

Impulsivity and Fast-Food Consumption: A Cross-Sectional Study among Working Adults



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ARTICLE INFORMATION

Article history:

Submitted 19 May 2014

Accepted 6 May 2015

Available online 19 June 2015

Keywords:

Impulsivity

Fast food

Delay discounting

Dietary behaviors

Convenience

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Nutrition and Dietetics.

<http://dx.doi.org/10.1016/j.jand.2015.05.003>

ABSTRACT

Background Little is known about the decision-making process of adults who choose to eat at fast-food restaurants. Impulsivity is the concept that individuals value immediate rewards and disregard future costs.

Objective To determine the association between impulsivity and consumption of fast food among employed adults and to explore their reasons for eating fast food.

Design A cross-sectional, online survey was conducted; participants were recruited using a mass electronic mailing.

Participants/setting Four hundred seventy-eight adults employed in a university setting completed the survey.

Main outcome measures The association between frequency of fast-food consumption and impulsivity was assessed. Impulsivity is assessed by the area under the delay discounting curve (AUC). The AUC is estimated by using a binary choice delay discounting task incorporating hypothetical monetary rewards. Greater AUC reflects lower impulsivity.

Statistical analyses performed Analysis of variance, Student's *t* tests, and Pearson correlation coefficients were used to measure unadjusted associations among demographic variables, fast-food consumption, and AUC. Linear regression was used to assess whether AUC was a significant predictor of having consumed fast food in the past 7 days, controlling for age, total household income, and education.

Results The majority (67%) of the participants reported eating one or more meals from a fast-food restaurant or pizza place in the past 7 days. The mean number of meals was 2.8 ± 2.5 per week among those who reported eating at a fast-food restaurant or pizza place. Both fast-food consumption and body mass index (BMI) were correlated with greater impulsivity. Controlling for age, total household income, and education level, fast-food consumption was negatively related to AUC ($P=0.017$). The most commonly reported reasons for consuming fast food were convenience and to socialize.

Conclusions These findings indicate that greater impulsivity was associated with greater fast-food consumption. Successful efforts to encourage healthful dietary behaviors might emphasize methods to overcome impulsivity, such as reward substitution and precommitment.

J Acad Nutr Diet. 2016;116:61-68.

ONE OF THE MOST PROMINENT TRENDS IN AMERICANS' dietary behaviors over the past 40 years has been the increase in foods and beverages prepared and eaten outside of the home.¹⁻³ This trend is evident in both the number of times individuals "eat out" and the amount of foods and beverages consumed during these occasions.² The dietary trend of "eating out" has been scrutinized because studies have shown that those individuals who consume foods and beverages away from home have high intakes of total energy, fat, saturated fat, carbohydrates, sugar, and sugar-sweetened beverages and low intakes of micronutrients.³⁻⁶ Furthermore, longitudinal and cross-sectional studies have linked away-from-home food and beverage consumption to weight gain and obesity,⁷ clinical indicators of type 2 diabetes,⁸ and cardiovascular disease.⁹

Increased urbanization and globalization of the food industry have been cited as reasons for a shift in consumption toward more unhealthy food options.¹⁰ As the dynamic of the household as well as the nature of the fast-food industry have evolved over the past several decades, Americans are "eating out" more often. In addition, the increased marketing, availability, and affordability of fast food coupled with households earning higher incomes (more women entering the workplace, more two-earner households, and smaller family size) have spurred Americans to opt for fast-food restaurants.¹¹⁻¹⁴ Recent work has shown that during and after the 2007-09 recession, the percentage of Americans eating at fast-food restaurants on any given day remained constant; however, the percentage eating at sit-down restaurants declined.¹¹ As the name implies, fast food is meant to save time and increase convenience in a society that has come to value

efficiency and immediate gratification.¹⁵ Previous research has found that frequency of fast-food consumption is significantly associated with the perceived convenience of fast food, as well as a dislike of cooking.¹⁶

