

The Effect of Green Space on the Psychological Well-being  
of Apartment Dwellers  
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### Abstract

Apartment dwellers generally lack the accessibility that homeowners have, however, green space is suggested to be an important component in the psychological well-being of residents. Prior studies suggest benefits like stress reduction, mood improvement, reduced feelings of anxiety and depression, and an overall improved psychological well-being from exposure to green space and views of green space. This research study uses a questionnaire to evaluate individuals' accessibility to green space and their levels of life satisfaction, stress, and general psychological well-being. A follow up interview with apartment residents suggests the components that comprise an effective green space that residents can enjoy and benefit from, such as adequate seating, shade, tree coverage, flowers, grass, and a sufficient size.

## The Effect of Green Space on the Psychological Well-being of Apartment Dwellers

As cities get more crowded and denser, apartment living will become more common, therefore, apartment complexes must become more suitable to the well-being of residents as well as for the environment. Oftentimes apartment residents living in buildings lacking green spaces will feel more easily overwhelmed and stressed causing a generally less psychological wellness than those who have easy access to outdoor spaces or open spaces. Unfortunately, communal green space in an apartment complex is generally seen as a luxury amenity rather than a necessity.

In a Korean study testing the effects of green space in apartment complexes, research proved that when the subjects relaxed in the green space of the apartment building tension and anxiety were reduced and positive emotions like vitality and vigor ranked significantly higher outdoors than it did indoors using a 5-point Likert scale (Kim, et al., 2022). In addition, the mental health and wellbeing of a resident decreases as the apartment floor increases because access to open space is farther away and less accessible (Larcombe, et al., 2019). Apartments that lack green spaces don't allow for the benefits that the fresh air and a common area can provide including faster mental and physical stress recovery, socialization, and overall increased well-being. After the COVID-19 pandemic more people are working from home meaning that apartment complexes must strongly consider and improve the environment and living space of the residents.

### **Methodology**

To gain a general understanding of the psychological effects of green space in relation to their residency and gain an understanding of how this can be implemented to benefit apartment

dweller prior studies were reviewed to investigate the psychological benefits of green space and the natural environment. Studies suggested advantages of green space on psychological well-being, as well as reviewing previous questionnaires to collect information on pertinent questions to ask on my questionnaire. By reviewing previous surveys, necessary questions were asked to answer the research question of how green space can be implemented into apartment buildings to provide psychological benefits to residents.

Next, the questionnaire was sent out to several subjects in Arizona, Mississippi, California. A questionnaire made using Qualtrics asking subjects about their type of residency, their access to communal or personal green space, their life satisfaction, stress level, general psychological well-being, and their opinion on the effects of green space. I posted the link to my survey on Snapchat, which allowed me to collect data from friends and acquaintances in Arizona. Additionally, I sent the survey out to my family in San Francisco and Mississippi, who then sent it out to their friends, coworkers, and clients. I collected responses from 85 subjects in which I was able to compare pertinent data, such as living situation to life satisfaction to gain an understanding of apartment dwelling on subjective well-being in terms of life satisfaction, as well as access to green space and the possible correlation with psychological well-being.

Quantitative data was gathered through this questionnaire of 17 multiple choice questions using a 5-point Likert scale. Majority of questions used a 5-point Likert scale with options like “Strongly disagree”, “Disagree”, “Neither disagree nor agree”, “Agree”, and “Strongly agree”, other questions used the 5-point Likert scale to rank qualities like life satisfaction and psychological state. Some questions required “yes” or “no” responses (Appendix 1). The survey asked subjects questions on how green space may impact their lives and their general well-being.

Additionally, qualitative data was collected by conducting interviews asking apartment residents, who had previously taken the survey, questions about their access to personal and communal outdoor space in their apartment building. It also included their thoughts on it and how it can be improved and possible greening strategies, to gain more information on what makes a good or bad outdoor space. I interviewed five males and five females, in which I asked the questions listed in Appendix 3.

