

Abstract | The present research arises from the fact that there are only few studies that assess the elderly perception, concerning the elderly home garden design elements that affect their well-being, particularly in the Portuguese population. It is intended to produce scientific knowledge that can be used by designers of elderly home gardens. Thus, the research came from the following research question: «What is the seniors perception about the elderly home garden design elements that influence mobility, privacy, interpersonal communication and spatial orientation?». Resulting from the preliminary study carried out in the first investigative phase (speculative phase/State of the Art), it was possible to formulate the research hypothesis: «Elderly people perceive the composition elements of outdoor space». It was developed a practical study of target population perception evaluation, regarding to the design characteristics of the green spaces, with the recourse of 3D images (simulating specific details to be evaluated) and using the drawings made by the seniors of its own elderly home garden, revealing the most important elements. In «Mobility» field, it's possible to conclude from the investigation, that the designer of elderly home gardens should provide tree corridors to passerby. For helping in Spatial «Orientation», the garden should have flowers, trees and water element. Regarding to «Interpersonal Communication», it is necessary L disposition benches, promoting conversation (and white flowering tree in surroundings). For «Privacy», the most advantageous position is the situation of having more vegetation around the bench. It concludes the importance of multidisciplinary work development (architecture/landscape architecture/design) and to make elderly participate in the project development (using the User-Centered Design Methodology), so that effectively they can enjoy their life stage in elderly home gardens concerning their abilities and interests/motivations.

Keywords | Elderly People, Garden Design, Interpersonal Communication, Privacy, Orientation, Mobility.

1- INTRODUCTION

In the past, traditional societies practiced the veneration of the elderly, and it was intended that those who achieve an advanced age became patriarchs and counselors, being a reference for the younger generations. Nowadays in Western family, seniors are seen with less respect, some of them abandonment in their homes, day centers and even in hospitals (Henriques, 1998), but some protective laws positively arise.

It is necessary that seniors live this life stage with a feeling of being useful, autonomous and inserted in the society; fulfilling a goal or an interesting project that gives pleasure and feeling of satisfaction/Quality of Life (Guerreiro, 2005; Russel & Snodgrass, 2002). Thus, the past experience, time scheduling and the type of activity, like walking or gardening, are extremely important factors for it. This is affected by social and physical environment aspects, although each individual psychological characteristic must be taken into account (Henriques, 1998).

In recreational and leisure spaces such as gardens it is important to adapt the outside environment to the elderly population by promoting Mobility, Orientation, Communication and Privacy, as well as Safety, Effort and Stimuli (Birley, 2011; Nunes, 2016). Also, guarantee the outdoor spaces design quality, through the principles: Familiarity, Readability, Distinctive Character, Accessibility, Comfortability and Safety (Burton & Mitchell, 2007). According to Lynch (1960), the external spaces should be characterized by their identity, structure and meaning, which evokes a strong image (imageability) in the observer, contributing to this: Paths/routes; Frontiers/limits; Districts or regions; Nodes; Landmarks in the landscape.

Regarding to falls, 40% of them are mainly due to extrinsic factors like poor design quality of the environment (Lindquist *et al.*, 2001, *cit. in* Burger & Marincek, 2003). But ¼ are due intrinsic factors motivated by the physical and cognitive elderly characteristics (Nunes, 2005; Ferreira, 2011; INE/INSA, 2009, *cit. in* Gonçalves, 2010; Lúcio *et al.*, 2011; Silva *et al.*, 2010; Mezel, 1984; Brennan *et al.*, 2003; Barker *et al.*, 1995; Ivers, 1998).The elderly may have difficulty in using stairs, feel stress in certain activities, lack of strength/energy, impaired bones/joints such as rheumatism/arthritis, reduced mobility, bad posture and walking difficulty that may lead to hazards and falls (Burton & Mitchell, 2007).

In 1966, Edward Hall states that there are four levels of public spaces, from the most intimate to the largest social distance (Hall, 1986, *cit. in* Rebel, 2009; Army Corps of Engineers, 1997). For Alexander, 1977 (*cit. in* Bell *et al.*, 1996), there are three spatial hierarchies: places that guarantee intimacy/isolation, those that provide small group meetings and those that provide direct contact with the public. Daily functional communication such as friendship (for Riopelle, 1986, *cit. in* Berger & Mailloux-Poirier, 1995) is based on the "*exchange of human needs with one's neighbor*" (Berger & Mailloux-Poirier, 1995: 476). Communication is a complex process involving five dimensions that affect elderly satisfaction degree at biophysiological, psychological, sociological, cultural and spiritual levels (Neves, 2009).

Interdisciplinarity in a design home gardens project is important. Landscape Architecture (area that works in outdoors spaces, taking into account plants/fauna life cycle), Architecture (building) and Design (furniture/equipments) must act together in order to conceive spaces that respond to the users needs and motivations, such as in elderly homes.

2- MOBILITY, ORIENTATION, PRIVACY AND COMMUNICATION STUDIES

Participatory methodologies having into account the target population are being used in order to collect the satisfactory inputs from them. For example, population observation and actions mapping and behaviors (and elderly surveys) were carried out with local inhabitants in order to improve the Moita Municipal Park (Gama, 2015).

Positive emotions are associated to outdoors environment. In a familiar environment (excluding night) elderly passers-by feels comfortable, happy and demonstrates less anxiety/confused when choosing a route or distractive with sudden noises, even considering the senescence vs. environmental sensitivity variations increases that may affect social interactions (Burton *et al.*, 2004).

The presence of trees in a park/garden is positive; giving shade-sunlight balance and the reduction of luminosity facilitates the landscape delights in various directions. On the other hand, non-permeable views induce fears (Jackson, 2004). Trees density/size and pathways beneath it influences tourist's satisfaction in parks (Chhetri *et al.*, 2004 & Bigne *et al.*, 2005, *cit. in* Arabatzis & Grigoroudis, 2009). The satisfaction variables are the observed landscape, the landscape order/sequence and the landscape perception (Arabatzis & Grigoroudis, 2009).

Concerning elderly home gardens, they must include landmarks, non-toxic plants, edible plants, well-defined and signaled paths, alarm systems, cleaning/maintenance and room's visibility to it (Gonzalez & Kirkevold, 2016).

Gardens or parks should contemplate several places, creating easy interaction spaces between people, however shouldn't force it (Guite, n.d., *cit. in* Jones, 2002) - designated sociopetal space because "*pull people together*" according to Little, 2002: 223 -, and others with a private character or sociofugal, "*pushing people away from each other and fostering social isolation*" (Little, 2002: 223). Equipment stimulates social cohesion according to groups with the same interests, but if the project doesn't have well-defined boundaries, may create territorial/sound/smell interferences and/or intergenerational/interethnic/interactivities conflicts, from allowing different activities in simultaneous (Águas *et al.*, 2003; Thompson, 2007, *cit. in* Pacheco, 2010).

The furniture disposition is related with the patients interacting environment in a cafeteria hospital, an experience resulted in a strong interaction (triple) between people sitting in the corners (angle 90° or L) of a 2mx1m table than side-by-side arrangement (or even face to face - Sommer, n.d., *cit. in* Panero & Zelni, 2011; Hall, 1986, *cit. in* Pacheco, 2010). To induce social relationship in spaces, 45-90° benches will be needed (collaborativelandscape.org) and for privacy, simple and isolated ones (Austin, 1978).

