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Landscape design for vulnerable social groups.

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Abstract
Despite the adverse socio-economic conditions many countries are confronted with in the beginning of the 21st century, including Greece, a more sensitive design in regards to specific vulnerable social groups is evident. Although landscape architecture projects take into account and provide considerations for target groups like the blind, yet no true breakthroughs have been made, for more 'specialized' groups of people like those suffering disorders of the nervous system. Progress in the medical sector indicates advances in the ailments of dementia and Alzheimer, providing also, a prosperous ground for landscape architecture design. Urban space should facilitate people who suffer from the above disorders, to carry out their daily activities despite their special and demanding needs, promote physical activity, as well as provide opportunities for rehabilitation and social interaction. In other words, public spaces should be able to play the role of a large scale shelter in the everyday life of the elderly with such ailments.
This paper attempts to demonstrate a set of landscape design interventions upon the existing urban environment, which, with small, low cost changes and adjustments, may offer them help and support to adjust their everyday life style to the new living conditions. Through large scale landscape interventions, either on a neighborhood scale or in the wider city, the aim is to meet the needs of these groups with respect to their condition and therefore decrease the possibility of their early relocation to nursing homes.
Keywords: Urban public space; landscape design; vulnerable groups; dementia; Alzheimer.

1. INTRODUCTION

This paper addresses the question of which basic principles of a landscape architecture can be applied to open urban spaces in order to make living sustainable for those suffering from Alzheimer's disease. To this end, design solutions that can contribute to improving the daily living of Alzheimer's sufferers, were sought for. The aforementioned can initially only be achieved by ensuring that the therapeutic potential of the natural environment in which Alzheimer's patients live in is fully exploited.
The aim of this study is not only to sensitize public and private authorities but also to get designers and researchers respectively interested in conducting further research. Additionally, in order for the design principles to be applied most effectively is recommended that outdoor open spaces are created, mainly parks, specifically designed to accommodate Alzheimer's disease sufferers. These outdoor spaces should be as much as possible in close proximity to Care Centers, such as Nursing Homes for the Elderly or Open Protection Centers and Day Care Centers for the Elderly. Therefore, it is obvious that the collaboration with the Municipality and the authorities responsible for taking relevant actions is of vital importance since it would enable the application of complete design principles, through which the Alzheimer's sufferers would potentially highly benefit from. Nevertheless, it should be noted here that even firstly implementing smaller scale interventions with a low cost would prove to be immeasurably advantageous, especially as far as increasing the quality of life for Alzheimer's patients is concerned.
In the 21st century, medical studies carried out universally reveal the rapid increase of people contracting Alzheimer's. In Europe alone, one out of 8 elderly people suffer from this disease. Therefore, it is high time that our society realized that these people should not be marginalized and/or excluded from being able to equally enjoy the commodities offered by society. The urban space should be designed in such a way that will facilitate them when it comes to coping with their daily demanding needs, while promoting their physical and mental activities and subsequently increasing their chances for social interaction. In this way, the immediate need to be transferred to specialized Care Centers will ultimately be slowed down.

2. MATERIALS AND METHODS

The design solutions proposed for this study were based on the physical, motor abilities and psychological and social needs of people with Alzheimer's disease and in turn developed based on the relevant literature. Specifically, the fundamental principles primarily derived from the conceptual design of therapeutic gardens formed the basis for designing such spaces and then adapted to the subsequent design of open urban spaces. In other words, the attempt that was made to modify the existing design principles applicable to small scale projects in order to develop design principles that could be applied accordingly to corresponding large scale ones.

The main reason that the design principles of therapeutic gardens were solely used is that they constitute the only implemented project for outdoor open spaces designated for Alzheimer's sufferers. Furthermore, the design principles do not substantially differ in different sized scales owing to the fact that the environment has the same therapeutic effect regardless of scale [15]. Thus, the design principles of large scales projects handle Nature and its therapeutic properties in the same manner that smaller ones do. Additionally, ideas were drawn from the literature studies on the formation of friendlier cities for these sufferers, even though such studies have not yet been implemented. Moreover, medical data concerning the disease and its physical, social and psychological impacts was taken into consideration.

However, what was mostly taken into account was the fact when spaces are designed for the aforementioned people, the physical and mental limitations for future users should be considered. This is the case because dementia causes progressive reduction of patients' functioning, loss of memory, intelligence, social skills and their natural emotional reactions [20]. The management of all these symptoms is complex and multifaceted, as it focused both on prevention and medication, while today more and more emphasis is given on the contribution of environment. The natural environment generally has a positive effect on people's health, their happiness and quality of life. Consequently, keeping oneself actively engaged in the natural environment is regarded more and more as an effective way for Alzheimer's disease sufferers to cope with their psychosocial needs.

