1-1-2009

Influence Of Music Tempo On Calorie Consumption In A Restaurant Setting

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Influence of Music Tempo on Calorie Consumption in a Restaurant Setting

(TITLE)

BY

Rachel Rogers

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY

CHARLESTON, ILLINOIS

2009

YEAR

I HEREBY RECOMMEND THAT THIS THESIS BE ACCEPTED AS FULFILLING

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Influence of Music Tempo on Calorie Consumption in a Restaurant Setting

Abstract

This study examined the difference of calories consumed by restaurant patrons while listening to fast and slow tempo music. Twenty-three participants ate 2 meals spaced 5 days apart, 1 meal was eaten while listening to slow tempo music and 1 meal was eaten while listening to fast tempo music. Foods were weighed before being served to participants and after participants were finished eating to determine calories consumed. On average, participants consumed more calories while listening to slow tempo music versus fast tempo music. Although the mean difference between the conditions was not significant, the data trends were congruent with the hypothesis. Future studies in this area should have a larger number of participants.

Acknowledgments

Thank you Dr. Honselman, Dr. O'Rourke, and Dr. Painter for your expertise and advice throughout the research and thesis process. Thank you to the School of Family and Consumer Sciences for funding my research study.

Thank you to Kathy Rhodes for allowing me to carry out my research within the kitchen, preparing the food for my participants, and with all other aspects of my research study.

Thank you to the wait staff and my research assistants for serving my participants and assisting me in collecting data for my research study.

Thank you to my parents and Brian for all of your continued support throughout the thesis process and graduate school.

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Introduction

Problem & Problem Significance

Obesity rates have been steadily rising over the past 2 decades. According to the National Health and Nutrition Examination Survey (NHANES) (as cited by the Center for Disease Control, 2008B), approximately 33.3% of men, 35.3% of women, and 16.3% of children and adolescents were obese during 2005 to 2006. The obese population is more susceptible to chronic diseases such as type 2 diabetes, cardiovascular disease, including hypertension and dyslipidemia, cancer, and sleep apnea (CDC, 2008B). Due to the health consequences that are associated with obesity, health care costs also become an issue. According to Finkelstein, Fiebelkorn, and Wang (as cited by the CDC, 2007), approximately 75 billion dollars were spent in the United States from 1998 to 2000 attributable to obesity prevention, intervention and the chronic diseases caused by obesity (2004).

Recent research has examined the causes, treatment, and prevention of obesity. The CDC recognizes environmental factors as being one of the causes of obesity (2008B). Furthermore, other disciplines recognize that the environment can be manipulated to alter human behavior. For example, many institutions have done extensive research to find the most productive work environment. Other institutions that recognize the environment as an influence on human behavior include schools, universities, prisons, hospitals, retail outlets, and restaurants (Moos, 1976). Recent decades have revealed that environmental factors such as color, décor, lighting, sound, and smell influence the behavior of shoppers and restaurant patrons. Henry Murray was one of the first psychologists to recognize that if a person's environment is understood

then the person's behavior can also be understood. This perspective, also called the social climate perspective, also recognizes that environments have unique characteristics similar to a human's unique characteristics.

Wansink and Sobal (2007) have coined the term "mindless eating" to help explain environmental influences on eating. The authors state that there are micro- and macro-levels of environment. The micro-level examines the personal choices that an individual may make while the macro-level is more concerned with policy changes. This study falls into the intermediate level which is concerned with the environment as opposed to the taste or quality of the food (Wansink & Sobal, 2007).

Two different environments also exist. The first is the eating environment and the second is the food environment. The eating environment refers to the atmosphere which includes sound, food availability, social interaction, time of the day, time constraints and so on. The food environment refers to the presentation of the food, portion sizes, variety of food choices, and the salience of the food (Wansink & Sobal, 2007).

Specifically, environmental factors in a restaurant setting have been studied, including room and food temperature, colors, light, food presentation, and sound. Sound in a restaurant can be varied by changing the type of music, volume of music, or the tempo of music. Studies have shown that changing the sound in a restaurant may lead patrons to alter the amount of money they spend, the duration of their stay, or the amount of food and drink consumed (Stroebele & De Castro, 2004). Very few studies, however, focus on the effect of music tempo on the amount of calories consumed. This topic is important due to the impact it could have on helping individuals control consumption when dining out.

Purpose

The purpose of this project was to examine if music tempo has an effect on calorie consumption in a restaurant setting.

Objective

To determine the difference between total calories, soup calories, salad calories, entrée calories and dessert calories consumed when slow tempo music versus fast tempo music is played during a meal.

Hypothesis

Significantly more total calories, soup calories, salad calories, entrée calories and dessert calories will be consumed in the slow tempo music condition compared with the fast tempo music condition.

Definition of Terms

Obese: an adult with a body mass index (BMI) of 30 or higher (CDC, 2008B).

Overweight: an adult with a BMI between 25 and 29.9 (CDC, 2008B).

Body mass index (BMI): a number that correlates with amount of body fat calculated by using height and weight (CDC, 2008B)

Fast tempo: music having 92 or more beats per minute (BPM) (Milliman, 1986).

Slow tempo: music having 72 or less BPM (Milliman, 1986).

Review of Literature

The rates of overweight and obesity have been rising steadily over the past 20 years according to the CDC (2008B). There have been nutrition education efforts toward halting the climbing trend. Parallel to this trend is an increase in the number of meals that Americans eat outside of the home. Dining out can be defined as consuming any food or meal that is prepared in a restaurant, fast food restaurants, cafeterias, or convenience stores (French, Story & Jeffery, 2001). According to the National Restaurant Association (as cited by French, et al., 1998), the number of places that the population could eat outside of the home grew by 89% between 1972 and 1995. According to the University of Illinois Extension, in 1978, dining out was considered a treat and only about 16% of meals were eaten outside of the home (Farner, 2008). Now, more than 30% of meals are eaten outside of the home or almost one meal per day (Farner, 2008). Often, meals eaten outside of the home are higher in fat and calories than meals eaten at home (Biing-Hwan, Guthrie & Frazao, 1999). Due to this trend, and as a result of research findings, nutrition professionals have become increasingly aware of the role that environmental factors play in obesity.

