MASTER

Residents' perceptions of the perceived effects of trees in residential streets

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Hanne de Jong

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EINDHOVEN UNIVERSITY OF TECHNOLOGY

Department of the Built Environment

Residents' perceptions of the perceived effects of trees in residential streets

Master's Thesis

In partial fulfilment of the requirements for the degree of Master of Science in Urban systems and real estate (USRE) at TU/e

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I. Colophon

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II. Preface

In front of you lies the research paper "Residents' perceptions of the perceived effects of trees in residential streets". This master thesis is the final product of the Master Urban systems and Real Estate (USRE) at TU Eindhoven. I was engaged in researching and writing this thesis from June 2021 to July 2022.

I started my study career with the study urban design at Breda University of Applied Sciences. After finishing that study, I decided to deepen my knowledge at TU/e. After completing the pre-master, I could start the Urban Systems and Real Estate master, where I specifically focussed on the courses related to urban strategies.

I would like to thank my supervisors Theo Arentze and Pauline van den Berg, for their guidance, and feedback during this process. Especially, I want to thank Robert van Dongen, for his support, guidance, feedback, and my second job at the BUas! Second, I would like to thank the respondents that contributed to the survey and helped distributing it through their network. Also, I would like to thank my (TU/e) friend for the lovely time during this study. Finally, a special thanks to my father, who I could always call for support and a listening ear.

I hope you will enjoy reading my thesis!

Hanne de Jong

Breda, July 2022

III. Summary

The demand for healthy and liveable cities is on the rise due to increased urbanization and challenges posed by climate change. Featuring urban green more prominently in urban planning can help face these challenges because urban green has numerous benefits for improving the lives of the people and wildlife in urban areas. Urban green combats the challenges of climate change, improves the physical, psychological, and social health of urban residents, as well as making our cities eco-friendlier and more pleasing to the eye. However, urban green also has drawbacks that cause resistance by residents toward urban green. In order to improve the immediate living environment and the well-being of residents, the perceived effects of urban green must be studied. Including residents' assessment when planning urban green can prevent conflicts between residents and planners, and managers. Also, it can prevent failure to meet the user's needs, or the exclusion of certain people, and attracts undesirable activities or elements. Previous studies gave quite some knowledge about how people can perceive the effects of trees. However, the assessment of the perceived effects of trees, the affective response to trees versus the level of importance of trees, is still unknown. The literature also suggested that social, cultural, environmental, or economic differences can affect the assessment of trees. Therefore the assessment of the perceived effects of trees in residential streets by Dutch residents was studied.

When studying the assessment of urban green, it was necessary to include both the benefits and drawbacks of urban green in order for residents to make trade-offs. The trade-offs resulted in a relative weight which shows the relevance of the effects, the benefits and drawbacks, compared to each other. Knowing the relevance and the perception of the effects will result in more specific urban green recommendations and strategies. These are more effective in increasing the overall appreciation of urban green in streets. This will improve the number of valuable urban green spaces that meet the needs of its surrounding dwellers and improves the well-being and health of cities and their residents.

To narrow the research area, the focus of this thesis is on the urban green type trees. The literature study concluded that especially trees are very effective to counteract the challenges of climate change and are highly appreciated by residents. To investigate which effects residents take into consideration when assessing trees in their residential streets, the people's perceptions towards all the effects of trees in residential streets regarding the quality of the living environment must be studied. This included peoples' assessment of the level of importance and their affective response to the perceived effects of trees. By recognizing the level of importance and communicating clearly about the benefits and drawbacks offered by trees in residential streets, the effects that increase the appreciation of or the resistance to trees can be identified. With this knowledge, recommendations and strategies that improve the appreciation of trees in residential streets can be formulated and may prevent the removal and secure the placement of trees.

The literature identified 21 direct perceived effects of trees in residential streets. It made a distinction between the objective effects of tees, effects that influence people's physical health and their living environment as well as subjective effects. Subjective effects that influenced people's psychological and social health. The assessment of the subjective effects can vary strongly per individual, while the objective effects are based on facts. In order to assess both objective and subjective effects, people's perceptions of the effects of trees are asked. When studying the effects of trees in residential streets it is good to take into account multiple personal features that influence the perception of trees. A feature that can influences people's perception of trees is attitude. The attitude of people is influenced by their emotional bond towards urban green which is based on their childhood experience and how they use urban green. Also, people's social characteristics - gender, age, education, income, and migration - influence their perception of urban green. In order to find the extent to which the attitude of people and their social characteristics influences the assessment of the perceived effect of urban green, these features are included in the research.

This research aims to find how residents perceive the direct effects of trees in residential streets. Studying the 21 effects derived from the literate consists of two analyses. The first analysis will find the respondents' affective response to the effects of trees. Here, respondents need to identify on a 5-point Likert scale how positively or negatively they perceive the various effects of trees. We could determine to what extent respondents consider the effects of trees in residential streets as a benefit or as a drawback. The second analysis, which is a best-worst choice experiment, will find the relative weight of the level of importance of the perceived effects of trees. The respondents need to assess multiple sets that consist of various effects. The respondents indicate per set which effect they consider the most important effect and which effect they consider the least important effect. The Best-Worst Scoring (BWS) method is a popular method for studying the importance of an issue to an individual or groups of individuals relative to other issues under consideration. The advantages of this methodology are that it has greater discriminatory power than other scale measures; the BWS is a simple method for respondents and less cognitively demanding compared to a Likert rating; it provides rich information about the individual scale; and this method mitigates possible anchoring bias. From the different types of possible cases for BWS, the object case was chosen to study the respondent's level of importance of the effects of trees in residential streets. The Sawtooth software was used to design the experiment. With this software, a Balanced Incomplete Block design (BIBD) was made which included the 21 effects in 21 sets with five effects per set. Every effect was compared once with another effect (frequency balance) and appeared the same number of times across all sets (orthogonality). The effects were interconnected because they were linked through comparisons even though they were not paired as a comparison (connectivity) and each effect appears an equal number of times in every position of the sets (positional balance).

To find if the identified features affect people's perception of trees, neutral statements about the usage of urban green and people's social demographic characteristics will be added to the survey. The data will be analysed by using the programs SPSS and R-studio. SPSS is used to make a descriptive analysis which describes the characteristics of the participants, the participants' affective response toward the perceived effects of trees and their attitude is toward urban green. R-studio will be used to study the relative weights of the effects by determining their Best-Worst scores. Therefore, two methods are used, the counting approach and the modelling approach. The counting approach calculated the Best-Worst score by taking the number of times an effect is considered "best" (most important) and subtracting the number of times it was considered "worst" (least important). The best-worst scores can be ranked and it shows a simple and quick examination of the relative values of the effects. The modelling approach assesses the quality of the experimental design by estimating the average level of importance. With the computed effects coefficient, the utility that an effect is chosen as the most important effect can be estimated. This is called the share of importance.