3. RESULTS AND DISCUSSION

A complete design of a park-square or an urban development for people with Alzheimer's should therefore meet both the technical requirements and psychosocial ones. For this purpose, the construction of open urban spaces will serve as meeting point of Medicine and Landscape Architecture. Bringing these two sciences together naturally leads to the formation of the specific and necessary principles necessary for this architectural design.

It goes without saying that all these principles which affect, compliment and are often are a condition of the other have as a mutual point of reference the following:

i. Space Accessibility

ii. Simplicity and Functionality

iii. Orientation and Movement

iv. Safety and Convenience

As well as other psychological and social principles

v. Interaction with Nature
Development of Sociability, Social skills

Sensory Stimulation

Memory Recall

The aforementioned concepts namely accessibility, functionality, orientation and safety constitute the structural foundation upon which to build and develop other psychological and social principles and it is these, which this study develops [6].

i. Space Accessibility

Keywords:

- Space Proximity
- Ramps and Handrails

To encourage Alzheimer’s patients not to stay indoors but rather to go outdoors, the urban open spaces should be located in close proximity to as much as possible both to their homes or Care Centers. To be more exact, they should not be more than 500 meters way from the Care Centers, otherwise the elderly people would be discouraged from going outdoors [3].

The entry should be adjacent to main roads to be easily visible and accessible, while the street entry should provide safety, accessibility and be easily tracked. In the case that a part open space is elevated, above ground level, it is highly advisable to have a ramp and handrail. Nevertheless, changes in levels should be avoided as much as possible due to the decrease in balance and unstable walking ability that Alzheimer’s patients experience. If for some reason, the changes in level are unavoidable gentle slopes and very subtle changes in level are recommended [24].

ii. Simplicity and Functionality

Keywords:

- Simple and Functional design
- Absence of dead ends – labyrinths
- Comfortable walking Pathways

For that matter, architectural design is especially interested in the simplicity and functionality of a space. The limitations that the Alzheimer’s patients experience, their physical safety as well as the potential therapeutic benefits must be taken into consideration [17]. To this end, the space should be easily accessible and should in no way confuse them [17]. The scale of the space should not be big. This the case because very large spaces mislead patients since they cannot remember where to move and as a result they get anxious and scared [11]. Last but not least, there must be the design of discrete and identifiable places which cause less confusion [5].

The various subareas should be visible from one another to allow walkers to comfortably identify their place. The complex structure of space creates insecurity and as a result a simple road system is needed, without any unnecessary dead-ends and many junctions. Alternatively, the space should be clearly delineated, in order for the prospective visitor to be able to easily move about in it despite one’s limited physical and mental skills.

This simplicity should also be evident in the construction. Familiar objects help one feel much less reserved and thereby are more desirable. As a consequence, it is good for modern looking designs with abstract symbols to be avoided, as people with dementia might have great difficulty interpreting them. This does not mean to say that these individuals can only recognize traditional design features. However, the conclusion that can be safely drawn is that the clarity of how something is utilized and function seems to prevail over the style, whether traditional or modern, as the former proves to make a positive contribution overall [19].

Balance is also required in order for the space to provide stability on its whole. Equally important is plant rotation, which will essentially highlight the space. It follows that the use of repetitive patterns and the attempt to make a smooth transition from one landscape to another region is particularly important to create a good ‘flow’ especially when transitioning from areas of increased sociability to more private ones. [9].
iii. Orientation and Movement

Keywords:
- Primary and Secondary Routes
- Landmarks-destinations
- Nodes

Orientation is a general term including the way in which a person navigates within his environment. Most people who are in any kind of space begin to mentally form a map, a cognitive map that is, which as defined by Arthur Passini is a "mental structuring process leading to the creation of a cognitive map." People with dementia find it extremely difficult to formulate this map (due to disturbances in brain function in the course of their disease), therefore "orientation" is a particularly important feature that should be considered in the architectural design.

The main problems associated with the hindrance of orientation are [17]
- Memory Loss
- Confusion and tendency to drift out
- Irritability and aggression

All these problems are interrelated. As memory loss increases, so raises the difficulty to build a mental map of the environment [1], this weakness intensifies the confusion and thus the subsequent irritability levels rise. Therefore, the design should help to overcome this weakness to the extent that this is possible. To achieve orientation, a key element is the application of spatial hierarchy, that enables easy memorization of several reference points [5] and the ability to correctly distinguish primary from secondary routes [18].

