

## **Community Health Infrastructures and Medical Sports Facilities to Prevent AD Disease for Elderly People**

Tilemachos K. Koliopoulos<sup>1</sup>, Panagiotis Kouloumbis<sup>2</sup>, Slavoljub Hilcenko<sup>3</sup>

<sup>1</sup>Managing Director Telegeco Research Center, Collaborator University of West Attica, Athens, Greece.

<sup>2</sup>Telegeco Research Center, Athens, Greece

<sup>3</sup>Akademija Obrazovno-zdravstvenih strukovnih studija, Subotica, Vojvodina, Serbia, Academy of Vocational Studies for Educational and Health Professionals Autonomous, Subotica, Province of Vojvodina, Serbia.

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### **Abstract**

In this study useful solutions are presented focused on managing projects for sustainable development within public health protection and medical sports facilities. Particular analysis is being carried out on renewable energy projects within health tourism and protection of public health. Proposals are made for sustainable development projects of community health building infrastructures related to Alzheimer - Dementia (AD) disease as well as sports facilities related to monitoring of water projects and measures for avoiding environmental health pollution due to particular land uses and anthropogenic activities. Useful conclusions are presented in emerging technologies to protect public health, supporting sustainable development projects for the confrontation of ecological health pollution within water resources and associated medical sports facilities.

**Keywords:** Alzheimer disease (AD); dementia; efficient community health infrastructures; public health protection; sustainable construction designs; water resources; ecological health; lake protection; forest protection; geoinformation utilities; sustainable development; sustainable construction materials; efficient construction facilities; medical sports; health tourism; landfill design; landfill landscape; e-learning utilities; hydraulic projects.

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Contact Author: Tilemachos Koliopoulos, Managing Director Telegeco, collaborator University of West Attica, Egaleo, Athens, Greece, Telephone number: +30-210-7561914, e-mail: t.kol@otenet.gr

## 1. INTRODUCTION

Nowadays, Alzheimer – Dementia Disease (AD) disease is considered as a semantic epidemiologic disease in public health [24, 29, 31, 32, 33, 34, 40, 41, 44, 48, 50, 66, 78, 79, 81]. At the community health level, for example, the AD disease is one of the most important on the planet. Efficient construction infrastructures are necessary to provide assistance in relative health care facilities.

According to the literature review it is clear that Dementia will be cured when we fully understand its causes [24, 29, 31, 32, 33, 40, 41, 48, 78, 79]. The basic theory that has been developed for 15-20 years associates the disease with a protein with toxic properties, beta-amyloid. Preparations have been made in all three directions, which have been given to patients with dementia and have not worked [78, 79].

They have been given to patients with very mild, early symptoms and also not functioning. Now the possibility remains that they will work if given much earlier from the research results that the beta-amyloid deposition process begins perhaps 20 years before the onset of symptoms. Currently, studies are investigated being administered to asymptomatic people over 70 years old, who have been diagnosed with a relative scan for the presence of beta-amyloid. Hopefully, will be found in the next years the answer based on useful research results [32, 33, 40, 41, 48, 66, 78, 79].

## 2. UTILITIES AND METHODS - LITERATURE REVIEW

Another reason for dementia is apnea. Apnea creates dementia. The aggravating factor is apnea, during which the airways are closed, 200 or even 300 times a night, the vessels do not oxygenate, the person wakes

up constantly, which provokes several instabilities in human health. Moreover, depression, which comes from the degeneration of mood-control areas, also creates dementia [24, 31, 32, 33, 40, 41, 44, 48, 66, 78, 80].

Moreover, new paths are coming up based on research results to approach the causes of the AD disease. Several results from innovative research programs are useful to confront dementia. So far they have had two ways of identifying the causes. Through experimental animals (have been created Alzheimer's mice) and through molecular imaging with a PET scan. They have treated thousands of mice with Alzheimer's, with drugs that do not help humans. On the other hand, with imaging methods they reach a resolution of 2-5mm, but the molecular alterations are much smaller. The relative research projects are approaches that allow future personalized treatment providing solutions to AD disease [32, 40, 41, 44, 48, 50, 78, 79, 80].

However, efficient sustainable designs are necessary for patients with AD disease in community health buildings; medical sports construction facilities; medical tourism infrastructures; ecological health infrastructures so as to improve their activities, memory and positive behavior so as to avoid any depressions or negative attitudes [3, 5, 21, 22, 23, 24, 27, 30, 96].

Efficient e-learning tools are necessary not only for memory games but also for useful ICTs learning technologies in visual learning and reading materials utilising properly exergames; video games; virtual reality or augmented reality for patients with AD disease [1, 4, 13, 14, 47, 51, 57, 58, 60, 65, 67, 68, 73, 92, 93, 96]. In this way successful training e-learning applications and associated games, exergames will be useful so as to provide particular motivations to patients with AD disease in order to be improved their behavior, memory and healthcare services either on at

natural ecological environments or at artificial ones [1, 4, 13, 14, 19, 42, 43, 45, 54, 55, 56, 61, 62, 63, 64, 69, 70, 71, 72, 82, 83, 84, 85, 90, 91, 94, 97]. Effective landscape construction designs could be realized for medical sports facilities; safe mobility; and alternative types of tourism like health tourism; sports tourism; agricultural tourism and other associated ones. Proper urban planning, construction designs and utilization of geographic information systems could be achieved for landscapes' upgrade and clean technologies for environmental health - qualitative healthcare infrastructures on particular reclamation projects at brownfields; polluted water resources; old closed landfills that could be located next to renewed medical sport facilities and ecological tourism travel destinations like lakes; rivers, forests and coastal zones [2, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 23, 25, 26, 28, 30, 35, 36, 37, 38, 39, 46, 49, 86, 87, 88, 90, 91, 95, 96].

