PSYCHOGERIATRICS
The Official Journal of the Japanese Psychogeriatric Society
doi:10.1111/psyg.12143 *PSYCHOGERIATRICS* 2016; **16:** 145–153

REVIEW ARTICLE

Sexual disinhibition and dementia

Gabriele CIPRIANI, Martina ULIVI, Sabrina DANTI, Claudio LUCETTI and Angelo NUTI

Neurology Unit, Versilia Hospital. Lido di Camaiore, Italy

Correspondence: Dr Gabriele Cipriani MD, Ospedale della Versilia, via Aurelia, 55043 Lido di Camaiore, Lucca (Lu), Italy. Email: cprgrl@gmail.com

Received 14 September 2014; revision received 1 April 2015; accepted 18 May 2015.

Conflict of interest: None.

Key words: *dementia, hypersexuality, inappropriate sexual behaviour.*

Abstract

To describe inappropriate sexual behaviour (ISB) observed in patients with dementia, we conducted searches using the Cochrane Library, PubMed, and Web of Science to find relevant articles, chapters, and books published from 1950 to 2014. Search terms used included 'hypersexuality', 'inappropriate sexual behaviors', and 'dementia'. Publications found through this indexed search were reviewed for further relevant references. Sexuality is a human's need to express intimacy, but persons with dementia may not know how to appropriately meet their needs for closeness and intimacy due to their decline in cognition. Generally, the interaction among brain, physical, psychological, and environmental factors can create what we call ISB. The most likely change in the sexual behaviour of a person with dementia is indifference. However, ISB in dementia appear to be of two types—intimacy-seeking and disinhibited—that differ in their association with dementia type, dementia severity and, possibly, other concurrent behavioural disorder. Tensions develop from uncertainties regarding which, or when, behaviours are to be considered 'inappropriate' (i.e. improper) or abnormal. While most ISB occur in the moderate to severe stages of Alzheimer's dementia, they may also be seen in early stages of frontotemporal dementia because of the lack of insight and disinhibition. ISB are often better managed by non-pharmacological means, as patients may be less responsive to psychoactive therapies, but non-pharmacological interventions do not always stop the behaviour.

INTRODUCTION

Sexuality, one of the basic needs in the human experience, influences everyone. Studies have shown that whereas sexual activity decreases in elderly people, sexual interest does not.[1] However, stereotypical thinking, ignorance, and prejudice dominate current views on sexuality in the elderly, and as Kessel points out, sex between elderly people has traditionally been perceived to not exist, to be a topic of humour, or to be morally disgusting or otherwise grotesque.[2] Researchers have shown that regular sexual activity continues through the seventh and eighth decades.[3,4]

As people with dementia experience changes in cognition and judgement, the expression of their sexuality may result in behaviours that are challenging to manage, and concerns that demented patients will display inappropriate sexual behaviour (ISB) are frequently voiced. Occasionally, physical aggression may result if sexual needs are not met. Additionally, the diagnosis of dementia raises some considerations related to sexual behaviour, including the ability to give consent, advances towards unwilling participants, and displays of sexual behaviours in locations or situations not deemed appropriate by society. Ethical dilemmas often arise when balancing safety versus freedom for impaired patients who become incapable of appreciating or respecting moral or legal boundaries. ISB often results in feelings of anxiety, embarrassment, or unease in caregivers, and the result is often disruption in continuity of care for the patient at home, leading to home confinement or placement into a skilled nursing facility. [5]

METHODS

A systematic research (Cochrane Library, PubMed, and Web of Science) on ISB in dementia was conducted for the period from 1950 to 2014. Our search generated the following results: 112 articles using the terms 'inappropriate sexual behavior' and 'dementia'; 32 articles using the terms 'inappropriate sexual behavior' and 'Alzheimer's disease'; 7 articles using the terms 'inappropriate sexual behavior' and 'frontotemporal dementia'; 4 articles using the terms 'inappropriate sexual behavior' and 'vascular dementia'; 2 articles using the terms 'inappropriate sexual behavior' and 'Lewy body disease'; 3 articles using the terms 'inappropriate sexual behavior' and 'Huntington's disease'; 14 articles using the terms 'inappropriate sexual behavior' and 'Kluver-Bucy syndrome'; and 5 articles using the terms 'inappropriate sexual behavior' and 'mild cognitive impairment'. We manually screened the reference list of relevant studies identified.

What is ISB?

