

Older adults with Alzheimer's disease: a systematic review about the Occupational Therapy intervention in changes of performance skills

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Abstract: Introduction: Older adults with Alzheimer's disease present restrictions on engagement in occupations that may be associated with changes in performance skills. Objective: To identify and analyze the scientific production of Occupational Therapists interventions in the care of older adults with Alzheimer's disease who present changes in performance skills. Method: A systematic review was conducted, in a 10-year period (2006-2015), in English, Portuguese, and Spanish. The Web of Science, MEDLINE/PubMed, CINAHL, PsycINFO®, LILACS, SciELO, OTSeeker, and PEDro databases were used as sources of information. To search, the descriptors "Alzheimer Disease" and "Occupational Therapy" were used, which were combined with "behavior", "environment", "cognition" and "social support", using the boolean operators AND or OR. There were 13 articles identified that met the inclusion criteria selected for deeper analysis: scientific publications related to Alzheimer's disease in older adults, that approach interventions directed to performance skills, with the participation of at least one occupational therapist as an author, and without restrictions on the stage of the disease. Results: No national study was found. The identified interventions are directed toward emotional regulation, motor skills, and procedural skills. In their acting, occupational therapists use route navigation, external aid devices (calendars), computer activities and multisensory stimulation as therapeutic resources that attest the effect of the interventions in motor learning, spatial orientation or in the reduction of neuropsychological symptoms and/or behavioral changes. Conclusion: The publications are related to the intervention practices for the improvement of the older people functional capacity and emotional regulation. However, Brazilian Occupational Therapists face the need to publish interventions to justify the effectiveness of their actions and their insertion in shared professional practice, at the different attention levels to the health of older people.

Keywords: *Occupational Therapy, Alzheimer Disease, Aged, Therapeutics, Scientific and Technical Activities.*

Idosos com doença de Alzheimer: uma revisão sistemática sobre a intervenção da Terapia Ocupacional nas alterações em habilidades de desempenho

Resumo: Introdução: Idosos com Doença de Alzheimer (DA) apresentam restrições para o engajamento em ocupações que podem estar associadas às alterações em habilidades de desempenho. Objetivo: Identificar e analisar produções científicas acerca das intervenções de terapeutas ocupacionais junto a idosos com "Demência de Alzheimer" que apresentaram alterações nas habilidades de desempenho. Método: Foi realizada revisão sistemática da literatura, no período de 10 anos (2006 a 2015), nos idiomas inglês, português e espanhol. Foram utilizadas como fontes de informação as seguintes bases científicas: *Web of Science*, MEDLINE/PubMed, CINAHL, PsycINFO®, LILACS, SciELO, OTseeker e PEDro. Para a busca, utilizaram-se os descritores "Doença de Alzheimer" e "Terapia Ocupacional", que foram combinados com "comportamento", "meio ambiente", "cognição" e "suporte social", utilizando os operadores booleanos "AND" ou "OR". Foram identificados 13 artigos que atenderam aos critérios

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de seleção, tais como: publicações científicas relacionadas à doença de Alzheimer em idosos, que abordassem intervenções direcionadas às habilidades de desempenho, que tivessem participação de pelo menos um terapeuta ocupacional na autoria, e que não existissem restrições em relação à fase da doença. Resultados: Nenhum estudo nacional foi encontrado. As intervenções identificadas foram direcionadas à regulação emocional, habilidades motoras e processuais. Em sua atuação, os terapeutas ocupacionais utilizaram direcionadores de rotas, dispositivos de auxílio externo (calendários), assim como o uso de atividades no computador e estimulação multissensorial; como recursos terapêuticos que atestassem o efeito das intervenções no aprendizado motor, na orientação no espaço ou na diminuição dos sintomas neuropsicológicos e/ou das alterações comportamentais. Conclusão: As publicações estavam relacionadas às práticas interventivas para a melhoria na regulação emocional e na capacidade funcional do idoso. No entanto, os terapeutas ocupacionais brasileiros enfrentaram como desafio, a necessidade de publicar as intervenções para justificar tanto a eficácia de suas ações quanto sua inserção na prática profissional compartilhada, nos diferentes níveis de atenção à saúde do idoso.

Palavras-chave: *Terapia Ocupacional, Doença de Alzheimer, Idoso, Terapêutica, Produção Científica e Tecnológica.*

1 Introduction

The signs and symptoms of the “Alzheimer’s disease” (AD) are related to the decline of multiple cognitive domains, mainly represented by loss of memory, impairment in language and reasoning, as well as a decline in autonomy to make decisions and to complete tasks (GITLIN; CORCORAN, 2005; PADILLA, 2011a). Also, neuropsychiatric symptoms and behavioral changes may also appear such as depression, anxiety, agitation, apathy, hallucinations, inappropriate motor behavior, psychoses, changes in personality, sleep quality, appetite and libido (MACHADO, 2011; CHAVES; PRADO; CAIXETA, 2012).

As a progressive and irreversible evolutionary reference, the older adults are expected to increase restrictions on their occupations (ALZHEIMER’S..., 2013). Difficulties are often represented in a compromise of components of the social participation of the elderly people, defined as performance skills, which are motor, procedural and social interaction skills (AMERICAN..., 2014).