Furthermore, a risk assessment analysis is necessary for decision making not only for public health protection but also for quality management of particular pollutants at ecological health infrastructures. In Table 1, a characteristic case study is presented applying properly geoinformation tools for two characteristic pesticides with different physicochemical properties at Lake Karla in Greece [21]. The two examining pesticides are not carcinogenic. Risk assessment estimations to several environmental pollution and management subjects, most are site specific, with no single preferred method available. The risk reference doses of particular agrochemicals (RfD) can be found based on DEFRA, IRIS and EXTOXNET databases. For non carcinogenic chemicals the risk factor R is  $R=C_{max}/RfD$ , where  $C_{max}$  is the maximum concentration of the examining chemical and RfD the risk reference dose. In figure 1 below is presented the calculation of relative risk factors for examining agrochemicals in Lake Karla [26]. Similar results applying properly geoinformation tools could be achieved for other water resources like Koronia lake [21].

Hence, sustainable designs are necessary within particular water resources and ecological health

infrastructures in Balkan countries that could be rehabilitated properly for medical sports activities related to community health services creating useful activities for patients with AD disease [20,21,23,37,56,94,95].

Agro-chemical	Risk reference Dose RfD mg/kg/day	Maximum agrochemical concentration $C_{max}$ (mg/lit)	Risk factor $R=C_{max}/RfD$	Relative Risk Factor	Ranking
2,4-D	$1*10^{-2}$	$6.45*10^{-2}$	$6.45*10^{-2}$	$1.84*10^{-1}$	1
Atrazine	$3.5*10^{-2}$	$9.99*10^{-3}$	$2.85*10^{-1}$	$8.15*10^{-1}$	2
Total Risk			$3.495*10^{-1}$		

**Table 1. Risk assessment results for efficient hydraulic projects within ecological health infrastructures and public health protection from toxic agrochemicals in lake Karla. Source: [21]**

Based on the above, useful constructions are necessary related to medical sports on how can we prevent dementia. Also, medical tourism infrastructures could be useful so as to have good general health and to maintain the professional activity for elderly people.

Personal athletic and mental exercises from some minutes to some hours are necessary to think and getting on exercise a pension. In case that do not work a relative schedule for athletic – mental exercises then it should be applied to volunteers on a daily basis. Moreover, elderly people could participate in particular activities to read, to walk, to discuss applying useful ICTs, exergames, video games and e-learning tools. They could participate also in particular ecological community health activities in nature supported by family caregivers utilizing proper construction facilities i.e. cycling, running, trekking, swimming, other useful do it yourself activities etc. [14, 24, 29, 46, 55, 56, 57, 59, 60, 62, 63, 92, 96].

Therefore, in order to prevent dementia, first of all, is to have a good general health all the people that participate in relative community health programs. Secondly, to maintain, mainly the elderly people, their personal athletic - mental activity both physically and by the use of proper use of ICTs, geoinformation utilities. They should think through their activities that should never get a pension. And if not work, at least offer a steady daily volunteer work, read, see friends, play bridge or go to church, join groups, practice in several activities useful for them.

Nowadays, there are some 'weapons' against the disease in 2019. However, it is better to take care of the patient at home than in the nursing home. There are medications that make the symptoms milder and a number of psychosocial interventions to improve the quality of life of the patient and caregiver. Because caring for a person with dementia, often for a decade, creates a great deal of stress, the carer has an increased risk of dementia itself when he or she stops providing services. Hence, by interventions that affect the caregiver through the patient and vice versa, should be reduced the burden on the caregiver [3, 24, 29, 32, 33, 48, 66, 78, 80].

However, the most basic is the daily occupation of the patient in clean and safe qualitative eco-health environments applying proper geoinformation tools [5, 21, 24, 81, 73, 83, 85, 86]. Dementia quickly escalates to a person doing nothing. Other interventions increase safety at home and on the road (to get out, drive). In the US, one can test whether one is able to drive. In the US, they are not saying, "you have dementia you do not drive," [29, 58, 78].

