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Effects of offering tropical fruit beverages on fluid intake of older hispanic and non-hispanic residents in a long term care facility

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

EFFECTS OF OFFERING TROPICAL FRUIT BEVERAGES ON
FLUID INTAKE OF OLDER HISPANIC AND NON-HISPANIC RESIDENTS IN A
LONG TERM CARE FACILITY

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

in

DIETETICS AND NUTRITION

by

Raquel Castillo

2002

To: Dean Ronald M. Berkman
College of Health and Urban Affairs

This thesis, written by Raquel Castillo, and entitled Effects of Offering Tropical Fruit Beverages on Fluid Intake of Older Hispanic and Non-Hispanic Residents in a Long Term Care Facility, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

Marcia Magnus

Nancy Wellman

Victoria Castellanos, Major Professor

Date of Defense: February 4, 2002

The thesis of Raquel Castillo is approved.

Dean Ronald M. Berkman
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Florida International University, 2002

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DEDICATION

I dedicate this thesis to God and to my parents. Their support and unconditional love have made the completion of this work possible.

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I wish to thank the members of my committee for their support, patience and expert advice. Their gentle but firm direction has been most appreciated. Dr. Nancy Wellman was particularly helpful in guiding me toward a qualitative methodology and design. Dr. Marcia Magnus' expertise in the field of nutrition education and ethnic influences on nutrition was also a key factor for my proposal. Finally, I would like to thank my major professor Dr. Victoria Castellanos. From the beginning, she supported me and taught me not only the essential skills of research but also important values for my personal growth that will be a major asset for me in this profession.

ABSTRACT OF THE THESIS

EFFECTS OF OFFERING TROPICAL FRUIT BEVERAGES ON
FLUID INTAKE OF OLDER HISPANIC AND NON-HISPANIC RESIDENTS IN A
LONG TERM CARE FACILITY

by

Raquel Castillo

Florida International University, 2002

Miami, Florida

Professor Victoria Castellanos, Major Professor

The objective of this thesis was to determine how the availability of tropical fruit beverages, familiar to Hispanics, would affect fluid intake of Hispanic and non-Hispanic residents of a 120-bed nursing home. Beverage acceptance and intake were measured for three days with the following beverage offerings (including coffee): four fruit beverages usually served in the facility or two of the usual fruit beverages combined with two tropical fruit beverages. The presence of the tropical fruit beverages on the hydration cart significantly increased acceptance and intake in women but not men, regardless of ethnicity. Hispanic females chose and drank ($ps < .01$) more tropical fruit beverages than did their non-Hispanic counterparts. During the study residents consumed greater than six ounces of beverage 80% of the time and greater than ten ounces 57% of the time. Between-meal fluid intake in this population can be stimulated by offering generous servings (10-12 oz) of a variety of palatable beverages, including ethnic favorites.

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CHAPTER I

INTRODUCTION

Between 1990 and 1999, studies using a variety of measurements have shown that from 35 to 85% of U.S. nursing home residents are undernourished.¹ Malnutrition, dehydration, and weight loss in patients in nursing homes constitute one of the largest, silent epidemics in this country.¹⁻⁶

Dehydration is the most common fluid and electrolyte disorder in long term care settings and among frail older people in the community. If dehydration is not treated, mortality rates may exceed 50%.^{3,7} Dehydration may be caused either by increased fluid loss or decreased fluid intake. Physiological changes that occur as one ages, such as decreased thirst, renin activity and aldosterone secretion, also may contribute to dehydration, thereby increasing the susceptibility to urinary tract infection, pneumonia, pressure ulcers, hypotension, confusion, and disorientation.^{7,8}

Institutionalized older adults, who are more likely to be unwell and have limited access to palatable fluids, are at much greater risk for suboptimal hydration.^{9,10} Kayser-Jones et al.¹¹ measured factors that influenced fluid intake among nursing home residents who were not eating adequately and showed that clinical factors (undiagnosed dysphagia, cognitive and functional impairment, lack of pain management), sociocultural factors (minimal family visits, inability to speak English, and lack of attention to individual beverage preferences), and institutional factors (inadequate number of knowledgeable staff and lack of supervision of certified nursing assistants by professional staff) were the major determinants of low fluid intake among this population. Researchers suggest that adequate fluid intake can be achieved by simple interventions such as systematically offering residents preferred liquids.¹¹ In addition, if these fluids are high in calories, they

also will contribute to a higher caloric intake in older adults, which will help prevent malnutrition.¹²

Acceptance and intake of fluids in older adults can be influenced by one or more factors including increased variety and high palatability of fluids, cultural preferences and social dynamics.¹³⁻¹⁶

Other studies have shown that ethnicity and cultural preferences might strongly influence the food and beverage intake of the older adult population^{11,17-20} because individuals eat what is familiar and preferred.²¹ Furthermore, variety and palatability should be considered as strong stimulants of older adults' fluid intake since several studies have already demonstrated that relatively healthy older adults who have access to a variety of palatable fluids have adequate fluid intake.^{9,13,22} In addition, researchers have suggested that taste and flavor are determinant factors of food choices by older adults²³ which may influence in an increased hunger, acceptance and food intake of older adults.^{14,23}

Fluid and food intake of older adults, even more so than younger people, are influenced by beliefs about food, social interactions at meals, and by relationships with family, and significant others.²⁴ Having people around at meal times significantly increases intake of foods and fluids in older adults.²⁵

A number of studies have shown that social activity at meals produces greater calmness, reduced anxiety, and more elation. Through this mechanism social activity may release restraints on eating and extend the amount of time spent at a meal, thus increasing the amount consumed.^{25,26-29} In addition, the presence of other people may influence the

amount selected and eaten during a meal. It has been demonstrated that people will eat more in the presence of someone who eats a relatively large amount of food.³⁰

The goal of this experiment was to determine how the availability of tropical fruit beverages, culturally familiar to the Hispanic population, would affect fluid intake of Hispanic and non-Hispanic residents of a long term care facility.

Research hypotheses

The research hypotheses for this study are the following:

1. All residents will accept more beverages from the fluid cart when tropical fruit beverages are added to the usual fruit beverage offerings on the cart.
2. All residents will increase fluid intake (g) when tropical fruit beverages are offered in addition to the usual fruit beverages.
3. Hispanic residents will exhibit a significantly greater increase in fluid intake (g) than non-Hispanic residents when tropical fruit beverages are offered in addition to the usual fruit beverages.
4. The usual fruit beverages will be chosen most often by non-Hispanic residents and the tropical fruit beverages will be chosen most often by Hispanic residents.

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CHAPTER II

LITERATURE REVIEW

This review of literature asserts that dehydration occurs with frequency in institutionalized older adults and examines how different factors may influence older adults' food and fluid intake.

Dehydration in older adults

Dehydration is associated with lack of fluids in the body or excess water loss. Since fluids fill virtually every space in the cell and between cells, fluids or water are indispensable for our normal body balance.¹ Consequently dehydration is a problem that cannot be ignored. Water molecules not only fill space, but they help form structures of macromolecules such as proteins and glycogen.¹ As the primary fluid in the body, water serves as a solvent for minerals, vitamins, amino acids, glucose, and many other nutrients. Water also plays a key role in the digestion, absorption, transportation, and use of nutrients. Water is the medium for the safe elimination of toxins and waste products, and whole-body thermoregulation is critically dependent upon water.¹ From energy production to joint lubrication to reproduction, there is no system in the body that does not depend on water.¹⁻³

In order to prevent dehydration, fluid and electrolyte homeostasis must exist. This depends on a balance between the intake and output of water. In healthy individuals, water intake is controlled by thirst.⁴ Thirst is stimulated when osmolality increases or extracellular volume decreases. The sensation of thirst serves as a signal to seek fluids.⁴ On the other hand, water loss normally occurs through the kidneys in urine, the gastrointestinal tract in the feces, air expired from the lungs, and sweat from skin.⁴⁻⁶

Older adults are vulnerable to diseases and all kinds of health risk factors because their physiologic functions are decreased. Older adults are susceptible to malnutrition, weight loss and dehydration, among other health-related disorders.⁷ In fact, malnutrition, dehydration, and weight loss in nursing homes constitute one of the largest, silent epidemics in this country.^{6,7-11} Dehydration is characterized as the most common fluid and electrolyte disorder in long term care settings and among frail older people in the community.^{4,6,7-15}

The kidney is the main regulator of water loss. Changes in renal function with age are well documented and have been reviewed.¹⁶⁻¹⁸ Not only does the glomerular filtration rate decline, but also there is reduced ability to concentrate urine, a less efficient sodium-conserving capacity, and reduced ability to excrete a water load.¹⁶ These changes reduce the ability of older adults to conserve salt and water in the face of increased losses, predisposing them to hypovolemia and dehydration. An inability to excrete water can also put older adults at risk of water overload and hyponatremia.¹⁶⁻¹⁸ Moreover, both states lead to mental confusion, which can further impair fluid intake.^{13,16-19}

