

A PRELIMINARY STUDY ON THE EFFECTS OF BEHAVIORAL MIMICRY ON
DRINKING BEHAVIORS IN OLDER ADULT POPULATIONS

by

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THESIS ABSTRACT

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Malnutrition and dehydration are prevalent health risks among older adults in skilled nursing facilities, particularly among those with cognitive impairments. Existing behavioral interventions do not consider social aspects of mealtimes, and there is limited research on social aspects of mealtimes in older adults. The current study introduces nonconscious behavioral mimicry as a social approach to supplement existing interventions.

A repeated measures design examining the imitation of a confederate's drinking and cup touching behaviors was employed to investigate whether these behaviors can be altered due to nonconscious behavioral mimicry in healthy older adults ($N = 14$; $M = 71$ years old). Findings indicate that behavioral mimicry increased drinking behaviors, while no significant effect was observed with cup touching behaviors. One plausible reason for this is the goal-directed nature of drinking behaviors. This thesis supports further studies to increase the magnitude of nonconscious behavioral mimicry in older adult populations with cognitive impairments.

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In many cases, it is not what we eat, but who we eat with, that decides our level of well-being and perhaps also how much we eat.

from “The Importance of Food and Mealtimes in Dementia Care:

The Table is Set” by Berg, Grethe, Nygard, Aase-Marit,

2006

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CHAPTER I

INTRODUCTION

Definition of Clinical Problem

Malnutrition and dehydration are prevalent health risks that often go unrecognized. It is estimated that 25 to over 50% of adults are malnourished in the hospital setting (Agarwal et al., 2013). Malnutrition is often referred to as the “skeleton in the hospital closet” because it is frequently overlooked, undiagnosed, and untreated (Ferguson, 2001; McKee, 2006). Thus, malnutrition diagnosis rates in the hospital as determined by ICD-9 codes may not be an accurate measure of actual prevalence rates and may not fully represent the population suffering from malnutrition and dehydration (Sauer et al., 2016).

Malnutrition has serious medical consequences; it was the underlying cause of death in over 3,000 older adults over the age of 65 in 2014 (Kochanek, Murphy, Xu, & Tejada-Vera, 2016). Overall, malnutrition is a life-threatening medical issue requiring substantial attention, particularly for older adults. The frequency of malnutrition in older adults has been estimated to be 50.5%, 38.7%, and 13.8% in rehabilitation, hospital, and nursing home settings, respectively, across 12 countries (Kaiser, et al., 2010) and the rate of death from malnutrition dramatically increases with increasing age (Kochanek et al., 2016). In addition to this alarming data, the literature further affirms that maintaining nutritional and hydration needs is a high priority in order to decrease the potential for additional medical concerns and further cognitive deficits (Allison, 2000; Benigas & Bourgeois, 2016; Holmes, 2007). More specifically, malnutrition and dehydration have been found to be associated with decreased survival, function, and quality of life,

increased frequency and length of hospital stays, and higher rates of hospital readmission, complications, healthcare associated infections, cognitive impairment, depression, and increased healthcare costs (Allison, 2000; Barker, Gout, & Crowe, 2011; Sansevero, 1997; Scrimshaw & SanGiovanni, 1997; Thomas et al., 2002).

While a wide constellation of factors contributes to the development of dehydration and malnutrition, advanced age (including age-related decreases in sensitivity to taste and smell), cognitive impairments and other concomitant impairments, and insufficient staffing may be particularly relevant when discussing institutionalized older adults. Advanced age alone is a risk factor for malnutrition (Forster & Gariballa, 2005). Aging may negatively impact nutrition because of physical changes, decreased sense of taste and smell, difficulty accessing or preparing food, increased medication use, limited transportation options (limiting food access), decreased income to purchase healthy foods, loneliness, depression, anxiety, and decreasing social networks and support (Chandra, 2002; Rowe & Kahn, 1987). Therefore, eating becomes less pleasurable and more of a chore even for healthy elderly individuals, increasing their likelihood of becoming malnourished. Older adults also have low water and total beverage intake and thus have increased risk of dehydration (Elsner, 2002; Popkin, D'Anci, & Rosenberg, 2010; Zizza, Ellison, & Wernette, 2009).

In addition, risk factors for dehydration and malnutrition include decreased cognition, difficulty with communication, decreased sensation, and alterations in mobility, which can also be associated with advancing age (Murray, Doeltgen, Miller, & Scholten, 2015; Roque, Salva, & Vellas, 2013; Wotton, Crannitch, & Munt, 2008). For example, individuals suffering from cognitive impairments such as depression or

dementia are more at risk for dehydration and malnutrition as they may lack the ability to monitor their own food or liquid intake, not recognize the need to eat, be uninterested in food, and show no signs of being hungry or thirsty (Aselage & Amella, 2010; Benigas & Bourgeois, 2016; Rudman & Feller, 1989). Unfortunately, more traditional behavioral interventions such as learning compensatory strategies are not effective in treating this population because such strategies often require typical cognition and memory, increasing these individuals' susceptibility to malnutrition from anorexia and involuntary weight-loss (Aselage & Amella, 2010). This is of critical concern because cognitive impairments are widespread in skilled nursing homes, with 37% of residents having severe impairments, 25% exhibiting moderate impairments, and only 38% with mild to no impairment (Centers for Medicare and Medicaid Services, 2015). Additionally, though malnutrition and dysphagia are not always associated, these conditions frequently overlap and about 50% of individuals with dementia across various stages of the disease have dysphagia (Alagiakrishnan, Bhanji, & Kurian, 2013). Therefore, patients with cognitive impairments have a higher likelihood of feeding difficulties associated with malnutrition and dehydration and are a population highly in need of treatment (Chang & Lin, 2005).

An additional leading cause of both malnutrition and dehydration in nursing homes is inadequate staffing. For example, one certified nursing assistant (CNA) may be required to help 7 to 9 residents eat and drink during the day time, and as many as 12 to 15 during the evening meal, which results in a lack of individualized care (Burger, Kayser-Jones, & Bell, 2001). To optimize care, the ideal ratios are closer to one CNA for every two to three residents who require assistance with eating (Burger et al., 2001). Other structural factors such as high nurse aide turnover and a lack of professional

supervision of aides within the nursing home setting also contribute to the problem (Burger et al., 2001).

Ultimately, malnutrition and dehydration are prevalent and potentially fatal issues requiring clinical intervention. This is especially true for the older adult population and those living in institutionalized care settings as they are at increased risk for malnutrition and dehydration.

Review of Literature: Current Behavioral Interventions

Behavioral interventions addressing malnutrition and dehydration in older adults with cognitive impairments broadly include education, training, environmental modifications, and feeding assistance (e.g., Jackson et al., 2011; Liu, Cheon, & Thomas, 2014).

Education. Education programs train and inform the patient, caregiver, and other health professionals interacting with the patient. Topics include education about healthy feeding and drinking behaviors, feeding skills, food and nutrient requirements, swallowing difficulties, dental care, modifying texture of foods and liquids, nutritional assessment, dietary analysis, and increasing energy content of food (Jackson et al., 2011; Liu et al., 2014). One quasi-experimental study examined a feeding skills training program for nursing assistants in which nursing assistants participated in three hours of in-service classes and one hour of hands-on training (Chang & Lin, 2005). The treatment resulted in a significant improvement in the nursing assistants' knowledge and positive attitudes towards feeding dementia patients, but the program did not lead to any increase in patients' nutritional intake. Another study examined the effects of an education program for healthcare professionals in dementia wards that consisted of six, two- to

three-hour training sessions for six months. While significant increases in energy intake in patients were found, there were no significant changes in Body Mass Index (BMI), a measure of improved nutrition (Suominen, Kivisto, & Pitkala, 2007). Behavioral interventions focused on education have shown mixed results in their effectiveness for addressing malnutrition. In addition, the nature of educational behavioral interventions requires adequate staffing and time allotted for education. However, high staff turnover ratios, inadequate staffing, and lack of professional supervision are structural factors that may limit the practicality of this type of intervention (Burger et al., 2001).

Training. Training programs are similar to educational programs in that they target dyads of caregivers and older adults with cognitive impairments. These programs additionally train older adults with adequate skills and techniques for mealtime tasks and to improve self-feeding performance (Benigas & Bourgeois, 2016; Lin et al., 2010).

One effective training approach for this population is spaced retrieval, a memory training strategy used to support people with memory impairments to learn, maintain, and recall functional information by targeting relatively unimpaired implicit memory systems in persons with cognitive difficulties (Bourgeois et al., 2003). Spaced retrieval has been used with cueing hierarchy levels ranging from verbal cues to verbal cues with a visual aid (Brush & Camp, 1998; Camp & Foss, 1996). Benigas and Bourgeois (2016) found that when paired with a visual aid, spaced retrieval was a useful intervention for teaching five individuals with dementia to use compensatory strategies during oral intake. This technique may also be applied to increase water intake. However, this study examined the use of safer swallowing techniques outside of mealtimes and in a quiet environment such as a bedroom, activity room, or living room within the nursing home or participant's

home rather than in the typical dining environment. Generalization of the trained compensatory strategies to actual mealtimes was not analyzed. Further, this study focused on swallowing safety, which is not equivalent to improved nutrition, so the results of this study do not explicitly address the issues of increasing nutritional intake and decreasing malnutrition in this population.

