

What's new about wandering behaviour? An assessment of recent studies

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Problem. The number and quality of studies on wandering and other behaviours has lagged that of biological sciences in the field of dementia research. Recent studies of wandering are examined for quantity, rigour, and findings.

Approach. Medline, CINAHL and PsychInfo were searched systematically for studies of wandering. Research reports were reviewed and data was abstracted to characterise quantity and rigour. Study findings were organised by topic and summarised.

Results. Between 2003 and 2005 inclusive, 47 studies met inclusion criteria. The largest proportion of studies was quantitative and descriptive; an explicit theory or framework guided about half of the studies. Major findings encompassed quantification and description, epidemiology, associated factors, and intervention and management of wandering.

Conclusions. The growing body of research on wandering is becoming more rigorous. Newer measures of wandering have strong psychometric properties. Wandering occurs in multiple dementias and affects patients in larger numbers as dementia worsens. Wandering manifests similarly across cultural/ethnic groups and care settings and is associated with falls and increased mortality. A variety of interventions have been evaluated, but studies lack rigour.

Key words: wandering, dementia, ambulation, spatial disorientation, eloping, getting lost

Several decades of intensive research have produced remarkable gains in our understanding of Alzheimer's disease (AD) and other dementias, gains that are advancing approaches to diagnosis, treatment and even prevention of these devastating conditions. With early priority on pathophysiology, diagnosis and treatment of dementia, study of related behavioural and psychological phenomena initially lagged, even though these factors present major challenges in caring for affected people. More recently, dementia-related behaviours are receiving greater attention from scientists and funding agencies and new knowledge, with potential to guide practice, is emerging. This paper assesses the most current research bearing on wandering, a particularly perplexing and dangerous dementia-related

behaviour. Questions guiding this literature assessment were: (a) how does the quantity and rigour of wandering studies compare to that identified in earlier reviews? (b) How do the latest findings expand our knowledge of wandering?

Method

This literature assessment covers empirical studies containing discrete findings about wandering behaviour published as journal articles during the 3-year period encompassing 2003 through 2005. Studies were identified through electronic searches of Medline, CINAHL and PsychInfo by using the terms wandering, spatial disorientation, getting

Table 1 Characteristics of recent studies of wandering ($n = 47$)