Physiological factors affecting dehydration in older adults include not only reduced renal function, but also a decreased thirst sensation, which will reduce fluid intake. Changes in the hormone systems involved in sodium and water homeostasis occur in older people and alter thirst levels.¹⁶⁻¹⁸ Thirst and secretion of vasopressin depend on the normal functioning of receptors that detect dehydration of the cells (osmoreceptors) and decrease in plasma volume (baroreceptors).¹⁶⁻¹⁸ Osmoreceptor sensitivity in older adults have been tested in relation to vasopressin release and found to be increased, but baroreceptor sensitivity declines with age. These changes affect the release of

vasopressin. Renin-angiotensin-aldosterone represents another complex of hormones, which function in thirst regulation, and has been proven to decline with age.¹⁶⁻¹⁸

Early signs of dehydration include headache, fatigue, loss of appetite, flushed skin, heat intolerance, light-headedness, dry mouth and eyes, burning sensation in the stomach, and dark urine with a strong odor. Signs of severe dehydration include difficulty in swallowing, clumsiness, shriveled skin, sunken eyes and dim vision, painful urination, numb skin, muscle cramps and delirium.¹ This is why older people who do not consume an adequate amount of fluid are more susceptible to urinary tract infections, pneumonia, pressure ulcers, hypotension, confusion, and disorientation. Serious life-threatening electrolyte imbalances such as hypernatremia, hyponatremia and hyperkalemia can also occur.^{1,13,19} It is very important to encourage an adequate fluid intake among older adults since fluid intake is the only way to replenish water deficits; conversely, failure to hydrate patients can easily lead to death in these patients. It is said that if dehydration is not treated, mortality rates may exceed 50%.^{13,20,21}

Russell and coworkers recently proposed a modified food and beverage pyramid for people 70 years and older. They suggested that fluid or water intake equal to or greater than eight servings (glasses) or two quarts per day was important to prevent dehydration in older adults.²²

Factors that influence fluid intake in older adults

Fluid intake among older adults in institutionalized settings can be affected by a variety of factors including physiological factors like thirst, depression, renal regulation, as well as social and cultural factors, such as availability of preferred beverages.

Physiological regulation of fluid intake in older people

Several researchers have studied the influence of thirst sensation on fluid intake among older adults. Some studies examined healthy older people^{4,18} while other studies concentrated on persons in ill health²³; however, all have come to the conclusion that thirst is diminished among this population when compared to younger populations.

Miller et al.²³ described six older patients (68-91 years) who had prior strokes, repeated hospitalizations with dehydration and hypernatremia, and deficient thirst. There was no evidence for hypothalamic pituitary dysfunction in these patients. Furthermore, the patients were physically able to obtain water if they wanted. These authors suggested that the thirst deficit might have been due to cerebral cortical dysfunction.²³ On the other hand, Rolls and Phillips⁴ and Mack et al.¹⁸ demonstrated that thirst depression can be present in healthy older people without any cerebral dysfunction.

In 1984, Phillips et al.⁴ investigated the effects of dehydration on thirst, as well as on plasma and urine variables, in both healthy younger and older male populations. For over 24 hours, subjects were deprived of water and had access to only a dry diet. It was expected that the dehydration produced would contribute to osmotic and hypovolemic stimuli to increase thirst and vasopressin secretion. However, after dehydration, the older group showed no significant increase in thirst, mouth dryness, or unpleasantness of taste. These results support the theory of an age-associated deficit in thirst that may predispose older adults to disturbances on fluid balance.⁴

The researchers in this study suggested that water homeostasis is eventually achieved over time in older adults, probably through a combination of intake of palatable liquids and foods, as well as through renal factors.⁴ A significant finding from this study

was that thirst is diminished even in healthy older individuals. Should this decrease in thirst be accompanied by illness or physical incapacity that increases water loss or prevents access to water, dangerous dehydration could result.^{4,20,23}

A similar study conducted by Mack et al.¹⁸ examined osmotic control of thirst and free water clearance between two groups of healthy males, 65 years and older and 18 to 28 years old. In this experiment, researchers created a 2.4% decrease in body weight due to dehydration followed by a 3-hour rehydration period. They observed that the older male population showed lower plasma volumes compared to the younger group (18-28 years), lower thirst perception and higher plasma osmolality attributed to increased solute concentration of sodium. They suggest that the reduced homeostatic response was primarily responsible for the water deficit in observed older individuals. They also found that older people have lower thirst sensitivity to hypertonicity and a tendency to an increased thirst threshold. This means that their blood levels have to get more hypertonic and they have to get more dehydrated before the thirst mechanism kicks in. They concluded that the hyperosmotic and hypovolemic state in healthy older individuals is not a simple water deficiency but represents a shift in the operating point for control of body fluid.¹⁸

These data suggest that there is a relationship between thirst depression and old age and that this may lead to a dehydration even in healthy older people. In this population, water homeostasis is influenced by both impairments in the physiological control of water intake and output, and results in sluggish homeostatic adjustments to water deficits.

Importance of beverages as a source of calories and nutrients for older adults

High caloric beverages such as juices, may contribute to increase the caloric intake and prevent dehydration commonly seen in older adults. Di Meglio and Matters,²⁴ investigated differential effects of matched liquid and solid carbohydrate loads on diet and body weight. Results showed that caloric beverages, like juices, contribute to an increased energy intake because they do not diminish appetite proportional to their caloric content thus promoting positive energy balance. Intake of beverages also prompted a shift to food selection, since there were no protein or fats provided in the beverages.²⁴ In a similar study, conducted with 323 adult subjects, researchers investigated the effects of the spontaneous ingestion of particular foods or beverages on the meal pattern and overall nutrient intake of humans.²⁵ Results showed that the calorie-containing drink types (fruit beverages and regular sodas), unlike the noncaloric beverages (coffee, tea and diet sodas), generally appeared to be associated with a higher overall caloric intake in meals.²⁵ Users of the calorie-containing drink types took in significantly more total food energy on the days when individuals drank the beverage than on days when they did not, and in meals accompanied with the beverages than in meals that were not. They observed that food energy ingested in drinks added to the total calories and did not displace calories ingested in other forms. This means that within a meal or meals during the day, there is no compensation by a reduction of other intake for food energy ingested in calorie-containing beverages. The nutrients contained in the beverages appear to be simply added on to those contributed by other sources without adjustment or compensation.²⁵

There are several mechanisms that may account for this phenomenon. Researchers explain that masticating a solid may provide an internal satiety signal not triggered by simply swallowing a liquid.²⁶ Studies have demonstrated that both early pancreatic exocrine and endocrine responses to oral stimulation with viscous or solid stimuli are greater than those to fluids. Furthermore, these early responses may directly influence hunger and consequently increased intake.²⁶ Meals of larger volume, lower energy density and lower osmotic potential are emptied from the stomach at a more rapid rate. To the extent that gastric sensing elements for these properties generate signals influencing feeding, fluids may evoke weaker signals.²⁴ The more rapid transit of fluids also results in a different time course of exposure of nutrients to purported nutrient sensors in the gut or proximal duodenum with possible implications for meal initiation.^{24,27}

If energy-yielding fluids evoke relatively weak satiety signals and they contribute to a higher caloric intake, they may represent a vehicle for promoting intake by those in need, such as older adults especially those who are malnourished.²⁴

Pleasure of eating and drinking associated with food and fluid intake

It is known that older adults have a reduced fluid intake due to the physiological factors mentioned above, but there are many other factors that can affect fluid intake.¹⁰ Many studies suggest that fluid intake can be influenced by the palatability of fluids, which is directly associated with taste and pleasure. It is reported that when older adults have access to a variety of palatable fluids and are feeling well, they have no trouble with fluid balance.⁴ The pleasure of eating a food is highly dependent on the pleasantness produced by sensory characteristics of the food, in particular, the taste of the food.²⁸

Rolls²⁸ suggested that taste and flavor are the strongest determinants of food choices by older adults. Therefore, it can be deduced that if the food or drink is liked by the older adult and tastes good, the pleasantness and pleasure of eating will be high and intake will increase.^{28,29} Indeed, De Castro et al.³⁰ demonstrated that there is a strong relationship between palatability and intake. Researchers in this study recruited 564 participants, who were asked to maintain food intake diaries for seven days. They recorded intake along with palatability ratings for entire meals recorded on a seven-point scale. Self-ratings of the participants' degree of hunger, thirst, depression, anxiety, and the attractiveness of the food were also obtained at the beginning and again at the end of each meal. Results showed that meal consumption was 44% higher in meals where palatability was highest. In addition, they found that the relationship between "elation", defined as a feeling of happiness and pleasantness,³⁰ and intake is, to some extent mediated through palatability.³⁰ Researchers suggest that elation simply makes food look better or depression makes it appear less appealing. In summary, there is some suggestion that the presence of highly palatable foods might make one feel more elated and hungrier and/or that hunger might make food appear more attractive.³⁰

There are many possible explanations for the reduction of fluid and food intake in older adults. Probably, there exists an interaction of many factors, some which contribute to a greater extent and others that have less influence. What is known is that pleasure is an important factor in the eating process, and pleasantness of eating in older adults is often diminished.²⁹ Pleasure is important in selection of specific foods, in associating flavors with postingestive outcomes, in determining how much is eaten within a meal, and in learning food preferences.^{29,31} Falk et al.³² used a constructivist approach and

quantitative methods to elicit the food choice factors important to individuals 65 years and older. Participants' food choices and preferences were strongly influenced by beliefs related to appropriate food behavior and expected characteristics of foods and meals, many of which had been formed during childhood.³² The pleasure of eating is associated with liked foods and preference is highly associated with cultural traditions.

