

# How to achieve an increase of productivity and a decrease of absenteeism of office-based employees.

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## Preface

Before you lies my thesis about creating a work environment to increase the productivity and decrease the absenteeism of office-based employees. It has been written to fulfil the graduation for my Biology, Nutrition & Health program at the Aeres University of Applied sciences in Almere.

This thesis is written for employers and companies, who wants to create an healthy work environment for their office-based employees. Because of my own experience in offices, I think it is important that every person can live a healthy lifestyle, even if they work at the office all day long.

I would like to thank my supervisor Anita Okma and my co-reader Dinand Ekkel for their support and guidance during this process. I also wish to thank some fellow students for their help while writing my thesis.

I hope you enjoy your reading!

Henriëtte Haverhals

Almere, August 2018

## Abstract - English

Nutrition, Physical activity and a green environment are known as important factors for human health. However, much people work at an office and spend a large part of the day in the office. Research shows that this work environment is not healthy in all cases. The available food in the office is known as unhealthy and most of the employees show sedentary behaviour by spending a relative large amount of their time sitting behind a desk. Finally, most of the offices lack nature and any form of green. Thus, the physical environment of the employee does play a huge role in their health. In literature, health can also be expressed in productivity and absenteeism, like in this thesis. This leads to the research question of this thesis: *How can a work environment increase the productivity and decrease the absenteeism of office-based employees?* While for the employee himself health is more important, for the employer is productivity and less absenteeism mainly important.

To answer the research question, the following aspects are taken into consideration: nutrition, physical activity and a green environment. The goal is to find interventions and guidelines that offices can change in an environment that stimulates the health of the employees. In the discussion, criteria are used to rank the interventions and guidelines found in literature. These criteria are: the costs, short/long-term effects and feasibility of the interventions. If possible, the classification will be scientifically supported and otherwise, the author will give an estimation based on the earlier stated knowledge.

The results show that a healthy diet is important for the health of the employees. It can increase the productivity and decrease the absenteeism, caused by diseases as obesity. Therefore the canteen should offer healthy meals and food options and should also promote a healthy diet. In addition to a healthy diet is physical activity important as well. A lack of physical activity can result in neck and back pain, which can decrease the productivity and possibly increase absenteeism of the employees. Therefore, cutting prolonged sitting periods into short periods is of vital importance. Sit-stand desks with the option to stand, cycle or walk can be good solution. Finally, the use of natural elements in the office such as indoor plants and wood can increase the task performance and productivity. The combination of the previously executed studies combined with the practical interventions makes this thesis plausible input for a company that wants to take the step towards a healthy work environment.

## Abstract - Dutch

Voeding, beweging en een groene omgeving zijn bekend als belangrijk voor een goede gezondheid van de mens. Echter werken veel mensen in een kantoor, waar ze groot deel van hun dag doorbrengen. Uit onderzoek blijkt dat deze werkomgeving niet altijd positief is voor hun gezondheid. Het voedsel in de kantine zou ongezond zijn en de medewerkers vertonen veel sedentair gedrag door relatief veel achter hun computer te zitten. Daarnaast is er in veel kantoren weinig natuur of groen te bekennen. De fysieke omgeving van de werknemer speelt dus een grote rol als het gaat gezondheid. Gezondheid wordt in de literatuur wel uitgedrukt in productiviteit en ziekteverzuim, zoals ook in deze thesis. De hoofdvraag is dan ook: *Hoe kan de fysieke werkomgeving van kantoormedewerkers de productiviteit verbeteren en het ziekteverzuim verlagen?* Naast dat gezondheid voor de werknemer zelf belangrijk is, zijn productiviteit en ziekteverzuim vooral voor de werkgever van belang.

Om de hoofdvraag te kunnen beantwoorden wordt er gekeken naar de aspecten: voeding, beweging en een groene omgeving. Het doel is om interventies en richtlijnen te vinden die de kantoren kunnen veranderen tot een omgeving die stimulerend is voor de gezondheid van de werknemers. In de discussie zullen deze interventies geclassificeerd worden op drie verschillende aspecten: de kosten, korte of lange termijn effecten en de toepasbaarheid van de interventies in een kantoor. Waar mogelijk zal de classificatie onderbouwd worden met bronnen en anders zal het op inschatting van de auteur gebeuren.

De resultaten laten zien dat een gezond dieet belangrijk is voor de gezondheid van werknemers. Een gezond dieet kan de productiviteit verhogen en het ziekteverzuim verlagen, wat veroorzaakt wordt door ziektes als obesitas. De kantine moet daarom gezonde maaltijden en voedingsproducten aanbieden, en ook een gezonde voeding promoten. In aanvulling op goede voeding, ook beweging is belangrijk. Een tekort aan beweging kan resulteren in nek- en rugklachten die de productiviteit kunnen verlagen en mogelijk het ziekteverzuim van werknemers verhogen. Uit onderzoek blijkt dat het opknippen van lang aaneengesloten periodes van zitten van belang is voor de gezondheid. Verstelbare bureaus waar staand, fietsend of lopend aan gewerkt kan worden kunnen dan ook een goede oplossing zijn. Als laatste kan het gebruik van natuurlijke elementen zoals planten en hout in het kantoor, de productiviteit verhogen. De combinatie van eerder uitgevoerde onderzoeken, gecombineerd met de praktische interventies maken deze thesis een aannemelijke basis voor een bedrijf dat een gezonde werkomgeving wil creëren voor hun werknemers.

## Table of content

Chapter 1 Introduction.....	7
Chapter 2 Method .....	10
2.1 Collect the literature .....	10
2.2 Evaluate the data and answer the questions.....	11
Chapter 3 Results.....	13
3.1 Available nutrition at work and an increase in productivity and decrease in absenteeism of office-based employees. ....	13
3.2 Physical activity at work and an increase in productivity and decrease in absenteeism of office-based employees.....	17
3.3 A green environment and the increase the productivity and decrease the absenteeism of office-based employees at work .....	20
Chapter 4 Discussion .....	22
4.1 Available nutrition at work and an increase in productivity and decrease in absenteeism of office-based employees. ....	22
4.2 Physical activity at work and an increase in productivity and decrease in absenteeism of office-based employees.....	24
4.3 A green environment and the increase the productivity and decrease the absenteeism of office-based employees at work .....	25
4.4 General discussion points.....	26
Chapter 5 Conclusion .....	28
5.1 How can the available nutrition at work increase the productivity and decrease the absenteeism of office-based employees?.....	28
5.2 How can physical activity at work increase the productivity and decrease the absenteeism of office-based employees?.....	28
5.3 How can a green environment at work increase the productivity and decrease the absenteeism of office-based employees? .....	28
5.4 Research question .....	28
5.5 Relevance of the results .....	28
Chapter 6 Recommendations.....	29
List of references .....	30