Another training approach utilizes the Montessori approach to train cognitive, social, and functional skills to the patient by breaking down tasks to steps that progress from simple to complex and from concrete to abstract (Femia, 2006). This approach has been successfully implemented within long-term care settings, and, most recently, within the adult population. It has been shown to improve engagement, enhance mood, and reduce behavior disturbances of patients with dementia (Judge, Camp, & Orsulic-Jeras, 2002). Montessori-based activities focused on hand-eye coordination, scooping, pouring, and squeezing were found to decrease feeding difficulty and improved nutritional status (Lin et al., 2010). However, patients who were trained in Montessori-based activities required more physical and verbal assistance during mealtimes and, though the study reported promising results, the design and behaviors that were trained were vague and maintenance was not reported (Lin et al., 2010).

Environmental modifications. Environmental modifications involve making changes to the setting in order to provide additional support. Current interventions for modifying the environment include using bright tableware, using a conspicuous focal point such as an aquarium with bright fish to avoid other distractions during meals, utilizing a small dining room with special trays, and playing therapeutic music to decrease aggressive behaviors (Jackson et al., 2011; Liu et al., 2014). Dunne et al. (2004)

examined the effectiveness of visual contrast manipulations in table settings for food-intake in nine men with advanced Alzheimer's disease and found that high contrast red tableware significantly increased food intake as compared to white tableware. It was concluded that simple environmental manipulations can significantly increase food and liquid intake in cognitively impaired populations that do not possess the capacity to self-monitor food and liquid intake. However, these results were not lasting, as a significant decrease in both food and liquid intake was observed post-intervention. Temporary results were also observed in another study that used small aquariums containing bright fish and special lighting to minimize distractions during mealtimes (Edwards & Beck, 2013). Additionally, therapeutic recreation music during dinner has been shown to increase the percentage of food intake and to decrease agitation (Hicks-Moore, 2005; Ho et al., 2011; Richeson & Neil, 2004; Thomas & Smith, 2009). Decreasing noise levels, minimizing distractions, preserving a homelike environment, reducing clutter, providing adequate lighting, and promoting a pleasant setting have all been found to be important environmental considerations across cultures and settings (Amella, 2004; Chang & Roberts, 2008; DiMaria-Ghallili & Amella, 2005; Sandman, Norberg, & Adolfsson, 1988). However, the effects of environmental modification interventions have yielded mixed results overall as one systematic review revealed that this type of intervention produces little evidence for increased food intake (Liu et al., 2014). Further, even though preserving a homelike environment may produce significant results in increasing oral intake, it would be limited to the institutionalized setting, as it would not be applicable to those already living at or transitioning back home.

Feeding Assistance. Feeding assistance promotes consumption of food and liquids through verbal encouragement or cueing, physical help for proper positioning, or tray setup, and it is provided by the staff or caregiver in a one-on-one setting. Feeding assistance has been found to significantly increase total caloric intake, body mass index, and body weight in persons with dementia (Altus, Engleman, & Mathews, 2002; Simmons & Schnelle, 2004). There is further research stating that touch, guidance, redirection, and providing compassionate care result in positive outcomes in weight maintenance, weight gain, and increased meal intake (Amella, 2004). Though there is robust evidence for feeding assistance, the time constraints and the current issues surrounding inadequate staffing in these types of settings as described earlier often limit the practicality of this intervention (Simmons, Osterweil, & Schnelle, 2001). The average staff time required for one-on-one mealtime assistance has been estimated to be 42 minutes per meal per resident, with usual care taking 5-10 minutes per resident (Simmons et al., 2008). Moreover, feeding assistance is often performed by a familiar caregiver or loved one, and direct verbal cueing, such as frequent reminders and conversations about health-related topics, may be perceived negatively by the patient, thereby causing dissonance in their relationship (Goldsmith, Lindholm, & Bute, 2006). There is also evidence that one-on-one feeding assistance in nursing homes may still result in substandard nutritional consumption, even when fluids are offered more frequently (McGrail & Kelchner, 2015; Simmons et al., 2001).

Summary of Behavioral Interventions. Overall, current behavioral interventions addressing malnutrition and dehydration in adults with cognitive impairments focus on education, training, feeding assistance, and environmental modifications in order to

increase oral intake. Though the results of these programs have their specific advantages, they all present with concurrent weaknesses that lessen their potential effectiveness across populations. They also may not be sufficient to address feeding and drinking behaviors as a whole because they do not address the social component of mealtimes, particularly the quality of interactions between caregivers and patients, an integral component of meals (Amella, Grant, & Mulloy, 2007). Caregivers can play an important role in increasing oral consumption in individuals with dementia by creating opportunities for socialization during meals (Altus, et al., 2002; Amella, 2002; Chang & Roberts, 2008). Moreover, the quality of interaction during mealtimes appears to influence the amount of intake (Amella, 2002). Because elderly patients with cognitive impairments usually require the support of a caregiver, staff, or a spouse, preserving the quality of these relationships, particularly in the context of mealtimes, is critical. Current behavioral interventions do not consider the maintenance of positive relationships with caregivers in order to improve both patients' quality of life and their nutritional status. Further, educational interventions are difficult to implement because of the issues surrounding adequate staffing, which also contribute to the limitations of one-to-one feeding assistance. One-to-one feeding assistance has also been found to show inconsistent results for increased consumption and evidence of continued substandard consumption (McGrail & Kelchner, 2015; Simmons et al., 2001). Supporting positive relationships between the patient and caregiver may improve the patient's quality of life and nutritional status and decrease caregiver burden, areas that are currently not being addressed.

Meals as a Social Experience

There is growing evidence that meals are more than just a means for nutrition and survival. They reinforce our physical, psychological, and emotional connections to our families, social networks, and ourselves. In families, mealtimes contribute to child development and behavior, with meals providing a learning environment in which socialization and language development can occur (Harding, Wade & Harrison, 2013; Larson, Branscomb & Wiley, 2006). Humans also connect food to rituals, symbols, and beliefs, allowing for individuals to reaffirm, transform, and maintain relationships with others in daily life (Mintz & Du Bois, 2002). Eating a meal leads to increased energy and happiness levels, and socializing and eating are both activities that are strongly related to the creation of positive emotion (Brown, Edwards, & Hartwell, 2013; Locher, Yoels, Maurer, & Van Ells, 2005; Ochs & Shohet, 2006). Food itself encompasses strong emotional meaning. Evidence shows that social isolation, increased depression, and decreased quality of life are consequences of the inability to eat (Carneiro et al., 2014). Non-physiological stimuli, such as social, psychological, and environmental stimuli, have been found to influence food intake (de Castro & Stroebele, 2002). As social stimuli affect the amount of intake in adults, and the inability to eat results in negative social consequences, there clearly must be a central social component associated with mealtimes. The current behavioral interventions that exist, as described earlier, do not focus on, or capitalize on, these social aspects of mealtimes and may actually interfere with the quality of interactions.

Targeting the social aspects of mealtimes may be especially important for older adults who experience decreasing social network sizes and overall increased loneliness and depression (Carneiro et al., 2014). This constellation of changes, along with the age-

related changes in eating and nutrition described above, likely interact, further predisposing older adults to malnutrition and dehydration. Thus, successful malnutrition and dehydration prevention for older adults likely also needs to incorporate aspects of social interaction.

Supporting the need to focus on preserving close social networks in older adults, the Socioemotional Selectivity Theory, developed by Carstensen (1992), describes the social interactions in older adults as a discriminating choice between maximizing social and emotional gains and minimizing social and emotional risks. Carstensen's longitudinal study investigating this theory examined frequency of interaction, satisfaction with relationships, and degree of emotional closeness in six types of relationships over a period of 34 years. Results indicated that older adults strategically and adaptively cultivate their social networks to have more frequent, satisfying interactions while avoiding casual social contacts that provide fewer affective rewards and less satisfaction. Results were also consistent with the Selective Optimization with Compensation Model—the theory that as people age, they concentrate their efforts in the areas that hold the greatest value and allow less important goals to go unmet (Carstensen, 1992). In other words, it appears as though older adults aim to structure their social worlds to optimize emotionally meaningful experiences, and this theoretical framework supports the need to focus on preserving social networks in older adulthood. Thus, it would appear essential to consider the social relevance of eating during mealtimes when addressing eating therapeutically, particularly for older adults.

Given the increased importance of maintaining meaningful social interactions for older adults, nutrition-related interventions that train caregivers and family members to

continually cue patients and “medicalize” the mealtime can cause increased dissonance in both individuals and actually increase disengagement. This directly opposes older adults’ goals of increased social connectedness as predicted by the Socioemotional Selectivity Theory. Thus, examining malnutrition and dehydration in an alternative lens that accounts for the social aspects of the meal in conjunction with the naturally changing social networks of the aging population is likely of increasing value and ecological validity, in the older adult population.