Authors and dates	Design*	n	Participants	Setting	Country
Algase <i>et al.</i> (2004)	1, 3, 10	172	PWD	NH, ALF	US, CA, AU
Algase <i>et al.</i> (2003)	1, 3, 10	178	PWD	NH, ALF	US
Algase <i>et al.</i> (2004)†	1, 3, 5, 10	266	PWD	COMM	US
Aud (2004a)	2, 3, 5	14	ADM	ALF w/o SCU	US
Aud (2004b)	1, 2, 5	62	ELOP	NH, RC	US
Beattie <i>et al.</i> (2005)	1, 3, 5	108	PWD	NH, ALF	US
Beattie <i>et al.</i> (2004)†	1, 7, 9	3	PWD	NH	US
Bennett <i>et al.</i> (2003)	1, 3, 5	299	DLB, C	COMM	AU
Brazil <i>et al.</i> (2003)	1, 3, 5	15	STAFF	LTC	CA
Cherry <i>et al.</i> (2004)	1, 7	42	PWD	HCS	US
Chiu <i>et al.</i> (2005)†	1, 3, 5	116	AD, C	CL	Taiwan
Chiu <i>et al.</i> (2004)	1, 3, 10	116	PWD	CL	Taiwan
Ela (2004)	1, 3, 5	390	N/A	COMM	US
Feliciano <i>et al.</i> (2004)†	1, 7, 9	1	PWD	COMM	US
Fenton <i>et al.</i> (2004)	1, 3, 5	2015	RES	NH	US
Flicker <i>et al.</i> (2003)	1, 3, 6	1629	OW	NH and RC	AU
Heeren <i>et al.</i> (2003)	1, 3, 6	1165	RES	NH	US
Holtzer <i>et al.</i> (2003)	1, 4, 5	236	AD	CL	US
Kalova <i>et al.</i> (2005)	1, 7, 10	48	AD, C	CL	CzR
Katz <i>et al.</i> (2004)†	1, 4, 7	537	PWD	RC	US
Kavcic & Duffy (2003)†	1, 3, 5	26	AD, C	CL	US
Kibayashi & Shojo (2003)	2, 5, 9	2	AD	COMM	Japan
Kincaid & Peacock (2003)	1, 7	14	PWD	NH no SCU	US
La Bella <i>et al.</i> (2004)†	1, 5, 7	1	AD	CL	Italy
Lai & Arthur (2003)	2, 11	N/A	N/A	N/A	Japan
Landi <i>et al.</i> (2004)	1, 7	30	PWD	NH	Italy
Lopez <i>et al.</i> (2003)	1, 3, 5	1155	AD	CL	US
Mapstone <i>et al.</i> (2003)†	1, 3, 5	72	AD, MCI, C	CL	US
McGilton <i>et al.</i> (2003)†	1, 4, 7	32	PWD	NH	CA
Meguro <i>et al.</i> (2004)†	1, 4, 7	34	AD	NH	Japan
Miskelly (2004)	12	47	PWD	H, RC, HM	GB
Monacelli <i>et al.</i> (2003)†	1, 3, 5	101	AD, C	CL	US
Pai & Jacobs (2004)	1, 3, 5	112	AD	CL	Taiwan
Rabinowitz <i>et al.</i> (2004)†	1, 13	643	WA	NH	US, AU, NZ, EU, CA
Rowe & Bennett (2003)	1, 3, 5	93	PWD	COMM	US
Schonfeld (2003)	1, 3, 5	612	ADM/STAFF	ALF	US
Shalek <i>et al.</i> (2004)†	1, 7, 12	20	PWD	NH	US
Siders <i>et al.</i> (2004)	11	31	N/A	N/A	US
Sink <i>et al.</i> (2004)	1, 3, 5	5776	PWD, CG	COMM	US
Song <i>et al.</i> (2003)	1, 3, 10	151	PWD	NH, ALF	US, CA, AU
Suh <i>et al.</i> (2005)	1, 4, 5	252	AD	NH and COMM	Korea
Tanaka <i>et al.</i> (2003)†	1, 3, 5	15	AD, C	UNK	Japan
Uc <i>et al.</i> (2004)	1, 3, 5	168	AD, C	COMM	US
Wagenaar <i>et al.</i> (2003)	1, 3, 5	94	ADM	ALF	US
Ward <i>et al.</i> (2003)	1, 3, 5	50	CG	COMM	AU
Woods <i>et al.</i> (2005)	1, 8	57	PWD, BP	LTC	CA
Yao & Algase (2006)†	1, 3, 5	47	PWD	NH, ALF	US

AD, Alzheimer's disease; ADM, administrators; BP, behavioural problems; C, controls; CG, caregivers; DLB, Dementia, Lewy body type; ELOP, elopers; OW, older women; PWD, persons with dementia; RES, residents; WA, wanderers.

ALF, assisted living facility; CL, clinic; COMM, community; H, hospital; HCS, health care system; NH, nursing home; RES, residential care; SCU, special care unit; UNK, unknown.

AU, Australia; CA, Canada; CzR, Czech Republic; EU, Europe; NZ, New Zealand; US, United States.

*1 = quantitative, 2 = qualitative, 3 = cross-sectional, 4 = longitudinal, 5 = descriptive, 6 = explanatory, 7 = experimental, 8 = clinical trial, 9 = single or multiple case study, 10 = methodological, 11 = integrative review, 12 = pilot/feasibility, 13 = secondary analysis.

†Theory-based study.

lost and eloping as keywords, each combined with the term dementia. Citations published in English and with abstracts were exported to a bibliographic database. Abstracts were reviewed to eliminate duplicates, animal studies and non-research papers, yielding 53 possible studies for review. Full reports of these studies were further screened to confirm inclusion of results specific to wandering, wayfinding, getting lost or eloping and six irrelevant reports were eliminated. In reviewing the 47 eligible studies, design elements and study findings were extracted systematically into a database and sorted. Across studies, design features were described and evaluated; key findings categorized and summarized.

Results

Quantity and rigour of studies on wandering

Of the 47 papers, 20 were published in 2003, 21 in 2004 and only six in 2005, with an overall annual publication rate of about 16 papers. Over half (57%) of the studies were conducted in the USA, but European, Asian and other Pacific rim and North American countries also contributed. As shown in Table 1, studies predominantly had quantitative, cross-sectional, descriptive designs. Experimental designs and clinical trials were also well represented. Methodological, pilot/feasibility and single and multiple case studies; integrative reviews and secondary analyses appeared less frequently. Fewer than half of the studies were framed by an explicit theory or theoretical framework.

