

Effect of Lighting and space on depression and stress appearing in residential places

Ali Akbar Heidari^{1*}, Hossein Tavakol² and Nazgol Behdadfar³

- 1- Department of Architecture, College of Graduate Studies, Science and Research, Branch of Kohgiluyeh and Boyer-ahmad, Islamic Azad University, Yasouj, Iran
- 2- Master Of Architecture, Islamic Azad University, Yasouj, Iran
- 3- Master Of Architecture, Asalooieh International Payamnoor university, Asalooieh, IRAN

Corresponding author: Ali Akbar Heidari

ABSTRACT: Stress and depression are among the common psychological disorders and diseases in modern communities which increased in recent years in different group of ages due to different reasons such as living in apartment and dark and narrow houses. Thus it seems that the effect of light and spatial proportion in modern small houses is very important in occurrence and treatment of these disorders. Since the human behaviors are essential to them the present study first examines the Maslow's needs pyramid model and definitions of depression and stress disorders and based some levels of needs in the pyramid, if not met, may cause these disorders, and according to the results on psychology and architecture based on logical reasoning, discussed how these two variables affect on forming these two psychological disorders and presenting its architectural general solutions in designing small houses. The present study ultimately concluded that with flexible designing and lighting and optimal designing of spaces we could prevent and treat these disorders.

Keywords: Depression, stress, light, spatial proportions, flexibility, small houses.

INTRODUCTION

Stress and depression are among the common psychological disorders and diseases in modern communities which increased in recent years in different group of ages due to different reasons such as living in apartment and dark and narrow houses. Since architecture's mission is to design space and we could its behavioral management through proper spatial designing, thus observing the principles of architecture such as using proper light, dimensions and arrangement of space could really helpful. Since the houses are usually the places of residing people in different gender and age groups, to create a happy and sincere space free of any depression and stress it is required to design a space which, to some extent, meets the needs of all members of family in various situations. Thus, at first it is necessary to examine the platform of users' behaviors which are certainly human needs. So the present study at first examined Abraham Maslow's needs pyramid model as the basis of human physical and mental needs and based on some studies on psychology, gives a short definition of depression and stress psychological disorders and, based on these definitions, discuss some levels of needs in the pyramid, if not met, may cause stress and depression psychological disorders. In the next stage, it examines the role of *light* and spatial proportions in meeting these needs and treating or reducing these disorders and finally advises a series of general solutions on lighting and arrangement in small houses. Of course, it is noteworthy that the solutions are only part of the known solutions but have key roles in treating and preventing these disorders. The present study is an applied study with qualitative method. Data collection carried out based on documentary studies, literature review, references and experiences and their analysis and used logical reasoning to explore the subject.

Marlow's Hierarchy of Needs

Marlow's Hierarchy of Needs or in short Marlow's pyramid, is a theory proposed by Abraham Maslow, management classic theorist, in five human basic needs. He illustrates human needs as a five layer pyramid so

that the stronger needs are prioritized than the weaker needs. His recommended hierarchy included: physiological needs such as hunger and thirst, safety needs such as security of physical damages; belonging and love needs; such as membership in social groups and emotional needs; such as esteem need that is one needs high self-esteem and magnitude with others; and self-actualization need reflecting need to satisfy individual capacities; cognitive and aesthetic such as need to know and beauty for beauty (Lang, 2009).

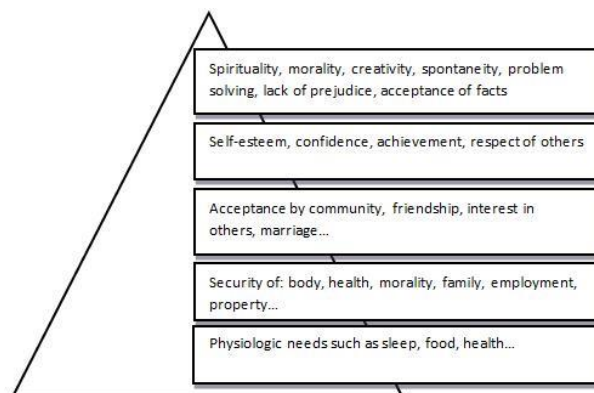


Figure 1. Maslow's Hierarchy of Needs (Lang, 2009) (Source: the authors)