In the older adults with AD, their motor skills impairment such as apraxia can lead to falls, or the need to use mobility assistance products at home and/or in the community (SCHABER; LIEBERMAN, 2010). The loss in procedural skill is represented by the non-recognition of familiar faces (GRIEVE, 2006), problems in sequencing ideas, in maintaining a conversation between friends (MANSUR et al., 2005), and finally difficulties in getting their bearings, with risks of being lost (MACHADO, 2011). Also, emotional dysregulation causes inappropriate behaviors in the social and

home environments (PAULA et al., 2013), which can modify social interactions.

In the occupational therapy area with the older adults with Alzheimer’s, the interventions in the performance skills include behavioral management programs and interventions with a focus on prevention or compensation (SCHABER; LIEBERMAN, 2010). The same authors highlighted that behavior management guides the patient towards socially accepted behaviors as well as instrumentalizes the caregivers in the identification of changed behaviors, to take strategies for emotional regulation. Therefore, preventive or compensatory interventions are performed when there are motor and praxis changes, as well as changes in perceptual skills (SCHABER; LIEBERMAN, 2010).

The objective of this manuscript was to analyze the scientific productions about the process of occupational therapeutic intervention for the elderly people with AD having changes in performance skills. Thus, the guiding question for the research was: What is the impact of interventions - that are directed to changes in performance skills - on the functionality of the elderly person with AD?

2 Method

It was a systematic literature review. In general, the systematic reviews seek to evaluate the scientific evidence available on a subject in a balanced way, as well as the quality of the studies produced. These reviews are recommended for decision-making in the area of evidence-based medicine, in public health topics, and for decision-making in clinical practice (MARTINÉZ-SILVEIRA, 2015). The systematic review allows the analysis of the scientific contribution on a

given topic or issue and facilitates the construction of a theoretical platform, which may generate innovative considerations (MARCONI; LAKATOS, 2009).

The corpus of the study was formed by the national and international scientific productions that evidenced the intervention process of the occupational therapists in the older adults with AD and with changes in performance skills. In this search, the 10-year time cut (2006 to 2015) was adopted. The searches were conducted in January and February 2015 and updated in December 2015.

The selected information sources were Scopus, Web of Science, MEDLINE/PubMed (via National Library of Medicine), Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO®, Latin American and Caribbean Literature in Health Sciences (LILACS), Scientific Electronic Library on Line (SciELO), Occupational Therapy Systematic Evaluation of Evidence (OTseeker) and Physiotherapy Evidence Database (PEDro). The choice of these sources was due to their greater scientific visibility in the multidisciplinary area, including international coverage. Sources from Latin America and the Caribbean were also prioritized since specific databases of occupational therapy or related areas were created.

Regardless of free access to publications, the inclusion criteria for the selection of the articles were: 1) addressing AD in the older adults; 2) including occupational therapy, or who had the participation of occupational therapist in the authorship; 3) providing focus on performance skills; 4) referring to the elderly person at any stage of the disease, without restricting adherence to treatment; and, 5) articles in Portuguese, English, and Spanish. On the other hand, the exclusion criteria were: 1) literature reviews; 2) other types of dementia or other conditions; 3) AD in people under 60 years old; and, 4) abstracts of congresses, annals, editorials and previous notes. The exclusion of these studies occurred many times because it did not contain the complete work.

To define the search terms, the "Descriptors in Health Sciences" (DeCS) were consulted. However, the following descriptors were stipulated: "behavior", "environment" and "cognition", combined with "Alzheimer's disease" and "occupational therapy", associated with their expressions in Portuguese and Spanish. Boolean operators "AND" and "OR" were used for combination. The keyword "social support" was also used. The constructed strategies and search expressions with results are presented in Table 1.

The manuscripts identified were exported to the online EndNote® Web software for storage and organization, starting the process of selecting the research corpus, which is presented in Figure 1.

There were 146 articles identified. After reading the selected articles in full, there were 13 articles attending the entire selection process. Only 28 of the 133 articles excluded in the second phase were eliminated by the methodology used; and 66 were publications that did not involve performance-based interventions, as they were for caregivers and/or to a specific mental function (memory, in most cases). Another 30 articles did not focus on the older adult with AD and/or OT performance. To conclude, five articles were not in the languages provided in the selection criteria and four were not complete articles.

Subsequently, a form was created for the analysis and systematization of the obtained data to organize the results, then submitted to a thematic categorization process. The articles were analyzed considering some points, such as authorship, year of publication, journals used, study objectives, methodological design, occupational therapy actions, outcomes, recommendations or conclusions of the studies. The quality of the studies by level of evidence and levels of recommendation for decision making was based on the study by Medeiros and Stein (2002).

3 Results and Discussion

In this study, the research had 13 articles characterized in Table 2, according to title, authorship, year of publication, place, and journals in which they were published. All the studies reviewed belonged to the international literature and were published in English.

To characterize the corpus of the research, it was observed that most of the studies were published in the last five years, with 10 articles (77%) between 2011 and 2015. Nine articles among these papers presented the occupational therapist (OT) in the main authorship.

The absence of national publications may be a reflection of the most recent aging process in developing countries, - when compared to developed countries that have experienced this phenomenon for many years (VERAS, 2009) - as well as the lack of government incentives in this area research (SILVA, 2012). Despite this reality, both national and international health systems require evidence-based practices, positioning scientific publications as legitimate resources to demonstrate the value of

Table 1. Information Sources, search expressions and results of the identified papers.