## Chapter 1 Introduction

Working, it is something a lot of humans have to do in their lives. As an illustration, take the Dutch AOW pension (paid under the National Old Age Pensions Act, AOW). The pension age for AOW is 66 years in 2018. This will increase in the following years so the AOW pension age is expected to be 67 years in 2022. (Sociale verzekeringsbank, 2018) The life expectancy in the Netherlands at birth in 2016 is approximately 79,9 year for men and 83,1 year for woman. Therefore, if people start working at the age of 15, they would have to work more than half of their life. (Volksgezondheid en zorg, 2018)

Throughout the 21<sup>st</sup> century, a healthy lifestyle has become more popular than before. This lifestyle takes aspects like healthy food, exercise and mental well-being into account (Euromonitor Research 2017). However, it is not a way of life for everybody. In 2016, the Netherlands started to adjust their health standards of nutrition and exercise (Ministry of Health, Welfare and Sport [VWS], 2015). Despite the fact that health seems more popular, there are still a lot of people who need to adopt a healthy lifestyle. Since humans have to work a lot, occupational health is important. One group in particular needs attention because their job can be harmful for their health: the office-based employees. One of the reasons is the amount of sedentary behaviour these employees show for a large part of the day. Sitting is an example of sedentary behaviour and this behaviour can exist at work, but also during public transport, leisure time, and at home. Every kind of activity is commonly expressed in Metabolic Equivalent of Task (MET). MET is a value for the amount of energy cost for a physical activity, in comparison to energy in rest. Activities with a metabolic expenditure 1,0 MET to 1,5 MET are considered sedentary although there are slightly differences in definitions. (Ford and Caspersen, 2012) This sedentary behaviour can be a health risk. Researchers associate this behaviour with diseases such as cardiovascular diseases, obesity, diabetes, high blood pressure and colon cancer (Yunlon & Ingdan, 2008). Illness like obesity and diabetes can lead to absenteeism, which is something an employer wants to prevent and avoid.

Sedentary behaviour can cause a lack of physical behaviour, which is a global public health problem. The WHO defines physical activity as “any bodily movement produced by skeletal muscles that requires energy expenditure”. For clarity, this is different from exercise, which is a way of physical activity (WHO, 2018). It is estimated that in 2008 31% of adults above 15 years old had a lack of physical activity globally (World Health Organisation [WHO], 2018). For the Netherlands, one out of three Dutch people does not have enough physical activity in 2012 (National Institute for Public Health and the Environment [RIVM], 2012). This can be a risk factor for their health. Choi et al. (2010) found out that middle-aged US male workers with low physical activity at work have a significant risk factor for total and central obesity. The lack of physical activity also results in circa 3,2 million death annually around the world, due to insufficient physical activity. A study to the sedentary behaviour of mostly Chinese employees suggests that the people spend 76,9% of their day in sedentary activities (Waters et al, 2016). The group of people with an office job is quite big in the Netherlands. In 2016, there were more than two million office jobs in the Netherlands (Cushman & Wakefield, 2018). In comparison, at the end of 2016, more than eight million people are working (Statistics Netherlands). This means that office jobs are a quarter of all jobs in the Netherlands. By investing time in the health of office-based employees, the health of many people can be improved.

Besides physical activity, there are other factors that affect the health of employees in the office. It is known that good nutrition is vital for the human body. When striving for a way to improve the health of employees, the available nutrition at work is important. Employees should eat healthy food, which is mostly associated with higher nutrition density and a low energy content (Lassen et al. 2014). However, frequent use of canteens at work is related to an unhealthy diet and unhealthy food is related to obesity and diabetes. A canteen with healthier options can be the solution for this problem (Kjøllesdal, Holmboe-Ottesen & Wandel 2011). An US-based study by the Society of Public Health Education also showed that employees would be making healthier choices if a workplace has better health food options (Boyan, 2014). To decide whether a canteen is healthy, guidelines from institutes like the WHO or the Netherlands Nutrition Centre can be used.

Furthermore, it is known that nature and green space have beneficial effects on health (Groenewegen et al., 2006). The office buildings often lack green, like plants, in their surroundings or on the office rooms. The right environment is important because it can increase the human health and productivity (Heerwagen, 2000). Studies indicate that a green building might have a positive influence on the public health (Singh, Syal, Grady & Korkmaz 2010). A green environment can also indirectly affect the public health by encouraging exercise. Since people do not have enough physical activity, this can be a positive effect too. (Health Council of the Netherlands, 2004).

One thing is important when it comes to physical health, productivity and absenteeism: the cross-section between physical and mental health (Ohrnberger, Fichera & Sutton, 2017). Although strong cross-effects between these two are found, it is hard to tell whether interventions and policies have a direct or indirect influence on the health of an employee.

In the end, the improvement of health of employees is not only a benefit for the employee. The employer will benefit from healthy employees as well. The outcome of the research of Strömberg et al. (2017) indicates that health-related and work environment-related problems are linked to productivity loss. It even suggests that it costs the organization money. In the US, the health related absenteeism costs are approximately \$153 billion every year. It is not a surprise that employers and policy makers are driven to prevent this by improving the health of their employees through interventions. (Witters & Agrawal, 2011)

### **Knowledge gap**

Since the health of employees is of economic importance for the employers, guidelines and interventions on how to improve this are necessary. The health of employees can be determined by an increase in productivity and a decrease in absenteeism. There are several factors which affect the health of employees like physical, mental or environmental influences. Studies can be found about interventions and guidelines to improve the health of employees. However, most of the studies only examine one aspect or intervention. There is also a lack of recommendations for the most effective interventions in the environment of the office. For that reason, this thesis gives an overview of different interventions and guidelines to increase productivity and decrease absenteeism. It focuses on possible interventions and guidelines that are occurring in the physical environment because individual change is more likely to be sustained if the environment in which the choices are made support options to live healthier (WHO, 2003). Next to this overview, the interventions and guidelines will be discussed and ranked at different criteria to be able to make recommendations.



## **Research questions**

Research question: *How can a work environment increase the productivity and decrease the absenteeism of office-based employees?*

Sub questions to answer the main question

- How can the available nutrition at work increase the productivity and decrease the absenteeism of office-based employees?
- How can physical activity at work increase the productivity and decrease the absenteeism of office-based employees?
- How can a green environment at work increase the productivity and decrease the absenteeism of office-based employees?

## **Aim**

Mental aspects like stress about career and the amount of work are also a common reason for a lower performance of the employee (WHO, 2018). However, only the aspects that are in the physical environment of the office will be examined in this thesis. An example of physical aspects is the ability to cycle behind a desk, or plants in the office.

The aim of this literature review is to provide companies (with an office) several ways to create a work environment that improves directly or indirectly the health of the employees. Thereby, the thesis is mainly written for employers because they are able to change the (physical) environment in the office.

## Chapter 2 Method

This research was done to investigate the possible interventions for a healthy workplace for office-based employees. The aspects of available nutrition, the opportunity for physical activity and green in the office was examined. To obtain the right information, a literature review is needed. This chapter will therefore write how the literature review was done. The chapter was divided into two paragraphs which contains the following steps: collect the literature, evaluate the literature and answer the research questions with the literature. Some of the steps in this method are inspired on the ones from the University of Guelph (University of Guelph, 2018).