Environmental Psychology

Environmental psychology has emerged in recent decades as a discipline that examines the relationships between people and their physical surroundings (Sundstrom, Bell, Busby, & Asmus, 1996). People tend to react to the environment as a whole even though humans can distinguish between each single stimulus in the environment such as sound, movement, light, smell, etc. (Bitner, 1992). Related to this, a hypothesis states that optimum performance occurs when conditions of moderate arousal are met, usually in the

form of sound, temperature, or lighting (Sundstrom, et al., 1996). Another is the overload hypothesis. This hypothesis states that humans can only process a certain amount of stimuli at one time. When humans are overloaded with stimuli, they prioritize by ignoring the least important stimulus (Sundstrom, et al., 1996).

Because environmental psychology includes any environmental or physical surrounding influence on human behavior, psychologists have long recognized that store, school, work, home, and other built environments can have an impact on human behavior. From a retailer's or restaurant manager's point of view, the atmosphere will encourage the consumer's buying and/or consumption (Tai & Fung, 1997). The created atmosphere is extremely important to the retailer or restaurant manager because there are numerous other competitors that may not differ greatly in prices, products, or service.

Mehrabian and Russell (1994) defined a model of environmental psychology which is now called the M-R model. This model incorporates the stimulus, the organism, and the response. The stimulus factors include lighting, color, décor, sound, or layout in a store or restaurant. The emotional states are categorized as pleasure-displeasure, arousal-nonarousal, and dominance-submissiveness. The model states that every environment has the potential to affect a person's emotional state and can even change emotional states. The responses to the environment in the form of emotional states can be then classified as approach or avoidance behaviors. The M-R model plainly states that the environmental stimuli will affect the emotional states and from that emotional state, an approach or avoidance response will occur (Mehrabian & Russell, 1994).

In the retail and other service oriented businesses, a modified M-R model can be used (Tai & Fung, 1997). This model starts with the environmental stimuli which can

range from the novelty of the environment to décor to noise. These environmental stimuli are then perceived by the senses and affect the emotional state. The emotional state can be categorized as pleasure or arousal. Pleasure includes but is not limited to comfort or boredom and arousal includes but is not limited to excited or gloomy. These emotional states can either lead to a favorable emotional state or unfavorable emotional state. The favorable emotional state is called the approach behavior which may include shopping or dining enjoyment, extra time spent in the establishment, desire to return to the establishment in the future, or extra money spent in the establishment. The unfavorable emotional state can lead to avoidance behavior which can include shopping or dining discontentment, a desire to leave the establishment, or a desire to avoid future visits (Tai & Fung, 1997).

Automatic Behaviors

Humans use automatic behaviors every day. When a person smiles when amused or frowns when angry, he or she is displaying automatic behaviors. Automatic behavior exists due to the fact that the human brain can only process a certain amount of information at one time. Similar to social behaviors such as facial expressions, eating is an automatic behavior (Cohen & Farley, 2008).

A study by Tuomisto, Tuomisto, Hetherington, and Lappalainen (1998) examined the reasons for initiation and cessation of eating in an obese population. The sample consisted of 114 obese participants in a weight management program. The participants maintained diaries for 24 hours which included the reason for initiation and cessation of eating and mood before and after eating. There were different classes of reasons that the participants chose from to record in their diaries. These five main classes included

"environmental events or activities, hunger and other sensations, reasons based on self-assessment and cognitions, social reasons, and other reasons" (Tuomisto, et al. 1998, p. 215). The researchers found that obese men and women were more likely to initiate eating with environmental cues (32.7%) as opposed to feelings of hunger (20.9%). Most participants stopped eating due to feelings of fullness (39.4%) while 10% of the participants reported that they stopped eating only because no food was left. This implies that hunger is not the main reason people choose to eat and often feelings of fullness do not control when people stop eating. Environmental cues may play a larger role in eating than people may realize (Tuomisto, et al., 1998).

Cohen and Farley (2008) suggest that automatic behaviors can be controlled, however; controlling automatic behaviors over a long time period could be near impossible. The mere task of controlling automatic behaviors related to eating is mentally taxing. Related to the above statement, a study by Baumeister, Bratslavsky, Muraven, & Tice (1998) examined how participants performed on an unsolvable puzzle based on three conditions. All participants were under the impression that the study would include a taste test. In the first condition, the participants were allowed to eat chocolate chip cookies and were instructed not to eat radishes that were also sitting at the table. The second group had access to the cookies but was instructed to only eat radishes and the third group did not have any access to food. In addition, all participants were instructed to skip one meal before the experiment. After the taste test, participants were given the unsolvable puzzle and told the maximum time to work on it was 30 minutes. The researchers found that the second group quit working on the puzzle in the shortest amount of time (8 minutes), while group one and group three worked on the puzzle for longer (19

minutes and 21 minutes, respectively). After participants had worked on the puzzle, the investigator asked the participants to fill out a manipulation check questionnaire. This questionnaire assessed the difficulty associated with the task of eating. The participants in the radish only group rated the task of eating more difficult than the participants in the cookie only group. This study implies that refusing an automatic behavior related to food and eating is extremely taxing (Baumeister at al., 1998). With this in mind, nutrition professionals must educate regarding eating as an automatic behaviors. If individuals desire to control the automatic behaviors, they must accept the influence of environmental factors on their eating behaviors (Cohen & Farley, 2008).

Environmental Factors as Consumption Stimulators

Individuals may often eat simply because food is visible, not because they are hungry. As mentioned above, in the Tuomisto et al. study (1998), participants often started eating due to environmental factors. These environmental factors range from mealtime to watching TV to seeing and smelling food. The majority of participants started eating when it was meal time or they were watching TV or listening to the radio. However, in the focus of this study, environmental influences in a restaurant are more of a concern.

Environmental factors in a restaurant can include the lighting, presence of other people, food presentation, smell, temperature and color of the food and room, and sound. Stated more simply, environmental factors are the factors that are independent of food. All of these environmental factors work together to influence consumption. Researchers believe that dim lighting relaxes an individual and lowers inhibited eating compared to a brightly lit room (Wansink, 2004). Dim lighting may then encourage people to consume

an extra drink or stay longer for desert due to the fact that people are less inhibited when the lights are dim compared to when the lights are bright.

