Bachelor Thesis

**What are the effects of green interior in the office on well-being of employees?**

**Preface**

This is my bachelor thesis written in the context of my bachelor business and consumer studies (BBC) at the Wageningen University. Within my bachelor thesis, I’ve chosen to be specialized in the direction of business. I’ve finished my minor abroad at the University of Guelph (Canada), where I learned about the significant challenges and opportunities from environmental issues such as climate change and transparency of business developments. Sustainable development, sustainability innovations, and organisational change belong to my field of interest. Finding a way to innovate and act sustainable whilst maintaining business processes and still accomplishing prospects and goals triggers me. I’ve chosen to write my thesis in the chair group of management studies, after following a course in my minor called ‘Environmental Assets for Health’, where I obtained knowledge about the importance of the environment for one’s health. Combining business and environmental assets for health resulted in a thesis subject researching the effects of green interior on well-being in the office.

I would express my gratitude to my supervisor, Dr. Herman Kok, for assisting me while writing my thesis. All the meetings filled with advice and humour are highly appreciated. I would like to thank Dr. Kok for his flexibility because of supporting me during the summer holidays. Dr. Kok has the ability to stimulate me to write my thesis, just by his own honesty, positivity, and expertise in this field.

For now, enjoy reading this analysis of effects of green on well-being in the office,

Hanneke van Haeff

Content

[**Chapter 1: Introduction, problem statement, research questions and methodology** 5](#_Toc521475410)

[1.1 Introduction 5](#_Toc521475411)

[1.2 Methodology 7](#_Toc521475412)

[**Chapter 2: Well-being** 8](#_Toc521475413)

[2.1. Well-being 8](#_Toc521475414)

[2.2 Psychological well-being 10](#_Toc521475415)

[2.3 Physical well-being 10](#_Toc521475416)

[2.4 Social well-being 11](#_Toc521475417)

[2.5 Well-being in the workplace 12](#_Toc521475418)

[2.6 Conclusion 13](#_Toc521475419)

[**Chapter 3: Green interior in the workplace** 13](#_Toc521475420)

[3.1 The office 13](#_Toc521475421)

[3.2 Green interior in the workplace 14](#_Toc521475422)

[3.2.1 Plants 15](#_Toc521475423)

[3.2.2 Plants in the workplace 15](#_Toc521475424)

[3.3.1 Green pictures 16](#_Toc521475425)

[3.3.2 Green pictures in the workplace 16](#_Toc521475426)

[3.4 Conclusion 16](#_Toc521475427)

[**Chapter 5: Effects of green interior on well-being in the office** 16](#_Toc521475428)

[5.1 Effects of plants on well-being in the office 17](#_Toc521475429)

[5.2 Effects of green pictures on well-being in the office 18](#_Toc521475430)

[**Chapter 6: Answering the research questions, discussion and future work** 22](#_Toc521475431)

[6.1 Summary and conclusion 22](#_Toc521475432)

[6.3 Discussion and future work 23](#_Toc521475433)

[**Chapter 7: References** 24](#_Toc521475434)

# **Chapter 1: Introduction, problem statement, research questions and methodology**

# 1.1 Introduction

The increase of urban environments across the globe within the last 200 years and the shift towards a knowledge driven economy has disengaged human beings from the natural environment (Axelrod and Suedfeld, 1995; Burton-Jones, 2001). Due to the increase in urban development in terms of overexpansion, greater commercial land use and decreasing areas of undisturbed parcels of land, more people are working and spending leisure time indoors (Westphal, 2003). Further, the knowledge driven economy has increased the office-related employment opportunities (Arts et al., 2005). As a result of less time spent in natural surroundings, people are potentially experiencing negative consequences such as longer hours at the office, and a subconscious separation from nature. (Kaplan, 1992). The workplace is where people in employment spend most of their waking hours, therefore it is important to create a healthy working environment.

A healthy working environment can positively influence employee well-being (Quintiliani et al., 2010). An office environment can easily be adjusted with green interior in terms of plants and green pictures, which contributes to a healthy working environment. Frumkin (2001) reported that plants make office employees feel calmer and more relaxed, and that an office with plants is a more desirable place to work than without plants. Frumkin’s study is in consonance with Wilson’s (1984) “biophilia” hypothesis, humans are innately attracted to other living organisms. Kellert and Wilson (1994) have expanded this concept and suggest that humans have an innate bond with nature more generally. This implies that certain kinds of contact with the natural world may benefit well-being (Wring & Cropanzano, 2000). Green interior enables contact with natural world in the office in terms of plants and green pictures.

Plants in the office can improve employee well-being (Bergs, 2002). Improved well-being due to working in presence of plants was evidenced in terms of in increased productivity, attentiveness, reduced stress, mental fatigue, lower blood pressure and fewer report of illness (Lewis, 1993; Lohr, 2000; Beute & de Kort, 2018). Also Dravigne et al. (2008) found that individuals who worked in an office with plants reported that they felt better about their job and the work they performed. Thus, working in presence of plants improves employee well-being (Bergs, 2002).

Well-being is the balance between an individual’s resource pool and the challenges faced, featuring three components: psychological, social, and physical well-being (Dodge et al., 2008). Many different interpretations of well-being such as “living the good life” (Rogers, 1961), “being a fully functioning person” (Rogers, 1961), and “being happy, satisfied, developed and connected to community” (Shah & Marks, 2004) are all seen as a point of equilibrium between the resource pool and challenges faced.

Well-being in the workplace reflects the quality of working life and has an effect on behavior at work such as task performance (Carmichael et al., 2016). Thus, Improving employee well-being can benefit business through increased task performance such as productivity. Further, improving well-being can reduce costs associated with well-being such as injuries and illness including costs relating to presenteeism and sickness absence (Hosie & Sevastos, 2015; Goetzel & Ozminkowski, 2006; Shain & Kramer, 2004).