Samples were primarily composed of people with dementia and not generally limited to or described in terms of specific dementias, such as AD. Also studied were comparison groups [e.g. young, middle-aged and older adults, and people with mild cognitive impairment (MCI) residents of long-term care settings and administrators of assisted living facilities (ALF)]. Samples were drawn most frequently from residential care facilities (e.g. nursing home, ALF), but inclusion of outpatient and community settings was evident. Very few studies were done in the homes of participants. Sample size varied widely, with the majority of studies having fewer than 100 participants.

Most often clinicians, other staff or family identified wanderers using part of a larger measure of dementia-related behaviours, records or other documents, or by judgment alone. The Algate Wandering Scale or observational means to quantify wandering was used in 10 studies. Another 10 studies used specific measures or tests of spatial disorientation or getting lost. In quantitative studies, data analytic proce-

dures ranged from simple descriptive summary statistics to complex, multivariate analyses.

Although a number of the studies reviewed were theoretically sound and well-designed, several shortcomings were recurrent. Many studies had threats to external validity. Samples were often small, non-random and heterogeneous with regard to dementia type, thereby weakening ability to generalize or apply findings. Other threats to external validity included an unclear or unspecified referent population and low response rates to survey studies. Threats to internal validity included: (a) potential for bias in ratings, (b) some instruments without established psychometrics, (c) insufficiently described methods and (d) interventions with insufficient theoretical and/or empirical support, unknown fidelity, and absent rationale for frequency, duration, or other 'dosing' specifications.

Latest findings

Findings from 47 studies could be grouped into four categories: (a) definition and measurement, (b) epidemiology, (c) factors associated with wandering and (d) intervention and management. Some studies contributed information to more than one category.

Definition and measurement

Six studies produced results in this category and are shown in Table 2. Primarily methodological in purpose, these studies expose a multi-dimensional structure to wandering that encompasses at a minimum the amount of walking or wandering, spatial disorientation and eloping behaviour. Tests or measures for specific dimensions of wandering, specifically amount of walking and spatial disorientation, are also evolving. Findings also reflect a continuing overlap in the conception and measurement of wandering and agitation.

Epidemiology

Main findings from 17 studies addressed epidemiological aspects of wandering and are compiled in Table 3. Studies encompass prevalence estimates, course and consequences or outcomes of wandering. Prevalence is considered within populations by gender, race, setting and country, although population characteristics are not well defined in many studies or consistently reported across them. Detailed information about the nature, emergence and course of wandering co-incident with the nature and progress of dementia continues as a gap in the scientific literature. Studies focused

on outcomes of wandering indicated major risk for fall, elopement and discharge from residential care. Wandering, as well as the dimension of spatial disorientation/getting lost, were risk factors for increased mortality.

Factors associated with wandering were grouped in three categories: specific dementias, cognitive functioning and environmental factors. Findings of these 17 studies are displayed in Table 4. In AD, spatial disorientation was demonstrated in overwhelming proportions, up to 93% of cases. However, it was also found at similarly high rates (67%) in probable Lewy body dementia and other non-specified dementias, as well as at lower rates in those with MCI and older normals. Specific types of visual impairments found in AD were associated with spatial disorientation. Whether these visual impairments or other neurological ones account for the spatial disorientation found in other dementias is not entirely clear. However, an imbalance in neurotransmitters, specifically involving dopamine, is a rival hypothesis with some supporting evidence.

Similarly, cognitive functioning has been examined in relation to wandering and spatial disorientation. Evidence exists that attention deficits, but not memory, play a role. Spatial disorientation, conceived functionally as the degree of a wayfinding effectiveness, was related only to the spatial/navigational aspect of wandering and much less so, if at all, to other domains, such as amount of wandering or eloping behaviours.

The relationship of environmental factors to wandering was the focus of only one study. Given that incoming stimuli initially are processed faster for emotional (over cognitive) value, ambiance or the emotional valence of an environment was examined in relation to amount of walking. Accordingly, the engaging dimension of ambiance was shown

to have an inverse relationship to walking in long-term care settings.