The number of people present at meal times also seems to have influence on intake. A study by De Castro and Brewer (1991) examined how much intake is influenced when other people are present. The researchers had 153 participants keep 7-day diaries detailing food eaten and the number of people present at each meal. The researchers found that as the number of people present increased, the meal duration and intake also increased. When eating with a large group of people, the participants were found to consume an average of 75% more calories when compared with eating alone (De Castro & Brewer, 1991).

If food is presented on a larger serving dish, more tends to be consumed. This is illustrated by a Wansink and Cheney (2005) study that examined the impact of serving bowl size on intake. The participants were all graduate students invited to watch the Super Bowl. Participants were split up into two groups and led to two different buffet tables. On one table, high energy density snacks were placed in two large serving dishes and on the second table, the same snacks were placed in four smaller size serving dishes. Participants served themselves on the same size plates. The weight of the food was documented before consumption and after consumption. The researchers found that participants who were served from the large serving dishes consumed approximately 53% more calories than participants who were served from the smaller serving dishes (Wansink & Cheney, 2005).

Wansink (1996) conducted a study to examine if package size affects consumer usage. In the study, two different sizes of items (Crisco oil and spaghetti) with the same

volume were presented to participants. The participants were read a scenario in which the product would be used and then the participant poured out how much of the product that they would use for that scenario. Participants poured 122 ml out of the large Crisco container compared with 99 ml out of the small Crisco container. Similarly, participants poured 302 ml out of the large spaghetti container compared with 234 ml from the small spaghetti container. The researchers found that more of the product was poured out when the package size appeared to be larger. With these results, it can be assumed that larger package sizes can lead consumers to use more of the product while preparing food (Wansink, 1996). With increasing portion sizes, it is likely that the general public is unknowingly consuming more calories. Wansink explained why large portion sizes increase consumption by stating that people view these large portion sizes as normal because it is what they are given.

Smell refers to the food odors and its effect on intake. Smell can enhance the taste sensation of a food. Smells of food can also spark memories which can affect intake on an individual basis. In addition, if there is an unpleasant smell present individuals are likely to shorten the duration in a restaurant (Wansink, 2004). However, smell is a sense that is difficult to study due to the differences in perceptions of smells between individuals (Prescott, 1999). Prescott also explains that flavors are often combinations of smell and taste properties and those two components are extremely difficult to separate. Literature reviews concerning smell have come to the conclusion that it is unknown whether or not a pleasant smell will increase duration of stay however; smell has a role in initiating consumption (Wainsink, 2004).

Temperature can refer to the temperature of the food or the temperature of the room. Temperature of food affects intake depending upon the individual preferences and cultural norms (Zellner, Stewart, Rozin & Brown, 1988). Ambient temperatures may influence intake with research finding that colder temperatures increase intake due to the normal increase in basal metabolic rate (Westerterp-Platenga, 1999).

Colors of the surroundings have been studied in the retail area. A study by Bellizi, Crowley, and Hasty (1993) examined how color affects retail store design. The researchers recognized that warm colors stimulate the human mind while cool colors relax the human mind. The researchers examined consumer perception, physical attraction, and approach orientation of five different colors, red, yellow, green, blue, and white, in a laboratory setting. A questionnaire was administered to the 124 participants to assess perception of the store. Observers noted the attention and physical attraction of the participants with each color. The investigators found that participants were the most physically attracted to the yellow color and least attracted to the white color. The participants favored the cool colors over the warm colors and called the red color the tensest color. The authors suggest that in a consumer environment, the warm colors may influence the customers to shop more quickly while the cool colors influence customers to increase the duration of shopping (Bellizi et al., 1993).

Color can also refer to the color of the food. In a study by Pangborn and Hansen (1963), participants were trained on distinguishing sweetness between pear-nectars before data collection and then were asked to taste different nectars to detect the sweetness of each sample. All samples of the nectar contained the same amount of sucrose; however,

the participants chose the green-colored samples as the least sweet implying that the color of food has a profound impact on taste perception (Pangborn & Hansen, 1963).

Sound as an Environmental Factor

Sound generally refers to the music that is played in a restaurant or the lack of music in a restaurant. Music can vary by volume, type, and tempo. Compared to other environmental influences, music is very easily controlled. Soft background music adds to the ambience of the environment; however, many consumers are not conscious of the sound or its impact on their behavior (Stroebele & De Castro, 2004).

A study by Sullivan (2002), examined the effects of music volume, tempo, style, and no music on meal duration and expenditure. Ten meal parties were selected during each night. Duration was calculated using seated time and the time the bill was paid. Sullivan found that when any music was played, patrons stayed an extra 16.25 minutes compared to the no music condition. Also related to duration, when soft music was played, participants stayed on average an extra 13 minutes when compared to loud music. In addition, the study found that expenditure and duration increased significantly when soft music was playing. Sullivan also found that when any music played compared to no music, participants spent more money and food and drink. Sullivan did not find any significant differences between tempo and popularity of music on duration or expenditure (2002). This study implies that if a manager would like to increase duration and expenditure then music should be played at a soft level (Sullivan, 2002).

A study by Gueguen, Jacob, Guellec, Morineau, and Lourel (2008) examined the effects of music volume on beer consumption in a bar setting. Two different noise levels were examined. One noise level was the usual noise level at the bar while the other was a

higher level. Participants of two-party tables were observed by researchers. Number of drinks, time spent to drink one beer, and number of gulps per beer was recorded. When the usual-level music was playing an average of 2.6 drinks was consumed compared to 3.4 drinks when the loud music was played. In the usual volume level, participants spent an average of 14.51 minutes to consume a beer compared to 11.45 minutes in the high level. The difference between numbers of gulps was not significant. The researchers explained that perhaps bar patrons were able to talk less when the loud music played which led to higher and quicker beer consumption (Gueguen et al., 2008).

Another study concerned with volume by McCarron and Tierney (1989) also found that as music volume increases, consumption increases. McCarron and Tierney observed 15 participants in three different noise level environments. In all noise level environments, participants were free to drink as many soft drinks as they desired. Five participants comprised each group and were randomly divided into a no music condition, 70 dB level condition, and 90 dB level condition. When the sound level increased from 70 dB to 90 dB, the median consumption doubled from 250 ml to 500 ml, respectively. The authors found that as the noise level increased, the total number of soft drinks consumed also increased (McCarron & Tierney, 1989).

