A Behavioral Model for the Assessment and Management of Dehydration in Older Adults

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A BEHAVIORAL MODEL FOR THE ASSESSMENT AND MANAGEMENT OF DEHYDRATION IN OLDER ADULTS

by

Leilani Feliciano

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
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Leilani Feliciano
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CHAPTER I

INTRODUCTION

A Behavioral Model for Assessment and Management of Dehydration in Older Adults

Dehydration is a serious health concern for the elderly constituting one of the ten most common causes for their hospitalization (Sanservo, 1997). Fluid losses of 10% can lead to serious illnesses and losses of 20% can lead to death (Moore, 1992). Research has indicated that at least 17.4% of elders who become dehydrated die within 30 days of hospitalization, with an additional 30.6% mortality rate from one month to one year later (Warren et al., 1994). When examining hypernatremic dehydration, a particular type of dehydration that refers to high blood sodium levels, the mortality rate increases to 46% of elders (Himmelstein, Jones, & Woolhandler, 1983). While the variability in post-hospitalization mortality rates for dehydration appears to be related to the primary diagnosis (e.g., respiratory illnesses, urinary tract infections, diabetes), the presence of dehydration in any of these cases further increases the risk of mortality (Warren et al.).

The impact of dehydration can be grouped into two areas: personal and financial. Personal impact reflects that dehydration contributes to or causes health problems including delirium, urinary tract infections, constipation, mental and functional decline, and increased morbidity and mortality (Chidester & Spangler, 1997; Sanservo, 1997; Silver, 1990; Weinberg & Minaker, 1995). In addition, the oldest old are at increased risk
for dehydration and are up to six times more likely to be hospitalized for it (Warren et al., 1994). Financial impact refers to the health care system, which absorbs the cost of repeated emergency room visits and other impacts from other related chronic illnesses. Warren and colleagues investigated the reimbursement rates from Health Care Financing Administration (HCFA) for treatment of Medicare beneficiaries in 1991. They found that for elders (65 and older) who were hospitalized for dehydration, the cost was 446 million dollars for that year. This number does not include the more than one half million hospitalizations for non-HMO elders in which dehydration was listed as a complicating diagnosis (Warren et al.).

Dehydration occurs frequently for older adults for several physiological reasons. First, elders often experience dehydration as a side effect of medication, which they tend to take in greater quantity than younger adults (Belsky, 1999). Particularly problematic medications (over-the-counter and prescription) include diuretics, laxatives, nonsteroidal anti-inflammatory drugs (NSAIDS), sedatives and tranquilizers (Cooper, 1999; DeMaagd, 1995). Decreased renal function due to normal aging and health problems also contribute to dehydration because the body has a decreased capacity for regulating fluid balance (Sanservo, 1997). Another cause for dehydration includes increased fluid loss related to normal aging processes such as decreased muscle mass, which holds 40% of total body water (Lavizzo-Mourey, 1987). Elders may also experience decreased perception of thirst, which leads to failure to drink enough to compensate for water loss (Lavizzo-Mourey, 1987; Phillips et al., 1984). Finally, some elders for whom incontinence is a concern, may self-limit the amount of fluid they consume in order to decrease the number of accidents or frequency of trips to the restroom (Simmons, Alessi, & Schnelle, 2001).
Functional barriers may also contribute to dehydration in elders. For example, arthritis may affect an individual’s mobility making it difficult or painful to ambulate, may limit the ability to open containers and even drink easily from a cup (Sanservo, 1997). Reduced sensory input may also affect an elder’s ability to adequately hydrate. For instance, reduced vision can impede their ability to locate and/or obtain fluids easily, and reduced olfaction may contribute to decreased stimulation of appetite for food and fluids (Blair, 1990).

Problems Identifying Dehydration

Despite the commonness of dehydration and the many reasons for it, there are several problems inherent in the identification of dehydration. Unlike the management of some chronic illnesses (e.g., diabetes, high blood pressure) there are currently no simple home tests available to the public to monitor hydration levels. Physical examinations of the skin (e.g., skin turgor), the mouth (i.e., tongue furrows and dry mucous membranes), and face (i.e. sunken eyes) are commonly done in the physician’s office. However, these symptoms can often be generated by other physical conditions and medication usage, and thus should not be used as sole indicators of dehydration. For example, an examination of skin elasticity (turgor) in a younger person is a good identification tool because skin loses elasticity when a person is dehydrated. However, in an elderly person the same effect will occur (i.e., skin that is lightly pulled up remains tented after release) due to age-related loss of elasticity and subcutaneous fat, regardless of hydration status. Likewise, dry mouth is an excellent indication of dehydration in a young person, but is commonly seen in elders due to the presence of certain medications or chronic illnesses (e.g., Sjogren’s syndrome). One final indicator of dehydration in a younger person is chronic sensation of
thirst, however, thirst sensation is often decreased in older adults (Lavizzo-Mourey, 1987; Phillips et al., 1984) making it more difficult for the elder to detect and report dehydration. These indicators typically require a medical visit for detection and thus do not fit easily into a prevention model.

Because of these diagnostic difficulties, the typical identification of a dehydrated elder is at the emergency room (ER), where dehydration is a complicating or contributing factor for an acute health issue such as delirium, congestive heart failure (CHF), or liver failure. Typically, the importance of dehydration may be overshadowed by the more acute condition rather than viewed as a potential chronic contributing factor for the other health problems. Once in a medical setting, dehydration can be detected by laboratory tests. Laboratory tests generally involve assessments of electrolytes, serum osmolality, blood urea nitrogen (BUN) and creatinine, serum urea nitrogen (SUN), SUN/creatinine ratios, and urine-specific gravity (Weinberg & Minaker, 1995). Electrolyte levels assist in the evaluation of dehydration because they provide information regarding levels of sodium, potassium, and chloride, which may indirectly affect water levels (intercellular and intracellular) in the body. For example, an increase in sodium levels would directly lead to dehydration, while a decrease in potassium would indirectly contribute to dehydration through diarrhea or vomiting. BUN and creatinine levels are waste products eliminated by the kidneys and BUN/creatinine ratios are typically elevated (score ≥ 18) when kidney function is impaired and are also elevated in dehydration (WebMD, 2001). SUN/creatinine ratios provide similar information utilizing blood serum instead of whole blood. Finally, urine specific gravity measures provide a score indicating the percentage of water in the urine with a score of 1.029 considered indicative of borderline
dehydration and scores of 1.030 or higher reflecting increasing severity of dehydration (Mentes, 2000).

Hodgkinson, Evans, and Wood (2003) recently conducted a review of the dehydration literature covering the time period of 1966 to February of 2002. They sought to determine the best methods to assess risk and to monitor oral fluid intake. They concluded that a “fluid intake sheet and urine specific gravity might be the best methods of monitoring daily fluid intake” (p. S19).

Interventions for Dehydration

Interventions for dehydration in elders typically occur in three settings: the ER, physician’s office, and nursing homes. A typical intervention for the elder who presents in the ER involves the intravenous (IV) administration of fluid. While effective in restoring fluid, IV administration is an invasive procedure that does not provide protection against future episodes in terms of teaching the person how to detect and manage his/her hydration status. In the physician’s office, a typical intervention might include verbal instruction, which may be inadequate for the individual’s needs. An instruction to take 64 ounces of fluid daily, the most common recommendation in the available literature, may not be accurate because the optimal amount of fluid intake should be based on body weight and activity level (Chidester & Spangler, 1997). Even when the recommendation is accurate, recommendations alone may be inadequate to produce good treatment adherence.

Psycho-educational and medical recommendations alone often do not produce lasting behavior change in the form of adherence. For example, Vincent (1971) studied patients with glaucoma who were given verbal instructions to use eye drops three times
daily or they would lose their eyesight. Even with threat of such dire consequences, treatment adherence was only 42% (cited in Meichenbaum & Turk, 1987). With chronic conditions such as diabetes, only seven percent of individuals with diabetes adhere fully to their treatment regimens, despite demonstrating sufficient knowledge of treatment procedures (Cerkoney & Hart, 1980; cited in Meichenbaum & Turk, 1987). Estimates of treatment nonadherence for medication management range from 19-74%. Approximately 20-60% of individuals prescribed medications discontinue usage prior to recommendation, and 25-60% take the medication incorrectly (Stimson, 1974). Among the elderly, non-adherence rates with medication are estimated to range from 43-62% (Meichenbaum & Turk). The degree to which elderly adults adhere to prescribed fluid consumption has not been empirically documented. Two lines of evidence suggest that non-adherence is a major concern. First, the relatively high prevalence of dehydration and associated medical complications and the similarity between prescribed fluid consumption and the other adherence behaviors (e.g., medication management) for which high levels of non-adherence have been documented.

Difficulties with treatment adherence are particularly prominent with individuals with chronic conditions, when the risk is temporally distant, when changes in lifestyle are indicated, or when prevention (rather than cure or symptom management) is the goal (Meichenbaum & Turk). For these reasons traditional approaches to the prevention of dehydration have not typically proven effective.

Three studies have investigated interventions for dehydration in nursing homes. Spangler and colleagues (1984) examined the utility of a health care prompt system designed to decrease incontinence and increase hydration status in 16 non-ambulatory nursing home residents. Nursing aides offered a choice of beverages every 1.5 hrs while
engaged in social conversation. If there was no response, the aide provided a physical prompt by placing a cup in the resident’s hand and re-presented a verbal prompt. No further prompting was given and negative responses lead to removal of the cup. This routine was evaluated in a hybrid design consisting of a multiple baseline design across two groups with the intervention presented in an ABAB format. Two urine samples were collected daily to provide urine specific gravity dependent measures, which indicated a clinical and statically significant improvement in hydration status after intervention. These findings suggest an environmental intervention package consisting of prompts and choice of beverage may be useful in increasing hydration status in non-ambulatory nursing home residents.

Simmons et al. (2001) evaluated a three stage behavioral intervention involving prompts and beverage choice to improve hydration in 48 participants compared to 15 control nursing home residents. The researchers manipulated the frequency of systematic prompts to drink beverages in two stages and added choice of beverage in the third stage. Results indicated that 81% of participants increased their average daily fluid intake in the first two phases together and an additional 21% increase was observed when choice of beverage was introduced (stage 3). In addition, a significant decrease in number of beverage refusals was noted when beverage choice was introduced suggesting that both prompting and the introduction of choice may be important variables in increasing hydration.

Inouye et al. (1999) examined the use of a standardized protocol to reduce dehydration as part of a multi-component intervention strategy for the prevention of delirium (an acute delusional state complicated by dehydration). They targeted 426 age, sex, and risk level (for delirium) matched pairs of hospitalized geriatric patients in which
one pair received standard hospital care and the other received the multi-component intervention. The dehydration protocol consisted of "early recognition of dehydration" and provided encouragement for drinking fluids. The exact procedures for doing so were not outlined in the study. Dehydration was assessed through BUN/creatinine ratios. The overall adherence rate for each of the protocols was reported, with adherence for the dehydration protocol reported as 81%. Difficulties with adherence included refusal by the patient and lack of adequate staffing to provide adequate fluids. Overall results indicated that the package was effective in preventing development of delirium in patients at intermediate risk and reduced the total number of days with delirium in high-risk patients. However, component analyses indicated that change in dehydration level was not significantly different between the intervention and usual hospital care groups (p = 0.22). Unlike the results found by Simmons et al. (2001), these results suggest that simply encouraging fluid intake is not sufficient to produce behavior change even when a full-time nursing care staff is available to provide intervention.

While two of the three studies identified promising interventions, they occurred in settings in which an organized nursing care system could manage the person's hydration and, thus, are not appropriate models for community settings in which the individual must manage his or her own fluid intake. In addition, these interventions are typically not individually tailored and do not consider possible environmental factors which may be relevant for successful hydration. The absence of individual tailoring might be a concern as individuals may exhibit topographically similar behavior (e.g., drinking at a low level) but the etiology of this behavior may vary across individual and thus require individualized approach to treatment planning (O'Neill & Carr, 2000). Behavioral
interventions require that individualized care plans be tailored for each person’s needs, increasing the likelihood of successful intervention for that person.

We suggest that a functional approach to management of dehydration may prove useful for community dwelling elders at risk for dehydration. The remainder of this paper will provide a behavioral conceptualization of the factors influencing dehydration in elders and a proposed method of directly linking assessment of those factors to function-based interventions that can be implemented in the community.

Utility of a Behavioral Conceptualization of Dehydration

Although dehydration is typically viewed from a medical model as inadequate fluid intake, a behavioral conceptualization of dehydration may prove beneficial in developing individualized intervention. From a behavioral perspective, an individual’s behavior is viewed as a product of the interaction between the person and his/her environment (Bijou, 1995). When applied to dehydration, drinking healthy fluids can be conceptualized not just as a biological event, but also as a behavior that is subject to the influences of environmental variables. Multiple environmental variables may lead to a person not drinking enough water to maintain healthy hydration status and those same environmental variables may be able to be manipulated in an effective intervention for dehydration.

Another benefit to a behavioral perspective relates to the availability of an extensive empirical literature supporting the effectiveness of behavioral interventions with different populations across several problems or conditions (Carr, Coriaty, & Dozier, 2000). However, the portion of this literature devoted to work with elders has historically received the least attention despite recognition of its potential utility with this
population. In fact, as early as the 1960’s Lindsley promoted the use of behavioral interventions with the elderly population and in 1986, Burgio and Burgio echoed his sentiment when they outlined the utility of behavioral procedures in treatment of behavior problems in the elderly through skill-building, using caregivers in the delivery of behavior change procedures, and environmental modification. Some of these suggestions have been carried out in interventions designed to treat depression (e.g. Teri, 1996), treating urinary incontinence (Burgio, Engel, Hawkins, & McCormick, 1990), increasing ambulation (Burgio, Burgio, Engel, & Tice, 1986), and increasing engagement in daily activities (Engelman, Altus, & Mathews, 1999), however much more work is needed in these areas.

While the literature in behavioral gerontology continues to grow, a separate literature provides extensive empirical support for the effectiveness of behavioral procedures with individuals with autism and other developmental disabilities (Carr et al., 2000). One of the most important contributions of this literature is functional assessment, which provides a direct link to functional intervention. The next sections will provide an overview of functional assessment and an outline of the relevance of functional assessment for dehydration.

**Functional Assessment**

A functional assessment examines the environmental factors that contribute to a problem. Understanding why a behavior occurs, or fails to occur, provides information that may directly guide the choice of an appropriate intervention, whereas inadequate knowledge of the function of the target behavior could lead to a less effective or inappropriate intervention (Carr et al., 2000). Furthermore, the consequences of spending
time and resources on less appropriate interventions may delay access to a more effective treatment, lead to contra-indicated treatment, or expose individuals to more punitive or restrictive procedures (Lennox & Miltenberger, 1989).

A functional assessment typically involves examination of each aspect of the four-term contingency (Bijou, 1995). That is, a functional assessment examines the role of antecedents, consequences, and settings events or establishing operations upon human behavior. Antecedents are environmental stimuli that precede the occurrence of the behavior and whose presence increases the likelihood that the behavior will occur (Lundervold & Lewin, 1992). For example, with individuals with dementia, a person walking by may serve as an antecedent to ask repetitive questions. Thus, antecedents refer to environmental stimuli that reliably predict behavior. Discriminative stimuli (S\textsuperscript{D}) in particular, are antecedent stimuli that control behavior because of a historical relation between the presence/absence of the stimulus and the differential availability of reinforcement. Consequences refer to the conditions that occur immediately after the behavior that increase, maintain, or decrease behavior (Lundervold & Lewin, 1992). Consequences include both positive and negative reinforcement, which function to increase the likelihood that the behavior will occur again in the future (Malott, Malott, & Trojan, 2000). For example, every time the individual with dementia asks a question, the person (family or staff) stops and provides attention by answering, comforting, etc. Consequences may also include aversive elements, which serve to decrease the future frequency of the behavior (Malott et al.).