There is little consensus on the terminology or classification to employ for ISB (Table 1).[6] According to Bardell *et al*., ISB can be defined as 'overt acts associated with increased libido, or persistent, uninhibited, sexual behaviours directed at oneself or other people',[13] while Johnson *et al*. prefer this definition:[6] 'a verbal or physical act of an explicit, or perceived, sexual nature, which is unacceptable within the social context in which it is carried out'. Prakash *et al*. proposed that ISB displayed by persons with dementia be categorized into 'sex talk', 'sexual acts' and 'implied sexual acts'.[11] 'Sex talk' is the most common and involves the use of inappropriate language that is not consistent with the patient's premorbid personality. 'Sexual acts' include touching, grabbing, exposing, or masturbating in private or public areas, and 'implied sexual acts' include openly reading pornographic material or requesting unusual genital care. For example, one case involved an 85-year-old demented man who, on a daily basis, attempted to have sexual relations with his wife, who resisted verbally. He was unsuccessful in these attempts and would then masturbate for several hours to the point of self-injury.[15]

ISB can also be classified in relation to the object of sexual gratification as 'conventional' (i.e. involving culturally and socially sanctioned interests) and 'unconventional' or 'paraphiliac' (i.e. children, animals, and non-consenting persons).[16] Perceptions of what constitutes appropriate behaviour vary between individuals and might be influenced by a host of factors, such as religious beliefs or prevailing societal views of elderly persons.[17,18] Because sexuality is expressed through means learned by socialization, social context is bound to influence sexual behaviour. All societies have faced the problem of reconciling the need to control sex with the need for adequate expression, and all have solved it by some combination of cultural taboos, permissions, and injunctions. Because sexual behaviour is influenced by socialization, what is deemed 'normal' can vary widely across cultures. In some cultures, sexual activity is considered acceptable only within marriage, although premarital and extramarital sex are also common. Some sexual activities are illegal either universally or in some countries, and some are considered against the norms of a society. For example, sexual activity with a person below the age of consent and sexual assault in general are criminal offenses in most jurisdictions.

Knowledge of dementia and familiarity with patients are important in contextualizing ISB. Behaviours, such as public undressing or genital touching, may be misunderstood as hypersexual when the behaviour may be a result of pain, discomfort, hyperthermia, or attempts to be freed from a restrained environment.[6] Most ISB are related to a patient not considering the contextual environment and feelings of others. Moreover, hypersexuality is often confused with normal sexual needs for sex and intimacy,[9] which can cause a cluster of difficulties that impede a patient's daily care; as a result, caution is needed when evaluating ISB to ensure that events have not been perceived incorrectly. As the majority of elderly patients have been involved in long-lasting relationships and marriages, they may now misidentify the appropriateness of the situation because of their overall cognitive decline.[19] Therefore, 'inappropriateness' may derive from the disapproving attitudes and judgements of observers (clinicians, nurses and other staff, family, other residents) rather than the behaviours per se.[17]

Some words about aetiology

Generally, the interaction among brain, physical, psychological, and environmental factors can create ISB.[20] Neuroscience can provide a better

Table 1 Terminology and classification of ISB

References	Category of definition	Definition of ISB	Main focus	Social context in which ISB happens	Neurological conditions to which IBS definition is linked	Applies to resident or inpatients
Zeiss *et al*. 1996[7]	Specific sexual behaviour	Overt acts with sexual meaning	Difference between IBS, sexually appropriate behaviour, and sexually ambiguous behaviour	Considered inappropriate if public; inappropriateness depends if caregiver has no interest in sexuality	Dementia syndromes (men)	Yes
Nagaratnam & Gayagay[8]	Aberrant behaviour	Cuddling, touching of the genitals, sexual remarks propositioning, grabbing and groping, use of obscene language, and masturbating without shame	Description of sexual expression of elderly living in nursing care facilities	Not considered	Cerebral infarctions, Alzheimer's disease, and Parkinson's diseases	Yes
Black *et al*.[9]	Disruptive behaviour	Uncommon behavioural disturbances	Consequences of IBS because their interference with the provision of care	Not considered	Dementia syndromes	Yes
Johnson *et al*.[6]	Disruptive behaviour	Verbal or physical act of an explicit, or perceived, sexual nature, which is unacceptable within the social context in which it is carried out	Definition and quantification of ISB; the absence of standardized tools to record ISB	Considered as unacceptable in the social context it takes place	Acquired brain injuries and dementia syndromes	Yes
De Medeiros *et al*. 2008[10]	Specific sexual behaviour	Sexual disinhibited behaviours marked by apparent loss of control or intimacy seeking misplaced in social context/ directed towards wrong target; behaviours not sexual in their forms but in their suggestions	Intimacy-seeking and disinhibited sexual behaviour	Inappropriateness depends on observers	Alzheimer's disease and other dementias	Yes
Prakash *et al*.[11]	Disruptive behaviour	Sex talk, sexual acts, or implied sexual acts	Difference between IBS and other behavioural issues; treatment of IBS	Considered as inappropriate in both private and public	Dementia with Lewy bodies	Not only
Wallace & Safer[5]	Hypersexual behaviour	Persistent, uninhibited sexual behaviours directed at oneself or at others	Logistical and ethical problem as consequences of IBS	Inappropriateness depends on observers	Dementia syndromes	Not only
Tsatali *et al*. 2010[12]	Disinhibited behaviour	Vigorous sexual drive that interferes with normal activities or is pursued at inconvenient times and with unwilling partners	Differences between IBS and hypersexuality	Considered as unacceptable in the social context it takes place	Dementia syndromes	Not only
Bardell *et al*.[13]	Disruptive behaviour	Overt acts associated with increased libido; persistent, uninhibited, sexual behaviours directed at oneself or other people	Phenomenology of ISB in the geriatric population; treatment of IBS	Not considered	Frontal lobe stroke and dementia syndromes	Yes
Fabà & Villar 2013[14]	Complex behaviour	The one proposed by Johnson *et al*.,[6] expanded with the one proposed by De Medeiros *et al*. 2008	Difference between IBS and hypersexuality; lack of universally accepted definition of IBS	Inappropriateness depends on observers	Frontal lobe stroke and dementia syndromes	Not only