Depression and stress

Depression and stress are among the most common psychological diseases in modern communities who engaged many people in different age groups. These psychological disorders have different definitions and reasons and the present article only discuss their general definitions based on psychological studies:

Depression

Depression is sort of sadness and excessive reduction of happiness for a particular subject. People naturally are sometime happy sometimes sad but these mode declination in natural condition is not strong enough to make people feel depression and is called "depressed". In fact, depression is not an intentional disorder which people make it happen, it is a psychological illness from psychological pressures occurs during lifetime in psychological structure and ultimately it appears in an upsetting event. Therefore, depression is a psychological disorder affects thought, feeling, behavior and physical performance (Butler and Hop, 1999). So far no special theory and learning introduced able to explain all the features and dimensions of depression. Among the various theories about depression, four of them are stronger and more comprehensive than others:

First theory– Depression is the reaction to a shortage: Sigmund Freud, the great psychological scientist, defines depression as a psychological reaction to a shortage. The theory, which considers stress as a psychological reaction to "threat" and depression as a psychological reaction to "shortage", for years, has been amongst the most popular theories and attracted attentions of many scientists. Freud, in fact, examining similarities between "mourning" (The grief of losing a loved one or something that we have a strong attachment) and depression introduced his theory and believes that depression is a sadness of losing something.

Second theory – Depression is causes by self-invasion: A number of scientists believe that human naturally is equipped with a criticism and attack mechanism and the individual depresses as he/she targets the bayonets to his/her own.

Third theory – Depression is looking at events through pessimism black glass: Depression is just like looking at everything through black glasses. Either you think about yourself or world or future everything looks dark, ambiguous and disappointing.

Fourth theory – Depression is caused by biochemical changes in brain: All people have alternations, rise and fall in their own attitude but not everyone exposed to depression equally. In other words, when a similar incident happens to several people, not all of them are depressed. One of the reasons of this difference is the variety of biochemical structure of human brain and all aspects of biochemical processes in the brain can't be brought under control (Butlerand Hop, 1999).

Stress

Stress includes pressure and erosion of body while encountering environment is always changing. Such changes impose physical and emotional effects on humans and could create positive or negative feelings within the person. If positive, the effects of stress make the person act inevitably and bring fresh awareness and new exciting outlook for the person. Stress is a state within body and soul caused by incurring physical and psychological pressures, in a sense, stress resulted from stress pressures and it is appeared against external incompatible stimuli. In other definitions, stress is the person’s reactions against threatening situations in the environment. Stress is not an external agent; in fact, it is a negative reaction in which one shows against other persons, events and things (Mohiyeddini, 2009).

Those were general definitions on stress; however, the purpose of this paper is to examine two environmental parameters of light and spatial proportions in house to prevent negative stress. Thus before these two parameters are examined we should identify factors seem stressful to human. These factors are:

Factors almost identical among all people: Those spaces in which person encounters shortage in information or excessive information to the nervous system, and as a result some disorders happen in the perceptual process. Lack of understanding of the environment will cause stress. Experience proved that when a person engages in a position in where he/she feels not able to control the environment or even has lost the ability to anticipate it, he/she will get stress (Miller, 2008).

Factors different among people: These factors are created as the result of differences in human character. These cases for their personal matter have less been studied and examined and then in a standardized form they barely could be classified in a specific format (Miller, 2008). The present study examined the subject based on the first factor almost identical to all people.

Stress and depression based on Maslow’s pyramid

According to the definitions of depression and stress presented in the previous section, it could be said that depression occurs due to reduced happiness, grief for a shortage such as losing dear ones, job position or anything that person has an attachment, loss of confidence, self accusation as well as being pessimistic about himself or herself and others and being abandoned... Comparing these factors with their counterparts in connection with Maslow’s pyramid, it could be found that depression occurs due to dissatisfaction of third and fourth levels of needs (Figure 2). At the other hand, as stress defined it is a negative reaction towards people, events and things which are felt threatening to person. Thus with this and comparing with Maslow’s Pyramid it is found that stress occurs due to dissatisfaction of second level needs (Figure 3).