Less interaction with nature can result in a lower level of well-being. The decreased level of well-being can increase costs associated with well-being such as psychologist appointments due to depression or a burn-out. The rising amount of health complaints due to employees spending more time indoors can be suppressed by adapting the office environment into a green workplace in order to improve employee well-being. Therefore the following main research question and sub-research questions have been formulated:

***What are the effects of green interior in the office on well-being of employees?***

Sub-research questions

1. What are indicators/aspects for well-being of employees?
2. What constitutes a green interior in the office?
3. What effects are known of green interior on employee well-being?

## 1.2 Methodology

A literature study has been done in topics as well-being, office environment, and green interior. Literature studies have been done concerning the effects of green interior on office conditions, effects of office conditions on employee well-being, and effects of green interior on employee well-being. The following scientific research engines have been used to generate articles with the subjects mentioned above: Google Scholar, Scopus, and the WUR Library.

At first combinations of search terms were used with help of ‘AND’ and ‘OR’. Examples are: employee well-being AND plants OR nature; well-being AND office; well-being AND green OR nature OR plants; psychological well-being OR mental health AND office. Other search terms are: psychological, physical, and social wellbeing, green interior, plants, nature, pictures, health, occupational wellbeing, and workplace. This resulted in multiple scientific articles. All titles that were somewhat appealing and relating to the search terms were chosen to read the abstract. If the abstract contained useful information or implied possible useful information, the whole article was scanned. If concrete information was found during the scanning of the article, it was read fully. After reading the article, it was decided whether this article would contribute to answering the research questions. If yes, information was worked out. Bibliographies from included studies and additional review articles were additionally screened for relevant references. All titles of related articles were scanned and from possible useful related articles the abstract was read. Once again, if the abstract sounded appealing the article was scanned, read and used.

Next to generating knowledge from scientific articles via search terms, advice from the supervisor concerning important concepts in certain topics was used. For example, the phenomenon of ‘biophilia (Wilson, 1984) was used and a company called Ambius with expertise in the field of plants in workplaces was recommended.

After enough information was found in order to answer the research questions, all information was critically reviewed in order to write a summary and assess the limitations of the study. An overview of the literature found is processed in the following categories: well-being, green interior, the office, and the effects of green interior on well-being in the office, respectively, chapter 2, 3, 4, and 5. In chapter 6, a summary is given, conclusions have been drawn, and a discussion and limitations have been debated.

# **Chapter 2: Well-being**

## 2.1. Well-being

The word wellbeing can be divided in two parts: ‘well’ implies a positive state, and ‘being’ implies a state that can be achieved (White, 2008). There are many interpretations of well-being. Aristoteles first defined eudaimonia, now often translated to wellbeing, as ‘the overarching goal of all human actions’ (Dodge et al, 2008). Rogers (1961) discussed wellbeing in terms of “the good life”, or more thorough ‘living the good life’. Each individual should strive towards becoming a fully functioning person who is open to experience, trusting her/his own organism, and leading an increasingly existential life (Rogers, 1961). Other research defines well-being as feeling satisfied and happy, developing as a person, being fulfilled and making a contribution to the community (Shah & Marks, 2004).

Dodge et al (2008) conducted a meta-analysis of defining well-being and formulated the following definition for well-being: the balance point between an individual’s resource pool and the challenges faced. The balance or equilibrium is affected by events or challenges throughout someone’s whole life (Wring & Cropanzano, 2000). Figure 1 graphically describes the balance between the resource pool and the challenges, that both are determined by psychological, social, and physical factors. These factors are interrelated, whereas social well-being in terms of a positive social environment (positive relations with others) allows for psychological growth in terms of stress relief and positive mood (Ryff & Singer, 2000; Ryan & Deci, 2001; Ryff et al., 2001). Also, physical well-being in terms of energy available to the self is correlated to psychological well-being in terms of personal autonomy and relatedness (supportive interpersonal relationships for well-being) (Ryan & Frederick, 1997). The figure is designed with a focus in three areas: the idea of a set point for wellbeing; the inevitability of equilibrium; and the fluctuating state between challenges and resources.

*Figure 1: The graphical definition of well-being by Dodge et al. (2008)*

The equilibrium of an individual constitutes of life satisfaction (cognitive sense of satisfaction with life), pleasant affect, and unpleasant affect (moods and conditions such as joy, affection, anxiety, and sadness) (Diener & Suh, 1997). Ryan & Deci (2001) hold about the same components: life satisfaction, presence of positive mood, and the absence of negative mood.

However, Headey and Wearing (1989) suggested that the equilibrium of well-being consists of personality, life events, well-being and ill-being. Ryan & Deci (2001) only agree on personality as a link that affects the three components. Therefore a focus will be on the three components of Diener & Suh (1997). High well-being consists of maximized happiness, equivalent to more positive affect, less negative affect and greater life satisfaction (Diener & Lucas, 1999).

The equilibrium is an individual experience, which makes well-being subjective (Herlich, 1973). Well-being is subjective, because every individual has different interpretations and perceiving’s of challenges and resources (Okun et al., 1984). The equilibrium in well-being is a state people like to ‘attain or keep’ (Herlich, 1973; Cummins, 2010).

People tend to return to a set-point for well-being (Heady and Wearing, 1989). A set-point is a point of equilibrium in well-being where people experience no challenges (Dodge et al., 2008). According to the lifespan model of development, people can increase well-being by successfully facing challenges (Hendry & Kloep, 2002). The accomplishment of a challenge influences the three components of well-being. A successful challenge results in pleasant affect such as joy. Not only pleasant affects can increase well-being (Parrot, 1993). In some situations (such as death of a loved one), having negative emotions can contribute to well-being (Rogers, 1963). King & Pennebaker (1998) expand this by suggesting that suppressing or withholding emotions can negatively impact psychological and physical well-being.

