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The Bath Environment, The Bathing Task, And the Older Adult: A Review and Future Directions for Bathing Disability Research

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Abstract

Purpose. To review existing research studies to identify optimal intervention strategies for remediation and prevention of bathing disability and future directions for bathing disability research.

Method. Bathing disability, defined as problems in the interaction between the person and the environment during bathing performance, is examined through a comprehensive, narrative literature review.

Results. Most studies focus on the relationship between the person and the environment (such as assistive device use and environmental hazards) while fewer studies focus on analysis of the bathing task or the interaction of the person, environment, and bathing task. Of intervention studies, most do not focus solely on remediation of bathing disability and outcomes vary widely.

Conclusions. In order to help remediate and prevent bathing disability, it will be necessary to better understand and measure the person-environment-occupation interaction involved in bathing as it relates to specific groups of older adults.

Introduction

Approximately 5 – 7% of community-living older adults require personal assistance with bathing [1]. Bathing is one of the first activities of daily living in which people become disabled [2],[3], and bathing disability is associated with many adverse consequences such as increased hospital utilization [4], admission to skilled nursing facilities [5], incidence of bone fractures [6], and mortality [7]. Despite the consequences, little is known about how to best remediate bathing performance problems and prevent bathing disability. One reason for this lack of knowledge may be that bathing is a difficult task to research. It is complex, requiring many personal capacities, and it is closely related to environmental factors. The purpose of this paper is to (i) describe a theoretical model for conceptualizing bathing disability, (ii) summarize literature according to each part of the model, (iii) identify empirically-tested treatment strategies, and (iv) suggest future directions for bathing disability research.

Bathing disability and the person-environment relationship

It is increasingly recognized that the influence of the environment on health and functioning in older adults has not been well studied [8],[9]. A recent review of research on home environments concluded that the few studies carried out tend to be descriptive in nature and lack a clear theoretical base [10]. In order to help people function in their everyday lives, a better understanding of the relationship between a person and his or her environment is needed [10],[11].

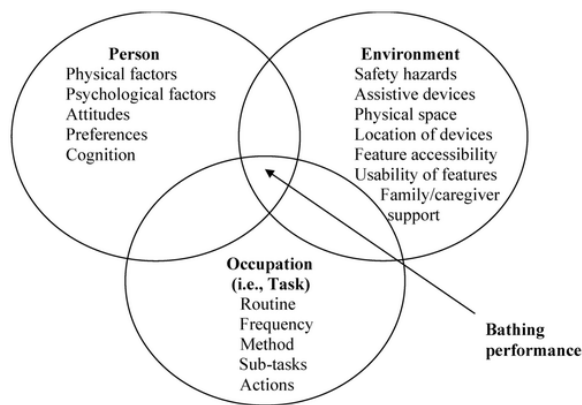
Many general models of disability incorporate the environment, including the International Classification of Functioning, Disability, and Health [12], and the Disablement Process [9]. Within the field of occupational therapy, the person-environment-occupation (P-E-O) model [13] was developed to guide treatment for individual clients. This model is particularly useful to examine bathing disability research and identify gaps in the knowledge. In the model, three broadly-defined domains represent a holistic picture of task performance: The person (who has unique characteristics and capacities), the environment (which includes physical and social aspects that are dynamic over time) and the occupation (which involves all elements of the task and subtasks) [13]. The interaction among the person, environment, and occupation (called the P-E-O interaction) identifies problems in task performance. Bathing disability, therefore, can be defined as problems in the P-E-O interaction that impair bathing performance.

The P-E-O model is also a valuable tool to better understand and develop research on the prevention of bathing disability. The definition of the environment is particularly critical to use for assessment of future disability because environmental barriers may arise from changes in personal support as well as from reductions in personal capacity. In addition, the inclusion of the occupation domain helps to broaden the conceptualization of the bathing task to not only include sub-tasks, but also how the task is performed to meet individual needs, such as timing, routine, and frequency of task performance.

