Chapter 6

Digital Technologies in Dementia Care

Tiago Coelho
https://orcid.org/0000-0001-7847-2401
School of Health, Center for Rehabilitation Research, Polytechnic Institute of Porto, Portugal

ABSTRACT

Dementia is characterized by significant cognitive deterioration, behavioral and psychological symptoms, and expanding disability. The well-being of people with dementia is influenced by the support provided by caregivers and health professionals. Especially in the past two decades, advancements in digital technology have helped reshape the way care and treatment are delivered. The main goal of the chapter is to describe technological solutions aimed at supporting the independence and safe participation of people with dementia in meaningful activities, as well as promoting their involvement in engaging experiences that seek to delay cognitive decline and diminish behavioral and psychological symptoms. These technologies include distributed systems, robotics, wearable devices, application software, and virtual reality.

INTRODUCTION

Dementia is a syndrome that is characterized by a significant cognitive decline in areas such as memory, language, executive functions, social cognition, psychomotor speed, attention, orientation, and visuoperceptual abilities (Arvanitakis, Shah, & Bennett, 2019; World Health Organization [WHO], 2021). Also known as a neurocognitive disorder, it has different subtypes which are categorized according to their etiology (American Psychiatric Association, 2013). Dementia is usually caused by neurodegenerative conditions, such as Lewy body disease, frontotemporal lobar degeneration, Parkinson's disease, and Alzheimer's disease – which accounts for 60-70% of cases (Gale, Acar, & Daffner, 2018; WHO, 2017). Frequently, these conditions are accompanied by cerebrovascular disease, which contributes to the cognitive impairment (Arvanitakis et al., 2019; Gale et al., 2018). Although dementia affects each person in a different way, depending on the underlying brain pathology, cognitive reserve, among other factors, cognitive deterioration gradually increases during several months or years in most cases, starting by

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causing difficulties in recalling events and facts, learning new information, and communicating, whereas in later stages, an overall severe cognitive impairment is evident (Arvanitakis et al., 2019; WHO, 2012).

In addition to cognitive deficits, nearly all people with dementia (PwD) present neurocognitive disturbances, known as behavioral and psychological symptoms of dementia (BPSD), which, in general, worsen as dementia progresses (Gottesman & Stern, 2019; Savva et al., 2009). These include depression, anxiety, apathy, delusions, irritability, aggressiveness, hallucinations, disinhibition, eating disorders, changes in circadian rhythms, euphoria, agitation, and aberrant motor behavior such as wandering (Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012; Cipriani, Lucetti, Nuti, & Danti, 2014; Savva et al., 2009). Although apathy, agitation, depression, and irritability seem to be the most frequent, BPSD are largely unpredictable and may vary from individual to individual, as well as during the course of dementia (Cerejeira et al., 2012; Gottesman & Stern, 2019; van der Linde et al., 2016). Certain factors such as environmental stressors, pre-morbid personality traits, and difficulty to communicate unmet physiological and psychosocial needs, may contribute to these neuropsychiatric symptoms (Cerejeira et al., 2012; Cohen-Mansfield, Dakheel-Ali, Marx, Thein, & Regier, 2015).

Furthermore, dementia interferes with participation and with the ability to perform activities independently. These functional difficulties usually expand to several areas of occupation over time, considering the progressive nature of the vast majority of dementias (Arrighi, Gélinas, McLaughlin, Buchanan, & Gauthier, 2013; Chung, 2004; Giebel, Challis, & Montaldi, 2015). Indeed, people in early stages of dementia may struggle to execute more complex instrumental activities of daily living – such as shopping or managing medication – and experience difficulties in social participation. However, later stages are characterized by general inactivity and complete disability in all areas, including basic activities of daily living, such as bathing or eating.

In dementia, functional problems are primarily associated with the cognitive deterioration that defines the syndrome. For example: memory deficits may lead PwD to forget appointments or tasks (e.g., feeding pets, turning off an oven); problems in spatial orientation may result in people getting lost and severely impact the ability to participate in the community; and limitations in executive functions (e.g., judgement, planning, interference control, problem-solving, cognitive flexibility, insight) affect goal-oriented behaviors, impairing the performance of complex activities (e.g. driving, managing communication technologies). However, BPSD may also impact participation and occupational performance (Cipriani, Danti, Picchi, Nuti, & Fiorino, 2020; Norton, Malloy, & Salloway, 2001; Saari, Hallikainen, Hintsa, & Koivisto, 2020; Zawacki et al., 2002). For example: apathy and depression frequently result in less motivation, initiative, and persistence regarding participation (Cerejeira et al., 2012; Cipriani et al., 2020); modifications in circadian rhythms reduce the quality of sleep which may impact occupation in several areas (Kuhn, Fulton, & Edelman, 2004; K. M. Rose & Lorenz, 2010); wandering may interfere with the involvement in daily tasks, as well as lead to falls (Ali et al., 2016; Cipriani et al., 2014; Colombo et al., 2001; Volicer, van der Steen, & Frijters, 2013); and hallucinations often impair the performance and completion of several basic activities of daily living (Mok, Chu, Chung, Chan, & Hui, 2004; Rapoport et al., 2001).

Consequently, PwD need assistance from others to fulfill basic needs and to maintain quality of life as long as possible, normally during several years. Support is primarily provided at home by informal caregivers, who are typically family members, often lacking the necessary knowledge and training to successfully perform all care-related tasks and to fully maintain their own health and well-being, in response to the challenges of the role (Chiao, Wu, & Hsiao, 2015; WHO, 2017). Indeed, it is vastly recognized that caregivers of PwD usually experience high levels of physical, psychological, social, and/

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