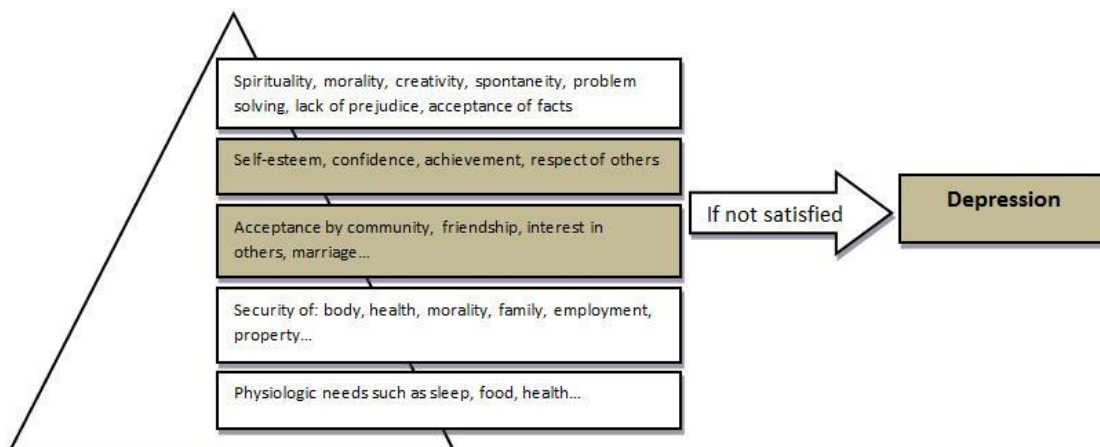


Figure 2. The reasons of depression occurrence based on Maslow’s pyramid (Source: the authors)

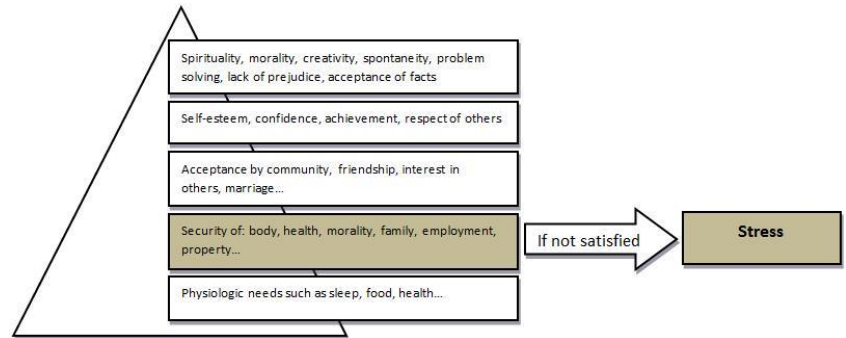


Figure 3. The reasons of stress occurrence based on Maslow's pyramid (Source: the authors)

It could be said that dissatisfaction of second to fourth level of needs in Maslow's pyramid lead to such psychological disorders. Thus we should look for architectural solutions to resolve these needs in modern small houses in order to improve such states. Since examining all architectural aspects such as color, light, dimensions, scales, arrangement... is beyond the scope of the present article, therefore, the present study only discussed light and spatial proportions.

Light versus depression and stress

Light is the first condition for any visual conception. Neither space nor forms and colors are distinguishable in absolute darkness. However, light is not just a physical necessity but its psychological value is one of the most important effective factors on human lives in all grounds (Grütter, 2004). Among the major problems of our times, is living in small and dark houses which has been causes many tensions and psychological disorders such as depression and stress. Therefore, it seems that it is necessary to examine how light make these disorders occur based on current psychological studies.

Light and depression

Some studies and examinations proved that in human thought and mind, sunny days are always accompanied with love, happiness and some sort of special warmth and excitement with hope (Boa, 1997). Day lighting in human phantasm reminds such memories and brings some sort of mobility and positive energy to the person and, in contrast, cloudy and dark days and sometimes rainy are always accompanied with a sense of dullness, loneliness, worry, depression and discouragement (Etemadifar, 2008).