Setting events are temporally removed from the target behavior but affect the occurrence of behavior. Lundervold and Lewin (1992) outline several pertinent setting events for elders including medication, medical problems, disrupted sleep cycle, diet,
daily schedule, availability of activities, ambient noise, and social interactions. Wisocki (1991) also included biological changes associated with aging as being influential on behavior. For example, sensory or memory impairments might fall under this category. The term establishing operations, recently referred to as motivating operations, refers to a specific form of setting event that alters the reinforcing or punishing effectiveness of other environmental events (reinforcer value-altering effect) and alters the frequency of occurrence of behavior relevant to those events as consequences (evocative behavior altering effect) (Laraway, Snycerski, Michael, & Poling, 2003; Michael, 1993). Following our previous example, if the person with dementia had been isolated for a length of time, this isolation (i.e., attention deprivation) is likely to increase the value of any attention provided as a consequence for repetitive questioning and increase the frequency of all behaviors that have been reinforced with attention (e.g., asking questions).

Thus, the purpose of functional assessment is to identify the maintaining variables for the specific elder's behavior and can also be applied to behavioral deficits (such as liquid consumption) that might lead to more effective interventions. There are several different levels of functional assessment including indirect (informant), descriptive, and functional analysis (Lennox & Miltenberger, 1989). Indirect assessments involve use of interviews, rating scales, etc. to assist in the formulation of hypotheses regarding the function of the target behavior. Because the information is gathered from the informant and does not allow direct access to the behavior, it is referred to as indirect. Indirect assessments have utility in the ease and quickness of administration and in the ability to provide information, which due to the nature of the target behavior may not otherwise have been acquired (Austin, Carr, & Agnew, 1999). Limitations include those inherent in
either self-report or interview measures, such as observer bias, reliance on the ability to accurately recollect events, etc. (Lennox & Miltenberger, 1989).

Descriptive assessments typically occur in the natural environment and involve direct observation of the immediate antecedents, target behavior, and consequences to assist in generation of hypotheses about the function of the behavior (Lerman & Iwata, 1993). A limitation of direct observation relates to use with low frequency behaviors and behaviors that occur only while the individual is alone. The validity of the results from a functional assessment should be further evaluated by conducting confirmatory analyses through examination of the effects of a function-based intervention (Fisher, Harsin, & Hayden, 2000). If the function is correctly identified, the behavior should either decrease or increase depending on the nature of the specific behavior target. If the function-based intervention does not produce desired results (and the intervention was carried out with integrity), it is possible that the maintaining variables were not correctly identified.

The third type of functional assessment, functional analysis, involves the experimental manipulation of the variables thought to reliably predict or maintain the problem behavior. This is the most rigorous form of functional assessment, in which hypotheses are directly tested (typically in an analog situation) and the controlling variables, once identified, can be manipulated in the natural environment to affect behavior (Lennox & Miltenberger, 1989).

The most commonly used methodology for functional analysis was disseminated in 1982 by Iwata, Dorsey, Slifer, Bauman, & Richman. They examined self-injury in nine individuals with mental retardation and exposed them to four different randomly ordered experimental conditions in an alternating treatments design. Each session lasted approximately 15 min and consisted of either: (1) “social disapproval”, which consisted
of contingent attention provided on the occurrence of the target behavior, (2) “academic demand”, which consisted of a difficult task which either resulted in praise for completion of task and a new trial, or contingent withdrawal of demand contingent on self-injury, (3) “unstructured play”, which consisted of a variety of toys available and no task demand with social praise delivered contingent on appropriate behavior, while self-injury was ignored, and (4) “alone”, which consisted of the participant alone in the therapy room without toys or other environmental stimuli. Iwata and colleagues found that higher rates of self-injury were related to different stimulus conditions for different individuals, thus providing “direct empirical evidence that self-injury may be a function of different sources of reinforcement” (p. 206). Since development, these methods have been successfully applied to other behavioral excesses including stereotypy, aggression, and disruptive behaviors (Lerman & Iwata, 1993). Some limitations of this methodology include potential reactivity to the analogue nature of the assessment, cost and staff time requirements, and difficulty of application to behavioral deficits (i.e., behaviors that fail to occur when they should occur) and low-rate behaviors.

Functional Assessment in Elderly Adults

A small number of studies have reported functional assessments with elderly adults, mostly focusing on behavioral excesses where the goal was to reduce that particular behavior. Heard and Watson (1999) conducted a descriptive assessment of wandering behavior with four nursing home residents with dementia. Researchers hypothesized that the maintaining variable was attention (2 participants), access to tangibles (1 participant), and sensory stimulation (1 participant). Researchers then manipulated the treatment conditions utilizing the variable identified through the
descriptive assessment procedures in a differential reinforcement of other behavior (DRO) procedure. Results indicated successful decreases in time spent wandering for each individual.

Most recently, Buchanan and Fisher (2002) examined the function of repetitive vocalizations and attempted to reduce this behavior. Researchers conducted a functional analysis and found that attention maintained repetitive vocalizations in two elderly nursing home patients. In addition, they determined that an increase in stimulation might also be a maintaining variable for one of the two individuals. Using a reinforcement-based procedure (non-contingent reinforcement) to alter the antecedent conditions, researchers were able to effectively reduce the frequency of disruptive vocalizations.

As mentioned previously, most functional assessments are related to issues of behavioral excess. Functional assessment of behaviors that do not occur or seldom occur (behavioral deficits) is more difficult due to a limited opportunity to observe the behavior, as well as a limited opportunity to manipulate environmental events.

Dehydration falls into the category of behavioral deficit because drinking does not occur at an adequate level to produce healthy functioning. A functional assessment model has been proposed for examining parallel behavioral deficits in the contexts of organizations and safety. This model may have utility if applied to dehydration.

**Functional Assessment of Behavioral Deficits and Extension to Hydration in Elders**

Austin and colleagues (1999) suggest that there are multiple barriers that may hinder an individual’s performance resulting in a behavioral deficit. They propose several factors in four primary areas that could enhance, maintain, or hinder performance in organizations including antecedents, equipment, knowledge and skills, and consequences.
Antecedents in this model refer to goal setting related to performance, assessing whether there are adequate prompts in the environment to evoke the behavior of interest, and the presence of any rules that may impede progress towards those goals. Equipment refers to not only having the necessary materials, but also the physical arrangement of the equipment. Knowledge and skills refers to the lack of/insufficient safety related behaviors or other physical skills, and consequences refers to response effort or lack of feedback. The model proposed by Austin et al. (1999) describes some of the potential areas that might be considered when there is a behavioral deficit and can be applied/translated to relevant environmental variables for elders who do not drink adequate amounts of healthy fluids.

The following sections will outline the potentially relevant variables in each of their categories. Table 1 also provides a summary of the relevant variables from each category and the interventions that may be used to overcome each obstacle.

**Antecedents**

According to this model, the relevant antecedents are either not present or not salient in the environment. In the case of elders at risk for dehydration, there are at least two potential problems with antecedents. First, remembering problems may render typical environmental cues such as seeing a water cooler, or the passage of time, ineffective in occasioning drinking. For most young adults the noon hour is a time-cue or prompt (discriminative stimulus) for having a beverage with lunch, but for the elder the simple passage of time may no longer occasion drinking. Additionally, a person with intact remembering will be more effective in tracking how many beverages they have consumed in a day while a person with impaired remembering may be less effective or accurate in his/her estimation. Second, thirst sensation, which in a younger person.
typically functions as a physiological stimulus for drinking or as an establishing operation to make drinking more reinforcing and occasions behaviors that have typically resulted in obtaining water, is no longer present for the typical elder (Phillips, et al., 1984). Thus, there is no motivational operation in effect, and water deprivation no longer leads to engagement in behaviors that have typically been reinforced with drinking (J. Michael, personal communication, February 5, 2003).

Knowledge and Skills/History

Austin et al. (1999) mention that insufficient knowledge or skills is a common difficulty that may prevent adequate performance of a given behavior. This category is not limited to knowledge or skills about how to drink (unless there is impaired motor functioning present that requires the acquisition of different skills in order to drink liquids, most elders still possess this skill) but may also be related to several issues about knowledge of proper hydration. First, it may be the case that the elder does not know about the dehydrating effect of medications he/she is taking and therefore does not effectively increase their fluid intake to compensate. A second possibility may be a lack of awareness of physical changes that may cause an increase in fluid loss (e.g., decreased renal function, decreased muscle mass). In either of these two possibilities, an elder who has maintained the same drinking repertoire as he/she had as a younger adult, will no longer be adequately hydrated. An alternative possibility may be related to a lack of awareness of the difference between healthy and dehydrating drinks. For example, elders as a cohort frequently drink coffee and tea (Dowd, Campbell, & Jones, 1996). As these beverages contribute to dehydration, consumption may be a complicating factor in an elder’s inadequate hydration status. Another possibility is that the elder does not know how much fluid they should be drinking. Lastly, the elder’s personal history may also be
relevant. A personal history with tap or well water that did not taste good or was not healthy may have led one to avoid drinking all water.

Response Effort

Response effort may be related to the functional barriers mentioned earlier. For many elders, difficulties with ambulation or strength issues may contribute to a situation in which it becomes too effortful to get a drink. Factors that may contribute to this situation include difficulties walking or simultaneously managing a walker and beverage. Strength issues that may be relevant to the level of effort include difficulty with managing heavy glasses or standing up with a pitcher. Medical complications such as arthritis or osteoporosis may make a simple procedure such as pouring water from a pitcher into a glass, opening some beverage containers, or walking across a room a highly effortful event. From a reinforcement perspective, the amount of effort it takes to acquire a beverage may overpower the reinforcing value of the reinforcer (e.g., water) itself, particularly if the EO (thirst sensation) is weakened due to biological changes with age. Note that if engaging in the behavior is also painful, the precurrent behaviors to drinking may be punished.

Consequences.

For many elders, drinking may lead to several aversive consequences which function as punishers and result in decreased fluid intake. For example, drinking may lead to more frequent trips to the bathroom, which may be aversive if difficulties with ambulation or strength issues are present. A second factor that is likely to be a major contributor to inadequate hydration is incontinence (Simmons et al., 2001). If increased drinking is associated with increased accidents, an elder may be compelled to restrict his/her fluid consumption in an effort to avoid embarrassing incidents of incontinence. A
third factor may involve aspiration or spilling which may be fear provoking or sufficiently embarrassing that the person may choose to avoid situations in which these consequences may be likely to occur. In addition, there may be a lack of positive consequences for drinking healthy beverages (e.g., no EO in effect). For these reasons, elders who have attempted to hydrate themselves may be unlikely to engage in these behaviors again in the future.

*Competing Behaviors*

Another factor that is likely to prevent adequate hydration is engagement in competing behaviors. It may be the case that healthy drinks, such as water are non-preferred, while unhealthy dehydrating drinks such as coffee or tea are much more preferred. In this case, a person may be more likely to drink something that tastes good in lieu of something that has no taste, or is unpalatable.

In summary, a behavioral conceptualization may prove beneficial because it may directly guide individualized treatment. An individualized approach to treatment/prevention may be advantageous, as it will take into account the environmental variables that may place a specific individual at risk for dehydration and/or maintain an unhealthy drinking history.

*Rationale for the Current Study*

Dehydration is a serious health concern that can have serious consequences for elders. Typical interventions have not proven well suited to home dwelling elders. A functional approach to assessing hydration may lead to individually tailored interventions that directly target the environmental factors that affect drinking. The purpose of this study was to examine whether the use of a functional assessment interview tool and
resulting function-based intervention would prove beneficial in addressing the issue of dehydration for community-dwelling elders.
CHAPTER II

GENERAL METHOD

Participants

Participants were recruited from a local senior subsidized apartment complex and through flyers posted in the local and neighboring southwestern Michigan communities. Nine community dwelling male and female elders (age 65 and older living independently or with a significant other) participated (refer to Table 2). Information about each participant is provided within the specific descriptions for the experiments in which they participated.

Determination of Risk Status

Risk for dehydration was determined at the informant level (either caregiver/family member or participant report), based on the responses to the first three items of a semi-structured interview. Items included information about the number and type of medications the elder was taking, recent hospitalization for dehydration, presence of disease (e.g., kidney or liver), recent infection (particularly those with accompanying fever, diarrhea, vomiting), chronic illnesses, incontinence, and poor nutritional history. In addition, elderly individuals who complained of common symptoms of dehydration (e.g., vomiting, syncope) were also considered at risk. Endorsement of any two of these items qualified the participant for the study. For example, an elder who was taking five or more
medications and was experiencing any symptoms of dehydration (items #2 and 3 of the interview) would meet the criteria for inclusion.

**Mental Status Criterion**

Participants were administered the Mini Mental Status Exam (MMSE - Folstein, Folstein & McHugh, 1975), a commonly used measure of cognitive status, prior to any other aspect of participation (excluding consent activities). All individuals who scored within the range of 21-30 (indicating no substantial cognitive impairment) were qualified to give informed consent (Maddox, 1995) for participation and could be expected to be able to provide reasonable responses to the interview.

**Exclusion Criteria**

Individuals who did not meet criteria (i.e., mental status performance, one or no endorsed risk factors for study 2) were given a brief handout outlining the risks for developing dehydration (see Appendix A), encouraged to contact their physician if they developed any of these symptoms at a later time, and thanked for their participation. Those individuals with pre-existing medical conditions placing them at excessive medical risk for fluid overloading (e.g., congestive heart failure, uncontrolled diabetes, severe kidney or liver disease) were excluded from participation in intervention but could serve as a pilot participant and were encouraged to contact their primary care physician immediately for on-going health maintenance or intervention. In addition, individuals who were receiving prescribed diuretic therapy could serve as pilot participants but were also excluded from participation in intervention as they could also be at risk for fluid overloading (Levitan & Rutecki, 2003), unless their primary care physician indicated that
care program were excluded because of the portion of their time spent in a setting in which their fluid intake was regulated.

Setting

Participants were assessed and treated within their natural home environments in order to tailor the intervention to meet specific environmental demands and to facilitate maintenance and generalization of the intervention to the natural environment after completion of the study. All participants lived independently or with a significant other in senior subsidized apartments, trailer parks, or suburban homes.

Semi-structured Interviews

The Hydration Interview (HI) was developed for this study specifically to examine factors from each of the functional categories according to the Austin et al. (1999) model. Items were generated for each functional category based on literature reviews in the domains of nursing, occupational therapy, and psychology. The format of the interview’s administration was modeled on the Functional Assessment Interview Form (FAI) (O’Neil et al., 1997) and adapted to address drinking as the behavior of concern. To encourage a more thorough interview process, patient and caregiver/significant other versions were created. However, all of our pilot participants were living independently and thus only the patient version was administered. This interview tool served a dual purpose: assessment of risk for dehydration and generation of hypotheses related to possible environmental influences. Experts in the fields of nursing, occupational therapy, and behavior analysis reviewed a preliminary version of these interviews. Appropriate changes to the format of questions were made based on the comments of experts.
Dependent Measures and Equipment

Urine Specific Gravity

Participants were asked to provide a daily urine catch of the first morning urination, which is the most concentrated sample of the day and reflects the highest likelihood of detection of dehydration (Hyduke, 2003). Sterile specimen cups were provided as well as a small portable cooler with cooling packs for storage and transportation of specimens. Participants were instructed in how to collect a clean urine catch (Appendix B) prior to their first data collection. Research assistants retrieved samples on a daily basis at a designated time. Urine samples were tested by trained research assistants according to protocol (Appendix C) using a Leica model index refractometer, which uses the principle of light refraction to measure the urine specific gravity of a sample. Scores between 1.002 and 1.028 are considered optimal (Koren, 2002) and higher scores are indicative of dehydration (Mentes, 2000). The refractometer readings served as the primary dependent measure for making phase changes in experiment 3.

Fluid and Food Intake

Participants were asked to keep a daily diary of their food and fluid intake. A datasheet was provided for ease of data collection and prompted recording three times daily reflecting morning, afternoon, and evening intake (Appendix D). During the initial interview, the size in ounces of the typical drinking glasses the elder used was assessed to ensure accurate reporting. Participants were asked only to indicate type of food consumed at each time interval.
Healthy and unhealthy fluid intake in ounces were calculated and graphed each day. A beverage was categorized as healthy fluid if it was decaffeinated and nonalcoholic (e.g., water, sparkling water, juice). A beverage was categorized as unhealthy fluid if it contained caffeine or alcohol (e.g., coffee, tea, wine). The fluid intake measures served as a secondary dependent measure for experiment 3.