Behavioral Mimicry

One proposed mechanism through which social relationships can be enhanced is interpersonal coordination. The study of interpersonal coordination examines how people synchronize behaviors with one another in a nonrandom, patterned, or synchronized interaction (Bernieri & Rosenthal, 1991). In a broader context, all activities in society as a whole are, in some form, an outcome of the process of imitation and thus, imitation is an integral component of what makes up a society (Ellwood, 1901). Though many behavioral imitations are highly deliberate and intentional, the literature also documents a phenomenon called nonconscious behavioral mimicry, which is a more passive social imitation indirectly influencing a particular behavior. Chartrand and Bargh (1999) describe this type of behavioral mimicry as the perception-behavior link: perceiving another’s behavior creates a tendency to automatically and nonconsciously engage in that same behavior. Though behavioral mimicry is often a nonconscious process, it is a social tool used to build rapport and efficiently communicate (Bernieri & Rosenthal, 1991). Overall, mimicry has been associated with feelings of affiliation, enhancing cohesion and rapport (Chartrand & Bargh, 1999; Chartrand & Lakin, 2013; Chartrand, Maddux, &

Lakin, 2005). The literature supports the idea that mimicking the mannerisms of other people plays a crucial role in the regulation of social interactions, and that the physical aspect of human interaction, even as mere perception, is related to social and emotional relationships (Bernieri & Rosenthal, 1991; Castelli, Pavan, Ferrari, & Kashima, 2009).

Using behavioral mimicry, as a natural instinct, could be considered as a viable behavioral intervention because it is a nonconscious process that does not require new learning, memory, or training (Chartrand et al., 2005). Nonconscious behavioral mimicry is also a social phenomenon that allows individuals to socially engage with each other, a factor that decreases with older age, and promotes increased quality interactions (Bernieri & Rosenthal, 1991; Carstensen, 1992). Thus, nonconscious behavioral mimicry appears to have the necessary components for it to possibly be an effective intervention approach for older adults with cognitive impairments.

Eating and Behavioral Mimicry. The current behavioral interventions addressing nutritional intake, as described above, do not consider the social aspects of mealtimes, which can negatively affect the already decreasing social network sizes of the aging population. Taking advantage of mealtimes as a social experience to increase food and water intake can be a means to address the limitations of current behavioral interventions and optimize therapeutic effects. A social facilitation of meals exists, specifically related to the presence of others and the amount of interactions, in which manipulation of social contexts results in increased intake (Clendenen, Herman, & Polivy, 1994; Paquet et al, 2008; Redd & de Castro, 1992). Further, if all social experiences contain an element of a perception-behavior link leading to nonconscious behavioral mimicry, then subtle suggestion through the act of someone else ingesting

food or drinking water may be an effective method for increasing healthy food and water intake in patient populations. Though plausible, it is unclear if nonconscious mimicry specifically is the underlying mechanism for the social facilitation of intake. If so, behavioral mimicry during mealtimes could be manipulated as a therapeutic tool for both increasing intake and promoting enhanced socialization.

A recent study tested whether nonconscious behavioral mimicry can alter drinking behavior in nineteen younger adults ($M_{\text{age}} = 20.32$ years) and concluded that mimicry likely contributes, at least partially, to social modeling of drinking behaviors (Shune & Foster, in press). This study provided initial evidence that nonconscious behavioral mimicry is one underlying mechanism that can influence drinking behavior in typical adults. Of the limited research examining the social facilitation of modeling in eating, other recent literature has also suggested that behavioral mimicry may increase consumption in children and younger adults. Young adults have been found to match their eating companion's rate of consumption by increasing consumption when their eating companion increased consumption and demonstrated the opposite effect with decreased consumption from the eating companion (Florack, Palcu, & Friese, 2013; Vartanian, Sokol, Herman, & Polivy, 2013). One study found that the cookie eating behaviors of the consuming partner influenced intake in 136 young adult participants (Florack et al., 2013). Another experiment also examined cookie consumption but in 71 female undergraduates in high-intake, low-intake, or no model conditions and found that behavioral mimicry influenced food intake (Vartanian et al., 2013). The study further concluded that behavioral mimicry is a nonconscious process as the participants attributed their eating behaviors to taste and hunger rather than the behavior of their

social models (Vartanian et al., 2013). Similar results were also found in a study examining the influence of social modeling on a whole meal among young female undergraduates (Hermans, Larsen, Herman, & Engels, 2012). Another study specifically examined the effect of behavioral mimicry on 79 young adults' alcohol intake while watching a movie containing 25 alcohol cues and concluded that exposure to actors sipping alcohol appeared to have a direct impact on the drinking behaviors of the viewers (Koordeman et al., 2011). Similarly, 70 dyads of young women during a 20-minute meal were observed and found that the participants generally mimicked the intake of their eating companion—participants were significantly more likely to take a bite when other person was also taking a bite (Hermans et al., 2012). Contrary to past research suggesting that the effects of behavioral modeling would be stronger in a sociable context, one study examining social modeling of intake in 100 young women using M&Ms actually found the opposite (Hermans, Engels, Larsen, & Herman, 2009). There was increased behavioral mimicry when the participant observed an unsociable peer with high-intake rather than a sociable peer. It is plausible that this could be due to the desire to affiliate with a stranger by mimicking his or her behavior, while there is less of a need to establish a bond with a sociable peer (Hermans et al., 2009). Together, these findings suggest the robustness of behavioral mimicry and social modeling in eating among younger adults across various contexts and between various partners (e.g., familiar versus not familiar). Yet there is little evidence about social modeling and mimicry in eating among older adults, including healthy older adults. It is necessary to first determine the possible presence of this phenomenon in healthy older adults before determining any potential therapeutic value.

Purpose of Current Study

Malnutrition and dehydration are serious issues in the aging population, particularly for those with cognitive impairments. Unfortunately, the current behavioral interventions all present with limitations. Importantly, they do not directly address social participation during meals, a key component of overall quality of life for these individuals, and thus lack some degree of ecological validity. Taking advantage of mealtimes as a social experience in order to increase food and water intake can be a means to address the limitations of current behavioral interventions and optimize therapeutic effects.

The current study was conducted to explicitly examine whether drinking behavior can be altered as a result of behavior mimicry in typical older adults. In other words, can a social phenomenon influence eating-related behavior? If typical older adults increase water consumption as a result of nonconscious behavioral mimicry, then this phenomenon could potentially be used as a behavioral intervention by caregivers, family members, or nursing staff in order to increase drinking and eating in older adults with cognitive impairments while simultaneously supporting improved social connectedness. The study examined two different types of behavior—cup touching and drinking—to examine the type of behaviors that could induce drinking-related mimicry. Cup touching and drinking were considered two different types of actions: cup drinking was considered a goal-directed behavior and cup-touching a related non-goal-directed behavior. Based on the literature reviewed in combination with predictions made by the Socioemotional Selectivity Theory, it was hypothesized that older adults would exhibit an increase in their drinking behaviors given the presence of increased drinking and an increase in cup

touching behavior given the presence of increased cup touching by an unfamiliar social communication partner despite participants being unaware of the partner's increase in the target behavior (i.e., nonconscious mimicry).

CHAPTER II

METHOD AND PROCEDURES

Participants

Participants included 14 healthy older adults over the age of 60. Additional inclusion criteria for the study required participants to have normal or corrected vision and hearing, be English speakers, and have no previous history of speech or language difficulties. Potential participants were recruited through online and local advertisements in Eugene, Oregon. The final sample of participants ranged in age from 60 to 93 years old ($M = 71$ years, $SD = 9$) and included eight females (see Table 1 below).

Participant ID	Age	Sex
P1	63	M
P2	62	F
P3	93	F
P4	70	M
P5	87	M
P6	74	F
P7	76	M
P8	69	F
P9	68	F
P10	60	F
P11	76	F
P12	69	M
P13	65	F
P14	63	M

Table 1

Participant Characteristics.

Experimental Protocol

The study took place in a laboratory located inside the basement of the Clinical Services Building at the University of Oregon. All task procedures were approved by the

local Institutional Review Board. All participants signed written informed consent for the cover study (see Appendix B) prior to participation and signed a debriefing form (see Appendix F) for the actual study after completion of the experiment.

The protocol (see Table 2 below) followed that of Shune and Foster (in press), which was adapted from Chartrand and Bargh (1999). To explicitly test the role of nonconscious or unprompted mimicry of drinking behaviors, it was necessary to place drinking within a task that was not directly related to eating or drinking. Thus, a “cover study” was created that involved the examination of different types of visual stimuli on conversational output. During the study tasks, each participant interacted with a confederate who was a female in her early 30s and a member of the laboratory. The confederate was introduced to the participants as a conversation partner. As part of the cover study, participants completed two picture description tasks, which consisted of describing pictures with the conversation partner. There were two different sets of pictures, one set of paintings and another of photographs, with 10 to 15 minutes of time being allotted to describing each set ($M_{\text{painting}} = 14.14$ min, $M_{\text{photograph}} = 14.36$ min; see Appendix D for example of images). Task order was randomly assigned with some participant-confederate dyads describing the paintings first and others describing the photographs first. During the picture description tasks, the participant and confederate took turns describing the series of images. On average, four to five images were used for each task in order to stay within the allotted time. The confederate and participant sat side by side at a single table, facing the experimenter who sat on the opposite side of the table (see Appendix E for script and Figure 1 below for a visual of the lab setting).