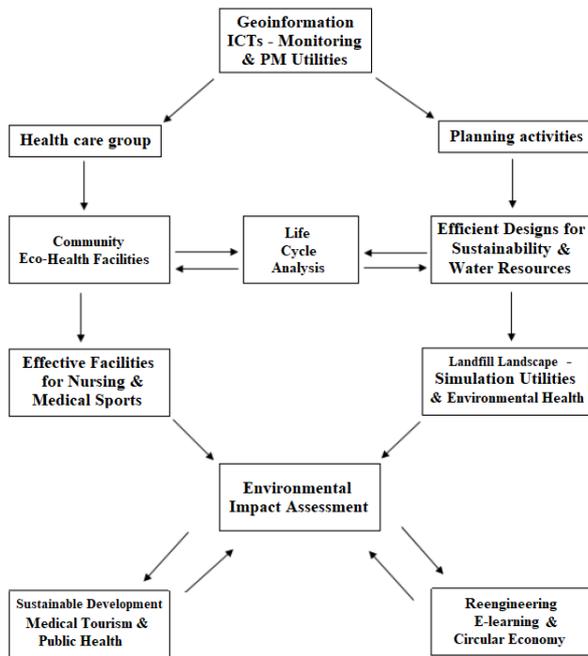
Other interventions reduce neuropsychiatric symptoms. Because it's not just the memory loss, it's the serious apathy, the constant worry (i.e. at 5 in the afternoon he starts walking home and says "I want to go home"), insomnia, because dementia patients tend to be disturbed the circadian (daily) cycle of 24 hours. It takes 25 and 26 hours, and if there is no intervention, one hour is added every day until the

timetable is completely reversed. One of the purposes of sleep is to remove toxins from the brain, one of them being beta-amyloid. Someone who is not asleep has increased amounts of beta-amyloid [78, 79, 80, 81].

### **3. PUBLIC HEALTH FRAMEWORK METHODOLOGY**

Nowadays, the confrontation to dementia is to support proper constructions and geoinformation tools in health care facilities either at home or in the nursing home, community health care center. It is obvious that at home health care support provides some benefits than at nursing home one. In Greece, in Serbia and in other Balkan or nearby Mediterranean countries, health care to elderly people is better because relatives prefer to keep their own at home.

In USA there are outpatient clinics and specialty nursing homes, but they are not enough, they are not free and not all insurance is covered [3, 24, 29, 32, 33, 48, 66, 78]. It is the control of psychiatric factors that influence the development of a serious chronic condition (diabetes, stroke, respiratory, etc.) to improve its course at several hospitals. However, for the past 5-6 years they have been developing teams that control from a psychiatric and psychological standpoint, in collaboration with the physician of basic disease, every patient who is admitted to the hospital, doing psychotherapy, supporting families. When patients are discharged, they are monitored in the outpatient departments. They are trying to introduce the system to primary health care [3, 24, 29, 32, 33, 34, 48, 66, 78, 80].



**Figure 1. Working framework for sustainable development within community health infrastructures and public health protection.**

Furthermore, in Greece, in Serbia and in other Balkan countries or nearby Mediterranean Sea's countries there may be no organized units, but there is the family. Based on the above, in figure 1 is presented a useful working framework that it is necessary for sustainable development within community health infrastructures and public health protection in particular health care services for patients with AD disease or other associated ones. Efficient construction designs and proper geoinformatics tools are necessary for interconnected medicine facilities within medical sports and activities that improve the health of patients with AD disease.

Moreover, innovative reclamation projects at brownfields and closed landfill sites are necessary

for efficient community health infrastructures at upgraded ecological landscapes so as to support ecological health and to protect public health at lakes, rivers, forests or coasts next to them.

In figure 1 the presented working framework should be followed for the right decision making in measures applying properly ICTs, e-learning tools and IoTs that should be taken into account to tackle environmental health pollution so as to ensure the quality of the hygiene environment, ecological health and protect public health at associated community health centres for patients with AD disease. The relative reclamation projects could be combined with proper geoinformation utilities, Ict, IoTs, exergames and e-learning tools for efficient medical sports facilities for patients with AD disease [24, 40, 41, 48, 63, 92, 96].

#### 4. CONCLUSIONS

Proper constructions are necessary for community infrastructures; health facilities; sustainable development; medical sports; alternative types of tourism related to health promotion of innovative construction designs and associated geographic information systems application that enable proper qualitative infrastructures in medical facilities for people with AD disease - demencia. Landfill designs are necessary not only for sustainable energy designs covering particular necessities in circular economy but also for ecological landscape reclamation; development of efficient associated hydraulic projects, and innovative green infrastructures in recreational projects that protect public health and support health care services for patients with AD disease or associated ones.

The latter projects could be combined with proper geoinformation utilities, ICTs, IoTs, exergames, videogames and e-learning tools. In this

way could be promoted travel destinations for integrated medical sports facilities as unique choice for travelers combined with innovative ecological infrastructures next to lakes, forests, rivers or coastal water resources, supporting eco-tourism and sports activities for older people with AD disease. In this way based on the above useful solutions could be provided to elderly people with associated dementia health problems, protecting public health and sustainable development.

Scientists working in teams should take into account all the above so as to achieve common goals. Bearing in mind the above presented working framework it will be useful so as to set up a day care unit for dementia patients for an integrated environmental health protection; sustainable development; efficient health care systems in the society; creation of new jobs; provide innovative opportunities in circular economy and support of emerging clean technologies for challenges in sustainability.