Information sources	Search Expressions	Results
CINAHL with Full Text (EBSCO)	("occupational therapy" OR "Occupational therapy/methods") AND ("Alzheimer" OR "Alzheimer disease" OR "Alzheimer's disease") AND ("behavior" OR "environment" OR "cognition" OR "occupation" OR "activities" OR "social support")	59
LILACS	"Alzheimer" [Palavras] and "occupational therapy" [Palavras] OR "Behavior" [Palavras] and "Alzheimer disease" [Palavras] OR "environment" [Palavras] and "Alzheimer disease" [Palavras]	77
MEDLINE/ PubMed (via National Library of Medicine)	((("occupational therapy"[All Fields] OR "Occupational therapy/methods"[All Fields]) AND ("Alzheimer"[All Fields] OR "Alzheimer disease"[All Fields] OR "Alzheimer's disease"[All Fields])) AND ("behavior"[All Fields] OR "environment"[All Fields] OR "cognition"[All Fields] OR "occupation"[All Fields] OR "activities"[All Fields] OR "social support"[All Fields]))	120
OTseeker	("occupational therapy" OR "Occupational therapy/methods") AND ("Alzheimer" OR "Alzheimer disease" OR "Alzheimer's disease") AND ("behavior" OR "environment" OR "cognition" OR "occupation" OR "activities" OR "social support")	09
PsycINFO	Any Field: "occupational therapy" OR "Occupational therapy/methods" AND Any Field: "Alzheimer" OR "Alzheimer disease" OR "Alzheimer's disease" AND Any Field: "behavior" OR "environment" OR "cognition" OR "occupation" OR "activities" OR "social support"	157
PEDro	"Alzheimer" OR "dementia"	31
Scielo Citation Index	Tópico: (occupational therapy) AND Tópico: (Alzheimer disease) OR Tópico: (behavior) AND Tópico: (Alzheimer disease) OR Tópico: (environment) AND Tópico: (Alzheimer disease)	43
Scopus	TITLE-ABS-KEY ("Occupational Therapy" OR "Occupational therapy/methods") AND TITLE-ABS-KEY ("behavior" OR "environment" OR "cognition" OR "occupation" OR "activities" OR "social support") AND TITLE-ABS-KEY ("Alzheimer" OR "Alzheimer disease" OR "Alzheimer's disease")	158
Web of Science	Tópico: ("occupational therapy" OR "Occupational therapy/methods") AND Tópico: ("Alzheimer" OR "Alzheimer disease" OR "Alzheimer's disease") AND Tópico: ("behavior" OR "environment" OR "cognition" OR "occupation" OR "activities" OR "social support")	41
Total of Articles Search		695

Source: The author, 2016.

occupational therapeutic actions, as well as to put pressure on the public policies that will organize the supply of their services to the elderly population (GOERGEN, 1998; BRASIL, 2014).

The analysis of the publications was presented in Table 3, in which the objectives, methodological designs, therapeutic resources, outcomes and limitations of each study were described.

The results showed a focus on the interventions directed to the older adults that presented changes in getting their bearings, motor skills, developed together with those who presented pictures of aggression, depression, irritability and/or apathy, with limitations

to the emotional regulation. Articles 05 and 12 deal with studies on interventions in elderly people with AD that have altered procedural skills, represented mainly by the difficulty of getting their bearings, with risks of being lost even in a familiar environment, or of jeopardizing the safety during the vehicular driving. Technological devices appear as resources that improve spatial orientation and allow greater autonomy for mobility. Two articles focused on motor skills. The first articles are about the gait changes, and the second articles on the motor skills training (n° 03, 10). Repetitive training and health education were the resources to increase motor exercises and to prevent falls, respectively. The other articles were

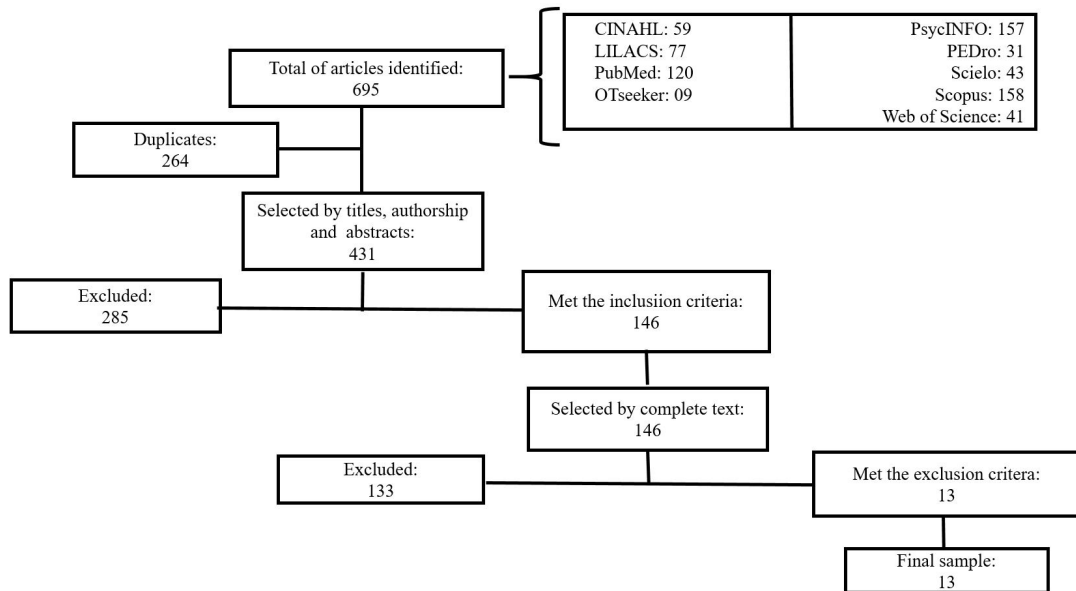


Figure 1. Flow of the selection process. Source: Elaborated by the author, 2016.

focused on social interaction skills, with the aim of achieving better emotional regulation of the elderly person with AD to keep him at full social participation (nº 01, 02, 04, 06, 07, 08, 09, 11, 13). The non-pharmacological resources identified for the improvement of the behavior included clusters of sensorial, motor and cognitive activities. The interventions, their results, and discussion are presented below.

