, with or without a meal, 41% and 47%, respectively,  $\chi^2(1) = 2.00, p = .16$ . The analyses of food choices focused on 427 participants that arrived at the cafeteria to buy meals (172 males, 255 females; 234 controls, 193 diagnosed with ADHD, of whom 54 reported using ADHD-related medications). Medicated and not medicated students with ADHD were similar in terms of female to male ratio (a ratio of 1.4 for medicated females and a ratio of 1.6 for medicated males), age (25.6 and 25.5), and ASRS score (59.7 and 57.7). Of note, the proportion of students with ADHD among the cafeteria visitors was higher than the general proportion of ADHD among the faculty students, 43% compared with 11%, respectively,  $\chi^2(1) = 510.12, p < .001$ .

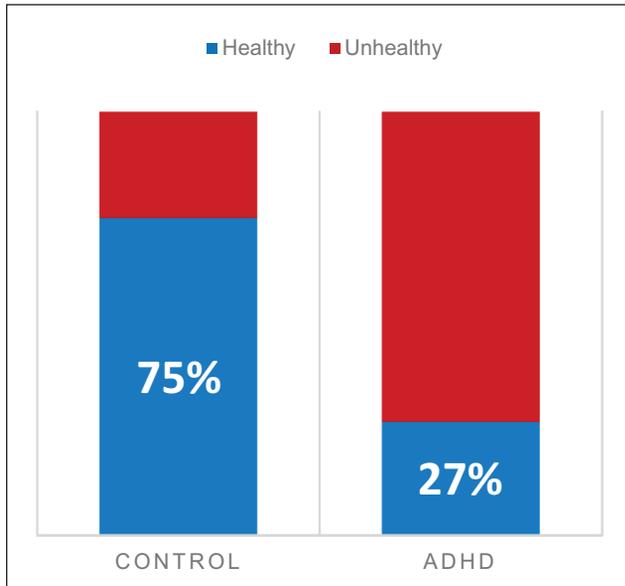
### Demographic and Clinical Characteristics

The comparison between the characteristics of the control and ADHD groups confirmed no significant differences in age and gender, that are known to affect diet patterns and

**Table 1.** Demographic and Clinical Characteristics by Diagnostic Group.

	Controls ( <i>n</i> = 234)	ADHD ( <i>n</i> = 193)	Group comparison
Age <i>M</i> ( <i>SD</i> )	25.88 (3.06)	25.46 (2.50)	$t(425) = 1.53$ ( $p = .34$ )
Gender	41% males	39% males	$\chi^2(1) = 0.12$ ( $p = .73$ )
ASRS <i>M</i> ( <i>SD</i> )	41.06 (5.88)	58.24 (6.99)	$t(210) = -19.43$ ( $p = .02$ )

Note. ASRS = adult ADHD self-report scale.

**Figure 1.** Food choices in the no advertising period.

may serve as moderators of ADHD-associated unhealthy food preferences (Cortese & Vincenzi, 2012; Dempsey, Dyehouse, & Schafer, 2011; Nigg, 2013; Nigg et al., 2016). The analysis also confirmed that the ADHD group had significantly higher ASRS scores than controls, as expected (Table 1).

### Effects of Advertising on Total Food Choices (Hypothesis Testing)

Figure 1 shows that less students with ADHD chose healthy food items (19 out of 71 participants) than controls (64 out of 85 food participants) in the “no advertising” period,  $\chi^2(1) = 36.60$ ,  $p < .001$ .

Figure 2 summarizes the effects of advertising on food choices. Advertisements did not affect food choices of the control group. However, participants with ADHD were attracted by the advertisement, regardless of the advertised item—egg or cheese sandwich,  $\chi^2(1) = 4.50$ ,  $p < .05$ , and  $\chi^2(1) = 9.81$ ,  $p < .01$ , for egg and cheese sandwiches, respectively.

Of note, in contrast to the differences between the groups during the no advertising period, no differences between the

groups were found in the period of healthy advertising. Thus, 62% of the ADHD students chose healthy items (37 out of 60 participants), compared with 70% of the control group (53 out of 76 participants),  $\chi^2(1) = .98$ ,  $p = .36$ . However, in the period of unhealthy advertising, the differences between the groups remained. Thus, 27% of the ADHD students chose healthy items (17 out of 62 participants), compared with 71% of the control group (52 out of 73 participants),  $\chi^2(1) = 25.76$ ,  $p < .001$ .