## 5. REFERENCES

- [1] Abdullah Tobaigy, A., Alshehri, M. A., Timmons, S., Farouk Helal, O. (2018). The feasibility of using exergames as a rehabilitation tool: the attitudes, awareness, opinions and experiences of physiotherapists, and older people towards exergames, *J. Phys. Ther. Sci.*, vol. 30, pp. 555–562.
- [2] Amenta ,L., Attademo, A., Remøy, H. , Berruti, G. , Cerreta, M., Formato, E., Palestino, M.F., Russo, M. (2019). Managing the Transition towards Circular Metabolism: Living Labs as a Co-Creation Approach, *J. Urban Planning* , Volume 4, Issue 3, pp. 5–18.
- [3] Burns A, Jacoby R, Levy R (1990). Psychiatric phenomena in Alzheimer's disease, IV: disorders of behavior. *Br J Psychiatry* vol. 157, pp. 86–94.
- [4] Boot, W. R., Kramer, A. F., Simons, D. J., Fabiani, M., & Gratton, G.: The effects of video game playing on attention, memory, and executive control. *Acta Psychologica*, 129(3), 387-398. (2008).
- [5] Babatsikou, F., Koliopoulos, T., Koutis, C., (2017) Efficient Design of a Community Health Infrastructure and Public Health Protection in Emergencies, *Review Clinical Pharmacology and Pharmacokinetics*, International Edition, 31, pp. 79-84, Pharmakon Press.
- [6] Baudhdh, K., Singh, B., Korstad, J. (2017) *Phytoremediation Potential of Bioenergy Plants*, Springer.
- [7] Brimicombe (2003). *GIS, environmental modelling and engineering*. Taylor & Francis, Boston.
- [8] Canter L. (1996). *Environmental Impact Assessment*, McGraw-Hill, New York, USA.
- [9] CEC. (1992). *Landfill Gas from Environment to Energy*, Brussels, Belgium.
- [10] Ciarkowska K, Gambus F, Antonkiewicz J, Koliopoulos T. (2019). Polycyclic aromatic hydrocarbon and heavy metal contents in the urban soils in southern Poland, *J. Chemosphere*, pp. 229:214-226. doi: 10.1016/j.chemosphere.2019.04.209.
- [11] Crowder, D.A., *Google Earth, For Dummies*, 2007.
- [12] Davis M. and Cornwell D. (1998) : *Introduction to environmental engineering*. McGraw Hill Publications

- [13] Ferguson, C., Davidson, P.M., Scott, P.J., Jackson, D., Hickman, L. D. (2016). Augmented reality, virtual reality and gaming: An integral part of nursing, *J. Contemporary Nurse*, pp. 1-6.
- [14] Hanna Wüller,H., Behrens, J., Garthaus,M., Marquard, S., Remmers, H. (2019). A scoping review of augmented reality in nursing, *J. BMC Nursing*, vol. 18:19, pp. 1-11.
- [15] DOE. (1995) : Making Waste Work, White Paper, HMSO, London.
- [16] El-Fadel M.and Massoud M. (2000). Emissions from landfills: A methodology comparative assessment, *J. Environmental Technology*, 21(9), pp. 965-978.
- [17] Elliott P., Briggs D., Morris S., Hoogh C., Hurt C., Jensen T.K., Maitland I., Richardson S., Wakefield J. and Jarup L. (2001). Risk of adverse birth outcomes in populations living near landfill sites, *BMJ*, **323**, pp. 363-368.
- [18] Friis R.H. and Sellers T.A. (2004). *Epidemiology for Public Health Practice*, Jones and Bartlett Publishers.
- [19] Jorgensen, M.G., Laessoe,U., Hendriksen,C. Faurholt Nielsen, O. B. Aagaard, P. (2013). Efficacy of Nintendo Wii Training on Mechanical Leg Muscle Function and Postural Balance in Community-Dwelling Older Adults: A Randomized Controlled Trial, *J Gerontol A Biol Sci Med Sci.*, vol. 68(7), pp. 845–852.
- [20] Kofitsas, J. (2001) *Road Design Elements*, ION press, Athens.
- [21] Koliopoulos, T. (2019). *Environmental Energy Designs – EcoHealth Policy & Economy*, Lambert Academic Publishing, Berlin, Germany.
- [22] Koliopoulos, T., Katsoni, V. (2019). The Innovative Health Tourism’s Environmental Management Sustainable Design Facilities Assessment Capability, Chapter 6, pp. 79-87, In: *Proceedings of: Smart Tourism as a Driver for Culture and Sustainability Fifth International Conference IACuDiT, Athens 2018*, Editors: Katsoni, Vicky, Segarra-Oña, Marival (Eds.), Springer.
- [23] Koliopoulos, T., Katsoni, V. , Radu, C. (2018). Information Tools for Health Tourism’s Sustainability and Safe Mobility, *Emerging Environmental Technologies and Health Protection* (1), ISSN 2623-4874 e-ISSN 2623-4882 , pp. 138 - 146, Telegeco.
- [24] Koliopoulos, T, Babatsikou, F, Koutis, C. (2016). Design Evaluation of a Care Communal Building Facility for People with Alzheimer’s disease. *International Journal of Caring Sciences*, vol. 9 (1), pp. 348-357.
- [25] Koliopoulos, T., Koliopoulou, G. (2007) A diagnostic model for M.S.W landfill's operation and the Protection of Ecosystems with a Spatial Multiple Criteria Analysis – Zakynthos Island Greece, *Wessex Institute of Technology - Book of Transactions on Ecosystems and Sustainable Development*, ed. Tiezzi E., Marques, J.C., Brebbia C.A., Jorgensen S.E., VI, pp. 449-462, W.I.T. Press, U.K.
- [26] Koliopoulos, T., Leonidis, G., Alexiadis, A. (2005). Risk assessment of pesticides’ concentrations in lake Karla, Greece, In *Proceedings of Sozopole 2005 Conference, 31st International Conference on Applications of Mathematics in Engineering and Economics*, Volume 944, Pages 9, Sozopol, Bulgaria.
- [27] Osofero, A.I., Emmanuel Momoh , Mahgoub Salih, Koliopoulos, T. (2018). *Innovative Use of Agricultural Wastes For Eco-Friendly Construction*, Telegeco
- [28] Pivato, A., Vanin, S., Barausse, A., Mangione, G., Rasera, M., and Monego, G., 2013. Biopotentiality as an index of environmental compensation for composting plants. *Waste Managment* 33, 1607-1615. USDA, Natural Resources Conservation Service (Watershed Science