Measurement Integrity

Refractometer Measurement Calibration

To promote confidence of measurement accuracy, approximately 10% of all refractometer samples in each condition were also evaluated in a formal laboratory setting prior to during experiment 1 and during experiment 3 to assess for observer drift. Using the total agreement method, the laboratory readings were compared to those gathered by the primary data collector. Calculations indicated an agreement of 99.7% and above for all measurements. The laboratory at the Sindecuse Student Health Services Center reported consistent refractometer scores within 0.001 to 0.002 of the primary data collector’s scores on USG data. In addition, calibration of refractometers was conducted on three randomly selected days. On each day, the refractometer was tested with a 100% distilled water solution to increase confidence in the reliability of the equipment. Refractometer readings were consistently at 0.000, indicating that the refractometers remained calibrated throughout the study.

IOA for Refractometer Scores

A second independent observer measured 33-100% of samples using the refractometer and IOA was computed using the total agreement method. The lower
refractometer score was divided by the higher refractometer score and the result was multiplied by 100. IOA ranged between 94.4 - 100% (refer to Table 3).

Food and Fluid Diaries

Because many of our participants lived alone, there was no second independent observer available to collect IOA for fluid consumption.
CHAPTER III

METHODS

Experiment 1 - Plotting of the HI and Participants

Participant A was an 84-year-old African-American female residing alone in an apartment in senior subsidized housing. She completed 11 years of education and was a homemaker. She scored a 30 on the MMSE. This participant was unable to participate in the intervention phase because she was on a physician monitored fluid restricted regimen, but she otherwise met the criteria for inclusion in the pilot study. This participant had several risk factors including greater than five medications including an incontinence medication, Type II diabetes, limited mobility, pain with ambulation, limited access to shopping, poor knowledge of the difference between healthy and unhealthy beverages.

Participant B was an 80-year-old Caucasian female residing alone in an apartment in senior subsidized housing. She completed 13 years of education and was previously employed as a surgical technician. She scored a 29 on the MMSE. This participant was currently on a fluid restricted regimen as prescribed by her physician, otherwise she would have met criteria for inclusion in the intervention study based on the presence of several risk factors (e.g., greater than five medications, arthritis in her back, a history of heart problems). Similarly to Participant A, because of her fluid restricted diet, she could only be included for piloting of procedures.
Participant C was a 78-year-old Caucasian female residing alone in an apartment in senior subsidized housing. She completed 12 years of education and was previously employed as a secretary. She scored a 28 on the MMSE. This participant would have qualified for the intervention study based on the presence of several risk factors (e.g., greater than five medications, arthritis, hypotension), however she was also on a strict diet including a fluid restricted regimen as prescribed by her physician.

Procedures

Administration of Semi-structured Interviews

After consent was established (Appendix E), the HI was administered to the three pilot participants to determine whether the questions were easily understood. The examiner administered the interview in a one-to-one format as per instructions (refer to Appendix F). Each interview took approximately 30 – 60 min to administer. At the conclusion of the HI administration, a brief post-evaluation interview was conducted (e.g., “Was there anything that was difficult to understand?”, “was that too long?”, etc.). The HI was edited based upon the responses of the pilot participants (e.g. simplification or clarification of questions that participants had difficulty understanding). These edits were minimal as participants indicated that they felt that the interview length was appropriate, questions were thorough and appropriate given the topic. Participants indicated that they did not always understand the medical terms (first page of the interview), thus, a supplementary definitions page was created (Appendix G). Two additional questions were reworded for ease of understanding, but otherwise the interview remained unchanged. The term HI in this document refers to these final versions of the interviews included in Appendices H and I.
Next, the pilot participants were asked to collect urine samples and food and fluid diaries for 2 days. Afterwards they were asked about utility and ease of these procedures and revisions were made based on their feedback. All participants indicated that the urine collection and food and fluid diary procedures were clear and easy to understand. Two participants found the specimen collection easy to complete, while one participant indicated that a nun’s cap (i.e., plastic urine collection device that fits over the toilet) would have been helpful. In response to this suggestion, participants were asked about potential difficulties with urine specimen collection prior to data collection (and throughout data collection) and provided with a nun’s cap if necessary to facilitate the ease of data collection and participation.

Results and Discussion

All participants successfully completed the HI without difficulty. Each interview took approximately 45-60 min to administer. Participants indicated positive impressions of the interview tool. Specifically, the participants reported that the questions were thorough and the interview was complete with no omissions of questions they would have expected us to ask. Pilot participants indicated that they thought the length of the interview was appropriate. One participant indicated that just when she “began to wonder if the interview was going to be over soon, it was, and so the length was fine.” All participants indicated that they rather enjoyed the process and the company of the investigators. In addition, all participants were able to successfully collect the data and had no concerns about its collection. One participant remarked that she liked the daily food and fluid diaries as they served as a reminder to her that she had not eaten very much during the day and prompted intake. These findings indicate that an interview
asking questions about environmental events that may impact hydration status was appropriate and acceptable to elders.

Experiment 2 – Functional Assessment and Participants

Amy was an 83-year-old Caucasian female residing alone in senior subsidized housing. She completed 16 years of education and was previously employed as a psychiatric nurse. She was currently retired. She scored a 29 on the MMSE. The relevant risk factors for dehydration that qualified her for inclusion were arthritis, self-reported memory problems, mobility concerns, and some minor visual problems.

Rhonda was a 72-year-old African-American female living alone in senior subsidized housing. She completed 20 years of education and was previously employed as a physician. She was currently retired, but active in the community doing volunteer work. She scored a 29 on the MMSE. The relevant risk factors for this participant were arthritis, back pain, kidney problems, visual problems, a history of falls, edema, mobility concerns, and greater than five medications.

Emily was an 87-year-old Caucasian female residing with her daughter in a suburban home. She had completed 12 years of education and was previously employed for 30 years as a sales clerk. She scored a 29 on the MMSE. The relevant risk factors for this participant included arthritis, occasional incontinence, frequent headaches, visual problems, tremors, and more than 5 medications.

Virginia was a 79-year-old Caucasian female living with her spouse in a mobile home. She had completed 12 years of education and was a homemaker. She scored a 27 on the MMSE. The relevant risk factors for this participant included arthritis, visual problems (legally blind due to macular degeneration), mobility concerns, a history of
falls, gastroenteritis, chronic edema, and scoliosis. This participant was currently on diuretic therapy, but her physician indicated that an increase in her healthy fluid would not be contraindicated, thus she was admitted for inclusion in the study.

David was a 77-year-old Caucasian male living with his spouse in a mobile home. He had completed 12 years of education and was currently employed in the automobile industry. He scored a 28 on the MMSE. The relevant risk factors for this participant included arthritis, diabetes (non-insulin type, controlled), edema, heart problems, history of stroke, greater than 5 medications, and a history of a previously hospitalization for dehydration. This participant was currently on diuretic therapy, but his physician indicated that an increase in his healthy fluid would not be contraindicated, thus he was admitted for inclusion in the study.

Kathryn was an 83-year-old Caucasian female living with her spouse in a suburban home. She had completed 13 years of education (plus on the job training) and was previously employed as a nurse LPN. She scored a 30 on the MMSE. The relevant risk factors for this participant included arthritis, frequent headaches, an ulceration on her ankle that made movement painful, a history of falls, memory problems, occasional tremor, and fibromyalgia.

Procedures

Functional Assessment

The revised HI (Appendix I) was divided into four main sections. The first section, Section A, was devised to gather some basic demographic information, screen for inclusion criteria, and assess the frequency and timing of drinking. The next section, Section B, assessed antecedent events. This section contained questions designed to
assess the availability of beverages, beverage preference, time most likely to drink, presence of discriminative stimuli (e.g., person with whom the participant would be most likely to drink a beverage), and the participant’s opinion of the potential utility of antecedent interventions (e.g., “would you drink more if someone reminded you?”). The third section, Section C, assessed the consequences or outcomes that may maintain the participant’s current drinking level. This section addressed both aversive and pleasant consequences of drinking, as well as assessing any previous strategies that had proven helpful and not helpful in increasing hydration. The last section, Section D, assessed for general fund of knowledge about hydration and skill level of the participants. This section included questions designed to assess the participant’s knowledge of how much healthy fluid a person should drink, awareness of types of beverages that are unhealthy, and knowledge about the impact of their specific risk factors on their drinking behavior and daily requirements for fluid intake. Two additional questions were added to determine if the participant needed to gather a clean catch urine specimen due to vaginal discharge or blood in the urine and overall level of confidence for performing this procedure with or without a nun’s cap.

**Scoring**

The primary contributing environmental factors were identified through the interview process in the following manner: Each item on the interview would be scored on the Coding Sheet (refer to Appendix J) as per specific instructions. For example, the investigator would be instructed to code item 12 as a “+” if the person indicated that he/she used a cane or a walker to assist with ambulation. Once the Coding Sheet was completed, the investigator used this sheet to complete a Functional Assessment Profile.
(FAP), which would inform treatment selection. The FAP is composed of five broad categories of potential environmental factors that might function to limit drinking healthy fluids and corresponding function-based interventions. Each item is scored and the percentage of endorsed items for that category is calculated by dividing the total number of items endorsed by the total number of items in that category (see Appendix K). Each category (and subcategory) has a cutoff score set at endorsement of 50% of more of the items, indicating the likelihood that this is relevant variable.

Category I contains all six items related to incontinence and has a cutoff score of 3 endorsed items. Category II contains all six items related to reminders/prompts/memory (insufficient SDs) and also has a cutoff score of 3. Category III contains all items that are related to functional barriers. This category is divided into four subcategories including Vision, Hand Strength/Control Issues, Swallowing, and Mobility. Each of these subcategories has a cutoff score based on the endorsement of 50% of items. Vision has a cutoff score of 3, Hand Strength/Control has a cutoff score of 5, Swallowing has a cutoff score of 2, and Mobility has a cutoff score of 5. Thus, a sample score of 3/6 (50%) in the general Antecedent category, subcategory Functional Barriers - Vision would indicate that the participant’s visual problem is a likely contributor to the participant’s inadequate hydration.

Procedural Integrity

All interviews were audio taped and scored by a trained research assistant to provide a measure of procedural integrity to determine whether interviews were administered in a manner consistent with instructions and in the format specified (see Appendix L). Implementation of each of 6 specific steps was compared to specific
guidelines about conduct of that step. Integrity averaged 88.9% with a range from 66.7% to 100%. The lower range occurred during the assessment of David in which 4/6 steps were correctly completed. Further review of the audiotape revealed that the two incorrect steps were due to minor fluctuations in the introduction of the script (i.e., the script was paraphrased slightly rather than read word for word because the participant kept interjecting phrases politely suggesting that the examiner should get into the interview quickly) and an omission of the inquiry about any additional questions the participants might have at the end of the interview period. Review of the audiotape indicated that the participant was asking questions independent of this prompt, thus, this detail was not thought to be significant.

Results and Discussion

Amy’s HI yielded the following profile depicted in the top panel of figure 1:
Category I – Incontinence 0%, Category II – Reminders/Prompts/Memory 66.7%, Category III Functional Barriers, subcategory Vision 50%, Category III – Functional Barriers, subcategory Hand Strength/Control 33.3%, Category III – Functional Barriers, subcategory Swallowing 0%, Category III – Functional Barriers, subcategory Mobility 50%, Category IV – Preference and Access 0%, and Category V – Knowledge/Skills 66.7%. Thus, multiple factors seemed to be affecting her hydration status. Categories V (Knowledge/Skills) and II (antecedent variables - memory deficits) had the highest percentage of items endorsed and were considered the most likely contributors to dehydration. Responses to Category II items suggestive of memory deficits included prescription of Aricept (a cognition enhancing medication), indication of current memory problems, acknowledgement that she thought that she would drink more liquids if
reminded and if she thought about it more. Category V items endorsed included poor knowledge as to what fluids contribute to dehydration, that exercise increases an individual’s fluid requirement, and that her arthritis or memory problems may contribute indirectly to her hydration status. Category III (Mobility) and Category III (Vision) were also possible contributors to dehydration risk, however they did not meet our criterion for initial targets (highest percentage endorsement categories). These categories could potentially be added if the initial intervention was not effective.

Rhonda’s HI yielded quite a different profile, which is depicted in the middle panel of figure 1. Category I – Incontinence was 0%, Category II – Reminders/Prompts/Memory was 16.7%, Category III – Functional Barriers, subcategory Vision was 33.3%, Category III – Functional Barriers, subcategory Hand Strength/Control was 33.3%, Category III – Functional Barriers, subcategory Swallowing was 0%, Category III – Functional Barriers, subcategory Mobility was 70%, Category IV – Preference and Access was 40%, and Category V – Knowledge and Skills was 83.3%. Thus, multiple factors seemed to be affecting her hydration status. In accordance with our treatment selection system, the initial targets would be the two highest categories: Category III (Mobility) and Category V (Knowledge/Skills). Category III items suggestive of mobility problems included arthritis, history of falls (four in the last year), and movement from room to room rated as extremely difficult when she also has pain, requiring a lot of effort, and consuming excessive time. She also indicated that she believed that she would drink more fluids if they were easy to get to. Category IV revealed poor knowledge about the types of fluids that contribute to dehydration, poor knowledge about the impact of activity level on hydration status, and the impact of her medical conditions on hydration status.

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Emily’s HI yielded the following profile depicted in the bottom panel of figure 1. Category I – Incontinence was 33.3%, Category II – Reminders/Prompts/Memory was 16.7%, Category III – Functional Barriers, subcategory Vision was 16.7%, Category III – Functional Barriers, subcategory Hand Strength/Control was 44.4%, Category III – Functional Barriers, subcategory Swallowing was 25%, Category III – Functional Barriers, subcategory Mobility was 40%, Category IV – Preference and Access was 50%, and Category V – Knowledge and Skills was 50%. Category IV (Preference and Access) and Category V (Knowledge/Skills) had the highest percentage of items endorsed and were considered the primary factors affecting her hydration status. Category IV suggested that beverage preference and access to beverages were potential culprits. Category V revealed poor knowledge about fluids that contribute to dehydration, how much healthy fluid a person should drink, and how her medical problems (arthritis in her back and knees) might impact her hydration status.

Virginia’s HI revealed the following profile (see Figure 2, top panel). Category I – Incontinence was 0%, Category II – Reminders/Prompts/Memory was 16.7%, Category III – Functional Barriers, subcategory Vision was 16.7%, Category III – Functional Barriers, subcategory Hand Strength/Control was 22%, Category III – Functional Barriers, subcategory Swallowing was 0%, Category III – Functional Barriers, subcategory Mobility was 50%, Category IV – Preference and Access was 30%, and Category V – Knowledge and Skills was 50%. Thus, two factors seemed to be affecting her hydration status. Similar to Rhonda, both Category III (Mobility) and Category V (Knowledge/Skills) had the highest percentage of items endorsed. Category III suggested mobility problems due to arthritis and a history of falls, an excessive time requirement for moving from room to room, difficulty moving from room to room, and use of a walker.
outside of the home. Thus, limited mobility may have produced avoidance of an aversive consequence (i.e., pain or potential fall) while simultaneously serving as a factor limiting total fluid intake. Additionally, the increased effort to move may outweigh any existing thirst (i.e., easier to remain where seated than get up to move to next room to procure a beverage). The specific items endorsed in Category V indicated that she did not have an understanding of how her arthritis, activity level, or mobility status may affect her hydration status. She also indicated that she did not know what types of beverages contributed to dehydration.