The survey was spread among residents that live in an urban area in the Netherlands who are 18 years old or older. The experiment was distributed in February 2022. Of the 375 respondents, 238 completed all the sections of the survey and were included in this study. The data sample was overrepresented by highly educated people with a high income. The sample population was not independent for the Dutch population except migration background of the sample population were equal to the Dutch population. The respondents' most important reason to use urban green was relaxation, and the least important reason was cultural activities. Most of the respondents grew up in a semi-urban environment. The effects that were perceived as most positive were the effects, 'Trees capture fine dust', 'Trees bring nature closer' and 'Trees increase biodiversity'. The effects that were perceived as least positive were the effects 'Trees drip sticky juice' and 'The roots of trees exert pressure on the pavement'.

The Best-Worst experiment concluded that the effect 'Trees provide organic shade' (0.132) was the most important effect and was considered a positive effect of trees. Followed by the effect 'Trees increase biodiversity' (0.124) which was perceived as a strongly positive effect. The least important effects were 'Trees block wind' (-0.153) and 'Trees make sound' (-0.113). Both were perceived as positive effects. The modelling approach used the effect 'Trees influence the house prices' as normalized and gave a similar outcome as the counting approach by showing a correlation of 0.990. The share of importance showed that the effect 'Trees provide organic shade' is approximately two times as likely to be selected as the most important effect as the effect 'Trees block wind' and approximately 1,5 times more likely to be selected as the most important as the effect 'Trees drop organic products'.

Differences were found between the social characteristics groups' level of importance and their affective response to certain effects of trees. There were more differences between the average mean affective response scores of trees of the social characteristics' groups than between their level of importance. Within the age groups, the most significant differences were found.

Another feature that arose during the conduction of the survey, was the storm Eunice. The storm Eunice affected the respondents' assessment of a few effects of trees. The effects 'Trees take up space on sidewalks' and 'Trees drop organic products' were perceived as more important during/after the storm. The average affective response of the effects 'Trees provide a habitat for animals' and 'Trees drop organic products' was lower by the respondents that filled in the survey during/after the storm.

The balance between the beneficial effects and the detrimental effects leans towards the positive side. This indicates that trees should be kept and continued to be implemented in residential streets. In order to do that, a strategy must be made where for each level of importance and each affective response can be seen how the overall appreciation of trees in residential streets can be increased. It is recommended for urban green decision-makers and planners to first remain the most important positive effects. Then, improve the most important negative effects. Third, meet the needs of the less important negative effect. Last, pay minimal effort to the less important positive effects to increase the overall appreciation of trees in residential streets. With an adaption of the strategies which include the individual characteristics or some design rules of trees, it can improve the appreciation of an individual tree or a group of trees.

To conclude, this thesis shows which effects form a resistance against trees and which effects contribute to the appreciation of trees. It also shows the importance level of the effects and clarifies which effects urban green planners need to focus on. A strategy is made to increase the appreciation of trees in streets. This increased appreciation of trees improves the valuable urban green places in urban areas, which improves the well-being of residents that are threatened due to the changing climate in cities and the densification of cities.

IV. Abstract

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Understanding how urban residents perceive the effects of trees in residential streets is crucial in developing appropriate strategies to improve the appreciation of trees. This study explored residents' perception of the perceived direct effects of trees in residential streets through a questionnaire survey based on the best–worst scaling (BWS) method. The results demonstrated that the balance between the beneficial effects and the detrimental effects of trees lean towards the positive side. The most important effects were perceived as most positive while the more negative effects were ranked on an average importance level. This indicates that existing trees should be kept and new trees should be implemented in residential streets. The survey also found similarities and differences between different social groups. Analysing the influence of social demographic, concluded that there were more differences found between the social characteristics groups' average affective response than between their level of importance scores. Whitin the age groups the most significant differences were found by both the affective response scores and the level of importance scores. During the execution of the survey another feature arose, the storm Eunice, and showed that an extreme weather event can influence residents' assessment. A strategy was made to increase the appreciation of trees in streets. This increased appreciation of trees improves the well-being of residents that are threatened due to the changing climate and the densification of cities.

Overall, the study shows that the focus need to switch to retain the important positive effect of trees instead of the drawback of trees that are relatively less important. With this insight more valuable urban green places can be made and maintained in order to optimizing the appreciation of trees in residential streets, and so optimizes the well-being of residents.

Keywords

Trees, residential streets, perceived effects, affective response, relevance, perception, urban green, well-being. Best-Worst method

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VI. Abbreviations

UN	=	United Nation
WHO	=	World Health Organisation
WUR	=	Wageningen University
USGCRP	=	United States Global Change Research Program
BWS	=	Best – Worst Score
BIBD	=	Balanced Incomplete Block Design
ACL	=	Aggregate Conditional Logit
SI	=	Share of importance
ARS	=	Affective Response Score
CBS	=	Central Bureau for Statistics

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Chapter 1

Introduction

This chapter explains the motives and the relevance of this research. First, an introduction is given to the subject. Second, the problem statement will be explained. Next, the scope, relevance and research questions are described. The introduction ends with the research design, which explains the structure of this research.

1.1 Introduction to the subject

1.1.1 Introduction

The urban population is rising. In 2018, 55% of the world's population lived in urban areas. The UN expects an increase of 68% by 2050 (United Nations, 2018). Besides urbanization, the climate is changing which refers to a change in temperature and weather patterns. The temperature is rising (Giridharan and Emmanuel, 2018; O'Malley et al., 2015; Kaloustian and Diab, 2015; Xi et al., 2012; Priyadarsini et al., 2008), and periods of extreme droughts are alternated with short heavy rainfall (United Nations, World population prospects: The 2011 revision, New York, 2012) and the air is becoming more polluted (Popovich, Migliozzi, Patanjali, Singhvi, & Huang, 2019). These effects are caused primarily by the increased greenhouse gas emissions since the 1800s (United Nations, 2021). Modern cities face the challenges of urbanization and the growing impact of climate change (WHO, 2017). These challenges influence the way cities are designed and increase the demand for healthy and liveable cities (Kabisch, Korn, Stadler, & Bonn, 2017).

The World Health Organization (WHO) defines a healthy city as follows;

> *"A healthy city is one that continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential"* (WHO, 2021).