The type of music has also been suggested to have an effect on consumer behavior including expenditure. A study by North, Shilcock, and Hargreaves examined the effect of music on expenditure in a restaurant (2003). The researchers included all restaurant patrons during 3 weeks as participants. The purpose of the study was to compare the effects of pop music, classical music, and no music on total expenditure in a restaurant setting. The researchers found that classical music created the greatest

spending compared to pop music or no music. Approximately 10% more money was spent on the total bill when classical music was played compared to pop music and no music (North, et al., 2003). The authors note that classical music may give rise to more spending because it blends with the environment of the restaurant, it is preferred by patrons, or it increases money spent because of its upscale association (North, et al., 2003).

Music Tempo

Studies have found that slow tempo music may increase the time that patrons spend in a restaurant. The slow tempo music may cause patrons to chew and consume food at a slower pace, and increasing the duration of time they spend at a restaurant resulting in higher consumption of food and drink (Caldwell & Hibbert, 2002). Furthermore, the patrons will also spend a longer amount of time in a restaurant if they like the music that is being played. If a patron stays in the restaurant for a longer duration, that patron may spend more money in the restaurant.

Caldwell and Hibbert (2002) conducted a study examining the effect of tempo on duration, expenditure, and enjoyment and experience of the restaurant. The sample consisted of two-seat tables in a restaurant. The same type of music was played and was consistent with the music that was commonly played in the restaurant. Researchers observed the participants throughout their dining experience and administered a questionnaire after dining concerning time spent in the restaurant, opinion of the music, and enjoyment of the dining experience. The researchers found that slow music may also increase the amount of money that is spent in a restaurant because the extended duration may lead to extra drinks or dessert (2002). The researchers found that when slow music

was played participants on average stayed 15 minutes longer and spent approximately 23% more money on food and drink when compared to fast music. In addition, the participants spent an average of 13% more money on food and 60% more money on drinks when listening to slow music compared to fast music. Tempo did not have a significant effect on perception of time spent in the restaurant or the enjoyment of the dining experience. Most importantly, time spent in the restaurant also led to higher expenditure. It can be assumed that if slow tempo music may lead to slower consumption as hypothesized, then it can lead to higher expenditure as proved in the study (Caldwell & Hibbert, 2002).

Similarly, a study by Milliman (1986) examined the effect of music tempo on expenditure while dining out. Restaurant patrons were observed on different nights and music tempo was alternated each night. The sample consisted of 644 customer groups. On average, the participants listening to slow tempo music completed their meal in 56 minutes compared to 45 minutes in the fast tempo music condition. As a result of the slower table turnover, the researchers found that the waiting time increased significantly. In the slow tempo music condition, the average waiting time was 47 minutes compared to 34 minutes in the fast tempo music condition. The average dollar amount spent on food did not differ significantly between the music tempos which disagrees with the Caldwell and Hibbert (2002) study. However, the Milliman (1986) study did find a significant difference in the amount of money spent on drinks. In the slow tempo music condition an average of $30.47 was spent compared to $21.62 under the fast tempo music condition. The total bill, then, did differ significantly between the two music tempos. Milliman

discovered that slow tempo music may lead restaurant patrons to consume more alcoholic beverages which increased total expenditure and duration (1986).

Other researchers have found that fast tempo music and loud music influenced the bar patrons to consume more beer and also to consume it more quickly when compared to the slow tempo and soft music (Gueguen, et al., 2008; McElrea & Standing, 1992). As stated in a previous section, when music is loud, higher consumption can be explained by less socializing which increases consumption. Fast tempo music however can influence patrons to consume at a quicker pace. When food and drink are consumed quickly, individuals often do not monitor how full they are feeling. This high rate of consumption may lead to higher calorie intake (Wainsink, 2004). The study by McElrea and Standing (1992) examined the drinking time of 40 participants in fast and slow tempo music. The participants were asked to rate the flavor of a soft drink in two separate rooms. Half of the participants listened to slow tempo music and the other half listened to fast tempo music. The researchers found that the participants in the fast tempo music group consumed the soft drinks significantly faster (9.70 minutes) than the participants in the slow tempo music group (13.52 minutes). These findings suggest that fast tempo music can lead people to consume drinks more quickly compared to the rate of consumption when listening to slow tempo music (McElrea & Standing, 1992). The research in this area offers explanations as to why fast and slow tempo music may increase consumption. The research mentioned above found conflicting results which warrants the attention of future researchers.

Although there is a contradiction in the literature, a trend does exist. The trend is that music does have an influence on consumption, duration, and expenditure in a

restaurant; however, if the type, tempo, or volume of music blends well with the restaurant environment, it may enhance consumption even more (Stroebele & De Castro, 2004). In the Milliman (1986) and Caldwell & Hibbert (2002) studies, both showed that slow tempo music increases duration and expenditure in a restaurant. The increased duration can imply that more calories will be consumed; however, no study has examined the difference of calories consumed in fast and slow tempo music. Conversely, the study by McElrea and Standing (1992) also suggests that fast tempo music causes people to ingest drinks at a quicker pace which may also lead to higher consumption.

Studies examining music tempo and volume have used different restaurant environments. For example, the study by Gueguen at al., McElrea and Standing (1992) and McCarron and Tierney (1989) used a bar or a bar-like setting for the experiment while the studies by Caldwell and Hibbert (2002) and Milliman (1986) used fine dining restaurants for the environment in their studies. In a study using a leisurely dining environment, the slow and soft music may lend itself more to the overall restaurant environment compared to fast and loud music usually heard in a bar or fast food dining environment (Stroebele & DeCastro, 2004). Comparatively, a bar or fast food restaurant environment lends itself more to the fast and loud music compared to the slow and soft music. Therefore, in studies that observe bar patrons and beer consumption, a possible reason for higher beer consumption in fast music tempo condition may be due to fast music being a better fit with the environment than the slow music tempo. Similarly, studies that observe participants in a full service restaurant have reported an increase in expenditure when slow tempo music is played compared to fast tempo music may be because the slow tempo music lends itself to the environment of that type of restaurant.