David’s HI yielded a still different profile (see Figure 2, middle panel): Category I – Incontinence was 0%, Category II – Reminders/Prompts/Memory was 16.7%, Category III Functional Barriers, subcategory Vision was 16.7%, Category III – Functional Barriers, subcategory Hand Strength/Control was 0%, Category III – Functional Barriers, subcategory Swallowing was 0%, Category III – Functional Barriers, subcategory Mobility was 10%, Category IV – Preference and Access was 30%, and Category V – Knowledge/Skills was 0%. No factors met the 50% cutoff for a likely factor affecting his hydration status. Yet, this participant’s USG measures were the highest of all participants, nearing the level indicative of dehydration on some days. Additionally, he had a history of hospitalization for dehydration. Thus, he was included as a participant in the intervention phase and Category IV (Preference and Access/Cost) was targeted because the percentage of items endorsed was higher than any other category (30%). An examination of Category IV revealed that several items related to preference and access to healthy beverages were endorsed including an indication that he would drink more liquids if he had a variety to choose from, that he would drink more liquids if they tasted better, and that he would drink more healthy liquids if they tasted...
better. Because no category reached cutoff, individual item analyses were also conducted to look for potential area of intervention. While an examination of Category V revealed that no specific items were endorsed it was clear that this participant was not behaving in accordance with his level of knowledge/skills as indicated in the topographical assessment items of the HI (found within Section A). This would need to be addressed in Study 3 as an educational booster/feedback intervention component.

Kathryn’s hydration interview yielded the following profile (see Figure 2, bottom panel): Category I – Incontinence was 16.7%, Category II – Reminders/Prompts/Memory was 83%, Category III Functional Barriers, subcategory Vision 0%, Category III – Functional Barriers, subcategory Hand Strength/Control was 55.5%, Category III – Functional Barriers, subcategory Swallowing 25%, Category III – Functional Barriers, subcategory Mobility 50%, Category IV – Preference and Access was 0%, and Category V – Knowledge/Skills was 66.7%. Multiple factors seemed to be affecting her hydration status and in accordance with our treatment selection system Category II (antecedent variables in the form of memory deficits) and Category V (Knowledge/Skills) were targeted for intervention. An examination of Category II revealed that several items suggestive of memory deficits were present including endorsement of memory problems, and that she was most likely to drink with a food prompt (otherwise does not think about it). In addition, she indicated that she believed that she would drink more if she thought about it more and she would drink more if drinks were given with food. An examination of the specific items endorsed in Category V indicated poor knowledge regarding the impact of activity level on hydration, fluids that contribute to dehydration, and impacts of her medical (e.g., arthritis and incontinence) problems on her hydration level.
Most of the participants had multiple factors that met our criterion as a factor contributing to their risk for inadequate hydration. The variable that most commonly occurred across was a knowledge/skills deficit regarding hydration (Amy, Rhonda, Emily, Virginia, and Kathryn). Because each participant’s risk factors comprised a different profile, the educational intervention would necessarily need to be adjusted to address each issue (e.g., how a higher activity level affects hydration status). For the remaining participant (David), his factual knowledge was adequate but his application of that knowledge appeared inadequate. Functional barriers also appeared to be an important contributor to inadequate hydration in several participants. For example, mobility concerns appeared as a likely barrier to effective hydration in 4 of 6 participants and was ranked as one of the categories with the highest percentage of endorsed items (and thus a target for intervention) for 2 of those 4 participants. Hand strength/control issues were endorsed highly in 2 of the 6 participants, and Vision was identified as a barrier in 1 of 6 participants. Finally, insufficient discriminative stimuli (SD) in the form of reminders/prompts/memory problems was a contributing factor for 2 of the 6 participants.

Surprisingly, incontinence did not appear as a major contributor for any of the six participants which is contrary to our initial expectations given the reports in the literature that incontinence commonly occurs in elders who may self-restrict fluid intake to reduce incontinent episodes (Dowd et al., 1996; Lavizzo-Mourey et al., 1988). Sanservo (1997) notes that “some elderly clients, most notably women, often restrict their oral intake of fluids purposefully to decrease their risk of incontinence, which they find embarrassing” (p. 56). We do not believe that our findings are due to under reporting as 2 of our 6 participants endorsed that incontinence was present but not contributing substantially to
their beverage intake, possibly because they were receiving adequate pharmacological treatment for incontinence.

Every category had at least one participant endorsing some items contained within it, so each category seems to be appropriate for inclusion in a hydration interview. No conclusions can be drawn about the overall importance or equivalence of the categories in general, because the profiles were each so distinct. The distinctiveness of the profiles suggests that an idiographic approach to treatment is necessary to address each individual’s specific needs.

Experiment 3 - Function-Based Intervention and Participants

Four of the six participants for Experiment 2 continued in Study 3. These participants included Amy, Rhonda, Emily and David. Virginia discontinued participation after baseline data collection because the baseline data indicated that she was drinking an adequate amount of fluids as indicated by USG (M = 1.012). She also reported that she had recently been treated by occupational therapists who had recommended all of the interventions that would have been recommended according to our protocol (e.g., devices to alert people who are visually impaired that their glass was full to prevent spills, devices that assisted with tipping a tea kettle, setting out prefilled glasses of water, etc.). Thus, no true baseline could be established. Similarly, Kathryn discontinued participation after demonstration of adequate hydration in her initial day of data collection as indicated by both USG (1.009) and Food and Fluid diaries (72 oz. healthy fluid) and discovery that many of the interventions we would have recommended were already in place (e.g., reminder/prompt system already in place to remind her to
drink an adequate amount of water) precluding an uncorrupted baseline. An educational handout was given to both of these participants and no further data was collected.

Research Design

Evaluation of the effects of the function-based interventions was attempted using a non-concurrent multiple baseline design across participants. A multiple baseline design is arranged such that measurements are taken on each person prior to the intervention (baseline phase), with the intervention being introduced in a staggered fashion such that each person has a successively longer baseline period (Kazdin, 1982). This design controls for such confounds as maturation. The key feature of this design is that the behavior should change only when the intervention is applied and not before, thus providing evidence that the intervention and not some extraneous variable is responsible for the behavior change. Phase changes were based on level, trend, and stability of USG measures (see description below). Visual inspection was used to compare baseline data to treatment data to determine if there was a significant decrease in USG, which would indicate improved hydration. If hydration status was improved this would lend a measure of support for the criterion validity of the functional assessment measure. Appropriate function-based interventions were applied after the refractometer data indicated a steady pattern in baseline.

Procedures

Baseline

During the baseline phase, each participant collected daily urine samples and food and fluid diaries.
**Function Based Intervention**

An individualized intervention plan was evaluated for each participant based on the results of the functional assessment interview. The intervention plan was designed to address the most pressing environmental factors as identified by the interview. If multiple variables were identified as contributing equally (i.e., an equal percentage of items endorsed for each factor), a combined intervention was developed and, if possible, a component analysis was conducted. If multiple variables were identified but one variable was endorsed at a higher level than the others, only that variable was targeted initially and others were later targeted if the initial intervention was insufficient to produce change. A list of potential function based interventions is provided in Table 1, a summary of the interventions administered is provided in Table 4, and the specific components of each plan are described below. The participant administered these interventions for him/herself or with minimal assistance from another in a typical community dwelling situation.

Amy received an intervention consisting of psycho-education only for three days followed by a combined intervention of psycho-education plus prompts for two days. The intervention was terminated after two days due to attrition (i.e., participant went on vacation). Because psycho-education alone was ineffective for the first participant and has typically proven ineffective in other investigations of regimen adherence (Meichenbaum & Turk, 1987), the remaining three participants received psycho-education in conjunction with other components from the outset. Rhonda received a combined intervention package of psycho-education and a cooler to ensure ready access to beverages. After three days, an additional type of beverage container was provided to further reduce the effort involved in obtaining a beverage. Emily received a combined
intervention package of education and a preference assessment with subsequent access to preferred healthy fluids. David initially received an intervention package consisting of education and a cooler to ensure ready access to fluids. After 5 days he stated that he did not like the healthy beverages that were available to him so a preference assessment was conducted and subsequent access to preferred fluids was provided, and a feedback intervention was added as well. On day 12 of the intervention, the system in which the feedback was delivered was altered from personal delivery (the day after an increased USG score had been observed) to a more immediate form of delivery (in which the participant was telephoned daily after the urine specific gravity was measured on each day the specimens were collected, and provided feedback regardless of whether his USG score had increased, decreased, or maintained at its previous level).

**Psycho-education**

All participants received psycho-education as part of their intervention package. This involved an individual meeting with the participant in which a custom tailored educational handout (based on Sanservo’s 1997 educational handout) was provided and reviewed with the participant (Appendices M - P). The handout included a minimum daily fluid goal based on the participant’s weight (fluid intake standard as proposed by Chidester & Spangler, 1997), addressed how his/her individual concerns affected hydration status (e.g., arthritis, memory problems), and provided some simple suggestions of how to ensure that he/she took in enough fluids despite these concerns (e.g., using pre-filled containers and drinking one every time you go into the kitchen). The participant was allowed an opportunity to ask any questions of the examiner and all questions were answered to the satisfaction of the participant.
Prompt System

As the HI indicated that memory deficits could contribute to dehydration for Amy, the second component of her intervention addressed memory issues using an antecedent intervention in the form of a prompt system. The examiner provided a copy of the treatment regimen and the intervention was explained in detail. The participant was then asked which of four types of prompts (i.e., pager, visual cues, watch timer, personal prompt) she would find preferable. She indicated that large text visual cues ("Don’t forget to drink your water", “Have you had a glass of water lately?”) would be preferred. These cues were in 85-point Times New Roman font and printed in high contrast (e.g., solid black against yellow paper). They were laminated and placed around her home such that she could see them from her favorite chair and other widely used areas in the home.

Coolers for Ready Access

Rhonda and David each received coolers to contain healthy beverages and provide ready access with decreased effort. For Rhonda, this intervention was designed to address that fact that mobility was an issue due to pain secondary to an intermittent compression of the L5 vertebra, a right knee injury (due to auto accidents), weakness in both the upper and lower body, and arthritis. She received a sports bottle with a flip top and an attached lightweight cooling apparatus. She also received a small cooler with a spout to release water. She was instructed to fill the bottle with ice and water in the morning when preparing breakfast and to keep it on the table next to her easy chair. She was also encouraged to continue her current strategy of utilizing pre-filled containers (6-8 oz glasses of water) set within her refrigerator to assist with monitoring hydration levels. At day 23 she indicated that she had run out of her preferred beverage and getting
to the store was a concern so several cans of frozen concentrate were provided and she was encouraged to purchase these in the future rather than the half gallon cartons to produce more fluid from the same number of shopping trips. David was provided with two insulated coolers with shoulder straps and pre-marked ounce measurements and was instructed to use them to bring healthy fluids to his workplace.

Preference Assessment

Preference assessments were conducted with Emily and David. The first step of the preference assessment involved was a vocal paired stimulus preference assessment for drinks (P3 - fruit flavored drinks, P5-sugarfree fruit flavored drinks compatible with a diabetic regimen) available in local grocery store (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992). Each beverage was paired with each other beverage (e.g., 1-8, 1-7, 2-8, 2-7, 3-8, 3-7) in random order using index cards that were shuffled. The assessment was introduced with the statement "I would like to ask you some questions about ____ (e.g., fruit flavors). I will give you two options and you can pick the one you would like best." For each assessment, 20 sec for a selection response was allowed and the item was scored as either selected or no response. The options were alternated in order of presentation and the serial position for each trial was noted on the datasheet. The investigators then asked "Do you prefer (e.g., strawberry) or (e.g., lemon)?" and recorded the participant's choice. This was repeated until all pairs were presented. After the preference assessment procedure was completed, a rank order was computed to select the top preferred flavors for inclusion in the taste test.

The second step of the preference assessment was a blind sampling of the nominated items from step 1. The participant was allowed to taste each flavor and the
participant’s vocal response to each beverage was noted. For Emily, the top 4 ranked flavors were purchased in 9 different healthy beverages (e.g., Crystal Light Raspberry Ice, Orange Tang). The top 4 preferred beverages (Crystal Light Raspberry Ice, Propel Berry flavored water, Welch’s Peach and White Grape juice) were then purchased in bulk for Emily and she was encouraged to drink all she wanted because replacements would be provided. For David, the top 4 ranked flavors were purchased in 8 different healthy beverages (e.g., generic brand strawberry, sugar free, calorie free sparkling water) and were provided in a blind taste test. The top 4 preferred beverages were four flavors of sparkling water: strawberry, cherry, kiwi-lime, and peach. The beverages were purchased in bulk for David and he was encouraged to drink all he wanted because replacements would be provided. David informed the researcher that he would prefer to pick them up himself at the grocery store when they did their once to twice-weekly shopping trips.

**USG Feedback and Charting**

David was instructed in how to chart his daily USG and was given a simple graph of his USG data and instructed to keep his chart posted on the refrigerator for ease of location and to serve as a prompt to either continue intake at his current level or to adjust intake as necessary. He was then contacted daily with his same day USG level by telephone such that he could chart his progress. Feedback was delivered in the form of data for graphing (e.g., “Good morning, your USG level today is 1.010.”) and brief interpretation if USG levels were approaching borderline dehydration. For example on Day 41, the examiner called and said “Good morning, Mr. X, your USG level today is at 1.019. If you notice on your chart, this is .008 higher than yesterday. While not dangerous at this time if it continues to increase, it may approach worrisome levels. We
think this may have occurred because your healthy fluid consumed was over 20 oz less yesterday than it was the day before.”

Follow-up

At approximately four weeks post-treatment, participants were asked to provide one additional urine sample. This sample was utilized to assess maintenance of the intervention effects over time. Participants were telephoned the evening before to remind them of the sample collection and to confirm a time to have a research assistant pick up the sample.

Social Validity

Upon completion of the study, a brief 5-item questionnaire was administered as an interview to assess both treatment acceptability and outcome acceptability (see Appendix P). Participants were thanked for their participation in the study and asked for honest feedback that would assist in evaluation of the study. The research assistant then directly asked participants each of the questions and their responses were recorded verbatim.

Results and Discussion

USG Data

In general, the results of the function-based interventions indicated no detectable changes for two of the participants (Participants Emily and Amy) on USG measures as seen in the top and bottom panels of Figure 3. All USG samples fell well within the range of normal hydration throughout all phases for both participants.
All USG samples fell within the range of normal hydration for the other two participants (Rhonda and David) as well, but greater variability was evident. Although Rhonda demonstrated immediate reductions in USG level with the application of the intervention, these effects did not last beyond a few days (see Figure 4 top panel), suggesting there were no lasting changes in USG level over time for her. With David, the administration of the intervention resulted in an immediate reduction in USG ($M = 1.013$) as compared to baseline ($M = 1.017$). Upon visual inspection of the data (see Figure 4 bottom panel) a reduction in the variability of USG was evident, suggesting good treatment effect. When a feedback component was introduced (day 5 of treatment), the USG level decreased initially but then recovered to previous levels. With each subsequent feedback session (intervention days 8, 11) the behavior responded in the desired direction (decrease in USG). In an attempt to transfer control of the intervention to the participant, on intervention day 12 the participant was taught how to use a line graph to chart his progress, and this chart was kept in a central location (on the refrigerator). Daily phone calls were made to the participant to provide him with his immediate USG, decreasing the delay time between evidenced with the previous method of feedback delivery (i.e., one hour delay vs. one day delay) and the participant was observed to chart his progress daily. This feedback system led to a decrease in USG with variable levels over time. Four week follow-up data indicated that all participants' USG levels remained with the normal range but were not significantly different from baseline.

The reported levels of fluid intake are much more encouraging for each of the participants. In general, small effects on fluid intake were observed for one participant (Emily) and larger clear effects of the interventions on fluid intake were evident for the remaining participants (Amy, Rhonda and David).
The fluid intake for participant 3 is depicted in the top panel of figure 5. Emily consumed a very stable level of unhealthy beverages in baseline (i.e., 20 ounces), which initially fluctuated in intervention but returned to baseline level. Baseline levels of healthy fluid consumption were extremely low (M = 14 ounces) but increasing in baseline resulting in an overall average increase in treatment (M = 27.4) over baseline but without an important change in level and trend. Data at the four-week follow-up indicate that her healthy fluid intake maintained at levels higher than baseline (32 oz) while unhealthy fluid consumption remained steady.