Variety and food intake

The food served in institutionalized settings is frequently repetitive. Institutionalized older adults who are more likely to be unwell and have limited access to a variety of fluids and foods, are at much greater risk of suboptimal hydration. These older adults are at increased risk for mortality and morbidity when increased stress is placed on their bodies due to illness.^{12,33,34}

Since variety is a process by which eating is stimulated, increasing the variety of fluid offerings to institutionalized older adults would be expected to increase their fluid intake. In fact, studies have demonstrated that variety enhances intake, due to a sensory stimulation of appetite.^{12,33,34}

Although there are no studies reported on the association of beverage intake and variety of fluids of institutionalized older adults, it can be mentioned that older adults who are relatively healthy and have access to a variety of palatable beverages consume sufficient fluids.^{4,12}

Cultural influences on food intake

The surrounding environment influences food preferences, selection and intake. Human beings are not isolated; they interact, grow and develop in social environments. That is why social and cultural factors must be taken in account as significant

determinants of food and fluid intake. Food behavior has social and cultural connotations resulting from acquired knowledge, as well as carefully selected and maintained traditions. Historically food has been intimately woven into the life fabric of a society.^{35,36} For humans, almost all instances of eating can be fully understood only in a social context.³⁷

Culture is a major determinant for food and fluid intake because people eat what is familiar, liked and preferred.³⁸ Culture is usually associated with their traditional food and drink preferences.³⁸ Culture might have determined what they have eaten all their lives. The degree of attachment to culturally preferred and familiar foods is particularly reinforced in immigrants and others away from their native environments because native foods are associated with being with family and enjoying holidays. Consequently food becomes their linkage with all that is far away from them.^{38,39}

Food patterns are learned after birth. A young mammal can acquire information from its maternal parent about at least some of the foods that she has eaten. Galef⁴⁰ mentions that experience with milk flavors affects later food preferences and choices. Then habits and preferences begin to develop depending on the availability and exposure of food choices to the child.⁴⁰ As children become adults they will transfer their food patterns to their own children and the cycle continues, reinforcing determined food patterns that have been passed from one generation to another.^{40,41}

Exposure is largely a product of culture because individuals are exposed to the subset of all possible foods that one's ecology and culture support.⁴² It is also known that exposure is a recurrent and necessary cause for food preferences. Exposure to particular foods makes individuals consume those foods repeatedly, and increases their familiarity

to those foods. These processes may increase the preference among those foods.⁴² This process creates a base or pattern for cultural food preferences.^{41,42}

Specific food habits result from the combined sources of influence exerted by attitudes, beliefs, and experiences on the food practices of a community group, as well as economic factors in conjunction with local market resources.⁴¹⁻⁴³ Cultural forces are defined as the values, beliefs, and practices accepted by a community of individuals, which are learned and passed from generation to generation.⁴² There is evidence to show that cultural identity and food habits have long supported and reinforced one another. In most societies, foodways and cuisine (traditional foods, characteristic flavors, modes of food preparation and ways of eating) are passed on to their children, so that each subsequent generation knows what is commonly considered as food.⁴¹⁻⁴³

Cultures and individuals vary in the importance they attribute to food in their lives, the ritual and moral significance of food, and the role of food as a social vehicle. Thus, cultural differences in food preferences and choices might be enormous. However, any persons of various cultures and ethnicities living away from their country of origin will try to conserve and practice the elaboration of their traditional foods as long as possible, until acculturation has a major influence in their food consumption patterns.^{43,44}

Social facilitation of food intake in older people

People act in certain ways as a reaction to pathophysiological states, social mores, emotional states, or environments in which they find themselves. Those behavioral responses in older adults are especially apparent in relation to beliefs about food, about eating styles, and about relationships with staff in health care institutions, family and significant others.⁴⁵

An individual's nutritional health results from a series of social acts. For most people, obtaining, preparing, and eating food are social events.⁴⁶ Older people obtain food, as well as information about food, through their interaction with others. They often rely on others for transportation to the market, for prepared meals, and for companionship at meals.⁴⁶ It can be argued that adequate nutrition depends, in part, on the adequacy of the individual's social relations with others. Several studies with older adults have found that those individuals who had more social relationships and found them satisfactory also had superior diets.^{46,47}

McIntosh et al.⁴⁷ investigated the relationship among social support, stressors and related nutritional strain (loss of appetite) with the risk of poor nutritional health among 179 older adults. The sample was obtained from 805 participants at 13 federally-funded nutrition sites in the Shenandoah Planning District of Virginia. Researchers hypothesized that the risk of poor nutritional health is reduced among older adults with high levels of social support and exacerbated among those experiencing stressful events and strain. Findings showed that an extensive friendship network has positive consequences for appetite and nutritional intake among older adults.⁴⁷ Furthermore, friendship seems to have a more beneficial effect than family or marriage in older adults, probably because older adults have a greater frequency of active leisure activities with friends, especially those in nursing home facilities.⁴⁸ They also prefer to interact with friends who have similar needs and desires.^{47,48}

Having people around during meal times will significantly increase intake of foods and fluids. If these people are friends, the social interaction will have a greater

impact.^{47,48} It is still unclear how the presence of other people affects the amount and selection of foods by individuals. There are, however, a number of potential explanations.

Increased food and fluid consumption by older adults in the presence of other people may be due to the imitation factor.⁴⁹ This model suggests that an individual will increase intake in the presence of someone who eats a relatively large amount of food. Indeed, subjects in the presence of a high intake model tend to eat large amounts, while subjects in the presence of a low intake model tend to eat very little.⁵⁰ Another study with preschoolers also showed that their preferences and consumption patterns are strongly influenced by peers in their age range.⁵¹ A target child was exposed to peer models who were selecting and eating the target child's non-preferred food. Peer influence was a significant factor in the decisions of the target children selecting non-preferred foods, rather than their customary preferred foods. Data indicated that the target children were not only selecting but also consuming the non-preferred items, which confirms that peer-influence is very strong among this population.⁵¹ These relationships seem to also have an influence in older adults. Sixteen older adults of different congregate eating centers in New York were interviewed to learn about how they chose foods.³² Results indicated that the social influence of the individual's social framework played a prominent role in food choices of nearly all participants. Many participants concurred they would still attend the aggregate meal site even if they were going to be served a food that they disliked.³² Many of the social gatherings of these participants centered on food.³² People with whom one associated influenced the food-choices.³²

It has also been found that the presence of other people might induce and arouse states that lead to greater consumption. This explanation postulates that the presence of

other people increases the individual's drive level, which facilitates the emission of dominant responses.⁵² Several studies have investigated this phenomenon and a number have concluded that social facilitation increases the amount consumed by individuals due to increased levels of arousal.^{48,53} According to this statement it can be deduced that nursing home residents who eat and drink with others in dining rooms may be receiving more positive effects in their intake compared to those who eat and drink in their rooms.^{48,53}

De Castro⁵³ studied the impact of different types of companions on the spontaneous intake of free-living humans. Five thousand adults were paid to maintain a 7-day of everything they ate or drank, the time of occurrence, self-rated hunger, anxiety, and elation, the number of other people present, and their gender and relationship to the subject. He observed that meals eaten with other people generated less anxiety, more elation, and were larger and longer in duration compared to meals eaten alone, regardless of the relationship of the eating companion to the subject.⁵³ These findings are consistent with other research indicating that social facilitation might operate by inducing an emotional response which may produce and increase in intake.⁵⁴

The characteristics of the eating companion can effect meal intake in different ways. For example, meals eaten with one's spouse and family were larger and consumed faster than meals with other companions, whereas meals eaten with one's spouse and family were larger and consumed faster, while meals eaten with friends were larger and of longer duration.⁵³ Research indicates that social meals produce a greater calmness, which releases the restraints on eating and might also extend the amount of time spent at a meal thus, increasing the amount eaten. This may be especially when the individual is

with friends, who create an environment of openness, trust and positive feedback that causes enjoyment.^{48,53} In addition, in this study, the presence of males produced a social facilitation of increased intake in females but not in males, which suggests that the imitation explanation of social facilitation is more applicable to females who are prone to increase their intake in the presence of higher intake consumers (males).^{48,53}

Other studies have shown that the rate with which food is ingested tends to decrease, fairly linearly, as a function of the number of people present.⁵⁵⁻⁵⁷ The presence of more people significantly correlates with higher intake levels. In addition, researchers have observed that increases in the number of people present usually are associated with a decreased satiation level, thus intake is increased.⁵⁵⁻⁵⁷