Average Time	Condition	Activity
15 minutes	Baseline (start at Activity 3)	<ol style="list-style-type: none"> 1. Participant enters room 2. Video recording begins 3. Water provided to participant and confederate (see Appendix A for script) 4. Cover study consent (see Appendix B) obtained 5. Experimenter leaves to get confederate. Participant left in room alone. 6. Experimenter brings in confederate
1 minute	N/A	7. Introduction/Explanation of study procedures to participant and confederate (see Appendix C)
14 minutes	Drinking/ Cup touching*	8. Presentation of set of photos/paintings* (see Appendix D for examples of images)
14 minutes	Cup touching/ Drinking	9. Presentation of set of paintings/photos
15 minutes	N/A	<ol style="list-style-type: none"> 10. Participant and confederate fill out questionnaire (see Appendix E) 11. Confederate excused from room 12. Participant debriefed on true purpose of study 13. Consent obtained (see Appendix F)

*The first condition (drinking or cup touching) and the first set of pictures (photos or paintings) was randomly assigned. The second condition/set was whichever condition/set not presented in the first condition/set.

Table 2

Schedule of Events.



Figure 1

Participant and confederate sat side-by-side, across from experimenter. Between the participant and confederate lay the image to be discussed. Blue tape was present on the table to indicate area within which the pair were to keep most of their movement to allow best video capture of non-verbals and gestures (this was only specified if participant inquired about the blue tape). Each individual was filmed with a separate camera.

Two confederate behaviors were manipulated in the session: cup/water drinking (a complete drinking gesture) and cup touching (lifting the cup off the table and holding it without drinking). Order of the behaviors were also randomly assigned. Confederate behavior order was signaled to the confederate during the first condition through the experimenter's use of either a red (cup touching) or blue (cup/water drinking) pen during the study. In the red, cup touching condition, the confederate was instructed to frequently touch the cup by lifting it off the table and holding it without using a drinking gesture, which was defined as tilting the cup towards her face and/or lips. In the blue, drinking

condition, the confederate frequently took sips of water throughout. No apparent differences in task length were present between the cup touching and drinking conditions ($M_{\text{touching}} = 14.22$ min, $M_{\text{drinking}} = 14.28$ min).

In addition to participant behaviors during the study tasks, baseline measurements of participant cup touching and drinking were also assessed from when the cup of water was initially set in front of the participant until the first picture for the first condition was provided to the participant. Thus, prior to presenting the consent form to the participant at study onset, the experimenter provided the participant with a cup of water, indicating that the room was very dry and the tasks required a lot of talking. A second cup of water was poured for the confederate, conversation partner, who was not yet present in the room. The same brand and type of clear plastic cups were used for the experiment, and the same amount of water was provided for each trial. The confederate was invited into the room following a delay after the consent form was signed in order to create a time in which baseline data of the participant's drinking behavior without the influence of the confederate could be obtained. Baseline durations ranged from 7 minutes to 23 minutes ($M = 15$ min; $SD = 4$).

Following both tasks, a funneled debriefing based on Chartrand and Bargh (1999) occurred, in which the participant first filled out a questionnaire regarding the quality of the interaction and rapport felt with the partner to probe for any suspicion regarding the true nature of the study and conscious awareness of any specific mannerisms (i.e., cup drinking or touching) the confederate displayed (see Appendix E for questionnaire). Participants were then fully debriefed. The contents of Appendix E were communicated verbally and then formal consent was obtained. No participants indicated any suspicion

regarding the true nature of the study or awareness of the confederate's cup-related mannerisms.

Data collection and analysis

The entire experiment was recorded using two Canon VIXIA HF R52 camcorders. Two camcorders, one focused on the participant and the other on the confederate, were used in order to ensure that coders were blind to condition and to avoid observer and experimenter bias. Following the experimental procedures, all video-recorded tasks for both the participant and the confederate were coded according to the occurrence and duration of each drink and cup touch for each condition. The videos were then segmented into three conditions: baseline (from the time the cup of water was presented to the start of the first image description task), confederate drinking (termed 'drinking condition'), and confederate cup touching (termed 'cup touching condition'; see Table 2 above).

For each condition, four primary participant outcome measures were calculated:

1. Number of drinks per minute
2. Number of cup touches per minute
3. Percentage of time spent drinking
4. Percentage of time spent touching the cup

The number of drinks and cup touches per minute for the confederate was also calculated for a manipulation check. Repeated-measures ANOVAs were used to test the effects of condition (i.e., drinking versus cup touching) on the dependent variables. Baseline measures were used as a covariate in order to adjust for individual differences in drinking behaviors in the absence of another person (Chartrand & Bargh, 1999). In addition, paired *t*-tests were used to quantify differences in mean drinking behavior between the

task conditions and baseline. A p -value of $< .05$ was considered statistically significant, and statistical analysis was performed using SPSS (IBM Corporation, Armonk, NY).

CHAPTER III

RESULTS

Manipulation check

The number of times per minute the confederate spent drinking versus touching the cup were coded and analyzed in order to confirm the (increased) presence of the target behaviors in both the drinking and cup touching conditions. Due to equipment error, data were only available for 12 (out of 14) sessions. A repeated-measures ANOVA revealed that the confederate significantly drank more during the drinking condition ($M = 0.780$ drinks/min, $SD = 0.169$) as compared to the cup touching condition ($M = 0$ drinks/min, $SD = 0$; $F(1,11) = 254.964$, $p < .001$). Similarly, the confederate touched the cup more during the cup touching condition ($M = 0.991$ touches/min, $SD = 0.343$) as compared to the drinking condition ($M = 0.005$ touches/min, $SD = 0.019$; $F(1,11) = 98.628$, $p < .001$). Moreover, in the questionnaire at the end of the study, none of the participants expressed awareness of the cup touching or drinking behaviors of the confederate.

Drinking behaviors

The graph in Figure 2 (see below) plots the frequency of drinking (number of drinks per minute) at baseline versus the frequency of drinking during the experimental conditions (i.e., drinking and cup touching conditions) for each participant. The data indicate that more than half of the participants (9/14) increased their rate of drinking during the drinking condition as compared to baseline. The five participants who did not increase their rate of drinking during the drinking condition all had higher rates of drinking at baseline with three having baseline rates that were nearly one SD above the