Two approaches can be used to explain the concept of well-being. Hedonism reflects the view that well-being consists of pleasure or happiness, and eudemonism furthers this view by conveying the belief that it consists of more than just happiness by also considering the actualization of human potential (Kahneman et al., 1999; Waterman, 1993).

* The hedonic approach focuses on happiness and is measured in pleasure attainment and pain avoidance (Ryan & Deci, 2001). According to Ryff & Singer (1998), the hedonic approach does not adequately measure psychological well-being.
* The eudemonic approach focuses on meaning & self-realization and is measured in the degree to which a person is fully functioning (Ryan & Deci, 2001). Opposite to the hedonic approach, the eudemonic approach tends to have a stronger focus on psychological well-being (that will be further explained in chapter 3.1.1) (Ryff & Singer, 1998).

Next to the hedonic and eudemonic approach there is the self-determination theory, that attempts to specify self-actualization and how it can be accomplished. The self-determination theory is highly related to the eudemonic approach and operationalizes three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2001). The fulfilment of these needs results in higher well-being in terms of psychological growth, social integrity, life satisfaction, and physical well-being (Ryan & Frederick, 1997). The self-determination theory is important because it describes the conditions that facilitate or undermine well-being in specific social contexts such as the workplace (Ryan & Deci, 2001).

Thus, research has shown there are multiple approaches to operationalize well-being and its factors: psychological well-being, physical well-being, and social well-being. There are some differences in the operationalizations of well-being but they all refer to a subjective equilibrium of an individual that exerts a state of well-being in for example happiness, positive mood or life satisfaction. The hedonic approach mainly focuses on physical and social well-being, whereas the eudemonic approach and the self-determination theory focus mainly on psychological well-being. The three factors of well-being have multiple differences in dimensions and effects, which will now be further explained.

## 2.2 Psychological well-being

Bradburn (1969) defined psychological well-being as ‘avowed happiness’, a balance between positive and negative effect of moods and conditions. Although it looks like the three components mentioned before (life satisfaction, pleasant affect and unpleasant affect), psychological well-being goes further and focuses on the self-actualization and meaning emphasized by the eudemonic approach.

Herzlich (1973) only took into account pleasant and unpleasant affect, and referred to an equilibrium in psychological well-being when there is evenness of temper, freedom of movement and effectiveness in action. Ryff and Keyes (1995) covered all three components (life satisfaction, pleasant affect and unpleasant affect) and constituted 6 dimensions for psychological well-being: self-acceptance (holding positive attitudes towards oneself); positive relations with others (ability to love); autonomy (regulation of behaviour from within, individualisation); environmental mastery (ability to create environments suitable to his/her conditions); purpose in life (belief in meaning and purpose); personal growth (continue to develop one’s potential). These dimensions specify what promotes psychological well-being, such as absence of depression, a low stress level, positive mood and high self-confidence (Ryff, 1989; Ryff and Keyes, 1995). Pleasant affect refers to positive emotions and mood, and vice versa (Diener & Suh, 1997). Thus, high psychological well-being, for example in terms of a high ability to create suitable environments implies more prone to experience positive emotions and less prone to experience negative emotions (Wring & Cropanzano, 2000).

In line with Ryff and Keyes (1995), Mc Gregor and Little (1998) operationalized psychological well-being as happiness (equivalent to self-acceptance and environmental mastery) plus meaningfulness (equivalent to personal growth, purpose in life, autonomy, generativity and relationship quantity). Mc Gregor and Little (1998) thus expand the six dimensions of Ryff and Keyes (1995) with generativity (concern for people besides self) and relationship quantity.

Psychological well-being is a phenomenological event which means people are happy when they subjectively believe themselves to be so (Wring & Cropanzano, 2000). This phenomenon relates to self-acceptance, the ability to hold a positive attitude towards oneself. People who believe they are happy increase their psychological well-being in terms of stress relief and positive mood (Ryan & Deci, 2001).

The three factors of well-being are interrelated. Psychological well-being influences physical well-being in terms of immunological function, health promotion (Ryff & Singer, 1998) and behaving in healthful ways (Peterson & Bossio, 1991). Psychological well-being influences social well-being in terms of consciously interacting with people (Ryff & Snger, 2000; Ryan & Deci, 2001). Aspinwall and Taylor (1990) confirm that psychological well-being indirectly predicts better physical well-being.

## 2.3 Physical well-being

Physical well-being is the most visible dimension of well-being, that used to be defined as absence of a serious illness. Today’s definition refers to the absence of disease and fitness level (Koshuta, 2018). According to Herzlich (1973) physical well-being is in an equilibrium when there is absence of fatigue, and plenty of physical resources. Physical fitness, absence of illness such as allergy or asthma symptoms and mental stability are important measures for physical well-being (Carmichael et al., 2016). Remarkable is that Carmichael et al. (2016) include mental stability as a measure for physical well-being. Koshuta (2018) referred to even more precise measurements for physical well-being, namely physical activity, nutrition and diet, alcohol and drugs, medical self-care, rest and sleep. Physical well-being can also be expressed in the amount of energy available to the self (Ryan & Frederick, 1997).

As already mentioned in chapter 3.1, the three factors of well-being are interrelated. Individuals with high levels of physical well-being are more likely to have a high level of social well-being in terms of meaningfulness in the social system and social integration (Heidrich & Ryff, 1993).

Physical well-being is also related to a higher level of psychological well-being in terms of autonomy (King, 2017), reduced anxiety, improved mood states, resilience to stress and improved cognitive function (Fox, 1999). Further, physical well-being can also improve physical self-perceptions and in some cases global self-esteem (Fox, 1999). Physical well-being in terms of physical activity can increase psychological well-being in terms of better mood states and better functional capacity (Penedo & Dahn, 2005). Further, individuals with low physical well-being and high psychological well-being tended to increase their physical well-being more quickly than individuals with low psychological well-being.