Approaches to increase intake in nursing home residents

Among the most important factors that may influence fluid intake of institutionalized older adults are the behavioral factors. Some behavioral factors are: fear of incontinence; physical or cognitive inability to independently obtain and drink fluids; inadequate staff available to systematically offer fluids and assist residents to drink; and lack of accessibility to fluids in general but, in particular, fluids of choice.⁵⁸ In a recent study by Simmons,⁵⁸ 63 incontinent nursing home residents were randomly selected and placed into intervention and control groups. The intervention consisted of three phases for a total of 32 weeks: (1) 16 weeks of four verbal prompts to drink per day, in between meals; (2) 8 weeks of eight verbal prompts per day, in between meals; and (3) 8 weeks of eight verbal prompts per day, in between meals, plus compliance with participant beverage preferences. Between-meal fluid intake was measured in ounces by research staff during all three phases of the intervention. Findings showed that the majority (78%)

of the participants increased their fluid intake between meals in response to the increase in verbal prompts (phases 1 & 2). For a subset of residents (21%), however, only the offerings of preferred fluids increased their fluid intake (phase 3). Verbal prompting alone was effective in improving fluid intake in the more cognitively impaired residents; whereas, preference compliance was needed to increase fluid intake among less cognitively impaired nursing home residents.⁵⁸ In summary, the behavioral intervention that consisted of verbal prompts and beverage preference compliance was effective in increasing fluid intake among most of the sample of incontinent nursing home residents; moreover the significant increase of fluid consumption in response to prompting and preference compliance between meals did not occur at the expense of reduced consumption of food or fluids during meal.⁵⁸

For most people, cultural food preferences are very stable throughout life.⁴² Changing cultural preferences can take longer to occur than one might think, especially among older people whose habits are difficult to change.⁴² However, some older adults who live in nursing homes or long term care facilities are often deprived of their preferred foods and drinks.

Researchers have demonstrated that older adults are able to tell and select their food preferences, which if used to determine menu offerings may result in an increase in client satisfaction and food intake.^{59,60} Taking in account periodic solicitation of older adults with regard to food choices, frequency of offering certain items, and method of preparation preferred by these population may result in a decrease in plate waste, while enhancing nutrient-energy intakes.^{59,60}

Few studies have observed the influence of social and cultural factors on fluid intake among the older adult population; however, many researchers have suggested the importance of paying more attention to cultural preferences.^{13,14} One of the goals of a large 5-year anthropological study was to describe the dynamics of nutrition care among nursing home residents who were eating poorly.⁶¹ This study investigated the social, cultural, environmental and clinical factors that influenced eating behavior in nursing homes.⁶¹ Analysis of qualitative data revealed three factors that contributed to a moderate to high intake of food and energy. These were tube-feeding of residents, family assistance at mealtimes, and provision of preferred foods.⁶¹ For example, a Chinese man, who preferred Chinese food, was not served his native food in the nursing home. A Chinese adult day health center arranged for transport to the congregate site at lunchtime once weekly. On the day he went to the Chinese center, he ate all of the food served plus a quart of wonton soup brought in by a relative. He significantly increased his food intake compared to when his culturally preferred food was not available.⁶¹

Kayser-Jones et al.¹³ also observed factors that influenced fluid intake among nursing home residents who were not eating well. During the study, the fluid intake of 40 residents was evaluated during three consecutive days, beginning with breakfast on Sunday and ending with dinner on Tuesday (nine meals for each resident). The results showed that even though there were adequate fluid servings with and without meals, 39 of the 40 older adults maintained low fluid intakes of approximately 897 mL/day. Kayser-Jones et al.¹³ concluded that clinical factors (undiagnosed dysphagia, cognitive and functional impairment, lack of pain management), sociocultural factors (lack of social support like family visits, inability to speak English, and lack of attention to

individual beverage preferences), and institutional factors (inadequate number of knowledgeable staff and lack of supervision of CNA's by professional staff) were the major determinants of the low fluid intake of the elders in the study. Researchers proposed that adequate fluid intake can be achieved by simple interventions such as offering residents preferred liquids systematically and by having an adequate number of supervised staff to help older adults to drink while properly positioned.¹³ Other researchers have also suggested that preferences or cultural preferences be considered when trying to increase fluid intakes.^{14,33,38}

Intake of culturally familiar foods by Hispanic populations

Hispanics are a specific ethnic group, which represent nearly 17% of the total population of the United States. If current growth trends continue, the number of Hispanics in America will double within 25 years.⁶² By early century, they will surpass African Americans as the largest nonwhite minority.³⁷ Spanish-speaking individuals are frequently identified as Hispanics: Puerto Ricans, Cubans, Mexicans, and persons of other countries in Central and South America⁶³ which share a common language and a relatively common cultural heritage.⁶⁴

Bartholomew et al.⁶⁵ reported that cultural orientation was the major variable influencing food intake in low-income, free-living Hispanic and non-Hispanic older adults residing in San Antonio.^{37,65} Differences in nutrient intake were primarily associated with cultural orientation, independent of socioeconomic status.

Since different foods are eaten by different cultures, it has been observed that some cultures have higher or lower intakes of particular nutrients. Bermúdez et al.⁶⁶ studied the intake and food sources of macronutrients among older Hispanic adults and were

interested with the association of macronutrient intake cultural orientation, acculturation and length of residence in the United States. A representative sample of older Hispanics (age 65 and older) and non-Hispanic whites living in the Western United States were compared in order to describe the food intake and food sources of macronutrients. The Hispanic subjects were comprised of Puerto Ricans, Dominicans, other Hispanics from Central and South America, and Cubans from the Caribbean. This study found that Hispanics consumed less saturated fat and simple sugar foods in relation to the non-Hispanics. However, the Hispanics living in the United States for a longer time (more than 20 years) tended to have patterns more similar to non-Hispanics.⁶⁶

Another study investigated the preferred foods of Hispanics who were hospitalized.⁶³ This study found that foods preferred by Hispanic tended to be spicy. They also found that Puerto Ricans and Mexicans rarely consumed milk as a beverage, and the most preferred beverages among Mexicans were heavily sweetened coffee, sodas and fruit drinks.⁶³ The most common beverages consumed by Hispanics in this study were hot chocolate, coffee with milk, and cold drinks made with tropical fruit flavors.^{37,63} Although researchers asked hospitalized Hispanics about their most preferred foods, they did not determine how much food intake was improved when this factor was considered.

Hispanics in long- term care

Old age for Hispanics can be a very different experience than for other ethnic groups. Hispanic population 65 and older is growing rapidly because of the improvements of health. By the year 2050, the U.S. Census Bureau projects that nearly 13 million people 65 and older will be of Hispanic origin.⁶² Of these, nearly three million will be 85 years and older.³⁹ Since Hispanics have tended to care for their parents in their

homes, there has been little incentive to build long term care facilities that attend to their preferences and respect their culture and customs. With changes in the family's ability to care for older adults, experts predict that Hispanic-oriented facilities may become more common in the future as the demand for them grows and as they become viable financial ventures.³⁹

The fact that Hispanics constitute one of the largest minority populations in the United States has permitted them not only to maintain their culture of food but also disseminate it throughout other cultures. However, Hispanic older adults living at nursing homes or long term care facilities are often deprived of preferred foods in these settings. They frequently encounter foods and cooking methods that are unfamiliar to them, even though accommodation of their cultural food preferences can potentially promote improved intake in this group.⁴²

Summary

In summary, physiological, psychosocial, social, cultural, and situational factors interact to determine consumption of foods and fluids among the older adult population. A search of published literature does not indicate any studies on the acceptance of tropical fruit beverages among nursing home residents. More information regarding this issue is needed to allow nutritionists, dietitians and other health professionals to make the best decisions about what types of beverages should or might be offered in their particular facilities.

Since dehydration is a problem among the institutionalized older adults, and consideration of culturally familiar beverages may increase fluid intake,³⁶ the study aimed to assess the impact of offering culturally familiar beverages (tropical fruit beverages) on

fluid intake of both Hispanic and non-Hispanic residents of a nursing home facility. The culturally familiar beverages that were offered were those commonly known and familiar to the Hispanic population, since they constitute 57% of the population in Miami-Dade County.