Bathing within the P-E-O model

Several factors are specified in each domain of the model representing the P-E-O interaction involved in bathing (see Figure 1). These factors include anything that could potentially help or hinder bathing performance. Within the *person* domain, there are physical factors (e.g., balance, gait, strength, endurance, pain, limited range of motion, decreased vision, impaired sensation), psychological factors (e.g., depression, low falls efficacy [i.e., lack of confidence in ability to perform activities without falling]), attitudes and preferences about bathing, and cognition. The *environmental* domain includes the physical and social environment. The physical environment includes safety devices, bathroom hazards, materials or objects used in the performance of the activity (e.g., soap, shampoo, towels), and physical space. Physical space comprises the size and layout of the bathroom; doorway width and threshold heights; locations of light switches, outlets, fixtures, appliances; floor material and finishes; light and noise levels; and accessibility and usability of features such as the type of water controls in the tub or shower [14]. The social environment includes support from family or caregivers to perform bathing. Occupation is defined as groups of activities and tasks engaged in to meet personal needs [13]. For the task of bathing, the *occupation* domain includes bathing routines or method (such as frequency or techniques used) as well as task demands, that is, the specific sub-tasks and actions required to perform the task. The task demands include aspects of sequencing, timing, and required physical and cognitive performance skills [15]. The *P-E-O interaction* is assessed by the level of 'fit' among the domains of the model [13]. Greater overlap among the domains indicates better fit and, therefore, better bathing performance.

Figure 1. The Person-Environment-Occupation Model for Bathing. Note. The original figure of the P-E-O model appeared in the following article: Fearing V, Law M, Clark J. An occupational performance process model: Fostering client and therapist alliances. *Can J Occup Ther* 1997;64, p 11. This Figure is reprinted with permission by CAOT Publications.



The relationship between person and environment

Much of the research on bathing has examined the person-environment relationship (that is, the overlap between the person and environment domains of the model in the figure). Most of this research focuses on aspects of the physical environment such as assistive device use and environmental hazards. Population-based studies on assistive device use among community-living older adults carried out in Sweden and in the UK show that bathing devices (e.g., grab bars, raised toilet seat, tub-seat) are most commonly used with a trend of higher usage rates among those who are older [16], female [16-18], and who have visual impairment [17]. The rates and usage of different bathing devices also appear to differ by type and severity of impairments (e.g., cognitive, physical, visual) [19],[20].

Attitudes and preferences about device use have also been examined. Bathing devices have been viewed favourably to promote safety and prevent falls in a study using focus groups [21]. However, problems with using

bathing devices were common in one study [22]. Reasons for dissatisfaction and disuse of bathing devices included the denial of need, feelings of embarrassment, and awkward or unsafe device use [21],[23],[24].

The bathroom has been cited as one of the most common sites for environmental hazards in the home [25-27]. The relationship between environmental hazards in the home and experiencing falls has been examined in studies [28-32], however, the differences in how environmental hazards are defined make it difficult to synthesize the findings. No studies could be found that focus specifically on the relationship between falls in the bathroom and bathroom environmental hazards. Gill et al. examined the relationship between a specific bathroom hazard, the absence of bathroom grab bars in homes, and physical and psychological factors [33]. For community-living older adults, deficits in standing from a chair and low falls efficacy were associated with having no grab bars in the bathroom which suggests the installation of grab bars is one means to prevent bathing disability.

In summary, research on the relationship between the person and environment focuses on only a few aspects of the physical environment and use of devices. Little is known about the physical environmental features needed for optimal bathing performance (including lighting levels and accessibility of fixtures) or how bathing performance changes with transitions into different environments (such as a move from home to a senior housing facility).