Institute and Wildlife Habitat Management, 1999. Conservation Corridor Planning at the Landscape Level Managing For Wildlife Habitat. United States.

[29] SelwoodaK.JohnstonaC.KatonabC.LyketsoscG.Livingstona (2007). Systematic review of the effect of psychological interventions on family caregivers of people with dementia, *Journal of Affective Disorders* Volume 101, Issues 1–3, pp. 75-89.

[30] Estela Mariné Roig (2014). From the Projected to the Transmitted Image: The 2.0 Construction of Tourist Destination Image and Identity in Catalonia, University of Rovira, Spain.

[31] Rebecca Sims , Nandini Badarinarayan , Rachel Raybould1 , Stefanie HeilmannHeimbach, Maria Vronskaya, Per Hoffmann, Markus M. Nöthen, Wolfgang Maier, Stefan Herms, Andreas J. Forstner, Denise Harold, Rhodri Thomas, Taniesha Morgan, Nicola Denning, Elisa Majounie, Michelle K Lupton, Christopher Medway, Kristelle Brown, Bernadette McGuinness, Petra Proitsi, Pau Pastor, Ana Frank-García, Ina Giegling, Harald Hampel, Patrizia Mecocci, Virginia Boccardi, Martin Scherer, Markus Leber, Steffi Riedel-Heller, Anne Braae, Carlo Masullo, Gianfranco Spalletta, Paola Bossù, Eleonora Sacchinelli, Pascual Sánchez-Juan, Frank Jessen, John Morris, Chris Corcoran, JoAnn Tschanz, Maria Norton, Ron Munger, María J Bullido, Eliecer Coto, Victoria Alvarez, Maura Gallo, Amalia Cecilia Bruni, Martin Dichgans, Daniela Galimberti, Elio Scarpini, Michelangelo Mancuso, Ubaldo Bonuccelli, Antonio Daniele, Gerad/Perdes, Oliver Peters, Benedetta Nacmias, Matthias Riemenschneider, Reinhard Heun, Carol Brayne, David C Rubinsztein, Jose Bras, Rita Guerreiro, John Hardy, Ammar AlChalabi, Christopher E Shaw, John Collinge, David Mann, Magda Tsolaki , Jordi Clarimón, Rebecca Sussams, Simon Lovestone, Michael C O'Donovan1 , Michael J Owen1 , Simon Mead, Clive Holmes, John Powel, Kevin Morgan, Peter Passmore, Dan Rujescu, Sara Ortega-Cubero, John “Keoni” Kauwe, Lesley Jones, Valentina Escott-Price, Peter A Holmans, Alfredo Ramirez, Julie Williams (2017). Rare coding variants in PLCG2, ABI3 and TREM2 implicate microglial-mediated innate immunity in Alzheimer’s disease, *Nat Genet*, 49(9), pp. 1373–1384. doi:10.1038/ng.3916.

[32] Lauretti E1, Iuliano L2, Praticò D1. (2017). Extra-virgin olive oil ameliorates cognition and neuropathology of the 3xTg mice: role of autophagy. *Ann Clin Transl Neurol*. 2017 Jun 21;4(8):564-574. doi: 10.1002/acn3.431. eCollection 2017 Aug.

[33] Lauretti E1, Nenov M1, Dincer O1, Iuliano L2,3, Praticò D1. (2019). Extra virgin olive oil improves synaptic activity, short-term plasticity, memory, and neuropathology in a tauopathy model. *J Aging Cell*. doi: 10.1111/ace.13076.

[34] Al Rihani SB1,2, Darakjian LI1, Kaddoumi A1,2. (2019). Oleocanthal-Rich Extra-Virgin Olive Oil Restores the Blood-Brain Barrier Function through NLRP3 Inflammasome Inhibition Simultaneously with Autophagy Induction in TgSwDI Mice. *J ACS Chem Neurosci*. 2019 Aug 21;10(8):3543-3554. doi: 10.1021/acschemneuro.9b00175

[35] Kris Steen, K., Bueren, E. (2017). Urban Living Labs, Amsterdam Institute for Advanced Metropolitan Solutions, Delft University of Technology.