To improve quality of life it is important to promote an environment of familiarity where preferred and known foods and beverages are available. Nursing home residents who do not receive adequate nutrition and hydration during the last months or years of their lives are denied one of life's greatest pleasures, the enjoyment of food and drink of their choice in a pleasant, social environment.⁷

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CHAPTER III*

EFFECTS OF OFFERING TROPICAL FRUIT BEVERAGES ON FLUID INTAKE OF OLDER HISPANIC AND NON-HISPANIC RESIDENTS IN A LONG TERM CARE FACILITY

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Introduction

Dehydration is the most common fluid and electrolyte disorder in long term care settings and among frail older people in the community.^{1,2} Left untreated, mortality rates may exceed 50%.^{1,3} Institutionalized older adults, who are more likely to be unwell and have limited access to palatable fluids, are at much greater risk for suboptimal hydration.^{4,5} Kayser-Jones et al⁶ found that clinical factors (undiagnosed dysphagia, cognitive and functional impairment, lack of pain management), sociocultural factors (minimal family visits, inability to speak English, and lack of attention to individual beverage preferences) and institutional factors (inadequate number of knowledgeable staff and lack of supervision of certified nursing assistants by professional staff) were the major determinants of low fluid intake among nursing home residents. These same researchers have suggested that older adults' adequate fluid intake can be achieved by simple interventions such as systematically offering residents preferred liquids.⁶

Variety and palatability may also stimulate older adults to increase their fluid intake. The findings of several studies indicate that varied and palatable beverages contribute to optimal hydration in relatively healthy older adults.^{4,7,8} Furthermore, cultural norms and preferences might also strongly influence food and beverage intake of the older adult population^{6,9-12} because individuals eat what is familiar, liked and preferred by them.¹³ Fluid and food intake of older adults depends not only on their pathophysiological state but also on their beliefs about food, the way they prefer to take their meal, and the social interactions they establish with friends, staff and family at these meals.¹⁴

The goal of this experiment was to determine how the introduction of tropical fruit beverages, culturally familiar to the Hispanic population, would affect between-meal fluid intake of Hispanics and non-Hispanic residents of a long term care facility.

Methods

This study was performed at a 120-bed nursing home in Miami, Florida. Protocols were approved by the Institutional Review Board of Florida International University. Informed consent was not necessary for this study.

The fluid intake of 46 residents, 24 Hispanic and 22 non-Hispanic, were observed. Residents were excluded from the study if they were receiving enteral feeding, had swallowing problems or were categorized as “severely impaired” in the cognitive skills for daily decision making as indicated by the Minimum Data Set (Version 2.0, USHHS 1998).

Design

This experiment studied the number of beverages accepted or declined from a hydration cart, as well as the total amounts of beverages consumed by residents. The hydration cart was customarily pushed at 2:30 pm by a Certified Nursing Assistant (CNA) whose ongoing responsibilities included the provision of between-meal fluids to residents. Each day during the study the hydration cart carried 4 fruit beverages and decaffeinated coffee, with cream and sugar optional (Appendix 1). The combination of fruit beverages offered was chosen from the list of 4 beverages commonly served in the facility (apple juice, pink lemonade, cranberry juice cocktail and orange juice) and two tropical fruit juices (mango and guanabana) introduced at the time of the study. Tropical fruit beverage offerings were chosen through informal interviews with Hispanic residents

at a second nearby long term care facility. This second facility was also used to determine the most practical and appealing way to offer and serve a variety of beverages from the hydration cart (Appendix 2).

This study examined the effect on fluid intake of offering 2 tropical fruit beverages in place of 2 of the 4 juices commonly served on the hydration cart. Afternoon fluid intake was measured under the following 2 conditions: 1) offering of 4 fruit beverages usually served in the facility (4USU condition); 2) offering of 2 usual fruit beverages and 2 tropical fruit beverages (2USU+2TROP condition). On the 3 days of the 2USU+2TROP condition, the usual fruit beverages provided with the tropical juices were as follows: Day 1, lemonade/orange; Day 2, lemonade/cranberry; and Day 3, apple/orange.

For the seventeen days prior to data collection (days -17 to -1) the beverage offerings varied, in random order, between the 4USU (8 days) and 2USU+2TROP (9 days) conditions. Following the 17-day run-in period, data collection occurred for 3 days each of the 4USU and 2USU+2TROP conditions. The days for each condition alternated, starting with 4USU condition and ending with 2USU+2TROP condition (Appendix 3).

The CNA who was offering beverages from the hydration cart each day was blind to the purpose of the study. This CNA was responsible for showing a display of commercial fruit beverage containers to residents and accepting resident beverage requests. Each day residents had the option to accept or decline a beverage. The research assistant accompanying the CNA did not interact with the residents but was responsible for portioning out exactly 11 ounces of the selected beverage into an attractive clear, pre-numbered 12-ounce cup and recording the beverage choice (Appendix 4).

Additional research assistants picked up cups with fluid remains after residents had finished their beverage or after 1 hour had elapsed. Remains were weighed on an electronic balance to establish the amount consumed by the residents.

Data Analysis

Statistical analysis was performed using the SPSS for Windows 10.0 software (SPSS Inc. Chicago, IL). Repeated measures ANOVA was used to compare 3-day drink acceptance and fluid intake in the 4USU and 2USU+2TROP conditions, with ethnic group as the between-subject variable and condition as the within-subject variable. To compare fluid intake and type of beverage chosen between Hispanics and non-Hispanics in the 2USU+2TROP condition, non-parametric independent sample t-tests using the Mann-Whitney U and Wilcoxon signed rank test were utilized.

Results

The presence of the tropical fruit beverages on the hydration cart significantly increased the number of beverages accepted by women, from an average of 2.0 drinks in the 4USU condition to 2.6 drinks in the 2USU+2TROP condition over 3 days ($p < 0.05$, Table 1). This increase in drink acceptance resulted in increased fluid intake ($p < 0.001$, Table 1). Average 3-day fluid intake was greater by 284 grams in the 2USU+2TROP condition compared to the 4USU condition. Hispanic and non-Hispanic female residents responded similarly, in both drink acceptance and gram intake, to the substitution of tropical fruit beverages for 2 of the usual beverage options (4USU vs. 2USU+2TROP). On the other hand, men did not show a significant increase in either the number of drinks accepted or in fluid intake in the 2USU+2TROP condition compared to the 4USU condition. Due to the limited number of male residents studied, there was not enough

statistical power to determine if Hispanic (N=6) and non-Hispanic male residents (N=4) responded differently to the availability of tropical fruit beverages.

To further explore the popularity of the tropical fruit beverage offerings, drink choice patterns were examined on those days when 2 usual beverages and 2 tropical beverages were offered (2USU+2TROP condition, Table 2). It was found that the tropical fruit beverages were popular choices on those days, even among non-Hispanic residents. Tropical fruit beverages comprised 50-67% of the drinks chosen by non-Hispanic females and males from the hydration cart, and 78-82% of the beverages chosen by Hispanic males and females, respectively. Even so, female Hispanics chose more tropical fruit beverages $p = 0.001$, and drank more of the tropical fruit beverages $p = 0.012$, than did their non-Hispanic counterparts. With the limited number of men in this study no statistical difference in drink choice ($p = 0.371$) or intake ($p = 0.376$) was found between Hispanic and non-Hispanic male residents.

In order to examine the portions consumed of different types of beverages, data were combined from the 2USU+2TROP and 4USU conditions and these were sorted by drink type, ie coffee, usual fruit beverages and tropical fruit beverages (Table 3). Under the conditions of this study, residents consumed a greater volume of their drink when they were served either coffee or tropical fruit beverages than when they were served the fruit beverages typically offered in this facility (orange, apple, pink lemonade and cranberry juice cocktail).

Eleven out of 46 residents chose coffee at least once and several residents (5) chose regular coffee at least 50% of the time they accepted a drink. When residents chose coffee from the hydration cart, they tended to drink a significant volume of fluid; 90% of

coffees were consumed above the 6 oz level (> 166 g) and 71% above the 10 oz level (>276 g). Although coffee represented a significant source of fluid for these individuals, with an average energy density of only 0.15 kcal/g, (range = 0.07-0.27 kcal/g) the coffee provided only 25 to 33% of the calories they would have received had they consumed an equivalent amount of one of the fruit beverages.

The typical amount of beverage consumed at mid-afternoon was also examined in order to determine the beverage portion size that would both maximize intake and minimize waste in this population. Under the conditions of this study, with 11-oz (320 g) served from the hydration cart greater than 6 oz of fluid was consumed approximately 80% of the time (166 out of 208 beverages). The volume of fluid consumed was substantive in most residents, as 66% of drinks were consumed above the 8 oz level and 57% were consumed above the 10 oz level (137 out of 208 beverages).

Discussion

This study confirms earlier findings that fluid intake in older people can be stimulated by offering a variety of palatable fluids^{4,7,8} and further indicates that between-meal fluid intake can be significantly increased in long term care residents by simply offering generous servings of appealing beverages.

Before the experiment, residents were receiving between 4 and 6 oz (120 to 180 g) of fluid at between-meal offerings. However, this study showed that the majority of residents have the capacity to drink a much greater volume. These data suggest that increasing portion sizes of fluid between meals could easily reduce the risk of dehydration in this population.

Budget-conscious managers may be concerned about increased waste, but the results in this study showed that most residents (80%) consumed more than 6 oz (180 g) and the majority (57%) of the population drank more than 10 oz (300 g). Thus, this small investment in increased portions of fluid (approximately \$0.02-0.025/oz for beverages such as apple, orange and cranberry cocktail juice or \$0.05-0.055/oz for tropical beverages such as mango and guanabana) will significantly reduce the financial cost associated with dehydration. At current prices, increasing the portion sizes of the usual fruit beverages, from 4 to 10 oz, would cost an additional \$0.12 - 0.15/day for each resident. If large (10 oz) tropical fruit beverages are offered, the additional cost would be \$0.42 – 0.45/day for the residents who chose tropical fruit beverages. For the facility used in this experiment, this represents an increase in food cost from \$4.26 to \$4.68/resident day the 38% of the time that tropical fruit beverages were selected. It is also important to consider that beverage waste went down for all residents when tropical fruit beverages were offered.