A study by North, Hargreaves, and McKendrick (1999) illustrated the idea of music congruency with consumer behavior. The researchers investigated if different types of music would influence consumers to purchase different types of wine. French and German music was played in a wine store on alternating nights. A wine display featured both French and German wines during the study. When French music was played, a total of 40 French wines were bought compared with 8 German wines. Comparatively, when German music was played a total of 12 French wines were bought compared with 22 German wines. The participants were also administered a questionnaire after their purchases and only 6 of the 44 participants acknowledged that the music influenced their purchase. This study provides a clear picture of how the store or restaurant environment is congruent with the items purchased or consumed.

Another confounding factor in previous studies is the participant population. Meiselman, Johnson, Reeve, and Crouch (2000) point out that different types of people eat in a first-class restaurant as compared to a cafeteria or fast food restaurant. Perhaps the people frequenting the first-class restaurant are expecting to spend more money on food and drink and spend a longer duration at the restaurant. Contrastingly, people going to a fast-food venue are not expecting to spend a lot of money on a meal and they do not plan to spend a long duration at that restaurant (Meiselman et al., 2000). When a group of people goes to a restaurant or fast food venue, they have expectations regarding the environment. The current study will seek to eliminate the influence of money, time, and expectations of the dining environment that normally have an influence over the amount of food ordered and consumed.

Summary

In some research, the findings from Gueguen, et al., McElrea and Standing (1992), and McCarron and Tierney (1989) imply that fast and loud music may increase intake and the findings from Caldwell and Hibbert (2002) and Milliman (1986) imply that slow and soft music may increase intake because duration is increased. For this reason, more research is needed on the influence of music on eating and drinking behaviors. Furthermore, there is little to no research concerning the actual difference of calories consumed by restaurant patrons when they are exposed to different music tempo. This study is designed to explore that area further to possibly aid in weight loss management and education.

Method

Design

A quantitative, correlational design was used to assess the influence of music tempo on calorie consumption in a restaurant setting. The variables were fast music tempo, slow music tempo and calorie consumption.

Sample

The sample consisted of 27 restaurant patrons in a university community. The sample included both males and females of various ethnicities and ages. The sample was recruited from the Eastern Illinois University community. All participants signed an informed consent prior to the first meal (see Appendix A). The only exclusion criterion was if the participant had a known food allergy to the food that was served.

Data Collection Instruments

A spreadsheet was used to record weights of food before service to the participants and after the participants were done with the food. A scale was used to weigh all of the food. A questionnaire designed to assess the hunger of participants, was administered prior to the meal.

Spreadsheet. The participants were assigned a number of 1 through 40 and either an "F" or "S" for fast tempo music or slow tempo music, respectively. Pre and post weights for each participant were recorded on the spreadsheet (see Appendix B) according to the assigned number.

Scale. A scale was used to weigh the food items. All foods were weighed in grams. Before weighing each food item, the scale was calibrated to insure accurate weights.

Hunger Questionnaire. The questionnaire (see Appendix C) assessed the participants' hunger status at the meal time using a scale of 1 (least hungry) through 5 (extremely hungry). The same scale was used on both days. An average was calculated and compared from each questionnaire.

Procedure for Data Collection

Institutional Review Board approval was obtained prior to any participant recruitment or data collection. Participants attended two meals, which were spaced 5 days apart. Both meals were approximately at the same time and took place in the same room. The participants were assigned to separate groups based on the time of arrival. The room was separated by a divider. Half of the participants were assigned to one side of the room and the other half were assigned to the opposite side of the room. Room 1 had slow tempo music playing and room 2 had fast tempo music playing. To gather data on the second day, the participants traded rooms.

The same food was served at both meals. The menu included: green salad, tomato bisque soup with crackers, four cheese lasagna, breadsticks, and chocolate mousse. All nutritional information was obtained before data collection from the Standard Reference Database from the United States Department of Agriculture website (2009) or the nutrition label on the food package. Standardized portions of each food item were assigned an average weight prior to each meal time. This average weight was determined based on five sample servings.

All participants received a number for recording purposes based upon time of arrival. The music was playing softly as the participants entered the room. Both music samples were instrumental and did not differ in type. Participants were asked to fill out a

questionnaire assessing hunger at that point in time. After participants were finished eating their food, they placed one of their numbered index cards on the plate. The plate was returned to the foods lab by the wait staff for weighing. If there was food left on the plates, then the remaining food was weighed to assess calories consumed per participant. If there was no visible food left on the plate, then a weight of zero was assigned to that food. All participants were offered additional portions of the menu items during both meal times. The weights of the food were recorded on the spreadsheet by research assistants.

Controls for Environment

1. Each participant was served by the same person at both meal times.
2. The same food was served during both meal times.
3. Each participant sat with the same people at both meal times.
4. Both meals were served on the same size dishes.
5. The wait staff followed the same script at both meal times.
6. The same slow tempo and fast tempo music was played at both meal times.

Data Analysis

Using the nutrition information obtained before data collection, calories consumed was calculated using the before and after weights of the food for each participant. To assess the statistical significance of the difference between the means of total calories, soup, salad, entrée, and dessert, a paired samples *t*-test was used for the analysis on SPSS software. A paired samples *t*-test was also used to determine the difference between the means of the hunger questionnaire to rule out hunger as a confounding factor in this study.

Results and Discussion

The objective of this study was to determine the difference of total calories, soup calories, salad calories, entrée calories and dessert calories consumed when slow tempo music is played during a meal compared to when fast tempo music is played. It was hypothesized that significantly more total calories, soup calories, salad calories, entrée calories and dessert calories would be consumed in the slow tempo music condition compared with the fast tempo music condition. As described previously, data were collected from before and after weights of food served to participants. The results are discussed below.

Description of the Sample

The original sample consisted of 27 participants from the Eastern Illinois University community. The participants were recruited through email contacts. The final sample consisted of 23 participants with an attrition rate of 15 percent. Demographic data were not collected on the sample. Participants were assigned to a group based on time of arrival.

Results

It was hypothesized that significantly more total calories, soup calories, salad calories, entrée calories and dessert calories would be consumed in the slow tempo music condition compared with the fast tempo music condition. The amount of calories consumed per participant can be found in Figure 1. Sixteen out of 23 participants (70%) consumed an average of 215 more total calories under the slow tempo condition when compared to calories consumed under the fast tempo condition. A paired-samples *t* test was calculated to compare the mean of total calories consumed under the slow tempo

music condition to the total calories consumed under the fast tempo music condition. The mean calories consumed under the slow tempo condition was 820.65 (SD = 227.63), and the mean calories consumed under the fast tempo music condition was 714.43 (SD = 282.61). The difference between the two means approaches statistical significance (p = .062).