The relationship between person and occupation

Bathing, as an occupation, has been examined most often through a reduction into bathing sub-tasks. Czaja et al. examined the physical actions required to perform bathing sub-tasks through videotape analysis and found that the most frequent actions were standing, lifting/lowering, and precise finger grips (i.e., to manipulate tub or shower water controls) [34]. Reported bathing difficulty was associated with problems bending and reaching. Naik et al. examined several bathing sub-tasks (such as obtaining and using supplies, getting into bathing position, washing the whole body) and found that difficulty or dependence (i.e., needing personal assistance) was most often reported in the sub-tasks of getting into and leaving the bathing position followed by washing whole body [35]. For the bath transfer alone, studies have found that 12 – 66% of community-living older adults report difficulty [23],[35],[36]. The lower prevalence found in one study (12%) may have been due to the exclusion of participants who required any type of assistance with the bath transfer including stand-by assistance [36].

There is little information on the frequency or routine of bathing among older adults. Aminzadeh et al. found that one-third of residents in senior housing modified their bathing routine due to fear of getting into the tub to bathe [23]. Assessment questions that examine the change in frequency or method of performing everyday tasks have been developed in order to identify signs of 'pre-clinical' disability in community-living older adults [37]. Using an adapted version of these questions for bathing, our research team found that almost half of a sample of 59 older adult residents (47%) of a congregate housing facility changed their method of bathing due to their health condition, 17% reduced their frequency of bathing, and 26% avoided taking tub baths because of difficulty [38].

Studies that have examined the relationship between person and occupation have begun to examine disability in specific bathing subtasks. Little is known about how and when community-living older adults perform bathing to compensate for functional deficits.

The relationship between occupation and environment

There are few studies that investigate the occupation of bathing as it relates to environmental design. Some biomechanical design studies were undertaken to determine the physical space requirements needed for bath and shower transfers for wheelchair users [39],[40], to determine specifications for bathroom grab bars [41],

and to test specific tub and shower seats among older adults and spinal cord injured patients [42]. These studies provide important preliminary information about bathroom design; however, most of them lack a standard protocol and detail about how the studies were conducted which make them difficult to synthesize [43].

Another approach used to enhance bathroom design in assisted living and dementia-specific facilities is post-occupancy evaluation. Specifically, architects design or redesign buildings based on information about how people perform within the environment which often involves interviewing staff members and facility residents [44],[45]. Post-occupancy evaluations vary widely in the amount of time to conduct and number of people involved. In one study, an environmental researcher was trained as a nursing assistant and worked at a dementia-specific facility for several weeks in order to identify problems and help redesign facility bathrooms to better ensure safety, reduce fear of bathing, and provide ease of cleaning [44].

Based on these studies, more work is needed to examine physical factors of bathrooms for frail older adults as well as those with specific disabilities. These studies should include a broad set of physical environmental features.

The person-environment-occupation interaction

Community-living older adults

Whereas most bathing studies have examined pieces of the P-E-O interaction, few studies have comprehensively assessed bathing disability by examining all domains (P-E-O) involved in bathing performance. Studies that assessed the P-E-O interaction in bathing have examined how the physical environment is utilized during a bath transfer [23],[36],[46] and performance difficulties experienced [36]. In the studies of environmental utilization, grab bars are the most commonly utilized feature during the bath transfer; however, high rates of utilization of unsafe environmental features (i.e. ones not designed to be used as a support such as the bathtub perimeter or sink tops) have been reported [23] and observed [36]. Utilization of bathroom environmental features (i.e., nonskid mats, grab bars, shower chair, handheld shower, long handled sponge, or emergency rescue device) was found to be higher among independently-bathing older adults with observed deficits standing from a chair compared to those with no observed deficits [46]. In addition, increased utilization of bathroom environmental features is independently associated with self-reported difficulty with the bath transfer [36]. In the only study found that examined performance difficulties (defined as lack of fluid movement or difficulty negotiating the environment) [36], one-third of older adults who reported independence in bathing had one or more observed performance difficulties. Of the performance difficulties measured, falling or 'plopping' onto a tub seat or into the tub was the most common (51%).