Intervention and/or management was the subject of 16 studies with results compiled in Table 5. These included two integrative reviews about interventions as well as studies of four approaches to treatment and care: environmental modifications, person-focused therapies, drugs and care systems and services. Integrative reviews varied in scope and depth, but agreed that, in the main, few intervention studies to manage wandering were sufficiently rigorous, although the evidence for effectiveness of subjective barriers was mounting. Two studies reviewed in this paper provided additional support for effectiveness of subjective barriers as a form of environmental modification.

Person-focused therapies included a wayfinding intervention, a behavioural communication technique, air mat therapy, exercise and therapeutic touch. Among these, the behavioural communication and the air mat had positive results, therapeutic touch was ineffective and the remaining approaches had limited value. While rigour among these studies was widely variable, person-focused intervention studies were the most likely to have a theoretical basis. Drug studies were limited to resperidone, which appears to have some benefit over placebo in reducing wandering and fall risk at 1 mg/day, but increases fall risk at higher doses. However, no pharmacologic study was double-blind and placebo-controlled. The final group of studies, while grouped as care services systems and services, were quite diverse. One examined adoption of clinical management guidelines for dementia (that specifically addressed wandering among other aspects of dementia care). Another was a feasibility study of a specific tracking technology in hospital, home and residential care settings; a third assessed the

Table 2 Studies addressing Definition and Measurement of Wandering (n = 6)

Author(s)	Date	Findings
Algase D <i>et al.</i>	2003	Among four biomechanical activity recording devices, the StepWatch most closely matched observed wandering behavior and was best tolerated by participants, i.e., was worn for the highest proportion of observation periods. Although staff preferred the Step Sensor, because it was smaller and more easily concealed, its correspondence to observed wandering was low.
Heeren O <i>et al.</i>	2003	Wandering emerged as one factor (3 items) among five within the behavior subscale of the Psychogeriatric Dependency Rating Scale, which was taken to reflect agitation.
Algase D <i>et al.</i>	2004a	Algase Wandering Scale (AWS-V2) was valid and reliable quantifying 4 domains (persistent walking, spatial disorientation, eloping behaviors, shadowing) of wandering in LTC settings.
Algase D <i>et al.</i>	2004b	Psychometric evaluation of the AWS-CV validated the 6-factor tool (persistent walking, repetitive walking, spatial disorientation, eloping behavior, mealtime impulsivity, negative outcomes) for use with community samples.
Chiu Y <i>et al.</i>	2004	The Everyday Spatial Questionnaire for Dementia (patient version) was valid, reliable, theory-based tool for assessing wayfinding difficulty in early AD.
Kalova E <i>et al.</i>	2005	Virtual and real world testing of allothetic and ideothetic orientation yielded similar results.

Table 3 Epidemiological Studies of Wandering (n = 17)