The main route must be large enough to allow a comfortable walk for a group of people as well as the intersection of at least two wheelchairs. It should either lead to a full circular stroll around items of particular interest or to the center of the site leading up to a landmark [5]. The secondary pathways are alternative routes offered for slow walks. Secondary routes perpendicular to the central one, do not confuse users, while providing a relative degree of independence as far as their choice of direction is concerned. They also encourage people to walk freely and readily provide quiet areas for relaxation. Interesting selections of plants, meeting areas could be points along the routes that provide, a sense of security and can also act as an incentives for individuals to develop social contacts [5].

The directions of movement may take on the following forms: radial, linear, circular and looped. A straight path that leads to a dead-end should be avoided, due to the fact that patients with Alzheimer's will eventually get over stimulated and become stressed. By the same token, complex paths are not deemed as appropriate and landscape architects should avoid making use of, mainly, labyrinth designs [13]. A circular is much more preferable especially loop shaped, because it will lead users along a path with interesting focal points and then bring them back to their starting point [5]. Thus, the individuals are much less likely to experience feelings of entrapment.

To increase the likelihood of orientation being achieved various coating materials could be utilized. A continuous path with specific material can guide and give a sense of direction in the right way. Therefore, at least the main path must be paved by different coating materials in order to be easily distinguished from the secondary paths [5].

Another point worth mentioning is that, it highly is advisable for the edges on paved paths to be brightly painted or slightly elevated. These signposts would help to enhance spatial orientation while emphasizing on the interchange of the paving to the planted area [12].

Planting, such as alleys with aromatic trees or with striking foliage, can also assist in one's orientation. Certain types and categories of trees should be avoided, such as cypress, due to the justified negative associations they may create. The contrast between the green grass and the walking pathways, provides a visual indication that leads the elderly along the route to their destination points [5].

Another essential element in the orientation process are landmarks-destinations. Landmarks are placed in locations where the elderly have the natural tendency to end their walk and they often serve as destinations as well. There are not any special features to define a landmark, they could be focal points which one merely thinks is worth going in the direction of. Benches, patios with seats,
special structures, or plantings placed at key points, serve as destinations and attractions worth circulating around, encouraging movement and walks respectively. A landmark of particular importance is that of the water element, due to its multi-esthetic nature. Water fountains, small waterfalls, ponds, and springs produce natural sounds helping to stimulate the hearing process, while at the same time attracting birds and other small animals, thus giving the opportunity for discussions and contributing to the increase of socialization [5]. Landmarks can also be areas with aromatic gardens with herbs or a greenhouse. Apart from orientation, the main goal always remains the same, to attract the interest of the elderly with Alzheimer’s and at the same time motivate them to walk around and communicate with others. Besides the usual landmarks, a special interest lies in two of its particular subcategories. These are the landmarks—artworks pertaining to significant historical and cultural events [7]. In the first case, the inspiration can be drawn from Artistic gardens. However, its creators must take into account that the elderly, particularly those with Alzheimer’s disease, prefer depictions of nature, simple and clear forms and react negatively to abstract art or any project for that matter with unclear meaning and ambiguous concepts [8].

Landmarks with historical or cultural references and inspiration can be drawn not only from monastery gardens, paradise gardens of the East, but also from cultural elements of the local society [4]. Thus, inspired by the monastery gardens, in the center of a park or an open space, a seating area could be constructed enclosed with columns or arches [5]. As located in the center of the park, it may offer interesting views on the surrounding areas, while at the same time encouraging social interaction. Furthermore, it could serve as a shelter in the case of sudden weather changes. The use of suitable plantings may provide the necessary greenery. Paradise gardens also provide elements for inspiration. This model is based on Islamic gardens and their fundamental features, which are those of enclosure, the presence of the element of water and greenery [14]. Therapeutic gardens inspired by historical and cultural references provide very interesting and at the same time exploitable elements. Their design is based on history, tradition and daily life of the local community [10]. In this case, the specific park is characterized by its recognizable identity, while at the same time creating a strong link with the local community [21]. Traditional springs, a small watermill, a brick base well with its wheel, a wooden dray with flowers or an old car become focal meeting points for elderly visitors. The use of symbolic landmarks, apart from encouraging conversations and social contact, helps the target group cope with memory loss, which is an equally important goal of the design. The process of memory recall can be supported by the use of elements that reflect old habits or activities. Alzheimer patients might have loss of memory concerning more recent details, but old habits linger [11]. This goes to show significant it is for these people to be able to recognize familiar items during their walks.