Older adults with dementia

Two studies have been found to have assessed the P-E-O interaction for older adults with dementia. They examine both the physical environment and social environment (i.e., the caregiver-client relationship). These studies describe the specific problems with the P-E-O interaction experienced by caregivers and older adults to create intervention strategies [47],[48]. Bathing problems as reported by caregivers included resistance in performing bathing, agitation, lack of ability to follow the bathing routine, and safety [48].

The few studies on bathing among older adults with dementia consider many aspects of the P-E-O interaction. Studies on the P-E-O interaction in community-living older adults are currently limited to how adults function within the physical bathroom environment. More work is needed to examine how bathing is performed or how it changes over time considering social support factors (such as help from a spouse).

Recommendations to improve bathing performance based on the literature

- The use of assistive devices is commonly recommended, however, adequate training and follow-up with use of devices prescribed by therapists is needed to promote device use [24].

- Since the bath transfer is the most problematic bathing sub-task [35] and performance difficulties during the bath transfer are only independently associated with having functional limitations in range of motion and low falls efficacy [36], environmental solutions and practicing bathing strategy may be more appropriate methods of reducing performance difficulties when compared to remediation of personal capacities.
- The high rate of unsafe environmental feature utilization, even in housing facilities designed for older adults [23],[36], indicates the need for intervention for community-living older adults to help prevent bathroom-related falls and bathing disability.

Bathing interventions

Community-living older adults

Few studies have evaluated the effectiveness of bathing interventions. Table I shows intervention studies that include bathing treatment or focus only on bathing in community-living older adults and in older adults with dementia. For community-living older adults, bathing has been included in the context of broader interventions designed to modify the home environment and to prescribe and teach the use of assistive devices [49-51]. Bathing was also included in a multi-factorial fall prevention intervention in which assistive devices and exercise were possible treatments for unsafe bath transfers [52]. Only two studies could be found that tested specific bathing interventions [53],[54]. One study examined the effect of home training in bathing device use among stroke patients recently discharged from the hospital in a randomized control trial ($n = 53$) [53]. The intervention group (who received 1 – 3 home visits) had significantly higher physical function, reported satisfaction with the devices, and a higher rate of device use than the control group at 3 months follow-up. The other bathing study was done to examine the effectiveness of a housing advocacy program that provides bathroom devices to low-income frail older adult renters [54]. Among the small sample who were seen at baseline and follow-up ($n = 20$), older adults who received the bathing intervention (i.e., two home visits from an occupational therapist involving identification of assistive device needs and prescription of devices) had significant improvement in the ability to bathe after the intervention. Given the current lack of research in this area, studies that examine bathing interventions geared to community-living older adults are needed.

Table I. Interventions that include or focus on bathing in older adults.

Author(s), year	Sample	Study design	Intervention	Results
Community-living older adults				
Cumming et al. 1999 [49]	530 older adults recently discharged from hospital, mean age 77 years	RCT	A home visit by an occupational therapist for environmental hazard reduction and home modification	Among prior fallers, reduced rate of falls in the intervention group compared to control group.
Mann et al. 1999 [50]	104 frail older adults, mean age 73 years	RCT	Provision of assistive devices and home modification over 18 month period	Both treatment and control group declined on overall functional status (on FIM), but treatment group had significantly less decline.
Stark 2004 [51]	16 low income older adults with activities of daily living impairment, mean age 67 years	Pretest-Posttest	Provision of adaptive equipment and home modification (baseline, 3-month, and 6-month follow-up visits)	At post-test, participants had significantly higher scores on satisfaction and performance subscales of the Canadian Occupational Performance Measure (COPM).
Tinetti et al. 1994 [52]	301 community-living older adults with at least one fall risk factor (including the inability to transfer to bath/toilet safely), mean age 70 years	RCT	Based on baseline individual risk factors, participants in the intervention group received 2 – 22 visits of exercise, transfer skills training, or environmental modification. Control group participants received equivalent social contact visits	Of all participants who had unsafe bath/toilet transfers at baseline, significantly more of the control group continued to have unsafe transfers at post-test compared to the intervention group (65% vs. 49%, $p = 0.05$).
Chiu et al. 2004 [53]	53 older adults who had experienced a stroke in need of bathing devices who were	RCT	Intervention and control groups received assistive device training in the hospital and one home visit pre-discharge, intervention group received 2 – 3 home visits for additional	Participants in the intervention group had significantly higher functioning (on FIM) and satisfaction with devices. Bathing devices were more utilized in the