Author(s)	Date	Findings
Holtzer R <i>et al.</i>	2003	Wandering was present in 39 to 57% of patients each year and increased as a function of time and disease progression. Once present, it had a high likelihood of persisting.
Katz I <i>et al.</i>	2004	Wandering was present in 73% of residential care patients with behavioral problems. Fall risk increased with higher degrees of wandering.
Brazil K <i>et al.</i>	2003	Wandering was the second most frequently reported behavior problem in LTC, reported by 28% of respondents. Trying to get to a different place was among behaviors most often seen as disruptive.
Schonfeld L	2003	Wandering was the 4th most frequent problem, reported by 9% of ALF and 5th most difficult, reported by 6.3%. Wanderers resided more often in smaller ALFs but wandering occurred on a greater number of days in larger ones.
Heeren O <i>et al.</i>	2003	Wandering was higher in males.
Ward S <i>et al.</i>	2003	CGs reported wandering in 8% of mild, 14% of moderate, and 12% of severe dementia cases. 34% of carers whose family members wandered considered it a problem.
Flicker L <i>et al.</i>	2003	Wandering was reported in 10% of participants receiving low-level care and in 16% of those with high-level care. No correlation between walking ability and wandering was reported. Wandering was associated with high risk for falling.
Beattie E <i>et al.</i>	2005	No differences were found in 6 dimensions of wandering (persistent walking, specific patterns, spatial disorientation, eloping behavior, attention shifting, negative outcomes) comparing NH and ALF samples, although ALF residents had better motor ability.
Sink K <i>et al.</i>	2004	Wandering was the most prevalent dementia-related behavior within each of three ethnic groups: White (58%), Black (67%), and Latino (63%) Americans. After controlling for multiple confounds, increased risk of wandering was found for Blacks (OR = 1.40; 95% CI = 1.08–1.81, p = 0.012) and Latinos (OR = 1.59; 95% CI = 1.21–2.26, p = 0.009).
Song J <i>et al.</i>	2003	Wandering, measured with the AWS-V2, did not differ in LTC in the US, CA, and AU; differences reported were due to differences in care environments.
Wagenaar D <i>et al.</i>	2003	Administrators reported dementia as the most common mental illness (60%) among ALF residents and wandering (26%) as the second most common problematic behavior. Wandering was also a common cause for denying admission to (43%) and discharging from (43%) an ALF.
Aud M	2004b	Wandering outside building, eloping or repeated eloping attempts were serious safety hazards and a cause for transfer in 100% of the ALFs. Associated behaviors (packing a suitcase, increased wandering, poor wayfinding, intrusion into others space, nighttime wandering) were less serious causes for concern, but could lead to a transfer.
Aud, M	2004a	47% of elopers had a history of elopement attempts, 45% had eloped successfully before, 40% showed intent to elope (looking out windows repeatedly, testing door locks, packing belongings, putting on or carrying a coat, asking for directions) before doing so. Determination and opportunity played a role in succeeding. Factors contributing to successful elopements from ALFs were: lack of effective precautions, lack of awareness of residents' whereabouts by staff, and 3) ineffective use of alarms.
Suh G <i>et al.</i>	2005	Wandering was an independent risk factor for mortality (RR = 1.89, 95% CI = 1/18–3.02, p < 0.05), after controlling for age, dementia severity, MMSE, vascular risk factors, and group (NH, COMM). Wandering remained an independent risk factor for mortality in analyses by group; RR was higher for the NH cohort (RR = 2.18, CI = 1.20–3.96) than it was for the COMM cohort (rr = 1.57, CI = 1.00–2.99).
Ela G	2004	Of 390 instances where search and rescue operations involving a state game/wildlife department, 11 (3%) involved cognitively-impaired older persons.
Rowe M & Bennett V.	2003	Of 93 PWD lost in the community and died, 67% were males; 61% had lived at home, 16% in NH and 21% in ALF. Most died of exposure ((68%), followed by drowning (23%), and other less frequent reasons (injury/falls, hit by vehicle, asphyxiation. 81% became lost on foot, 15% while driving, and 4% when on a normal outing. 40% had left between 9pm and 7am. Only 25% were found within 24 hrs. of leaving; in 1/3 of cases, it took over a week for the person to be found.
Kibayashi K <i>et al.</i>	2003	Two cases of death by hypothermia were due to wandering. In both cases, undressing was explained by dementia and not a "paradoxical undressing" event associated with hypothermia.

intersection of wandering and psychiatric consultation referrals in long-term care. Finally, an Australian study summarized approaches to wandering attempted by family caregivers.

Discussion

When compared with prior systematic reviews of literature on wandering in dementia, the studies published during this

Table 4 Factors associated with wandering (n = 17 studies)