4 Changes in Spatial Guidance

The spatial disorientation - the studies of Grierson et al. (2011) (nº 05) and Yi et al. (2015) (no. 12) performed with the elderly person at an early stage of the disease - showed that the use of the technology (vibration belt and Global Position System (GPS)) allowed the participants to independently carry out the stipulated routes, reducing cognitive demand during mobility in the hospital environment or in a vehicular driving simulator, respectively. Similarly, it was found that GPS, the use of computers with speech synthesizers (that emit the reading of a text) or the computational systems that provide clues for the accomplishment of activities were described in the studies of Anjos and Regolin (2012), as products used for patients who need spatial orientation.

However, the responsibility of the occupational therapist in the use of technologies to assist cognition

was not restricted to the analysis and choice of which practice would be beneficial to the elderly person with AD. Therefore, it is the professional's job to train and monitor their use; because it will be possible to analyze the adequate resource to the context of each patient, as well as its optimization in the cognitive function. Participation in all stages contributed to the maintenance of these assistance devices (ANJOS; REGOLIN, 2012).

In the reviewed studies, failures to perform activities correctly were correlated with the presence of visual stimuli in hospital corridors (GRIERSON et al., 2011), or also when the elderly person had to look at the GPS screen and drive the simulator at the same time (YI et al., 2015). The visual stimulus was pointed out as one of the factors that interfered in the attention and safety, necessary to perform the mobility with independence.

In general, vehicular driving is a recurring theme in international research, because it is a complex activity closely related to independence and mental health (ASIMAKOPOLUS et al., 2012). In fact, vehicular drivers must associate a series of coordinated activities with their hands and feet while receiving visual and auditory information. Drivers need to make decisions based on what they see and hear, as well as being attentive to other drivers, with traffic signs, road conditions and the presence of pedestrians (LAVOOT et al., 2012). The elderly person with Alzheimer's, in the initial phase of

Table 2. Characterization of the research according to the title, year, authors, journals and country.

Nº	Title	Authors/Year	Journal	Country of the Study
01	Efficacy of aromatherapy (lavandula angustifolia) as an intervention for agitated behaviours in Chinese older persons with dementia: a cross-over randomized trial	Lin et al. (2007)	International Journal of Geriatrics Psychiatric	Hong Kong
02	The effects of snoezelen (multi-sensory behavior therapy) and psychiatric care on agitation, apathy, and activities of daily living in dementia patients on a short term geriatric psychiatric inpatient unit	Staal et al. (2007)	International Journal of Psychiatry in Medicine	USA
03	Reduced feedback: motor learning strategy in persons with Alzheimer's disease	Rice et al. (2008)	Physical & Occupational Therapy in Geriatrics	USA
04	Managing agitated behaviour in people with Alzheimer's disease: The role of live music	Cox, Nowak e Buetner (2011)	British Journal of Occupational Therapy	Australia
05	Application of a tactile way-finding device to facilitate navigation in persons with dementia	Grierson et al. (2011)	Assistive Technology	Canada
06	A controlled naturalistic study on a weekly music therapy and activity program on disruptive and depressive behaviors in dementia	Han et al. (2011)	Dementia and Geriatric Cognitive Disorders	Singapore
07	The Efficacy of Nonpharmacological Treatment for Dementia-related Apathy	Ferrero-Arias et al. (2011)	Alzheimer Disease & Associated Disorders	Spain
08	Meeting the needs of caregivers of persons with dementia: an important role for occupational therapy	Piersol, Earland e Herge (2012)	OT Practice	USA
09	Cognitive stimulation in patients with dementia: randomized controlled trial	Mapelli et al. (2013)	Dementia and Geriatric Cognitive Disorders	Italy
10	Preclinical Alzheimer disease and risk of falls	Stark et al. (2013)	Neurology	USA
11	Implementing Interprofessional Evidence-Based Approaches for Older Adults and Their Families	Piersol e Flynn (2014)	Home & Community Health Special Interest Section Quarterly	USA
12	The effect of the global positioning system on the driving performance of people with mild Alzheimer's disease	Yi et al. (2015)	Gerontology	Australia
13	Multistimulation Group Therapy in Alzheimer's Disease promotes changes in brain functioning.	Baglio et al. (2015)	Neurorehabilitation and Neural Repair	Italy

Source: Author's elaboration from the data obtained in the research, 2016.

the disease, deems fit to continue to perform the function of driving (LLOYD et al., 2001).

Different from the perception of the older adult, when evaluating in a first point the performance of drivers with dementia, and in a second moment statistical studies of traffic accidents, the American Academy of Neurology (AAN) published in its guidelines in 2000, that patients with a value of Clinical Dementia Rating 1 (representing mild

dementia) should no longer drive (DUBINSKY; STEIN; LYONS, 2000). However in Brazil, there is no specific recommendation for this population, but Adura (2011) reinforced the adoption of the same American guidelines. The author also stated the need for further studies to verify whether such a recommendation applies to all types of dementia.