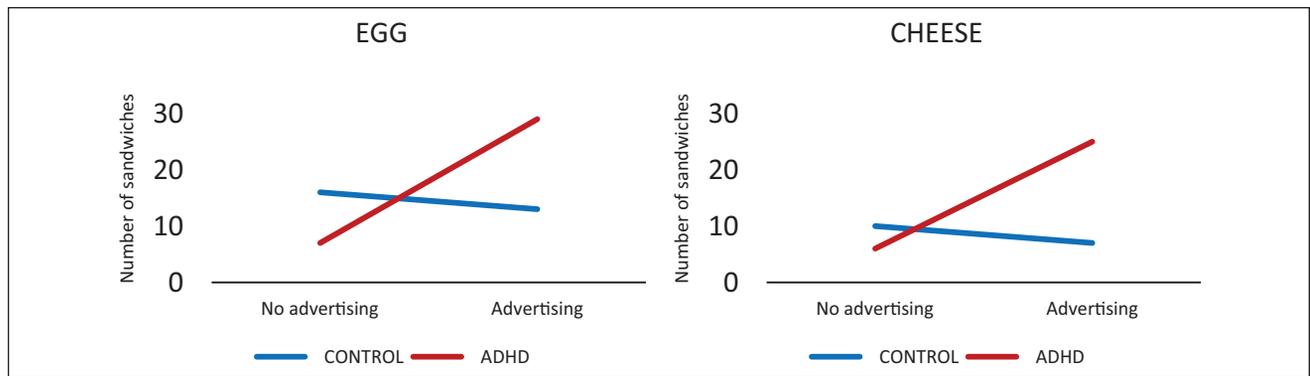
As 54 of the students reported using medications for treating ADHD, we repeated the analyses using logistic regression with medication usage (yes/no) as a covariate. The results were not substantially changed.

## Discussion

Recent studies demonstrated unhealthy dietary patterns of individuals with ADHD. The current study tested whether students with ADHD make more unhealthy food choices by direct observation, compared with non-ADHD controls, at the university cafeteria. It was found that university students with ADHD chose unhealthy food items about three times more often compared with students without ADHD. This pattern remained after excluding the subjects who reported using medications used to treat ADHD, suggesting that the different food choice pattern is not accounted for by the pharmacological treatment.

As a follow-up to previous research showing that contextual food cues (attractiveness and convenience) increase the consumption of healthy food (Wansink, 2015), the current study focused on real-life environment (cafeteria) and examined the effect of contextual food cues (advertising) on food choices of ADHD students.

We found that students with ADHD were influenced by the advertising while the control group was not affected. During the days of advertising, students with ADHD consumed more of the advertised sandwiches, compared with the days without advertising. However, the food choices of students without ADHD were unchanged. Here as well, the exclusion of the participants who reported using medications treating ADHD did not change the results. It is noteworthy to mention that while most of the previous studies reporting unhealthy diets by people with ADHD relied on self-reporting tools, the current study examined food choices of people with ADHD using a formal assessment.



**Figure 2.** The effects of the advertising on egg versus cheese sandwich choices of ADHD and control students.

The interpretation of these results may relate to the characteristics of the disorder, which makes people with ADHD more vulnerable to contextual food cues. First, contextual cues (such as sight, smell, or location), evoke an expectation that a reward will be imminently received (Reichelt, Westbrook, & Morris, 2015). Individuals with ADHD may be more sensitive to the reward (Luman et al., 2010; Tripp & Wickens, 2009), therefore, may be more sensitive to contextual cues of rewards (like advertising). Second, individuals with ADHD are more reluctant to engage in mental effort (American Psychiatric Association, 2013), which might make them more sensitive to convenience cues; they will grab the item that is more convenient to pick. Finally, it has been found that negative emotion (such as under a stressful situation) can enhance responsiveness to food cues, evoking an attentional bias (Hepworth, Mogg, Brignell, & Bradley, 2010). Among university students, ADHD symptoms correlated with self-reports of stress, depression, and anxiety (Gudjonsson, Sigurdsson, Eyjolfsson, Smari, & Young, 2009). This emotional instability can influence food choices of students with ADHD (Oliver & Wardle, 1999) and make them more sensitive to contextual cues. It is possible therefore that students with ADHD may be more sensitive to contextual cues because of their hypersensitive reward system, their reluctance to engage in mental effort and their emotional instability. These factors may also explain the high rates of students with ADHD at the cafeteria that have been found in our study (43% of the total number of visitors). The cafeteria environment includes a variety of rewarding stimuli, demanding minimal effort and emotionally satisfying, all of which may attract individuals with ADHD.