Author(s)	Date	Findings
Specific Dementias (n = 8)		
Kavcic V & Duffy C.	2003	When compared to normal controls, AD patients showed deficits in rapid visual processing and optic flow that may contribute to spatial disorientation.
Monacelli A <i>et al.</i>	2003	93% of patients with AD have spatial disorientation, an inability to link landmarks and routes.
Mapstone M <i>et al.</i>	2003	Spatial disorientation was associated with impaired optic flow in AD patients and in a subset of MCI patients and older normals.
LaBella V <i>et al.</i>	2004	Early signs of spatial disorientation were reported for a case with phenotype of early onset AD and a novel mutation of the presenilin I gene and absence of positive family history.
Pai M & Jacobs J	2004	54% of non-institutionalized AD patients (mean MMSE = 16 ± 7) had topographical disorientation (TD). Those with TD were more likely to have been escorted home by others, be disoriented when away from familiar territory, have a smaller familiar territory range, and have caused worry in caregivers if out alone. Multiple regression showed that a change of residence and duration of AD explained 47% of the variance associated with TD. Those who had been escorted home performed more poorly on the MMSE, CASI, attention, visual construction, language, and orientation tests.
Uc E <i>et al.</i>	2004	AD participants were more likely to make incorrect turns, get lost, and make at-fault errors while driving than normal controls, similar to navigational errors while walking. At-fault safety errors were due to increased cognitive load imposed by a route following task.
Tanaka Y <i>et al.</i>	2003	PET studies revealed an inverse relationship between BEHAVE-AD-FW subscale for behavior (composed of aggressiveness and activity and diurnal rhythm disturbances) estimated binding potential for striatal D2 receptor density, implying that an excess of dopamine may account for behavioral (but not psychiatric symptoms) in AD.
Bennett H <i>et al.</i>	2003	Significant differences in pentagon copying were found across elders with CRD = 0 (39% inaccurate), CDR = 0.5 (43% inaccurate), and those with dementia (67% inaccurate). Lewy body group performed worse as higher CI, differences between pDLB and non-DLB were not significant.
Cognitive Functioning (n = 7)		
Heeren O <i>et al.</i>	2003	Wandering correlated with cognitive impairment but not depression.
Lopez O <i>et al.</i>	2003	Wandering was more frequent in moderate or severe dementia and was associated with agitation and psychosis at all levels of dementia.
Chiu Y <i>et al.</i>	2005	Impaired attention significantly predicted getting lost behavior in familiar and unfamiliar environments.
Algase D <i>et al.</i>	2004b	The spatial disorientation sub-scale of the AWS-CV correlated negatively with four domains of wayfinding effectiveness: both simple and complex wayfinding goals and both analytic and global wayfinding strategies. Wayfinding problems are a component of wandering, but the two are not equivalent.
Kalova E <i>et al.</i>	2005	Allothetic (map-based) orientation and location sequencing are impaired in early AD.
Monacelli A <i>et al.</i>	2003	Spatial disorientation in AD is not related to memory impairment.
Mapstone M <i>et al.</i>	2003	Spatial disorientation was not dependent on impaired memory.
Environmental Factors (n = 1)		
Yao L & Algase D	2005	Ambiance, especially the engaging subscale, had an effect on reducing locomoting behaviors.

narrow time-period suggest increasing scientific interest in wandering behaviour. Having a similar focus and using similar search strategies for the several decades covered by electronic databases up to 1998, Algase (1999) identified 108 studies with any discrete findings about wandering behaviour. A review by Peatfield, Futrell and Cox (2002) that also covered an extended time period surfaced 31 papers meeting narrower inclusion criteria.

While the publication rate increased, studies examined in this review continued dominantly in the vein of quantitative, cross-sectional and descriptive designs. Although descriptive in design, a greater proportion of recent studies were epidemiological in nature and more narrowly focused on specific diseases, neural substrates and cognitive factors

associated with wandering, when compared with a broader range of social and psychological factors reported in earlier reviews. However, the rigour of these recent studies has improved in several areas when compared with those reviewed earlier. Recent methodological work has strengthened markedly the quantification of wandering and related concepts when compared with studies reviewed earlier, where wandering was rarely defined or measured and criteria for identifying wanderers were often absent. A larger number of studies covered in this review were guided by theory or, at least, systematically exploring hypothesized relationships. According to Peatfield *et al.*, only a few studies in their review employed a theoretical framework.

Table 5 Intervention and management of wandering (n = 16)