Focussing on the physical environment, a healthy city that combats the challenges of urbanization and climate change has learned that featuring urban green more prominently in urban planning can help face these challenges (Streimikiene, 2015). Back in the days, urban greening was once nothing more than parks and tree-lined streets. Today, it has become clear that urban green has numerous aims that are successful in improving the lives of the people and wildlife in urban areas. A few examples; urban green combats the challenges of climate change, improves the physical, psychological, and social health of urban residents, increases biodiversity as well as makes our cities eco-friendlier and more pleasing to the eye. Mainly, trees in residential streets are an effective urban green type that counteracts the challenges of climate change and are mainly appreciated by residents. Cities worldwide use urban greening to improve and protect their skylines and their residents health.

According to many studies and researchers, besides the numerous benefits from urban green, urban green also has some drawbacks. These drawbacks could cause resistance by residents toward urban green. Mainly, the disadvantages of urban green in the immediate living environment of residents can cause resistance. Lohr et al. (2004) identified some drawbacks residents could experience from urban green in their living environment. Residents could get injured from falling branches or roots that lift and crack open the pavement, or residents could fall over slippery leaves. Residents could experience nuisance from animals that lives in urban green, like insects or birds in trees. Or residents' social and traffic safety reduces due to urban green blocking sights and signs.

Likewise, the growing importance of urban green in cities, also citizens are demanding a more active role in the planning and decision making of healthy urban green spaces in their communities. The increased importance of the value of non-market characteristics from urban green instead of the economic and utilitarian benefits that have steered urban green planning and management increases the awareness among planners that they have to include citizens in their designing process (Balram & Dragićević, 2005). In order to improve the urban green in residential spaces, it is essential to investigate the people's beliefs about their urban green values and include them in the designing process. Only then more valuable urban green spaces are made that meet the needs of their surrounding dwellers.

1.1.2 Problem with the current residents' assessment of urban green

Previous studies on the residents' perception of urban green yield a lot of knowledge on urban green in general, or more especially, in the urban forest. However, Madureira, Nunes, Oliviera, Cormier, & Madureira (2015) did a comparative review of different studies and found some inconsistencies between the results. Some of these studies only studied the benefits (Lohr, Pearson-Mims, Tarnai, & Dillman, 2004; Vesely, 2007; Sanesi & Chiarello, 2006; Lo & Jim, 2012; Jim & Shan, 2013), while others include the drawbacks but studied them separately (Lorenzo, Blanche, Chi, & Guidry, 2000). Other studies did not include social characteristics to find social differences or questioned how the respondents perceived urban green, in general, to understand to which extent respondents are affected by some effects. And most of these studies were held in different cities, countries, and continents and showed different results. Here, different climates and cultures affected the results. Some of these studies studied trees in various contexts, like in urban forests or parks (Eriksson, Nordlund, Olsson, & Westin, 2012; Peckman, Duinker, & Ordóñez, 2013), but even in these studies, the effects had different relevance scores or where not included in that context.

To conclude, the reason behind those differences seems that these studies were done in different countries using a specific city as a case study or a particular national and cultural context. Schroeder et al. (2006) confirmed that differences in culture and climate could affect residents' perception of urban green. They compared different studies worldwide and found that people with different cultures or who lived in a different climate zone assessed the drawbacks of urban green differently. This suggests that there is a need for further research into the perceived effects of urban green in the Netherlands and the Dutch cultural context.

Roman et al. (2021) argue that many stakeholders have nuanced perspectives about urban green, but also trees. These differences could impact the way residents identify an array of beneficial and detrimental impacts in specific decision-making situations. Vaz et al. (2017) stated that the benefits and drawbacks are fundamentally coupled, and discussion of one must also include and acknowledge the other. The benefits and drawbacks must be better integrated into stakeholder decision-making by assessing trade-offs and synergies (both good and bad), where they simultaneously identify the various effects and how they weigh the effects. It should also include peoples general perceptions toward urban green, their attitudes, preferences, beliefs and values. Shackleton et al. (2016) admit that we now fail acknowledging the diversity and validity of residents opinions about urban green. Roman et al. (2021) argue that it is essential to support urban green programs to prevent unavoidable trade-offs and potentially detrimental effects and draw attention to the drawbacks. When forgetting the drawbacks, planting programs may not meet sustainability goals and could yield undesirable consequences, such as water shortages or increasing gentrification.

The problem with the current assessment of urban green is that social, cultural, environmental, or economic differences affect the evaluation of urban green. The perception of the Dutch population is unknown. Next, the benefits and drawbacks are not integrated into one research to find the actual relevance of the effects. By, both including the beneficial and detrimental effects in one study is necessary to study the trade-offs Dutch residents would make to find the relevance of all effects. With this knowledge, a more specific strategy can be formulated that increases the appreciation of trees in residential streets. For example, by looking at the most valuable effects of urban green according to residents and optimising the positive important effects and improving the negative important effects.

1.1.3 Necessity of residents assessment of urban green

The necessity to include residents assessment of urban green is that urban green planners have noticed that the value of non-market characteristics, such as park visits, wildlife viewing has increased among residents in the last years (Balram & Dragićević, 2005). The focus has switched to residents, where residents have a more active role during the planning and decision making process of green spaces in their communities. This focus includes the peoples beliefs about urban green values. The failure to address peoples beliefs may generate conflicts between residents, planners, and managers (Eriksson, Nordlund, Olsson, & Westin, 2012), or it could fail to meet the users need, excluding certain people, and attract undesirable activities or elements. In extreme cases, the urban green spaces may be neglected by its users (Burgess, Hassison, & Limb, 1988; Hayward & Weitzer, 1983).

Including residents in the planning and decision-making process of green spaces in their communities, the number of valuable urban green space that meets the needs of its surrounding dwellers increases. Featuring more valuable urban green in the immediate living environment of residents increases their health and living conditions.

1.2 Problem definition

Due to the changing climate and the densification of cities, the well-being of urban residents is in danger. The well-being of urban residents is influenced by the quality of the immediate living environment, which increases the demand for healthy cities. The introduction concluded that urban green in residential streets improves residents' health and living conditions. This increases the importance of urban green in cities, especially in areas where daily life is taking place, like residential streets. Therefore, urban green can provide multiple functions and benefits to people and planet. The multifunctionality of urban green can contribute to the realization of various urban policy aims and meet the needs of different stakeholder groups (Ahern, 2013; European Environment Agency, 2012).

In order to improve the immediate living environment and the well-being of residents, urban green in residents' immediate living environment should be studied. Multiple analyses should be performed to find residents' perceptions of urban green in residential streets. First, the effects that influence the perceptions concerning urban green in residential streets must be investigated. Second, the affective response to the effects of urban green must be studied to find the positiveness level of the effects. Next, the relative weight must be studied to understand the relevance of all effects and last, the influences of the various social demographic characteristics should be taken into account. Only then various urban green strategies that meet the needs of Dutch urban residents and different stakeholder groups can be formulated. This improves urban green in residential streets and therefore the well-being and health of cities and their residents.