## **Literature Review**

### *Psychological Well-being Defined*

An important factor in determining the psychological effects of green space on apartment residents is defining psychological factors in addition to ways of measuring and evaluating these subjective factors. Psychological well-being is comprised of two general ideas, hedonic (the subjective feelings of happiness) and eudemonic (the purposeful aspect) (Robertson, 2022). Hedonic describes the positive emotions, and the subjective well-being, however, these positive emotions are not enough to maintain a positive psychological well-being. Humans need purpose in life, which is described by the eudemonic well-being. Professor and psychologist, Carol Ryff created a widely used and accepted model, called Ryff's 6, which describes the aspects of eudemonia as well as helps to evaluate a person's psychological well-being. The six components include self-acceptance, personal growth, purpose in life, positive relations with others, environmental mastery, and autonomy. A high level of self-acceptance refers to a generally positive outlook toward oneself, accepting all aspects and an acceptance of one's past. A high rating of personal growth is when you are moving towards your potential, and you feel continuous development in way that shows more knowledge and growth (David 2016). A person

with a high sense of purpose in life has goals and objectives to work towards and feel like there is a meaning to life. Positives relationships with others is a component demonstrated in those who have fulfilling and healthy relationships and displays emotions like empathy and affection. Environmental mastery includes having strategies to cope with stress and adapt to life's obstacles. Finally, autonomy refers to individuals who are independent and aren't too concerned with what others think of them. Another scale which is widely used is the Kessler's psychological distress scale (K10), which is a screening tool used by professionals to identify high levels of psychological distress (Winfield, 2012). While the Kessler's scale uses 10 questions to identify distress, the Ryff's scale uses six questions to rate one's psychological well-being using a Likert scale. While variations of these two scales are commonly used, this research study was loosely inspired from Ryff's scale as the six components of eudemonia are a general guideline to evaluate an individual.

### *Effect of Green Space on Psychological Well-being*

The following systematic reviews create a foundation of knowledge about the effective qualities in a green space and the implication on psychological well-being, which can be considered in the integration of green space in apartment buildings. A systematic review of green space quality and the effects on health, comprised of 68 articles from 59 different studies, compliments this research study by suggesting components of an effective green space (Nguyen et al, 2021). The primary scale of measurement used was Kessler's Psychological Distress scale (K10). A variety of land cover types were observed in these studies, which suggested that those who visited coastal and rural locations reported a greater level of mental restoration than those exposed to urban green space. The studies discussed that spaces perceived as more natural

provided greater restorative effects, likely why the combination of habitats, species diversity, and natural soundscapes is suggested to have restorative effects, trigger positive feelings, and reduce stress. While natural green spaces provide stress reduction, mood improvement, reduced anxiety and depression, pocket parks have a weak association with these positive effects which reinstates the idea that a perceived natural aesthetic is more valuable towards psychological well-being (Jabar et al, 2021). It's also suggested that exposure and interaction with forests provide protection from mental distress, more so than grass and shrubs provide (Nguyen et al, 2021). In addition, a higher density of trees in a park is linked to a higher quality of life, as well as a higher richness which is proposed to influence positive psychological well-being (Jabar et al, 2021). These components of a naturally perceived environment could be used in application techniques in apartments to create green spaces with components like a variety of plant species and integration of more trees, or even water features that provide natural soundscapes.

Another systematic review, comprised of 46 publications, suggests that urban green spaces promote social interaction, which in turn, aids in psychological well-being, a component of eudemonic well-being described by Carol Ryff (Jabar et al, 2021). Urban green space features, such as brightly colored flowers, clean water, richness of trees, and general vegetation cover may have a strong association with improved psychological well-being and mental stress recovery. The composition and configuration of a park are other features to keep in mind, as the actual design of the urban green space can be arranged in a way to encourage social interaction or increased walkability (Jabar et al, 2021). A UK study, which was conducted in London researched additional important variables in relation to green space, and found that the mental health benefits of green space are most advantageous when the green space is within a 300 m of an individual's residence. In other words, green space must be within a short walking distance,

which is commonly accessible for homeowners unlike many apartment residents (Jabar et al, 2021). In fact, the level of life satisfaction decreases when the radius of green space proximity increases from one's residency. Furthermore, green space accessibility, size, cleanliness, and quality are all proposed to have a positive relationship with the reduction of mental stress and depression. A study in Scotland, described in the systematic review suggests that frequency of green space use is associated with reduced stress levels in the body (Jabar et al, 2021).