ISB, inappropriate sexual behaviour.

understanding of the behavioural mechanisms involved in human sex, and ISB usually has a biological origin because disinhibited behaviour, cognitive problems, and disorganization are core features of dementia. Several neuroanatomical structures have been implicated in sexual motivation and behaviour, and their insults can produce drastic changes in sexual behaviour. Sexual appetite can be elicited from different sources—visual, auditory, olfactory, somatosensory, and even cognitive. For example, positron emission tomography was used to identify activation in men after exposure to sexually explicit, humorous, or emotionally neutral film clips. Sexual arousal was associated with bilateral activation of the inferior temporal cortex, the right insular and inferior frontal cortex, and the left anterior cingulate cortex.[21] These areas are related to the limbic system, and the degree of activation correlates with plasma testosterone levels.

Four brain systems have been implicated in the neurobiology of ISB: the frontal lobes, the temporolimbic system, the striatum, and the hypothalamus. Specifically, frontal lobe dysfunction may lead to alterations of the inhibitory mechanisms of sexual behaviour, while temporal lobe dysfunctions may involve problems regarding the emotional and intellectual interpretation of one's sexual arousal.[5] Some sexual behaviours are associated with lesions of the corticostriatal circuits, and they have been theorized as being obsessive-compulsive in nature.[22] Lesions on the hypothalamus can lead to an increase in sexual behaviours.[23]

Additionally, neuroendocrine and neurochemical systems modulate responses to sexual stimulation. Human and animal sexual behaviour have been extensively studied from the standpoint of sexual hormones. Endocrine factors include androgens, oestrogens, progesterone, prolactin, oxytocin, cortisol, and pheromones; neurotransmitters and neuropeptides include nitric oxide, serotonin, dopamine, adrenaline, noradrenaline, opioids, acetylcholine, histamine, and gamma-aminobutyric acid.[24] The appearance of ISB in people with dementia has also been linked to the use of certain psychoactive drugs such as levodopa, benzodiazepine, and alcohol.[25]

Apart from neurobiological factors, the emergence of ISB among those with dementia has also been related to psychosocial factors. Lack of privacy, restrictive attitudes, and social cues may result in inappropriate behaviours.[26] Another possibility is the person with dementia mistakes someone for his or her partner and tries to make sexual advances on that person,[27] or he or she could misinterpret cues such as those seen on television or in opposite-gender carers.[25]

Sexually inappropriate behaviour and dementia

The most likely change in the sexual behaviour of a person with dementia is indifference (or apathy),[28] but disturbing behaviour or ISB should be seen as a part of the symptom cluster of behavioural disturbances associated with dementia. Studies of the prevalence of sexually disinhibited behaviour in people with dementia reportedly range from 4–5% to 25%,[29–32] with a higher prevalence found in residents of skilled nursing facilities than in community-dwelling people.[33] In part, this may be because of the effect of direct observation by nursing home staff, family members of community-dwelling people with dementia may underreport incidents because they are either unaware of or embarrassed by such behaviours. ISB frequently co-occur with other behavioural disturbances and are most commonly found in men, although the exact sex ratios are not clear.[34,35] According to one survey,[36] the observed behaviours depended on gender. Specifically, men were more physically aggressive, whereas women were more verbal. Even more important than the prevalence of ISB are its consequences. ISB are not one of the most frequent alterations among dementia patients, and their appearance may have harmful outcomes that affect patients as well as those around them in a particularly intense way.

A significant positive association was found between ISB and severity of dementia.[33] However, ISB was described even in the stage of mild cognitive impairment (9.8%).[34] One group observed correlation with concurrent behaviour disorder, but not with age, dementia duration and severity, and functional status.[28] One report proposed an association of abnormal sexual behaviour with type of dementia, linking 'silent cerebral infarctions' observed on brain computed tomography to disinhibited sexual behaviours in a small case series.[8] Alagiakrishnan *et al*. reported that vascular dementia is more commonly associated with ISB.[34] To determine the prevalence, aetiology, and treatment profile of abnormal sexual behaviour in subjects with dementia in

psychogeriatric practices, they studied a group of cognitively impaired older adults. Only 1.8% ($n = 41$) displayed actions that could be considered IBS. Of these subjects, 54% had vascular dementia, 22% had Alzheimer's disease, and 9.8% had mild cognitive impairment.