In order to study the effects of urban green in residential streets, we should take the characteristics of an effect into account;

1) Some effects are objective and others subjective. The temperature reduced by trees in residential streets is measurable, as is the increased housing prices due to new or renewed urban green in the neighbourhood. For example, the nuisance people experience from birds, as well as how urban green

affects the appearance of the street, differs per person. When combining both effects in the same research, people's perceptions concerning the effects of urban green must be considered in order to study the effects. When asking about their perceptions, the answers are based on their experiences and opinions. It is a subjective way to study which effects residents take into consideration when evaluating urban green.

2) Every individual experiences the effects differently and therefore the affective response and the level of importance of the effects differ per person. To study how residents assess urban green in residential streets, all effects must be taken into account and every effect should be assessed in comparison with all other effects.

3) Some effects are directly caused by urban green and others indirectly. In this study, only the direct effects of trees will be studied to ensure causality and prevent bias. When including the indirect effects, the study becomes too comprehensive due to the enormous number of indirect effects of trees. Additionally, when studying the direct effects of trees in residential streets more specific policy measures, and strategies can be recommended.

To narrow the research area, one urban green type is chosen to be further investigated. The literature study concluded that especially trees are very effective when counteracting climate change and are highly appreciated by residents. Besides the fact that trees are the most effective and most appreciated urban green type, residents also experience the most drawbacks from this type (de Jong, 2021). This makes this urban green type less favourable. To investigate which effects residents take into consideration when assessing trees in residential streets, the people's perceptions concerning trees can be examined. With this insight, recommendations can be given to urban tree planners to maintain and improve the placement of trees in residential streets.

1.3 Academic and societal/managerial relevance

1.3.1 Research objectives

The aim of this study is to explore which effects of trees residents perceive in residential streets and how they assess all these effects. With this insight, we can examine which effects form a resistance against trees and which effects contribute to the appreciation of trees including the relevance of the effects. The different perspectives of residents related to trees are taken into account, including their social demographic characteristics and attitude towards urban green. Measuring the individual's attitude towards trees in residential streets can be difficult, due to the complex social characteristics of local environments and the higher cost-efficiency. In this research, the immediate environment of residents, the residential streets, will be studied. The results form the foundation for the formulation of a strategy that optimizes the appreciation of trees in residential streets.

1.3.2 Academic relevance

Measuring the individual attitude towards trees has received some coverage in the environment and planning literature. Mainly the benefits are discussed in these studies, or they did not study the individual's attitude towards trees in relation to the direct contexts of residents, like residential streets (Madureira, Nunes, Oliviera, Cormier, & Madureira, 2015). Madureira et al. (2015) also stated that measuring the individual attitude towards trees in residential streets can be difficult, due to the complex social characteristics of local environments and the cost efficiency, it is more cost-efficient to use larger scales of result analysis. Another reason could be that the individual attitude of urban green types is studied in general and not per type.

Madureira et al. (2015) highlighted that it is essential to understand how urban residents rate the benefits and drawbacks associated with urban green spaces to develop appropriate urban green infrastructure strategies. For this thesis, the residents' perception of the effect of trees in their immediate living environment and residents' attitude towards urban green will be studied. Their social differences are taken into account and neutral statements are used to objectively study the effects residents experience from trees in residential streets.

1.3.3 Societal/managerial relevance

Besides the scientific relevance, there is a practical relevance within this research. As previously explained, planners and policymakers are becoming more aware that residents value green spaces more for their non-commercial attributes than for the economic and practical benefits that have so far guided planning and management. Currently, citizens are demanding a more active role in the planning and decision-making of the green spaces in their communities. These demands are motivated by reasons such as a desire to improve the quality of community life; protection of the environment; participation in decisions that affect residents' lives; social condition concerns; residents require satisfaction with their environment; pride in the legacy between generations; and distrust in the performance of the elected officials (Roseland, 1998; Simonsen & Robbins, 2000). Including residents in urban green planning and management generates more benefits for more people. Urban green planners and city governments can incorporate citizens into the decision stream by considering their preferences and expectations. A market-research study into how residents perceive trees in residential streets could be a start to gaining support and fostering the empathy of stakeholders in delivering products that match the wishes of the consumers (Jim & Chen, 2006).

Besides the increased awareness of planners and policymakers, a new law will be implemented in the Netherlands, the Environmental Act. In this act, participation will play a key role in permit procedures and new instruments such as the environmental plan and the environmental vision (Getting started with the Environment Act, 2022). With this new act, the importance of including residents during planning and decision making for urban green in streets will only increase.

The increased participation includes residents in the establishment of design, location, and management. However, local assessments of residents' beliefs about the effects of urban green space and especially trees should be encouraged (Madureira, Nunes, Oliviera, Cormier, & Madureira, 2015). Planners and researchers need to communicate effectively about the multiple effects offered by trees. When understanding how urban residents rate the effects associated with trees, appropriate strategies can be made which contribute to the care, management, and protection of trees in streets (Sommer, Learey, Summit, & Tirrell, 1994; Coder, 1996). These strategies could be used to make appropriate strategies for the urban green infrastructure to combat the challenges of climate change and improve the immediate living environment of residents to ensure their well-being.

1.4 Research questions

The aim of this research is to explore which effects of trees residents perceive in residential streets and how they assess all these effects to improve the immediate living environment of residents. To achieve this aim, the following main question is formulated:

What are urban residents' perceptions of the effects of trees in residential streets on the quality of the living environment by taking into account residents´ affective response to and relevance of the effects of trees?

To answer this main question, the following sub-questions are formulated:

1. *What are the objective effects of urban green and trees in residential streets?*
2. *How do residents assess the perceived features and their effects of trees in residential streets? More specifically, to what extent do they consider it a benefit or a drawback?*
3. *Which features and effects are according to residents' perceptions the most relevant when assessing trees in residential streets, and what are their respective weights?*
4. *Which personal characteristics, residents' social demographic characteristics and residents' attitudes towards urban green, influence the perceptions of residents on the perceived effects of trees in residential streets?*
5. *What are the differences between certain subgroups in society in evaluating trees in residential streets?*
6. *What is the balance between the beneficial and detrimental effects and what does this balance mean for residential street tree design and planning? I.e., should trees be kept / implemented or removed / not implemented in a residential street and which policy measures should be recommended?*