In the present study, Certified Nursing Assistants (CNAs) were instructed to display a tray, attractively arranged with beverage options, before asking the residents what they wanted to drink. The drink display was not practiced in this facility prior to this study. It is unknown if the demonstration of the sample tray and the verbal inquiry by the CNA regarding drink choice increased the rate drink acceptance vs. decline, and/or the overall consumption of fluid in this study. Verbal prompting during a drinking episode has been shown to increase the beverage intake of older adults.¹⁵ It is possible that the attractive presentation of the beverages (clear drinking cups and a display of beverage options) could have influenced the high acceptance and intake seen in this study, in

addition to the larger portion served in this experiment. Further studies should examine the potential influence of each factor on fluid intake.

It was hypothesized that fluid intake would increase in Hispanic residents when tropical fruit beverages were available because Hispanics would be able to choose beverages that are culturally familiar to them. It was further hypothesized that some non-Hispanic residents would choose the tropical fruit beverages when they were available but that presence of tropical fruit beverages on the hydration cart would not have a large impact on fluid intake in this group. Contrary to what was predicted, it was found that both Hispanic and non-Hispanic females significantly increased acceptance and fluid intake of all beverage types when tropical fruit beverages were offered. This could be a result of one or a combination of factors including increased variety, high palatability of the tropical fruit beverages, cultural familiarity and social dynamics.

It has been shown that increased dietary variety can induce a sensory stimulation of appetite,^{4,7,8} which may account for the enhanced intake and acceptance of both tropical fruit beverages and usual beverages. Before the experiment, fruit beverage offerings of this facility were limited to orange juice, apple juice, cranberry juice cocktail and pink lemonade. Although no studies have specifically examined the effect of beverage variety on fluid intake, several studies have demonstrated that older adults who have access to a variety of palatable fluids and are relatively healthy consume sufficient fluids to avoid dehydration.^{4,7,8}

Fluid and food intake of older adults, even more so than for younger people, are influenced by beliefs about food, social interactions at meals and by relationships with staff, family and significant others.¹⁴

Tropical fruit beverages are common in Latin America and the Caribbean. Results of this study showed that the consumption of tropical fruit beverages was significantly greater in Hispanic compared to non-Hispanic females. This is consistent with other studies that show that people, especially older adults, drink and eat what is familiar, including what is culturally familiar.^{6,9-12} Ethnic groups living away from their country of origin have been known to conserve and practice food traditions as long as possible.^{16,17} During the study, a number of Hispanic residents showed excitement when tropical fruit beverages were offered and these beverages were chosen by most Hispanic residents when available.

The enthusiasm of the Hispanic residents toward their culturally familiar beverage may have also contributed to increased fluid consumption by non-Hispanic residents, especially in females who are known to be more influenced by social interaction.¹⁸⁻²⁴ In the present study the majority of the residents were gathered in a common room when beverages were offered. Older adults, specifically females, establish extensive friendship networks, which according to other studies, have positive consequences for appetite and nutritional intake.^{20,25}

Imitation²⁶ may also account for the higher fluid consumption observed in non-Hispanics in the 2USU+2TROP condition. Females tend to increase their beverage intake in the presence of others who are ‘higher consumers’.¹⁸ Further, imitation may not only influences the amount consumed but also may influences people to accept items that “everybody” is choosing.²⁷ Our data showed that tropical fruit beverages comprised 50-67% of the drinks accepted by non-Hispanic males and females when these types of drinks were offered.

The findings from this study highlight the potential for using high calorie beverages as a vehicle to increase energy intake in nursing home residents. In the present study a number of residents preferred coffee as their afternoon beverage choice. Even when the resident used the maximum amount of sugar and cream (4 portions of each), the calories obtained (65 calories) were fewer than those acquired from 8 ounces (240 g) of the lowest caloric beverage (pink lemonade), which contributed to 96 calories. The highest caloric fruit juice, guanabana, contributed to 144 kcal/8 oz (144 kcal/240 g). High caloric beverages, like guanabana and grape juice (155 kcal/240 g), are likely to make a significant difference in the overall caloric intake of nursing home residents, as researchers have observed that food energy ingested in high caloric beverages do not displace calories ingested in other forms and tend to be additive to total calories consumed.^{28,29}

Recommendations

Nursing home professionals should routinely offer a wide variety of colorful, flavorful beverages between meals, served in an appealing manner, in order to promote adequate hydration among residents. Beverages that are culturally familiar to ethnic groups residing in the facility, Hispanics, for example, should be included among the beverage options and are likely to be enjoyed by a wide range of residents.

In addition to variety, offering generous portions of beverages will promote voluntary fluid intake. It is recommended that a minimum of 10-12 ounces of high-calorie beverage be offered in between meals, if diet and fluid restrictions allow.

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Table 1. Acceptance and fluid intake of Hispanic and non-Hispanic residents*

	n	Number of beverages accepted		Total grams of fluid consumed		Average grams of fluid consumed	
		4USU [†] condition	2USU+2TROP [‡] condition	4USU [†] condition	2USU+2TROP [‡] condition	4USU [†] condition	2USU+2TROP [‡] condition
Non-Hispanic							
Females	18	1.9 ± 0.2	2.4 ± 0.2	378 ± 67	672 ± 64	184 ± 23	274 ± 14
Males	4	2.0 ± 0.5	1.5 ± 0.9	582 ± 187	493 ± 284	282 ± 24	329 ± 1
Hispanic							
Females	18	2.1 ± 0.1	2.8 ± 0.1	474 ± 67	750 ± 67	224 ± 20	262 ± 20
Males	6	2.2 ± 0.5	2.3 ± 0.5	615 ± 154	769 ± 162	279 ± 28	330 ± 3
Combined							
Females [§]	36	2.0 ± 0.1	2.6 ± 0.1	426 ± 47	710 ± 46	205 ± 15	268 ± 12
Males	10	2.1 ± 0.4	2.0 ± 0.5	602 ± 112	658 ± 147	280 ± 18	329 ± 2

*USU= usual beverages, TROP = tropical beverages, values represent means ± SEM.

[†] Each resident accepted a total of 0-3 beverages over 3 days

[‡] 3-day total of fluid consumed

[§] Significant increase in beverages accepted and grams consumed in females, but not males, in 2USU+2TROP compared to 4USU condition, p< 0.05.

Table 2. Drink choice and intake of USU beverages vs. TROP beverages during 2USU+2TROP condition*						
	n	Beverage Choice		Beverage Consumption (g)		
		USU beverages	TROP beverages	USU beverages	2USU+2TROP condition†	TROP beverages
Non-Hispanic Females	18	1.2 ± 0.2	1.2 ± 0.2	332 ± 76	339 ± 64	
Males	4	0.5 ± 0.3	1.0 ± 0.6	158 ± 92	334 ± 193	
Hispanic Females§	18	0.5 ± 0.2	2.3 ± 0.2	120 ± 58	630 ± 88	
Males	6	0.5 ± 0.5	1.8 ± 0.6	160 ± 160	608 ± 199	

*USU= usual beverages, TROP = tropical beverages, values represent means ± SEM.

†USU beverages + TROP beverages = total number of beverages chosen over 3 days in 2USU+2TROP condition, maximum = 3.

‡Values represent total grams of beverage of each type consumed over 3 days.

§Both beverage choice and beverage consumption statistically different from non-Hispanic females, p< 0.05.

Table 3. Volumes of beverages consumed by beverage category

Amounts consumed	% of beverages consumed to each volume			
	All beverages [*]	Coffee [†]	TROP beverages [‡]	USU beverages [§]
> 6 oz (180 g)	79	90	89	68
> 7 oz (210 g)	74	84	85	62
> 8 oz (240 g)	66	77	77	55
> 9 oz (270 g)	61	74	70	50
> 10 oz (300 g)	57	71	63	46

^{*} Percentage of all beverages accepted over 6 days of the study (total of all types = 208 beverages).

[†] Percentage of 31 coffees accepted over 6 days.

[‡] Percentage of 79 tropical fruit beverages accepted over 3 days.

[§] Percentage of 98 usual fruit beverages accepted over 6 days.

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CHAPTER IV

DIRECTIONS FOR FUTURE RESEARCH

In any experiment there are always logistical and practical constraints, which limit the scope of the study and conclusions that can be drawn from it. In addition, it is not always possible to eliminate or avoid all of the possible confounding factors in a particular experiment. These also limit the conclusions that can be drawn from the data. The following section will further elaborate in both the limitations and confounding factors in this experiment and how they have influenced the interpretation of the results.

In the present study, both Hispanic and non-Hispanic females significantly increased their acceptance and beverage intake when tropical fruit beverages were included in the beverage offerings compared to when only usual fruit beverages were offered. Although this effect was very robust under the conditions of this study, it is possible that findings would vary with different study populations or under a different set of circumstances

Limitations of the study

Limitations of conducting a study in only a single nursing home

This study was conducted at a single 120-bed nursing home in south Miami with a resident population, which was more than a 50% of Hispanics. The particular characteristics of this nursing home may limit our findings to nursing homes with residents of similar acuity and care requirements and with a similar ethnic breakdown.