At last, low physical well-being can result in lower well-being in general because it often presents functional limitations, which can detract one from opportunities (Ryan & Deci, 2001).

## 2.4 Social well-being

Social well-being can be defined as someone’s grounding in a social and cultural location (White, 2008). It is the ability to maintain relationships in marriage, family, friends, and in particular the workplace.

According to Keyes (1998) social well-being constitutes of five dimensions: social integration (relationship to society and community), social acceptance (hold trust in human nature), social contribution (one’s social value), social actualization (potential and trajectory of society), and social coherence (concern for knowing about the world) (Keyes, 1998). The five dimensions determine one’s circumstance and functioning in society (Keyes, 1998). A sense of belonging in a group (social integration) enhances social well-being and vice versa (King, 2017).

Campbell (1976) refers to social networks and interaction, social exclusion, disfunction and personal isolation to measure social well-being. These factors only relate to two dimensions of Keyes (1998): social integration and social contribution. Campbell is more focused on the self because it does not include social acceptance, social actualization and social coherence. There is more research that focuses on the self. Baumeister and Leary (1995) refer to the universal need of individuals to form interpersonal bonds and look for affiliation. Also, if an individual believes he/she is social, then he/she is more likely to act on it and have interaction with others, resulting in higher social well-being (Ryan & Deci, 2001).

Also social well-being influences physical and psychological well-being. Social well-being in terms of social interactions such as strong relationships with friends, family and neighbours relate to higher psychological well-being (Helliwell & Putnam, 2004). A positive social environment can also result in higher psychological well-being in terms of stress relief and positive mood (Ryff & Singer, 2000; Ryan & Deci, 2001; Ryff et al., 2001). Low social well-being can also result in decreased psychological well-being in terms of depression and anxiety due to personal isolation (King, 2017). Negative effects of social well-being are even more strongly related to psychological well-being than positive social well-being characteristics (Rook, 1984).

Also, social interactions during exercise environment increase well-being in terms of life satisfaction and social support has a positive effect on physical well-being in terms of physical activity (McAuley et al., 2000; Kang et al., 2016).

## 2.5 Well-being in the workplace

Well-being in the workplace refers to ‘health and comfort of employees’ (Bluyssen et al., 2011). It reflects quality of working life and incorporates narrower concepts of physical and mental health (such as physical fitness, absence of illness and mental stability), and safety from health risks (Carmichael et al., 2016). Employee well-being is influenced by experiences at work, and has an effect on behaviour at work such as task performance (Sonnentag, 2015). The office environment itself influences employee well-being. Indoor stressors such as moisture, noise, vibration, radiation, chemical compounds, thermal factors, and lighting can cause positive as well as negative and long- and short- term effects on well-being (Bluyssen et al., 2011).

Psychological well-being in the workplace has been defined as: “A dynamic state in which the individual is able to develop their potential, work productively and creatively, build strong and positive relationships with others and contribute to their community. It is enhanced when an individual is able to fulfil their personal and social goals and achieve a sense of purpose in society”(NICE, 2009). Psychological well-being in the workplace can be measured in anxiety, depression, stress/distress/burnout, emotional well-being such as positive emotions, life satisfaction and coping (Brown et al., 2012).

Physical well-being in the workplace includes physical quality of life and general health. Brown et al. (2012) measured physical well-being in pain/discomfort, physical functioning, general health, health complaints such as vitality, energy, tension, nervousness, relaxation and self-esteem, fatigue, and physical satisfaction.

Social well-being in the workplace can be defined as feeling embedded in meaningful communities and having satisfying short term interactions and long term relationships with others (De Simone, 2014). According to De Simone (2014), social well-being in the workplace includes satisfaction and cooperation with peers as well as with leaders, (giving and receiving) social support, and feelings of belonging to work communities such as teams or the whole organization that have a climate of trust and respect.

Companies should take into account the workplace conditions in order to enhance well-being in the workplace (Kowalski, 2017). According to Kowalski, 2017), a changing work environment, innovation technologies and the company culture influence well-being in the workplace. Providing services such as counselling, fitness programmes, stress management and health information or even workplace well-being programmes can enhance employee well-being (Carmichael et al., 2016; Rucker, 2017). These services also encompass economic benefits because employees tend to work harder if they believe that they are genuinely being looked after (Tyers and Hicks, 2014; Carmichael et al., 2016). A positive work environment can also influence the ability of an employee to care for their well-being and personal resources (Hymel et al., 2011). However, employees should also assume personal responsibility for their own health and well-being (Carmichael et al., 2016). Interconnecting work-related and non-work-related factors could benefit employee well-being (Quintiliani et al., 2010).

## 2.6 Conclusion

Well-being refers to an equilibrium in an individual’s resource pool and challenges faced. The resource pool and challenges are determined by psychological, social and physical factors that are interrelated. The main characteristics of psychological well-being are positive or negative mood, depression, and stress level. Physical well-being characteristics are being physically healthy in terms of a low blood pressure, absence of sickness, no symptoms of asthma or allergies, high fitness level and absence of fatigue. At last, social well-being can be conceptualised in terms of social relations with others, networks, cooperation, and contribution to community.

# **Chapter 3: Green interior in the workplace**

## 3.1 The office

According to van Meel (2000), an office is a workplace for employees in order to support business processes, flexibility of the organisation, and interaction with stakeholders such as colleagues, organisations and institutions. The main function is to facilitate and support processes of the organisation (van Meel, 2000). Employee office activities include generating, collecting, exchanging and saving information and ideas (Stijnenbosch, 2012).