1.5 Research design

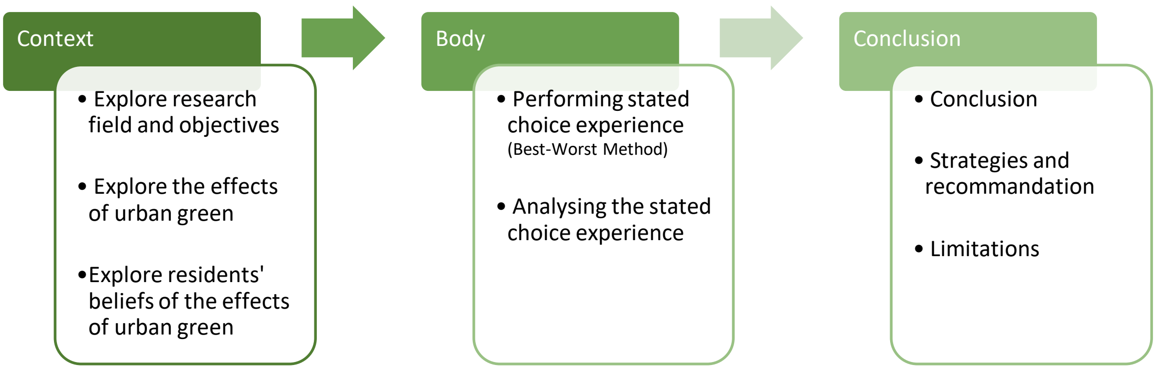


Figure 1. Research design

This thesis consists of three parts, the context, the body, and its conclusion (figure 1). The first part is the basis of this study where information about urban green and its relevance is explained. In the literature review, all effects related to urban green but especially trees are studied, as how people perceive urban green in general although more importantly trees. From this literature study, the issues – the perceived effects of trees in residential streets - and the features that influence the choice behaviour are derived.

The next part of this thesis consists of a stated choice experiment on urban residents. With this experiment, a quantitative approach is chosen to get as many as possible respondents. This approach collects data that ranks the perceived effect of trees in residential streets according to respondents' level of importance and also provides robust numbers which can be analysed.

The experiment demands an individual measurement tool were the preferences of the perceived effects of trees in residential streets can be tested. The best-worst method, a choice-based conjoint analysis, is chosen to investigate the individual’s preferences in different hypothetical settings. With this method, respondents need to choose between choice alternatives. When repeatedly choosing between these different choice sets, the importance of the issues can be measured. This method will further be explained in the methodology chapter.

The last part, the outcome, will answer the main question and sub-questions, evaluate the results, and form the recommendation/strategies for urban green planners to maintain and improve the trees in residential streets. This thesis will end with its limitations.

Chapter 2

Literature review

The literature study consists of multiple sections. First, the definition of the quality of the living environment will be explained, including how the living environment affects urban residents' well-being. Second, the definition of urban green will be clarified. Next, a comprehensive explanation of all the effects of urban green and a section that reviews how urban residents assess the effects of urban green in other studies. The last part of this chapter will sum up all the perceived effects that residents could experience from trees in residential streets and which features affects the assessment of trees.

2.1 Quality of the living environment

The quality of a healthy physical environment has a strong effect on people's life and their well-being (Metz, 2000; Holman & Coan, 2008; Kahn, 2002). Extreme events like natural disaster, floods, droughts and earthquakes, and epidemics but also the long-term effects from climate change may influence people's health. These events may increase the number of deaths, injuries and diseases (Streimikiene, 2015).

One of the most important factors to ensure a sustainable and stable well-being is to maintain environmental and natural resources. According to Dodge, et al. (2012) a stable well-being is achieved when an individual has the psychological, social, and physical resources to meet a psychological, social, and/or physical challenge. A stable well-being is important to meet certain challenges.

To improve the well-being of urban residents it is important to improve the quality of the living environment. The living environment is an assembly of the built and natural environment where residents perform all kinds of activities (cultural, social, physical, recreational, etc.). These activities form the living environment and is constantly changing due to constant change of these activities over time and space (Tiwari, et al., 2015). When studying the direct living environment of people concerning urban green, researchers Kempermans & Timmermans (2014) uses a radius of 100 m to study the objective environmental characteristics. Within this radius of 100 m of the respondent's dwelling, its residential streets can be found.

In order to improve the living environment and indirectly the well-being of residents in dense areas, it is important to focus on featuring urban green more prominently in cities (Streimikiene, 2015). When urban green is present in residents' direct living environment, it allows people to satisfy their basic needs, the company of others and to enjoy their free time (Balestra & Sultan, 2013; Pretty, Peacock, Sellens, & Griffin, 2005), which positively influences residents physical, psychological, and social health.

It can be concluded that featuring urban green in residential streets is important to improve the quality of the living environment which improves the well-being of urban residents.

2.2 Definition of urban green

The previous section explains why it is important to feature urban green in residential streets to improve the well-being of urban residents. However, urban green knows many different definitions and includes different urban green spaces and urban green types. This section will discuss the definition of urban green.

As introduced, urban green has many definitions and includes different types of urban green spaces and urban green types. On a city scale, different types of urban green spaces can be found. Bastian, Haase, & Grunewald (2012) include forests, trees, park allotments, or cemeteries. Kabisch and Haase

(2013) refer to it as "any vegetation found in the urban environment, including parks, open spaces, residential gardens, or street trees". Feltynowski and Kronenberg (2020) added the importance of the difference between public and private in urban green spaces. Haq (2011) defined urban green as "*public and private open spaces in urban areas, primarily covered by vegetation, which are directly (e.g., active or passive recreation) or indirectly (e.g. positive influence on the urban environment) available for the users*". This definition is agreed on by ecologists, economists, social scientists, and planners. But still, there is a difference within and between the disciplines about the interpretation of green space. Taylor and Hochuli's interpretation focuses on the urban landscape (urban forests, urban farms, parks, yards, and gardens (Kumar, Mukherjee, Sharma, & Raghuban, 2010) and the human influence on urban green space. It implies that human involvement and planning are necessary to ensure its success (Taylor & Hochuli, 2017).

De Vries, et al (2012) defined 'urban green' as "all kinds of vegetation that give the street a green appearance". Taylor and Hochuli (2017) also focus more on the word green. The word green could be associated with the colour green, and will not hold when a park only consists of a pond. Because water can also be seen as urban green. Water produces multiple services, such as food, water purification, temperature regulation, and others, which are crucial for urban adaptability (Benedict & McMahon, 2012). Second, when water is available within an urban space it provides diverse environmental, economic, and social benefits to people and other living organisms (Roberts, et al., 2012).

Besides the multiple definitions of urban green spaces, there are also different types of green spaces. The central bureau for statistics (CBS) identified 4 types of land use in an urban area where different types of green occur. 1) Public garden, 2) Park and gardens (greenbelt, green area, heath park, park and gardens, playground, sunbathing area) 3) Cemetery 4) Residential area (green area less than 1 hectare, yards, and gardens, playing fields and playgrounds). Within the radius of 100 m from resident's dwelling, which includes the residential streets, Kempermans & Timmermans (2014) identified four types of urban green spaces: community garden, number of trees, grassland, and a park.