### 2.1 Collect the literature

Before collecting the literature, an idea of a subject was needed. Popular sources and articles were used as an indication for the possible problem and a the research questions were formulated, based on the articles. The following steps were undertaken to do this.

Step 1: Keywords and search terms were formulated and written down in an Excel sheet.

To get the right search terms, the next tips were followed:

- The searching started with simple words which were combined;
- The word 'AND' was used to get more specific information;
- More words were added to specify the search term.

The following search terms were used to get the information needed per sub question (table 2.1.1).

*Table 2.1.1 Search terms that will be used to collect relevant literature*

Information for	Search term
Introduction	<ul style="list-style-type: none"><li>- Employees AND health</li><li>- Work AND health</li><li>- Work environment AND health</li><li>- Physical health AND work</li><li>- Office health employees</li></ul>
SQ 1: How can the available nutrition at work increase the productivity and decrease the absenteeism of office-based employees.	<ul style="list-style-type: none"><li>- Nutrition AND health</li><li>- Nutrition AND work</li><li>- Canteens AND health</li><li>- Canteens AND work AND health</li><li>- Nutrition AND intervention AND work</li><li>- Nutrition AND intervention AND workplace</li><li>- Nutrition AND intervention AND office</li></ul>
SQ 2: How can physical activity at work increase the productivity and decrease the absenteeism of office-based employees.	<ul style="list-style-type: none"><li>- Physical activity AND health</li><li>- Sedentary behaviour AND health</li><li>- Sedentary behaviour AND work</li><li>- Sedentary behaviour AND office</li><li>- Physical activity AND intervention AND work</li><li>- Physical activity AND intervention AND workplace</li><li>- Physical activity AND intervention AND office</li></ul>
SQ 3: How can a green environment at work increase the productivity and decrease the absenteeism of office-based employees.	<ul style="list-style-type: none"><li>- Green AND health</li><li>- Green environment AND health</li><li>- Green environment AND work</li></ul>

	<ul style="list-style-type: none"> <li>- Green AND office</li> <li>- Green AND office AND health</li> <li>- Intervention AND green AND work</li> <li>- Intervention AND green AND workplace</li> <li>- Intervention AND green AND office</li> </ul>
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Step 2: The search terms were used in at least two different scientific search engines (like ScienceDirect and Google Scholar) and the first 50 articles within a search term were investigated. Access with possible accounts from school or work will be checked to get free articles. The articles were searched for official scientific terms to use for other search terms. The sources that are generated by use of the search terms were sorted by the selection criteria.

It is critical to the decide beforehand what kind of sources will be used. There are different criteria which were used to define the relevant literature:

- Only studies that have been carried out since 2000 were used. This period is important because the knowledge about health can have changed a lot. At least ten of the articles should be written less than ten years ago.
- At least ten of the scientific articles were peer reviewed.
- The intention is the use of national and international sources to compare different strategies.
- Because this review has a narrow topic, research with specific information were used. For example, an article about the intervention to reduce the amount of coffee that are drink in offices.
- An article was only used if there is access to the whole article. However, if there is only a summary available, it will be used for suggestions and not for a clear statement.

The abstract of an article was used to determine if the source meets the selection criteria.

Step 3: The articles were investigated. Whenever there is useful information, a short summary per article was written down in Excel, according to the format (table 2.1.2). The references from articles were checked for other useful literature.

*Table 2.1.2 Matrix to list the sources*

Search term	Name	Date	Link	Summary	Peer reviewed

Step 4: The literature that contains primary information, which is important for the overall knowledge of the subject, were highlighted in green. The articles with specific information were highlighted in orange.

## 2.2 Evaluate the data and answer the questions

The collected information was used to write the introduction and answer the sub questions. In the table down below, the content of each sub question was described (table 2.2.1).

*Table 2.2.1 Content of each sub question in the thesis*

Sub question	Content
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1. How can the available nutrition at work increase the productivity and decrease the absenteeism of office-based employees?	Definition of available nutrition. The importance of healthy nutrition. Link between healthy nutrition and productivity. Link between healthy nutrition and absenteeism. Potential ways to encourage office-based employees to eat healthier in the workplace.
2. How can physical activity at work increase the productivity and decrease the absenteeism of office-based employees?	Importance of physical activity and the risks of sedentary behaviour. Link between physical activity and productivity. Link between physical activity and absenteeism. Potential ways to stimulate physical activity.
3. How can a green environment at work increase the productivity and decrease the absenteeism of office-based employees?	Definition of a green environment. Link between a green environment and productivity. Link between a green environment and absenteeism. Potential ways to create a green environment in the office.

To evaluate the different interventions and existing guidelines, the following aspects have been considered:

1. costs in euro's to introduce the intervention;
2. effort in time to introduce the intervention;
3. feasibility of the interventions in the office

These aspects have three criteria each (table 2.2.2) which have been used to rank the interventions in order to give an advice to employers. The criteria count for one person and the interventions will be ranked by the authors estimation. If an intervention is applicable for a whole office, then a small office with 10 employees is assumed. The criteria amounts were made by noting down all intervention costs and by dividing the maximum intervention cost by three to come up to a ranking number of three.

*Table 2.2.2 Criteria per aspect to evaluate the interventions and guidelines for one employee.*

Aspect	Criteria	Ranking number
Costs in euro's to introduce the intervention	Costs < €250	1
	Costs < €500	2
	Costs > €500	3
Duration in time when the effects are noticeable	Short-term; 3 months	1
	Mid-long term; 3-6 months	2
	Long-term; 6 months and longer	3
Feasibility of the intervention in the office	Easy	1
	Moderate	2
	Difficult	3

## Chapter 3 Results

In this chapter the results are written down per sub question. Each sub question is a paragraph. These results are presented by a narrative summary. Firstly the terms are explained and secondly the link between possible interventions and the health of employees are written down. Finally, the interventions and guidelines to improve the health of employees in the office are pointed out. The interventions and guidelines are found in researches or at the websites of institutes like the WHO.

### 3.1 Available nutrition at work and an increase in productivity and decrease in absenteeism of office-based employees.

This thesis describes available nutrition as the food that companies offers their employees for example in the canteens. The use of these canteens is associated with an unhealthy diet (Kjøllestad, Holmboe-Ottesen & Wandel 2011) and eating out of home has been associated with weight gain (Bezerra, Curioni, Sichieri, 2012). However, a canteen is important because it is a key channel for interventions to improve the health among adults. It is a possibility to supply healthy food according to current and new guidelines. According to Roos, Sarlio-Lähteenkorva & Lallukka (2014), canteens can change people's food choices, because canteens with healthy options can even result in a healthier diet. A healthy diet, and therefore the right nutrition, helps to prevent malnutrition and a lot of noncommunicable diseases and conditions. The chronic diseases that are related to diet and nutrition are: obesity, diabetes, cardiovascular diseases, cancer, osteoporosis and dental diseases. In 2001, 46% of all diseases were chronic and this percentage is expected to increase by 11% by 2020. Almost half of the chronic diseases are cardiovascular diseases. Also the quantity of people with obesity and diabetes is growing rapidly and they occur earlier in life than before. A healthy diet plays a key role and can prevent chronic diseases and an overall poor health. (WHO, 2003) These diseases and a poor health among employees can lead to absenteeism. Furthermore, research suggests that there exists a strong link between health and productivity. Health-related productivity costs are significantly higher than other medical and pharmacy costs. Obesity is an example of an important cause of productivity loss. (Loeppke R. et al., 2009).