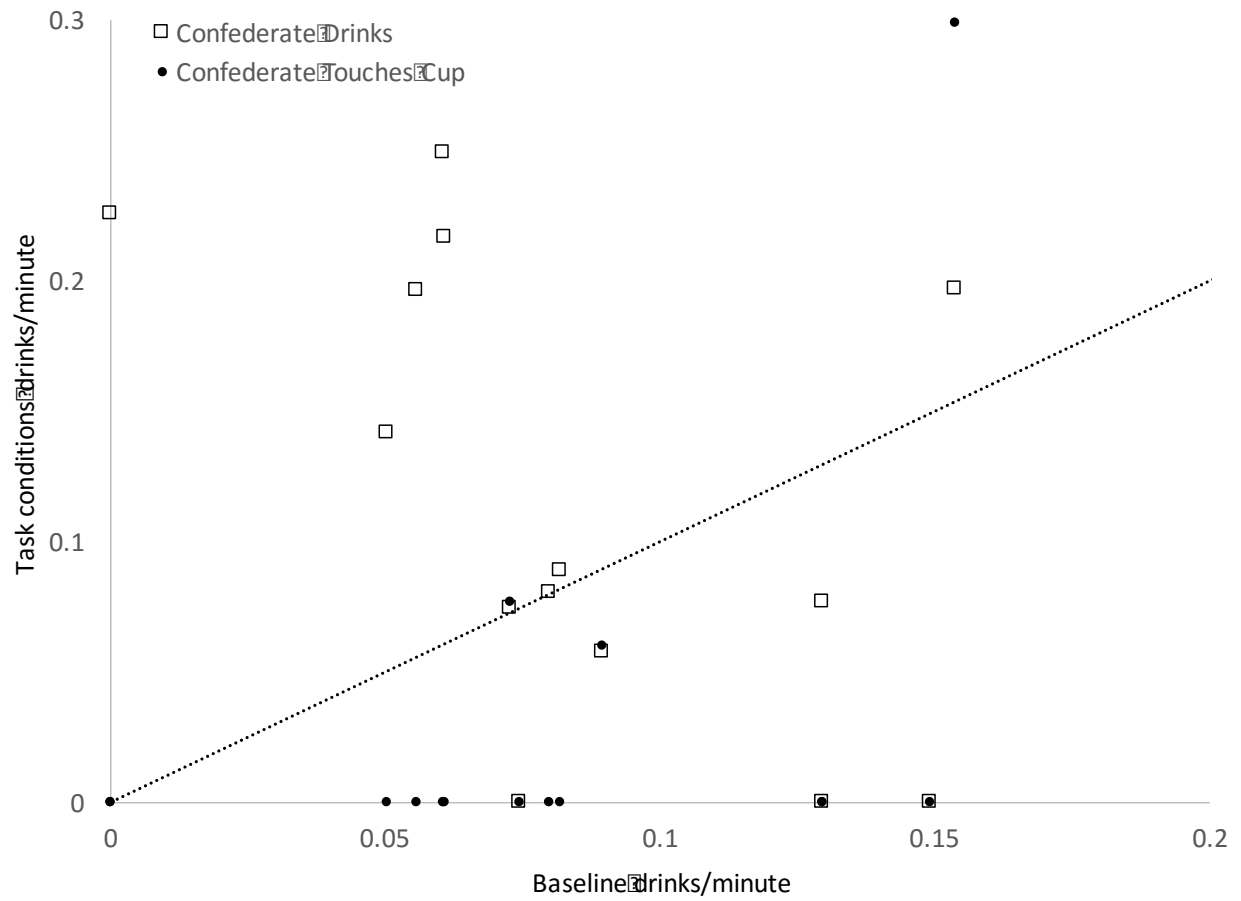


Figure 2

Participant drinks per minute for each condition (baseline, confederate drinking, confederate cup touching) plotted for all participants. Data points falling above the dotted reference line indicate a higher consumption rate during the task condition as compared to baseline, points falling below indicate a lower consumption rate during the task as compared with baseline, and points on the reference line indicate the same consumption rate.

mean for the group. Only three participants drank during the cup touching condition. Of interest, the participants who drank the most at baseline either did not drink at all or drank more than the other participants during the task conditions. There was a trend for participants to increase their drinking behavior in the drinking condition ($M = 0.114$ drinks/min, $SD = 0.089$) as compared to baseline ($M = 0.085$ drinks/min, $SD = 0.043$; Cohen's $d = 0.427$, small to medium effect). However, this result did not reach statistical significance ($t(13) = 0.954, p = .179$). In contrast, there was a significant difference in drinking rates between the cup touching condition ($M = 0.031$ drinks/min, $SD = 0.081$) and baseline ($t(13) = -2.761, p = .008$), meaning that drinking rates were significantly decreased in the cup touching condition as compared to baseline.

In order to explicitly examine whether behavioral mimicry affected participant behavior, the results were further analyzed by comparing participant drinking behavior in the drinking and cup touching conditions. To account for individual variability in baseline drinking behavior among participants, baseline drinking was used as a covariate in the repeated measures analysis. A repeated measures ANOVA showed that participants drank significantly more frequently during the drinking condition ($M = 0.114$ drinks/min, $SD = 0.089$) as compared to the cup touching condition ($M = 0.031$ drinks/min, $SD = 0.081$; $F(1,12) = 29.749, p < .001$; see Figure 3 below). When the percentage of time spent drinking was examined, the analysis revealed consistent results. Participants spent significantly more time drinking during the drinking condition ($M = 1.18\%$, $SD = 0.929\%$) than in the cup touching condition ($M = 0.277\%$, $SD = 0.712\%$; $F(1,12) = 22.214, p = .001$; see Figure 4 below). Overall, participants drank more frequently and

spent more time drinking when the confederate was also drinking rather than when touching her cup.

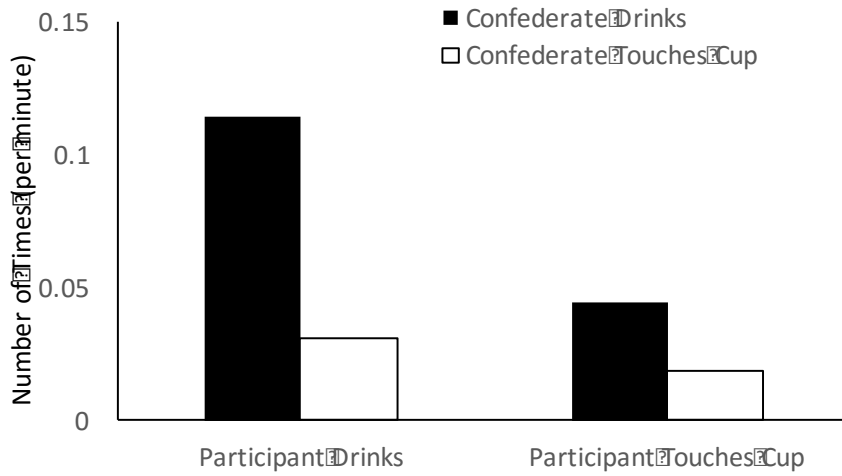


Figure 3

Number of times participants drank and touched their cup per minute for the two task conditions.

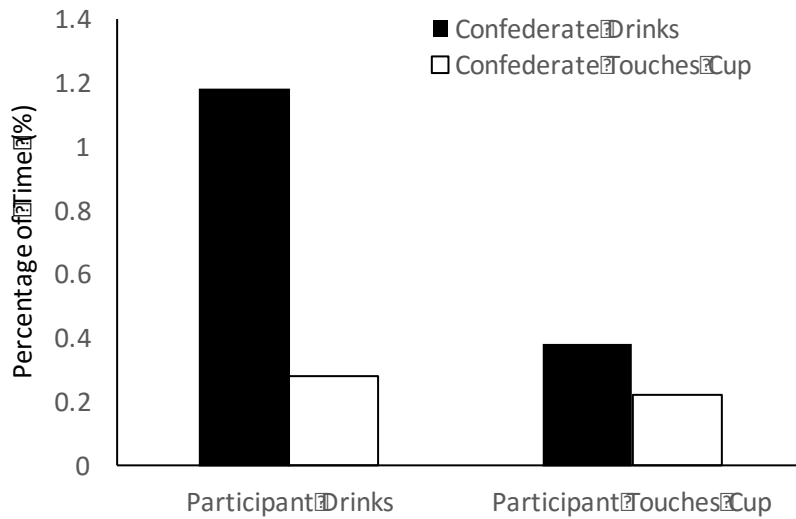


Figure 4

Percentage of task time participants spent drinking and touching their cup for the two task conditions.

Cup touching behaviors

There were no participants who touched their cup without actually drinking at baseline, so covariates were not included in this analysis. Overall, cup touching occurred infrequently. There were no differences in the frequency of participant cup touches between the drinking ($M = 0.044$ touches/min, $SD = 0.091$) and cup touching conditions ($M = 0.019$ touches/min, $SD = 0.069$; $F(1,13) = 1.273$, $p = 0.280$). Similarly there were no differences in the time participants spent touching their cup between the drinking ($M = 0.382\%$, $SD = 0.765\%$) and cup touching conditions ($M = 0.224\%$, $SD = 0.839\%$; $F(1,13) = 0.675$, $p = 0.426$). The results indicate that participants were not more likely to touch their cup when the confederate touched her cup as compared to when she drank from her cup.

CHAPTER IV

DISCUSSION

The purpose of the current study was to examine whether drinking behavior can be altered as a result of behavioral mimicry in the older adult population. Specifically, the experiment aimed to answer two main questions: 1) Does behavioral mimicry significantly influence cup touching behaviors and drinking behaviors in older adults?, and 2) If so, does the type of behavior (i.e., drinking, cup touching) influence the tendency to engage in behavioral mimicry? It was hypothesized that older adults would increase both cup touching and drinking behaviors during social interaction without consciously being aware of the cup touching and drinking behaviors of their communication partner.

The Effects of Behavioral Mimicry

To address these questions, 14 healthy older adults (60+ years old) participated in the current study. The results showed that participants drank more frequently and spent more time drinking during the drinking condition than in the cup touching condition. Therefore, behavioral mimicry significantly influenced drinking behaviors in older adults while cup touching behaviors were not mimicked. This finding suggests that the type or goal-directed nature of behavior does influence the tendency to engage in behavioral mimicry. Cup touching was not sufficient to elicit either a drinking or cup touching behavior because it is not a goal-directed behavior resulting in oral consumption. However, the nonconscious perception of a complete drinking gesture, rather than cup touching, significantly increased the older adults' imitative behavior. Overall, the results indicate that nonconscious behavioral mimicry may significantly increase healthy

drinking behaviors in older adults, and the results indicate that one plausible reason for this is the goal-directed nature of a drinking behavior.

Findings Relative to Previous Literature. Previous studies have examined the effects of social modeling of food intake and found that behavioral mimicry significantly increases food/drink consumption in a variety of age groups ranging from one-year-old children to 56-year-old adults (e.g., Hermans et al., 2012; Shune & Foster, in press; Vartanian et al., 2013). Though it is unlikely that older age would negate the effects of behavioral mimicry, particularly in light of the increased importance placed on social connectedness in older age (Carstensen, 1992), it had not yet been studied. A better understanding of mimicry's impact on eating-related behaviors in healthy older adults is a necessary prerequisite to determining its potential impact on our primary target population, older adults, particularly those living in nursing homes and in acute rehabilitation settings (Kaiser et al., 2010). The current study directly studied the effects of behavioral mimicry in the older adult population and found similar results to those studies investigating mimicry in children and younger adults. Though different types of consumption (eating vs drinking) were examined, both eating and drinking were determined to be behaviors related to oral intake. This indicates that the presence of behavioral mimicry for eating and drinking behaviors is not limited by age.