A focal point (used as Landmarks and helping the wayfinding process) allows the interpersonal communication occurrence - constituting a more open place, generating group activities: "*Environment whose functional arrangement of objects facilitates social interaction*" (Ramos *et al.*, 2010: 125) -, or privacy, allowing contemplation/relaxation/connection of the place (Palma, 2011) - also required silence, security (natural surveillance), comfort and not allow (direct eyes) contacts between strangers (Bell *et al.*, 2001). Instead benches,

chairs could be moved and get the right configuration concerning each one goal; as well, should be able to sit/lift easily having lateral supports (Austin, 1978; Bell *et al.*, 2001).

3- PRACTICAL SURVEY: CASE STUDY

3.1. METHODOLOGY

Visual Methodologies in interviews are increasingly used (Gauntlett & Holzwarth, 2006) since they constitute simple means of understanding between researcher and participant (Vassenden & Andersson, 2010). For example, recent studies use Photo Elicitation technique as a research methodology (Beilin, 2005; Vassenden & Andersson, 2010; Heyman, 2012) and Virtual Involvements (Baños *et al.*, 2004; Young, 2010; Gemeinboeck, 2004).

It is possible to conduct interviews through images. Image is the "*mental representation that can be formed even when the object, person, place or area to which it refers is not part of the current sensory information*" (Filho, n.d.). Follows photographic simulations inputs: "*photographic simulation, usually consisting of single slides or pairs of slides, has also been used successfully in both a route and a survey context*" (Golledge, 2002: 159).

Thus, in the present research with Structured Interview (Non-interventionist Case Study Methodology, with quantitative and qualitative basis - Bardin, 2009; Reis, 2001, *cit. in* Silva & Sousa, 2003), elderly participants are expected to report their perception and satisfaction by visualizing 3D gardens images (and making drawings of it), revealing the preferences for certain situations, concerning the investigation question.

The specific goals are to investigate the design parameters which give Privacy to the elderly (vegetation scale and spatial position near a bench) using 3D simulations; induce interpersonal Communication in the elderly (bench setting in the picnic area vs. spatial arrangement of the tree and color); provide elderly Mobility (path width and (in)existence of vegetation and spatial arrangement); and provide the spatial Orientation (elements identified in the elderly home garden by performing a hand free draw).

3.2. TOOL

Tridimensional garden images were built in Autodesk® AutoCAD® and 3D Studio Max® software's. The interviews were first applied, as a pre-test (with 5 seniors), in Sagrada Família Elderly Home, placed at Amadora Council, for images and questions evaluation, to make the necessary improvements for being assertively used in the final interview (with 61 elderly volunteers) in ABE, Fonte Santa and Nª.SªVitória Elderly Homes.

Because of the gaps detected in the State of Art (see previous chapters), relating gardens at Portuguese Elderly Homes, follows the investigation questions:

-Mobility - "*Which of the following situations [3D images presented in a PowerPoint multimedia show] mostly induce the walk...?*"

-Orientation - "*Please draw [in an A5 paper] your home garden elements, describing them*".

-Privacy - "*Imagine yourself in a pleasant environment without disturbing elements. Which of the following situations would you choose for having privacy?*"

-Communication - "*...Which of the following situations would you choose to develop communication between users (interaction/conviviality)?*"

3.3. QUESTIONNAIRE

The interviews were conducted in an individual and private context (inside a room), avoiding seniors influence to each other (Fig.1).



Figure 1- Interviews environment (pre-test phase) (Source: author)

The chosen 3D image (from the laptop screen) had a hyperlink to another slide with 2 or 3 more tri-dimensional simulations, intended to be analyze other variable. For not influence the participant decision, some repeated images

were located in a different screen position (left or right). The questions were recorded to be included in Microsoft PowerPoint® and so all the interviewers perceived them equally. It was possible to adjust the volume of the recording to the auditors' listening needs. For being anonymous, it was attributed numbers to seniors and institutions.

3.4. 3D IMAGES

Modules, textures, background and light were developed to create 3D simulations, allowing Cad®/3D Studio Max® to isolate the variables to be analyzed in a single image. The images were saved in «.jpeg» format and inserted into the M.PowerPoint®. The file was later saved in «.pps» extension, for a forward multimedia presentation without opening the software.

An A5 sheet and pen/pencil were provided to senior be able to draw the perception of his own elderly home garden, contributing to the orientation variable research. In this context, it is intended to know the most significant elements in the environment (present in the senior's memory) and the relation between elements.

In the respect of Mobility variables, senior participant viewed two images side by side and had to choose «image A» (straight path) or «image B» (wide path, i.e. double it) (Fig.2). When clicking in the hyperlinked image A, a new slide appears with others two new images that could be chosen: A1 (straight path and a row of trees) or A2 (straight path without trees). Having chosen the image A1, another slide appears with A3 (straight path and 1-row of trees) and A4 (straight path and double tree-lined avenue, i.e. 2-rows trees alignments), images to be chosen again, considering his perception of which situation mostly induce the walk. On the other hand, if the participant had initially chosen the image B, another slide would appear with the B1 (wide path without trees) and B2 images (wide path and 2-rows trees alignments); if the B2 was chosen, another slide with B3 (wide path and 2-rows trees alignments) and B4 images would appear (wide path and 1-row of trees).

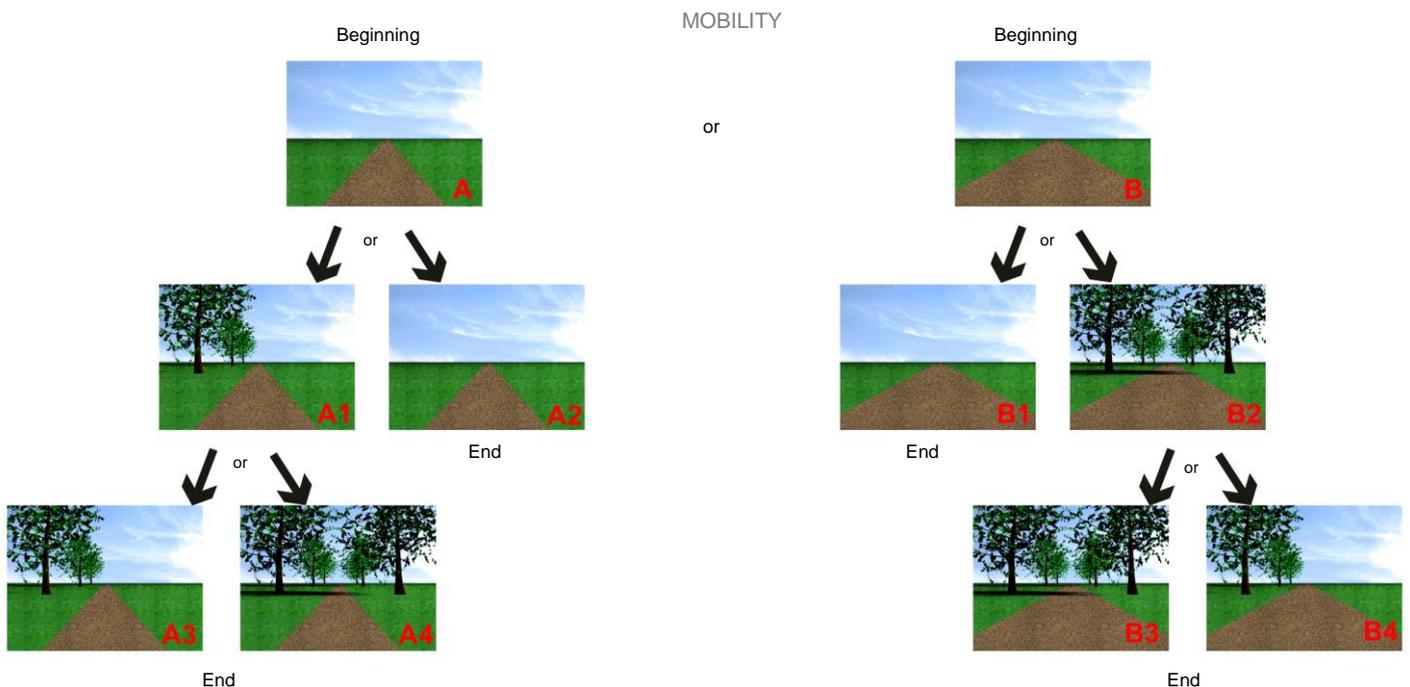


Figure 2 - Schematic diagram of hyperlinked images in the multimedia presentation (Mobility) (Source: author with Cad/3DSMax support)