	about to be discharged from the hospital, mean age 72 years		instruction on assistive device use and safety techniques	intervention group compared to controls (97% vs. 57%).
Gitlin et al. 1999 [54]	34 low income older adults	Pretest-Posttest	Two home visits by an occupational therapist for assessment of self-care and provision of assistive devices	Significant improvement in bathing ability (assessed on a difficulty scale by OT) at post-test.
Older adults with dementia				
Gitlin et al. 2001 [55]	171 family caregivers of older adults with dementia	RCT	Five 90-min home visits with caregivers by occupational therapist for education and physical and social environment modification	Intervention caregivers reported less declines in self-care and behaviour problems at 3 months. Women caregivers reported increased self-efficacy in handling behaviours and dependency.
Gitlin et al. 2003 [56]	255 family caregivers of older adults with dementia	RCT	Five home visits and one telephone contact	Intervention caregivers reported less upset with behaviour problems, less need for assistance from others, and better affect.
Sloane et al. 2004 [58]	73 nursing home residents with dementia and agitation during bathing; 73 nursing assistants	RCT	Participants received baths which were person-centred, towel baths, or usual bath method from nursing assistants	Aggression declined most with person-centred bathing, followed by towel baths, discomfort declined significantly in both intervention and control groups.

Older adults with dementia

A few studies focused on manipulating the environment and training caregivers of older adults with dementia to enable better performance in daily living tasks which included bathing [55],[56]. These studies used a multi-layered theoretical model in which the environment was divided into object, task, social group, and culture [57]. In one study that particularly focused on the bathing task, several strategies were devised to enhance the P-E-O interaction such as removing unnecessary objects (object level), use of verbal and tactile cueing (task), use of a formal healthcare provider (social group), and positive reinforcement of appropriate behaviours (culture) [48]. In a randomized controlled trial, Sloane et al. tested the effectiveness of two types of bathing approaches (person-focused showering and towel bed bath) in which members of staff were trained to work with older adults with dementia who reside in nursing homes [58]. Both approaches led to significantly fewer incidents of agitation and aggression and less discomfort experienced by residents.

Most of the intervention studies found do not focus solely on bathing. Only three studies have specifically designed interventions that focus on bathing [53],[54],[58], and of those studies, only one examined the P-E-O interaction in bathing rigorously [58]. In these studies, intervention outcomes vary widely.

Future directions for bathing disability research using the P-E-O model

Based on this review, different groups of older adults are being targeted for bathing interventions based on their functional status: Community-living well older adults, older adults who have experienced a significant health event such as a stroke, and older adults who have dementia. Bathing disability has been assessed in a variety of ways and based on other studies in this review, there is a potential to assess many other aspects of the P-E-O interaction in bathing. Table II, which is offered as a framework to guide research development for future intervention studies, shows the different groups of older adults, intervention goals based on expectation of functional improvement, and assessment of the P-E-O interaction for tracking outcomes or guiding intervention strategies.

Table II. Application of the P-E-O interaction for bathing intervention.