The fluid intake for Amy is depicted in the bottom panel of Figure 5. There were no significant changes in consumption of healthy fluid from baseline (M = 59.5 oz) to psycho-education only (M = 71.2 oz), but there was an increase in reported healthy fluid consumption while the prompt system was in place (M = 92.5 oz) with each data point falling outside of the range of data points in previous phases. Although we hoped to conduct an experimental reversal by removing and re-introducing the prompt system to replicate the effect, we were unable demonstrate experimental control due to premature termination. This increased level of consumption was not evident at 4-week follow up (52 oz) and, interestingly, the prompts were not displayed within the home during the follow-up interview because the participant had taken them down (natural reversal). This participant consumed very few unhealthy beverages during any phase of the study.

Fluid intake for Rhonda is depicted in the top panel of Figure 6. These results illustrate a large increase in consumption of healthy fluids (M = 73.1 oz) and a decrease in consumption of unhealthy fluids (M = 5.6 oz) with the administration of the package intervention when compared to baseline (M = 46.7 oz, M = 19.4 oz respectively) with increasing separation between these two data paths over time. At 4-week follow-up the
changes in fluid consumption were maintained. In addition to the multiple baseline design, the goal was to complete a component analysis using a reversal design for Participant 2. Rhonda’s intervention with baseline followed by a combined intervention composed of both education and strategies to reduce effort and a follow up phase of education only with a subsequent return to the package intervention phase. However, initial gains in USG did not maintain and the participant indicated that she would buy the coolers for herself if they were removed in a reversal design so no reversal was conducted.

Fluid intake for Davis is depicted in the bottom panel of figure 6. The largest impact on fluid consumption occurred for this participant. With the administration of the intervention, level of healthy beverage intake increased (M = 82 oz) and unhealthy beverage intake decreased (M = 6.5 oz) as compared to baseline levels A (M = 15.5 oz, M = 46.3 oz, respectively). At follow-up, healthy fluid consumption remained at a high level (82 oz) while unhealthy fluid consumption remained at very low levels (6 oz), indicating that positive behavior change maintained over time.

Social validity measures were conducted via interview for each participant. Interview data indicated that in general, all participants found the interventions easy to do, helpful, and non-intrusive. Three out of the four participants with active interventions indicated that they would do the intervention again in the future if dehydration were a problem. All participants indicated that they felt the intervention changed their behavior.

Pearson product moment correlation coefficients were computed to examine the relations between refractometer readings and self-report of fluid intake for each participant (refer to Table 5). For David, there was a significant negative relationship (r = -0.387) between the amount of reported healthy fluid intake and his urine specific
gravity, indicating that as his fluid intake increased, his urine specific gravity decreased and vice versa. This relation occurs in the expected direction and is small to moderate. For Rhonda, a similar trend towards this relationship was demonstrated \((r = -0.305)\), however this correlation did not reach significance \((p = 0.07)\). For Amy and Emily the data are less clear \((r = 0.249, r = 0.015, \text{respectively})\). This may indicate poor agreement between reported and actual intake, but it could also be reflective of the quality of food intake (e.g., poor nutritional intake or high intake of salty foods) as reflected in their Daily Food and Fluid Diaries.

**Discussion**

In general, the HI appears to be useful in identifying potential areas for intervention. For 5 of 6 participants, it clearly identified potential barriers to adequate hydration. For the remaining participant, item analyses indicated two potential areas for intervention and corresponding interventions. Virtually every participant required psycho-education as a component to their intervention. In the future, researchers should consider including this piece with all active interventions.

The function-based interventions used in this study did not produce robust lasting changes in Urine Specific Gravity, although all measures clearly fell within the range of adequate hydration. Different results may have been evident for individuals who were consistently closer to the dehydration range when moderate increases in fluid consumption might have a greater impact on measured hydration status (as with David’s data). Future researchers may want to consider targeting participants that are less hydrated and thus at a higher risk to determine if initial levels of hydration may impact the utility of the intervention.
Some effects on fluid intake were observed for certain participants with maintenance of these effects over time (e.g., Amy and David). For example, the initial introduction of a prompt system led to substantial increases in fluid intake for Amy. These results are encouraging because healthy fluid consumption is the specific target of all of the function-based interventions while hydration status is only an indirect effect of this critical behavior. This finding is consistent with Inouye et al., (1999) who assessed dehydration using BUN/creatinine ratios. Although they estimated 80% compliance with their hydration intervention of encouragement to drink and demonstrated clinical improvement in the most severely impacted, they did not find a significant change in hydration status on their laboratory measures.

Similarly, USG as a permanent product measure is affected by multiple variables including salt in the diet, activity level, and fluid intake. For three of our participants (Amy, Rhonda, and David) we observed a substantial reported increase in healthy fluid intake, however this increase was not consistently reflected in their USG levels. For example, during the Social Validity questionnaire, Amy indicated that she had found the intervention to be effective in changing her behavior (e.g., seeing the cue cards reminded her to drink more), but the additional 1-2 cups of water ingested (as indicated on the Food and Fluid Diary) did not produce a clearly lower USG level. This discrepancy may indicate that her reported fluid intake was false producing an artificial discrepancy. Alternatively, it may indicate a natural discrepancy exists between these measures for this elder and the increase in her fluid intake was not enough to produce an appreciable change in USG of an already well-hydrated individual.

Although the USG measures did not demonstrate sensitivity to smaller behavioral changes in this study (e.g., 1-2 cup healthy fluid increase), future researchers may want to
consider including it as a useful indicator of gross hydration status. In this manner, researchers could be assured that their interventions did not inadvertently cause a worsening in hydration status which could occur if a person is over hydrated as well as under hydrated, thus preventing poor outcome.

The function-based interventions identified by the HI seem to have a clear impact on changing behavior (i.e., level of fluid intake) for three participants (Rhonda, David, and Amy) and some change in behavior in the remaining participant (Emily). This behavior change was evident at 4-week follow-up. In some cases the effectiveness of the interventions appear to be relatively fragile. Anecdotal evidence suggests that intervention efficacy is affected by activity level (e.g., the more active, the more variability) and situational stressors (e.g., day trips, planning vacations, etc.). For example, Rhonda was a highly active individual and this is reflected in the extreme fluctuations in her daily fluid intake. This may suggest that an emphasis on teaching individuals how to plan ahead may be a worthwhile addition to the protocols. Future researchers may consider collecting concurrent data about the level activity, as well for those individuals who are highly mobile and maintain an active lifestyle to evaluate this potential effect on intervention efficacy. In the case of Amy, it may be that the environmental cues were not salient enough to prompt behavior change in the face of situational stressors (i.e., planning for a trip). Alternatively, it is possible that she may have habituated to the presence of the cues, thereby weakening their evocative effect. From the Social Validity Questionnaire the participants reported that they found the interventions to be relatively easy to use and non-intrusive. Thus, it is unlikely that fragility of the interventions were due to the level of effort required to carry out the interventions. It is also possible that initial changes in behavior also resulted in a shift of
behavioral function. For example, initially the factor affecting hydration may have been preference-related, but after receiving access to preferred beverages a change in the variable maintaining hydration status may have changed (e.g., consequences). There is some precedence for this in the functional analysis literature with individuals with developmental disabilities. Lerman and colleagues (1994) found that in three of four developmentally delayed adults who had relapsed following termination of treatment services, additional functional analyses indicated that the behavior had taken on new or additional functions. These additional functions would most likely not have been identified during our problem-solving sessions as no reassessment using the HI was conducted at that time.

In some instances, it may be that competing behaviors may have altered the efficacy of the interventions and served as a barrier to effective hydration. For example, both Emily and David indicated a preference for unhealthy beverages. Preference assessments were utilized in an attempt to combat this potential barrier in combination with other function-based interventions. While the preference assessment was useful as an effective intervention for David, it was not as clearly helpful for Emily. On the last day of data collection, Emily stated that while she liked and rather enjoyed some of the newer beverages introduced, they could not compare with her preference for Diet Dr. Pepper. This was problematic given that Diet Dr. Pepper is classified as an unhealthy beverage due to its caffeine (a natural diuretic) and carbonation (which contributes to dehydration indirectly as a bladder irritant, causing more voiding and thus less fluid retention). This is analogous to a diabetic who just loves a particular desert (e.g., chocolate) and eats it despite the education provided by his doctor informing him that it is bad for his health to do so. In the case of Emily, it is most likely that the availability of
a pleasant tasting healthy beverage was not a powerful enough reinforcer to overpower the strongly preferred unhealthy beverage.

The first critical limitation of this study is the failure to demonstrate experimental control with USG for experiment 3. This experiment utilized a non-concurrent multiple baseline design across participants design to evaluate of the effects of the function-based interventions. This design adequately controls for such confounds as maturation. With this design the behavior should change only when the intervention is applied, providing evidence that the intervention is the variable responsible for the behavior change. However when using USG as the primary indicator, for all four of our participants an examination of the level and trend of the data did not provide any evidence for such control. Likewise when using Food and Fluid data as the indicator, one of our six participants (Emily) showed no significant change in behavior after application of the intervention. Amy’s data showed more promise with the application of the cue cards, an immediate increase in healthy fluid intake was observed. However, due to attrition (i.e., vacation) we were unable to collect more than two data points after this was instituted (customary to have a minimum of three data points to demonstrate a trend). In addition, we had planned to institute reversal designs were appropriate as a further demonstration of experimental control, but were unable to do so due to attrition (Emily) and noncompliance with reversal (Rhonda). Our end result then was a series of participants with staggered baseline length but no clear and immediate demonstration of treatment effects due to the manipulation of the independent variable. Thus, there is no definitive demonstration that our intervention reliably produced therapeutic change and no definitive evidence of experimental control.
Another possible limitation to this study relates to the reliance on self-report as the main indicator of amount of fluid intake. It is possible that the Food and Fluid Diaries showed change based on social desirability. Given that the data were not reviewed within the presence of the participant, the participant was allotted the same amount of time with the data collector regardless of data, and (with the exception of David), the participants were not provided with feedback regarding the amount of fluids consumed, it is less likely that the amounts recorded showed change based on social desirability alone. Also if the data were being influenced by bias one might expect larger changes in the desired direction to occur regardless of the intervention provided. However, data indicated very little or no change with psycho-education only (Amy), little change with administration of the preference assessments and access to preferred fluids (Emily), and large variability with application of the intervention (Rhonda and David). Additionally, unlike previous studies conducted in nursing home environments where intake could be closely monitored and recorded, this study was conducted within the community where many of our participants lived alone (n=4) or their significant others worked (n=2), and thus it was not possible to have a second person available to provide a secondary observation of actual fluid consumed. Anecdotal data provided by the two available caregivers indicated observations of the participants taking care to fill out their Food and Fluid Diaries after dinner and after snacks. One spouse remarked that she noticed that her husband (David) filled his coolers every morning and took his coolers to work every day.

Another potential limitation relates to conducting our social validity measure as an interview. While commonly used in the literature, interviews are highly subject to social desirability bias. To limit this potential problem, social validity measures were conducted at the end of the study (at the four-week follow-up) by a trained and
independent researcher (not the primary investigator) but there is certainly a strong possibility that individuals rated the experimental procedures as more valuable or favorable due to previous relationship with the primary experimenter and lack of anonymity.

“Although much is known about fluid homeostasis, dehydration, and contributory factors in the aging process, water disorders remain prevalent in this group. A great deal of work is still needed concerning ‘best practices’ and creative clinical interventions to support adequate fluid intake behaviors” (Sheehy, Perry, & Cromwell, 1999, p. 35). This study represents an initial step in determining whether function-based behavioral interventions may be useful in improving hydration status in community dwelling elders at risk for dehydration. Previous research has been carried out with good effect in nursing home settings in which the participant’s hydration level is under more direct control of the experimenters. When applied to a community setting, however, the results appear to be more variable. Given the prevalence of dehydration and the serious nature of the health concerns it can cause for our elders, more research is needed in this area. As our sample of participants appeared to be relatively well hydrated despite their risk level, future researchers may want to consider screening for participants who have higher levels of dehydration to determine if initial levels of hydration may impact the utility of the intervention. In addition, as evidenced from David, the utility of feedback may also be an essential component in increasing the effectiveness of the interventions over time. Future researchers may want to consider including feedback as a regular component of the intervention.
Table 1: Most likely Antecedent and Consequence Variables Contributing to Dehydration and Samples of Potential Interventions.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Assessment Item</th>
<th>Potential Intervention</th>
<th>Citation For Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antecedent (Insufficient S_Ds)</td>
<td>Would you drink more liquids if you were reminded?</td>
<td>Prompt system (e.g., pager, visual cues, watch timer, personal prompt)</td>
<td>Austin et al., 1999</td>
</tr>
<tr>
<td>Antecedent (Functional barriers)</td>
<td>Would you drink more liquid if you could find it easily? (e.g. easier to see)</td>
<td>Use of high contrast drinking containers, or brightly colored pre-filled containers</td>
<td>Sanservo, 1997</td>
</tr>
<tr>
<td>Knowledge and skills</td>
<td>How much healthy fluid should a person have?</td>
<td>Education</td>
<td>Austin et al., 1999; Sanservo, 1997</td>
</tr>
<tr>
<td>Response Effort</td>
<td>Would you drink more if it wasn’t hard to get around your home?</td>
<td>Reduce effort (e.g., portable cooler, attachment to walker)</td>
<td>Reedy, 1988</td>
</tr>
<tr>
<td>Consequences (Preference)</td>
<td>Tell me your 5 favorite drinks.</td>
<td>Preference Assessment (i.e., systematic method of determining what types of beverages a person likes)</td>
<td>Kleiner, 1999</td>
</tr>
<tr>
<td>Consequences (Incontinence)</td>
<td>Would you drink more if you didn’t have to worry about accidents?</td>
<td>Toileting schedule Bladder training</td>
<td>Armstrong-Esther, Browne, Armstrong-Esther, &amp; Sander, 1993; Sanservo, 1997; Simmons et al., 2001</td>
</tr>
<tr>
<td>Consequences (Aversive)</td>
<td>Would you drink more if you didn’t have to worry about spills? (i.e., due to tremors)</td>
<td>Use of weighted gloves or wrist wraps</td>
<td>Armstrong-Esther, Browne, Armstrong-Esther, &amp; Sander, 1993; Sanservo, 1997; Simmons et al., 2001</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Sex</th>
<th>Ethnicity</th>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy</td>
<td>83</td>
<td>Female</td>
<td>Caucasian</td>
<td>Arthritis, Memory Problems, Mobility concerns, Visual Problems</td>
</tr>
<tr>
<td>Rhonda</td>
<td>72</td>
<td>Female</td>
<td>African-American</td>
<td>Arthritis, Back Pain, Kidney Problems, Visual Problems, History of Falls, Edema, Mobility concerns, &gt;5 Medications</td>
</tr>
<tr>
<td>Emily</td>
<td>87</td>
<td>Female</td>
<td>Caucasian</td>
<td>Arthritis, Incontinence, Headaches, Visual Problems, Tremors, &gt;5 Medications</td>
</tr>
<tr>
<td>Virginia</td>
<td>79</td>
<td>Female</td>
<td>Caucasian</td>
<td>Visual Problems, Mobility Concerns, History of Falls, Arthritis, Gastroenteritis, Chronic Edema, Scoliosis</td>
</tr>
<tr>
<td>David</td>
<td>77</td>
<td>Male</td>
<td>Caucasian</td>
<td>Arthritis, Diabetes (non-insulin type), Edema, Heart problems, History of Stroke, &gt;5 medications, History of previous hospitalization for dehydration</td>
</tr>
<tr>
<td>Kathryn</td>
<td>83</td>
<td>Female</td>
<td>Caucasian</td>
<td>Arthritis, Headaches, Swallowing Difficulties (food only), Ulcer on Ankle, History of Falls, Memory Problems, Occasional Tremor, Fibromyalgia</td>
</tr>
</tbody>
</table>
Table 3: IOA Data on USG Measures for Participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>% of Baseline Observations Collected</th>
<th>% of Intervention Observations Collected</th>
<th>% of Overall Observations Collected</th>
<th>Overall IOA Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy</td>
<td>62.5%</td>
<td>33%</td>
<td>54.5</td>
<td>99.98%</td>
</tr>
<tr>
<td>Rhonda</td>
<td>55%</td>
<td>41%</td>
<td>48.6%</td>
<td>94.42%</td>
</tr>
<tr>
<td>Emily</td>
<td>50%</td>
<td>100%</td>
<td>80%</td>
<td>99.92%</td>
</tr>
<tr>
<td>Virginia</td>
<td>70%</td>
<td>N/A</td>
<td>70%</td>
<td>100%</td>
</tr>
<tr>
<td>David</td>
<td>47.6%</td>
<td>38.8%</td>
<td>41%</td>
<td>99.3%</td>
</tr>
<tr>
<td>Kathryn</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Table 4: Summary of the Interventions Administered by Participant.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Phase 1</th>
<th>Intervention Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy</td>
<td>Psycho-education</td>
<td>Prompt System</td>
</tr>
<tr>
<td>Rhonda</td>
<td>Psycho-education</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coolers for Ready Access</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subsequent Access to Fluids</td>
</tr>
<tr>
<td>Emily</td>
<td>Psycho-education</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preference Assessment &amp;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subsequent Access to Fluids</td>
</tr>
<tr>
<td>David</td>
<td>Psycho-education</td>
<td>Preference Assessment &amp;</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Feedback</td>
</tr>
</tbody>
</table>