The World Health Organization discusses theories that clarify the positive human response to natural stimulus. The psycho-physiological stress reduction theory is based off the term biophilia which describes our instinctual connection with the natural environment which stems from our use of nature for food, water, and refuge. Stress reduction theory (SRT) was coined in 1991 by R. Ulrich who theorized that we have an autonomic nervous system response to looking at natural scenery, like greenery or water which triggers positive emotions and has calming and restorative effects (Sok-Paupardin, 2019). Additionally, our response after stressful situations is improved quickly with natural stimuli. The attention restoration theory explains how our cognitive performance is improved when our involuntary attention is placed on natural stimuli (WHO, 2016). The natural environment restores our direct attention, which is necessary for cognitive focused tasks.

A UK study regarding physiological response to the natural environment used electroencephalography devices (EEG) to measure brain signals. The study suggested that a short walk in a green space may relate to enhanced relaxation and restoration. Furthermore, a walk in nature produces stronger benefits than a walk in the urban environment (WHO, 2016). Similar studies use blood pressure, heart rate, skin conductance, and muscle tension to demonstrate the restorative and improved physiological responses caused by viewing or interaction with nature.



Additionally, diurnal cortisol patterns are commonly used as a biomarker of chronic stress.

Another UK study used hair cortisol to demonstrate that exposure to green space reduces chronic stress in adults and that exposure to green space reduces neural activity in a section of the prefrontal cortex, which eases depression (WHO, 2016).

### *Psychological and Physiological Effect of View of Green Space*

Along with outdoor exposure to green space, your indoor view of green space is also an important factor to consider. An individual's mental performance is improved when there is a view of greenery from the workplace or residency (Jabar et al, 2021). A study of 22 subjects equal in gender distribution investigated the impact that the window view has on individuals. The researchers used 10 pictures from low floors (1-5), medium floors (11-15), and high floors (21 and higher), in which the lower floors had a view of the greenery and vegetation while the higher floors had significantly fewer natural views. The psychological response was found using a questionnaire to evaluate emotions, while the physiological response was found by measuring autonomic nervous system responses, like blood pressure, heart rate variability, blood pressure, and pulse rate before being exposed to pictures of the views at different floor levels and after being exposed. The study found that negative mood states like tension, anxiety, anger, and hostility were higher with the views of buildings, and the lowest physiological stress was discovered with views of nature (Jeon, et al., 2021).

### *Green Space Implementation in Apartment Complexes*

Many studies suggest the psychological benefits of green space, however, it's important to note the greening strategies and implementation of these practices within apartment complexes

considering the increased urbanization and apartment usage. Besides the obvious greening strategies, previous studies and architects highlight the design of outdoor space within apartment buildings to create a restorative experience. Humans have an instinctual desire and need to feel safe and have a sense of shelter. By designing a green space in an apartment that has enclosed spaces in addition to open spaces, as well as accentuating the surrounding natural environment within the green space, residents can gain the psychological benefits (Osama, 2019).

While the built environment and the perception of natural components are important, the intervention of greenery when implementing green spaces into apartments is especially crucial. A comparative study on the aspect of green space on life satisfaction for single family home dwellers versus apartment dwellers suggested that the general life satisfaction of home residents was greater than apartment dwellers, likely due to the accessibility of green space (Kooshali et al, 2015). Edward Wilson, a sociobiologist, theorized that the need for humans to communicate with other living things and other forms of life is not being fulfilled in recent years due to urbanization and the increased numbers of apartment dwellers because apartments disregard the necessity of harmonizing humans with nature. However, apartment dwellers are more satisfied with their life generally when their complex has an open space with nature or a green space, compared to residents who have open space without greenery. Additionally, trees, shrubs, and elements of water were associated with positive psychological well-being and stress restoration. In contrast, apartment dwellers with a lack of green views experienced signs of mental boredom and depression (Kooshali et al, 2015). Implementation strategies for green space within apartment complexes to maximize the psychological well-being of residents include private, semi-open space and green space (green terraces), natural views, green roofs, or communal green spaces. A different study of 500 households in Korea, which focused on measuring the hedonic

and eudemonic psychological components in regard to green space in apartments, found that urban green space was predicted to be one of the most essential variables in achieving happiness and general life satisfaction within apartment complexes. Apartment complex landscape space (ACLS), while smaller than urban green spaces, can provide restorative effects and enhance residents' quality of life. Walking tracks with elements of greenery, eco-activities like gardening, and other features for residents to experience nature will enable an individual to interact with nature and gain the restorative effects and improved psychological well-being.