Impulsivity has been defined as action that reflects shortsightedness or lack of reasoned forethought with respect to decision making and has been operationalized in different ways.¹⁷⁻¹⁹ A recent study has shown that foods that are highly palatable and readily available, such as fast food, are consumed in greater quantities by individuals who are impulsive.²⁰ A critical component of impulsivity is the tendency for an individual to choose immediate rewards over long-term benefits and to minimize the subjective value of possible long-term costs. The field of behavioral economics, a discipline focused on decision making that resides at the intersection of psychology and economics, offers a way to characterize an individual's degree of impulsivity by using a concept known as "delay discounting." Delay discounting is the idea that individuals devalue (discount) the future to varying degrees, depending on how far into the future rewards are received, incorporating the concepts of both time and value. Unfortunately, the tendency to discount the future is extremely strong and persuasive, leading individuals to place unequal weight on immediate short-term rewards relative to future costs and benefits.²¹ For instance, consumers may opt for the immediate smaller reward (eg, taste and convenience) of an unhealthy snack that contains mostly empty calories over the delayed larger reward of a more healthful snack. From a health perspective, this explains why many unhealthy behavioral patterns emerge, involving immediate rewards (eg, consuming fast food because it is convenient and highly palatable) combined with delayed costs (eg, obesity or diabetes).²¹

Impulsivity has been examined in regard to several negative health behaviors and has been found to be greater in smokers,²² alcohol abusers,²³ and illicit drug users²⁴ compared with controls. Despite a growing body of literature on impulsivity in addictive behaviors, relatively few studies of impulsivity in preventive health behaviors, particularly dietary behaviors, have been performed. A limited number of studies have shown an association between individuals' impulsivity and their dietary behaviors.^{25,26} Previous research has shown that lower impulsivity was associated with better overall diet quality as measured by the Healthy Eating Index²⁵ and by a food behavior checklist.²⁶ Although research has shown that people who live in areas with higher concentrations of fast-food restaurants relative to full-service restaurants tend to be more impulsive,²⁷ only one study has examined the association between impulsivity and actual consumption of foods away from home and ready-to-eat foods.²⁰ This study, which focused on overweight and obese women, found that those who were more impulsive tended to consume more calories from away-from-home and ready-to-eat foods than those who were less impulsive. However, no association was found between impulsivity and frequency of consumption of such foods.

Because of the lack of research in this area, we undertook this study to determine the association between impulsivity and consumption of fast food among middle-aged employed adults in a region with high rates of obesity and diabetes. A secondary objective was to explore middle-aged adults'

reasons for eating at fast-food restaurants (eg, taste, price, convenience, and opportunity to socialize).

MATERIALS AND METHODS

Study Participants

A cross-sectional online survey was conducted with participants recruited by using a mass electronic mailing. The recruitment letter was sent via electronic mail to all full- and part-time employees ($n=8,000$) of a large university located in the southeastern United States; 478 completed the survey and were included in the analysis. Based on sample sizes of previous studies using a similar method for measuring impulsivity, a sample size of 200 was determined to adequately address the research question.^{20,22-24,28,29} The criterion for inclusion in the study was age 19 years or older. The survey consisted of an online questionnaire that participants completed in October of 2012 at a location of their choosing. Only those participants who proceeded through the entire questionnaire were included in the data analysis. Auburn University's Institutional Review Board approved the study protocol, and all participants provided informed consent electronically.

Measures

Dietary Behaviors. Items from the National Health and Nutrition Examination Survey Flexible Consumer Behavior Survey were included to characterize eating behaviors, including participants' frequency of fast-food consumption and their reasons for eating at fast-food restaurants.³⁰ Consumption of foods away from home was measured by asking, "During the past 7 days, how many meals did you get that were prepared away from home in locations such as restaurants, fast-food places, grocery stores, cafeterias, or from vending machines?" A follow-up question, "How many of those meals did you get from a fast-food or pizza place?" was used to measure frequency of fast-food consumption. Reasons for eating fast food were measured, using questions such as, "Do you buy food from fast-food or pizza places because it is more convenient than cooking at home?" Similarly structured items were included related to cost, nutrition, taste, and the social aspect of buying food from fast-food or pizza places.