Author(s)	Date	Findings
Integrative reviews (2 of 16 studies)		
Lai C <i>et al.</i>	2003	Categorized putative etiologies as biomedical, psychosocial, and person-environment interaction models. Concluded that intervention studies generally were weak and no widely effective intervention is available.
Siders C <i>et al.</i>	2004	Identified 6 categories of intervention studies: subjective barriers, walking/exercise/activity, special environments, behavioral techniques, music, and alarms. Concluded that evidence in support of subjective barriers was compelling.
Environmental Modification (n = 2)		
Kincaid C <i>et al.</i>	2003	Mural significantly reduced overall door-testing behaviors. Reductions were also significant for two types of door-testing (calm and team efforts), but were not significant for following others through door or agitated/hostile door testing.
Feliciano L <i>et al.</i>	2004	Cloth barrier reduced entries into a prohibited area from a rate of 7.6 per hour to an average rate of 0.4 per hour across all intervention variations. Redirection alone was not successful without the barrier.
Person-focused Therapies (n = 5)		
McGilton KS <i>et al.</i>	2003	Compared to controls, residents that participated in a wayfinding intervention were better able to find the dining room within 3 mo. of relocation. Benefits were not sustained to 5 mo.
Beattie E <i>et al.</i>	2004	A behavioral communication intervention decreased table-leaving and increased food intake and time at table during meals.
Shalek M <i>et al.</i>	2004	Air mat therapy reduced agitated wandering and agitation pre- and post- intervention. An overall effect on agitation was demonstrated after 10 days air mat therapy.
Landi F <i>et al.</i>	2004	Participation in a moderate intensity exercise program for 4 weeks reduced wandering (and other problem behaviors) from baseline as compared to a control group.
Woods D <i>et al.</i>	2005	Therapeutic touch, as compared to placebo and control conditions, did not reduce searching/wandering, but did reduce pacing/walking, although effect was not significant.
Pharmacological (n = 3)		
Meguro K <i>et al.</i>	2004	Wanderers receiving 1 mg/d of risperidone 1 month after relocation showed decreased daytime sleep, increased nighttime sleep, and fewer hours of wandering compared to wanderers who received usual care.
Katz I <i>et al.</i>	2004	At 1 mg./day, risperidone decreased wandering behavior and decreased fall risk by 70%, especially among wanderers. Higher doses (2 mg.) and low-level wandering increased fall risk.
Rabinowitz J <i>et al.</i>	2004	Risperidone had a significant effect ($p = 0.007$, OR 1.58, CI 1.13–2.21) in reducing wandering, measured as an item from the CMAI. 56.6% of the wanderers improved with risperidone as compared to 45% who received a placebo. When measured with the wandering item from the BEHAVE-AD, the effect was not significant ($p = 0.13$, OR 1.35, CI.92–1.99).
Care Systems and Services (n = 4)		
Ward S <i>et al.</i>	2003	Of all behavioral problems, wandering was the only one that required an “assertive” response from family carers, i.e., involving outsiders, restricting movement, reprimand, medications).
Fenton J <i>et al.</i>	2004	NH residents who were referred for psychiatric consultation had a higher mean for wandering than those not referred. Wandering was not a significant ($p = 0.07$) predictor of psychiatric consultation, whereas aggression and agitation were.
Cherry D <i>et al.</i>	2004	Implementation of Alzheimer’s disease management guidelines increased risk assessment for wandering behavior from 8% prior to 74% post intervention. Social workers conducted 68% (versus 32% by MDs) of these assessments.
Miskelly F	2004	Electronic tagging devices accurately identified wandering events (PWD’s entry into prohibited spaces) in all three settings. Few false alarms. Only one successful removal of device by a participant.

This review also points to several weaker areas within this body of research. Although some definitions and measures of wandering are beginning to be adopted by researchers beyond the originators, more general use of a standard definition, or some consistency in terminology for domains or aspects of wandering is recommended. Also, important is identification of those aspects or amounts of wandering that are hazardous. Further work is also needed to clarify the overlap of wandering and agitation and of both their common and

divergent causes. Similarly, wandering should be differentiated from its outcomes, such as elopement.

Sampling is also a problematic area in the wandering research that limits generalization and application of findings. Samples are still often small and non-random; although a number of recent studies have overcome this limitation, power analyses are seldom reported. Recent samples also frequently heterogeneous regarding the type of dementia. As newer work is beginning to suggest different possible

physiological and cognitive mechanisms to explain wandering and newer measures can now enable studies of various aspects of wandering in relation to these mechanisms, clearer specification of samples to type of dementia (or sub-analyses by type of dementia) will become increasingly important.

Intervention studies continue to be weak, from prior to current reviews. The push for tested interventions is certainly understandable. However, strong intervention studies require substantiated theory and sufficient pilot work to guide intervention design and to target interventions to appropriate populations or sub-groups of wanderers and wandering behaviours. Despite advances in defining wandering, knowledge of aetiology or mechanisms supporting it is yet insufficient to fully specify treatment or intervention strategy based upon them and targeted to the specific aspects of wandering behaviour to be affected. This situation explains why many of the interventions attempted have met with such limited success.

Conclusions

In sum, this review of recent research on wandering behaviour has demonstrated increased scientific interest in the behaviour extending throughout the developed countries, where the ageing demographic reflects the need for information. Evidence for improved quality of studies is clear with regard to testing and measurement for wandering and its dimensions and in the use of guiding theories and hypotheses. Exploration of associated factors is concentrated primarily on the association of wandering to specific dementias and aspects of cognitive functioning. A wide range of intervention studies are reported, but these are often weakened by poor conceptualization and design. Better understanding of the basis for wandering and targeting of specific wandering behaviours and sub-groups of wanderers will improve the outcomes of intervention work.

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