Next to the different types of green spaces, researchers and organisations identified multiple urban green types. Van Dongen & Timmermans (2019) identified six types of urban green in residential streets - grass, flowerbeds, hedges, small trees, large trees, and vertical green. The Rijksinstituut voor Volksgezondheid en Milieu (RIVM) and the Atlas Natuurlijk Kapitaal (2021) have developed different maps for the Netherlands where they identified the different types of green. They distinguish three types of green, trees, hedges and low vegetation.

To conclude, there are multiple types of urban green spaces that can be found in residential areas. But there are also multiple urban green types that can be found within these spaces. In the next session the effects of all urban green spaces and types will be discussed to ensure a comprehensive study.

2.3 The effects of urban green

This section will elaborate more on the effects of urban green and how all the effects are analysed. It provides also insight into how residents assess the various effects in previous studies and what features influence the assessment, like the attitude of people towards urban green and social demographic differences.

2.3.1 Categorisation of the effects of urban green

This subsection will discuss how the various effects of urban green can be categorised to structure the literature, subjective vs objective, positive vs negative, direct vs indirect.

Urban green has many effects on people and planet. Effects of urban green known worldwide are that it combats the challenges of climate change, it increases the changes of injuries due to falling material or roots and urban green influence the appearances of the street.

Figure 2. Nuisance from leaves in the roof gutter (Sewer, 2022)

Figure 3. Boy playing with leaves (Pixabay, 2022)

Before the multiple effects are explained, it is important to acknowledge that there are multiple ways to analyse the effects of urban green. The first way to analyse an effect is to look at how people perceive the various effects. People could be positively or negatively influenced by urban green. In other words, people have an affective response to certain effects. When people are positively influenced by urban green the effect is a benefit and when people are negatively influenced by urban green it is a drawback. Unfortunately, not all effects can be assigned as a drawback or benefit. People can perceive effects differently, which means that some people perceive it as a benefit while others perceive it as a drawback. And of course, the other way around is possible as well. Or, people would not experience the effect at all. Another possibility is that an effect can be both a benefit as a drawback. As explained with figure 2 and 3, the effect 'from trees and hedges fall leaves' can be perceived as a drawback because the leaves may clog the gutters. But another person could enjoy the fallen leaves because they will play with it. To conclude, assigning an fixed, homogeneous affective respond to certain effects of urban green is not justified.

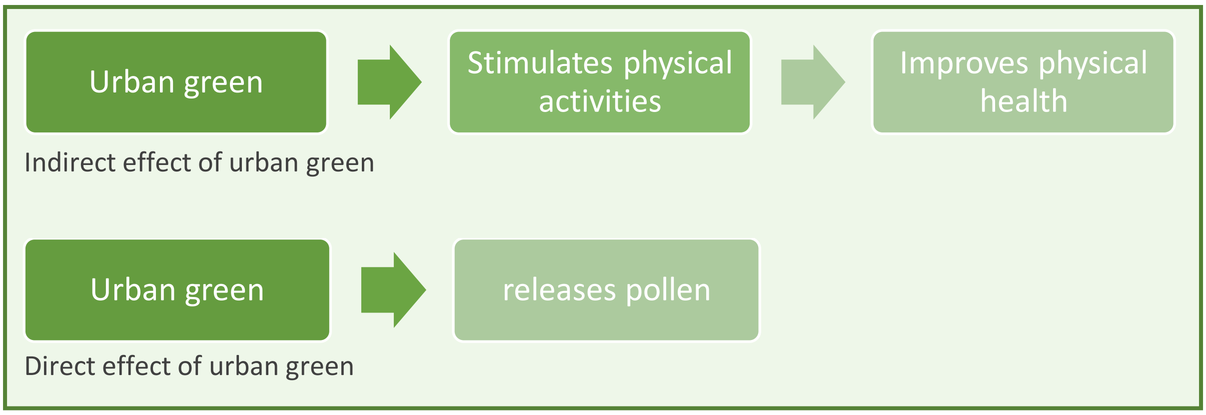


Figure 4. The cause of the effect explained.

Another way to analyse an effect is by looking at the cause, an effect can be a direct effect from urban green or, the effect is a response from another (direct) effect. An effect is direct when the effect is directly related to its causer. For example, urban green releases pollen, the pollen is produced by urban green which forms a direct consequence of urban green (figure 4). An indirect effect is mediated or transmitted through another effect, a third party. This means that urban green has a certain effect that creates another effect. For example, urban green improves physical health. Urban green stimulates physical activities which improves people's physical health.

So, an effect can be perceived as positive or negative and can be direct or indirect. Third manner to arrange effects of urban green is by considering them as a subjective or objective effect, the nature of the effect. A subjective effect is based on or influenced by a personal feeling, taste, or opinion. While objective effects are based on facts and researchers found evidence that these effects are caused. Subjective effects can differ strongly among people while objective facts are not influential.

When evaluating urban green, it is necessary to identify what is considered (figure 5). This thesis makes a distinguishing between facts (objective effect) or opinions (subjective effect). Next, if the effect is caused by urban green (direct effect) or if the effect is mediated or transmitted by a third party (indirect effect). The affective response (positive or negative effect) is excluded to ensure the objectiveness of this literature review.

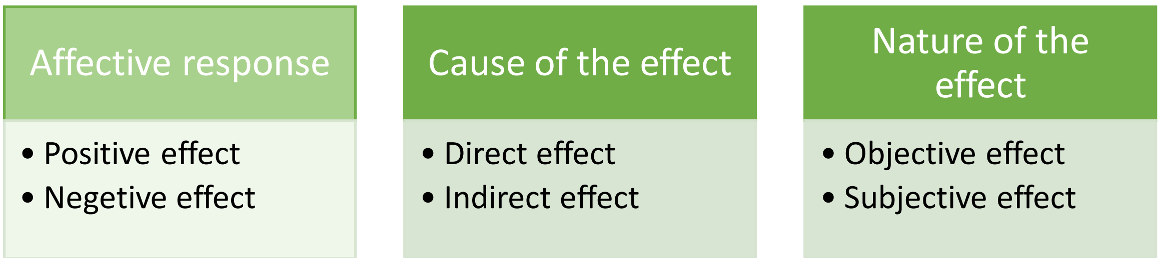


Figure 5. Multiple measurement types the analyse an effect

2.3.2 Objective effects of urban green

The objective effects of urban green are based on facts, and research. The objective effects influences people's health or their living environment.