Impulsivity. To operationalize impulsivity, a widely used binary choice delay discounting procedure was employed that elicits self-reported preferences for money at varying values and delays.^{31,32} Each participant was presented with the question, "Would you prefer \$500 now, or \$1,000 (X days/weeks/months/years) from now?" Seven delays were used, which included 1 day, 1 week, 1 month, 6 months, 1 year, 5 years, and 25 years. A decreasing adjustment algorithm was used so that values of the smaller, sooner reward varied depending on the participant's choice in the preceding question, with each adjustment being half the preceding adjustment.³³ The value of the larger, later reward remained constant at \$1,000. For example, if a participant chose \$1,000 one day from now over \$500 now, the subsequent question would be, "Would you prefer \$750 now or \$1,000 one day from now?" Alternatively, if the participant's choice in the first question were \$500 now, the subsequent question would be, "Would you prefer \$250 now or \$1,000 one day from

now?” Values of the immediate reward were varied in this way for subsequent questions and could range anywhere from \$15.62 to \$984.38. Using this decreasing adjustment algorithm, six questions are required for each of the seven delays, resulting in a total of 42 questions per participant. For each delay, the values are assumed to converge after six choices are made so that the value of the immediate reward that would have been offered in the seventh question represents the point at which the participant is indifferent between receiving that amount now and receiving \$1,000 after the specified delay. This iterative procedure was programmed using display logic in Qualtrics survey software. Indifference points for each delay were then used to calculate normalized area under the delay discounting curve (AUC), using the trapezoidal method.³⁴ Normalized values range from 0 to 1. AUC was chosen because it is independent of a particular theory (eg, hyperbolic shape of the discounting function) and tends to be more normally distributed than traditional parameter estimates for discounting functions.³⁴ Normalized AUC values are indirectly related to impulsivity, with lower AUC values representing greater impulsivity.

Demographics. Participants' sex, age, marital status, education level, and total annual household income were assessed. Body mass index (BMI; weight in kg/height in m²) was calculated using self-reported height and weight, and used to categorize participants as underweight (<18.5), healthy weight (18.5–24.9), overweight (25.0–29.9), or obese (≥30.0).³⁵

Statistical Analysis

Descriptive statistics were used to characterize the sample. Analysis of variance, Student's *t* tests, and Pearson correlation coefficients were used to measure unadjusted associations among demographic variables, fast-food consumption, and AUC. Linear regression models were used to assess whether impulsivity (AUC) was a significant predictor of having consumed fast food in the past 7 days, controlling for age, total household income, and education level. For our linear regression modeling, fast-food consumption was capped at 7 times in the past 7 days. We present predicted fast-food consumption at high (75th percentile) and low (25th percentile) AUC values.

RESULTS

Demographics of the sample are reported in Table 1. The majority of those responding to the survey were female, currently married, and had a total household income of \$70,000 or more per year. Approximately one third had a bachelor's or associate's degree, and more than half had a graduate or professional degree. Age ranged from 21 to 76 years, the most common age group being 35 to 49 years, followed by less than 35 years and finally those 50 years of age or older. The mean age of these employees was 42±12 years. BMI ranged from 17.3 to 61.5, with a mean of 27.1±6.5. The majority of survey participants were classified as overweight or obese.

A vast majority (91%) of participants reported that they had eaten at least one meal prepared away from home in locations such as restaurants, fast-food places, grocery stores, cafeterias, or from vending machines during the past 7 days

(data not shown in table). Among those participants who had eaten at least one meal away from home, the mean number of meals prepared away from home was 4.6±3.7, and it ranged from 1 to 19 per week. The majority (67%) of participants reported eating one or more meals from a fast-food or pizza place in the past 7 days. Among those participants who reported eating food from a fast-food or pizza place, the mean number of meals eaten from these places in the last 7 days was 2.8±2.5, with responses ranging from 1 to 17.

Associations between demographic variables and fast-food consumption are shown in Table 1. Factors demonstrating a significant association with fast-food consumption were sex, education, and BMI category. Specifically, males reported a greater fast-food consumption compared with females. Fast-food consumption was greatest in participants with no college education and lowest in those with a graduate or professional degree. Participants who were at a healthy weight reported a lower fast-food consumption compared with participants who were overweight or obese. Marital status, household income, and age were not associated with fast-food consumption.