Nodes as points of orientation increase activity as gathering points or even stopping points along the way of a typical walking route [4]. Nodes can be main entrances or a crossroads in the park that give to the visitors the opportunity to choose a direction [4]. They can function as rest places, in the same way as a bench or a trellis can, where walkers can enjoy the shade, chat with others and enjoy the view [26]. Therefore, promotion of the orientation ability within the garden is of vital importance in the landscape architectural design. Its success is ensured by the proper design of path routes, the attractive use of plants, sculptures and water features, in order to highlight and create focal points. The main objective is for the prospective visitors to be encouraged to move around, to come in contact with nature and to develop sociability [11]. It follows that when the design allows the visitors to orientate themselves through visual indications provided, individuals with Alzheimer’s are assisted in gaining a sense of control, self-confidence and having their self-esteem boosted.

iv. Safety

A primary concern in the designing of an urban site is to ensure the safety of its visitors. The main goal is to create a supportive environment. The proper design and arrangements of the urban space is the crucial key factor to consider an open space as welcoming and safe [11].
Keywords:

- Non-slip and Anti-reflective surfaces
- Ramps - Handrails
- Tidiness and Drainage
- Raised Flowerbeds
- Water features
- Micro climate
- Signage
- Lighting
- Suitable plants
- Urban Equipment

Architectural design should take into account the fact that people with dementia, have general health problems due to their age, such as visual impairment, movement difficulties, reduced physical strength and stamina, poor balance etc. Furthermore, they are more vulnerable to temperature changes [4]. The weakness and dependence that they feel has an emotional impact and as result feelings of incompetence are often expressed by people with dementia. Many of them feel extremely insecure to such an extent that they avoid going out and prefer to stay within their familiar surroundings [25]. However, these sufferers should be encouraged to go out, to get in touch with nature and their fellow people.

Special care must be taken in order to achieve this. More specifically, since one of the biggest risks in particular for these people, is that of a fall, wide walkways should be designed, paved without potholes, loose or slippery materials. The surface of the paving of the paths must be slip-resistant, but not too rough, to avoid hindering the movement of pedestrians or wheelchairs. The materials and colors used should be able to filter/reduce reflections as much as possible. It is also recommended that the edges of tiling be highlighted. Access ramps are necessary at the points where there is an unavoidable change in level, in order to assist pedestrians and people using wheelchairs by providing them with obstacle-free access [4]. In addition, handrails and rest areas along the walkways can encourage even those who are more worn out to continue their walk [4].

Planting along the pathways must be arranged properly so as to prevent leaves, fruits and flowers from falling on the paths [4]. This precaution must be taken because of the fact that the elderly due to their unstable gait could slide along the walkways. An important safety factor is to provide a proper routing for rainwater and drainage in the paths and paved areas.

Seasonal plants with bright colors are more attractive for patients, bringing them closer to the cycle of nature, while contributing to their orientation as regards to time (seasonal time changes, religious feasts, etc.) [17]. However, it is necessary to take into consideration their potential toxicity, their attractiveness to bees and even their allergy causing properties [22]. The issue of toxicity is of particular importance, since people with Alzheimer do not have a sense of hazard and might try to eat leaves, flowers or fruits [5]. Thorny plants should also be avoided and instead plants resistant to insects and diseases should be selected, in order to eliminate any possibility of pesticides having been use [17].

It is also advisable to make use of raised flowerbeds of varying heights, that gives visitors a closer view of the area while the nooks on their interior or on their edges make the area more accessible [4]. A raised flower bed can allow people using wheelchairs to touch the plants and participate in gardening activities. It also serves as a natural divider or fence in order to create an enclosed environment. A certain level of space enclosure is necessary for people with Alzheimer, to avoid disorientation, typical sign/symptom of the disease [5]. This can be achieved through a design using fences or shrubs, but without creating any feelings of confinement or entrapment.

Another matter that needs to be addressed is the vulnerability of the elderly to temperature changes, bright light and in general extreme climatic conditions [11]. Therefore, open spaces and especially seating areas, should be designed by landscape architects by taking into account and utilizing
sunlight, shade and wind elements [4]. The orientation of the open space should be such, that it gets direct sunlight for several hours per day and is also protected from the prevailing winds and downdrafts[4]. A draft in an enclosed area could be a serious problem. With the appropriate modifications, though, in its use it can prove to be highly beneficial for locations with hot weather [23]. This becomes especially evident in countries that have very hot summers, like Greece, where if orientation is taken into consideration, open urban spaces can get the most out of air currents. The use of pants as windbreaks and barriers is ideal in order to limit the direct exposure to sunlight glare, solar rays and provide protection from strong winds and high temperatures. [4]

Plantings play a significant role as they serve multiple functions such as the following: filtering dust particles, contributing to relative humidity improvement around them, while also providing a certain degree of acoustic insulation [16]. The use of the appropriate evergreens and deciduous tree plantings can provide sunny and shady outdoor/seating areas always in accordance to the season.