[36] Kollias, P. (1993) Solid Wastes, Athens, Greece.

[37] Koutsopoulos, K. (2006) Analysis of Space: Theory, Methodology and Techniques, Deenaikais Pubs, Athens, Greece.

[38] Lawrence D. (2003). Environmental Impact Assessment, John Wiley & Sons, New Jersey, USA.

[39] Lewandowski, I., Clifton-Brown, J.C., Scurlock, J., and Huisman, W., (2000). Miscanthus: European experience with a novel energy crop. *Biomass and Bioenergy* 19, pp. 209-227.

[40] Lyketsos CG, Veiel LL, Sheppard JME, Baker A, Steele CS: A randomized, controlled trial of bright light therapy for agitated behaviors in dementia patients residing in long-term care. (1999). *Int. J. Geriatr. Psychiatry*, vol. 14, pp. 520–525.

[41] Lyketsos, C.G., Steinberg, M., Tschanz, J., Norton, M. C., Steffens, D.C., Breitner, J.C.S. (2000). Mental and Behavioral Disturbances in Dementia: Findings From the Cache County Study on Memory in Aging, *Am J Psychiatry*, vol. 157, pp. 708–714.

- [42] Madrigal, E., Prajapati, S., & Hernandez-Prera, J. C. (2016). Introducing a virtual reality experience in anatomic pathology education. *American Journal of Clinical Pathology*, 146(1), pp. 462-468.
- [43] Rosenberg, D., Depp, C. A., Vahia, I. V., Reichstadt, J., Palmer, B. W., Kerr, J., & Jeste, D. V. (2010). Exergames for subsyndromal depression in older adults: A pilot study of a novel intervention. *American Journal of Geriatric Psychiatry*, 18(3), pp. 221-226
- [44] McKeith, I.G., Dickson, D.W., Lowe, J., M. Emre, J.T. O'Brien, H. Feldman, J. Cummings, J.E. Duda, C. Lippa, E.K. Perry, D. Aarsland, H. Arai, C.G. Ballard, B. Boeve, D.J. Burn, D. Costa, T. Del Ser, B. Dubois, D. Galasko, S. Gauthier, C.G. Goetz, E. Gomez-Tortosa, G. Halliday, L.A. Hansen, J. Hardy, T. Iwatsubo, R.N. Kalaria, D. Kaufer, R.A. Kenny, A. Korczyn, K. Kosaka, V.M.-Y. Lee, A. Lees, I. Litvan, E. Londos, O.L. Lopez, S. Minoshima, Y. Mizuno, Molina, J.A., Mukaetova-Ladinska, E.B., Pasquier, F., Perry, R.H., Schulz, J.B., Trojanowski, J.Q., Yamada, M. (2005). Diagnosis and management of dementia with Lewy bodies, Third report of the DLB consortium, *J. Neurology*, vol. 65, pp. 1863-1872.
- [45] Martínez, D.N., Dalgo Flores, V.M. (2017). Ambientes virtuales de aprendizaje utilizando realidad aumentada, *J. Enfermería Investiga*, Vol. 3, No 1, pp. 49-52.
- [46] Raju, K.S.N. (2011). *Fluid Mechanics, Heat Transfer, and Mass Transfer*, AIChE, Wiley, USA.
- [47] Rutherford-Hemming, T., Lioce, L., Jeffries, P. R., & Sittner, B. (2016). After the National Council of State Boards of Nursing Simulation Study—recommendations and next steps. *Clinical Simulation in Nursing*, 12(1), pp. 2-7.
- [48] Teri, L. (1994). Behavioral treatment of depression in patients with dementia. *Alzheimer Dis Assoc Disord*, vol. 8, (suppl 3), pp. 66-74.
- [49] Tchobanoglous G., Theisen H. and Vigil S. (1993). *Integrated Solid Waste Management*, McGraw-Hill Book Company, New York.
- [50] Teng EL, Chui, H.C. (1987). The Modified Mini-Mental State (3MS) examination. *J. Clin Psychiatry* vol. 48, pp. 314-318.
- [51] Vlavianos-Arvanitis A. (1991). *Biopolitics the Bio-Environment*, B.I.O. Publications.
- [52] Vrijheid, M. (2000). Health Effects of Residence Near Hazardous Waste Landfill Sites: A Review of Epidemiologic Literature, *Environmental Health Perspectives*, Vol 108, Supplement 1, pp. 101-112.
- [53] Venturi, P. and Venturi, G., 2003. Analysis of energy comparison for crops in European agricultural systems. *Biomass and Bioenergy* 25, 235-255.
- [54] Williams, J. (2017). *Simulated Learning in Midwifery: Exploring the use of virtual reality technology in neonatal resuscitation*, The School of Nursing and Midwifery, Faculty of Health and Medicine, The University of Newcastle, Australia.
- [55] Yocheved Laufer, Y., Dar, G., Kodesh, E. (2014). Does a Wii-based exercise program enhance balance control of independently functioning older adults? A systematic review *J. Clinical Interventions in Aging*, vol. 9, pp. 1803-1813.
- [56] Weiner, E., Trangenstein, P., Mcnew, R., & Gordon, J. (2016). Using the Virtual Reality World of Second Life to Promote Patient Engagement. *Studies In Health Technology & Informatics*, 225198-202. doi:10.3233/978-1-61499-658-3-198
- [57] Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, 9(4), pp. 625-636.
- [58] World Health Organization (WHO). 2010. *Framework for action on interprofessional education & collaborative practice*. Geneva, Switzerland: WHO.