Frontotemporal dementia (FTD) is a neurodegenerative disorder characterized by progressive changes in behaviour and personality with a decline in social and personal interaction, emotional blunting, disinhibition, and language disorders in the early stages and more general cognitive decline in the later stages.[37] In the literature, some patients had a history of paedophilic behaviour associated with different lesions in the frontal and temporal lobes.[38] Brain lesions could alter sexual orientation towards children or, alternatively, facilitate or release a paedophilic orientation in predisposed individuals. Rainero *et al*. described the case of a patient with FTD who presented with a history of abnormal sexual behaviour (heterosexual paedophilia) and aggressiveness.[39] Mendez *et al*. reported the case of a 60-year-old, left-handed man hospitalized after stalking, accosting, and attempting to molest children.[40] For 18 months, he followed children home from school in his car and tried to touch them. The patient met the Lund and Manchester criteria for FTD,[41] with a personality change characterized as a progressive decline in social and personal awareness and behavioural changes reflecting decreased judgement and compulsive behaviour. Klüver–Bucy syndrome, described in the late 1930s,[42] is associated with bilateral amygdala lesions and is characterized by a cluster of symptoms including hypersexuality, hyperorality, hypermetamorphosis (excessive exploration of visual stimuli), visual agnosia, apathy, and withdrawal. Patients with FTD are particularly prone to this syndrome.[43,44]

Huntington's disease is an autosomal-dominant, inherited neuropsychiatric disease. It is considered a tripartite neurodegenerative disorder, with motor, cognitive, and psychiatric changes. It has been found to be associated with hypoactive sexual disorder as well as with increased sexual interest and paraphilias.[45] George Huntington described 'two married men with Huntington's disease who [were] constantly making love to some ladies, not seeming to be aware that there [was] any impropriety in it and they never let out an opportunity to flirt with a girl'.[46] Hypersexual behaviour is more commonly observed in men, with reported prevalence rates of 3.9–30.0%, whereas the prevalence rate in women is 2.1–25.0%.[47] Also, sexual aberrations, such as sexual assault, promiscuity, incest, indecent exposure, and voyeurism, have all been described in Huntington's disease.[45,48]

ISB have not been reported adequately in dementia with Lewy bodies. The core features of dementia with Lewy bodies include progressive cognitive decline, fluctuating cognition, the presence of parkinsonian symptoms, and visual hallucinations that are typically recurrent, well-formed and detailed. Prakash *et al*. described ISB in a case of dementia with Lewy bodies with predominant frontal lobe signs.[11] The patient, a 61-year-old woman, would express her sexual wishes to her daughter-in-law. She would say it out very clearly in foul language that she wanted to have sex. Other times, she would try to touch the private parts of her daughter-in-law or would ask her to touch her genitals.

Management

To determine the optimal management of ISB, the evaluation should include a thorough medical history and physical examination, sexual history, and medication review.[25] The history should also cover specifics of the demonstrated behaviour, such as potential precipitants and consequences.[49–51] It is important to know the frequencies of ISB, when and where they occur, and with whom. The treatment of ISB in dementia patients is largely a matter of trial and error.[35] ISB are extremely difficult to manage; drug treatment is reported primarily in case reports, but there are no practice guidelines available for the treatment of abnormal sexual behaviours in the cognitively impaired elderly population. Moreover, no randomized controlled trials have been published to establish the efficacy or safety of the many proposed treatments of ISB, and it is unclear in which order these treatments should be used when patients fail to respond to initial treatments. However, principles of management include carefully documented evaluation, treatment tailored to the individual patient, and initial use of non-pharmacological interventions, even if staff and physicians prefer to treat problematic behaviour with medication because of the ease of administration and perceived efficiency.[52] Tucker describes a number of case studies but concludes that ISB in persons with progressive cognitive impairment is very difficult to treat and urges the use non-pharmacological treatments to prevent unnecessary prescription of

psychotropic medication.[53] When non-pharmacological interventions are only partly effective, psychopharmacological agents may be an option.