The mean normalized AUC calculated using the delay discounting task was 0.37±0.25 (Table 2). AUC was not significantly associated with sex, marital status, education level, household income, or age. A significant association was found between AUC and BMI category, with employees categorized as obese having the lowest AUC (highest impulsivity). Employees who had reported eating at a fast-food or pizza place in the past 12 months had a lower AUC than those who did not. Bivariate correlations between fast-food consumption, AUC, and BMI reveal that fast-food consumption was significantly negatively correlated with AUC ($r=-0.109$, $P=0.017$) and positively correlated with BMI ($r=0.241$, $P<0.001$) (data not shown in tables). AUC was significantly negatively correlated with BMI ($r=-0.214$, $P<0.001$). Controlling for age, total household income, and education level, fast-food consumption was negatively related to AUC ($P=0.017$). On average, participants who reported high AUC (75th percentile) consumed 1.6 fast-food meals, and those who reported low AUC (25th percentile) consumed 1.9 fast-food meals in the preceding 7 days (Table 3).

Almost all (97%) of the participants reported eating at a fast-food or pizza place within the past 12 months (data not shown in tables). When these participants were asked the reasons why they buy from fast-food or pizza places rather than cooking at home, 93% said because it was more convenient. Half (50%) of the participants who reported eating fast food within the past 12 months said they eat there to socialize, and 12% said because it tastes better. Only 10% indicated because it was cheaper compared with meals prepared at home. AUC was not found to be significantly associated with stated reasons for eating at a fast-food or pizza place.

DISCUSSION

To our knowledge, this is the first study to demonstrate that greater impulsivity is associated with increased frequency of fast-food consumption in middle-aged working adults in a region with high rates of obesity and diabetes. Impulsivity was associated with frequency of fast-food consumption even after controlling for age, income, and education.

Table 1. Demographics and frequency of fast-food consumption in a cross-sectional study of 478 adults (aged ≥ 19 y) employed by a large university in the southeastern United States

	Frequency ^a (%)	Number of meals eaten at a fast-food or pizza place in the past 7 days (mean \pm SD ^b)	P value ^c
Sex			
Male	149 (31)	2.2 \pm 2.9	0.043*
Female	329 (69)	1.7 \pm 2.2	
Marital status			
Single	83 (17)	2.1 \pm 2.8	0.581
Currently married	332 (70)	1.8 \pm 2.3	
Separated, divorced, widowed	63 (13)	2.0 \pm 2.6	
Highest level of education			
No college	15 (3)	3.9 \pm 5.3	<0.001***
Some college but no degree	56 (12)	2.2 \pm 2.6	
Bachelor's or associate's degree	147 (31)	2.4 \pm 2.8	
Graduate or professional degree	260 (54)	1.4 \pm 1.7 ^d	
Total annual household income (\$)			
<20,000	13 (3)	2.6 \pm 4.0	0.476
20,000-69,999	200 (42)	1.9 \pm 2.5	
70,000-139,999	199 (42)	1.8 \pm 2.4	
$\geq 140,000$	65 (13)	1.6 \pm 2.0	
Age (y)			
<35	152 (32)	1.9 \pm 2.7	0.476
35-49	176 (37)	2.1 \pm 2.6	
50-64	139 (29)	1.5 \pm 1.9	
≥ 65	9 (2)	1.7 \pm 1.7	
BMI^e category			
Underweight (BMI <18.5)	8 (2)	2.0 \pm 2.6	<0.001***
Healthy weight (BMI 18.5-24.9)	195 (41)	1.4 \pm 1.9	
Overweight (BMI 25.0-29.9)	137 (29)	1.5 \pm 1.7	
Obese (BMI ≥ 30.0)	132 (28)	2.9 \pm 3.3 ^f	

^aTotals may not add to 478 because of missing data.^bSD=standard deviation.^cDemographic differences in fast-food consumption, calculated using Student's *t* test or analysis of variance.^dPost hoc comparisons: graduate or professional degree different from no college ($P=0.001$) and bachelor's or associate's degree ($P=0.001$).^eBMI=body mass index (category based on self-reported height and weight [kg/m²]).^fPost hoc comparisons: obese category compared with healthy weight ($P=0.001$) and overweight ($P=0.002$).* $P<0.05$.*** $P<0.001$.