One of three images (Fig.3) would be available to senior evaluation (A, B or C). When choosing option A, the participant opted by a bench with two bushes that do not fills the back of the seat; if instead the option B was chosen, opted by a bench with shrubs filling the backs; and if C, bench with shrubs filling the back and sides. And from that choice, when clicked on an image (with hyperlink associated to another slide), two others images appear on a new slide (A1 or A2, B1 or B2, C1 or C3). When the option A1 was taken, senior opted by choosing a bench with two low bushes not filling the back of the seat; if A2, bench with two high bushes not filling the backs. Choosing

the B1, participant opted for a bench with high bushes filling the backs; if B2, bench with low shrubs filling the backs. When choosing the C1, it was made the option for a bench with high bushes filling the back and sides; if C2, bench with low shrubs filling the back and sides of the seat surroundings.

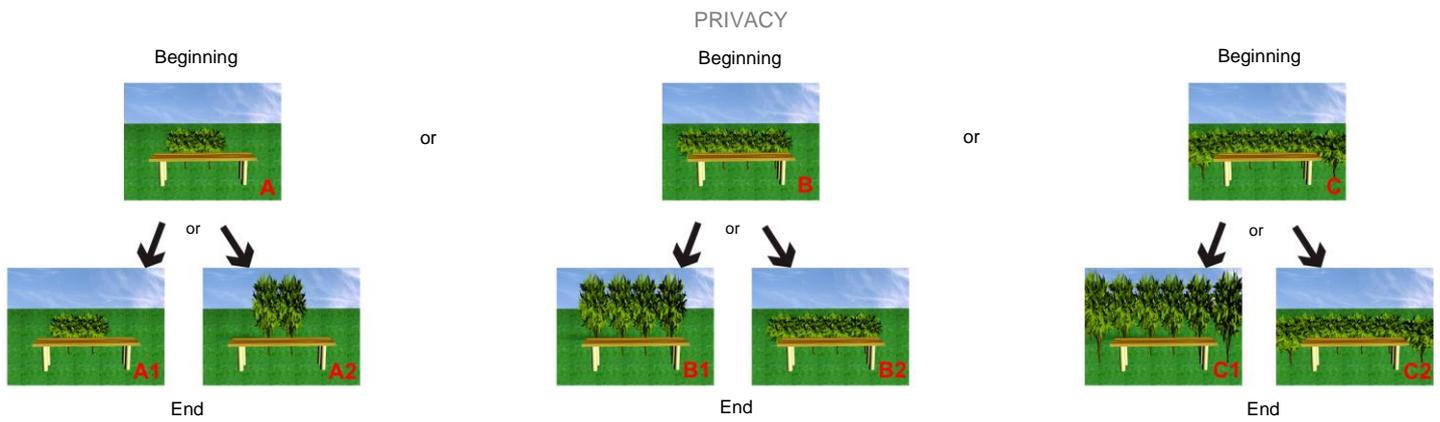


Figure 3 - Schematic diagram of hyperlinked images in the multimedia presentation (Privacy) (Source: author with Cad/3DSMax support)

Initially it was possible to choose from the image A (with an individual bench and table) or B (L-bench and table). From the initial image A, senior may choose the A1 (individual bench and white blooming tree in the front) or A2 (individual bench and white blooming tree in the back). From the A1 image, A3 may be chosen (individual bench and white blooming tree in the front) or the A4 image (individual bench and red foliage tree in the front); and from A2, the A5 image (individual bench and white blooming tree in the back) or A6 (individual bench and red foliage tree in the back). Or, if senior had chosen the image B, then could choose the B1 (L-bench and red foliage tree in the back) or B2 (L-bench and red foliage tree in the front). From the B1 image, B3 (L-bench and red tree foliage in the back) or B4 image (L-bench and white blooming tree in the back); and from B2, B5 (L-bench and red foliage tree in the front) or B6 (L-bench and white blooming tree in the front). The following figure illustrates the above explanation (Fig.4).

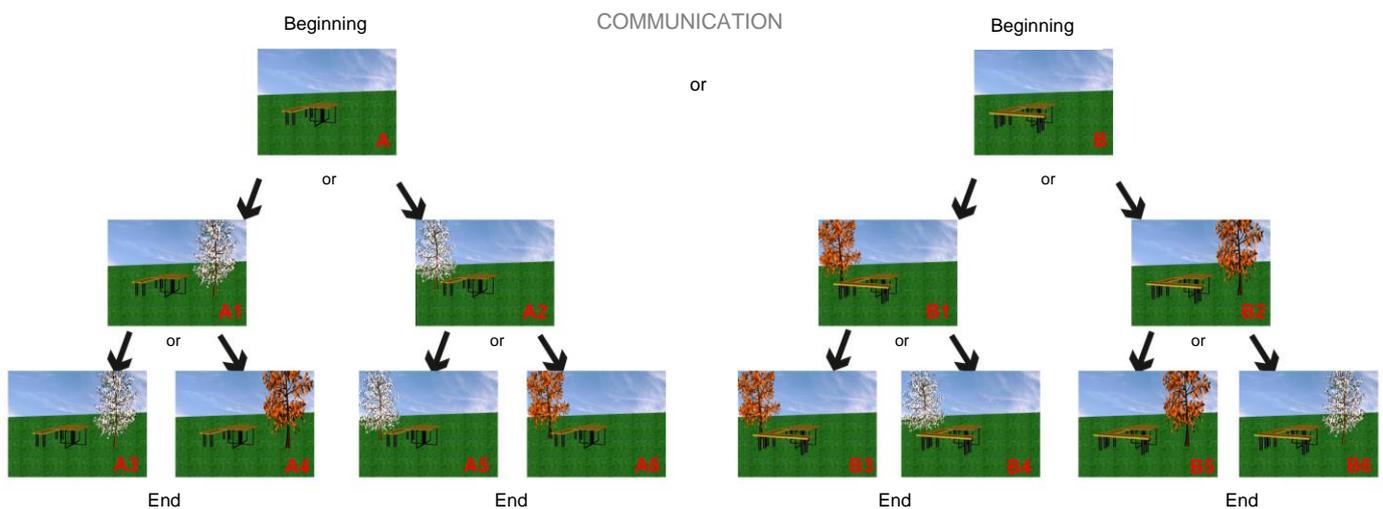


Figure 4 - Schematic diagram of hyperlinked images in the multimedia presentation (Communication) (Source: author with Cad/3DSMax support)

3.5. PRE-TEST

In the pre-test phase in Sagrada Família Elderly Home, the interviewed seniors (N=5) perceived the composition elements of outdoors spaces, once they had identified the 3D images following elements:

- Mobility - Image with a path; path and trees on the left; path and trees on both sides of it;

- Privacy - Wooden bench with two bushes behind; bench with several bushes behind; bench with shrubs behind and two on the side; bench with two (higher) shrubs behind; bench with several high bushes behind; bench with high bushes behind and two high ones on the side;

-Communication - Picnic table with an individual bench in wood; picnic table with a bench forming an L; sometimes with a white blooming tree or with reddish foliage, at the front or at the back.