Water is an element that may affect the micro climate and improve the outdoor thermal comfort conditions in open urban spaces during hot weather seasons. Some of the water elements but to name a few that can be integrated into an urban development and contribute to the improvement of the micro climate are: horizontal water surfaces, artificial ponds, fountains, vertical water surfaces and water jets. Although the existence of water is considered necessary in areas for Alzheimer patients, due to its multiple sensory utility, still the necessary precautions should be taken to ensure that the constructions are safe. The borders of the constructions must be clearly defined, specifically the lakes or streams should be designed in a way that can accommodate larger water inflows than planned, as for example during a downpour. In the case of an increased depth being installed, the landscape architects have to make provisions for the installation of railings. If the depth is limited, a boundary may be sufficient. Plantings may also be used in order to block access. In the case of a fountain with a level of water exceeding twenty-five centimeters it is necessary that the boundaries are closed, elevated or not allowing access in order to prevent the occurrence of any potential accidents. The most secure structure for a fountain is that of a small jet type fountain, with a small sump underneath, covered by a layer of pebbles. [11]

The design of lighting during nighttime is also a essential, especially in countries like Greece, where the hot summers keep the elderly out late at night. Adequate lighting should be installed at the entrances of parks and into its sub-regions so that it can ensure best results. Furthermore adequate lighting must be established along the pathways for orientation, helping to determine the limits of the paving and to avoid intense shadows [4].

Finally, the materials of the outdoor furniture (chairs, tables), should be carefully selected. Specifically, soft or wooden materials should be preferred over others that are not good heat and cold conductors. Their edges should also be smooth and rounded. The design of appropriate structures, the right choice of design elements for the site and their maintenance should be the primary concern of the landscape architect in order to achieve high levels of security for access to the site.

4. DISCUSSION

Open urban spaces, specifically parks designed especially for people with Alzheimer's disease, can play a significant role in supporting and providing care for them. With their specific standards and by making provisions therapeutic activities could prove to be helpful in increasing the chances of preserving their abilities, both cognitive and physical and also reducing confusion and over stimulation, which are symptoms often associated with this disease [17].

Even the smallest intervention to open urban spaces, the design of which aims to be as familiar and friendly to them as possible, can offer a number of benefits, enabling their more active involvement in community life.

All the proposed solutions are based on specific theories and principles, architectural, psychological and medical. However, they are still part of a theoretical framework and as a result their beneficial
functionality through implemented projects is yet to be proven. The only executed ones, are those of therapeutic gardens, their undeniable benefits of which are a primary step in the application of the principles mentioned above. Therefore, it is suggested these standards are initially applied to a park, a square or a waterfront on an experiment level, close to a care unit, always by making the appropriate modifications.

Moreover, the project can be expanded and investigated in detail and likewise new suggestions for future research can be made. Apart from the outlined design principles, we should encourage the participation of the individuals themselves in the designing process. With the assistance of the health center's management or by personal contact, interviews and patients questionnaires, we can gain valuable insight into crucial matters such as the type of plantings they prefer, or feel more comfortable with, their preferred shapes, height and colors that improve their emotional well being. These questions could be asked by using 3D images, thus presenting realistic scenarios to patients to choose from, on the basis of what they consider more appropriate. A subject for future research could also be, the development of open urban space with design principles tailor made to meet the needs of the patients accordingly, in all three stages of the disease. Finally, it is important in order to develop the socialization of the elderly, for a joint effort to be made, which entails the cooperation of health centers (private and public) with the municipal authorities. To achieve this it would be helpful to organize at regular intervals, group activities mainly physical in nature, such as musical performances, dancing. In this way, the elderly taking part in these activities would be urged to enjoy the parks or squares near their homes.

5. CONCLUSIONS

Needless to say that the effort made should continue. The whole community can be involved in the design process of a user-friendly environment for people with Alzheimer's and dementia. An anthropocentric society could by no means be considered one, by socially excluding and/or isolating particular groups of people. A joint effort, a little more inspiration and sensitivity is all it takes to turn a hostile urban space into a friendly one, which would contribute if not towards treating these people, but at least to enhance their quality of life and at the same time making them feel that they have a meaningful life worth living.

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