Non-pharmacological treatment

In the case of a patient who only displays ISB in certain contexts, it could be hypothesized that those behaviours might be elicited by situational factors, such as excess or insufficient stimulation or participating in activities that may be confusing.[25,26] Non-pharmacological treatments for these behaviours begin with modification of the social cues that are being misinterpreted, which usually leads to a reduction in frequency and intensity of ISB. Common examples of non-pharmacological treatments include removal of precipitating factors and providing opportunities to relieve sexual urges. Distraction with other activities may be a very useful technique for some of the patients.[54] Kamel and Hajjar have suggested practical solutions such as clothing that opens in the back so that it cannot be easily removed, activities that involve the hands to minimize public fondling or masturbation, and affection from family or pets to satiate patients' needs for companionship, love, and intimacy.[55]

Pharmacological treatment

Guay systematically reviewed the published literature on pharmacological therapy for ISB in dementia.[56] The author concluded that antidepressants should be the first-line treatment, with treatments being tried in the following order: (i) selective serotonin re-uptake inhibitors;[57,58] (ii) tricyclic antidepressants;[59] (iii) mirtazapine;[13] (iv) trazodone;[60] (v) anti-androgens; (vi) luteinizing hormone-releasing hormone antagonists; and (vii) oestrogens.[61] Other classes of drugs also reported to be useful include neuroleptics that reduce dopamine,[11,61–63] mood stabilizers,[64,65] gabapentin,[66] pindolol and propanolol.[67,68] One study also points out that cimetidine, which has anti-androgen properties, decreases libido and hypersexual behaviour without serious side-effects.[69] Spironolactone and ketoconazole, non-hormonal anti-androgens, have been shown to be effective in sexual disinhibition treatment of dementia.[29,69] Controversial data exist on the therapeutic influence of cholinesterase inhibitors on sexual disorders (Table 2).[70–72] However, there are neither randomized controlled studies available investigating treatments for ISB nor comparative pharmacological intervention studies.[53]

CONCLUSION

Being elderly and sick does not necessarily mean that there is a decline in sexual desire. Often sexuality in patients with dementia may arise as ISB. Sexual inappropriateness remains one of the least understood and most difficult to treat behavioural issues seen in persons with dementia. Tensions develop from uncertainties regarding which, or when, behaviours are to be considered 'inappropriate' (i.e. improper) or abnormal. Inappropriate behaviour can be defined as any vigorous sexual drive after the onset of dementia that interferes with normal activities of living or is pursued at inconvenient times and with unwilling partners.[73] Giving a specific definition relating to hypersexuality or inappropriate sexual expression is not simple because of the lack of clear criteria including the types and frequency of such behaviours. Also, any definition of such behaviours depends strongly on each observer. We propose the definition by Johnson *et al*.:[6] 'a verbal or physical act of an explicit, or perceived, sexual nature, which is unacceptable within the social context in which it is carried out'.

There is no single well-established explanation for ISB's causes or triggers. ISB usually has a biological origin, as disinhibited behaviour, cognitive problems and disorganization are core features of dementia. Four brain systems have been implicated in the neurobiology of ISB: the frontal lobes, the temporolimbic system, the striatum, and the hypothalamus. Psychosocial factors or psychoactive drugs can also engender sexual disinhibition and hypersexuality.

ISB are often best managed by non-pharmacological means, as patients may be less responsive to psychoactive therapies, but these interventions do not always stop the behaviour. Given the paucity of comparative data, the choice of medication should be based on the individual's medical condition and ability to tolerate potential side-effects.

Health-care providers, including those serving in the community, must be educated to manage this condition. Future scholarly discussion and research is warranted to address this important issue.

Table 2 Pharmachological interventions

Drugs	Mechanism	Adverse effects
Antidepressant drugs (Bardell *et al*.,[13] Stewart & Shin,[57] Chen,[58] Leo & Kim,[59] Simpson & Foster[60])	Decrease libido and possible anti-obsessive effect	
Selective serotonin re-uptake inhibitors (first line-agents)		
Fluoxetine, paroxetine, citalopram		Nausea, tremor, hyponatremia
Mirtazapine		Sedation, weight gain, myelosuppression
Clomipramine		Orthostatic hypotension, urinary retention, constipation, worsening cognition
Trazodone		Sedation, orthostatic hypotension, priapism
Hormonal agents (Alkhalil *et al*.[61])	Reduction in serum testosterone level	
Anti-androgens		
Medroxyprogesterone acetate		Sedation, weight gain, hot flashes, depression, elevated blood glucose
Cyproterone acetate		Gynecomastia, galactorrhoea, elevated blood glucose, depression, osteoporosis,
Finasteride		Gynecomastia, testicular pain, depression
Oestrogens		Weight gain, gynecomastia, venous thromboembolism
Gonadotropin releasing hormone analogues		
Leuprolide, triptorelin, goserelin		Weight pain, bone pain, osteoporosis
Antipsychotics neuroleptics (MacKnight & Rojas-Fernandez,[15] Chen,[58] Kobayashi[63])	Block dopamine receptors	
Haloperidol, quetiapine, risperidone		Sedation, extrapyramidal symptoms, falls, weight gain, arrhythmias
Anticonvulsants (Freymann *et al*.,[64] Lonergan & Luxenberg,[65] Alkhalil *et al*.[66])	Unknown	
Carbamazepine		Sedation, depression, Stevens–Johnson syndrome, agranulocytosis, hyponatremia
Valproate		Tremor, sedation, falls, weight gain, hair loss, empathic dysfunction
Gabapentin		Sedation, depression, ataxia, tremor
Beta-blockers (Jensen[67])	Decrease adrenergic drive	
Pindolol, propranolol		Fatigue, hypotension, bradycardia, bronchospasm, depression
H2-receptor antagonist (Wiseman *et al*.[69])	Anti-androgen action	
Cimetidine		Worsening cognition, dizziness, drug-drug interactions
Potassium-sparing diuretics (Wiseman *et al*.[69])	Anti-androgen action	
Spironolactone		Hyperkalemia, gynecomastia, gastrointestinal ulcers
Antifungals (Wiseman *et al*.[69])	Anti-androgen action	
Ketoconazole		Sedation, headache, rash, photosensitivity, pruritus, hepatotoxicity, gastrointestinal upset
Cholinesterase inhibitors (Alagiakrishnan *et al*.,[70] Chemali,[71] Canevelli *et al*.[72])	Treat symptoms of cognitive impairment—conflicting results	
Rivastigmine, donepezil, galantamine		Nausea, urinary incontinence, syncope, potential for emergence of hypersexuality