Considering this productivity loss, when an employee wants to avoid this they should change something about their (unhealthy) diet and make it healthy. Each individual has different needs, but the overall principles of a healthy diet are the same. According to the WHO, a healthy diet for adults and thus employees, should contain the following aspects:

- Fruits, vegetables, legumes nuts and whole grains
- At least 400 g of fruits and vegetables a day.
- Less than 10% (and ideally 5%) of total energy intake from free sugars which is equivalent to 50 g for a person of healthy body weight consuming approximately 2000 calories per day.
- Less than 30% of total energy intake from fats. Unsaturated fats are preferable to saturated fats.
- Less than 5 g of salt per day, and use iodized salt. (WHO, 2015)

In the Netherlands, the Netherlands Nutrition Centre developed the Wheel of Five to decide whether products form a healthy option (Figure 3.1.1). This wheel shows the ultimate combinations of foods from different product groups for an average person, and is thereby the recommended dietary

pattern for people in the Netherlands. For example products which contains a lot of sugar, salt, saturated fat and a little fibre are not included in the Wheel. It also shows in which ratio your diet should be per food category. (Netherlands Nutrition Centre, 2017)

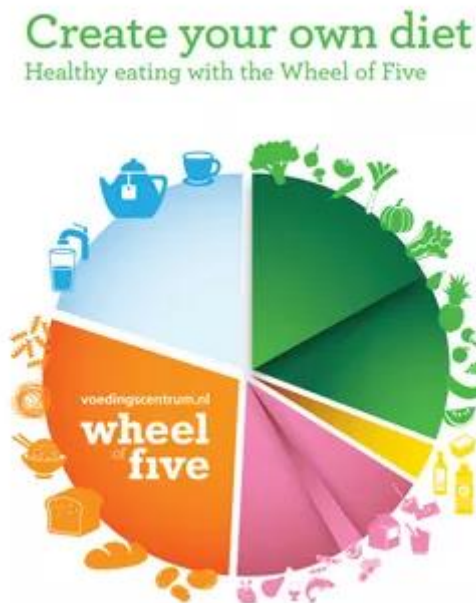


Figure 3.1.1 The Wheel of Five

A healthy canteen can encourage to eat healthy. It is important that the provided healthy food will be chosen above the other products and meals. There are institutes and researchers that draw up some guidelines and interventions.

The WHO drawn up some effective actions for policymakers, so they can encourage the consumer to eat healthy food and meals. (WHO, 2015)

The following are applicable for adults and employees:

- promote the awareness of a healthy diet,
- educate people about nutrition and healthy dietary practices;
- encourage culinary skills;
- support and ensure accurate point-of-sale information about the food; and
- provide counselling for nutrition and dietary at primary health care facilities.

In addition, the Netherlands Nutrition Centre did research to healthier canteens, to encourage the consumer to eat healthy. Based on literature, some guidelines for these canteens are drawn up:

- The canteen should mainly offer healthy options.
- Every product group has a better/healthier option.
- This healthier product stands in a prominent place.
- The food products at the cash register should be only healthy products.
- The canteen stimulates drinking water with a water tap.
- The canteen offers fruit and vegetables which should look appetizing
- The machines in the canteen consists of healthier options.
- Promotions or discounts are only given on the healthier options. (Netherlands Nutrition Centre, 2017)

Next to the guidelines, different researchers used interventions to investigate ways to create a healthy canteen. For example Bandoni et al. (2010) examined the availability and consumption of fruit and vegetables in workplace cafeterias in Brazil and the effect on the consumption of fruits and vegetables. Most of the companies (eighteen companies) were from the industrial sector. The randomized intervention was held under twenty-nine companies and 2510 employees and the intervention was in four stages:

- First, a manual with information about the importance of fruit and vegetables and the new menu was introduced.
- Second, the cafeteria workers got workshops for preparing and presentation of the meals, especially of vegetables.
- In the third stage, the educational materials to encourage the intake of fruit and vegetables were distributed at the tables and labelling information was added at the counter tops. Employees could see which meal contains the most fruit and vegetables
- The last stage, posters were placed around the cafeteria, which described the third stage, to get more people involved.

De results were shown in the amount of vegetables and fruit (in grams). The availability of vegetables and fruit in canteens increased with 49g per meal. Furthermore, the intervention group consumed approximately 11g fruits and vegetables per meal extra, which is an increase of 15%.

Like the study of Bandoni et al., there are several studies that combine educational and environmental interventions. However, a study to the impact of these interventions in Dutch worksite cafeterias tried to determine the unique contribution of different environmental interventions. There were four conditions:

- the educational program;
- the food supply program plus educational program;
- the labelling program plus educational program;
- and a control group.

The data was measured by a self-administered questionnaire about the food intake. Furthermore, the employees wrote down their intake during lunch, and there was sales data about the products that were sold. The outcome showed no significant effects on the consumption of fat, fruits and vegetables. However, there was a significant effect of the labelling program to reduce the fat intake, for people who believed they should decrease their fat intake. Furthermore, the sales data showed only a significant effect of the labelling program on the desserts. (Steenhuis et al., 2004)

An aspect which was not measured before, was the link between healthy food and the costs (price). Therefore, Horgen and Brownell (2002) studied the way price change and health message interventions could promote health food choices. The research was over a period of four months. The results indicates that a price decrease could increase the number of healthy products purchased. However, the combination with the health message interventions showed almost no improvement in the purchase of healthy products.

In sum, a canteen with healthy food options is of importance to decrease the absenteeism and to improve the productivity of employees. Therefore the available food at work and in canteens should at least have healthy options like fruit and vegetables. Because of the negative association of

canteens with unhealthy food, some interventions and guidelines are found in literature to create a canteen which can provide people of healthy meals. It is also important that employees choose the healthier options. For example educational material and discounts on healthy products can stimulate people to choose a healthy meal.