Due to a shift towards a knowledge driven economy, the office-related employment opportunities have increased (Arts et al., 2005). Because more people spend most of their waking hours in the office, it becomes a necessity to develop a pleaseant office environment for the business itself and the employees (Hosie & Sevastos, 2015; Goetzel & Ozminkowski, 2006; Shain & Kramer, 2004).

According to El-Zeiny (2012), the perceived office environment is dependent on 9 factors: colour, outside view, noise, privacy, spatial arrangement, presence of plants, light, temperature and furniture These factors are used to determine the office space quality (El-Zeiny, 2012). El-Zeiny (2012) researched that furniture has been perceived as most influential factor on employees’ performance, colour as least influential factor and presence of plants ended at place 4 out of 9.

The 9 factors are influenced by a trend in office space design moving towards an ecologic and green design in order to be sustainable (Aktas, 2013). The demand on resources as well as the environmental impact of human activities is increasing because of the increase in world’s population. The earth is a closed ecosystem and will not be able to cope with such growth (McDonough, 2002). Therefore a wise use of renewable resources and diminishing non-renewable resources in use is required (Aktas, 2013). The United Nations’ World Commission on Environment and Development defined sustainability in the 1987 Bruntland Report as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’. Sustainable development is with help of rating systems such as LEED (Leadership in Energy and Environmental Design) and BREAAM (Building Research Establishment Environmental Assessment Method) incorporated in office space design.

Adding plants to the office space is a way to enhance sustainability in the office (Sustainable Business Toolkit, 2017). Office factors that are influenced by plants are air quality, noise, temperature, lighting, humidity, and dust (Thatcher & Milner, 2014). Presence of plants can positively affect the indoor environmental air quality, the image of the workplace and in terms of physical surroundings (Thomsen et al., 2011; Ambius, 2018). Other possibilities to enhance sustainability in the office are a clear desk policy, removal of personal bins and centralised recycling (Sustainable Business Toolkit, 2017). According to Lindner (1998), open and airy building design and architecture, bright colours and artwork, and plants and windows contribute to a positive office environment in terms of good working conditions such as a pleasant temperature and clean and fresh air.

Another aspect concerning the office environment is the increased awareness of benefits for a business from employees working in a healthy working environment. It cannot only improve employee well-being (Quintiliani et al., 2010), it can also be valuable for business in terms of higher job satisfaction (Parker, 1992), increased productivity and less absenteeism (Kahya, 2007), and contributes towards becoming an employer of choice (Contributor, 2014).

Thus, the office is a space where an increasing amount of people spend most of their waking hours. It is important this environment is a positive and healthy environment for employees, which promotes the use of green interior in the office. Especially the trend in sustainable development amplifies the need to use green interior in the office, not only to promote employee well-being but also to improve business processes.

## 3.2 Green interior in the workplace

The term ‘green interior’ refers to all plants and green pictures, such as ferns, photos and posters. In general, green interior can refer to all kinds of interior, such as furniture, walls, and textiles (Jones, 2008). These attributes contribute to the design of an area, such as the workplace. Now, a focus will be on plants and green pictures only, because these attributes can easily be adjusted in a workplace. ‘Green’ not only refers to the colour, but also to scenic views, such as a field of grass with horses or flowers in a garden. Green interior in the office environment is an accessible tool to create a positive and pleasant office environment. For example, putting plants in offices is not costly nor time-consuming but it positively affects employee-wellbeing (Dravigne et al., 2008). Dravigne et al. (2008) also evidenced a positive effect of green window views on employee well-being. However, a window view cannot easily be adjusted into a green window view because it is not inside the office. Replacing existing buildings and changing infrastructure with parcs or other forms of nature in order to create a green window view will be time consuming and costly. Therefore a focus on green interior in terms of plants and pictures is more useful.

Green interior has been chosen as a tool to influence employee well-being because people have a natural desire to connect with nature and other forms of life, which is commonly known as ‘biophilia’ (Wilson, 1984). Biophilia is also referred to as the innate need of a human to nature, therefore it is necessary for architects to integrate nature in their office designs (Ambius, 2018). Nature has a healing effect, it positively influences well-being in terms of reduced stress, lower blood pressure and a positive influence on someone’s concentration (Gifford, 2007). Beute and de Kort (2018) also noted that exposure to nature reduces stress when people are inside in the presence of plants. Nature has patterns that can easily be processed by the brain, which reduces stress and improves well-being (Joye & van den Berg, 2011).

Thus, integrating aspects of nature in the workplace might improve employee well-being by intervening in the office with forms of green interior. Green interior can be divided into two subcategories: plants and green pictures and will now be discussed.

### 3.2.1 Plants

A plant is a living organism that grows in the earth, and usually has a stem, leaves and roots (Oxford Dictionary, 2018). The term ‘plants’ refers to all live indoor plants, such as succulents and ferns (Dennis, 2010). Photosynthesis is an important phenomenon occurring with plants. All green parts (mainly leaves) of a plant absorb carbon dioxide, water and (sun) light, which they convert to oxygen and glucose (Bouwman, 2018). Glucose serves as nutrition for the plant and oxygen is necessary for people to live (Bouwman, 2018).

Plants have multiple functions. They detoxify the environment by absorbing carbon dioxide and other air pollutants and they produce fresh oxygen (Bouwman, 2018; Ambius, 2018). While indoor plants often serve as decoration, they can have beneficial effects on their environment in terms of improved air quality and improved well-being of people in general (Aktas, 2013; Kaplan, 1973). In both active and passive interactions such as gardening and being in presence of plants, well-being can be improved (Kaplan, 1973). Research shows that plants increase attentiveness, reduce stress and mental fatigue, decrease blood pressure and result in fewer reports of illness (Kaplan, 1992; Lewis, 1993; Lohr, 2000; Ulrich and Parsons, 1992). Plants also increase the amount of positive feelings and thus improve the mood (Dennis, 2010)The body of evidence concerning the positive effects of plants on humans confirms the concept of biophilia, that explains the innate need of humans to connect with nature (Wilson, 1984).