REFERENCES

1 Mulligan T, Siddiqi W. Changes in male sexuality. In: Cassel CK, Leipzig RM, Cohen HJ et al, eds. *Geriatric Medicine: An Evidence Based Approach*, 4th edn. New York: Springer-Verlag, 2003; 719–726.

2 Kessel B. Sexuality in the older person. *Age Aging* 2001; **30**: 121–124.

3 Starr BD, Weiner MB. *The Starr-Weiner Report on Sex and Sexuality in Mature Years*. New York: McGraw-Hill, 1981.

4 Marsiglio W, Donnelly D. Sexual relations in later life: a national study of married persons. *J Gerontol* 1991; **46**: S338–S344.

5 Wallace M, Safer M. Hypersexuality among cognitively impaired older adults. *Geriatr Nurs* 2009; **30**: 230–237.

6 Johnson C, Knight C, Alderman N. Challenges associated with the definition and assessment of inappropriate sexual behaviour amongst individuals with an acquired neurological impairment. *Brain Inj* 2006; **20**: 687–693.
7 Zeiss AM, Davies HD, Tinklenberg JR. An observational study of sexual behavior in demented male patients. *J Gerontol A Biol Sci Med Sci* 1996; **51**: M325-9.
8 Nagaratnam N, Gayagay G Jr. Hypersexuality in nursing care facilities—a descriptive study. *Arch Gerontol Geriatr* 2002; **35**: 195–203.
9 Black B, Muralee S, Tampi R. Inappropriate sexual behaviors in dementia. *J Geriatr Psychiatry Neurol* 2005; **18**: 155–162.
10 de Medeiros K, Rosenberg PB, Baker AS, Onyike CU. Improper sexual behaviors in elders with dementia living in residential care. *Dement Geriatr Cogn Disord* 2008; **26**: 370–377.
11 Prakash R, Pathak A, Munda S, Bagati D. Quetiapine effective in treatment of inappropriate sexual behavior of Lewy body disease with predominant frontal lobe signs. *Am J Alzheimers Dis Other Demen* 2009; **24**: 136–140.
12 Tsatali MS, Tsolaki MN, Tessa PC, Papaliagkas VT. The Complex Nature of Inappropriate Sexual Behaviors in Patients with Dementia: Can We Put it into a Frame? *Sexy Disabil* 2011; **29**: 143–146.
13 Bardell A, Lau T, Fedoroff JP. Inappropriate sexual behavior in a geriatric population. *Int Psychogeriatr* 2011; **23**: 1182–1188.
14 Fabà J, Villar F. Dementia and inappropriate sexual behavior (ISB): What we know and what we need to know. Revista Temática Kairós Gerontologia 2013, **16**(1), "Eroticism/Sexuality and Old Age", pp.49–68. Online ISSN 2176-901X. Print ISSN 1516-2567. São Paulo (SP), Brasil: FACHS/NEPE/PEPGG/PUC-SP
15 MacKnight C, Rojas-Fernandez C. Quetiapine for sexually inappropriate behavior in dementia. *J Am Geriatr Soc* 2000; **48**: 707.
16 Kafka MP, Prentky R. Fluoxetine treatment of nonparaphilic sexual addictions and paraphilias in men. *J Clin Psychiatry* 1992; **53**: 351–358.
17 Hajjar RR, Kamel HK. Sex and the nursing home. *Clin Geriatr Med* 2003; **19**: 575–586.
18 Hajjar RR, Kamel HK. Sexuality in the nursing home, part 1: attitudes and barriers to sexual expression. *J Am Med Dir Assoc* 2004; **5** (2 Suppl): S42–S47.
19 Tsatali MS, Tsolaki M, Christodoulou TS, Papaliagkas VT. The complex nature of inappropriate sexual behaviors in patients with dementia: can we put it into a frame? *Sex Disabil* 2011; **29**: 143–156.
20 Vloeberghs E, Van Dam D, Franck F, Staufenbiel M, De Deyn PP. Mood and male sexual behaviour in the APP23 model of Alzheimer's disease. *Behav Brain Res* 2007; **180**: 146–151.
21 Stoléru S, Grégoire MC, Gérard D *et al*. Neuroanatomical correlates of visually evoked sexual arousal in human males. *Arch Sex Behav* 1999; **28**: 1–21.
22 Janati A. Kluver-Bucy syndrome in Huntington's chorea. *J Nerv Ment Dis* 1985; **173**: 632–635.