Effects that influence people's physical health

People's physical health is influenced by multiple effects; people's health increases when people's physical activities increases. However, it decreases due to pests that transmit diseases, or allergies which are caused by pollen. Last, injuries from urban green can affect people's physical health.

The first effect of urban green that influences people's physical health is urban green stimulates physical activities. Physical activities such as walking, cycling, gardening, and sport and leisure reduces the chance of obesity, mortality, cardiovascular disease (Braubach, Egorov, Mudu, & Wolf, 2015). It also reduces recovery time after injuries, increases fertility (Braubach, Egorov, Mudu, & Wolf, 2015) and the immune system (WHO, 2017). Godbey et al. (1992) found a significant relation between visiting parks and the perceived state of health. Residents who visited the park more frequently were more likely to be healthier. In short, urban green stimulates physical activity which improves the physical health of that person.

The next effect that affects people's physical health is related to pests. Pests like mosquitoes, rats, ticks, and oak processionary caterpillars are causing rash (the hair from the oak processionary caterpillars) and vector-borne diseases (like malaria, dengue, West Nile, borreliosis) (Braubach, Egorov, Mudu, & Wolf, 2015) from mosquitos and ticks. These pests are transmitting diseases or hair which influence people's physical health.

Another effect of urban green that influences people's physical health is that urban green releases pollen into the air which can causes an allergic reactions, like hay fever. Between 800,000 and 1.5 million people in the Netherlands have hay fever (WUR, 2021). They have allergic reactions like sneezing, blocked noses, and/or irritated eyes from the pollen of trees and grasses that are released into the air. Because of the growing population, the number of allergic people is likely to rise, which increases the impact of this effects in the following years.

The last effect that influences people's physical health is that urban green can causes injuries. For example, the root pressure of trees lifts and crack open the pavements which increases the change of stumbling (Lohr, Pearson-Mims, Tarnai, & Dillman, 2004). Also, people in a wheelchair, elderly, or people with a pram could experience difficulties while crossing the uneven pavement. Another factor that could cause injuries is the falling material from urban green (Lohr, Pearson-Mims, Tarnai, & Dillman, 2004), such as leaves, branches, nuts, or fruits. The falling material on the pavement could become slippery which increases the chance of stumbling. Especially during autumn where trees drop their leaves, which can become slippery due to the rainy days in the autumn. Next to that, people could fall over branches and can get injured. The direct effect here is that urban green may drop organic products, branches or leaves, which causes multiple indirect effects that influence people physical health.

In figure 6, a visualisation is shown were the effects of urban green that affect people's physical health are displayed. Also, how it influences the physical health, and the outcome of these effects are shown.

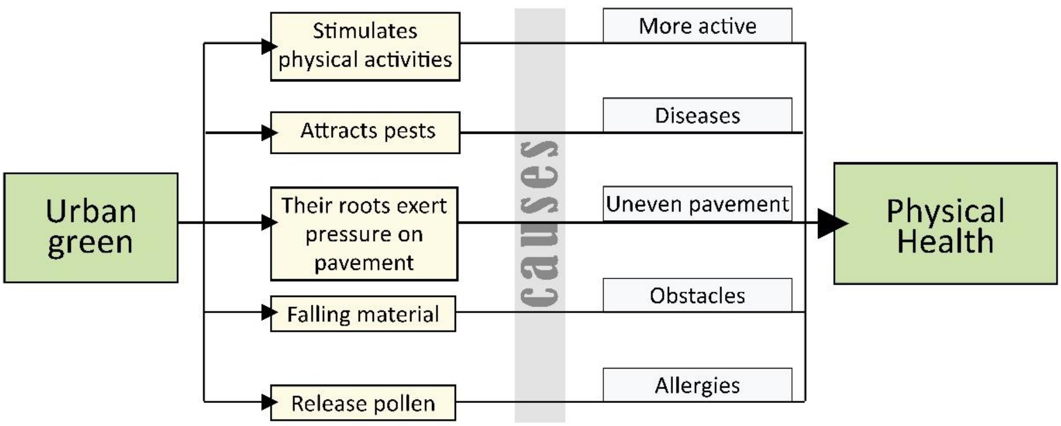


Figure 6. Objective effect of urban green on people's physical health

Effects that influence the living environment
Urban green does not only affect people's health, but it also affects their living environment. Urban green provides adaption to climate change (improves air quality, reduces temperature, reduces water nuisances), increases land prices and the biodiversity in cities.

The first effect that influence the living environment is that urban green provides adaption to climate changes (Braubach, Egorov, Mudu, & Wolf, 2015). Since the industrialization the climate is changing, the air quality in cities is deteriorating, the temperature is rising, and more heavy rainfalls are experienced. All these environmental changes are affecting life on earth. Urban green has the ability to combat these negative changes.

Multiple researchers found that urban green improves the air quality in cities by absorbing pollution from the air (Nowak, Crane, & Stevens, 2006; Hartig, Mitchell, Vries, & Frumkin, 2014; Yüksel & Yilmaz, 2008). Pollution is a large threat to people's health. Even in the United States, which has some of the cleanest air in the world, 88,000 deaths were caused by pollution in 2015. This makes pollution more deadly than both the flu and diabetes (Popovich, Migliozzi, Patanjali, Singhvi, & Huang, 2019). A study by Heidt and Neef (2008) indicated that an urban green space of 50 to 100-meter depth can improve the air quality up to 300 meters away in their neighbourhood.

Other researchers argue that the maintenance of urban green produces more CO_2 than it actually can absorb, which increases the CO_2 in the air (Townsend-Small & Czimczik, 2010). This study of Townsend-Small & Czimczik on urban green space states that maintenance – like irrigation, fertilizing, mowing and leaf blowing increases the CO_2- emission.

Maintenance of urban green is performed by humans, and the increased CO_2 due to this maintenance is not a natural effect of urban green. Only natural effects will be included in this research to study urban residents' perception towards urban green. For this reason, this effect is excluded from this research and only the natural direct effect urban green improves the quality of the air is included in this research.

The next urban green effect that influences the living environment of residents in relation to climate change is that urban green reduces the temperature in cities. The temperature in cities is rising due to the increased greenhouses gasses and the Urban Heat Island (UHI). The UHI effect is caused by the increased absorption of sunlight, the physical properties of the materials, urban morphology, urban compactness, and the deficiency in urban green spaces (Giridharan and Emmanuel, 2018; O'Malley et al., 2015; Kaloustian and Diab, 2015; Xi et al., 2012; Priyadarsini et al., 2008) which increases the temperature in cities. Dimoudi et al. (2013) stated that the average temperature in urban areas can be 1.0–6.0 °C warmer than the nearby non-urban regions. The USGCRP (2017) reported that the air temperature in American cities was 0.5 to 4.0 °C higher during daytime and 1.0 to 2.5 °C higher during the night than in the nearby rural areas. The increased temperature increases the risk of heat-related deaths and illnesses. Especially vulnerable people (adults with an age older than 65 and children) have a higher than average risk of heat-related death (USGCRP, 2016).