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Table 5: Correlation between USG and Fluid Intake.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pearson r1</th>
<th>p1</th>
<th>Pearson r2</th>
<th>p2</th>
</tr>
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<tbody>
<tr>
<td>Amy</td>
<td>0.249</td>
<td>0.263</td>
<td>-0.013</td>
<td>0.955</td>
</tr>
<tr>
<td>Rhonda</td>
<td>-0.305</td>
<td>0.071</td>
<td>0.298</td>
<td>0.078</td>
</tr>
<tr>
<td>Emily</td>
<td>0.015</td>
<td>0.957</td>
<td>0.011</td>
<td>0.967</td>
</tr>
<tr>
<td>David</td>
<td>-0.387</td>
<td>0.012*</td>
<td>0.265</td>
<td>0.094</td>
</tr>
</tbody>
</table>

Note. Pearson r1 = correlation between USG and healthy fluids, P1 = p value for Pearson r1, Pearson r2 = correlation between USG and unhealthy fluids, P2 = p value for Pearson r2. An * = significant at the p< .05 level.
Figure 1: Data from Hydration Interviews (for Amy, Rhonda, and Emily)
Figure 2: Data from Hydration Interviews (for Virginia, David, and Kathryn)
Figure 3: Data for Urine Specific Gravity (for Emily and for Amy During the Day)

Baseline Function Based Intervention

Preference Assessment & Subsequent Access to Fluids

1.040
1.035
1.030
1.025
1.020
1.015
1.010
1.005
1.000

Baseline

Function Based Intervention

Preference Assessment & Subsequent Access to Fluids

1.040
1.035
1.030
1.025
1.020
1.015
1.010
1.005
1.000

Baseline

Function Based Intervention

Psychoeducation Prompt System

1.040
1.035
1.030
1.025
1.020
1.015
1.010
1.005
1.000

Baseline

Function Based Intervention

Psychoeducation Prompt System

Emily

Amy

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Figure 4: Data for Urine Specific Gravity (for Rhonda and for David During the Day)

Baseline Function-Based Intervention
Coolers for Ready Access & Subsequent Access to Fluids

Baseline Function-Based Intervention
Coolers for Ready Access & Subsequent Access to Fluids

Borderline dehydration

Frozen Concentrate Supplied

Day Trip

4-Wk Follow-Up

Fluid Intake in Ounces

Rhonda

David

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Figure 5: Data on Healthy and Unhealthy Fluid Consumption (for Emily and Amy)

Baseline Function-Based Intervention
Preference Assessment & Subsequent Access to Fluids

Emily

Vocal Preference Assessment
Unhealthy Beverages

Healthy Beverages

Unhealthy Beverages

4-Wk Follow-Up

Amy

Psychoeducation
Prompt System

Healthy Beverages

Unhealthy Beverages

4-Wk F-Up

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Figure 6: Data on Healthy and Unhealthy Fluid Consumption (for Rhonda and David)

Baseline Function-Based Intervention
Coolers for Ready Access & Subsequent Access to Fluids

Rhonda
Unhealthy Beverages
Healthy Beverages

4 Wk Follow-Up

Baseline Function-Based Intervention
Coolers for Ready Access & Subsequent Access to Fluids

David
Healthy Beverages
Unhealthy Beverages

Preference Assessment
Self-Monitoring

0 20 40 60 80 100 120 140
0 20 40 60 80 100 120 140
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43

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REFERENCES


References—Continued


References—Continued


References—Continued


References—Continued


References—Continued


References—Continued


APPENDIX A

SAMPLE OF EDUCATIONAL HANDOUT
HOW DRY ARE YOU?

When you don’t drink enough water, you become dehydrated – you dry up. Water is lost through perspiration, respiration, breathing, evaporation through the skin, and excretion in urine and feces. The only way to replace it is to drink.

Some signs of inadequate water intake are
- Constipation
- Dry mouth
- Thirst
- Dry skin
- Headache

Some signs of dehydration are
- Flushing
- Dizziness
- Weakness
- Confusion

Why older people are at increased risk

With aging, sensitivity to the sensation of thirst may decrease. This can be especially dangerous
- During hot weather
- With vomiting or diarrhea
- When you have a fever
- For heavy drinkers of alcoholic beverages
- When taking certain medications

Your body loses a great deal of water under these conditions. Without thirst to tell you to replace what you’ve lost, you may not be aware of the need to drink more. Unless you make a conscious decision to drink more fluids, you can become dehydrated. During summer heat waves, avoid heat stroke by staying out of the sun, wearing lighter clothes, and drinking more fluids.

How to be sure to drink enough
- Fill six to eight 8-ounce glasses of water and leave in the refrigerator. Drink a glass whenever you go into the kitchen or go to the refrigerator.
- Carry water with you in a thermos or water bottle
- Drink before, during, and after exercise
• Drink before, during, and after exercise
• For those who have difficulty walking or getting to the refrigerator or sink, leave water, a cup, and a straw if desired, within reach of the bed or chair.
• For those who are wheelchair-bound, pouches can be attached to wheelchairs or walkers – put a container of water in the pouch.

When to restrict fluids
• Some conditions cause the body to retain excess fluid: Congestive heart failure, severe kidney disease, and severe liver disease are common examples. Part of the treatment may include fluid restriction to less than four 8-ounce glasses per day. Sodium intake is also usually restricted because sodium causes the body to hold onto fluid. Adhering to these restrictions is an important part of treatment. However, restricting fluids on your own is very dangerous. Never restrict fluids unless your health care provider tells you to!

APPENDIX B

INSTRUCTIONS FOR URINE CATCHES
Standard Urine Specimen Instructions (Males)

Try to take a catch at the same time daily.
Do not take a catch at the same time as you are having a bowel movement.

1. Using one of the sanitary wipes provided, wipe clean the head of the penis.
2. Then take the specimen container and catch the urine, filling it to the dark line.
3. Remove the container from the stream and place the cap securely on.
4. Place container in cooler with one frozen cooler pack and close top of cooler.

Standard Urine Specimen Instructions with Nunscap (Females)

Try to take a catch at the same time daily.
Do not take a catch at the same time as you are having a bowel movement.

1. Lift the toilet lid and place the Nunscap on the toilet, towards the front and close lid.
2. Using one of the sanitary wipes provided, wipe clean the vaginal area and discard wipe in the trashcan.
3. Urinate into the Nunscap, taking care not to drop the toilet paper into the Nunscap when finished.
4. Stand up, lift toilet seat, and carefully lift Nunscap and place on counter.
5. Take a specimen container and using the pour spout, slowly pour into container until it reaches the dark line.
6. Place the cap securely on the container and flush any remaining fluid from the Nunscap.
7. If you accidentally poop in the specimen cup, pour it into toilet, discard the specimen cup and get the next catch you can. Otherwise,
8. Place container in cooler with one frozen cooler pack and close top of cooler.
9. Rinse out Nunscap with water and spray with disinfectant provided so that it will be ready for use later.

Clean Catch Urine Specimen Instructions (Males)

Try to take a catch at the same time daily.
Do not take a catch at the same time as you are having a bowel movement.

1. Using one of the sanitary wipes provided, wipe clean the head of the penis.
2. As you start to urinate, allow a small amount to fall into the toilet bowl.
3. Then take the specimen container and catch the urine, filling it to the dark line.
4. Remove the container from the stream and place the cap securely on.
5. Place container in cooler with one frozen cooler pack and close top of cooler.

Clean Catch Urine Specimen Instructions (Females)

Try to take a catch at the same time daily.

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Do not take a catch at the same time as you are having a bowel movement.

1. Using of the sanitary wipes provided, wipe clean the vaginal area.

2. As you start to urinate, allow a small amount to fall into the toilet bowl and then stop.

3. Take the specimen cup and place over vaginal opening and fill cup with urine until it reaches the dark line.

4. If you accidentally poop in the specimen cup, pour it into toilet, discard the specimen cup and get the next catch you can. Otherwise,

5. Place the cap securely on the container.

6. Place container in cooler with one frozen cooler pack and close top of cooler.

Adapted from MEDLINEplus® Health Information, Medical Encyclopedia: Urine Specific Gravity

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APPENDIX C

RESEARCH ASSISTANT REFRACTOMETER PROTOCOL
Materials:
Refractometer, transfer pipets, sterile gloves, distilled water, specimen samples, lens paper, specific gravity data sheets

Conduct specific gravity measurements in the following manner:

1. Begin by locating the appropriate specific gravity data sheet and logging in the sample (i.e. enter date evaluated, examiner initials, participant number, sample number)
2. Clean the surface of the cover and prism of the refractometer with a dampened piece of lens paper and then dry with lens paper.
3. With a transfer pipet, place one or two drops of the control or participant sample on the prism surface
4. Close the prism cover slowly, taking care not to get any air bubbles trapped beneath.
5. Look into the ocular end and rotate the eyepiece until the scale is in focus.
6. Read the number that appears where the dividing line between the light and dark fields meet.
7. Record on the data sheet this number to the third decimal place.
8a. Dry the refractometer with lens paper between each specimen (if conducting more than one at a single setting).
8b. Or if readings are completed, dry the refractometer, add a drop of distilled water to cleanse the prism and dry with lens paper. Close cover and put away.

Adapted from Point of Care.net Specific Gravity Procedure for the Total Solids Refractometer
APPENDIX D

FOOD AND FLUID DIARY
<table>
<thead>
<tr>
<th>Name:</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>What You Drank</th>
<th>What You Ate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Today</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Morning:</strong></td>
<td><strong>Morning:</strong></td>
</tr>
<tr>
<td>What?</td>
<td>What?</td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
<tr>
<td>What?</td>
<td></td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
<tr>
<td><strong>Afternoon:</strong></td>
<td><strong>Afternoon:</strong></td>
</tr>
<tr>
<td>What?</td>
<td>What?</td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
<tr>
<td>What?</td>
<td></td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
<tr>
<td><strong>Evening:</strong></td>
<td><strong>Evening:</strong></td>
</tr>
<tr>
<td>What?</td>
<td>What?</td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
<tr>
<td>What?</td>
<td></td>
</tr>
<tr>
<td>How much? ___oz.</td>
<td>___oz.</td>
</tr>
</tbody>
</table>
APPENDIX E

PILOT PARTICIPANT PERMISSION DOCUMENT
A Behavioral Model for Assessment and Management of Dehydration in Older Adults

Principle Investigator: Linda A. LeBlanc
Graduate Student Investigator: Leilani F. DiLiberto, MA
Department of Psychology
Western Michigan University

You are being invited to participate in a project on the assessment and management of dehydration that is being conducted by Leilani F. DiLiberto under the supervision of Dr. Linda A. LeBlanc. Dehydration is a serious health concern constituting one of the top ten reasons for hospitalization in individuals aged 65 and older. Through use of an interview tool and an appropriate intervention plan, we hope to increase hydration levels and prevent the need for more costly medical intervention in older adults at risk for dehydration. You have been selected as a participant because your name was randomly selected from the list of residents at Dillon Hall, and you indicated interest in participating after hearing about the project from the Service Coordinator, Peggy Rienzo at Dillon Hall.

This project has two phases, which include an assessment interview and brief data collection. If you decide that you would like to participate, we will begin by conducting a 30-45 minute interview with you and a caregiver/family member (if appropriate). These interviews will be audio taped for ease of data collection and to ensure that the interviewers are performing their job correctly. We will collect demographic data, information on current drinking and eating habits, preferred beverages, etc. in an effort to identify those things that may prevent individuals from drinking an adequate amount of fluid. Then we will ask you a few follow-up questions about your opinion about our interview.

Next, you will be asked to keep a daily food and fluid diary for two days to assist with monitoring nutritional intake throughout the study. You will also be asked to provide two daily urine samples to monitor your hydration level. A research assistant will come to your home each day to collect the samples. This will provide us with the information regarding the ease and utility of our data collection procedures.

During this experiment there are minimal risks to you. This project may also require a good deal of time and effort. To minimize the time and effort required on your part, we will make every effort to make data collection procedures easy, providing you with ready-made materials (pocket notebooks, cups, cooler, etc.) to make participation as simple as possible. Also, you may choose to discontinue your participation at any time. The potential benefit of participation is that we may develop an effective way to help other elders who are at risk for dehydration.

Any information obtained in connection with the project (including the audio taped interviews) that can be identified with you or your caregiver/family member will remain confidential. Participants will be identified with a number instead of by name. Information collected in this project will be kept for a period of three years and disclosed in professional journals to assist other clinicians, educators, and caregivers in their understanding of assessment and management of dehydration. Information presented in such journals will be anonymous (e.g., names changed or no names provided) to ensure confidentiality.
As in all research, there may be unforeseen risks to you, the participant. If an accidental injury occurs, appropriate emergency measures will be taken; however, no compensation or additional treatment will be made available to you except as otherwise stated in this consent form.

Your decision whether or not to participate will not jeopardize your future relations with Western Michigan University or with Dillon Hall. If you choose to participate, you may discontinue participation at any time without penalty. If you decide to withdraw from the study, you may also withdraw any information collected.

We invite you to ask any questions that you may have. If you have additional questions later, feel free to contact either Leilani DiLiberto (387-4363) or the supervisor, Dr. Linda LeBlanc (387-4920) who will be happy to answer them. You may also contact the Chair, Human Subjects Institutional Review Board (387-8293) or the Vice President for Research (387-8298) if questions or problems arise during the course of the study. You will be given a copy of this form to keep. This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not sign this document if the corner does not show a stamped date and signature in the upper right corner of both pages.

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE HAVING READ THE INFORMATION PROVIDED ABOVE.

__________________________
Date .......................... .......................... Time

__________________________
Signature of Participant    Signature of Investigator
APPENDIX F

EXAMINER SCRIPT FOR CONDUCTING THE INTERVIEW
Good afternoon. My name is _______________________ and I am here to interview you regarding the assessment and prevention of dehydration study we are conducting at Western Michigan University. After we go over the consent form together, if you decide you would like to participate, we will spend the next 30-45 minutes talking about different things that may place you at risk for dehydration. These questions fall into several broad categories including health status, medication usage, nutrition, and access to necessary items. If you are not quite sure what it is that I am asking, please feel free to stop me and I will be happy to repeat the question or clarify at anytime. With your permission, we would like to audiotape this interview to ensure that I record all of your answers correctly and that I do not leave anything out. Are you ready to begin?
APPENDIX G

DEFINITIONS FOR USE WITH THE HYDRATION INTERVIEW
Diabetes: caused by a problem with the body's ability to use insulin.

- Type 1 diabetes: The body produces little or no insulin.
- Type 2 Diabetes: Both doesn't produce enough insulin or cannot use the insulin it produces.

If insulin isn't being used properly, then blood sugar can't get into the cells and it backs up in the bloodstream. The body tries to get rid of the excess sugar through the urine.

People with Type 1 diabetes are at risk for developing Diabetes Ketoacidosis if not treated. In Type 2 and other cases, untreated high blood sugar will, over time, affect your health by causing diabetes complications. In fact, a number of Type 2 patients already have complications at the time they are diagnosed with diabetes.