### 3.2 Physical activity at work and an increase in productivity and decrease in absenteeism of office-based employees.

Another option to increase productivity or decrease absenteeism is to not only focus on a healthier canteen, but also on the physical activity of your employees. It is known that physical activity is of vital importance. However, employees in an office show a lot of sedentary behaviour and have a lack of physical activity. Therefore, the workplace is a key setting to promote physical activity. Due to the frequent sedentary behaviour and the time employees spend in their office. (Iwasaki et al., 2017). This sedentary behaviour can affect the overall health and is associated with cardiovascular diseases, obesity, diabetes, high blood pressure and cancer (Yunlon & Ingdan, 2008). Research suggests that there exists a strong link between health and productivity. Health-related productivity costs are significantly higher than other medical and pharmacy costs. For example back/neck pain, which can be caused by prolonged sitting, is one of the important causes of productivity loss. In the long term, it may also cause more absenteeism. (Loeppke R. et al., 2009)

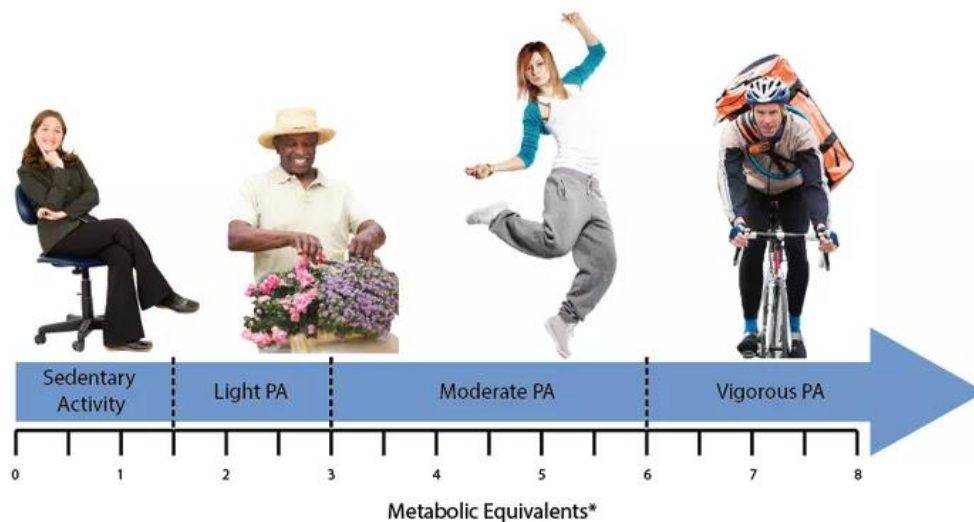


Figure 1 Metabolic Equivalents per activity

To avoid a lack of physical activity, the WHO made recommendations for adults aged 18-64 years:

- They should do at least 150 minutes of moderate-intensity aerobic physical activity per week or do at least 75 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of these two.
- Aerobic activity should take a minimum of 10 minutes per bout.
- For additional health benefits, the moderate-intensity aerobic physical activity should be around 300 minutes throughout the week or 150 minutes of the vigorous-intensity aerobic physical activity per week or an equivalent combination of these two.
- The major muscle groups should be trained by muscle-strengthening activities for at least 2 days a week.

These recommendations can be irrelevant for people with specific medical conditions, so they should be adjusted to each individual. (WHO, 2011) Sedentary activity, light, moderate and vigorous physical activity are expressed in MET value (refer to chapter one). The MET value is used to make this distinction between the different types of physical activities. Examples of these different physical activities are shown in Figure 1 and can be used as an example for employees.

Linked to this, the Health Council of the Netherlands (2017) draw up some recommendations for physical activity as well. Adults should be moderate active for two and a half or more hours per week. In addition to that, muscle- and bone-strengthening activities are recommended as well. The point is, people should be more active on a permanent basis.

Moreover, research suggests that the pattern of physical activity over the entire 24h is important. Not only purposeful exercise, but the impact of incidental activity and lifestyle-embedded activities can be life-changing (Tremblay et al., 2007). The 2008 Physical Activity Guidelines for Americans recommends to avoid inactivity and suggest that any physical activity will produce a health benefit (U.S. Department of Health and Human Services, 2008). Furthermore, Owen et al. (2010) found that a lack of physical activity is different from showing a lot of sedentary behaviour. Even if a person does line up to the recommendations for physical activity, sedentary behaviour can be harmful for the person's health because their metabolic health is compromised. Especially prolonged sitting periods can be harmful and should be avoided and divided into small sections. This can decrease the negative effect of sedentary behaviour.

To encourage employees to have more physical activity, a worksite environment that promotes this, is essential. On-site gyms or other facilities for physical activity are an example for this (WHO, 2008). It might be helpful to have interventions that incorporate environmental and policy-level. The combination of these two factors can make the intervention more feasible in workplaces. (Buman et al., 2017).

A first example of an intervention found in literature is about the effect of a 16-week lunchtime walk on employees of a British University. 75 employees participated, which were physically inactive non-academic employees, of 32 different departments. They did not have any special reasons for their lack of physical activity and they worked full-time. The intervention was held in the Winter and in Spring-Summer. A questionnaire was used to rate the overall performance on the days the employees worked in the past 7 days. The outcome suggest that the lunchtime walking intervention can help the individuals increase vitality, and improve perceptions of work performance. These changes to last for up to at least four months after the end of the intervention. (Thøgersen-Ntoumani, 2014)

Next to these lunch-walks, activity-permissive workstations can also help to reduce sedentary behaviour in the office. Evidence is supporting that this is possible without compromising work performance (Neuhaus et al. 2014) It is even suggested that the acute cognitive performance of an employee may improve during standing, cycling or walking (Mullane et al., 2017). There are different workstations which make it able to interrupt the prolonged sitting periods:

- First, a sit-stand workstation. Zhu et al. (2018), examined the long-term effect of sit-stand workstations among 36 participants. 25 of these participants are examined during the follow up as well (69% retention). The active interventions period had a duration of 4 months, with an follow-up at 18 months. The sitting time was reduced after 4 months and it slightly increased at 18 months, but still with a large effect. The prolonged sitting periods were broken down into small sections, which may affect the cardio-metabolic health. Despite the standing, Zhu et al. found no effect for increased productivity. However, research of Mullane et al., 2017 showed that dividing the prolonged sitting period in bouts per hour, with an total of 90 minutes of standing in 6 hours, significantly and acutely improved psychomotor

function and working memory and attention. This study was over a period of 5 weeks, among 9 adults who did not meet the guidelines for physical activity and they had pre-hypertension and/or pre-diabetes.

Also Hedge and Ray, did research to height-adjustable worksurfaces in the office. Their study had a duration of 4 – 6 weeks. The results showed significant improvement in productivity in the afternoon. Furthermore, the discomfort in the upper body segment decreased. Despite the significant improvements, the researchers themselves acknowledge that they still have to examine the possible placebo effect, but the sit-stand workstation seems to have a positive effect on the employees' health and productivity.

- Second, a desk with a treadmill. Zhu et al. (2018) did mainly research about the sit-stand workstation. Moreover, the researchers also placed some treadmill workstations in the common areas of the work environment to see if they could increase the physical activity of employees as well. The result: no significant changes were found in LPA or MVPA during and outside work time, which suggest that these stations were not commonly used.
- Third, a sit-cycling desk. Physical activity at a sit-cycling desk can result in an improvement in the acute cognitive performance and a reduce in cardiometabolic risk factors. Light-intensity rather than moderate activity can provide a healthy balance between these performance or risk factors. Cycling may provide even more improvements in comparison with walking or standing behind the desk. (Mullane et al., 2017).
- At last, a stepping device desk, which can be used as similar to walking. The stepping device can increase the energy expenditure (up to 200-300 kcal/hour), which can decrease obesity. It especially made a difference for obese subjects, rather than lean subjects. In this study, 19 healthy sedentary volunteers were recruited and ten were obese. The device was tolerated well by the participants and they enjoyed using it (it was a very silent device to use). The study was short and consists of several measurements, but they did not extend during the work day. The stepping device was compared with a treadmill and the researchers found that it could have similar increases in energy expenditure. However, the stepping device could be a tenth of the cost and size (McAlphine et al., 2007).