### 3.2.2 Plants in the workplace

Plants have multiple functions in the office such as filling up space, contributing to a green interior style by serving as interior finishing material and to the image of sustainability, which is rising in popularity (Aktas, 2013; Dennis, 2010). Plants in the office also help to provide a pleasant visit for associates and customers (Ambius, 2018).

Plants also have beneficial effects on physical workplace factors such as air quality, noise, temperature, humidity, and ambiance (Bringslimark et al., 2007; Wolverton, 1989). According to Ambius (2018), a company that’s been enhancing interior landscapes since 1963, introducing plants to the workplace can improve the indoor environmental quality such as improved indoor air quality and better thermal comfort, that will be explained more broadly in chapter 5.2.

### 3.3.1 Green pictures

The term ‘green pictures’ refers to the green design of a painting, drawing, photograph, or even an image on a television screen (Oxford Dictionary, 2018). All kinds of pictures are useful, provided they image some kind of nature, such as a field of tulips, a plant or an animal.

Because nature can improve well-being and green is seen as a ‘calming’ and stress reducing colour (El-zeiny 2012; Jalil et al., 2012), pictures with these views might result in the same effects. Green (2012) mentioned that pictures or artistic depictions of nature such as photos and paintings with plants or animals can have calming effects. Kaplan (1983) suggested that especially scenic views can have a restorative effect on human behaviour.

Multiple research (Ainsworth et al., 1993; Stone & English, 1998; Kwallek & Lewis, 1990; Stone, 2003) has shown that green colours and green pictures do not significantly relate to well-being factors such as mood, satisfaction, anxiety, depression, and tension. However, Plack and Shick (1974) researched that a blue-green colour had a relaxed and calming effect that improved comfort, security and peace. Also Madden et al. (2000) investigated the meaning of colour, where green is the second highest evaluated colour and related to calmness, gentle, passive and peaceful characteristics. These effects could influence employee well-being.

### 3.3.2 Green pictures in the workplace

Green pictures can have multiple functions in the workplace. They can serve as a contribution to the green interior style, fill up space, and contribute to provide a pleasant visit for associates and customers (Aktas, 2013). Multiple research suggested that scenic views contribute to the workplace conditions because people have the innate need to connect with nature (Wilson, 1983; Ambius, 2018).

Lindner (1998) suggested that scenic artwork, such as paintings, can contribute to ‘good working conditions’. Subsequently, Vaclavik (2018) evidenced that workplaces with pictures of nature in the office were perceived as ‘spacious, clean, and nice’. Next to scenic pictures, green colours in the workspace had no significant results in terms of well-being (Kwallek & Lewis, 1990).

Thus, green pictures cannot affect the physical office conditions such as temperature and air quality, but it can positively affect the ambiance through design of the workplace.

## 3.4 Conclusion

Green interior in the office constitutes of attributes in terms of plants and green pictures. Green interior affects the office environment. Physical office conditions of the office environment are indoor air quality, acoustics, temperature, humidity, and ambiance. A large body of evidence confirms that plants affect all physical office conditions, mainly because of photosynthesis. There is less evidence concerning the effects of green pictures such as posters, photos and small movies on the office environment. Research showed that green pictures have the ability to influence the ambiance through design.

# **Chapter 5: Effects of green interior on well-being in the office**

Well-being of people is influenced by its environment, thus the office environment affects employee well-being. Multiple factors of the office environment influence employee well-being, such as furniture, colours, interior style, plants, lighting, and air quality (El-Zeiny, 2012). Research has shown that green interior (plants and pictures) in the office can positively affect employee well-being (Lohr et al., 1996; Dravigne et al., 2008). Although plants and green pictures have matching effects on well-being, there are differences. Thus, they will be explained separately.

## 5.1 Effects of plants on well-being in the office

Plants have a positive effect during a work session (Lohr et al., 1996). According to the University of Exeter, office plants can boost employee well-being up to 47% (Knight, 2013). Plants have multiple effects on employee well-being in the office, which will be explained in detail for all 3 factors of well-being (psychological, physical, and social well-being). First, the effects of plants on employees in the office will be clarified, subsequently they will be linked to the factors of well-being.

To start, there has been done a lot of research in the effects of plants in the office on employee well-being. The presence of plants in the office results in reduced mental fatigue, reduced stress, increased attentiveness, and lowered blood pressure (Lohr et al., 1996). Plants in the office also improve mood and involve positive feelings (Adachi et al., 2000; Shibata & Suzuki, 2004). Plants in the workplace increase self-confidence, general well-being, and mood (Thomsen et al., 2011; Dravigne et al., 2008).

As already mentioned in chapter 3.3, plants influence physical office conditions such as air quality, noise, temperature, humidity and ambiance (Gou et al., 2011). The effects of plants on these conditions are explained:

1. Plants can improve the indoor environmental air quality of the office (Fjeld et al., 1998; Ambius, 2018). Plants reduce the amount of air toxins up to 84% within 24 hours in an office (Ambius, 2018). Plants can also reduce the amount of CO2 in the air up to 10% respectively 25% (Tarran et al., 2007). Plants can absorb chemicals in the office and produce fresh, clean oxygen (Ambius, 2018). In that way, the accumulation of dust, and the amount of airborne particles and air pollutants can be reduced (Lohr et al., 1996; Wolverton, 1989).