Studying the psychological research, it is noteworthy that to neurologists, the visual information is ten times higher than audio information because the sending bytes (information units) of light waves are higher than audio waves. Nowadays eye surgeons and also neurologists believe that even if the eye is blind for some reasons, it still has the capability of lighting. So we could realize the changes in lighting during day or night with closed eye. Thus it could be justified the reason behind unbearable feeling of winter grieves, misses or impatience of cloudy days without sunlight or depression of long cold nights (Naebi et al., 2007). Based on what was discussed earlier, depression is a reaction to a shortage and here one of the reasons of depression could be seen as a reaction of human to shortage of proper sunlight which has a strong attachment and its loss may reduce love, happiness, excitement with hope, mobility and positive energy. Accordingly reduced happiness leads to boredom and isolation and causes the person doesn't have inner satisfaction of the current situation and lose the desire of togetherness and eventually is depressed. Thus according to the theories in connection with the reasons of depression occurrence and its interpretation, Figure (4) can be illustrated based on Maslow's pyramid:

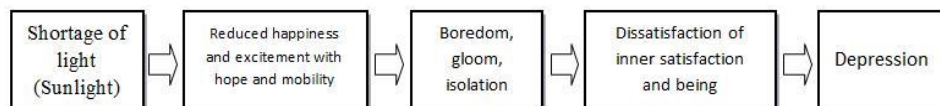


Figure 4. The model of sunlight effects on depression based on research (Source: the authors)

At one hand, based on studies, exposing to sunlight avoids producing melatonin hormone in blood and consequently the level of melatonin hormone in people with seasonal affective disorder is increased in cold seasons as it shows direct association with their psychological situation and occurrence of anxiety in them (Zoueshtiagh, 1985). Dr Ott believes that human body uses light just like water or food as a nutrient in fuel processes. Thus natural light is a stimulus for essential biological functions in the brain and divided into colors that

are vital to human health. A cloudy day or poor lighting condition and inability in recognizing colors to perceive colors could affect attitude and human level of energy (Edwards and Torcellini, 2002).

Thus according to the results of these studies, it can be concluded that reduced light causes melatonin hormone resulting in an increase in drowsiness and decreased activity of essential biological functions in the brain and consequently bad mood and reduced level of energy and freshness and based on the theory No.4, which considered depression as the result of biochemical changes in the brain, depression occurs.

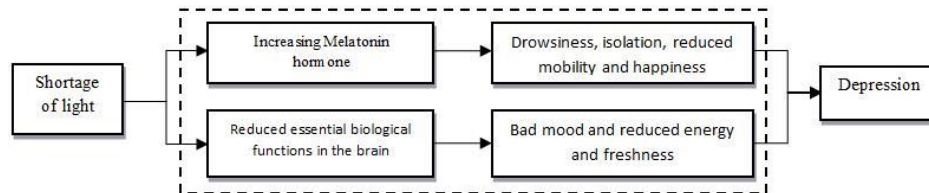


Figure 5. The model of light effects on depression based on the research and the fourth theory of depression (Source: the authors)

Based on the theories in explaining the reasons of depression occurrence and Maslow's pyramid of needs, it can be concluded that human is essentially needs sunlight for psychological calmness and, of course, the amount of receiving light should be appropriate; neither so severe that brings disturbance and tension nor low that suffocates a series of vital needs such as inner satisfaction and being togetherness due to reduced happiness and excitement with hope and consequently isolation and depression. It is true with artificial lighting and should be considered as it is necessary to use artificial lighting in nighttime and cloudy days and in houses with low or no natural light.

Light and stress

According to research, brightness in environment affects spatial function from two sides and it increases its efficacy (Etemadifard, 2008):

Conceptual effects: The results showed that high and appropriate brightness increases visual power, accurate the perception of things and makes it easy to distinguish their parts. At the other hand, human in brighter environment recognizes colors better.

Psychological effects: A lot of studies suggests that proper lighting enhances concentration and strongly reduces or delayed fatigue of sensory-motor organs. Some studies shown that white light improves even human temperament and concentrates the motivational forces on more activities.