For example, in the current study drink acceptance, choice and intake of beverages were compared only between Hispanic and white non-Hispanic residents. This facility did not serve a significant number of other ethnic minorities such as Asians and African Americans. If the study had been able to examine more than two ethnicities in

this nursing home it would have expanded our findings into a more global investigation of how beverage options affect acceptance and intake in nursing home residents.

Including nursing homes in this study with larger sub-acute units and dementia units, and with a variety of ethnic populations would have allowed us to extend the scope of the study and conclusions to residents with a wider range of care needs.

Limitations of sample size

The selection of a sample size, which is representative of the population is critical to allow findings from the study sample to be generalized to the larger group (population) from which the sample was drawn. The more representative the sample, the more assured the researcher will be that the findings from the sample also apply to the population. Selection of a large sample size helps to increase external validity, confidence and reliability of findings.

The fluid intake of 46 residents, 24 Hispanic and 22 non-Hispanic, were observed in this study. Residents were excluded from the study if they were receiving enteral feeding, had swallowing problems or were categorized as “severely impaired” in the cognitive skills for daily decision making as indicated by the Minimum Data Set (Version 2.0, USHHS 1998). The exclusion and inclusion criteria for this study limited the number of residents who could have participated in this experiment. Inclusion of residents with swallowing problems and those with severe cognition impairment would have required an adjustment in the experiment design, however, it would have given a larger sample size and would have allowed for examination of the effect of beverage offerings in a wider range of nursing home residents.

Furthermore, of the 46 residents in the study, 36 were females and only 10 were males. The small sample of male residents did not provide sufficient statistical power for differences in intake and acceptance between Hispanic and non-Hispanic males. A larger sample size would have given a greater statistical power and would have allowed for a more thorough examination of the interaction between gender, ethnicity and beverage type on fluid intake.

Limitations of portion size and time of day study was conducted

In preparation for this study, a pilot test was conducted in a different facility in order to establish the best way to offer and serve beverages from the hydration cart. Fifteen Hispanic and non-Hispanic residents were approached and asked different questions concerning type, size and presentation of beverages. On the first day of the pilot study residents were offered 8 oz of fluid, which was 2 ounces more than they usually received in between meals. Residents were purposely given more than it was thought they would drink so that portion size would not limit intake.

It was determined that the majority of the residents drank all of their beverage when they were served 8 oz. Therefore, on the second day residents were served an additional 3 ounces, for a total of 11 oz. To surprise, many of the residents also drank all of the 11 oz serving. Portions of fluid larger than 11 oz were not tested. Bigger drinking glasses would have been needed, which would have represented both a higher cost for the facility and might have been difficult for older adults to handle, particularly those who are cognitively impaired.

Finally to understand how fluid offerings can be manipulated to maximize intake between meals, it is important to systematically explore the issue of optimal portion size.

The best portion size for different times of the day should also be explored since this experiment provides data only from the afternoon hydration cart. The time of day, i.e. morning or bedtime (7 p.m.) as well as concurrent offerings of foods such as crackers, cookies and sandwiches might also influence fluid consumption in nursing home residents.

In summary, there were a number of logistical and practical constraints that limited the scope of the study. This raises the question of whether these results would be the same in other nursing facilities, all type of nursing home residents and for all between-meal fluid offering situations.

Potential confounding factors

Potential confound of two different CNAs approaching the residents of these study

The hydration cart in this facility is customarily pushed by one Certified Nursing Assistant (CNA) each day, with each CNA working part of the week. During the data collection phase of the study, one CNA offered beverages two out of three times for the 2USU+2TROP condition and one out of three times for the 4USU condition, with other CNA working the remainder of the 6 data collection days. It is unknown if the behavior of the CNAs differed significantly regarding encouragement of beverages acceptance and intake. It is theoretically possible that differences in CNA behavior could have contributed to differences in intake between 2USU+2TROP and 4USU days. The ideal design would have utilized only one CNA for the duration of the study. This would have prevented any confounding effect of staff or beverage intake.

In considering the possible confounding impact of CNA on beverage intake, it is important to consider that these nursing assistants did not know the objective of the

study, which reduces the chance that they would have acted differently on 2USU+2TROP days than on 4USU days. Both CNAs were of the same ethnicity (Caribbean), neither spoke Spanish and both appeared to exhibit similar behaviors. It is unknown whether one of the CNAs was better liked by the residents or, alternatively, had a more positive disposition toward pushing the hydration cart.

Although it is possible that unequal use of the two CNAs for each condition could have contributed to the treatment differences, it is unlikely. Statistical analysis revealed that residents also drank similarly on the 4USU day, that is there was no “day” effect on beverage acceptance and intake of residents. If one of the CNAs acted differently than the other we would have expected tropical or usual beverage intake to be higher or lower on her days compared to the other CNA.

Potential confound of afternoon resident activities

In the afternoon hydration opportunity the majority of the residents received their beverage in the dining room, where a large number of individuals gathered to share, talk or participate in different activities. It was observed that during the most popular activities, such as bingo and crafts, more people were present in this room. In addition, these activities appeared to increase the residents’ arousal and enthusiasm, which may have contributed to the individual’s determination to drink more.¹ During this study, bingo and crafts were offered for two out of the three days of the 2USU+2TROP condition and none of days of the 4USU condition. The enthusiasm and excitement exhibited during the activity days could have had a positive impact in beverage intake, since the emotional state is a determinant factor of food and fluid intake.² In addition, the combination of preferred activities and offerings of tropical fruit beverages, could have

had a greater impact on the enthusiasm of the Hispanic population, which could explain why they had a higher intake during the days tropical beverages were offered.

On the other hand, some residents received their beverage in their room. It is unknown if these residents could have been influenced less by social factors than those in the activity room and whether this affected their acceptance and intake of beverages. It has been shown that the more people present at a meal time and the more they interact, restraints on eating are disinhibited and the meal is prolonged resulting in a longer period of eating and drinking.³

Statistical tests and analysis were performed to observe if the type of activity interfered with the results and if there was a “day effect” where people drank more on the days of the popular activities (bingo and crafts). Results showed that that even though the liked activities were offered on two days of the 2USU+2TROP condition, drink intake was not significantly higher on these two days than on the day that there was no activity. This suggests that the observed increase in intake was probably due to beverage offerings and not to afternoon activities.

Potential confounding influence of the weather

Weather varied during the experiment as it normally does in the summer in South Florida. Two of the days of the 2USU+2TROP condition were very rainy and dark and the temperature was not as hot as it usually is this time of the year. It seemed that the air conditioning was keeping the building colder than normal on the rainy days, which combined with the overcast sky could have given residents the impression of a “cold and rainy” day when looking out of the window. Rainy days could have decreased the appeal of beverages to the residents, particularly cold beverages. It also could have increased

resident preference for hot drinks (coffee). However, the lack of and observed “day effect” in the data analysis suggests that residents maintained a fluid consumption similar to the non-rainy day of the 4USU.

In summary, although there were a number of potential confounding factors in the study, analysis of the data indicate that residents behaved similarly on all three days of each condition. These data suggest that any effects of these potentially confounding factors were outweighed by the main effect of the beverage offerings. Future studies should explore the contribution of each of these factors to beverage acceptance and intake.

Potential topics for future studies

Verbal prompting or preference compliance

For this experiment, CNAs showed a sample tray with the different beverage options and asked the resident to identify their preferred beverage. If the resident did not understand, the CNAs repeated the options and showed them the containers closely until they accepted or declined a beverage. It is unknown if the verbal prompting practiced by the CNAs had similar effects in all the individuals or affected resident subgroups differently.

According to Simmons⁴, verbal prompting is more effective in more cognitively impaired individuals, whereas offering preferred beverages is more effective at increasing intake in less cognitively impaired residents.⁴ In the present study, the association between verbal prompting, beverage preference, cognitive impairment, and fluid intake were not explored. It would be beneficial to more fully understand the relationship between verbal prompting, personality of the CNA and fluid intake of older adult

residents in order to determine the best strategy to prevent dehydration in different resident subgroups.

Variety of beverages as a factor that influences fluid intake

For the purpose of this study we offered four fruit beverages commonly served at the facility and two tropical fruit beverages introduced at the time of the study. It is unknown if the increased intake seen with the tropical fruit beverages was due to a greater variety or if the offering of culturally familiar beverages increased fluid intake.

In order to understand better the relationship between variety and fluid intake, future studies should examine the effect of beverage type as well as the effect of variety on fluid intake. Understanding the impact of the type and variety of beverage offerings on fluid intake of residents may allow for the development of snack and hydration cart menu guidelines that are evidence-based.