The images presented were correctly identified by the elderly, showing that they were intelligible/comprehensible, as well as the questions made and so, no improvements were necessary to do to the next phase (final 61 interviews).

To evaluate the Orientation variable, the elderly volunteers were asked to make a drawing of their elderly home garden, in an A5 white sheet by pencil/pen distributed by the researcher. It was noted that the elderly with less drawing ability mentioned the need to write in the places where they intended to put the elements, also because it was asked to "*describe the elements of the garden*" (some had described them orally).

3.6. CASE STUDY CHARACTERISTICS

3.6.1. ELDERLY HOMES

The ABE Elderly Home (with 48 seniors) belongs to an Evangelical religious association, being part of the Instituição Particular de Solidariedade Social (IPSS). The Fonte Santa Elderly Home is a private one with 34 seniors in total. The N^a.S^a.Vitória Elderly Home is an IPSS, has 90 residents and a roman-catholic background. The interviews were made respectively to 26, 10 and 25 elderly people. Seniors' socio-economic stratum belongs to the middle class, with IPSS supporting part of resident's costs. The N^a.S^a.Vitória Elderly Home is located in Lisbon, has a frontal garden and a kitchen garden at the south of the residence, accessible by stairs next to the wall. The others Elderly Homes are situated in a non-urban context (Loures) and have a small garden area, concentrating in the front of the residence, at the Fonte Santa Elderly Home; and in the back, at the ABE Elderly Home.

3.6.2. SAMPLE

In the study universe (N=61), 20% are men (min.65 years-old; max.91; \bar{x} .79,92; Standard Deviation, S.D.7,69) and 80% women (min.65; max.99; \bar{x} .81,88; S.D.8,57). From the entire sample, until retirement 72% worked (men worked all labor lifetime) and 28% didn't (35% of women performed domestic activities, considered a non-labor activity). The women (W.) had a disability range of 86% and men (M.) 83%, mostly related to mobility (W.38%; M.33%); others deficits (W.32%; M.17%) like asthma, diabetes, heart and limb problems, osteoarthritis; vision (W.18%; M.17%); low dementia level (W.8%; M.22%) and hearing issues (W.5%; M.11%). The male population has more academic degrees. Women manifest illiteracy in 18% of the cases, knowing how to read-write but without degree 2%; men in turn, 0% on both. Elementary school: W.33%, M.75%; high school or vocational school: W.17%, M.43%; university W.4%, M.8%.

3.6.3. PROTOCOL

Firstly, it was constituted a list of possible elderly homes with garden that could participate in the survey, placed in Lisbon/periphery, facing researcher physical proximity. Three institutions collaborated (in Loures, ABE and Fonte Santa; in Lisbon, N^a.S^a.Vitória). It was intended to interview volunteers aged 65 or above, being this stage the retirement start (INE, 2002); that frequented the institutional garden (not bedridden, impossible to experiencing it (Astell *et al.*, 2009)); with satisfactory residual vision for providing positive results (Burton *et al.*, 2004; Bright *et al.*, 1997); without dementia (or in an initial phase, not affecting the study, like in the surveys of: Gollodge, 2002; Burton *et al.*, 2004; Jheng & Pai, 2009; Zavitch & Zaphiris, 2005). The senior was pre-selected by the researcher and health care professionals, being the interviews announced properly by each institution. Researcher and participant (in a private room disposing table, chairs and laptop) signed an «Informed Consent Term» with the procedures explanations, where after a multimedia file will be displayed. It was used as PowerPoint slides text, a 40 size dark Arial lettering, contrasting with the white background and it was mention the senior's interviews outputs contribution for the quality of the elderly homes gardens. The questions were sequentially made and annotated by the

researcher: "Which of the following situations mostly induce the walk...?", "Please draw your home garden elements, describing them", "Imagine yourself in a pleasant environment without disturbing elements. Which of the following situations would you choose for having privacy?", "...Which of the following situations would you choose to develop communication between users (interaction/conviviality)?", "What is your personal data (Age, Gender, Profession, Disability, Qualifications)?". At the end of each individual presentation participant will be grateful.

3.6.4. RESULTS

A mixed Methodology of Case Study (quantitative and qualitative data descriptive analysis) was used to support the structured senior's volunteer's interviews, through 3D garden images visualization (and by his draws describing the elderly homes outdoors). The answers were pointed out, by the researcher, in a pre-printed grid (double entry matrix), which crossed the chosen image with the participant number (for anonymous reasons). At data processing phase, that inputs were analyzed and inserted in the Microsoft Excel® software. The content analysis of each senior drawing (with oral or written notes) was categorized in a word format and grouped at the end with a single designation (e.g. "roses" and "flower clove" were grouped under the category «flowers») (Bardin, 2009). According to goals, excel graphics were made to show in image the senior's gardens preferences, taking into account the variables: Mobility (walking induction elements); Privacy (private situation areas); Interpersonal Communication and Spatial Orientation.

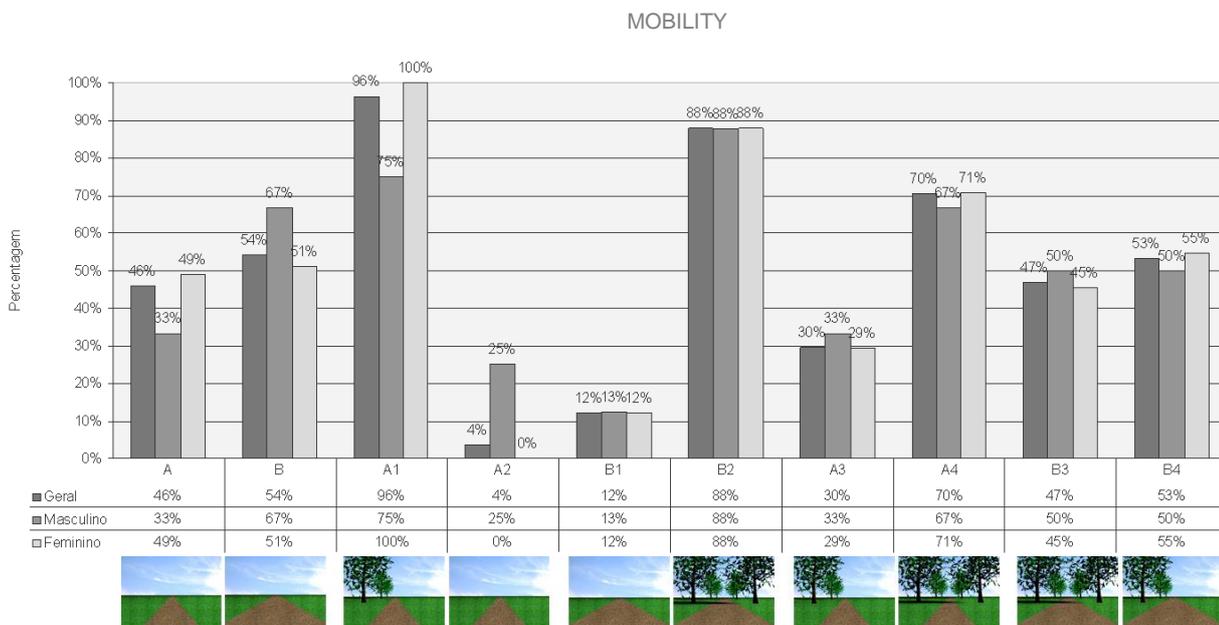


Figure 5 – Mobility graphic and images (Source: author with Excel® support)