When a person is in a state in which psychologically engages in a balanced and satisfactory condition and, in other hand, have the required abilities for deep and accurate conception of phenomena, his or her behavior due to these factors would have the minimum mistake with maximum quality and consequently one of the most important psychological needs of person is provided in order to relax and deal effectively with others. In this regard, improper lighting can cause an annoying sense in person. Also bad lighting can fill the place full of distressing atmosphere or make its local residents upset and anxious; poor and unaccounted light may cause headache, eye fatigue or anxiety (Haman, 2008).

Based on the definitions provided and the stresses that were previously described, it can be concluded that human in dark or poor light environment, as it is impossible or restricted to understand and control the surrounding area, the person receives low information from the environment and, therefore, gets stressful and anxious. At one side, exposing to an environment with very intense light also for excessive receiving information the nervous systems gets stress and shows negative reactions and in both states it could be said that the person feels insecurity and his or her need to security has not been responded.

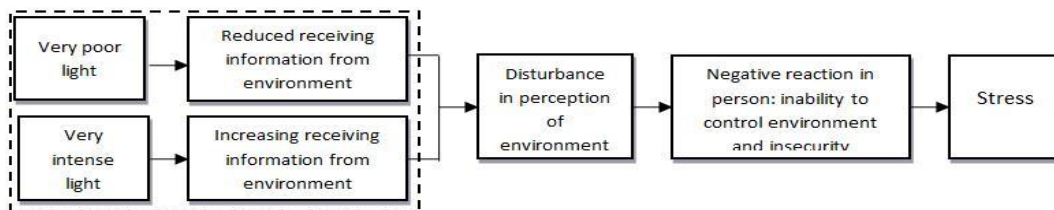


Figure 6. The model of light variable effect on stress (Source: the authors)

General solutions for house lighting

So far the present paper examined the effect of light on depression and stress, now it is time to present a series of solutions based on the mentioned topics. As it is difficult to explain partial and precise solutions, the present study discusses general solutions. According to the previous subjects, one of the positive features of a house is to expose to natural light. Thus it is better to choose houses with proper daylight for living to prevent occurring depression and stress. But inevitably we should use artificial light largely as unexposing to natural light is one of the problems for modern houses especially apartments.

As it is said earlier, shortage of light causes depression and feeling sleepy and depression often associated with isolation; thus it is necessity for houses to have spaces in where some parts have used bright lighting; because this type of lighting prevents melatonin hormone in blood and consequently feeling sleepy and illness and brings passion and joy. In one hand, sometimes human needs a cozy, safe and free of stress space; therefore, it could be useful to have a private room in where the person feels relaxed. It is better to use darker and sometimes relaxing lights in such spaces. It increases the production of melatonin in blood and exacerbates the feeling sleepy and, at the other hand, having such light avoids senses of insecurity and anxiety occurs in absolute darkness due to disturbance in perception of environment (Even et al., 2007).

Bedroom is the main room for rest and calmness in a house and as the present paper concentrated on small houses, it is seems that in most houses bedroom is used for other matters such as studying; thus the general solution is to use a general lighting, for lighting such space, with soft light as well as a series of independent and concentrated lightings for more accurate activities such as studying.

Living room is among the important spaces in a house as it plays a key role in creating intimate relationships between people and providing a sense of relaxation and reduced depression, isolation and stress. Most living rooms need flexible lighting methods, because these rooms have wide variety of variable applications. Lighting of a normal living room should provide a relaxing space for small group dialogues, group parties and individual activities such as studying and listening to music and watching television. Since flexibility is one of the principles of lighting living rooms, their lighting should accompany with light controller switches (Karlen and Benya, 2006).

Kitchen and dining room is another most commonly used spaces in a house where should be sometimes a quiet space free of stress to satisfy the security needs and sometime a gathering space of family members during dinner to satisfy needs such as togetherness, self-confidence, friendship, respect of others ... which consequently leads to reduce isolation and depression. With sharp tools and electric and gas appliances, a kitchen requires an appropriate lighting because insufficient light in kitchen may be dangerous and, in turn, could be a factor to produce a sense of stress and anxiety. Thus it can be assumed that kitchen too requires both general lighting and concentrated lights in spaces with dangerous appliances. For lighting of dining room, creating spirit and personal mood should be the top priority in standards of lighting design. It is noteworthy that the desired space of this type of room is always changing. It is important to create a live and official space in a cozy and exciting time and space in another time while an appropriate space for holding party in dining room (Karlen and Benya, 2006). Thus it is assumed that it is inevitable to have flexible lighting or a combination of general and spot lighting in such space.