A recent study in overweight and obese women, using a delay discounting task similar to that used in the current study, demonstrated a significant association between impulsivity and the calories consumed from away-from-home and ready-to-eat foods, but contrary to our study no association was found between impulsivity and frequency of consumption of such foods.²⁰ The disparate findings could be attributable to several methodological differences in the two studies. First, our study included

both men and women of all weight categories. Possibly a differential effect occurs in men vs women or overweight or obese vs healthy weight individuals. Second, our focus was specifically on fast-food restaurants, whereas the previous study did not differentiate between fast-food and full-service restaurants. Consumption of items from fast-food restaurants incorporates a convenience factor that provides more immediate gratification than items from full-service restaurants.

Table 2. Unadjusted relationship between demographics and impulsivity, measured using area under the delay discounting curve (AUC), in a cross-sectional study of 478 adults (aged ≥ 19 y) employed by a large university in the southeastern United States

	AUC (mean \pm SD) ^{a,b}	P value ^c
Sex		
Male	0.38 \pm 0.24	0.944
Female	0.37 \pm 0.26	
Marital status		
Single	0.41 \pm 0.28	0.264
Currently married	0.36 \pm 0.25	
Separated, divorced, widowed	0.40 \pm 0.23	
Highest level of education		
No college	0.28 \pm 0.27	0.058
Some college but no degree	0.35 \pm 0.28	
Bachelor's or associate's degree	0.35 \pm 0.24	
Graduate or professional degree	0.40 \pm 0.25	
Total annual household income (\$)		
<20,000	0.32 \pm 0.28	0.656
20,000-69,999	0.39 \pm 0.28	
70,000-139,999	0.36 \pm 0.24	
$\geq 140,000$	0.39 \pm 0.19	
Age (y)		
<35	0.37 \pm 0.27	0.758
35-49	0.37 \pm 0.25	
50-64	0.38 \pm 0.25	
≥ 65	0.46 \pm 0.20	
BMI^d category		
Underweight (BMI <18.5)	0.42 \pm 0.24	<0.001***
Healthy weight (BMI 18.5-24.9)	0.42 \pm 0.26	
Overweight (BMI 25.0-29.9)	0.40 \pm 0.24	
Obese (BMI ≥ 30.0)	0.29 \pm 0.24 ^e	
Reported having eaten at a fast-food restaurant or pizza place in the past 12 mo		
Yes	0.37 \pm 0.25	0.037*
No	0.51 \pm 0.28	
Reported having eaten at a fast-food restaurant or pizza place in the past 7 days		
Yes	0.36 \pm 0.25	0.061
No	0.41 \pm 0.25	
Overall	0.37 \pm 0.25	

^aSD=standard deviation.^bGreater AUC reflects lower impulsivity.^cCalculated using Student's *t* test or analysis of variance.^dBMI=body mass index (category based on self-reported height and weight [kg/m²]).^ePost hoc comparisons: obese category compared with healthy weight (*P*=0.001) and overweight (*P*=0.002).**P*<0.05.****P*<0.001.

Table 3. Predicted fast-food consumption at high and low AUC^a in a cross-sectional study of 478 adults (aged ≥ 19 y) employed by a large university in the southeastern United States^b

Predicted Fast-Food Consumption			
75th Percentile (High AUC) ^c		25th Percentile (Low AUC)	
Mean value	95% CI	Mean value	95% CI
1.6	[1.4 1.8]	1.9	[1.7 2.1]

^aAUC=area under the delay discounting curve. Predicted fast-food meals at high (75th percentile) and low (25th percentile) AUC values were from linear regression model using fast-food consumption as the dependent variable, adjusted for age, total household income, and education level.

^bIn the linear regression model, β -coefficient of AUC is not equal to 0 (t test: $P=0.017$). Fast-food consumption was negatively related to AUC.

^cGreater AUC reflects lower impulsivity.