To summarize, office-based employees show a lot of sedentary behaviour, which can cause a lack of physical activity. A lack of physical activity affects the overall health and can result in neck and back pain, which affects the productivity and possibly absenteeism of employees. Especially the prolonged sitting periods can have a negative impact on a person's health. Therefore, research suggests that a walk during lunch-time, and active-permissive workstations like a sit-stand workstation, a treadmill desk, a sit-cycling desk and a stepping device desk can possibly help to break down the prolonged sitting periods of office-based employees.

### 3.3 A green environment and the increase the productivity and decrease the absenteeism of office-based employees at work

Since the worldwide trend of urbanisation, “nature” of nonhuman is less present. Therefore, a green environment in the form of “urban nature” is becoming more important. This nature is in the urban areas often reflected in street trees, parks and indoor plants. Because of the changing environment, the focus on the physical health impacts of living in an urban environment has renewed. (Hartig et al., 2014) Research in the field of nature and health can help in understanding these health impacts.

The relation between nature and health consists of different pathways and the following pathways are found in literature:

- Air quality. Pollutant like particular matter and gases in the air can be reduced by trees and other vegetation. Therefore it may affect the overall human health. Just as plants can affect the outside air quality, it can contribute to the indoor air quality as well. This can be meaningful for office-based employees who spend almost eight hours a day indoors. A study to the perceived indoor air quality on productivity loss indicates the air quality can affect the productivity of office-based employees positively (Kosonen & Tan, 2004).
- Physical activity. For example, the interaction between obesity and green space. In a recent study, it is suggested that green space increases physical activity and therefore decreases obesity (Dempsey, 2018), which is an important cause of productivity loss (Loeppke R. et al., 2009). According to Sugiyama et al. (2008), recreational walking (physical activity) is one of the important mediators between nature and health.
- Social cohesion. Research in Australia suggests that social interaction in a neighbourhood is associated with the perceived green in the neighbourhood (Sugiyama et al., 2008). This can be due to social contact during the use of common spaces. The social contact can also be related to safety, since it is suggested that buildings with more green around them, displayed less aggressive behaviour (Hartig et al., 2014). However, more research is needed on the relation between social cohesion and the eventual relationship between nature and health.
- Stress reduction. Evidence is found about stress reduction and nature. Nature can reduce the stress in two general ways. Firstly, it can increase distance to stress factors and/or decrease the ability to perceive these factors. One way to explain this is the use of green spaces between houses and busy roads, in order to reduce the noise and possible nuisance. Secondly, people can use nature to restore their adaptive resources. It is known that a lot of the use of natural areas is due to escape from physical and social stressors. Recreation in green areas is also because of the appreciation of nature symbolic qualities and scenery.

To keep in mind is that the pathways may intertwine because they can all impact each other. (Hartig et al., 2014)

This knowledge of a positive relation between nature and health can be used at the workplace. Few studies examined the potential benefit of access to green areas outside of the office buildings. Potential benefits such as wellbeing (Hernandez, 2007), job satisfaction (Shin, 2007), work performance (Pati et al., 2008) and perceived level of stress (Pati et al., 2008, Shin, 2007) are mentioned. However, further research shows that despite these possible positive effects, most of the office workers stay inside because they think they are too busy, or the working culture does not include outdoor behaviour. (Lottrup, Grahn, Stigsdotter, 2013).

In this thesis, only the indoor physical environment is considered. Buildings play a major role when it comes to health, since they have the ability to create an environment that is whether harmful or good for the overall health. To define the indoor environmental quality (IEQ), different aspects such as: good ventilation, low-emitting materials, thermal comfort, daylight and views can be used. Researchers found that building with a high IEQ could provide health and productivity benefits. Some of the buildings with a high IEQ had a green certification and the participants showed a 26,4% higher cognitive function, better environmental perceptions and fewer symptoms. (MacNaughton et al., 2017).

Before the interventions and guidelines (arranged in this thesis) to make a green environment, it is vital to understand the meaning of a green environment used in this thesis. It refers to aspects that can affect the employee when at work in the office. For example the use of natural elements within the office building such as plants and other vegetation, colours, materials and the view. Three interventions are considered in the next part.

Research in Taiwan examined the effects of indoor plants and window views on the psychophysiological response in the workplace. The employees were less nervous when looking at photos of the room with a view of nature and/or indoor plants. This was shown by measuring their electromyography (EMG), electroencephalography (EEG), blood volume pulse (BV) and state-anxiety. Especially the view of nature showed positive results. (Chang, 2005)

The use of plants can tribute to the IEQ. However, specific species are needed for the optimal air quality. For example the use of species as English ivy and spider plant (Yoo, Kwon & Son, 2006). Both of these plants are shown to reduce the level of Volatile Organic Compounds (VOC's), which are indoor air pollutants. (Hartig et al., 2014) A person working in an area with plants might also have psychological and physical benefits of it such as an increased task performance and less symptoms of poor health (Bringslimark, Hartig & Patil, 2009).

Another possible solution to reduce stress of employees is the use of wood in the building. Fell (2010) studied the stress-reducing effect of wood and plants in the office among 119 university students. The effects were measured by skin conductance and inter beat interval. Both of these indicators of reduced stress, were monitored during a 10-minute baseline period, a 12-20 minute stressful task and a 10-minute recovery period. There were four offices environments with each different environments; plants, wood, plants and wood, no wood and no plants. The results showed that the office with just wood had stress-reducing effects on the participants.

To summarize, nature and a green environment does have a positive impact on humans health. For example it would reduce stress and can have a positive influence on task performance because of the contribution to the indoor air quality. However, when in an office, people tend to have a lack of contact with nature. To get people in touch with nature, green is among other things reflected by the use of natural elements indoors, such as indoor plants and the use of wood.

## Chapter 4 Discussion

### Purpose

The aim of this study is to find several ways to create a physical work environment that improves the health of the employees directly or indirectly. In this case, the health of employees is defined by productivity and absenteeism. Three aspects in the environment of the employees, that can affect their health are examined. These aspects are; available nutrition, physical activity and green in the environment. The results can help employers with an office to create an environment for their employees which stimulates a healthy lifestyle. Researchers also points out that employer education about the benefits of interventions and programs is necessary. In this way they can inform their employees well (Brown et al., 2018). In the end, the results can also be helpful for the employee itself, to see which possibilities are available to change their lifestyle.

In this chapter, first of all the results are shown and discussed per sub question. All of the interventions and guidelines, found in literature to increase productivity and decrease absenteeism are ranked according to the author's estimation. If possible, the results are used to support the rankings, or new sources will be checked. Second, the process, method and some overall discussion points are discussed.