In the universe of study, 54% prefer to walk in a ten meters wide path (see image below the Chart B, Fig.5) and 46% choose a path with half of it measure (A). Considering trees as Affordances (understandable as clues/action possibilities), they are responsible for inducing the walk in the larger majority: A1, 96%; B2, 88%. Few seniors prefer paths without trees (A2 and B1, respectively, 4% and 12%). Concerning trees «quantity» and «spatial arrangement» in a straight path; it is possible to analyze that the existence of more trees and in double-alignments (both sides of the path, i.e. 2-rows trees alignments) is the most chosen situation (A4, 70%). From image B4, 53% prefer 1-row tree wide path, instead of image B3, 47%, facing 2-rows. Men prefer image B with larger path (67%) than straight one. Also, A1 with 1-row trees in straight path (75%) than without trees; and B2 with 2-rows trees in wide path (88%) than without trees. Straight path is mostly needed in 2-rows trees alignments (A4-67%). B3 (2-rows trees alignments) and B4 (1-row) are equally needed in wide paths situation. From B2 image it possible to conclude that 88% prefer 2-rows trees with wide paths, then the ones without trees, B1 (13%). A quarter prefers straight paths without tree vegetation (A2) vs. ¾ with trees (A1). Concerning women, path width does not influence the responses

(but 51% of the cases match in image B, and 49% in A). All women prefer 1-row trees with straight path (A1) than without trees, and 88% of women opted by 2-rows trees with wide path (B2) than without trees (B1-13%). Straight path with 2-rows trees alignments (A4) is positive for 71% of women (vs. 29% in A3, just 1-row of trees). In turn, if in a wide path, 55% prefer 1-row of trees (B4) against 45% of 2-rows trees alignments preferences (B3).

Concerning Orientation, elements identified in the elderly home garden were drawn by residents (sometimes writing for meaning proposals). Thus, the possibilities of action (Affordances) or Landmarks mentioned by the interviewees are, in descending order of preference: flowers (26%); trees (17%); water element (13%); path (9%); building (7%); flowerbed (6%); bench (5%); land/lawn (4%); kitchen garden (4%); gate (3%); protective structures such as walls/handrails (2%); pergola, table and deck (both with 1%). For males it is important to exist in the same proportion (24%), trees and flowers. Following are the paths (16%); flowerbeds, land/lawn or water element (both with 8%). In equal proportion (4%), building, kitchen garden, protective structures (e.g. grids/walls). No reference was made to the elements: pergola; flooring; table; bench and gate. Flowers are the most referenced elements in space by women (27%); following the trees (15%) and the water element (14%). Then, building (8%), path (8%), bench (6%), kitchen garden (4%), gate (4%), land/lawn (2%), table (2%) and pergola (1%) (Fig. 6, 7, 8).

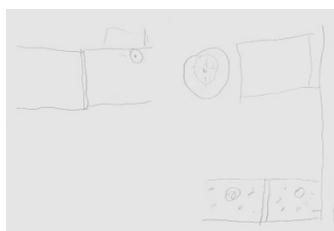


Figure 6 – Elderly Home I



Figure 7 – Elderly Home II

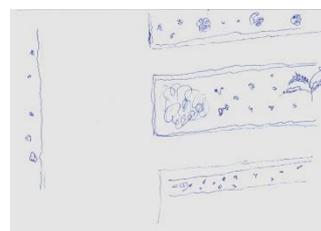


Figure 8 – Elderly Home III

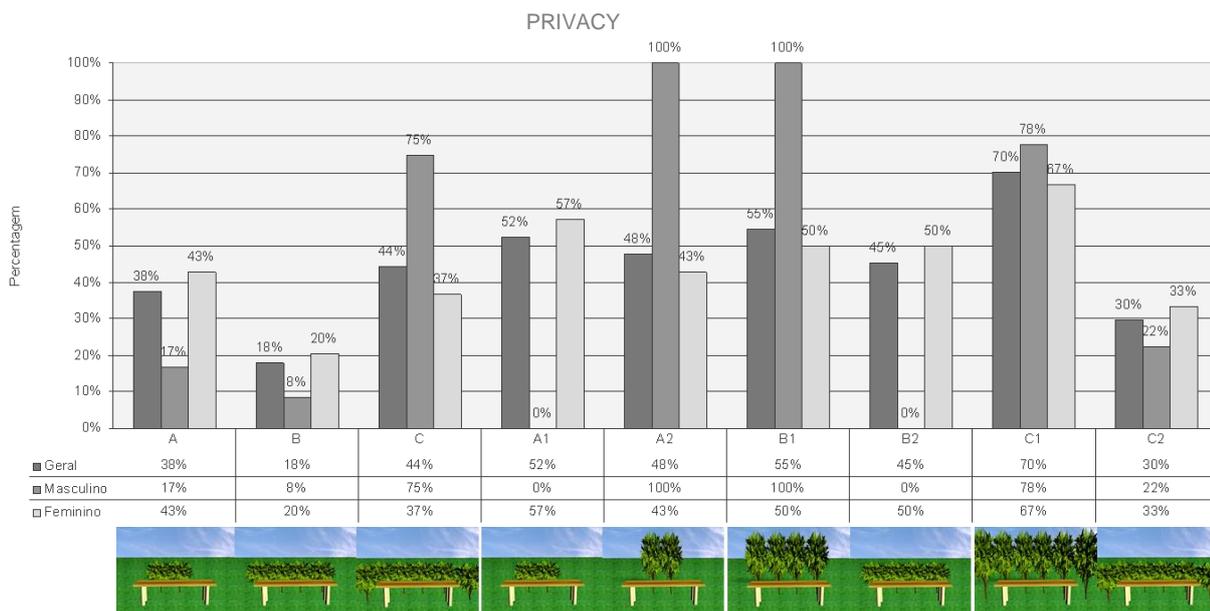


Figure 9 – Privacy graphic and images (Source: author with Excel® support)

Regarding Privacy (Fig.9), in bench situation according to the surrounding vegetation characteristics, three types of space could be chosen: elements with low shrubs behind the bench (image A); more plants covering the entire length of the seating area (B); and around the sides and the length of it (C). The image C is the most desired one (44%), followed by A (38%) and B (18%). Two situations could be chosen regarding «vegetation scale»: one-meter-high shrub and half of it. With plenty vegetation, the most desired situation is the highest one (70% chose the image C1 and 55% the B1). With two shrubs behind, are preferable lower ones in 52% of cases, as shown in image A1 (vs. 48% with higher vegetation, A2). Three Quarters of Male's preferences goes to the existence of more shrubs around the bench (image C), followed by fewer shrubs (A, 17%) and the intermediate situation (B, 8%). The highest vegetation (shown in images A2, B1 and C1) was the most desired situation to obtain privacy; respectively

registering 100%, 100% and 78% of respondents' male's responses. In the female universe the preferences are: less vegetation (A-43%), more vegetation behind and around the bench (C-37%) and the intermediate situation (B-20%). Most preferably the highest vegetation (forming a visual barrier): 67% of responses (C1) and next, A1 situation with 57% responses, then by B1-B2, equally with 50%.