## **Results**

### Survey

#### *Life Satisfaction*

The percentages of subjects' general life satisfaction for each housing type showed that those who live in a single-family home are approximately 80% satisfied or very satisfied with their life, while only 50% of people who live in an apartment are satisfied or very satisfied with their life. It is important to recognize that there were only 2 subjects living in a condominium and 3 subjects living in a different housing type than the ones listed, meaning these two categories are less reliable.

Responses of higher life satisfaction were observed in subjects who has access to a personal outdoor space or balcony. A personal outdoor space is defined as one in which only the individual and their roommates have private access to. The percentages of general life satisfaction for those with outdoor space or balcony compared to the life satisfaction of those who do not have a personal outdoor space or balcony. Approximately 75% of those who have a personal outdoor space or balcony are generally satisfied or very satisfied with their life, while only 49% of those without a balcony or outdoor space are satisfied or very satisfied with their

life. Of those who have a personal outdoor space or balcony, the majority are satisfied or very satisfied with their life.

Additionally, those who have a view of green space reported 41% very satisfied with their life, while those without a view of green space were only 10% very satisfied.

### *General Psychological Well-being*

People who have access to a balcony or personal outdoor space are generally psychologically well. My data shows that 58% of people who have an outdoor space or balcony are psychologically well or very well, while only approximately 34% of those without a balcony or personal outdoor space are psychologically well or very well. The data also shows that significantly more subjects without these spaces stated that they are psychologically very unwell.

In response to views from the subjects' window, those with a view of green space from their window reported having a better psychological well-being than those who did not have a view of green space.

### *Stress Levels*

My data also suggests the different levels of stress for those with a balcony or personal outdoor space and for those without. Majority of the survey subjects reported to have some level of stress, however, the very stressed and stressed levels are more prominent in those who do not have a balcony or personal outdoor space.

Subjects who had a view of green space were generally less stressed. The data showed that most subjects reported having some degree of stress. However, those without a view of green space are significantly more stressed than those with a view.

My data also showed that majority of survey subjects agreed or strongly agreed with the sentence stating that being in green space allows them to feel less stressed. Nearly 80% of subjects stated they either agreed or strongly agreed with this statement. Data also shows that most subjects agree or strongly agree that being in green space makes them feel more mentally refreshed. Nearly 90% of subjects agreed or strongly agreed that they feel more mentally refreshed in green space, with the other 10% of people being impartial to the statement.

#### Interviews

I interviewed five males and five females attending the University of Arizona between the ages of 18 and 23 who had previously taken the initial questionnaire and who live in an apartment complex.

#### *Current Personal Outdoor Space Quality and Usage*

Half of the subjects did not have access to a personal outdoor space, a space only accessible by the individual and their roommates, and the other half had access to a private balcony. The people who had a private balcony did not have real plants, although three of the subjects did have turf grass. The subjects who had a balcony responded that they use the balcony every day for 10 minutes to an hour and at least once a day for relaxation purposes or to clear their mind.

#### *Current Communal Outdoor Space Quality and Usage*

On the other hand, all ten subjects claimed to have access to a communal outdoor space accessible by all apartment residents, which was used by subjects between zero and twice a week. People used the communal outdoor space for activities like tanning, reading, and using the

pool or hot tub. Six subjects had an additional courtyard space, and three subjects had a dog park, however only one subject occasionally used this area. Generally, the subjects stated that the communal outdoor space was well maintained. All subjects stated that their communal outdoor space had very few plants and many of the plants were fake plastic plants. One of the ten subjects had trees in the apartment complex communal space. One subject stated that they had flowers, most subjects had minimal succulents and cacti. None of the subjects had real grass in their apartment complex. The consensus is that the outdoor space was mostly cement and fake plants, however all ten subjects had access to a communal pool and hot tub with a space with lounge chairs and couches, and four subjects had a fire pit.

#### *Desirable Implementations for the Outdoor Space*

I gained a variety of different responses when asking what would make people more likely to use the outdoor space. Multiple subjects said nicer weather, nicer quality space, more seating with shade, a functional hot tub, less crowded, and cleaner and better maintained spaces. One subject state that they would use the space more if it was closer in proximity to them, one subject answered saying better seating arrangements, another subject said more flowers and colors, one individual wanted outlets so they could study in the space, one subject wanted a bigger space, another subject stated that she would like a community garden in the apartment complex where people could learn to garden and use the produce.