Chronic Obstructive Pulmonary Disease (COPD):
Chronic obstructive pulmonary disease (COPD) is a lung disease in which the lung is damaged, making it hard to breathe. In COPD, the airways—the tubes that carry air in and out of your lungs—are partly obstructed, making it difficult to get air in and out.

Constipation:
The passage of small amounts of hard, dry bowel movements, usually fewer than three times a week. People who are constipated may find it difficult and painful to have a bowel movement. Other symptoms of constipation include feeling bloated, uncomfortable, and sluggish.

Gastroenteritis:
The irritation and inflammation of the digestive tract. This condition may cause abdominal pain, vomiting and diarrhea. Severe cases of gastroenteritis can result in dehydration. In such cases, fluid replacement is the primary factor in treatment. All ages and both sexes may be affected yet the most severe symptoms are experienced by infants and those individuals over sixty years old. The use of certain drugs such as aspirin, antibiotics or cortisone drugs may increase risk for this condition.

Urinary Tract Infection:
These may include a frequent urge to urinate and a painful, burning feeling in the area of the bladder or urethra during urination. It is not unusual to feel bad all over—tired, shaky, washed out—and to feel pain even when not urinating. Often women feel an uncomfortable pressure above the pubic bone, and some men experience a fullness in the rectum. It is common for a person with a urinary infection to complain that, despite the urge to urinate, only a small amount of urine is passed. The urine itself may look milky or cloudy, even reddish if blood is present. A fever may mean that the infection has reached the kidneys. Other symptoms of a kidney infection include pain in the back or side below the ribs, nausea, or vomiting.

Edema:
An accumulation of fluid between cells, causing swelling of the involved area. Edema is most often seen in the lower legs, the feet and around the eyes.

Hypotension: The clinical term for low blood pressure
APPENDIX H

HYDRATION INTERVIEW – (CAREGIVER VERSION)
Identification # ____       Sex _________     Interviewer Initials _______

A. RISK CRITERIA (Setting events)

Please answer the following questions.

1. What is ____________'s age? ___________ Weight?  Height? __________

2. Is he/she currently taking medications (include over the counter, prescription, & herbal supplements)?
   If yes, please list: ____________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

3. Has he/she recently experienced any of the following:
   *diabetes: ________________ constipation: ____________ vomiting: ____________
   arthritis: ________________ diarrhea: ________________ headaches: ____________
   incontinence: ____________ gastroenteritis: ____________ COPD: ____________
   weight loss or gain: ____________ kidney problems: ____________ dry mouth: ____________
   fever: ________________ hypotension: ____________ dehydration: ____________
   problems swallowing: ____________ chronic infections: ____________ **heart problems: ____________
   UTI: ________________ edema: ____________ falls: ____________
   memory problems: ____________ visual problems: ____________ tremors: ____________
   *if diabetes is checked, is it currently controlled or uncontrolled? ____________
   **if heart problems are indicated, please explain what the problems are ____________

4. How many meals does he/she eat per day? ________________________________

5. How much does he/she typically eat of each meal? (Give handout & then circle the answer given)
   Breakfast: 0% 25% 50% 75% 100%
   Lunch: 0% 25% 50% 75% 100%
   Dinner: 0% 25% 50% 75% 100%

6. Describe a typical breakfast in detail.

   Describe a typical lunch in detail.
Describe a typical dinner in detail.

7. What does he/she typically drink during each meal?

8. Does he/she ever drink alcoholic beverages? __________ If yes, what? ________________
   how much per day/week/month? _______________

9. How do beverages get into his/her home? (describe process in adequate detail)

10. What kind of activities does he/she engage in?
    exercise: __________ walking: __________ playing cards: __________ bingo: __________
    gardening: __________ social clubs: __________ other: ________________________________

11. What is his/her current mobility status?
    walk independently: ______ walk with cane: ______ walk with walker: ______
    walk with caregiver assistance: __________________________ wheelchair unassisted: __
    wheelchair assisted: ______

12. When he/she is moving from one room to another:
    is it time consuming? __________ are you worried that he/she will fall? __________

13. To what extent does __________ have the opportunity during the day to make choices about his/her
    activities and diet?

B. ANTECEDENT EVENTS

14. What types of beverages does he/she have in home right now/usually?

15. When is he/she most likely to drink beverages? Does he/she drink at any other times? If so, please list
    when and what type of beverage.

16. When is he/she least likely to drink beverages?

17. With whom is he/she most likely to drink a beverage? Least likely?

18. Of the following beverages, which five do you think he/she would like the best?
water ___________ milk ___________ 7-up ___________ decaf coffee ___________
hot tea ___________ orange juice ___________ iced tea ___________ cranberry juice ___________
fruit punch ___________ grape juice ___________ tomato juice ___________ prune juice ___________

19. How much does he/she like these beverages? (a lot, a little, etc.)

20. How often does he/she drink these beverages? (Can they drink them – diet restrictions?)

21. Do you think he/she would drink more if you could find something that tasted better?

22. If there is continence or mobility problems:
   does he/she currently wear adult briefs? ________________  If yes, how frequently does
   he/she need a change? ________________  could he/she carry a drink back to his/her seat without assistance and without spilling or dropping
   something? ________________  does he/she seem to be in a lot of pain when attempting movement? ________________

23. How often do you offer beverages?
   Every meal?  Every few hours?  Other? ________________

24. Do you think that he/she would drink more liquids if:
   someone reminded him/her? ________________  he/she thought about it more? ________________
   they were easy to get to? ________________  he/she could find it easily (easier to see)? ________________
   he/she had a variety to choose from? ________________  given with food? ________________
   cost wasn’t a problem? ________________  he/she had a lightweight cup and pitcher? ________________
   He/she had a straw? ________________  he/she didn’t feel nagged to drink more? ________________
   he/she could choose his/her own drink? ________________
   he/she didn’t have to go to the bathroom so urgently after drinking? ________________
   Other ________________

C. CONSEQUENCES OR OUTCOMES WHICH MAY MAINTAIN THIS PERSON NOT DRINKING AN
   ADEQUATE AMOUNT OF HEALTHY FLUID

25. Do you think he/she would drink more liquids if:
   they tasted better? ________________  they were easier to swallow? ________________
   he/she didn’t spill so often? ________________  it didn’t hurt to hold the cup/pitcher? ________________
   he/she didn’t have to go to the bathroom so urgently after drinking? ________________
26. Are there any problem behaviors he/she displays when offered beverages? (ex., upset, refusal, etc.)

If yes, give me an example of what happens when you offer a beverage

27. Are there any problems that happen when he/she drinks? (e.g., spill, choke)

28. Has this person ever complained about difficulties getting to the bathroom or needing to go more frequently after he/she has had something to drink? If yes, explain

29. What things (if any) has he/she tried in the past that have been effective in increasing his/her level of hydration?

Are there any things that have not been effective?

D. KNOWLEDGE/SKILLS

30. On average, how much healthy fluids should a person drink per day?

31. Which fluids contribute to dehydration?

32. Do you think this person drinks as much healthy fluid (e.g., water, juice) as he/she should? If not, how do you encourage drinking?

33. Do you think that his/her (e.g., memory problems, incontinence, mobility problems, arthritis, etc. from item 3) interferes with drinking? If so, please explain

34. Do you think that (condition/symptom endorsed from item 3) interferes with drinking (e.g., second

condition/symptom endorsed from item 3)? If so, please explain

35. Are there any other things you know about the history of (name) that affects his/her drinking behavior?

ADDITIONAL QUESTIONS

36. Do you know if he/she is currently experiencing any vaginal discharge (females only) or noticed any blood in his/her urine?
37. To your knowledge has he/she ever been asked to provide a clean catch urine sample? If so, do you think that he/she could perform this procedure without assistance? ___________
APPENDIX I

HYDRATION INTERVIEW – (PARTICIPANT VERSION)
Identification # _____  Sex _______  Interviewer Initials _______  

A. RISK CRITERIA (Setting events)

Please answer the following questions.

1. What is your age? _______  Weight? _______  Height? _______

2. Are you currently taking medications (include over-the-counter, prescription, & herbal supplements)?
   If yes, please list: ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. Have you recently experienced any of the following:
   *a. diabetes: __________  b. constipation: ___  c. vomiting: __________
   d. arthritis: __________  e. diarrhea: __________  f. headaches: __________
   g. incontinence: __________  h. gastroenteritis: ___  i. COPD: __________
   j. UTI: __________  k. edema: __________  l. dry mouth: __________
   m. fever: __________  n. hypotension: ___  o. dehydration: __
   p. swallowing problems: __________  q. chronic infections: __________
   r. heart problems: __________
   s. weight loss or gain: __________
   t. kidney/liver disease: ___  u. falls: __________
   v. memory problems: __________
   w. visual problems: __________
   x. tremors: __________
   y. other: ______________________________

   *If diabetes is checked, is it currently controlled or uncontrolled? __________
   **If heart problems are indicated, please explain what the problems are __________

4. How many meals, on average, do you eat per day? __________

5. Are you currently on any dietary restrictions? If so, please explain __________

6. Describe a typical breakfast in detail.

   _____________________________________________________________________________

6. Describe a typical lunch in detail.

   _____________________________________________________________________________

6. Describe a typical dinner in detail.

   _____________________________________________________________________________

   Daily fluid goal = __________________________
7. How much do you typically eat of each meal? (Give handout & circle the answer given)

Breakfast: 0% 25% 50% 75% 100%
Lunch: 0% 25% 50% 75% 100%
Dinner: 0% 25% 50% 75% 100%

8. What do you typically drink during each meal? How much? _______________________________________

9. Do you currently drink alcoholic beverages? __________ If yes, what? ________________
   If yes, how much per day/week/month? _______________________________________________________

10. What kind of activities do you engage in?
    exercise: __________ walking: __________ playing cards: __________ bingo: __________
    gardening: __________ social clubs: __________ other: _______________________________________

11. How do beverages get into your home? (describe process)

12. What is your mobility status? (e.g., use a cane, walker, wheelchair) _________________________

13. When moving from one room to another:
   a. does it hurt? ____________________________ b. does it require a lot of effort? __________
   c. is it time consuming? ____________________ d. are you worried you'll fall? ______________
   e. are you worried you'll spill or drop something? ___________________________

14. Rate how hard it is for you to move from room to room:
    1_________________________2____________________3____________________4____________________5
    extremely difficult difficult moderate effort typically easy very easy

15. To what extent do you have the opportunity during the day to make choices about your activities and diet?

B. ANTECEDENT EVENTS

16. What type of beverages do you have now/typically?

17. When are you most likely to drink beverages? (please list when and what type of beverage).
18. When are you least likely to drink beverages?

19. a. With whom are you most likely to drink a beverage? b. Least likely?

20. Of the following beverages, please choose five of your favorite.
   - water
   - milk
   - 7-up
   - decaf coffee
   - hot tea
   - orange juice
   - ice tea
   - cranberry juice
   - fruit punch
   - grape juice
   - tomato juice
   - prune juice

21. How much do you like these beverages? (a lot, a little, etc.)

22. a. How often do you drink these beverages? b. Can you drink them?

23. Do you think you would drink more if you could find something that tastes better?

24. If continence or mobility problems:
   a. do you currently wear adult briefs? If yes, how frequently do you need a change?
   b. how frequently do you use the restroom?
   c. do you have regular bowel movements?

25. Would you drink more liquids if:
   a. someone reminded you? b. you thought about it more?
   c. they were easy to get to? d. you could find it easily (easier to see)?
   e. you had a variety to choose from? f. given with food?
   g. cost wasn’t a problem? h. you had a lightweight cup and pitcher?
   i. you could choose your drink? j. you had a straw?
   k. you weren’t nagged to drink more?
   l. you didn’t have to worry about getting around your home?
   m. Other

26. Would you drink more liquids if:

C. CONSEQUENCES OR OUTCOMES WHICH MAY MAINTAIN THIS PERSON NOT DRINKING AN ADEQUATE AMOUNT OF HEALTHY FLUID

26. Would you drink more liquids if:
a. they tasted better? ________________  
b. it was easier to swallow? ________________

c. you didn't spill so often? ____________  
d. it didn't hurt to hold the cup/pitcher? ____

e. you didn't choke while drinking? ____________________________________________________________

f. you didn't have to go to the bathroom so urgently after drinking? ___________________________

27. a. What things (if any) have you tried in the past that have been effective in increasing your level of hydration? ______________________________________________________________________

b. Any that have not been effective? _________________________________________________________________

28. Do people remind/nag you a lot about drinking enough fluids? ____________________________________

D. KNOWLEDGE/SKILLS

29. On average, how much healthy fluids should a person drink per day? ______________________________

30. Do you think you drink enough liquids? __________________________________________________________

31. Which fluids contribute to dehydration? __________________________________________________________

32. Do you think that your __________________________ (e.g. memory problems, incontinence, mobility problems, arthritis, etc. from item 3) interferes with drinking? If so, please explain ____________________________________________________________________

33. Do you think that __________________________ (from item 3) interferes with drinking? If so, please explain _____________________________________________________________________
34. Are there any other things you can think of that may affect your drinking behavior?

________________________________________________________________________

35. Are you currently experiencing any vaginal discharge (females only) or noticed any blood in your urine?

________________________________________________________________________

36. Have you ever been asked to provide a clean catch urine sample?

________________________________________________________________________

If so, do you feel confident that you can perform this procedure?

________________________________________________________________________
APPENDIX J

CODING SHEET FOR THE HYDRATION INTERVIEW
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>code + if medications include Aricept, Excelon, or Reminyl, or code + if medications include Detrol, or other incontinence meds</td>
</tr>
<tr>
<td>3D.</td>
<td>code if positive for arthritis</td>
</tr>
<tr>
<td>3G.</td>
<td>code if positive for incontinence</td>
</tr>
<tr>
<td>3P.</td>
<td>code if positive for swallowing problems</td>
</tr>
<tr>
<td>3V.</td>
<td>code + if positive for memory problems or UTI</td>
</tr>
<tr>
<td>3W.</td>
<td>code + if positive for visual problems</td>
</tr>
<tr>
<td>3X.</td>
<td>code if positive for tremors</td>
</tr>
<tr>
<td>3Y.</td>
<td>code if negative for depression</td>
</tr>
<tr>
<td>4</td>
<td>code + if eats &lt; 3 meals daily</td>
</tr>
<tr>
<td>5</td>
<td>if on fluid restriction, call physician immediately after scoring completed</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>code + if little to no fluid intake with meals</td>
</tr>
<tr>
<td>9</td>
<td>code + if yes, or if not identified in item 31</td>
</tr>
<tr>
<td>10</td>
<td>code + for physical activity</td>
</tr>
<tr>
<td>11</td>
<td>code + if someone else shops for the participant or if transportation is limited (e.g., 1X per week)</td>
</tr>
<tr>
<td>12</td>
<td>code + if uses cane, walker, etc.</td>
</tr>
<tr>
<td>13A.</td>
<td>code + if hurt is indicated</td>
</tr>
<tr>
<td>13B.</td>
<td>code + if a lot of effort is indicated</td>
</tr>
<tr>
<td>13C.</td>
<td>code + if time consuming is indicated</td>
</tr>
<tr>
<td>13D.</td>
<td>code + if worried about falls</td>
</tr>
<tr>
<td>13E.</td>
<td>code + if worried about spills</td>
</tr>
<tr>
<td>14</td>
<td>code + if 3 or below</td>
</tr>
<tr>
<td>15</td>
<td>code + if limited or no opportunity to make choices about beverages</td>
</tr>
<tr>
<td>16</td>
<td>code + if 2 or less healthy beverages are available</td>
</tr>
<tr>
<td>17</td>
<td>code + if indicates most likely to drink in a social situation, or code + indicates most likely to drink when eating</td>
</tr>
<tr>
<td>18</td>
<td>code + if indicates alone</td>
</tr>
<tr>
<td>19A.</td>
<td>code + if a person is identified</td>
</tr>
<tr>
<td>19B.</td>
<td>code + if a person is identified</td>
</tr>
<tr>
<td>20</td>
<td>code + if not identify 5 from list</td>
</tr>
<tr>
<td>21</td>
<td>code + if a little or none</td>
</tr>
<tr>
<td>22A.</td>
<td>code + if a little, none, or not preferred</td>
</tr>
<tr>
<td>22B.</td>
<td>code + if cannot drink one or more fluids identified in item #20</td>
</tr>
<tr>
<td>23</td>
<td>code + if yes</td>
</tr>
<tr>
<td>24A.</td>
<td>code + if 2 or more changes of adult briefs occur</td>
</tr>
<tr>
<td>24B.</td>
<td>code + if &lt; 4</td>
</tr>
<tr>
<td>24C.</td>
<td>code if no</td>
</tr>
<tr>
<td>25A.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25B.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25C.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25D.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25E.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25F.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25G.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25H.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25I.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25J.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25K.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>25L.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26A.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26B.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26C.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26D.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26E.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>26F.</td>
<td>code + if yes</td>
</tr>
<tr>
<td>27A.</td>
<td>code + if answer indicates poor knowledge of what increases hydration</td>
</tr>
<tr>
<td>27B.</td>
<td>code + if treatment indicated</td>
</tr>
<tr>
<td>28</td>
<td>code + if yes</td>
</tr>
<tr>
<td>29</td>
<td>code + if other than 6-8 oz glasses</td>
</tr>
<tr>
<td>30</td>
<td>code + if no</td>
</tr>
<tr>
<td>31</td>
<td>code + if yes, but answer to item 29 indicates no</td>
</tr>
<tr>
<td>32</td>
<td>code + if identifies &lt; 3</td>
</tr>
<tr>
<td>33</td>
<td>code + if &quot;yes&quot; in categories I-IV, or &quot;no&quot; in category V on TSS</td>
</tr>
<tr>
<td>34</td>
<td>N/A</td>
</tr>
<tr>
<td>35</td>
<td>N/A</td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
</tr>
</tbody>
</table>
APPENDIX K

SAMPLE SEGMENT: FUNCTIONAL ASSESSMENT PROFILE (HYDRATION INTERVIEW)
Place a check mark on the appropriate line for each item on left, as per coding sheet.