23 McLean PD. Special award lecture: new findings on brain function and sociosexual behavior. In: Zubin J, Money J, eds. *Contemporary Sexual Behaviors: Critical Issues in the 1970s*. Baltimore, MD: Johns Hopkins University Press, 1973; 53–74.
24 Meston CM, Frohlich PF. The neurobiology of sexual function. *Arch Gen Psychiatry* 2000; **57**: 1012–1030.
25 Series H, Dégano P. Hypersexuality in dementia. *Adv Psychiatr Treat* 2005; **11**: 424–431.
26 Hashmi FH, Krady AL, Qayum F, Grossberg GT. Sexually disinhibited behavior in the cognitively impaired elderly. *Clin Geriatr* 2000; **8**: 631–637.
27 Mayers KS. Inappropriate social and sexual responses to a female student by male patients with dementia and organic brain disorder. *Sex Disabil* 2000; **18**: 143–147.
28 Derouesné C, Guigot J, Chermat V, Winchester N, Lacomblez L. Sexual behavioral changes in Alzheimer disease. *Alzheimer Dis Assoc Disord* 1996; **10**: 86–92.
29 Burns A, Jacoby R, Levy R. Psychiatric phenomena in Alzheimer's disease, IV: disorders of behaviour. *Br J Psychiatry* 1990; **157**: 86–94.
30 Wagner AW, Teri L, Orr-Rainey N. Behavior problems of residents with dementia in special care units. *Alzheimer Dis Assoc Disord* 1995; **9**: 121–127.
31 Szasz G. Sexual incidents in an extended care unit for aged men. *J Am Geriatr Soc* 1983; **31**: 407–411.
32 Ozkan B, Wilkins K, Muralee S, Tampi RR. Pharmacotherapy for inappropriate sexual behaviors in dementia: a systematic review of literature. *Am J Alzheimers Dis Other Demen* 2008; **23**: 344–354.
33 Baikie E. The impact of dementia on marital relationships. *Sex Relat Ther* 2002; **17**: 289–299.
34 Alagiakrishnan K, Lim D, Brahim A *et al*. Sexually inappropriate behaviour in demented elderly people. *Postgrad Med J* 2005; **81**: 463–466.
35 Levitsky AM, Owens NJ. Pharmacologic treatment of hypersexuality and paraphilias in nursing home residents. *J Am Geriatr Soc* 1999; **47**: 231–234.
36 Onishi J, Suzuki Y, Umegaki H *et al*. Behavioral, psychological and physical symptoms in group homes for older adults with dementia. *Int Psychogeriatr* 2006; **18**: 75–86.
37 Cipriani G, Borin G, Vedovello M *et al*. Sociopathic behavior and dementia. *Acta Neurol Belg* 2013; **113**: 111–115.
38 Mendez M, Shapira JS. Pedophilic behavior from brain disease. *J Sex Med* 2011; **8**: 1092–1100.
39 Rainero I, Rubino E, Negro EL *et al*. Heterosexual pedophilia in a frontotemporal dementia patient with a mutation in the progranulin gene. *Biol Psychiatry* 2011; **70**: e43–e44.
40 Mendez MF, Chow T, Ringman J, Twitchell G, Hinkin CH. Pedophilia and temporal lobe disturbances. *J Neuropsychiatry Clin Neurosci* 2000; **12**: 71–76.
41 Miller BL, Ikonte C, Ponton M *et al*. A study of the Lund-Manchester research criteria for frontotemporal dementia: clinical and single-photon emission CT correlations. *Neurology* 1997; **48**: 937–942.
42 Klüver H, Bucy PC. Preliminary analysis of functions of the temporal lobes in monkeys. *Arch Neurol Psychiatry* 1939; **42**: 979.
43 Miller BL, Chang L, Mena I *et al*. Progressive right frontotemporal degeneration: clinical, neuropsychological and SPECT characteristics. *Dementia* 1993; **3**: 204–213.
44 Edwards-Lee T, Miller BL, Benson DF *et al*. The temporal variant of frontotemporal dementia. *Brain* 1997; **120**: 1027–1040.
45 Dewhurst K, Oliver JE, McKnight AL. Socio-psychiatric consequences of Huntington's disease. *Br J Psychiatry* 1970; **116**: 255–258.
46 Huntington G. On chorea. *Med Surg Reporter Philadelphia* 1872; **26**: 317–321.
47 Fedoroff JP, Peyser C, Franz ML, Folstein SE. Sexual disorders in Huntington's disease. *J Neuropsychiatry Clin Neurosci* 1994; **6**: 147–153.