Impulsivity was also positively correlated with weight status in our study. Similar results have been found in other studies that used a delay discounting task,²⁹ or proxies for delay discounting, such as savings rates^{36,37} or willpower.³⁸ Taken together with the findings of the current study, this body of work implies that impulsivity is associated with unhealthy dietary patterns, and thus, efforts to encourage healthful dietary behaviors should emphasize methods to overcome impulsivity, such as reward substitution³⁹ and precommitment.⁴⁰ Reward substitution is the receipt of smaller, sooner rewards (eg, financial incentives) to counteract the tendency to neglect behavioral goals (eg, adherence to a healthful diet) that result in long-term, rather than short-term, benefits. Pre-commitment is any action that establishes real consequences for not sticking to a goal or commitment. For instance, planning to work out with a friend, then deciding the following morning to sleep in instead would result in hard feelings and a sense of guilt. Agreeing with a health care provider on a certain health behavior goal, then failing to meet that goal, would create feelings of embarrassment and shame for the patient. By committing to a goal ahead of time, an individual is less likely to choose the short-term over the long term when tempted by the short-term reward.

Previous research has suggested that delay discounting reflects inadequate inhibitory control in decision making.²⁸ Neuroimaging studies have shown activation in certain portions of the brain (the dorsal prefrontal cortex, the posterior parietal cortex, and the anterior parahippocampal gyrus) when individuals are making impulsive choices, indicating a potential biological mechanism.⁴¹ An individual may have a biological predisposition toward impulsivity, which then increases consumption of highly palatable foods that are readily available and provide immediate pleasure (such as fast foods), rather than long-term benefits.

The very nature of fast food implies greater convenience, possibly leading to greater consumption in individuals who value ready accessibility, such as those who have a tendency toward immediate gratification. In this way, certain characteristics of fast food may be very attractive to individuals who are impulsive. A study by Dave and colleagues¹⁶

demonstrated that frequency of fast-food intake among adults was associated with the perceived convenience of fast food and a dislike of cooking, rather than with the perceived unhealthfulness of fast food, suggesting that promotion efforts that focus on the health consequences of poor food choices may not have an impact on dietary behaviors. Other studies have confirmed that convenience is the most important factor influencing people's food choices.⁴²⁻⁴⁷ Our study demonstrated similar results, with perceived convenience being endorsed as a reason for consuming fast food by nearly every participant. An interesting finding is that taste and price tended not to be endorsed as reasons for eating at fast-food restaurants in our study. Other studies have contradicted these findings, demonstrating that taste preferences and affordability are important predictors of fast-food consumption.⁴⁸⁻⁵¹ In our study, the social aspect of the environment was endorsed as a reason by half of participants. However, the perception of fast-food restaurants as a place for socializing with friends and family was endorsed as a reason for eating at these establishments by only one-third of participants in one study,⁵¹ and the perception of fast food as fun and social was not strongly associated with frequency of fast-food consumption in another study.¹⁶ Almost half (42%) of participants in the study by Rydell and colleagues⁵¹ were unemployed, in contrast to the current study in employed adults. Possibly workers see fast-food restaurants as places to socialize during lunch and after work. Given the frequent endorsement of convenience as a reason for fast-food consumption in the current study, efforts to reduce consumption of fast food should emphasize the convenience and easy access to more healthful options.

Strengths of the study include the use of a widely used delay discounting procedure and validated measures to assess dietary behaviors. As is true for cross-sectional survey research in general, these results must be interpreted with caution in light of several limitations. First, the cross-sectional study design does not allow for establishment of causation. Second, all measures were based on self-report, introducing the potential for recall or social desirability bias, and social desirability was not measured in this study. Third, the study used a convenience sample of adult employees of a university, limiting generalizability to other populations or settings.

CONCLUSIONS

Results from this work provide important insights into the decision-making process of individuals who choose to eat at fast-food restaurants. Frequency of consumption of fast food was shown to be associated with impulsivity. This finding may be attributable to the convenience and socializing aspect of fast food, which provide immediate gratification. More research is needed to further untangle this association in other populations.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

This research was funded by an intramural grant through Auburn University.

ACKNOWLEDGEMENTS

The authors thank Jacqueline Kochak for providing editorial services.