- [59] Borghese, N. A., Pirovano, M., Lanzi, P. L., Wüest, S., & de Bruin, E. D. (2013). Computational Intelligence and Game Design for Effective At-Home Stroke Rehabilitation. *Games For Health Journal*, 2(2), 81-88.
- [60] Brox, E., Luque, L. F., Evertsen, G. J., & Hernández, J. E. G. (2011, May). Exergames for elderly: Social exergames to persuade seniors to increase physical activity. In *Pervasive Computing Technologies for Healthcare (PervasiveHealth)*, 2011 5th International Conference on (pp. 546-549). IEEE.
- [61] Chien-Yen, C., Lange, B., Mi, Z., Koenig, S., Requejo, P., Noom, S., Sawchuk, A., & Rizzo, A. (2012). Towards pervasive physical rehabilitation using Microsoft Kinect. 6<sup>th</sup> International Conference on Pervasive Computing Technologies for Healthcare , pp. 159 – 162, doi:10.4108/icst.pervasivehealth.2012.248714 .
- [62] Marinelli, E. C., & Rogers, W. A. (2014). Identifying Potential Usability Challenges for Xbox 360 Kinect Exergames for Older Adults. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 58, No. 1, pp. 1247-1251)*. SAGE Publications.
- [63] McLaughlin, A., Gandy, M., Allaire, J., and Whitlock, L.(2012). Putting fun into video games for older adults. *Ergonomics in Design: The Quarterly of Human Factors Applications* 20(2), pp. 13-22
- [64] Maillot, P., Perrot, A., & Hartley, A. (2012). Effects of interactive physical-activity video-game training on physical and cognitive function in older adults. *Psychology And Aging*, 27(3), pp. 589-600 doi:10.1037/a0026268
- [65] Laine, T.H., Suk, H.J. (2016). Designing mobile augmented reality exergames. *Games Cult.* 11(5), pp. 548–580
- [66] Ishii, T. (1966). Distribution of Alzheimer's neurofibrillary changes in the brain stem and hypothalamus of senile dementia. *Acta Neuropathol.* 6(2), pp. 181–187.
- [67] Im, D.J., Ku, J., Kim, Y.J., Cho, S., Cho, Y.K., Lim, T., Lee, H.S., Kim, H.J., Kang, Y.J. (2015). Utility of a three-dimensional interactive augmented reality program for balance and mobility rehabilitation in the elderly: a feasibility study. *Ann. Rehabil. Med.* 39(3), pp. 462-472.
- [68] Nawaz, A., Waerstad, M., Omholt, K., Helbostad, J.L., Vereijken, B., Skjaeret, N., Kristiansen, L. (2014). Designing Simplified Exergame for Muscle and Balance Training in Seniors: A Concept of 'Out in Nature'. 8th International Conference on Pervasive Computing Technologies for Healthcare, Oldenburg, Germany.
- [69] Schoene D, Lord S. R., Delbaere K., Severino C., Davies T. A., & Smith, S. (2013). A Randomized Controlled Pilot Study of Home-Based Step Training in Older People Using Videogame Technology. *PLoS ONE* 8(3): e57734. doi:10.1371/journal.pone.0057734
- [70] Whitlock, L.A., McLaughlin, A.C., Allaire, J.C. (2010). Training Requirements of a Video Game-based Cognitive Intervention for Older Adults: Lessons Learned. In: *Proceedings of the Human Factors and Ergonomics Society 54th Annual Meeting*, pp. 2343–2346. Human Factors and Ergonomics Society, Santa Monica.
- [71] Spence, I., & Feng, J. (2010). Video games and spatial cognition. *Review of General Psychology*, 14, 92–104. doi:10.1037/a0019491
- [72] Pigford, T. (2010). Feasibility and Benefit of Using the Nintendo Wii Fit for Balance Rehabilitation in an Elderly Patient Experiencing Recurrent Falls. *Journal of Student Physical Therapy Research*, 2(1): pp. 12-20.
- [73] Quiroga, M. A., Herranz, M., Gomez-Abad, M., Kebir, M., Ruiz, J., & Colom, R. (2009). Video games: Do they require general intelligence? *Computers & Education*, 53, pp. 414–418.
- [74]. Jones, D.L., Williamson, K., and Owen, A.G., 2006. Phytoremediation of landfill leachate. *Waste management* 26, 825-837.
- [75]. Koçar, G. and Civaş, N., 2013. An overview of biofuels from energy crops: Current status and future prospects. *Renewable and Sustainable Energy Reviews* 28, 900-916.