General lighting is the most commonly used lighting because it removes shadows; as shadows in long term brings fatigue and depression to the family members. In general, for house lighting, it is necessity to use a combination of general and applied lighting proportional to age, location, education, job and also lifestyle of users. Thus it can be concluded that the best method of lighting is the flexible and controllable lighting (e.g. using Dimmer). Accordingly the amount of required light can be regulated proportional to different conditions and time depending on application of space.

Proportions of house spaces on depression and stress

Different spatial proportions affect the psychology of human based on human nature. In past Iranian architecture this principle has been proposed as diplomacy (Meamarian, 1992). Houses in the past had bigger spaces, yard, garden ... but today they have been small and narrow and impose undesirable psychological effects on its members. The most negative psychological effects of these houses on people are resulted of restricted contact between them or, in contrast, high undesirable and inevitable contacts. This defect is more the direct result of mistakes by construction designers. For example, in small elevators people often feel that their privacy has been violated and don't want to have any connection in these conditions. They feel that other people have violated their "privacy" and have been a distance less than "ran away" with them (Grüter, 2004).

In general, people try to gain an appropriate level of privacy. Rapaport defined privacy as "an ability to control social interactions, right to choose and preferred social interaction". Privacy should not lead to dissociability and isolation. Excessive solitude leads to social isolation and low solitude can lead to feelings of subjective crowding. Congestion due to direct contact with "social pressure" can cause negative behaviors. The behavioral camps

should not be too crowded; that is the number of people should be appropriate with the current behavior pattern and people should have sufficient privacy and control their own domain (Lang, 2009). Excessive solitude reduces the level of intercommunications. It ultimately leads to isolation of person and reduces his or her level of happiness which is a factor in depression occurrence in person. In other hand, low privacy, or in other words, congestion in space increases social pressure on person, also congestion especially in connection with physical factors of environment increases the information obtained from the environment and two factors ultimately leads to increase tension between people and negative behaviors in person which, in turn, is a factor for stress occurrence in person (Figure 7).

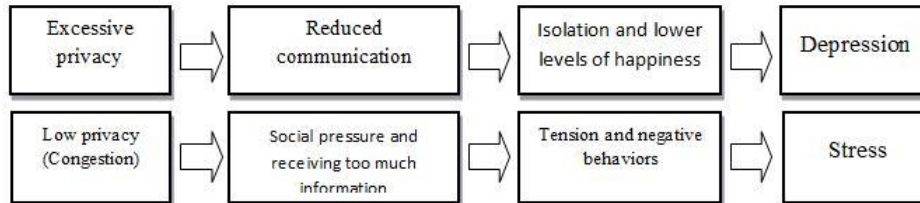


Figure 7. Privacy on depression and stress (Source: the authors)

Altman believes that people in different times should be in places compatible with their variable tendencies to having or not having contact with others. In his view, environments persist on only one of these two aspects, are static and still and couldn't meet the variable needs to privacy. He points out Japanese house as a good example of flexible environment so that the same space is used in different times for eating, sleeping and meeting others. He believes that variable spaces should be used more to regulate environment with our variable needs to privacy (Pakzad, 2010). Thus in house design, spatial proportions should be in a way that spiritual interactions arise between the family members at some hours of day or night in order to meet their needs of being togetherness, friendship and happiness... and avoid their isolation and depression. On the other hand, to deal with stress in small space, the arrangement of space should be in a way that it isn't stressful and people don't feel any choking, overcrowded and insecure. Since spaces in housing are small and it is not possible to allocate fixed furniture for different functions, the furniture of such spaces should have sufficient flexibility to accommodate with different functions. So it is better to use similar furniture in identical functions with ability to change to adapt to different functions (Borhani Darian, 2007).

John Lang says: "Tension occurs in spaces where person faces instability, imbalance composition, usage of high contrast, unfamiliar elements in unknown environment, incompatible and irritating intense colors, forms and lines with sharp angle, irritating intense light and, in contrast, calmness is gained placing familiar and lovely elements in a familiar environment" (Lang, 2009).