48 Oliver JE. Huntington's chorea in Northamptonshire. *Br J Psychiatry* 1970; **116**: 241–253.
49 Joller P, Gupta N, Seitz DP, Frank C, Gibson M, Gill SS. Approach to inappropriate sexual behaviour in people with dementia. *Can Fam Physician* 2013; **59**: 255–260.
50 Robinson KM. Understanding hypersexuality: a behavioral disorder of dementia. *Home Healthc Nurse* 2003; **21**: 43–47.
51 Buhr GT, White HK. Difficult behaviors in long-term care patients with dementia. *J Am Med Dir Assoc* 2006; **7**: 180–192.
52 Leon AC, Mallinckrodt CH, Chuang-Stein C *et al*. Attrition in randomized controlled clinical trials: methodological issues in psychopharmacology. *Biol Psychol* 2005; **59**: 1001–1005.
53 Tucker I. Management of inappropriate sexual behaviors in dementia: a literature review. *Int Psychogeriatr* 2010; **22**: 683–692.
54 Kamel HK. Sexuality in aging: focus on institutionalized elderly. *Ann Longterm Care* 2001; **9**: 64–72.
55 Kamel HK, Hajjar R. Sexuality in the nursing home. Part 2: managing abnormal behavior- legal and ethical issues. *J Am Med Dir Assoc* 2003; **4**: 203–206.
56 Guay DR. Inappropriate sexual behaviors in cognitively impaired older individuals. *Am J Geriatr Pharmacother* 2008; **6**: 269–288.
57 Stewart JT, Shin KJ. Paroxetina treatment of sexual disinhibition in dementia. *Am J Psychiatry* 1997; **154**: 1474.
58 Chen ST. Treatment of a patient with dementia and inappropriate sexual behavior with citalopram. *Alzheimer Dis Assoc Disord* 2010; **24**: 402–403.
59 Leo RJ, Kim KY. Clomipramine treatment of paraphilia in elderly demented patients. *J Geriatr Psychiatry Neurol* 1995; **8**: 123–124.
60 Simpson DM, Foster D. Improvement in organically disturbed behavior with trazodone treatment. *J Clin Psychiatry* 1986; **47**: 191193.
61 Alkhalil C, Tanvir F, Alkhalil B, Lowenthal DT. Treatment of sexual disinhibition in dementia. Case reports and review of the literature. *Am J Ther* 2004; **11**: 231–235.
62 Tariot PN, Profenno LA, Ismail MS. Efficacy of atypical antipsychotics in elderly patients with dementia. *J Clin Psychiatry* 2004; **65** (Suppl 11): 11–15.
63 Kobayashi T. Effect of haloperidol on a patient with hypersexuality following frontal lobe injury. *Psychogeriatrics* 2004; **4**: 49–52.
64 Freymann N, Michael R, Dodel R, Jessen F. Successful treatment of sexual disinhibition in dementia with carbamazepine. *Pharmacopsychiatry* 2005; **38**: 144–145.
65 Lonergan E, Luxenberg J. Valproate preparations for agitation in dementia. *Cochrane Database Syst Rev* 2009; CD003945.
66 Alkhalil C, Hahar N, Alkhalil B, Zavros G, Lowenthal DT. Can gabapentin be a safe alternative to hormonal therapy in the treatment of inappropriate sexual behavior in demented patients? *Int Urol Nephrol* 2003; **35**: 299–302.
67 Jensen F. Hypersexual agitation in Alzheimer's disease. *J Am Geriatr Soc* 1989; **37**: 917.
68 Ott BR. Leuprolide treatment of sexual aggression in a patient with dementia and the Kluver-Bucy syndrome. *Clin Neuropharmacol* 1995; **18**: 443–447.
69 Wiseman SV, McAuley JW, Freidenberg GR, Freidenberg DL. Hypersexuality in patients with dementia: possible response to cimetidine. *Neurology* 2000; **54**: 2024.
70 Alagiakrishnan K, Sclater A, Robertson D. Role of cholinesterase inhibitor in the management of sexual aggression in an elderly demented woman. *J Am Geriatr Soc* 2003; **51**: 1326.
71 Chemali Z. Donepezil and hypersexuality: a report of two cases. *Prim Psychiatry* 2003; **10**: 78–79.
72 Canevelli M, Talarico G, Tosto G, Troili F, Lenzi GL, Bruno G. Rivastigmine in the treatment of hypersexuality in Alzheimer disease. *Alzheimer Dis Assoc Disord* 2013; **27**: 287–288.
73 Higgins A, Barker P, Begley CM. Hypersexuality and dementia: dealing with inappropriate sexual expression. *Br J Nurs* 2004; **13**: 1330–1334.