Air pollutants cause symptoms of headache, sore eyes, nose and throat (Carrer et al., 1999; Mølhave & Krzyzanowski, 2003). Improving the indoor air quality in the office result in lower stress levels, and less allergy and asthma symptoms (Baugman & Arens, 1996; Ambius, 2018). An office with pleasant air conditions increases positive emotions, decreases blood pressure, decreases stress levels (Ulrich et al., 1991; Thatcher & Milner, 2014), and decreased cooperation with co-workers (Kahya, 2007). Flowering and blooming plants can offer a greater mood lift than those who do not (Ambius, 2018). Besides the actual increase in air quality, Khan et al., (2005) also researched that being in an environment enriched with plants increases the perceived air quality of the respondents.

1. Next to air quality, plants also affect the acoustics of an office by reducing the reverberation time (Ambius, 2018). Plants can reduce the amount of noise by absorbing, deflecting and reflecting the sound (Ciu et al., 2013; Ambius, 2018). Leaves of plants have the ability to absorb, deflect or reflect the sound in workplaces, especially background sounds (Ciu et al., 2013; (Ambius, 2018). Improved acoustics of an office results in lower stress levels (Ciu et al., 2013; Burton et al., 2001), less depression (Burton et al., 2001), less negative mood (Lamb & Kwok, 2016), more positive emotions (Montgomery, 2004) and decreased cooperation with co-workers (Kahya, 2007).
2. Plants affect the temperature of an office. Plants can regulate the air temperature (Ciu et al., 2013) and conserve heat in winter and cool in summer (Aktas, 2013). This can result in lower stress levels (Ciu et al., 2013, higher physical health in terms of asthma and allergies (Baughman & Arens, 1996), less negative mood (Lamb & Kwok, 2016), more positive emotions (Montgomery, 2004) and decreased cooperation with co-workers (Kahya, 2007).
3. Plants affect the humidity level of an office. Plants have the ability to raise the relative humidity level (Ambius, 2018). An increased relative humidity level can affect one’s physical health in terms of asthma and allergies (Baugman & Arens, 1996) and decreased cooperation with co-workers (Kahya, 2007).
4. The last physical office condition that can be influenced by plants in the ambiance of the office. Plants contribute to the ambiance of the workplace by providing visual and physical aesthetic enjoyment to people (Wolverton, 1989).

Positive effects of plants can be divided in three subgroups: psychological well-being, physical well-being and social well-being. To summarize, for each subgroup the effects of plants on well-being in the office are shown:

* Psychological well-being can be improved with help of plants in terms of increased positive emotions and less negative mood, increased attentiveness, increased self-confidence, decreased stress levels, and less depression.
* Physical well-being can be improved with help of plants in terms of , decreased toxins in the air, decreased blood pressure, higher physical health in terms of asthma and allergies and less symptoms of headaches, sore eyes, nose and throat.
* Social well-being can be improved with help of plants in terms of improved cooperation with co-workers (Kahya, 2007). Dravigne et al. (2008) showed that plants have a positive effect on the opinion about co-workers in terms of likability, competency, communication, and teamwork.

## 5.2 Effects of green pictures on well-being in the office

Although a lot of research has been done concerning the effect of plants and window views in the office (Dravigne et al., 2008; Fjeld et al., 1998; Gifford, 2007), few research has been done concerning the effects of green pictures in the office. Stone (1998) evidenced some beneficial effects of posters in the workplace. Presence of posters in the workplace increased positive mood, decreased fatigue, and increased confidence (Stone, 1998). Subsequently, Kweon et al. (2008) found that landscape posters in the office decrease stress levels and result in less negative emotions. Also Green (2012) mentioned that pictures or artistic depictions of nature such as photos and paintings with plants or animals can have calming effects because of lower blood pressure. Wolverton (1989) researched that green pictures can have a positive influence on the ambiance of the office because of visual and aesthetic enjoyment to people.

As already mentioned, there is a large body of evidence concerning the positive effects of green window views on employee well-being such as a lower stress level and higher level of happiness (Dravigne et al., 2008; Gifford, 2007). In addition to this, Young and Berry (1979) found that artificial pictures of nature scenes in the office were nearly as desirable as outside windows. This could imply that green pictures can have the same effects as outside windows.

Next to posters and pictures, also a nature movie can positively affect well-being. Ulrich et al. (1991) evidenced a nature movie can result in reduced stress. However, this study was conducted in a hospital, which differs from an office and therefore usefulness is doubtful.

Research has also shown there were no significant effects of green pictures on well-being in the office. Stone (2003) researched the effect of scenic pictures in an office environment with windows, as well as without windows. She suggested that, because of a large body of evidence that nature or green views have a positive effect on employee well-being (Thatcher & Milner, 2014; Dravigne et al., 2008), scenic pictures would also have a positive effect (Stone, 2003). The opposite has been evidenced: scenic pictures have no significant results in performance, mood, motivation or satisfaction (Stone, 2003).

Positive effects of green pictures can be divided in three subgroups: psychological well-being, physical well-being and social well-being. To summarize, for each subgroup the effects of green pictures on well-being in the office are shown:

* Psychological well-being can be improved with help of green pictures in terms of increased positive mood, less negative emotions, increased self-confidence, decreased stress levels, and a calming effect
* Physical well-being can be improved with help of green pictures in terms of decreased fatigue and lower blood pressure
* No effects of green pictures in the office on employee well-being were found

As research shows, plants have a high ability to influence employee well-being in the office. A lot of research has been done in the field of effects of plants on employee well-being in the office, showing it gives multiple contributions to employee well-being. The effects of green pictures on well-being in the office are less substantiated, but there is some evidence that green pictures have a positive effect. Figure 2 gives a clear overview of what the known effects of green interior on well-being in the office are. The effects of well-being are divided in three dimensions mentioned in chapter 3: psychological, physical and social well-being.

|  |  |  |
| --- | --- | --- |
|  | Plants | Green pictures |
| Effects on psychological well-beingPsychological well-being: a balance between positive and negative effect of moods and conditions. *(Bradburn, 1969)*  | * Less depression