Category I: Incontinence (Urine or Bowel)

Functional Assessment | Treatment Selection
--- | ---
Item | any except 32/33 (toileting schedule)
2 | 32/33. ___ (if no is indicated, education + toileting schedule)
3E. | 3J/16. ___ (education + toileting schedule)
If 3E is endorsed, score 32/33 here: | 32/33.
3G. | 3J.
If 3G is endorsed, score the following: | 32/33.
16 | 17
24 | 25A.
26E. | 25B.
25F. |
Total ________/6
If above 3, this is likely a relevant variable. Complete section on right to assist with treatment selection.

Category II: Reminders/Prompts/Memory

Functional Assessment | Treatment Selection
--- | ---
Item | any except 32/33 (toileting schedule)
2 | 32/33. ___ (if no is indicated, education + toileting schedule)
3E. | 3J/16. ___ (education + toileting schedule)
If 3E is endorsed, score 32/33 here: | 32/33.
3V. | 4. ___ (incorporate meal prompts)
If 3V is endorsed, score 32/33 here: | 32/33.
17 | 8. ___ (if unhealthy fluid or no fluid incorporate education plus prompt system)
If 17 is endorsed score the following: | 18. ___ (if less likely to drink when nagged, use nonhuman prompt system)
4 | 25A/25B. ___ (use automated prompt system)
6 | 25F. ___ (incorporate meal prompts or Meals on Wheels)
25A. | 25K/28. ___ (use nonhuman prompt system)
25B. |
25F. |
Total ________/6
If above 3, this is likely a relevant variable. Complete section on right to assist with treatment selection.
APPENDIX L

CHECKLIST OF ASSESSMENT: INTEGRITY OF DELIVERY ON SEMI-STRUCTURED INTERVIEW
<table>
<thead>
<tr>
<th>Audiotaped interview w/ participant #</th>
<th>Date Reviewed</th>
<th>Examiner Initials</th>
<th>Event</th>
<th>Place a &quot;+&quot; if the event occurred. Place a &quot;-&quot; if the event did not occur. Place an &quot;N&quot; if the event does not apply.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the interviewer read the script in full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the interviewer ask if the participant had any questions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If the participant asked any questions, did the interviewer answer them adequately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was the interviewer's speech at an appropriate volume level and clearly understandable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If this is a pilot participant, did the interviewer ask the feedback questions at the end of the interview?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were all applicable questions asked throughout the course of the interview? (e.g., if the participant indicates that she has arthritis in question 3, is it asked in follow-up item 30/31)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the interviewer arrange sample pickup time and location (as noted on the data sheet)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HOW DRY ARE YOU?

When you don’t drink enough water, you become dehydrated – you dry up. Water is lost through perspiration, respiration, breathing, evaporation through the skin, and excretion in urine and feces. The only way to replace it is to drink.

Some signs of inadequate water intake are
- Constipation
- Dry mouth
- Thirst

Some signs of dehydration are
- Flushing
- Dizziness
- Dry skin
- Headache
- Weakness
- Confusion

WHY OLDER PEOPLE ARE AT INCREASED RISK

With aging, sensitivity to the sensation of thirst may decrease. This can be especially dangerous
- During hot weather
- With vomiting or diarrhea
- When you have a fever
- For heavy drinkers of alcoholic beverages
- When taking certain medications

Your body loses a great deal of water under these conditions. Without thirst to tell you to replace what you’ve lost, you may not be aware of the need to drink more. Unless you make a conscious decision to drink more fluids, you can become dehydrated. During summer heat waves, avoid heat stroke by staying out of the sun, wearing lighter clothes, and drinking more fluids.

HOW TO BE SURE TO DRINK ENOUGH

- Fill six to eight 8-ounce glasses of water and leave in the refrigerator. Drink a glass whenever you go into the kitchen or go to the refrigerator.

Your daily fluid goal at your current weight of 165 lbs. is 61.3 oz

- Carry water with you in a thermos or water bottle
- Drink before, during, and after exercise
- For those who have difficulty walking or getting to the refrigerator or sink, leave water, a cup, and a straw if desired, within reach of the bed or chair.
• For those who are wheelchair-bound, pouches can be attached to wheelchairs or walkers – put a container of water in the pouch.

WHEN TO RESTRICT FLUIDS

• Some conditions cause the body to retain excess fluid: Congestive heart failure, severe kidney disease, and severe liver disease are common examples. Part of the treatment may include fluid restriction to less than four 8-ounce glasses per day. Sodium intake is also usually restricted because sodium causes the body to hold onto fluid. Adhering to these restrictions is an important part of treatment. However, restricting fluids on your own is very dangerous. Never restrict fluids unless your health care provider tells you to!


OTHER ISSUES THAT AFFECT DRINKING:

• Type of beverage
  o Some beverages actually contribute to dehydration! These beverages include those with caffeine and those with carbonation. These type of beverages irritate the bladder and cause more frequent urination, therefore indirectly contributing to dehydration through increased fluid loss.

  o For every glass of caffeinated tea, coffee, or soda pop you drink, you need to drink one 8 oz glass of water to compensate for the effects of those beverages.
HOW DRY ARE YOU?

When you don’t drink enough water, you become dehydrated – you dry up. Water is lost through perspiration, respiration, breathing, evaporation through the skin, and excretion in urine and feces. The only way to replace it is to drink.

Some signs of inadequate water intake are
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- Dry mouth
- Thirst

Some signs of dehydration are
- Flushing
- Dizziness
- Weakness
- Confusion

WHY OLDER PEOPLE ARE AT INCREASED RISK

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- During hot weather
- With vomiting or diarrhea
- When you have a fever
- For heavy drinkers of alcoholic beverages
- When taking certain medications

Your body loses a great deal of water under these conditions. Without thirst to tell you to replace what you’ve lost, you may not be aware of the need to drink more. Unless you make a conscious decision to drink more fluids, you can become dehydrated. During summer heat waves, avoid heat stroke by staying out of the sun, wearing lighter clothes, and drinking more fluids.

HOW TO BE SURE TO DRINK ENOUGH

- Fill six to eight 8-ounce glasses of water and leave in the refrigerator. Drink a glass whenever you go into the kitchen or go to the refrigerator.

Your daily fluid goal at your current weight of 172 lbs. is 60.11 oz

- Carry water with you in a thermos or water bottle
- Drink before, during, and after exercise
- For those who have difficulty walking or getting to the refrigerator or sink, leave water, a cup, and a straw if desired, within reach of the bed or chair.
For those who are wheelchair-bound, pouches can be attached to wheelchairs or walkers - put a container of water in the pouch.

WHEN TO RESTRICT FLUIDS

- Some conditions cause the body to retain excess fluid: Congestive heart failure, severe kidney disease, and severe liver disease are common examples. Part of the treatment may include fluid restriction to less than four 8-ounce glasses per day. Sodium intake is also usually restricted because sodium causes the body to hold onto fluid. Adhering to these restrictions is an important part of treatment. However, restricting fluids on your own is very dangerous. Never restrict fluids unless your health care provider tells you to!


OTHER ISSUES THAT AFFECT DRINKING:

- Pain
  - Regardless of its source, the presence of pain that occurs when walking (related to the back, legs, or hip regions) can affect a person’s ability/motivation to acquire beverages.

- Type of beverage
  - Some beverages actually contribute to dehydration! These beverages include those with caffeine and those with carbonation. These type of beverages irritate the bladder and cause more frequent urination, therefore indirectly contributing to dehydration through increased fluid loss.

    - For every glass of caffeinated tea, coffee, or soda pop you drink, you need to drink one 8 oz glass of water to compensate for the effects of those beverages.
HOW DRY ARE YOU?

When you don’t drink enough water, you become dehydrated – you dry up. Water is lost through perspiration, respiration, breathing, evaporation through the skin, and excretion in urine and feces. The only way to replace it is to drink.

Some signs of inadequate water intake are
- Constipation
- Dry mouth
- Thirst
- Dry skin
- Headache

Some signs of dehydration are
- Flushing
- Dizziness
- Weakness
- Confusion

WHY OLDER PEOPLE ARE AT INCREASED RISK

With aging, sensitivity to the sensation of thirst may decrease. This can be especially dangerous
- During hot weather
- With vomiting or diarrhea
- When you have a fever
- For heavy drinkers of alcoholic beverages
- When taking certain medications

Your body loses a great deal of water under these conditions. Without thirst to tell you to replace what you’ve lost, you may not be aware of the need to drink more. Unless you make a conscious decision to drink more fluids, you can become dehydrated. During summer heat waves, avoid heat stroke by staying out of the sun, wearing lighter clothes, and drinking more fluids.

HOW TO BE SURE TO DRINK ENOUGH

- Fill six to eight 8-ounce glasses of water and leave in the refrigerator. Drink a glass whenever you go into the kitchen or go to the refrigerator.

Your daily fluid goal at your current weight of 165 lbs. is 61.3 oz

- Carry water with you in a thermos or water bottle
- Drink before, during, and after exercise
- For those who have difficulty walking or getting to the refrigerator or sink, leave water, a cup, and a straw if desired, within reach of the bed or chair.
• For those who are wheelchair-bound, pouches can be attached to wheelchairs or walkers – put a container of water in the pouch.

WHEN TO RESTRICT FLUIDS

• Some conditions cause the body to retain excess fluid: Congestive heart failure, severe kidney disease, and severe liver disease are common examples. Part of the treatment may include fluid restriction to less than four 8-ounce glasses per day. Sodium intake is also usually restricted because sodium causes the body to hold onto fluid. Adhering to these restrictions is an important part of treatment. However, restricting fluids on your own is very dangerous. Never restrict fluids unless your health care provider tells you to!


OTHER ISSUES THAT AFFECT DRINKING:

• Pain
  o Regardless of its source, the presence of pain that occurs when walking (related to the back, legs, or hip regions) can affect a person’s ability/motivation to acquire beverages.

• Vision
  o If you have difficulties seeing (for example, differentiating between colors, or seeing clear fluids in a clear glass) this may affect your ability to pour, locate, or acquire beverages

• Type of beverage
  o Some beverages actually contribute to dehydration! These beverages include those with caffeine and those with carbonation. These type of beverages irritate the bladder and cause more frequent urination, therefore indirectly contributing to dehydration through increased fluid loss.

  o For every glass of cafffeinated tea, coffee, or soda pop you drink, you need to drink one 8 oz glass of water to compensate for the effects of those beverages.
APPENDIX P

EDUCATIONAL HANDOUT FOR DAVID
Educational Handout (Sanservo, 1997)

HOW DRY ARE YOU?

When you don’t drink enough water, you become dehydrated – you dry up. Water is lost through perspiration, respiration, breathing, evaporation through the skin, and excretion in urine and feces. The only way to replace it is to drink.

Some signs of inadequate water intake are
- Constipation
- Dry mouth
- Thirst

Some signs of dehydration are
- Flushing
- Dizziness

WHY OLDER PEOPLE ARE AT INCREASED RISK

With aging, sensitivity to the sensation of thirst may decrease. This can be especially dangerous
- During hot weather
- With vomiting or diarrhea
- When you have a fever
- For heavy drinkers of alcoholic beverages
- When taking certain medications

Your body loses a great deal of water under theses conditions. Without thirst to tell you to replace what you’ve lost, you may not be aware of the need to drink more. Unless you make a conscious decision to drink more fluids, you can become dehydrated. During summer heat waves, avoid heat stroke by staying out of the sun, wearing lighter clothes, and drinking more fluids.

HOW TO BE SURE TO DRINK ENOUGH

- Fill six to eight 8-ounce glasses of water and leave in the refrigerator. Drink a glass whenever you go into the kitchen or go to the refrigerator.

Your daily fluid goal at your current weight of 207 lbs. is a minimum of 66.2 oz
- Carry water with you in a thermos or water bottle
- Drink before, during, and after exercise
• For those who have difficulty walking or getting to the refrigerator or sink, leave water, a cup, and a straw if desired, within reach of the bed or chair.

• For those who are wheelchair-bound, pouches can be attached to wheelchairs or walkers – put a container of water in the pouch.

WHEN TO RESTRICT FLUIDS

• Some conditions cause the body to retain excess fluid: Congestive heart failure, severe kidney disease, and severe liver disease are common examples. Part of the treatment may include fluid restriction to less than four 8-ounce glasses per day. Sodium intake is also usually restricted because sodium causes the body to hold onto fluid. Adhering to these restrictions is an important part of treatment. However, restricting fluids on your own is very dangerous. Never restrict fluids unless your health care provider tells you to!


OTHER ISSUES THAT AFFECT DRINKING:

• Pain
  o Regardless of its source, the presence of pain that occurs when walking (related to the back, legs, or hip regions) can affect a person’s ability/motivation to acquire beverages.

• Vision
  o If you have difficulties seeing (for example, differentiating between colors, or seeing clear fluids in a clear glass) this may affect your ability to pour, locate, or acquire beverages

• Type of beverage
  o Some beverages actually contribute to dehydration! These beverages include those with caffeine and those with carbonation. These type of beverages irritate the bladder and cause more frequent urination, therefore indirectly contributing to dehydration through increased fluid loss.

  o For every glass of caffeinated tea, coffee, or soda pop you drink, you need to drink one 8 oz glass of water to compensate for the effects of those beverages.
APPENDIX Q

SOCIAL VALIDITY QUESTIONS
To be administered at follow-up

1. Did you find the intervention(s) relatively easy to have in your life?

2. Would you do the intervention again if hydration were a problem?

3. Did you find the intervention(s) to be beneficial/helpful?

4. Did you find the interventions to be non-intrusive?

5. Do you feel like your drinking behavior has changed?
   a. If yes, how?
   b. If no, why do you think that it hasn’t?
Date: November 13, 2003

To: Linda LeBlanc, Principal Investigator
Leilani F. DiLiberto, Student Investigator for Dissertation

From: Mary Lagerwey, Ph.D., Chair

Re: HSIRB Project Number: 03-09-04

This letter will serve as confirmation that your research project entitled "A Behavioral Model for Assessment and Management of Dehydration in Older Adults" has been approved under the full category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: October 15, 2003