#### *Response to Natural Elements*

When asked if different natural aspects would make subjects feel more mentally restored eight people said they would feel more mentally restored with the addition of trees, all ten

subjects would feel mentally restored with more flowers, and nine people would feel more mentally restored with real grass. When asked which natural feature they would feel the most mentally restored in three people said trees, three people said grass, and four people said flowers. When I asked the subjects if they would enjoy natural soundscapes eight individuals answered yes, and two answered no because they either preferred music or silence.

#### *Views from Bedroom Window*

When asked to describe the view from their bedroom window all subjects stated that there were many buildings and concrete with very minimal amounts of vegetation with a few trees. Five people had a view of mountains. One subject had a view of the other half of the apartment building, which caused less light, and stated that the view made her sad. Those who had a view of mountains had a much more positive response to their view than those who could not see mountains, which made those with less natural views feel unhappy. Three subjects had a view of a parking garage which they states was not favorable. One subject who had a view of the parking garage stated that she doesn't even open her blinds because she doesn't like to see the unappealing parking garage. All ten subjects stated that they wanted more natural features like vegetation, mountains, or water when looking out their bedroom window. One subject even stated that he wanted a bigger window in his bedroom to get more natural light and see more of the mountain scenery.

### **Discussion**

Literature reviews and prior research reviews assisted in finding pertinent questions to ask for the questionnaire, in addition to gaining a foundation of knowledge on the psychological effects of green space as well as a definition of psychological well-being. Psychological well-

being is composed of a hedonic and eudemonic, which encompasses the subjective feelings of happiness as well as the factors that create one's quality and fulfillment in life. The literature reviews generally suggested that factors like increased biodiversity, species richness, and tree density are correlated with positive psychological well-being and more mental restoration. Size of green space, frequency of exposure, proximity to green space, and view of green space are all correlated with a more positive psychological well-being. Additionally, physiological responses were observed, found by measuring autonomic nervous system responses, like blood pressure, heart rate variability, and pulse rate, as well as cortisol levels. A lower physiological response was evaluated in those with a view of green space and those after taking a short walk through nature.

The questionnaire suggests a positive psychological response towards exposure to green space. The questionnaire asked subjects about their living situation and their general life satisfaction, which found that those living in a home responded with having higher levels of life satisfaction compared to individuals living in an apartment. In addition, subjects who had access to a personal outdoor space or balcony may have less stress and a higher level of general life satisfaction. The questionnaire results also suggested that most subjects had some level of stress, however, those who did not have a view of green space from their window responded to having higher levels of stress. Majority of subjects agreed or strongly agreed that exposure to green space makes them feel less stressed and more mentally refreshed.

To better understand the components that residents found beneficial or that would contribute to creating a "good" green space a follow up interview was completed on ten apartment residents who had previously answered the questionnaire. The most desired and requested aspects of an outdoor space were more seating, more shade, implementation of trees, open grass, shrubs, and



flowers, as well as more views of natural space. One subject stated that a communal green space with a garden for residents would be advantageous. Subjects also wanted a green space that was bigger in size, which would reduce crowding and create more options and enjoyability for residents. Eight of the subjects would also enjoy natural soundscapes like the rustling of trees, sound of birds, or the sound of water, which could be implemented by integrating trees and water features.

### **Conclusion**

Nearly half of the world's population lives in cities and the population living in cities is predicted to increase. Cities will become denser causing an influx of apartment complexes. City living introduces factors like traffic, noise, constant movement, and a generally concrete environment with a lack of natural elements. Unlike single family home residents, apartment residents are deprived of a backyard and generally lack green space or a view of natural features. Apartment dwellers can sometimes feel cooped up and isolated causing feelings of psychological unwellness, whether it has to do with increased stress, feelings of anxiety or depression, or a generally lower level of life satisfaction. However, implementation of green space and natural elements is suggested to improve apartment residents' psychological well-being.

Prior studies and systematic reviews suggest that green space and nature is beneficial for mental health. Humans have an innate relationship with nature that stems from our need to seek food, water, and refuge from the natural environment. With that said, exposure to the natural environment may provide restorative effects and positive emotions. Implementation of green space in apartment complexes can be achieved through green roofs, outdoor or indoor green spaces, walking tracks with elements of nature, gardens, green terraces or private balconies with elements of nature, or eco-friendly leisure activities.