Opposite to the recommendation for immediate discontinuation of the driver's license - when

Table 3. Occupational Therapist Interventions for the Performance Skills.

N°	AUTHORS	OBJECTIVES	METHODOLOGICAL DESIGN	RESOURCES USED	OUTCOMES	LIMITATIONS OF THE STUDY
01	Lin et al. (2007)	To verify the efficacy of lavender in the treatment for agitation in patients who presented dementia in Hong Kong.	Randomized clinical trial with cross-over. Participants: 70 older adults, 44 of them with AD. Intervention group: lavender. Control Group: sunflower oil. Frequency: three weeks.	Intervention group: Inhalation of lavender. Group control: Inhalation of sunflower.	1) Lavender reduced agitation, dysphoria, irritability, aberrant motor behavior, and disorientation/nocturnal agitation. 2) There was no significant difference between genders, time of use and sequence of the aromas.	Low sampling. The treatment was not done blindly. There was the influence of other factors (medication, caring relationship of the older adult).
02	Staal et al. (2007)	To evaluate whether standard psychiatric care treatment or non-pharmacological intervention (multisensory behavioral therapy (MSBT)) reduced agitation and apathy, and increased participation in activities of daily living ADL.	Randomized clinical trial. Participants: 24 older adults. Group Intervention: 12 elderly people who received MSBT and standard treatment (medication) Control group: standard treatment and OT.	Intervention group: MSBT (six sessions) Control group: OT activity groups: puzzle games, labyrinth grains, tactile tasks.	1) The intervention group improved significantly in the agitation levels when compared to the control group, as well as a reduction of apathy. 2) There was improvement in the independence in ADL.	Pilot study. The evidence is inconclusive.
03	Rice et al. (2008)	To investigate the effectiveness of motor learning strategies in people with AD, using feedback frequency (KR).	Case-control study Participants: 40 people, 21 with AD and 19 without AD. Frequency: 33 attempts to hit the target in the acquisition phase, five in the retention phase and five in the transfer phase.	Target on computer. The task was to turn the button back and forth to hit a moving target on the computer screen.	1) The performance of participants without AD was better when compared to participants with AD. 2) Participants with reduced feedback had better performance, both in the retention phases and in the transfer of motor learning, when compared to the acquisition phase.	Multiple places of data collection. Computer use was unfamiliar to many, and participants felt intimidated by the computer.

Source: Elaborated by the author, 2016.

Table 3. Continued...

Nº	AUTHORS	OBJECTIVES	METHODOLOGICAL DESIGN	RESOURCES USED	OUTCOMES	LIMITATIONS OF THE STUDY
04	Cox, Nowak e Buettner (2011)	To investigate whether live music reduces the agitation behavior in hospitalized people, and also with AD.	Quase-experimental study. Participants: seven patients. Frequency: three interventions with each older adult. Time: 18 minutes. The interventions happened after two o'clock in the afternoon (more agitation).	Live music	1) During intervention: three participants stopped pacing and remained quiet after the music ceased. There was a reduction of the agitation to move the chairs and in the inspection of drawers and cabinets; but without statistical significance. 2) Negativism ceased in four participants and repetitive issues ceased for three participants. 3) The effects remained after the sessions. 4) The reception facilitated the interest and understanding of what would be done.	Few participants
05	Grierson et al. (2011)	To describe the applicability of the vibratory belt in the older adult with AD during mobility.	Experimental Study. Participants: 12 participants, 11 with mild and moderate AD and 1 with mild cognitive deficit (MCD). Frequency: To perform four routes. Go through each route once in a hospital.	Vibration belt placed at the waist, which reduced the cognitive demand for mobility, since it directed the route. The belt vibrates to provide the following directions: front, back, right side and left side.	1) There were 10 participants able to complete all routes. Those who had many errors on the route had a worse cognitive decline. 2) When there was visual stimulation in the hospital corridors, it suppressed or interfered with attention to the commands produced by the belt. 3) Elderly people with early-stage dementia were able to follow the vibration signals appropriately. They reported feeling confident and comfortable in accomplishing the stipulated routes.	The study suggested that the equipment was not functionally relevant for people with dementia in the moderate stages.

Source: Elaborated by the author, 2016.

Table 3. Continued...

N ^o	AUTHORS	OBJECTIVES	METHODOLOGICAL DESIGN	RESOURCES USED	OUTCOMES	LIMITATIONS OF THE STUDY
06	Han et al. (2011)	To investigate whether the program that associated occupational therapeutic activities and music therapy (MAP) improved the behavioral and depressive symptoms.	Randomized clinical trial. Participants: 43 elderly people, with AD or vascular dementia. Intervention group: 28 elderly people received music therapy (MAP) for six hours a week for eight weeks. Control group: 15 elderly people who did not receive MAP.	Intervention group: MAP: In the morning they performed warming, stretching, walking, gardening, horticulture, massage, interaction with animals and people of different generations; In the afternoon, they participated in live music, cognitive games, and reminiscence. Control group: usual care.	1) MAP participants improved complaints about "feeling alone" "being a burden to others" and "feeling bad and depressed". 2) MAP resulted in a significant improvement in the behavioral and depressive symptoms reported by caregivers. 3) Live music had a positive social effect (smiles and motivation) on participants who were initially resistant.	Small sample size, which limited the validity of the results.
07	Ferrero-Arias et al. (2011)	To determine the usefulness of a non-pharmacological, structured and formal treatment for dementia and apathetic patients.	Randomized controlled trial with cross-over, multicenter, single-blind. Participants: 146 patients (61.3%) Frequency: five times a week for four weeks. 50-minute sessions.	Intervention group: 1 st day: music therapy; 2 nd day: art therapy; 3 rd day: psychomotor activity. Rotating activities were carried out. Control group: TV, games, music, and books.	1) Apathy decreased in the intervention group and increased in the control group. The results were better for mild to moderate apathies. 2) Apathy was correlated with the intensity of cognitive loss and the severity of dementia. 4) Structured intervention was more beneficial than free use of activities in an unstructured environment.	The intervention time was small.