### 4.1 Available nutrition at work and an increase in productivity and decrease in absenteeism of office-based employees.

The right nutrition is of vital importance for the human body. A healthy diet influences a person's productivity and ratio of absenteeism. This can be due to diseases like obesity, which is a huge cause of productivity loss. To avoid a loss in productivity, several changes in the physical environment of the employee can be made with help of interventions and guidelines. The resulting interventions and guidelines, found in literature and named in chapter 3, are displayed and ranked in table 4.1.1. In this way, it is easier for the employer to see if something applies to him or her. The criteria for the ranking are described in table 2.2.2, and the reason for some of the choices are explained in the table down below.

*Table 4.1.1 The estimated costs, duration in time for effects to occur and feasibility in the office per intervention/guideline about the available nutrition for one employee.*

Intervention/guideline	Costs for the employer to introduce the intervention	Duration in time when the effects on productivity and/or absenteeism are noticeable	Feasibility in an office	Remarks (if relevant)
Promote awareness of a healthy diet	1	-	1	Educational material such as posters and manuals will cost less than €250 because the designer costs and print costs can be divided by ten.
Educational material at the tables	1	-	1	Educational material such as posters and manuals will cost less than €250 because the designer costs and print costs can be divided by ten.

Posters around the cafeteria	1	-	1	Educational material such as posters and manuals will cost less than €250 because the designer costs and print costs can be divided by ten.
A manual with information about a new menu	1	-	1	Educational material such as posters and manuals will cost less than €250 because the designer costs and print costs can be divided by ten.
Availability of healthy options vs. unhealthy snacks	1	-	1	Costs in normal case not more than €250, since the unhealthy products can be replaced by healthy food options. Furthermore, it should not be hard to ask the caterer for healthy products, or maybe change to another caterer.
Machines with healthy food options vs. unhealthy snacks	1	-	1	Costs in normal case not more than €250, since the unhealthy products can be replaced by healthy food options. Furthermore, it should not be hard to ask the caterer for healthy products, or maybe change to another caterer.
Healthier products in a prominent place	1	-	1	Arranging the counter differently should cost not a lot of money. It is maybe two hours of work for a caterer.
Fruit and vegetables are available and look appetizing	1	-	1	In normal case, it cost no more than €250, since the fruit and vegetables can replace unhealthy food options.
Labelling information at counter tops with amount of vegetables and fruit in a meal	1	-	1	The labelling information cost in normal case no more than €250, since the designer costs and print costs can be divided by ten.
Point of purchase (POP) information	1	-	1	The paper/screen with information cost in normal case no more than €250, since the designer costs and print costs can be divided by ten.
POP has only healthy products	1	-	1	Costs in normal case not more than €250, since the unhealthy products can be replaced by healthy food options.
Water tap	2	1	1	A water tap is for sale from €200/€250 euro's. It is feasible as long as there is money and a place to put it.
Promotion/discount only on healthier product	1	-	1	If the canteen is used to have discount on different kind of products, it can cost no more than €250 to give discount just on the healthy products.
Price change for healthy products	2	-	1	If the products should be cheaper, it is possible for the company to meet the missing costs. It should be feasible if there is enough money.
Provide counselling about a healthy diet	3	3	2	The WHO (2003) estimates these costs at €430 per participant per year.
Workshops preparing food for cafeteria workers	1	-	1	It should be possible to book a workshop for less than €250.

It is remarkable that a lot of the interventions or guidelines in table 4.1.1 have a ‘-’ sign in the middle row. However, this is due to a common thing. These interventions and guidelines do not have a directly effect on a person’s health. Hopefully the intervention will have an effect on the food choice and the employee will choose for a healthier option or meal, but we do not know that. So because of the indirectly effect, a ‘-’ sign is filled in, and this effect will not be taken into account. A lot of these interventions are about informing employees or providing healthy food, which cost not a lot of money and they seem quite easy to apply in an office. The water tap is also an proposed intervention. It may increase the consumption of water and even decrease the amount of beverages drunk in the office. This is which for the overall health, plus it can save money for the employer. One thing in particular seems very expensive, which is the counselling about a healthy diet. However, research showed that the absenteeism costs lowered by €125 per participant during the intervention period, and in the next year it even was lowered by €635 per participant in comparison to the control participants. (WHO, 2003) The costs done on improving employee health will therefore be pay back for the employer in time via less absenteeism.

To keep in mind is the differences in country and their diet, which can be totally different from each other. In this thesis, recommendations of the WHO are used, but also the of the Netherlands Nutrition Centre, because of the author’s origin. Also the difference between companies should be taken in consideration. The richer and bigger the company, the more luxe the canteen can be. However, this cannot be an excuse to not have healthy food available.

#### 4.2 Physical activity at work and an increase in productivity and decrease in absenteeism of office-based employees.

Office-based employees often show a lot of sedentary behaviour. This can cause a lack of physical activity which is associated with diseases like obesity and diabetes. Among other things, neck and back pain can be caused by sitting for a long time, which is an important cause of productivity loss. The interventions, shown in table 4.2.1 are found in literature. They are ranked in the same way as the results of sub question one.

*Table 4.2.1 The estimated costs, duration in time for effects to occur and feasibility in the office per intervention/guideline about physical activity in the office for one employee.*

Intervention/guideline	Costs for the employer to introduce the intervention	Duration in time when the effects on productivity and/or absenteeism are noticeable	Feasibility in an office	Remarks
Lunchtime walk	1	1	1	Research showed that employees perception of their work performance was increasing by the end of the experiment, which duration was 16 weeks.
Sit-stand workstation	2	1	1	A sit-stand workstation is available for €400,- (at IKEA). The sit-stand workstation can replace a regular one so no extra space is needed.



Desk with treadmill	3	1	1	A treadmill is for sale from €300. This should be bought in addition to a sit-stand workstation, so it would be a total of €700. The device can be put under the workstation, so no extra space is needed.
Sit-cycling desk	3	1	1	A cycling device is for sale from €300. This should be bought in addition to a sit-stand workstation, so it would be a total of €700.
Stepping device desk	3	1	1	A stepping device is for sale from €90. This should be bought in addition to a sit-stand workstation, so it would be a total of €700.

As shown in the table above, the sit-stand workstations with devices can be an investment for the employer. A note to the research with the treadmill was the fact that it was combined with a study to the sit-stand workstation. The results showed that employees hardly used the treadmill device. However, the treadmill was put in the common area, which can play a role in the choice to use it. For example the common area could be noisy, something that can bother the employee while at work. The lunchtime walk is actually not in the office. However, the employer can choose to make the walk mandatory. That way, the walk can break the long sitting periods during the middle of the day for a longer time.

#### 4.3 A green environment and the increase the productivity and decrease the absenteeism of office-based employees at work

Office-based employees are often in the office which means no contact with nature or green. However, nature and green are necessary for humans and have a positive impact on health. For example the air quality and stress reduction. By the use of natural elements in the office, some of the health effects can also occur indoor. Interventions to do this are shown in table 4.3.1 found in literature. They are ranked in the same way as the results of sub question one and two.