After analyzing the responses from an online questionnaire, I received positive subjective feedback in relation to green space. Initially I observed that those who reside in a single-family home suggested higher levels of life satisfaction and psychological wellness. In addition, those with access to a personal outdoor space or balcony were suggested to have higher levels of life satisfaction and lower levels of stress than those who didn't have a personal outdoor space or balcony. Furthermore, subjects generally had positive emotions towards green space at their residence. I wanted to indicate what people felt would be an effective and "good" outdoor green space, and my interviews with ten students at University of Arizona found that people want more natural elements and a good outdoor space has trees, shrubs open grass, views of nature, seating, and greater size to prevent crowding.

Considering the more common option of working from home combined with rising popularity of apartment living, accessibility to green space at one's residency should be more seriously considered. This research study suggests that the psychological well-being of residents is improved by views of greenery, frequent exposure to a communal and personal green space, which is most impactful on an individual's psychological well-being with a high biodiversity of species in green spaces, soundscapes, and in green spaces of a larger size.

### *Limitations*

The questionnaire was only loosely based on the factors of eudemonic well-being as the research on psychological well-being was done after the questionnaire was sent out so the questions may not be a good representation of one's psychological well-being. Additionally, the questions collected subjective responses so results may be incorrect. In addition, the interviews were collected from residents of only three different apartment buildings.

*Further Research*

A multitude of studies have been done in relation to the suggested benefits that exposure to green space has on the psychological and physiological responses of humans. However, city dwellers and apartment residents specifically could benefit from the greater implementation of green space at residential facilities. Further case studies should be done on apartment complexes with accessible outdoor green space to investigate the satisfaction and psychological well-being of residents and analyze the components of an effective and beneficial apartment complex landscape space. By gaining more information and new ways to incorporate green space into apartment complexes, apartment dwellers can reap the benefits and improve their mental health since apartment living lacks the natural elements that residents of single-family homes generally have. Design strategies should be created and implemented to provide and incorporate natural elements into buildings and cities in general that is aesthetic, but also perceived as natural to improve mental health of city dwellers. In addition, research regarding new and more accurate measurements of subjective well-being and objective physiological responses to the natural environment are necessary to provide additional evidence that green space is beneficial.

## Appendix 1

What gender do you identify with?

- Male
- Female
- Other

What is your age?

- 18-29
- 30-39
- 40-49
- 50-59
- 60 or older

What type of housing do you live in?

- Single-Family Home
- Condominium
- Apartment
- Other

If you live in an apartment, what floor do you live on?

- 1-5
- 6-10
- 10-15
- 16 or higher
- I don't live in an apartment

Do you have a balcony or personal outdoor space?

- Yes
- No

Do you have a view of green space from your window? (park, garden, woods, natural environment, etc.)

- Yes
- No

Do you have indoor plants at your residency?

- Yes
- No

If you live in an apartment, does your complex have a communal green space?

- Yes
- No
- I don't live in an apartment

If your apartment complex has a communal green space, how big is it approximately?

- 300 sq ft or less
- Between 300 sq ft and 800 sq ft
- More than 800 sq ft
- I live in an apartment, but don't have a communal green space
- I don't live in an apartment

How generally satisfied with your life are you?

- Very dissatisfied
- Dissatisfied
- Content
- Satisfied
- Very satisfied

How would you rate your stress level?

- Very stressed
- Stressed
- Average
- Relaxed
- Very relaxed

How would you rate your social well-being?

- Very anti-social
- Anti-social
- Average
- Social
- Very social

How would you rate your physical well-being?

- Very physically unfit
- Physically unfit
- Average
- Physically fit
- Very physically fit

How would you rate your psychological well being? (i.e. mental health, happiness, emotional resilience)

- Psychologically very unwell
- Psychologically unwell

- Average
- Psychologically well
- Psychologically very well

Being in green space allows me to feel less stressed.

- Strongly Disagree
- Disagree
- Neither disagree nor agree
- Agree
- Strongly agree

Being in green space increases my social skills.

- Strongly disagree
- Disagree
- Neither disagree nor agree
- Agree
- Strongly agree

Being in green space makes me feel mentally refreshed.