Older adults by functional status	Intervention goals	Assessment of the P-E-O interaction*
Independent or independent with difficulty	<ul style="list-style-type: none"> • Help prevent future disability • Reduce difficulty in bathing 	<ul style="list-style-type: none"> • Presence of environmental hazards • Utilization of environmental features
• Performance difficulties		
Requires assistance – expect improvement in functional status	<ul style="list-style-type: none"> • Increase independence in bathing • Increase safety in bathing 	<ul style="list-style-type: none"> • Measurement of bathing performance ^ Stand-by assistance
^ Environmental set-up		
^ Verbal and physical cueing		
^ Minimal physical assistance		
^ Moderate physical assistance		

^ Maximal physical assistance		
Requires assistance – expect no improvement in functional status	<ul style="list-style-type: none"> • Improve client-caregiver interaction 	<ul style="list-style-type: none"> • Caregiver difficulty
	<ul style="list-style-type: none"> • Increase quality of bathing 	<ul style="list-style-type: none"> • Client behaviours – Agitation, aggression, discomfort
<ul style="list-style-type: none"> • Cleanliness, skin condition 		

*The P-E-O interaction is assessed to track outcomes or to guide intervention strategies.

For well older adults who report being independent in bathing or who report that they are independent but have some difficulty bathing, intervention goals and aspects of the P-E-O interaction have not yet been well-delineated or examined in research studies. Ways to assess the P-E-O interaction include examination of the presence of environmental hazards, utilization of many environmental features, and observed performance difficulties.

For older adults who require assistance but have the potential to improve their functional status, assessment of the P-E-O interaction includes a functional measure of bathing performance. Most of what is known about bathing disability comes from self-report measures, such as the modified version of the Katz ADL index (which assesses dependence in bathing by the reported need for any personal assistance or equipment help) [59]. Some studies that assess bathing disability with self-report measures have also added a question about difficulty performing bathing [35],[44]. Although assessment of difficulty provides more information about people at earlier stages of disability, additional specification is needed to include assessment of those who need or prefer stand-by assistance to bathe.

Although self-report disability measures are easy to administer, studies have found that they are not strongly related to performance-based measures [60],[61] and they are not as sensitive to early decline [62]. Therefore, the use of performance-based bathing assessments would strengthen studies. Several performance-based activities of daily living assessments exist within the field of rehabilitation [63-66]. The Functional Independence Measure (FIM), part of the Uniform Data System for Medical Rehabilitation, is one of the most widely-accepted measures used to track progress of rehabilitation clients [59]. Although two intervention studies in this review used the FIM as an outcome measure [50],[53], the bathing item was subsumed in an entire score on a ‘motor’ subscale and thus it is impossible to know how much bathing itself has changed or which sub-tasks were improved.

The Performance Assessment of Self-Care Skills (PASS) [66] may be a particularly good tool to examine bathing disability. This criterion-referenced assessment has established reliability (test-retest and inter-rater) and validity (content and construct) [67] and measures the amount of physical and cognitive assistance needed to perform bathing sub-tasks as well as safety and adequacy of performance. Bathing performance is graded according to a hierarchy of assistance: verbal cueing (supportive, non-directive, directive), gestures, environmental set-up, demonstration, physical guidance, physical support, and total assistance. Performance-based measures are important to incorporate in bathing studies in order to better quantify the P-E-O interaction in bathing and to more precisely measure the effectiveness of bathing interventions.

For older adults with dementia (who require assistance and whose function is not expected to improve), research studies have assessed the P-E-O interaction by examining caregiver burden and problems that cannot be articulated by clients themselves (i.e., behaviours) [48],[58]. In addition, goals were identified for bathing interventions that include improving the client-caregiver interaction and increasing the quality of bathing.

Conclusions

There is a dearth of bathing research on community-living older adults and high quality bathing intervention studies are needed. Using the P-E-O model to examine bathing disability research has revealed many areas of

bathing disability that have been unexplored in the research. Improvements in the assessment of P-E-O interaction in bathing will help to better track bathing outcomes and help to guide remediation and prevention efforts.

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