*Table 4.3.1 The estimated costs, duration in time for effects to occur and feasibility in the office per intervention/guideline about a green environment for one employee.*

Intervention/guideline	Costs for the employer to introduce the intervention	Duration in time when the effects on productivity and/or absenteeism are noticeable	Feasibility in an office	Remarks
Plants in the office	1	1	1	A pot with the English ivy (Hedera Helix) can be bought from €1,50 for a small plant, up to €150 euro's for a huge one. It is easy feasible in the office, since there just has to be space for a pot.
Office with a view of nature	-	1	-	A view of nature can depends on the location of the building. If an building is in the city, it is hard to have a view of nature, so this will be not feasible.
Wood in the office	1	1	1	

An important note about the indoor plants is that research did not describe how many plants there should be on a square meters before an effect was measurable. The English ivy (*Hedera Helix*) is not an expensive plant, so it does not matter for the price range, but it does matter how many are needed for an effect on for example task performance. The plants are not only there for aesthetic reasons.

#### 4.4 General discussion points

In literature, one thing was pointed out several times which is in the first place the mindset of bosses and managers. If they do not want to invest some time and money, in order to change the environment of the employees, the employees certainly have less opportunity to become more healthy. Secondly, if the office-based employees are not willing to change any bad habits, nothing changes and no beneficial health effects will occur. Furthermore there are mental and social aspects, which are not included in this study. For example the influence colleagues can have on an employee. If colleagues do not have a healthy diet, it can put pressure on a person. It would be ideal to have an environment which promotes and supports healthy living. In the end, the employer has to decide, whether they consider a small investment in their employees is worth it. What is known is that small intervention effects in the office can have a big impact on the public health, since a lot of people do work in an office. (Sorensen, Linnan & Hunt, 2004)

Another important aspect is that there are few researches which combined the nutrition and physical activity component. Also the WHO wrote down a whole paper about these subjects. They should not be seen apart. Therefore, when recommending a few interventions, it should be remembered that both of these aspects together can have a greater value (WHO, 2003). On the other hand, there is the value of a green environment. Although physical activity is a pathway between nature and health, it is not known if the combination of physical activity and green in the office affect each other. For example, do people tend to stand up more or to use an active-permissive workstation? To the author's knowledge, there are no specific studies about the interaction between a green environment and nutrition, but it could be interesting to investigate. What if the presence of plants affects the food choices people make? Or would serving on a wooden plate change anything? This could be very interesting to examine in the future. One last aspect with a green environment is stress related. Research suggests that a green environment can reduce absenteeism due to stress. (Grime, 2004). This can be a side-effect.

#### **Reflection at process and method**

The author acknowledges the limitations of this thesis. Few examples will be described.

Firstly, the period of time set for this thesis, 280 hours, is a relatively short period for a thesis. Due to the limited time, the collection of results may not have been extensive enough. Secondly, the search terms which were used to find the data were accurate enough for the first two sub questions. However, the third questions needed more/different terms, because of the little data that was available. The term 'green environment' is used in multiple ways, and not all of them met the criteria drawn up for this thesis. This made it harder to find the right information. Thirdly, the author was not able to enter a lot of databases. If a report was not available, but the subject was important, the (extensive) summary of the study was used. However, insight in more reports could have given more depth in the thesis. As the intended goal of this thesis is mainly a literature study and due to the

limited time, no practical research was done, but this thesis can form an input for a company that really wants to take the step towards a healthy work environment.

A last remark about the process is that the discussion also contains practical tips for an employer, while in real literature studies only the literature research is reviewed. That is also the reason why this thesis also contains a results chapter, while a literature study normally does not have a result and a discussion chapter, but only one last discussion chapter.

However, the literature found and used in this thesis was enough to answer the research question. At least more than ten peer-reviewed articles are used. In addition, almost half of the literature consists of recent studies (<10 years) and all of them are no older than 18 years. Finally, different sources at national and international level are used, for example for the guidelines of a healthy diet.

## Chapter 5 Conclusion

This thesis described and discussed the evidence for ways to create a healthy work environment, to increase productivity and decrease absenteeism of office-based employees. Also the interventions and guidelines found in literature are discussed and ranked.

### 5.1 How can the available nutrition at work increase the productivity and decrease the absenteeism of office-based employees?

A healthy diet is very important for good productivity and less absenteeism. Therefore the canteen should offer healthy food option and stimulate employees to buy these healthier products. This can be done by promoting awareness, giving discounts and presenting them in an appealing way.

### 5.2 How can physical activity at work increase the productivity and decrease the absenteeism of office-based employees?

Office-based employees show relatively much sedentary behaviour which can lead to productivity loss and absenteeism due to, for example, back pain. Sedentary behaviour is caused by prolonged sitting periods. These periods can be broken down into small sections by the use of a sit-stand workstation. The sit-stand workstation can be extended with an stepping device or cycle to have more physical activity.

### 5.3 How can a green environment at work increase the productivity and decrease the absenteeism of office-based employees?

Nature and green can reduce stress and increase productivity. To apply this in the office, natural elements such as indoor plants and wood can be used.

### 5.4 Research question

By combining the results of the sub questions, the following research question can be answered:

*How can a work environment increase the productivity and decrease the absenteeism of office-based employees?*

The canteen should offer healthy meals and food options promote a healthy diet. The employees have to alternate their seated work with standing. For example on a sit-stand workstation with a bike or stepping device. Furthermore, the use of natural elements in the office such as indoor plants and wood can increase the productivity

### 5.5 Relevance of the results

In this thesis, literature is gathered about different interventions and guidelines to change the physical environment for the employee. An attempt has been made to simplify the literature, so that it can be understood by most of the employers. Because most of the literature found just examined one aspect or intervention this thesis has scientific value. There is also a practical relevance, due to the simplified results and recommendations for the employees and their employers.

## Chapter 6 Recommendations

The recommendations in this chapter are made for different groups. They can be divided in long and short term recommendations.

Firstly the short-term recommendations are given and can be divided in recommendations for employees and employers.

Recommendations for the employees:

- Ask your employer to provide healthy meals, good furniture and green such as indoor plants in the office.
- If your employer already offer similar options, use them and stimulate your colleagues to do the same. Your health is important!

Recommendations for the employers:

- Provide your employees of good furniture and healthy food. Create an environment which stimulates a healthy lifestyle. It will have an effect on the productivity of your employees and absenteeism will decrease. The costs done on improving employee health will be pay back in time via less absenteeism.

And finally the long-term recommendations for new research:

- What we have seen already in the discussion, the main focus of this thesis is a literature study, but no practical research was done. This thesis was only based on papers in which initial practical research was done. Therefore it would be interesting to see if the interventions really have effect in the office.
- An advice is to start with the cheap interventions stated in table 4.1.1, 4.2.1 and 4.3.1. A surprising result was that most options of the first table are relatively cheap and easy to apply in a canteen. That makes this thesis relatively suitable for a practical research and based on the conclusions of this thesis a positive effort can be expected.

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