Finally, advertising one healthy sandwich raised the percentage of healthy choices of the ADHD group. This finding suggests the potential significance of changing the environment of individuals with ADHD, by highlighting healthy foods (making them more attractive and convenient to choose). This may help students with ADHD to eat healthier and may lead to a better health outcome.

The current study offers several contributions to the research on food choices of people with ADHD. First, most of the studies reporting unhealthy diets by people with ADHD relied on self-reporting measures, whereas the present study examined food choices of people with ADHD using direct assessment of what they ate. Second, previous work on the influence of food contextual cues, has been limited to healthy people (Wansink, 2015), whereas the current study extended it to the ADHD population. As this population has strong association with unhealthy dietary patterns (Cortese & Vincenzi, 2012; Nigg, 2013), it is important to continue the research of food cues and the influence on their eating habits.

This study also has several limitations. As noted, the sample was recruited from one university faculty, which enhances control over many demographic variables, but at the same time weakens the ability to generalize the conclusions to other populations. Accordingly, the groups were similar in terms of age, gender, and academic level, which implicate that the ADHD group consisted of high functioning participants who may not represent the whole ADHD population. Another limitation considers the contextual cues. We do not know whether it was the attractiveness cue or the convenience cue, or both that influenced food choices, because we combined them together (we advertised and changed the location of the sandwich at the same day, to highlight the appearance of the sandwich). Therefore, future studies should examine these variables separately.

## Conclusion

We found that high rates of students with ADHD chose unhealthier food and that they were more influenced by contextual food cues (advertising). In addition, the contextual cues of the healthy food raised the consumption of healthy food for university students with ADHD. These findings suggest that advertising healthy foods may change food choices of individuals with ADHD and improve their eating habits.

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## ORCID iDs

Shirley Hershko  <https://orcid.org/0000-0003-2970-1129>

Samuel Cortese  <https://orcid.org/0000-0001-5877-8075>

Yehuda Pollak  <https://orcid.org/0000-0002-1293-499X>

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### Author Biographies

**Shirley Hershko** has recently completed her Ph.D. at the Seymour Fox School of Education, the Hebrew University of Jerusalem, Jerusalem, Israel. She is the manager of diagnostic and support center for students with ADHD.

**Samuele Cortese**, M.D., Ph.D., is a professor of Child and Adolescent Psychiatry at the University of Southampton, and Consultant at the Solent NHS trust, UK. He has published more than 150 papers on ADHD and he is a member of the European ADHD Guidelines Group and the CADDRA guidelines group.

**Eyal Ert** is a professor of Behavioral Sciences and Management at the Department of Environmental Economics and Management at the Hebrew University of Jerusalem. In his research, Eyal seeks to understand people's judgments and decisions in situations involving risk and uncertainty, and explores the role of cognitive processes and environmental structures in guiding behavior.

**Anna Aronis**, R.D., Ph.D. is a registered dietitian and a senior lecturer at the School of Nutritional Sciences, Robert H. Smith Faculty of Agriculture, Food and Environment of the Hebrew University of Jerusalem. Her areas of interest are nutritional assessment in a variety aspects of health and disease, micronutrients and nutritional supplements.

**Adina Maeir**, PhD OT. Director of Cognitive Rehabilitation Lab, School of Occupational Therapy. Faculty of Medicine, Hebrew University. Research on the functional implications of ADHD and development of Cognitive-Functional (Cog-Fun) intervention protocols.

**Yehuda Pollak** is an assistant professor at the Seymour Fox School of Education, the Hebrew University of Jerusalem, Jerusalem, Israel. His research focuses on ADHD-related risky behavior and suboptimal decision making.