- [76]. Lavagnolo, M.C., Cossu, R., Malagoli, M., and Alibardi, L., 2011. Energy crops cover in landfill. Sardinia 2011 - XIII International Waste Management and Landfill Symposium. 3 - 7 October, Cagliari.
- [77]. Lavagnolo, M.C., Malagoli, M., Alibardi, L., Garbo, F., Pivato, A., and Cossu, R., 2017. Use of oleaginous plants in phytotreatment of grey water and yellow water from source separation of sewage. *Journal of Environmental Sciences*, 55, 274-282.
- [78] Kales, H. C., Gitlin, L. N., & Lyketsos, C. G. (2015). Assessment and management of behavioral and psychological symptoms of dementia. *BMJ (Clinical research ed.)*, 350, h369. doi:10.1136/bmj.h369
- [79] Dean F. Wong<sup>1-4</sup>, Paul B. Rosenberg<sup>2,5</sup>, Yun Zhou<sup>1</sup>, Anil Kumar<sup>1</sup>, Vanessa Raymont<sup>1</sup>, Hayden T. Ravert<sup>1</sup>, Robert F. Dannals<sup>1</sup>, Ayon Nandi<sup>1</sup>, James R. Brasler<sup>1</sup>, Weiguo Ye<sup>1</sup>, John Hilton<sup>1</sup>, Constantine Lyketsos<sup>2,5,6</sup>, Hank F. Kung<sup>7</sup>, Abhinav D. Joshi<sup>8</sup>, Daniel M. Skovronsky<sup>7,8</sup>, and Michael J. Pontecorvo<sup>8</sup> (2010). In Vivo Imaging of Amyloid Deposition in Alzheimer Disease Using the Radioligand 18F-AV-45 (Florbetapir F 18), *J Nucl Med* 2010, vol. 51, pp. 913–920 .
- [80] Martin Steinberg<sup>1,\*</sup>, Huibo Shao<sup>2</sup>, Peter Zandi<sup>2</sup>, Constantine G. Lyketsos<sup>1</sup>, Kathleen A. Welsh-Bohmer<sup>3</sup>, Maria C. Norton<sup>4,5,6</sup>, John C.S. Breitner<sup>7</sup>, David C. Steffens<sup>3</sup>, JoAnn T. Tschanz<sup>4,5</sup>, (2008). Point and 5-year period prevalence of neuropsychiatric symptoms in dementia: the Cache County Study , *Int J Geriatr Psychiatry*, 3(2): 170–177. doi:10.1002/gps.1858
- [81] Mentes, J.C. (2006). A typology of oral hydration: problems exhibited by frail nursing home residents. *J. Gerontol. Nurs.* 32(1), PP. 13–19.
- [82] Nikou, S. (2015). Mobile technology and forgotten consumers: the young-elderly. *Int. J. Consum. Stud.* 39(4), PP. 294–304.
- [83] de Oliveira, L.C., Soares, A.B., Cardoso, A., de Oliveira Andrade, A., Lamounier Jr., E.A.: Mobile augmented reality enhances indoor navigation for wheelchair users. *Res. Biomed. Eng.* 32, 111–122 (2016)
- [84] Petrucco, C., Agostini, D. (2016). Teaching our cultural heritage using mobile augmented reality. *J. E-Learn. Knowl. Soc.* 12(3), pp. 115–128.
- [85] Pijukkana, K. (2012). Graphical design and functional perception on technology-driven products: case study on mobile usage of the elderly. *Proc. Soc. Behav. Sci.* 42, pp. 264–270
- [86] LAE, Landscape Architecture Europe, 2006. *Fieldwork*. Birkhauser LAE Foundation. ISBN 978-3-7643-7508-9.
- [87] Maciocco, G., Sanna, G., Serreli, S., 2011. *The Urban Potential of External Territories*. Franco Angeli, Milano. ISBN 978-88-568-3739-1.
- [88] McLeod, V., 2008. *Detail in Contemporary Landscape Architecture*. Laurence King Publishing Ltd.
- [90] Tsogkas, C. (1983). *River design*, Ministry of Education Publication, Greece.
- [91] Quinn, A.D. (1972). *Design and Construction of Ports and Marine Structures*, McGrawHill.
- [92] Buchner, A. (2016). *Moodle 3 Administration*, Packt Publishing.
- [93] Slavoljub Hilcenko, S. (2019). *Preschool Institution: Methods and Approaches to Learning – More Important Than Information Communication Technologies*, *J. Informatologia*, vol. 52, 1-2, pp. 90-98.
- [94] Raicevic, V., Bozic, M., Rudic, Z., Lalevic, B., Kikovic, D. (2011). The evolution of the eutrophication of the Palic Lake in Serbia, *African Journal of Biotechnology*, Vol. 10(10), pp. 1736-1744.

[95] Tchobanoglous, G., Burton, G., Stensel, D. (2003) Metcalf & Eddy Inc., Wastewater Engineering, Treatment and reuse, McGraw-Hill Book Company, New York.

[96] Reilly, T., Secher, N., Snell, P., Williams, C. (2005). Physiology of Sports. Taylor and Francis Publishing Group.

[97] Zegada-Lizarazu, W. and Monti, A., 2011. Energy crops in rotation. A review. Biomass and Bioenergy 35, pp. 12-25.