In particular, the results of this study were consistent with the findings of Shune and Foster (in press) who examined the effects of behavioral imitation in drinking behaviors of healthy young adults ($M = 20.32$ years). They also found that participants spent more time drinking and increased their drinking rate during the drinking condition more than the cup touching condition. Drinking rate also increased during the drinking

condition more than at baseline for many participants (although not all). In contrast to the results of this current study, however, many younger adults also increased their drinking rate in the cup touching condition as compared to baseline, which suggests that the characteristics of and contributors to these behaviors may vary among different age groups. Further investigation into these differences may be warranted.

Previous research has also shown that behavioral mimicry is a social phenomenon occurring in order to promote harmonious relationships (Bargh et al., 1996; Bavelas et al., 1986; Castelli et al., 2009; Gallese, Eagle, & Migone, 2007; Lakin & Chartrand, 2003). Similar to the experiment by Chartrand and Bargh (1999), the current study found that nonconscious mimicry can occur amongst strangers. Aside from two participants who had an established relationship with the confederate, the rest of the participants had not met the confederate prior to study onset. (The two participants who knew the confederate were not aware of the actual purpose of the study prior to the experiment and did not indicate any suspicion during the debriefing session.) Yet, all participants still imitated the drinking behavior when exposed to this target gesture of the confederate as compared to a non-drinking condition. That a significant change occurred in drinking behaviors as a result of behavioral mimicry among individuals without any previous relationship to the conversation partner affirms that the perception-behavior link is preconscious and not necessarily goal-dependent—it can occur among strangers even when no affiliation goal is present. Of note, while mimicry may not necessarily be driven only by affiliation-related goals, the current study does suggest some degree of goal-dependence as drinking (meaningful), but not cup touching (not meaningful) behaviors were mimicked. Other studies of mimicry have also found similar results when

examining imitation among strangers in continuing to smoke by following the smoking behaviors of confederates (Harakeh, Engels, Van Baaren, & Scholte, 2007) and in increased alcohol consumption when exposed to heavy-drinking confederate behaviors as compared to less confederate drinking (Larsen, Engels, Granic, & Overbeek, 2009). This finding that mimicry is not dependent on familiarity is important as we consider clinical implications regarding who might be able to utilize and implement this strategy, as will be described further below.

There is an extensive body of evidence affirming that familiarity and desire to increase rapport in a relationship increases coordination of behaviors of the interaction partners and these constructs reinforce each other—rapport in a relationship increases behavioral mimicry and imitation increases rapport (Bavelas, et al., 1986; Berneri & Rosenthal, 1991; Chartrand & Bargh, 1999). The current study, however, examined behavioral imitation with an unfamiliar partner and found that it increases even among strangers, possibly because a desire to develop rapport with an unknown conversational partner is present (Hermans et al., 2009). The previous literature indicating that familiarity can result in a greater effect in behavioral mimicry should be applied to future studies with older adults to determine whether behavioral imitation increases or decreases even more with a familiar interaction partner. Examining whether familiarity increases behavioral mimicry would be important in determining the hierarchy of individuals in the patient's life who will likely have the strongest to the weakest influence on behavioral mimicry.

Clinical Significance

If behavioral mimicry is a phenomenon that also occurs in the drinking and feeding behaviors of older adults with cognitive impairments, it can have significant clinical implications. This was a preliminary study that resulted in a significant change in the drinking behavior of healthy older adults, particularly in the frequency and time spent drinking, as a result of behavioral mimicry. Nonconscious behavioral mimicry may potentially be a powerful supplement to education, training, and environmental modification interventions that lack in considering the social components of meals. Mimicry, as a potential therapeutic strategy, could take place during the actual mealtime setting and discreetly suggest drinking and feeding behaviors through a caregiver's own drinking and feeding gestures. Further, though the use of direct, frequent verbal reminders as part of feeding assistance has also been successful in significantly increasing nutrition, such an approach may cause conflict between the patient and caregiver or loved one (Goldsmith et al., 2006). Thus, mimicry could prevent such negative tension that can arise from repetitive prompts because it implicitly suggests drinking and feeding behaviors through behavioral imitation. While mimicry would still require assistance on the part of a caregiver, it may not require 1:1 feeding assistance as is typically provided and may also not require as much time commitment for training. These factors will further alleviate caregiver burden, particularly for aides in institutional settings. In addition, because the current study also found that behavioral mimicry affects drinking behaviors amongst strangers and actually may increase the effects of behavioral mimicry (Hermans et al., 2009), if an individual does not have a consistent caregiver or family for meals and is in a situation in which the eating companion is frequently a stranger, the individual may still be (if not more) influenced by the eating behaviors of

surrounding strangers during mealtime. More research on the effects of behavioral mimicry using a familiar eating partner would be needed to determine the clinical significance of behavioral mimicry among loved ones.

This approach is additionally valuable because it focuses on strengthening caregiver and patient relationships by using the social aspects of a mealtime. Older adults, specifically, require the preservation of the quality of relationships because of their naturally decreasing social networks (Carstensen, 1992). Maintaining meaningful social experiences, during, for example, mealtime, is even more necessary in the older adult population with cognitive impairments (Amella, 2004). Preserving the natural state of mealtimes without interference, as occurs with verbal reminders and spaced retrieval techniques, can also create and preserve the positive emotions and pleasure associated with eating (Brown et al., 2013; Locher, et al., 2006; Ochs & Shohet, 2006). Furthermore, social modeling for consumption can occur in any setting for meals and drinking and not just in institutionalized settings, which was a setback of environmental modifications focusing on preserving a home-like environment (DiMaria-Ghallili & Amella, 2005). However, in the institutionalized setting, environmental modifications to create a setting similar to the home in conjunction with using behavioral mimicry during mealtimes may increase the effectiveness of the treatment. Behavioral mimicry across a range of behaviors has been shown to increase feelings of cohesion and social connectedness (Lakin & Chartrand, 2003). Thus, beyond the nutritionally related benefits, the use of behavioral mimicry as a therapeutic technique has the possibility of improving the existing behavioral interventions through highly relevant social-related feelings and higher overall quality of life.

Behavioral Mimicry in Relation to WHO ICF. Proposing an intervention based on behavioral mimicry acknowledges that malnutrition and dehydration are not only an oral consumption issue, but rather a multifactorial concern. Therefore, it has strong translational implications in that it could address malnutrition and dehydration issues in addition to social isolation, increased depression, and decreased quality of life (Carneiro et al., 2014). Behavioral mimicry as a strategy to increase oral consumption could improve malnutrition and dehydration at not only the impairment level, but also at the activity/participation-level while interacting with important contextual factors that are outlined in the World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) (World Health Organization Geneva, 2002). Impairments are those related to body structure (physical impairment, such as cleft palate) and body function (specific problem in function, such as weak lingual movement as a result of dysarthria). Activities limitations and participation restrictions are the things that an individual wants to do but can no longer partake in, such as reading a novel for pleasure. Environmental factors are what can help an individual perform better in a given setting, such as being in a quiet room. Personal factors include demographic information, such as race, and also personality traits and one's reaction to the disability. Interventions frequently target different components of the ICF in order to promote an individual's overall health, thus results may vary. For example, while restorative or process-oriented approaches directly target the impairment by focusing on the underlying impaired processes, social approaches target activity or participation but focus on the disorder as a social issue in order to address quality of life. The current behavioral interventions for managing nutrition, especially feeding assistance, further prevent patients from activities

and participation beyond the limitations of their disease process. This restriction can have negative psychosocial consequences, which may be further exacerbated by a decreasing social network (Carstensen, 1992; Paquet et al., 2008). Thus, in an attempt to narrowly focus on the impairment itself (e.g., nutritional insufficiency), such interventions may yield more widespread restrictions and limitations. An intervention based on behavioral mimicry would combine a restorative and social approach in order to target the multiple aspects of malnutrition and dehydration that other behavioral interventions currently lack in. Approaching the mealtime as a combination of quantity of nutritional intake and quality of socialization would appropriately address participation in addition to the impairment, likely leading to more widespread benefit.

Summary. Behavioral mimicry as a method of increasing oral consumption in older adults with cognitive impairments has promising clinical significance as it additionally focuses on patient quality of life that the other current behavioral interventions frequently overlook. Because our population of interest demonstrates difficulty in remembering to eat and/or drink and desires to preserve its decreasing social networks, caregivers could be trained to discreetly suggest drinking and feeding behaviors through their own drinking and feeding gestures instead of directly cueing the patient to eat or drink. This proposed method would not only remind patients to drink and/or eat, but it would also create a more natural and social environment that promotes healthy social interactions rather than interactions that can create conflict. Overall, targeting all the aspects of the WHO ICF framework can improve patient's physical, mental, and psychosocial health.