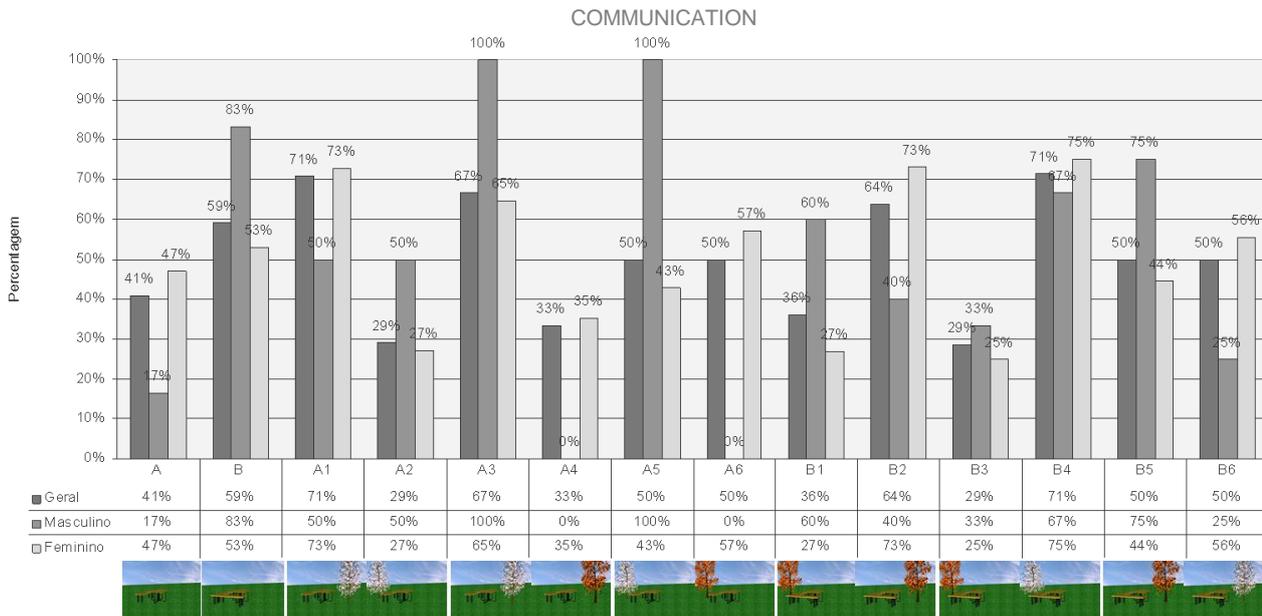


Figure 10 – Communication graphic and images (Source: author with Excel® support)

Bench's disposal in an L configuration (Fig.10, image B, with 59% of the answers) is the situation that gives more interaction/conviviality for the interviewed people, compared to the individual benches (41%, image A). Participants prefer frontal tree position (A1-71%, B2-64%). Analyzing the color parameter, the tree with white flowers is more interesting (A3-67%, B4-71%) than the autumnal/reddish color foliage (A4-33%, B3-29%). In the case of images A5 and A6 (individual benches), B5 and B6 (L-benches), the answers are equally divided, i.e. 50%. In males, situation B (L-bench) conquest more preferences in 83% of cases; and 60% prefer B1 (i.e. tree behind benches, although 67% of men prefer white blooming tree, B4, and not so much the red foliage color, 33%-B3). Considering individual bench, A4 and A6 situations had 0% of choices because of reddish foliage. White blooming tree in front of (A1) or behind (A2) the individual bench, had equally 50%. In women, L-bench reinforces more the communication (B-53%) than individual ones (A-47%) (Values are less expressive than in men case). Trees in the vision field are intended in 73% (A1) of the cases; and 65% (A3) if in individual bench there is a tree with white blooming/flowers than reddish foliage. In a L-bench situation, most women prefer the presence of white flowers - 56% (B6) - than reddish tree foliage (44%, B5); while the least voted option is B1 (27%) - reddish foliage tree in the back of the bench - compared to B2 (73%), i.e. tree placed ahead, in its field of view. For a higher degree of satisfaction, situation A6 (i.e., reddish foliage tree in the back of the individual bench) is required in a greater percentage of cases (57%), compared to A5 situation (43%), having the white flowers trees in the back of the individual bench. ¾ of the female preferences falls under option B4, i.e. white flowers (¼ instead prefers reddish foliage, B3) at the back of the L-shaped bench.

3.6.5. RESULTS DISCUSSION

There are more women than men in the elderly home garden interviews, spectable fact according to the literature (Coyle, 1997, Gist & Velkoff, 1997, *cit. in* Moody & Sasser, 2014; Carrilho & Gonçalves, 2004; Nunes, 2005) due females live on average for many more years. In terms of disability, both genders report negative issues concerning to low mobility, a fact that is also very focused on the literature (INE, 2002; INE, 2012), and is one of the reasons for entering at that type of institution (Neto, 2000, *cit. Mendes & Reloio*, 2006). From the data, it was possible to determine that there is no gender differentiation because the responses are similar; but deafness affects

more the man, as evidenced indeed by the literature (Berger & Mailloux-Poirier, 1995; Charness, 2009; INE, 2012). According to INE (2012) data and reported in the Case Study, walking for the elderly shows to be a more difficult activity, also registering a higher incidence of deficits in the eyesight. In the case of counseling, early dementia phases do not affect the Golledge studies (Golledge, 2002), Burton *et al.* (2004) and Jheng & Pai (2009). Other senior's studies, such as Zavitch & Zaphiris (2005), took into account grades of early dementia. In the present study, since the levels of dementia were very low and/or nonexistent, it was also possible to ascertain the abovementioned data (see sub-chapter 3.6.4). The interviewees showed ability to perceive the elements of outdoors space composition analyzed, responding assertively to the study. They identified elements that make up their elderly home garden, like flowers, trees and water element (also, path and building) - demonstrating that they are present in their memory and the relationship between them, through the realization of a drawing of the elderly home garden, usually elements reported as well in international studies (Gonzalez & Kirkevold, 2016; Hull, 1995, *cit. in* Arabatzis & Grigoroudis, 2009). In order to promote interpersonal communication, the situation of L-bench was chosen preferentially in the present study and in others studies mentioned in the State of Art, although they report others typology place examples (Austin, 1978; Panero & Zelni, 2001; Palma-Oliveira *et al.*, 1999). In mobility case, the preference of the interviewees refers to the trees number need, like the 2-rows of trees under the path. Some studies, such as from Arabatzis & Grigoroudis (2009) and Zhai & Baran (2017), reveals it. Lynch (1960) referred to the tree-lined avenues as suggestive of paths continuity, as well as Loide & Bernard (2003), *cit. in* Gouveia (2007), inducing a direction.

4- FINAL CONSIDERATIONS

The present study aimed to contribute and to fill some gaps regarding the importance which outdoor spaces design (relationships between variables in the elderly home garden) may originate in terms of therapeutic benefits, by promoting bio-psycho-social elderly aspects.