Source: Elaborated by the author, 2016.

Table 3. Continued...

Nº	AUTHORS	OBJECTIVES	METHODOLOGICAL DESIGN	RESOURCES USED	OUTCOMES	LIMITATIONS OF THE STUDY
08	Piersol, Earland e Herge (2012)	To verify that changes in the physical and social environment led to the reduction of behavioral disorders.	Case study. Participant: Caregiver, daughter of an elderly woman with AD. Aggressive and resistant patient to perform the activities.	Guidance on communication activities and strategies. Routine structuring and use of assistive products.	1) Behavioral changes reduced by changing the routine of activities performed in the morning to the afternoon. There was an increase in the elderly's participation in self-care. 2) For the caregiver, the production of care has become less painful.	Single case study.
09	Mapelli et al. (2013)	To investigate the effects of a cognitive stimulation treatment on daily activities and on behavioral and neuropsychiatric symptoms.	Randomized Clinical Trial. Participants: 30 elderly (16 with AD) Frequency: five hours a week, it can be one hour a day. 40 sessions in total.	Experimental Group: cognitive stimulation Placebo group: conventional OT (reading, playing, singing, psychomotricity) Control Group: routine asylum activities.	1) After eight weeks, only the experimental group decreased their dementia severity, and they were identified by the Clinical Dementia Rating (CDR). The other groups did not have any alterations. 2) The experimental group showed a significant decrease in behavioral changes, while the placebo and control groups did not show changes.	No limitations were reported.
10	Stark et al. (2013)	To determine falls in normal elderly person, with preclinical AD.	Prospective cohort. Participants: 125 elderly people Time: 12 months. AD detected by Pittsburgh compound B (PiB) and/or puncture of cerebrospinal fluid to identify the substances: beta 42, tau and phosphorylated tau.	A prepared calendar for recording falls, in which the caregiver or the elderly person monitored and recorded any incidents.	1) Total of 154 falls., Only 75 of these participants had a single episode of fall. 2) PiB high: 75% had at least one fall; PiB low: 60% had fall. 3) Phosphorylated tau without relation to fall. 4) Disorders in gait seemed to be associated or predicted decline in cognitive function.	Sample was homogeneous (white skin color and high education level). Other forms of pathology could be present. Self-reports were used to measure the falls (they could have sub-records).

Source: Elaborated by the author, 2016.

Table 3. Continued...

Nº	AUTHORS	OBJECTIVES	METHODOLOGICAL DESIGN	RESOURCES USED	OUTCOMES	LIMITATIONS OF THE STUDY
11	Piersol e Flynn (2014)	Presenting whether task-focused training would improve independence and behavior.	Case study. Participant: Only one. Older adult with aggressive behavior and lack of safety in the shower.	Modification of the environment (bathroom). Structuring of routines and orientations to the caregiver.	1) There were no reports of independence or greater autonomy in the shower, after treatment. 2) Behavior changes were related to low sugar levels since the patient had uncontrolled diabetes, but it was unrelated to AD. When controlling blood glucose, there were reports of improvement in aggressiveness 3) The caregiver reported that the structuring of the routine also had influence for decrease in the aggressiveness.	A case study. The generalization of the data could not occur.
12	Yi et al. (2015)	To evaluate the effectiveness of different types of GPS (audio, audiovisual, visual only) in vehicular drivers with AD.	Experimental Study. Participants: 28 with early-stage AD. Frequency: once a week, lasting two hours.	STISIM (Systems Technology Incorporated Driving Simulator) e GPS (Global Position System).	gbltm that damage in visual attention may contribute to increased risk of accidents.	No limitations were reported.
13	Baglio et al. (2015)	To verify the effectiveness of Multi Stimulation Therapy (MST).	Randomized univariate clinical trial. Participants: 82 elderly people with dementia. Frequency: 30 sessions, lasting two hours and thirty minutes, three times a week. Follow-up: in the 32 nd week.	Intervention group: MST with cognitive stimulation, recreational activities, and psychomotricity. Control group: usual care.	1) MST participants reduced behavioral changes (depression, anxiety, irritability, aberrant motor behavior) as well as increased cognitive skills (language and memory). 2) The improvement in cognition and behavior remained at the 22 nd -week post-intervention.	The follow-up was held in a very small space to assess if functional gains would actually remain.

Source: Elaborated by the author, 2016.

diagnosing a dementia syndrome - there is evidence that the elderly person can safely drive vehicles in the early stages of dementia, provided there are periodic reassessments and monitoring (APOLINÁRIO, 2012). Yi et al. (2015) (nº 12) still pointed to the repercussions of the driving license, with direct implications in the individual perception about his social role; especially interfering with family obligations and family expectations, as well as independence and engagement in everyday activities.