A paired-samples t test was also calculated to compare the mean calories consumed from the salad, soup, entrée (lasagna and breadstick), and dessert under the slow tempo music condition to the calories consumed from the salad, soup, entrée (lasagna and breadstick), and dessert under the fast tempo music condition. The mean calories consumed from the salad under the slow tempo condition was 39.73 (SD = 13.85), and the mean calories consumed from salad under the fast tempo music condition was 36.73 (SD = 13.76). No significant difference of calories consumed from salad was found (p = .343). The mean calories consumed from the soup under the slow tempo condition was 104.17 (SD = 34.39). No significant difference of calories consumed from soup was found (p = .162). The mean calories consumed from the entree under the slow tempo condition was 360.65 (SD = 173.93), and the mean calories consumed from entree under the fast tempo music condition was 285.91 (SD = 181.08). No significant difference of calories consumed from entree was found (p = .093). The mean calories consumed from the dessert under the slow tempo condition was 232.04 (SD = 59.07), and the mean calories consumed from dessert under the fast tempo music condition was 221.34 (SD = 109.42). No significant difference of calories consumed from dessert was found (p = .601). The average calories consumed in each course can be found in Figure 2.

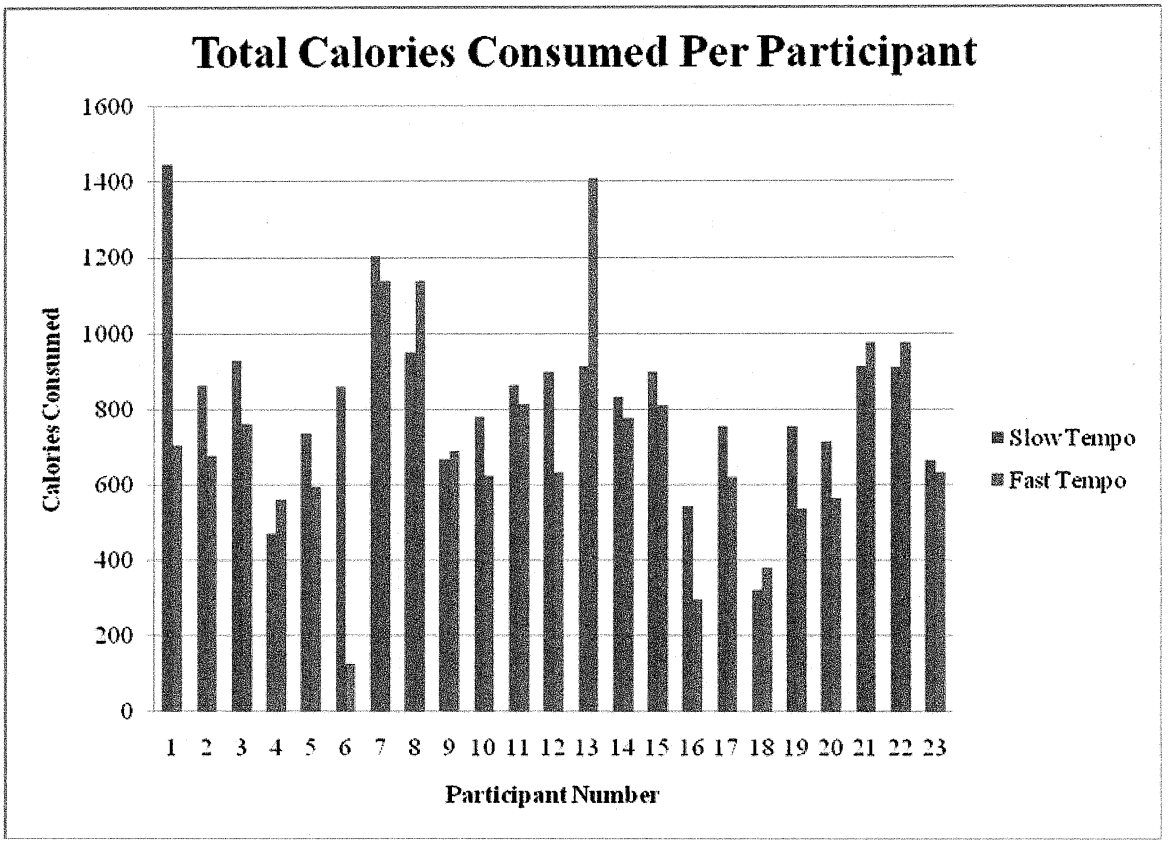

Figure 1. Calories consumed per participant in the slow tempo and fast tempo music conditions.

The results from the hunger scale revealed that under the fast tempo music condition, participants had an average hunger rating of 3.79 and under the slow tempo music condition participants had an average hunger rating of 3.83. A paired-samples *t* test was calculated to determine if there was any significant difference between the two music tempos. No significant difference between the two music tempos was found (p = 1.00).