Follows the proposals/recommendations from the present investigation outputs:

-Professional level - More interaction between peers (namely, Architects, Landscape Architects and Designers) for a more vehement project, so they should intervene together from the beginning of the project (and in subsequent phases). Projects should take into account the elderly heterogeneity, promoting (several) inclusive situations, to guarantee satisfaction and Quality of Life: Orientation (flowers, trees and water element), Communication (L-bench, white blooming tree in surroundings), Privacy (shrubs around bench) and Mobility (2-rows trees in the path). To use 3D simulations in complementary studies concerning the thematic, allowing an assertive variables selection in a single image (by using software and available resources). Creation and dissemination of manuals under the theme content, among others, like a guideline checklist creation for professionals to raise awareness of the issue;

-Legislative level - Revision of the Law «Portaria N.67/2012 of 21 March, Article 15, 2 c)». To stipulate a maximum distance from the elderly home to the surrounding parks/gardens and to check their real state, regarding orientation, mobility and others parameters. Institutional green areas implementation (e.g. to enjoy views from indoors windows, implement Winter Garden);

-Academic level - Creation of a project subject that reflects Architecture, Landscape and Design valences, for fulfilling multidisciplinary goals. To train relevant data information, to know elderly dimensions, usual behaviors and ways of using spaces and/or objects (e.g. furniture). Further academic studies in the area should be done, providing information to the scientific community (e.g. detailed Portuguese elderly population information);

-Participative level - User-Centered Design Methodology utilization contemplating elderly volunteer in their own garden project development, taking into account his preferences/abilities/limitations/motivations (reported in assertive studies). To project according to target inputs results, in detriment of the client/designer preferences (just with intuitive knowledge/experience, but not in a scientific way).

REFERENCES

- ÁGUAS, S., BRANDÃO, P. & CARRELO, M. (2002). *O Chão da Cidade, Guia de Avaliação do Design de Espaço Público*. Lisboa: Centro Português de Design.
- ARABATZIS, G. & GRIGOROUDIS, E. (2009). "Visitors' satisfaction, perceptions and gap analysis: The case of Dadia-Lefkimi-Souflion National Park". *Forest Policy and Economics*, N.12, pp.163-172. [Em linha] Disponível em: www.elsevier.com/locate/forpol [30/12/2011]
- ARMY CORPS OF ENGINEERS (1997). *Design Guide for Interiors: Human Behaviour and the Interior Environment*. US Army Corps of Engineers Internet Publishing Group. Human Behavior and the Interior Environment, p.2.2.
- ASTELL, A., ALM, N., DYE, R., ELLIS, M., GOWANS, G. & VAUGHAN, P. (2009). "Involving Older People with Dementia and their Careers in Designing Computer based Support Systems: Some Methodological Considerations". *Journal Universal Access in the Information Society*, Vol.8, N.1. Springer Berlin/Heidelberg, April, pp.49-58.
- AUSTIN, J.W. (1978). *The Design of Places*. Barkeley: University of California.
- BAÑOS, R.M., BOTELLA, C., ALCANIZ, M., LIAÑO, V., GUERRERO, B. & REY, B. (2004). "Immersion and Emotion: Their Impact on the Sense of Presence". *Cyberpsychology & Behavior*, Vol.7, N.6, pp.734-741.
- BARDIN, L. (2009). *Análise de Conteúdo*. Lisboa: Edições 70.
- BARKER, P., BARRICK, J. & WILSON, R. (1995). *Building Sight. Handbook of Building and Interior Design Solution to Inclusive the Needs of Visually Impaired People*. London: HMSO, Royal National Institute for the Blind, Challenging Blindness.
- BEILIN, R. (2005). "Photo-elicitation and the Agricultural Landscape: 'Seeing' and 'Telling' about Farming, Community and Place". *Visual Studies*, Vol.20, N.1, April, pp.56-68.
- BELL, P.A., GREENE, T.C., FISHER, J.D. & BAUM, A.S. (2001). *Environmental Psychology*. 5 Ed. NY: Harcourt College Publishers.
- BERGER, L. & MAILLOUX-POIRIER, D. (1995). *Pessoas Idosas, Uma Abordagem Global, Processo de Enfermagem das Necessidades*. Lisboa: Lusodidacta..
- BIRLEY, M. (2011). *Health Impact Assessment: Principles and Practice*. NY: Earthscan.
- BRENNAN, M., HOROWITZ, A. & SU, Y-P. (2003). "Sensory Impairment and Risk of Falling Among Older Adults: The Special Case of Dual Impairment of Vision and Hearing. Lighthouse International NY". In *International Conference on Aging, Disability and Independence*, Dec. 4-6th, Washington DC, USA, p.316
- BURGER, H. & MARINCEK, C. (2003). Injury Prevention: Concerted Action or Individual Responsibility. Institute for Rehabilitation, Ljubljana, Slovenia. In *International Conference on Aging, Disability and Independence*, Dec.4-6th, Washington, DC, USA, p.387.
- BURTON, E. & MITCHELL, L. (2007). *Inclusive Urban Design-Streets for Life*. Oxford: Elsevier, Architectural Press.
- BURTON, E., MITCHELL, L. & RAMAN, S. (2004). *Designing Dementia - Friendly Outdoor Environments*. Oxford: Oxford Institute for Sustainable Development, Department of Architecture, School of the Built Environment, Oxford Brookes University.
- CARRILHO, M.J. & GONÇALVES, C. (2004). *Dinâmicas Territoriais do Envelhecimento*. Lisboa: Instituto Nacional de Estatística (INE).
- CHARNESS, N. & JASTRZEMBSKI, T.S. (2009). "Gerontechnology". In SAARILUOMA, P. & ISOMA" KI, H. [Eds.]. *Future Interaction Design II* Springer-Verlag London Limited, pp.1-29.
- COLLABORATIVELANDSCAPE (n.d.). *Gardening Guidelines*. [Em Linha] Disponível em:http://collaborativelandscape.org/wiki/index.php?title=Theory_Behind_Therapeutic_Gardening#column-one [30/12/2010]
- DIÁRIO DA REPÚBLICA (2012). DR, 1ª Série, N.58: Portaria N.67/2012 de 21 de Março.
- FERREIRA, T. (2011). *Doença de Parkison*. Curso Saúde da Pessoa Idosa - Prevenção de Problemas. Lisboa: IPME.
- FILHO, O.B.A. (s.d.). *Os Estudos da Percepção como a Última Fronteira da Gestão Ambiental. Alguns Conceitos, Temas e Técnicas Fundamentais da Percepção Ambiental*. [Em Linha] Disponível em: <http://ivairr.sites.uol.com.br/percepcaoambi.htm> [30/12/2004]
- GAMA, M.A.C.O. (2015). *Envelhecimento Activo em Áreas PeriUrbanas. Aplicação de uma Metodologia Participativa com Vista a Maximizar o Contributo da Arquitectura Paisagista na Melhor Adaptação do Espaço Público às Necessidades da População Idosa. Caso de Estudo: Freguesia da Moita*. Dissertação do Grau de Mestre em Arquitectura Paisagista. Lisboa: Instituto Superior de Agronomia, Universidade de Lisboa.
- GAUNTLETT, D. & HOLZWARTH, P. (2006). "Creative and Visual Methods for Exploring Identities". *Visual Studies*, Vol.21, N.1, April, pp.82-91.