As already mentioned in environments impose a lot of information to human nervous system, the person get stressed thus if there are many things in a small space, not only it seems small and suffocating, but also huge amount of information may cause stress in user. Thus the solution of designing such spaces is to use small and compact furniture and things. In other hand, if the space doesn't meet some needs such as children's play and their energy discharge and providing a refreshing environment for teenagers, and because their needs are not satisfied, it causes depression, isolation and aggression in them and tension and stress in other members of family. Accordingly it is assumed that spaces in small houses should be designed in a way that in addition to flexibility avoid creating imbalance spaces and stressful.

RESULTS AND DISCUSSION

Result

The present article first introducing definitions of "depression" and "stress" concepts and examining the reasons of these psychological disorders and analyzing the concepts using Abraham Maslow's pyramid of needs concluded that if, among the hierarchy of needs, the needs at second and fourth levels are not met the risk of these disorders is increased. According to this basic theory, it tried to examine solutions to reduce these disorders considering the satisfaction of the needs in modern small houses. Since examining different and factors of effective psychology and sociology in occurrence of such disorders is beyond the scope of the present article, therefore, the present study only discussed light and spatial proportions, creates due to the architecture space in human.

The results show that depression occurs due to human reaction to a shortage and here human reaction to shortage of sunlight could be considered as a reason for depression. Reduced light decreases the level of mobility

and happiness in person and it leads to illness and isolation. In this state, person is not satisfied with the status quo at all and it leads to occurrence of depression in the person. In one side, reduced light increases melatonin hormone in body and it, in turn, reduces mobility and feeling sleepy and ultimately leads to isolation and depression in the person. In other hand, increased light increased the information gained in the environment and it, in turn, leads to perception disorder of environment and it ultimately causes the sense of inability to control the environment, or in other words, insecurity which consequently makes the person get stressed.

Spatial proportions are also effective in occurrence of depression and stress in some way. It is justified through the notions of privacy and congestion. Excessive privacy reduces the people's intercommunication and consequently the person feels loneliness and isolation. It ultimately reduces happiness and freshness in the person and thus the person may get stressed. In other hand, congestion in space may either occurs due to the increasing number of people in space or compressing the physical components of environment, increases the information obtained from the environment in the person and, consequently, it increases tension and occurring negative behaviors in the person. It finally leads to the occurrence of stress.

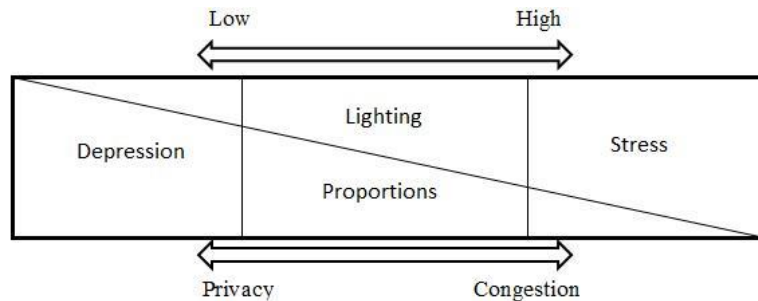


Figure 8. The effects of light and spatial proportions in stress and depression (Source: the authors)

Finally the paper recommends the approach of using flexible designing both in connection with spatial proportions and lighting of building. Because with flexible design these two variables could meet the mentioned needs of people (needs at second and fourth levels of Maslow's pyramid) in different conditions and times in modern small houses.

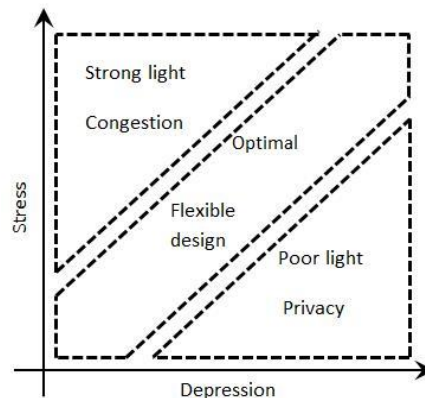


Figure 9. Using the optimal state in flexible design to avoid stress and depression (Source: the authors)

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