In the practice of professionals who work in this area, there is still a concern about the performance of this activity in a safe way for the driver, as well as for pedestrians. Considering that the elderly with AD experience memory deficiencies - a decrease in visuosperceptive and visuospatial abilities, visual information processing losses, attention and delay in insights - further studies are needed that can assess how long the elderly driver can continue with his driver's license (BERTOLUCCI, 2006). The high number of external causes (caused in transport) by elderly people with AD must be considered. The studies of this research pointed to the GPS as an external aid resource that could prolong the accomplishment of this activity in a safe way; but on the other hand, these data did not apply to the elderly person in the moderate and advanced stages of the disease.

5 Changes in Motor Skills

The studies of Rice et al. (2008) (nº 03) and Stark et al. (2013) (nº 10) found the acquisition of motor skills.

In study nº 03, the computer was used as a therapeutic resource. It was found that the elderly person with AD in the early and moderate stages had improvements in motor learning (to hit the moving target on the computer) without the need to receive feedback on their performance or necessary recommendations at any time. The results also showed a conscious skill to recall information and retain knowledge.

In the cohort study by Stark et al. (2013) (study nº 10), the intervention was directed to the prevention of falls. In this study, an educational program was used to monitor gait changes in the elderly person, and a calendar was created to record the incidents occurring within a year. Still according to this study, the same was done with elderly people in the prodromal phase of Alzheimer's disease, and

the risk of falls was considered a "predictor" of the decline in cognitive function.

Despite the study by Stark et al. (2013) state that gait disorders may indicate cognitive impairment, Christofoletti et al. (2006) associated a more expressive increase in the risk of falling after the appearance of some symptoms, such as cognitive disorders, visual deficits, lack of activity and general muscular weakness. Therefore, falls are currently a serious public health problem, with a risk of permanent functional limitations and even death. Despite this, incidents are minimally valued and reported by the elderly person and his relatives (MACIEL, 2010). In the study by Carvalho (2000), the risk for the fall followed by a severe fracture increased by 80% for the older adults with dementia, the home environment, and the bathing activity were the places with the highest cases reported.

However, occupational therapists in interdisciplinary action use some intervention strategies to reduce episodes of falls: physical training for balance and strength, guidance for caregivers on factors that can lead to falls, and finally the organization of the home environment (JENSEN; PADILLA, 2011). In elderly patients hospitalized - the use of medication (vitamin D and calcium), exercises, alarms, change in the hospital environment and protection in bed or walker - were used to avoid falls (OLIVER et al., 2007).

Although studies in the literature support these approaches, the randomized trial of Kerse et al. (2004) used the training of caregivers and staffs to prevent the falls in dementia elderly residents of a long-term institution, and these authors pointed out that this approach did not indicate an effect for the prevention of falls. However, the study by Hauer et al. (2006) also pointed to the need to deepen the effect of motor skills training aimed at some points, such as balance, gait speed, flexibility and strength for the prevention of falls. Recently, preventive strategies have been much addressed in studies, but there is still a lack of research to identify whether the strategies adopted in patients with cognitive deficits have the same potential (OLIVER et al., 2007).

Even with the presentation of evidence failures, the theme "Fall Prevention" cannot be overlooked. The falls in elderly people with or without cognitive deficits may have the worsening of the health condition as a consequence, as well as limitations in functional capacities, fragility and even hospitalization

(BRUCE et al., 2016). As a result, there will be a need for greater care by family members, resulting in a high cost for them or for high complexity public health services.

The prevention of falls and osteoporosis in the elderly people are actions foreseen in the "Pact for the Management of the Unified Health System" (SUS) to reduce the number of hospital admissions. These indicators are monitored by the "SUS Violence and Accident Surveillance Project" (VIVA) (CURITIBA, 2015). Thus, it is essential for health teams, including occupational therapists, to implement surveillance strategies for the elderly person who suffers falls, as well as prevention and case identification/monitoring actions.

6 Changes in Emotional Regulation

Most studies identified (01, 02, 04, 06, 07, 08, 09, 11, 13) referred to occupational therapy for elderly people with AD presenting neuropsychiatric symptoms and/or behavioral changes, with the objective of emotional regulation. These symptoms are represented by changes in mood, inappropriate motor behavior, psychoses, changes in personality, sleep quality, appetite and libido (CHAVES; PRADO; CAIXETA, 2012). The management of these disorders was pointed out as the greatest challenge in the treatment of the elderly person with AD (MELLO; FORTUNATO; RODRIGUES, 2012).

There is a consensus that non-pharmacological treatments are more appropriate for behavioral changes. However, when the non-pharmacological approach proves to be inefficient, drug treatment is indicated for the control of these changes (CHAVES; PRADO; CAIXETA, 2012). However, in patients with psychomotor agitation, the medication is introduced immediately, because the intensity of the neuropsychiatric and behavioral symptoms increases with the evolution of the disease (CHAVES; PRADO; CAIXETA, 2012).

With a focus on interventions for behavior management, the study by Baglio et al. (2015) (n°13) pointed to the multidimensional intervention with the accomplishment of leisure activities, psychomotor and cognitive stimulation. These activities were effective in reducing depressive disorders, anxiety, irritability and also in aberrant motor behavior; finally, providing the benefit of the elderly person in the social participation and in the increase of language

and memory. These benefits remained at follow-up for more than 22 weeks. In another example, in the randomized clinical trial of Mapelli et al. (2013) (n°09), cognitive stimulation was associated with a decrease in behavioral changes; although it did not specify which symptoms the participants presented in the pre-intervention.