- GEMEINBOECK, P. (2004). "Virtual Reality: Space of Negotiation". *Visual Studies*, Vol.19, N.1, April, pp.52-59.
- GOLLEDGE, R.G. (2002). "Environment Cognition". In BECHTEL, R.B. & CHURCHMAN, A. *Handbook of Environmental Psychology*. NY: John Wiley & Sons, p.141
- GONÇALVES, R.M.S. (2010). *Avaliação e Predição do estado de Saúde em Fisioterapia - Estudos em Pacientes com Osteoartrose do Joelho*. Dissertação Grau de Doutor em Motricidade Humana, na especialidade da Fisioterapia. Oeiras: Faculdade de Motricidade Humana, Universidade Técnica de Lisboa.
- GONZALEZ, M. T. & KIRKEVOLD, M. (2016). Design Characteristics of Sensory Gardens in Norwegian Nursing Homes: A Cross-Sectional E-Mail Survey, *Journal of Housing for the Elderly*, Vol.30, N.2, pp.141-155. [Em Linha] Disponível em: <http://dx.doi.org/10.1080/02763893.2016.1162252> [26/04/2017]
- GOUVEIA, M.I.R. (2007). *Paisagem e Luz*. Relatório de Fim de Curso em Arquitectura Paisagista. Lisboa: Instituto Superior de Agronomia, Universidade Técnica de Lisboa.
- GUERREIRO, A.C.F.M. (2005). Necessidades e Tendências. In UTL. *Resumo de Teses*, Vol.17. Lisboa: Universidade Técnica de Lisboa (UTL).
- HENRIQUES, S. (1998). *Idosos, Satisfação de Vida e Actividade (Monólogo Clínico)*. Lisboa: Instituto Superior de Psicologia Aplicada (ISPA).
- HEYMAN, E. (2012). "Analyzing recreational values and management effects in an urban forest with the visitor-employed photography method". *Urban Forestry & Urban Greening*, N.11, pp.267-277.
- INE (2002). "O Envelhecimento em Portugal: Situação demográfica e socio-económica recente das pessoas idosas". *Revista de Estudos Demográficos*. Lisboa: Instituto Nacional de Estatística (INE). [Em Linha] Disponível em: www.ine.pt [30/12/2012]
- INE (2012). *Saúde e Incapacidades em Portugal 2011*. 3 Dezembro. Dia Internacional das Pessoas com deficiência. Lisboa: Instituto Nacional de Estatística (INE).
- JACKSON, S. (2004). *A Forgotten Group? (Health)*. April. London: Green Places.
- JHENG, S-S. & PAI, M-C. (2009). "Cognitive map in patients with mild Alzheimer's disease: A computer-generated arena study". *Behavioural Brain Research*, Vol.200, pp.42-47.
- JONES, E. (2002). Mental Health. Wolfy. Health in Mind. *Landscape* 04.07. [Em Linha] Disponível em: www.landscapeinstitute.org.uk [30/12/2011]
- LITTLE, B.R (2002). "Personallity and the Environment". In BECHTEL, R B. & CHURCHMAN, A. *Handbook of Environmental Psychology*. NY: John Wiley & Sons.
- LÚCIO, C.C., LUDESCHER, N.O., VERGÍLIO, R.R. & RAZA, B.M. (2011). "Envelhecimento e Design Universal. Aplicação dos Critérios de Design Universal visando a Compensação das Limitações Físicas Impostas pela Idade Avançada". In VI Congresso Internacional de Pesquisa em Design. 10-12 Out. Gulbenkian, Lisboa: 6º CIPED, FCT.
- LYNCH, K. (1960). *The Image of the City*. Massachusetts: The MIT Press.
- MEZEL, D. (1984). *Evaluacion de la Salud en el Anciano*. Mexico: La Prensa Medica Mexicana.
- MOODY, H.R. & SASSER, J.R. (2014). *Aging: Concepts and Controversies: Concepts and Controversies*. 8 Ed. London, UK: SAGE Publications.
- NETO (2000). MENDES, R.C. & RELOIRO, M.F. (2006). "Seleção e Caracterização de Instrumentos Úteis à Intervenção da Fisioterapia em Idosos Institucionalizados". *EssFisiOnline*, Vol.2, N.3, Junho, pp.1-23.
- NEVES, R.M.M. (2009). *Do projecto de Vida ao Projecto de Cuidados para Lares Residenciais: A Dimensão Psicológica do Relacionamento*. Relatório submetido como requisito parcial para obtenção do Grau de Mestre em Psicologia. Especialidade em Psicologia Clínica. Lisboa: Instituto Superior de Psicologia Aplicada, Universidade Nova de Lisboa.
- NUNES, C. (2016). *Design Inclusivo e Ergonómico de Espaços Exteriores. Avaliação da percepção de seniores em relação aos elementos do design de Jardim de Lar*. Tese em Design. Lisboa: Faculdade de Arquitectura, Universidade de Lisboa.
- NUNES, M.P. (2005). *O Envelhecimento no Feminino. Um Desafio para o Novo Milénio*. Coleção Informar as Mulheres, N.22. Lisboa: Comissão para a Igualdade e para os Direitos das Mulheres, Presidência do Conselho de Ministros.
- PACHECO, C.P.N. (2010). *Equipamentos nos espaços verdes para a 3ª idade - O caso Quinta das Conchas*. Dissertação para a obtenção de grau de Mestre em Design de Produto. Lisboa: Faculdade de Arquitectura, Universidade Técnica de Lisboa.
- PALMA, J. (2011). *Design para a Promoção da Saúde e Bem-Estar*. [Em Linha] Disponível em: http://www.ambitushominis.com/pdf aulas/Design%20e%20comportamento_CHA.pdf [30/12/2011]
- PALMA-OLIVEIRA, RIBEIRO, RISQUES & MONTEIRO (1999). "A disposição do mobiliário na comunicação entre os idosos - uma intervenção no instituto de apoio à comunidade do Forte da Casa". In PALMA, J. (2011). *Design para a Promoção da Saúde e Bem-Estar*. [Em Linha] Disponível em: http://www.ambitushominis.com/pdf aulas/Design%20e%20comportamento_CHA.pdf [30/12/2011]

- PANERO, J. & ZELNI, M. (2009). *Dimensionamento Humano para Espaços Interiores*. Amadora: Editorial Gustavo Gili.
- RAMOS, I.L., BERNARDO, F., SARAIVA, M.G. & TEIXEIRA, T. (2010). "Paisagem Urbana: Viver a Cidade entre o Artificial e o Natural". In CESUR. *Manual-Métodos e Técnicas para o Desenvolvimento Urbano Sustentável. A Experiência dos Projectos Polis'08*. Coleção Expoentes. Lisboa: ParqueExpo.
- RUSSEL & SNODGRASS (2002). "Personality and the Environmental". In BECHTEL, R.B. & CHURCHMAN, A. *Handbook of Environmental Psychology*. NY: John Wiley & Sons.
- SAVITCH, N. & ZAPHIRIS, P. (2006). "Accessible Websites for People with Dementia: A Preliminary Investigation into Information Architecture". *ICCHP, LNCS 4061*, pp.144-151.
- SILVA, E.B. & SOUSA, I. (2003). "Configurações de vida na velhice". *ANTROPOlogicas*, N.7, Porto, UFP, pp.181-209.
- SILVA, F.N., SOARES, R., GOMES, A., CAMBRA, P. & LAJES, R. (2010). "Acessibilidades e Espaço Público". In CESUR (2010). *Manual - Métodos e Técnicas para o Desenvolvimento Urbano Sustentável. A Experiência dos Projectos Polis'08*. Coleção Expoentes. Lisboa: ParqueExpo.
- VASSENDEN, A. & ANDERSSON, M. (2010). "When an Image Becomes Sacred: Photo-elicitation with Images of Holy Books". *Visual Studies*, Vol.25, N.2, Sept., pp.149-161.
- YOUNG, G. (2010). "Virtually Real Emotions and the Paradox of Fiction: Implications for the Use of Virtual Environments". In *Psychological Research. Philosophical Psychology*, Vol.23, N.1, Feb., pp.1-21.
- ZHAI, Y. & BARAN, P.K. (2017). "Urban park pathway design characteristics and senior walking behavior". *Urban Forestry & Urban Greening*, Vol.21, pp.60-73. [Em linha] Disponível em: <http://dx.doi.org/10.1016/j.ufug.2016.10.012> [26/04/2017]