Mood and emotional state

The different states of mood, such as elation, depression, tiredness, anxiousness or tranquility, have been shown to significantly influence food and fluid intake.² Mood or emotional state were not directly measured for this study, however, it was observed that Hispanic residents showed greater enthusiasm and excitement when tropical fruit beverages were offered. This could have influenced the mood of non-Hispanic residents and consequently influenced in their fluid intake.

Consumer's acceptance studies, especially those conducted in the older adult population, should consider the impact of mood and emotional state. Prospective, longitudinal studies should carefully determine the mood of nursing home residents when they ingest different types of beverages and look for associations with the amount

consumed. It would also be interesting to consider mood in both cognitively intact and cognitively impaired populations, since their emotional state should vary considerably. This kind of information could be used by nursing home professionals to manipulate mood in order to optimize food and fluid intake and thus improve the nutritional status of this population.

Family, social facilitation and nutritional intake of older adult residents

Some of the residents of this study received family visits during the afternoon whereas others did not. It is unknown if the presence of the family could have influenced intake of the resident on those days. Research indicates that dietary intake is lower in families in which there exists excessive control over an individual member's behavior, frequent criticism of eating, excessive solidarity, or disagreement about how members ought to behave.⁵ However, other researchers affirm that the presence of family and friends has a positive effect in fluid and food intake of older adult residents.^{6,7}

To further understand these relationships, large groups of people at a variety of nursing homes should be studied. The impact of family visits at different meal times could be examined in different populations of nursing home residents. It is possible that there could be a different pattern in various groups, such as cognitively impaired, critically ill, healthy, young, old, male or female residents. A better understanding of the association between family visits and the eating responses of different kinds of residents would allow staff to promote or discourage family visits to the benefit of the nutritional status of each resident.

In addition, it is very important to investigate if the increase in the number of people present in dining rooms of nursing home facilities is associated with an increase or

decrease in acceptance and intake of afternoon beverages. Understanding the association between social meals and resident's afternoon beverage intake will allow nursing home facilities to schedule activities which will maximize fluid intake.

Resident's personal characteristics and the association to fluid intake

Personal characteristics of the residents studied in this experiment were not considered. Personal factors such as current physiological conditions or physical status could have strongly influenced food choices of this population. Many physical conditions related to the aging process, such as digestibility problems, physical debilitation, upper respiratory infections or even special medication could affect how these older people chose the beverages and perceive them, thus affecting intake.⁸

Designing studies that take into consideration personal factors of older adult residents may help increase understanding of their nutritional behavior and in the design of more effective interventions. Future research should study individuals with swallowing problems who receive thickened liquids, severely impaired residents who must be approached with different techniques, and critically ill residents and those receiving special medications that might impair taste and appetite.

Lunch and breakfast dietary intake of older adult residents

Intake of food and fluid during lunch and breakfast was not considered and it is unknown if people who ate large breakfasts and lunches could have had a lower or higher intake of beverages in the afternoon. The notion of caloric regulation predicts that people compensate at subsequent eating opportunities for eating more or less at a meal. This mechanism allows people to regulate caloric intake.² Future studies should examine food

and fluid intake relationship between meals and snacks in order to determine optimal approaches to feeding residents.

Portion size and serving method

The maximum amount of fluid given in this study was 11 oz (330 g) and it is unknown if residents would have been able to drink even larger portions. Future studies should try to establish the maximum amount of fluids that could be taken by older adults in between meals and at different times of the day. Systematic tests of different portions sizes, beginning with the minimum amount offered at nursing home facilities (4 oz) and increasing up to amounts over 11 oz, should be conducted. This would allow adoption of a standard portion size that prevents the costly state of dehydration in residents. It is also important to experiment with different portion sizes at different times of the day (mid-morning, afternoon or before bedtime) as it is unknown if different size offerings at different times of the day would have an impact on fluid intake.

Furthermore, nursing home facilities should determine which beverage serving method optimizes fluid intake. Some of the visual cues that could positively influence fluid acceptance and intake are the size of the glass, glass color and glass clarity. In addition, it should be determined whether residents prefer to see the containers in the hydration cart or a sample tray with the beverage containers, as well as the best way for residents to indicate what they want.

Conclusion

It is a fact that the population of older adults is increasing, which means that the need for health care for this population will increase. Dehydration and malnutrition are great risk factors for mortality in older adults, especially in nursing home residents.

Future research should further explore the relationships between social dynamics, appetite and dietary intake associated with dehydration and malnutrition. Fluid intake as it relates to portion size, beverage presentation, social facilitation, verbal prompting, beverage variety and mood, among other factors, will help determine optimal approaches to increase fluid intake in nursing home residents.

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APPENDIX 1
Beverages served on the hydration cart

Beverage	Brand	Amount served g (oz)	Calories Served (kcal)
Usual fruit beverages			
Apple juice	Healthy Trend Juice Blends	331(11)	152
Cranberry juice cocktail	Healthy Trend Juice Blends	327 (11)	165
Pink Lemonade	Sysco	320 (11)	129
Orange juice	Healthy Trend Juice Blends	317 (11)	138
Tropical fruit beverages			
Mango juice	Mauna Lai	335 (11)	179
Guanabana juice	Goya	333 (11)	202
Coffee			
Coffee	-	304 (11)	0
Sugar (1 package = 3g)			11
Powdered Non-Dairy Creamer (1package = 3g)			11

APPENDIX 2A
Pilot study at a second nearby facility

Tropical fruit beverage offerings were chosen through an informal preference interview with Hispanic long term care residents at a second nearby facility. Certified Nursing Assistants (CNAs) selected 15 Hispanic residents who were capable of giving an opinion and who didn't require thickened liquids. The researcher and the Nursing Assistant approached each resident individually and asked what were their favorite tropical fruit beverages. A list of tropical fruit beverages from the market was used as a guide to establish the communication with each resident. Samples of some beverages were shown and offered. Two kinds of the most preferred tropical fruit juices were chosen for the hydration cart. For the Serving Method Pilot Test, 15 Hispanic and 15 non-Hispanic residents were chosen and approached with the same procedure as the one used in the preference interview. A different question concerning type, size and presentation of glasses and beverages were asked each day for four days. Suggestions from these residents were gathered as to the best way to offer and serve beverages from the hydration cart.

APPENDIX 2B
Informal Preference Interview

1. Which are your favorite tropical fruit beverages?

2. Do you like to drink beverages directly from the container or from the glass?

3. Do you like to see through the glass or it doesn't matter to you? Do you like to see the color of the fluid?

4. Do you like cold drinks?

5. How do you like to drink your beverage, with ice or without ice?

APPENDIX 2C
Serving Method Pilot Test

Residents	10 ounce glass (8 ounces of preferred fluid given) 1st Day*	12 ounce glass (11 ounces of fluid given) 2nd Day*	Do they drink more when a bigger size is offered?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

*Drank everything: put a “check” in each row

*Remaining fluid: put an “X” in each row

Residents	Clear glass 3 rd Day*	Opaque glass 3 rd Day*	Do they like to see the color of the fluid through the glass or they don't care?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

*Prefer the option offered: put a "check" in each row

*Do not prefer the option offered: put an "X" in each row

Residents	Containers visible in the cart 3 rd Day*	Containers hidden 3 rd Day*	Do they choose by signaling the containers when they are visible or they just say what they want?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

*Prefer the option offered: put a "check" in each row

*Do not prefer the option offered: put an "X" in each row

Residents	Offer beverages, showing a tray with samples of the beverages 4th Day*	Just say the different options 4th Day*	Does the tray help to determine the choice and increase acceptance?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

*Prefer the option offered: put a “check” in each row

*Do not prefer the option offered: put an “X” in each row

APPENDIX 3

Beverages served during the run-in phase and the data collection phase

DAY	CONDITION	BEVERAGES OFFERED
RUN-IN PHASE		
-17	2USU+2TROP condition	Pink lemonade, apple/ mango, guanabana, coffee
-16	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-15	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-14	2USU+2TROP condition	Orange, cranberry/ mango, guanabana, coffee
-13	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-12	2USU+2TROP condition	Pink lemonade, orange/ mango, guanabana, coffee
-11	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-10	2USU+2TROP condition	Apple, cranberry/ mango, guanabana, coffee
-9	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-8	2USU+2TROP condition	Pink lemonade, cranberry/ mango, guanabana, coffee
-7	2USU+2TROP condition	Apple, orange/ mango, guanabana, coffee
-6	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-5	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-4	2USU+2TROP condition	Orange, cranberry/ mango, guanabana, coffee
-3	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
-2	2USU+2TROP condition	Pink lemonade, apple/ mango, guanabana, coffee
-1	2USU+2TROP condition	Apple, cranberry/ mango, guanabana, coffee
DATA COLLECTION PHASE		
1	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
2	2USU+2TROP condition	Pink lemonade, orange/ mango, guanabana, coffee
3	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
4	2USU+2TROP condition	Pink lemonade, cranberry/ mango, guanabana, coffee
5	4USU condition	Orange, pink lemonade, apple, cranberry, coffee
6	2USU+2TROP condition	Apple, orange/ mango, guanabana, coffee

APPENDIX 4

Intake Data Collection Form

4USU condition or 2USU+2TROP condition

Day: _____

[illegible]