*(Burton et al., 2001)** Lower stress level *(Ulrich et al., 1991; Lohr et al., 1996; Baugman & Arens, 1996; Ciu et al., 2013; Burton et al., 2001; Dravigne et al., 2008)*
* More positive emotions

*(Adachi et al., 2000; Shibata & Suzuki, 2004; Ulrich et al., 1991; Montgomery, 2004)** Less negative mood and more positive mood

*(Dravigne et al., 2008; Thomsen et al., 2011; Lamb & Kwok, 2016)** Increased self-confidence

*(Thomsen et al., 2011)** Less mental fatigue *(Lohr et al., 1996; Lohr, 2000)*
 | * Increased positive mood

*(Stone, 1998; Kweon et al., 2008)** Increased confidence *(Stone, 1998)*
* Lower stress level *(Kweon et al., 2008; Green, 2012)*
* A calming effect

*(Green, 2012)** Decreased mental fatigue

*(Stone, 1998)* |
| Effects on physical well-beingPhysical well-being: absence of disease and fitness level. *(Koshuta, 2018)* | * Better physical health *(Baugman & Arens, 1996; Ambius, 2018)*
* Less asthma and allergy symptoms *(Baugman & Arens, 1996; Ambius, 2018)*
* Decreased blood pressure

*(Lohr et al., 1996; Ulrich et al., 1991; Thatcher & Milner, 2014)** Less symptoms of headache, sore eyes, nose, and throat

*(Carrer et al., 1999; Mølhave & Krzyzanowski, 2003)** Less fatigue

*(Lohr et al., 1996)* | * Decreased fatigue *(Stone, 1998)*
* Lower blood pressure *(Green, 2012)*
 |
| Effects on social well-beingSocial well-being: someone’s grounding in a social and cultural location. *(White, 2008)* | * Increased perceived opinion about co-workers

*(Dravigne et al., 2008)** Improved cooperation with co-workers

*(Kahya, 2007)* |  |

*Figure 2: An overview of the known effects of green interior on well-being in the office*

# **Chapter 6: Answering the research questions, discussion and future work**

## 6.1 Summary and conclusion

The office is a workplace for employees in order to support business processes, flexibility of the organisation, and interaction with stakeholders such as colleagues, organisations and institutions. The office environment can be easily adjusted by introducing green interior design, such as plants and scenic posters and photos. Physical office conditions of the office environment such as indoor air quality, acoustics, temperature, humidity, and ambiance can affect employee well-being.

Employee well-being refers to the quality of the working life and can be divided into three subgroups: psychological well-being, physical well-being, and social well-being. Psychological well-being refers to a balance between positive and negative effect of moods and conditions. Physical well-being refers to the absence of disease and fitness level. Social well-being refers to someone’s grounding in a social and cultural location. These subgroups have distinct characteristics that recur to the utmost extent when researching the effects of green interior on employee well-being.

There is a large body of evidence that exhibits multiple effects of plants on all three subgroups of well-being. Multiple characteristics of psychological well-being are improved by intervening in the office environment through plants, such as more positive and less negative mood, a lower stress level, less depression, more positive emotions, increased self-confidence, and less mental fatigue. Physical well-being is also affected by adding plants to the office in terms of a better physical health, less asthma and allergy symptoms, decreased blood pressure, less symptoms of headache, sore eyes, nose, and throat, and less fatigue. Social well-being is affected by adding plants to the office in terms of increased perceived opinion about co-workers, and improved cooperation with co-workers. All characteristics of well-being are significantly related to positive effects of plants in the office, except for social well-being in terms of contribution to community.

Less research is conducted concerning the effects of green pictures on well-being in the office. There is evidence that green pictures affect psychological and physical well-being, but no evidence of social well-being was found. Psychological well-being can be improved by intervening in the office through plants in terms of increased positive mood, increased confidence, lower stress level, a calming effect, and decreased mental fatigue. No evidence of an effect of green pictures on depression. Physical well-being can be affected by green pictures in terms of decreased fatigue and lower blood pressure. No evidence was found concerning the effects of green pictures on physical well-being in terms of absence of sickness, symptoms of asthma or allergies, and fitness level. Concerning social well-being in terms of social relations with others, networks, cooperation, and contribution to community, no effects of green pictures on employee well-being in the office are found.

## 6.3 Discussion and future work

This analysis resulted in an overview of known effects of green interior on well-being in the office. An increase in employee well-being in the office is not only beneficial for the individual, it can also benefit the business itself through increased productivity, less absenteeism and less costs associated with injuries and illness including costs relating to presenteeism and sickness absence.

Next to a positive effect of improved employee well-being on the business processes, it might also affect society related factors, such as lower insurance costs. Higher well-being might lead to a dilution of insurance costs related to well-being such as appointments with a psychologist and asthma related medicines. Therefore, improving well-being in the office might have beneficial effects in society. Future research could extend this suggestion through a financial estimation of change in insurance costs related to a higher well-being. Another future research could be the financial estimation of the change in absenteeism in a business due the intervention of green interior in the office. This could increase the awareness among business owners about the value of a green working environment.

A limitation on this analysis is that it is a bachelor thesis with literature studies only, so it is possible that valuable research was not found and thus not included in this analysis. Another limitation is that during the assessment of the effects of green pictures on well-being in the office, research was used that had been conducted in another setting. Because there is lack of evidence concerning the effects of green pictures on well-being in the office, future research in the field of the effects of green pictures could expand this analysis. More knowledge about the effects of green pictures on well-being can be valuable for one’s business because they are easy attributes to intervene in an office. Green pictures incur few costs and are not time consuming to implement in the office.

Next to more research in the field of green interior, future research could also be done in the field of social well-being in the workplace, and in particular the effects of green interior on social well-being in the workplace.

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