Regarding research with less scientific evidence, the case studies of Piersol, Earland, and Herge (2012) (n°08) and Piersol and Flynn (2014) (n°11) used as a resource the following considerations: changes in the physical and social environment as well as the structuring of routines. After the intervention, the reduction of the stress environment and the routine organization of the elderly person with AD were associated with a decrease in aggressiveness. Despite the positive evidence on the structuring of routine behavioral management in the identified studies, researchers pointed to a weak association between these two variables (SCHABER; LIEBERMAN, 2010). There was no way to counteract the previous evaluation with the effects of changes in the routines of the elderly due to the lower scientific rigor of the publications found (case studies).

Lin et al. (2007) (n° 01) used emanating lavender or sunflower oil in the home environment as a therapeutic resource, during the nocturnal period. Inhalation of lavender was associated with reduced agitation, irritability, and aberrant motor behavior. However, the limitation of the study was attributed to the small number of the sample and the possible presence of patients with olfaction loss (anosmia).

In a randomized trial, Han et al. (2011) (n° 06) used an environment with music associated to the program of activities programmed by occupational therapy, and among the activities, they stood out: hiking, gardening, interaction with animals, among others. In this study, music was associated with increased interaction and improved motivation. Music along with the occupational therapy program was also related to the decrease of inappropriate behaviors and depressive symptoms (HAN et al., 2011).

It is identified in the literature that music has the potential to involve several aspects of the person, such as the motor, sensitive, sensory, cognitive, social and emotional components (COX; NOWAK; BUETTNER, 2011). In another randomized clinical trial, Ferrero-Arias et al. (2011) (n°7) made a selection between the approaches of music therapy, art therapy and psychomotricity and the results pointed to the

improvement of apathy in the “intervention group” when compared to the “control group”. Although these results are interesting, it was not possible to know which of the three features used had the most effect on behavior change. The relationship of music with increased patient motivation and reduced behavior of agitation and aggressiveness was also presented in the study by Cox, Nowak e Buettner (2011) (nº04).

Regarding the study by Staal et al. (2007) (nº 02), these authors presented the results of their pilot study, in which the “control group” received psychiatric care, while the conventional therapy and the “intervention group” received the same medical care, but with sessions of multisensory behavioral therapy (also performed by occupational therapy). This therapy was performed in an environment with several controlled sensorial stimuli (music, aroma, light, tactile stimulation, among others); and the results of the pilot study revealed that the group in which the modifications occurred in the environment, that is, the intervention, significantly improved the levels of agitation and apathy. This group also presented higher levels of independence to perform the activities of daily living, if compared to the “control group”. Given that the results originated from a pilot study, the sample was small, and the data could not be generalized.

Therefore, some studies have shown benefits derived from the use of music or a structured sensorial environment to improve the behavioral symptoms of people with dementia. Therefore, a systematic review study on non-pharmacological interventions to reduce neuropsychiatric and behavioral symptoms has shown modest scientific evidence on its effects with aromatherapy, phototherapy, ambient music and multisensory stimulation interventions (PADILLA, 2011b).

Multisensory intervention, using a variety of objects, materials, and games of interest to the patient is lately indicated as the most effective strategy to reduce agitation (PADILLA, 2011b). Kim et al. (2012) agreed with the evidence that sensory stimulation improved behavioral problems. However, they reported that environmental changes appeared to not improve depressive symptoms or other behavioral problems, different from Graff et al. (2007) that indicated improvement in the mood of the elderly person.

However, the use of an environment with sensory stimulation has proved beneficial in the life of the

older adults, and it has been documented in the scientific community as a relief to behavioral problems, even with authors claiming that their evidence was modest (PADILLA, 2011b). In the study with the use of lavender as a therapeutic resource, there were failures in its conduction; although it has benefits in reducing behavioral changes. This article was in line with the caution established by the systematic review of Padilla (2011b) since the reviewed publications presented several limitations that may have compromised the presented results. Thus, more scientific research was needed to establish the real benefits of using aromatherapy in this population.

Therefore, interventions for the sleep routine were not found in this review. It is known that the difficulties presented by the elderly people with AD during sleep refer to less sleep time, or to stay awake at dawn (MCCLEERY; COHEN; SHARPLEY, 2014). This behavior implies limitations to other occupations, since sleep cannot be considered “restorative”, and in general, the lack of it causes fatigue and discouragement to perform other daily activities. Also, the fact that the “main caregiver” is always on alert, with more wear and stress of the person who assumed this role is highlighted. Due to the repercussions of sleep disorders on the life of the elderly person, as well as his families, there was a need for new studies investigating the possibilities of non-drug treatment for the target population of this research.

7 Final Considerations

Current scientific evidence has shown that technologies can substantially improve spatial guidance and also preserve the autonomy and safety of older adults with AD during their mobility, as well as contribute to less concern and stress of caregivers. Regarding the motor skills, repetitive training and the educational program for the wake of motor alterations seemed to contribute to motor learning, cognitive decline or fall prevention. For the elderly who present neuropsychiatric and/or behavioral changes aimed at emotional regulation, multidimensional techniques have been adopted, such as aromatherapy, music and multisensory stimulation. Nonetheless, emotional regulation interventions (except the multidimensional technique) were cautiously recommended for the failures that occurred in the conduction of these studies. Therefore, studies of greater scientific evidence and verification of the

effect of these techniques in the post-intervention were recommended, since they greatly favored the consolidation of occupational therapy specific knowledge, contributing to the dissemination of this field of action, and also to the elaboration of oriented public policies for active aging.

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