Limitations

Drinking and Baseline Effects. The results of this study indicated that while there was a significant effect between the task conditions (i.e., drinking condition and cup touching condition) in regards to drinking behavior, drinking during the drinking condition did not significantly increase from drinking at baseline overall. Several reasons could account for this. Due to individual differences in the participant's ability to control his or her own rate of consumption and individual differences in thirst recognition and satiation, some participants may have been more influenced by behavioral mimicry than others (Hermans et al., 2013; Salmon et al., 2014). A desire to drink specifically in the baseline condition may also have increased as a result of the experimenter directly priming the participant by providing him/her with the cup of water (Bargh et al., 1996). Priming refers to the process by which a given stimulus activates mental pathways to enhance the ability to process subsequent stimuli related to the priming stimulus (Carver et al., 1983). In this case, providing the cup of water could have been a priming stimulus that positively influenced drinking behavior; thus, the baseline measures may not have been a true baseline (Bargh et al., 1996). The literature states that priming of a target behavior by exposing participants to words related to the behavior could be an effective method for increasing the behavior (Bargh et al., 1996). Priming with words suggesting close affiliation such as "friend" has also resulted in increased mimicry in a subsequent social interaction (Lakin & Chartrand, 2003). Thus, it may be useful to investigate whether priming either directly with the target behavior or the social relationship can have an effect in increasing drinking behaviors, in conjunction with behavioral mimicry, so that it can be incorporated into further studies and interventions. Additionally, the study contained low ecological validity as it was conducted in a controlled lab setting that

was not representative of eating/drinking in everyday life. Though conducting an experiment in a controlled lab setting allowed us to eliminate other factors that could influence drinking behavior and focus on isolating behavioral mimicry as an underlying mechanism for increased drinking behaviors, this unnatural environment could have limited natural drinking behaviors. Thus, it is possible that a greater magnitude of effect would be seen in a more naturalistic eating/drinking environment. These factors will be important considerations when conducting future experiments.

Representative Sample. Furthermore, the sample size of the current study was relatively small, with just 14 participants, which may not have yielded adequate representation in order to draw inferences about the entire population from the obtained results. The sample was also limited by location, as it was only conducted in Eugene, Oregon, a city with a predominantly white population, and is not a culturally representative sample. It is crucial to consider cultural aspects when examining mealtimes because components of meal structure, the daily rhythm of eating, the social aspects of eating and food choices vary across cultures (Manthorpe & Watson, 2003; Mellin-Olsen & Wandel, 2005). Culture and behavior are intertwined, since culture outlines how an individual should behave in different situations and how he/she should interpret others' behaviors (Keesing, 1974). Whether individualistic and collectivistic cultural differences affect the socialization process in increasing or decreasing behavioral imitation needs further examination (Gudykunst et al., 1996).

Cognitive Impairments. As the study examined behavioral mimicry in typical, healthy older adults, the results of the current study are not enough to indicate that behavioral mimicry also occurs in those with cognitive impairments. Some cognitive

impairments, such as schizophrenia or dementia, impact social communication, so it is possible that nonconscious, behavioral mimicry may not occur or the effects may be significantly diminished in such individuals (Penn, Addington, & Pinkham, 2006; Verdon et al., 2007). Moreover, since executive functions include cognitive processes related to goal-directed behavior and are controlled by the prefrontal cortex, those individuals exhibiting deficits in executive functioning or experiencing damage to their prefrontal cortex may not engage in behavioral mimicry as well and should be further examined (Best & Miller, 2010). In addition to compromised social and executive functions skills, other symptoms of cognitive impairments, such as aggressive behaviors and depressive symptoms, may impact socialization and inclination to imitate (Margari et al., 2012). As impairments progress and become more severe, not only social communication but also motor and physical abilities may also be affected, further limiting the individual's capacity to feed him or herself. There are also certain comorbidities relevant to mealtimes and nutrition to consider as many cognitive impairments occur alongside other disorders such as cardiovascular disease, diabetes, and dysphagia (Murad, et al., 2015; Sura, Madhavan, Carnaby, & Crary, 2012). However, in addition to the necessity of meeting nutrition needs, recent literature supports the importance of maintaining meaningful interactions during mealtimes in order to increase quality of life (Aselage & Amella, 2010). Thus, these findings of an effect in healthy older adults continue to hold promise of the clinical utility of mimicry in enhancing nutritional intake, and social connectedness, among various patient populations.

Future Directions

Factors Affecting Mimicry. In considering the next steps for research to examine the clinical significance of the proposed intervention, it is critical to determine the factors that strengthen or attenuate the effects of nonconscious behavioral mimicry. The current study found that the type of behavior (i.e., cup touching, drinking) can significantly affect the presence of nonconscious behavioral mimicry. This may indicate that in order for behavioral mimicry to occur, the target behavior must be goal-directed. Goal-directed behaviors require a goal and motivation; though consciousness may appear to be a requirement of goal-directed behavior, such behavior can actually be unconsciously primed (Dijksterhuis & Aarts, 2010). Therefore, the target behavior could prime the individual to engage in that behavior. The baseline drinking results reported here also suggest that priming may play a role in water consumption. Past research notes that priming can affect an individual's tendency to engage in the primed behavior (Bargh et al., 1996). Though priming is discussed as a limitation of this study as related to the baseline measures, it may be a useful purposeful addition to the proposed intervention to augment the effects of behavioral mimicry. Thus, further investigation into the use of priming to strengthen the effect of behavioral mimicry is warranted.

Different types of goal-directed behaviors related to water consumption should also be further explored to see whether different methods of drinking such as taking multiple sips or drinking with a straw can increase the likelihood to engage in imitation. Additionally, though water is the most optimal beverage to address issues of dehydration (Popkin, D'Anci, & Rosenberg, 2010), the type of drink (i.e., preferred drink such as orange juice) may also positively affect mimicry. This information would be helpful for those patients who are non-compliant and refuse to drink water while preferring another

beverage. The current study assessed the effects of behavioral mimicry using water, so it will be useful to examine whether the type of consumption can be expanded to different types of food consistencies and whether certain kinds increase behavioral mimicry more than others. In other words, it will be important to test the robustness of behavioral mimicry given different food/drink consistencies and flavors as well as modes of presentation in order to better understand the phenomenon and better apply it to real-world (eating) situations.

In addition to the types of consistency and behaviors, other participant and procedural factors should be investigated. As mentioned, the literature affirms that close affiliation can increase the effects of behavioral mimicry, yet the current study examined the effects of behavioral mimicry among strangers (Bavelas, et al., 1986; Berneri & Rosenthal, 1991; Chartrand & Bargh, 1999). Social psychology states that people have different social networks with varying levels of closeness (Westaby, Pfaff, & Redding, 2014). It will be useful to see how different levels of social networks affect behavioral mimicry. Based on the Socioemotional Selectivity Theory (Carstensen, 1992), it would be likely that higher affiliation increases the results of behavioral mimicry, but may also be that higher affiliation promotes increased mimicry. Lastly, the behavioral mimicry research on oral consumption, including the current study, investigates the effect within dyads (e.g., Hermans et al., 2009; Hermans et al., 2012; Shune & Foster, in press; Vartanian et al., 2013). Mealtimes frequently involve more than two people. Further, limitations due to inadequate staffing limit the strength for interventions that require direct 1:1 attention as discussed previously. Thus, it will be important to examine how varying sizes of groups with one confederate (or caregiver) affects imitation.

Clinical profiles. The inclusion criteria for the current study was broad and included any healthy older adult over the age of 60. Candidacy for future studies must be carefully selected and expanded in order to achieve the most effective outcomes. A qualification to consider is the type of cognitive impairment and severity. For individuals already receiving a type of behavioral intervention mentioned above in the literature review, it may be useful to examine how adding the social component of nonconscious behavioral mimicry would affect oral consumption. Lastly, after investigating which social networks positively or negatively affect behavioral mimicry, creating a hierarchy of the most effective to least or less effective people in the social networks of the older adult with a cognitive impairment may be an important consideration.

Summary. This study was designed to determine whether behavioral mimicry can influence the drinking behaviors of healthy older adults. While the current study supports that drinking behaviors can be increased through behavioral mimicry in healthy older adults, as discussed above, more research on the factors that strengthen the effects of behavioral mimicry and candidacy for the proposed intervention is needed. The goal of a mimicry-based intervention would be to encourage increased healthy consumption of food and water in those with cognitive impairments while still maintaining the overall quality of life in the aging older adult. Thus, it will be important to more closely examine whether behavioral imitation actually increases healthy consumption and promotes social engagement. Together, these future research directions may ultimately improve overall functioning in a population critically in need of a socialization-based approach to increased nutrition, shifting the patient care paradigm to more holistic management models that can be applied to other populations and interventions as well.