- Strongly disagree
- Disagree
- Neither disagree nor agree
- Agree
- Strongly agree

Appendix 2

Author	Description of Green Space	Outcome Assessment Tool	Psychological Effects
Nguyen et al November 2021	Trees and flowers  High density of trees  Dense shrubs  More “natural” green space (protected areas or bushlands)	Kessler 10 (‘K10) Psychological Distress Scale	Mentally restorative benefits  Higher quality of life  Reduced restorative benefits  Greater mental restoration

	<p>Combination of habitat, bird, and insect biodiversity</p> <p>Parks with high maintenance, refurbishments, infrastructure and amenities</p> <p>Large green space</p> <p>Safe green space, less crime, safe distance from road</p> <p>Cleanliness of park</p> <p>Natural soundscapes in parks</p>		<p>Restorative effects</p> <p>No association with emotional states, depression rates, or psychological distress</p> <p>Positive effect on depression and quality of life</p> <p>Better quality of life and reduced psychological distress</p> <p>Associated with lower rates of depression</p> <p>Positive feelings and reduced stress</p>
<p>Jabbar et al July 2021</p>	<p>Richness of trees</p> <p>Meadows</p> <p>Green space with richness of trees, clean water, and bright flowers</p> <p>Urban green spaces</p>	<p>Questionnaire</p>	<p>Strongly influences psychological well-being positive effect</p> <p>Limited effects on psychology</p> <p>Assist in mental stress recovery</p> <p>Promotes social interaction which enhances</p>

	<p>Diversity in composition and configuration</p> <p>Natural parks</p> <p>Green space within 300 m radius and frequent visits</p>	<p>Interviews based on hedonic and eudaimonic well being</p>	<p>psychological well-being</p> <p>Enhances psychological well-being and promotes social well-being</p> <p>Strong link with stress reduction</p> <p>Increased life satisfaction and positive hedonic and eudaimonic feelings</p>
Feng 2021	<p>Green space at residency</p> <p>Increased tree canopy cover</p>	<p>Kessler 10 ('K10) Psychological Distress Scale</p>	<p>Less psychological distress</p> <p>Better mental health</p>
Larcombe et al 2019	<p>Greening strategies surrounding high rise buildings</p> <p>Wealthy areas with nature and more environmental biodiversity</p>	<p>study</p>	<p>Fewer symptoms of psychological distress reported by residents</p> <p>Better mental health</p>
Tae et al 2022	<p>Urban green space</p> <p>Size of green space</p>	<p>questionnaire</p>	<p>Frequency of visits had higher correlation with resident satisfaction than size of green space</p> <p>Positively correlated with resident happiness</p>



Ribeiro et al 2021	Window views of natural environment	questionnaire	Reduced stress level and biological stress markers
Jeon et al 2021	Views of nature	Questionnaire and physiological markers like pulse rate and blood pressure	Negative emotions like tension, anxiety, anger and hostility with higher views of buildings, more positive emotions with views of nature Lower physiological stress in people with views of nature
WHO 1970	Natural stimuli  Walk in urban environment	Studies using wearable electroencephalography devices	Improves cognitive performance  Involuntary nervous system response causing feelings of relaxation  Less effective on cognitive performance than in green space

Appendix 3

Interview Questions for apartment residents Survey follow-up

Age?

Sex?

Do you have a personal outdoor space in your residency (a space only accessible by you or your roommates)?

Do you have a communal outdoor space in your residency (a space accessible by all of the apartment complex residents)?

Does your personal/communal outdoor space have vegetation? If so, describe the vegetation, is there grass, shrubs, flowers, or trees?

Do you use the outdoor space (communal or private)? How often?

What activities do you use the outdoor space (communal or private) for? How long?

What would make you want to use the outdoor space (communal or private) more frequently?

Is your outdoor space well maintained/ clean?

Would you feel more relaxed in an outdoor space that had more tree coverage?

Would you feel more relaxed in an outdoor space that had more open grass?

Would you feel more relaxed in an outdoor space that had flowers and shrubs?

Between tree canopy cover, open grass, or flowers, which natural feature is most appealing to you and would help you feel more mentally restored?

Would you feel more relaxed in an outdoor space that had more natural soundscapes, such as birds chirping, water sounds, rustling leaves?

Describe the view from your bedroom window? What natural features can you see (trees, mountains, grass, water, etc.)?

How does your view outside your window make you feel, what do you wish you had more of when you look out your bedroom window?

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