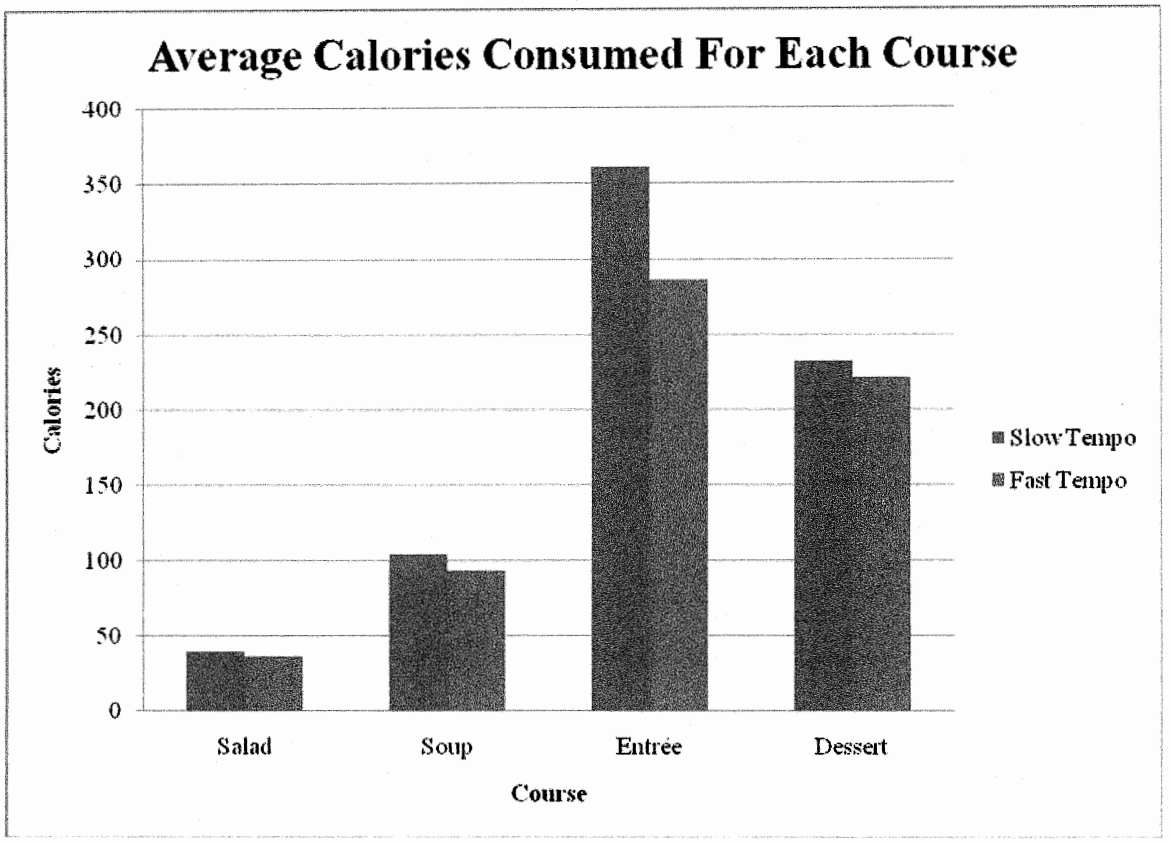

Figure 2. On average, more calories were consumed in each course under the slow tempo condition compared to the fast tempo condition.

Discussion

It was hypothesized that significantly more total calories and soup, salad, entrée, and dessert calories would be consumed in the slow tempo condition when compared with the fast tempo condition. As discussed in the literature review, slow tempo music may cause restaurant patrons to chew and consume food at a slower rate which may increase intake, duration, and expenditure.

These results concur with the implications of the Caldwell and Hibbert study (2002) and the Milliman study (1986). In the Caldwell and Hibbert study (2002), the researchers found that slow tempo music caused participants to stay an average of 15 minutes longer and spend approximately 23% more money on food and drink. In the

Milliman study (1986), it was found that slow tempo music caused participants to stay an average of 11 minutes longer and spend an average of $10.50 more on food and drink. The Caldwell and Hibbert study and the Milliman study noted that more money was spent when slow music was played which was likely a result of extra drinks or dessert. Both studies imply that a longer duration and increased expenditure may cause restaurant patrons to consume more food and drinks, however, no studies have been uncovered that measure the difference of calories consumed in fast and slow tempo music. However, unlike the above mentioned studies, this study tried to control for factors such as time and money constraints as well as expectations of the restaurant environment. The participants did not have to pay for their meal and the participants were also invited to stay as long as desired and were offered second portions of all food. In addition, data were collected in a conference room in hopes of eliminating expectations of the restaurant environment.

This study looked specifically at the difference of calories consumed in a slow tempo music condition and fast music tempo condition. The difference between the means of total calories, soup calories, and entrée calories is approaching significance. The difference between the means of salad calories and dessert calories was not significant. It seems that music tempo did not have influence on the amount of calories consumed from dessert possibly due to many reasons including that participants were full and were ready to return to work, homework, or studying. The mean calories and p values for all courses and total calories can be found in Table 1.

Table 1
Mean Calories and P Values for Each Course and Total Calories

Course	Slow Tempo Calories	Fast Tempo Calories	P Value
Soup	104.17	93.65	0.162
Salad	39.74	36.74	0.343
Entrée	360.65	285.91	0.093
Dessert	232.04	221.34	0.601
Total	820.65	714.43	0.062

Even though results from this study are not statistically significant, all data are trending in the direction indicating that with a larger sample size similar to the Milliman study, statistical significant differences in calorie consumption would be found. A majority of the participants consumed more calories in the slow tempo condition when compared to fast tempo music condition. As Caldwell and Hibbert (2002) suggested, when slow tempo music is playing, restaurant patrons may chew and consume food slower, increasing duration, which cause increased intake. In addition, results from this study indicate a potential for an increase in calorie consumption in the slow tempo music condition. Furthermore, in all courses, more calories were consumed by participants while in the slow music tempo condition.

Conclusion and Recommendations

Conclusion

It was hypothesized that significantly more total calories, soup calories, salad calories, entrée calories and dessert calories would be consumed in the slow tempo music condition compared with the fast tempo music condition. There are many environmental factors that influence eating behavior and intake. The results of this study indicate that music tempo may have an influence on intake much like the studies by Caldwell and Hibbert (2002) and Milliman (1986). The p values from the entire meal, soup, and entrée courses reveal that the difference of calories consumed under slow tempo and fast tempo music conditions is approaching statistical significance with slow tempo influencing participants to consume more calories. The small sample size is the likely reason as to why the p values were not statistically significant. It can be assumed that with a larger sample size, a statistically significant difference of calories consumed in the slow tempo condition and fast tempo condition would have been observed. However, an obvious trend is observed.

Under the slow tempo music condition, participants consumed an average of 120 more calories when compared to the fast tempo music condition. This study concurs with the idea put forth by Caldwell and Hibbert (2002), stating that slow tempo music may lead restaurant patrons to consume and chew food at a slower pace thereby increasing meal duration which may lead to extra servings of food that they would normally not consume. The p values of dessert and salad showed no statistically significant difference. The difference between calories consumed from salad showed no statistically significant difference due to many reasons which may include that approximately 56% of all participants consumed all of the salad or because salad is not calorically dense. There was

no significant difference in consumption of dessert calories possibly because participants were full and ready to leave the study.