APPENDIX A

SCRIPT USED FOR PROVIDING CUP OF WATER TO THE PARTICIPANT

Experimenter: *Because the lab is pretty dry and I'll be making you talk a lot, I'll pour you and XX (confederate name) a cup of water. I have a whole pitcher, so feel free to have as much water as you'd like.*

APPENDIX B

ADULT INFORMED CONSENT DOCUMENT

Project Title: Effects of visual stimulus type on conversational output

Principle Investigator: Samantha Shune, PhD, CCC-SLP
sshune@uoregon.edu
(541) 346-7494
Communication Disorders and Sciences

This consent form describes the research study to help decide if you want to participate. This form provides important information about what you will be asked to do during the study, about the risks and benefits of the study, and about your rights as a research participant.

- If you have any questions about or do not understand something in this form, you should ask the research team for more information.
- You should discuss your participation with anyone you choose such as family or friends.
- Do not agree to participate in this study unless the research team has answered your questions and you decide that you want to be a part of this study.

Introduction

- You are being asked to be in a research study about conversational patterns.
- You were selected as a possible participant because you are healthy and have no history of a speech-language, neurological, or psychiatric condition.
- We ask that you read this form and ask any questions that you may have before agreeing to be in the study.

Purpose of Study:

- The purpose of this study is to better understand how people's conversation patterns and non-verbal behaviors may change depending on the type of visual input provided (e.g., different types of pictures).
- Up to 45 people over the age of 60 will take part in this study.

Description of the Study Procedures:

- If you agree to take part in this study, your involvement will last for approximately one hour.
- During the study, you will be asked to verbally describe different types of pictures with another participant.
- Video recordings will be made during the study. These recordings help us analyze performance on our study measures (e.g., language complexity, turn-taking, non-verbal gesturing). The use of video recording is a required component of the current study. No portion of the video recording will be heard or seen outside of the research team without first obtaining your explicit, written permission.
- You will be free to stop any of the testing at any time.
- The results will be confidential, but we are happy to discuss any of them with you.

Risks/Discomforts of Being in the Study:

- There are no reasonable foreseeable (or expected) risks. This study may include risks that are unknown at this time.

Benefits of Being in the Study:

- You will not benefit from being in this study.
- We hope that, in the future, other people might benefit from this study because the results may help us better understand different ways to elicit specific conversational patterns, allowing for the development of better evaluation and treatment options for individuals with speech and language problems.

Payments:

- You will receive a \$10 gift card for your participation in this study.

Costs:

- There is no cost to you to participate in this research study.

Confidentiality:

- We will keep your participation in this research study confidential to the extent permitted by law. All records will be maintained for ten years for data analysis and publication purposes.
- The records of this study will be kept private. In any sort of report we may publish, we will not include any information that will make it possible to identify any participant. All records will be identified only by a code number.
- All paper/hard copy records (including video recordings) will be maintained in locked filing cabinets in a laboratory that is always locked unless a member of the research team is present.
- All electronic information (including video recordings) will be coded and secured on password-protected computers.
- Access to the records will be limited to the researchers; however, please note that regulatory agencies, and the Institutional Review Board and internal University of Oregon auditors may review the research records.

Voluntary Participation/Withdrawal:

- Your participation is voluntary. If you choose not to participate, it will not affect your current or future relations with the University.
- You are free to withdraw at any time, for whatever reason.
- There is no penalty or loss of benefits for not taking part or for stopping your participation. Not taking part or stopping your participation will not jeopardize grades nor risk loss of present or future faculty/school/University relationships. If you withdraw from the study early, payment will be pro-rated accordingly.

Contacts and Questions:

- We encourage you to ask questions.

- If you have any questions about the research study itself, please contact: Samantha Shune, Communication Disorders and Sciences, 249 HEDCO, (541) 346-7494, or email sshune@uoregon.edu.
- If you believe you may have suffered a research related injury, contact Samantha Shune at (541) 346-7494 who will give you further instructions.
- If you have any questions about your rights as a research subject, you may contact: Research Compliance Services, University of Oregon at (541) 346-2510 or ResearchCompliance@uoregon.edu

Copy of Consent Form:

- You will be given a copy of this form to keep for your records and future reference.

Statement of Consent:

- I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study. I have received (or will receive) a copy of this form.

Signatures/Dates

Study Participant (Print Name)

Participant or Legal Representative Signature

Date

Signature of Person who Obtained Consent

Date

APPENDIX C

SCRIPT FOR INTRODUCING THE EXPERIMENT

Experimenter: *I have two sets of pictures, one of paintings and one of photographs. We will go through both sets, one image at a time. I will lay the picture in front of you, and I want you and X (confederate name) to take turns describing the picture: how it makes you feel, a description, what it reminds you of. There's no right or wrong answer here—any comments you have about the picture. For example, X will describe the first picture first, and then Y (participant name) can contribute her thoughts about the same image. Feel free to have a conversation about the picture. Once both of you have nothing else to say about the picture, I will lay the next picture in front of you, and you will repeat the same thing. Each set will be given 10 to 15 minutes, so the whole study will take 20 to 30 minutes. After the image description, I will give both of you a questionnaire to fill out and that's it! Ready to begin?*

APPENDIX D

EXAMPLES OF IMAGES USED IN THE DESCRIPTION TASK

Saguaro Cactus Near Tucson, Arizona by Carol M. Highsmith



<http://www.loc.gov/pictures/collection/highsm/item/2010630267/>

Photograph

The Old Violin by William Michael Harnett



https://images.nga.gov/?service=set&action=show_content_page&language=en&category=16&set=11&qw=&page=2&grid_layout=1

Painting

APPENDIX E

END OF EXPERIMENT QUESTIONNAIRE

Please answer the questions in order. Please circle the phrase that best expresses your answer. On some questions, you may be asked to write your answer in the form of phrases or sentences.

1. How **likable** was the other participant?

1	2	3	4	5	6	7
Extremely Dislikable	Moderately Dislikable	A Little Dislikable	I Did Not Like or Dislike Them	A Little Likable	Moderately Likable	Extremely Likable

2. How **smoothly** would you say your interaction went with the other participant?

1	2	3	4	5	6	7
Extremely Awkward	Moderately Awkward	A Little Awkward	Not Awkward or Smooth	A Little Smooth	Moderately Smooth	Extremely Smooth

3. How **difficult** was it to describe the images?

1	2	3	4	5	6	7
Extremely Difficult	Moderately Difficult	A Little Difficult	Not Difficult or Easy	A Little Easy	Moderately Easy	Extremely Easy

4. Did the images you described fit together as two separate ‘sets’?

1	2	3	4	5	6	7
Extremely Bad Fit	Moderately Bad Fit	A Fairly Bad Fit	Not Bad or Good	A Fairly Good Fit	Moderately Good Fit	Extremely Good Fit

5. Please **describe your thoughts and feelings** (in a few words or a sentence) **while describing the paintings**. Please list these thoughts and feelings next to the bullets (dots) below. If there is not enough room, please use the lines below to describe further.

-
-
-
-

Other Thoughts/Feelings:

6. Please **describe your thoughts and feelings** (in a few words or a sentence) **while describing the photographs**. Please list these thoughts and feelings next to the bullets (dots) below. If there is not enough room, please use the lines below to describe further.

-
-
-
-

Other Thoughts/Feelings:

7. Did you notice any particular **mannerisms** that **you** displayed during the session?

Circle: **No** **Yes**

If yes, please list here:

-
-
-

8. Did you notice any particular **mannerisms** that **the other participant** displayed during the session?

Circle: **No** **Yes**

If yes, please list here:

-
-
-

9. Please use this space to add any additional comments you have about the experiment (any part of the experiment).

APPENDIX F

DEBRIEFING FORM

Project Title: **Changing eating behaviors through mimicry**
Principle Investigator: Samantha Shune, PhD, CCC-SLP
Communication Disorders and Sciences
sshune@uoregon.edu
(541) 346-7494

Thank you for agreeing to participate in this study. The general purpose of this research is to explore how behavioral mimicry, or the extent to which people mimic the behaviors and postures of other people during social interaction, may play a role in eating and swallowing behaviors. During the social interaction sessions that you participated in, we collected data on the degree to which you mimicked the Research Assistant through your behaviors. In particular, we measured the number of times you drank from and/or touched your cup of water. It was crucial to the experiment for you to be unaware that we were specifically investigating mimicking behavior in order to measure it in a naturalistic way. The data we have obtained from you in this study will further our understanding of human behavior during social interaction and specifically social interaction during mealtimes. The results of this study may allow us to develop strategies for increasing nutritional intake and swallow safety in vulnerable patient populations for whom more overt strategies may not be appropriate.

If you choose to opt out of the study at this time, as indicated by not signing this form, all data and video recordings associated with your session will be immediately destroyed.

Please feel free to ask us any questions you have at this time. If you have further questions in the future, please contact Samantha Shune at (541) 346-7494 or email at sshune@uoregon.edu.

Neither the Informed Consent Document nor this Debriefing Form are a contract. They are written explanations of what will/did happen during the study. You are not waiving any legal rights by signing the forms. Your signature here indicates that this research study has been explained to you, that your questions have been answered, and that you agree to have your data included in the study. You will be given a copy of this form to keep for your records.

Study Participant (Print Name)

Participant or Legal Representative Signature

Date

Signature of Person who Obtained Consent

Date

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