Limitations

The major limitation in this study was the sample size. Another limitation was the limit of food choice. Though useful as a control measure, participants were served the same food during both meal times and were not given a choice on what food was served. A participant's preference for salad, soup, entrée, or dessert may have resulted in larger amounts that were not a result of music tempo. By including the same participants for fast and slow music tempo conditions, it minimized the effect of food preference.

Another limitation was hunger status prior to each meal time. If a participant consumed a calorically dense meal prior to the meal time, then the participant may have consumed less during the meal time that was not a result of the music tempo. To control for this factor, a hunger scale was completed by all participants prior to each meal time and no statistically significant difference was found between the mean hunger score of participants indicating that all participants were equally hungry before each meal time.

In addition, the study could not control for the participants' mood or conversation during the meal time that may have affected calorie consumption. To try to control for this factor, the two meal times were spaced less than a week apart and participants dined with the same companions during both meal times.

Recommendations and Implications for Research

Currently, no other published research concerning the influence of music tempo on calorie consumption has been uncovered. Because the p value for calories consumed was approaching significance, further research should include a larger sample size to reduce possible sampling errors and for generalizability purposes. In addition, in further

research studies, research assistants should be planted at each table to conduct observations as to mood and conversation of the participants. Also, demographic data should be gathered on participants. Demographic data such as age, sex, and ethnicity should be gathered so that conclusions can be generalized across age groups, gender, and ethnicities.

Recommendations and Implications for Practitioners

Dietitians should educate their patients on the environmental influences on eating behavior. With the increasing number of overweight and obese individuals, individuals should remain informed regarding environmental influences on intake and calorie consumption. These findings may aid practitioners in weight loss education and indicate the need for future studies. Determining the impact of music tempo on intake may have implications for education of obese clients. If consumers are aware of how physical surroundings may affect their consumption, they may be able to modify their intake. In addition, in populations with potentially low intake, such as the elderly population in a nursing home, the music tempo that promotes intake could be played to increase calorie consumption.

For restaurant managers, slow tempo music should be played to increase duration, expenditure, and consumption. However, if a restaurant manager is interested in fast table turnover, the manager should play fast tempo music. In addition, if a restaurant manager is interested in marketing a "healthy eatery", the manager should note that lower calorie options for all courses should be offered if the manage is playing slow tempo music to keep consumption at a healthy level.

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Appendix A

CONSENT TO PARTICIPATE IN RESEARCH

Eating Behavior in a Restaurant Setting

You are invited to participate in a research study conducted by Rachel Rogers, Dr. Carla Honselman and Kathy Rhodes, MS, from the School of Family and Consumer Sciences at Eastern Illinois University. Your participation in this study is entirely voluntary. Please ask questions about anything you do not understand, before deciding whether or not to participate. Approximately 40 participants will be included in this study. The only exclusion criterion is a known allergy to the food that will be served.

• PURPOSE OF THE STUDY

The purpose of this study is to examine eating behavior in a restaurant setting.

• PROCEDURES

If you volunteer to participate in this study, you will be given a copy of the menu. Notify the investigators if you have allergies to any of the foods to be served. If you have any allergies to the food being served you will not be allowed to participate in the study. If you are not allergic to the foods you will be asked to:

Meet at the specified time in 1418 Klehm Hall. Participation will last from one to two hours for each meal. You will be expected to come on both dates (May 1 and May 5 at 11:00 a.m.). You will be assigned a number that will be used for both dates to ensure confidentiality. Upon arrival you will fill out a one-question survey. After you fill out the survey, you will be a served a meal by a wait staff. After you are finished with your meal you are free to leave. The same process will be followed on both days.

• POTENTIAL RISKS AND DISCOMFORTS

There is minimal risk involved in this study. When eating in a restaurant setting there is always a risk for food borne illnesses. However, the wait staff has been trained in food service sanitation and all food will be prepared according to food service sanitation preparation guidelines. There is also a risk of food allergen exposure. People with allergies to the foods being served will not be allowed to participate in the study.

• POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

Each participant will receive two free meals while participating in this study. There are no monetary gains for participating in the study. Society may benefit from the results of this research. Nutrition professionals may be able to provide better education.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of assigning a number to each participant. Participants will not be referred to by name. Participants will be referred to using a number. The information that will be collected through this study will be distributed through a master's thesis. No individual information will be released. All information will be grouped together to find a mean for analysis with no identifying data.

- **PARTICIPATION AND WITHDRAWAL**

Participation in this research study is voluntary and not a requirement or a condition for being the recipient of benefits or services from Eastern Illinois University or any other organization sponsoring the research project. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits or services to which you are otherwise entitled.

There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about this research, please contact:

Rachel Rogers, RD

Email: rlrogers@eiu.edu

Dr. Carla Honselman, RD, LDN

Email: cshonselman@eiu.edu

- **RIGHTS OF RESEARCH PARTICIPANTS**

If you have any questions or concerns about the treatment of human participants in this study, you may call or write:

Institutional Review Board
Eastern Illinois University
600 Lincoln Ave.
Charleston, IL 61920
Telephone: (217) 581-8576
E-mail: eiuirb@www.eiu.edu

You will be given the opportunity to discuss any questions about your rights as a research participant with a member of the IRB. The IRB is an independent committee composed of

members of the University community, as well as lay members of the community not connected with EIU. The IRB has reviewed and approved this study.

I voluntarily agree to participate in this study. I understand that I am free to withdraw my consent and discontinue my participation at any time. I have been given a copy of this form.

_____

Printed Name of Participant

_____ _____

Signature of Participant Date

I, the undersigned, have defined and fully explained the investigation to the above participant.

_____ _____

Signature of Investigator Date

Appendix B

Slow Tempo Music Condition					
Participant Number	Green Salad (g)	Tomato Soup (g)	Cheese Lasagna (g)	Breadsticks (g)	Chocolate Mousse (g)
1					
2					
3					
4					
5					
6					
7					
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24					
25					
26					

Appendix B

Fast Tempo Music Condition					
Participant Number	Green Salad (g)	Tomato Soup (g)	Cheese Lasagna (g)	Breadsticks (g)	Chocolate Mousse (g)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
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24					
25					
26					
27					

Appendix C

Participant Number: _____

On a scale of 1 (not hungry at all) through 5 (extremely hungry) rate your level of hunger at this present moment.

1 2 3 4 5

(not hungry at all) (extremely hungry)