Many researchers conclude that urban green spaces can reduce the UHI effect and therefore reduce the temperature in urban areas (Gago et al., 2013; Mackey et al., 2012), and prevents heat stress (Lee, Mayer, & Chen, 2016). The temperature in urban areas has a significant relation with urban green, the highest daily temperatures were measured in areas with the lowest amount of urban green, and the lowest daily temperature was measured in areas with the most urban green.

A study in Sydney Australia (Lin, Meyers, Beaty, & Barnett, 2016) studied how different landscape types affect temperature variation in different areas. They used as landscape type: pavement, bare soil/dry grass, green grass, and tree cover) and as areas: around the home, in the roads and footpaths and parkland. The study concluded that houses in residential streets have a lower surface temperature when the percentage of tree canopy increases. The roads and footpaths have a lower surface temperature when the percentage of tree cover and green grass increases. This study concludes that urban green – and especially trees – reduce the air temperature in urban areas, which makes everyday activities more enjoyable and healthier.

Other researchers concluded that the cooling effect provided by trees is directly related to tree size, canopy cover, tree location, and planting density. Shashua-Bar, Pearlmutter, & Erell (2009) concluded that as much as 80% of the cooling effect of trees results directly from shading. According to the study of Jamei et al. (2016), urban vegetation cools the cities through the process of shading, evapotranspiration, and changing the wind pattern. And trees were the most effective urban green type by providing shades and retaining water during extreme rainfall events.

Besides the increased temperature, cities are also dealing with the increased chance of heavy rainfall due to climate change. These increased short-term heavy rains are mostly expected during the summer and increase the flood risk in urban areas. Due to the increased risk of flooding in urban areas in combination with urbanization, the threat of loss of life and damage to properties increases. Urban green could be a good solution to this problem because it could function also as water storage for water regulation (WHO, 2017). Urban green allows water to easily infiltrate or getting absorbed, and urban green temporary stores water. This reduces the risk of flooding.

The UN reported that this flood risk is a worldwide problem and has become the most frequent and significant threat for 633 of the largest cities worldwide (United Nations, World population prospects: The 2011 revision, New York, 2012). Street trees have a positive influence on water runoff in streets as they reduce the urban runoff from summer rainfall. Not only does the soil in which trees are placed absorb the water, but the leaves and branches of trees also intercept, absorb, and temporarily store water before it reaches the surface and infiltrates into the soil (Mullaney, Lucke, & Trueman, 2015). The difference between various surfaces is large, for example, asphalt has a run-off of 62%, while tree pits have a run-off of 20% (Armson, Stringer, & Ennos, 2013). Besides the difference in surface type, there is a difference between tree types. Evergreen trees intercept more than 15.41 kL per year (Cappiella, Schueler, & Wright, 2005), while deciduous trees only intercept between 1.89 and 2.65 kL per year (Seitz & Escobedo, 2011). A study in Manchester United Kingdom concluded that an increase of 10% tree cover in high-density residential areas can lower the surface runoff by 5.7% in a 28 mm event (Gill, Handley, Ennos, & Pauleit, 2007).

All the previous urban green effects are objective and direct effects that counteract the challenges from climate change. Research has proven that urban green improves the living environment of people. Another direct and objective effect of urban green on people's living environment is that urban green functions as noise buffering (Margaritis & Kang, 2016). Noise pollution is one of the four major pollutions in the world. In the European Union, approximately 80 million people suffer from unacceptable noise levels (65 dB or higher) which decrease the well-being of people. Vegetation can reduce noise mainly in three ways, vegetation can diffract and reflect the sound waves by its plant elements, it can absorb the sound waves and transform them into mechanical vibrations, and last urban green can destruct the interference of sound waves (Dzhambov & Dimitrova, 2014). Research in how effectively urban green reduces noise showed that this reduction is so really small (Schäffer, Brink, Schlatter, Vienneau, & Wunderli, 2020). They concluded that urban green could reduce the traffic noise with 8 – 10 db (comparable with a falling leave). Due to the fact that the noise reduction is so low, it is hard for residents to measure or to experience. For this reason, the noise reduction effect is excluded from this research.

Another effect that influence the living environment of peoples is that urban green affects the air flow. Urban green can as well decrease the wind speed but also accelerate it. Hedges increases the air flow, while trees decrease it (Szkordilisz & Zöld, 2016). Especially the canopy of trees provides wind reduction and act as a windbreak (Salim, Schlünzen, & Grawe, 2015). Trees can funnel or baffle wind away from areas, it can modify air movements patterns by both vertical and horizontal concentrations of vegetation (Coder, 1996). These windbreaks shields buildings during the winter from the wind chill and reduce the wind speed in locations with uncomfortable wind. The wind-shielding effect of trees is both beneficial and detrimental. During the warmer month, wind reduces the surface temperature and increases ventilation in streets which makes them more comfortable. The wind shielding effect of trees in streets, reduces this wind speed and counteract this effect. However, during the colder month, the wind shielding effect from trees makes streets more comfortable because they are blocking the wind.

The following effect of urban green influence the land prices and is identified by multiple researchers. Urban green positively influences land value when properly maintained urban green is nearby (WHO, 2017). McMahon (1996) found that land prices could increase up to 15% when urban green in the neighbourhood is increased and well maintained. He also found evidence that 70% to 80% of the consumers rated natural open space as most important in a new-home development.

The increased land price is a direct effect of urban green and is considered by many as a positive effect, but the increased land prices could influences segregation or as the Anguelovski lab (2020) describes it: green gentrification. When a disadvantaged area is renovated by introducing urban green, the area becomes more attractive for higher-income classes. That leads to an increase in land value and slowly forces the original residents to leave this area because they have a lower income and cannot pay the new prices (Maantay, Maroko, Anguelov, & Connolly, 2020). This effect is not taken into account into this research but it could explain, why residents did not perceive this as a positive effect.

Apart from the effect on peoples living environment urban green also influences the living environment of other species. For instance, urban green stimulates biodiversity by providing a habitat for flora and fauna (Lovell, Wheeler, Higgens, Irvine, & Depledge, 2014). When placing new urban green, it provides a great stimulus for the plants and animals that live in the city. Cities are promising biodiversity hotspots, which means, implementing more greenery invites both animals and plants species to settle there (Beninde, Veith, & Hochkirch, 2018; Threlfall, et al., 2017).

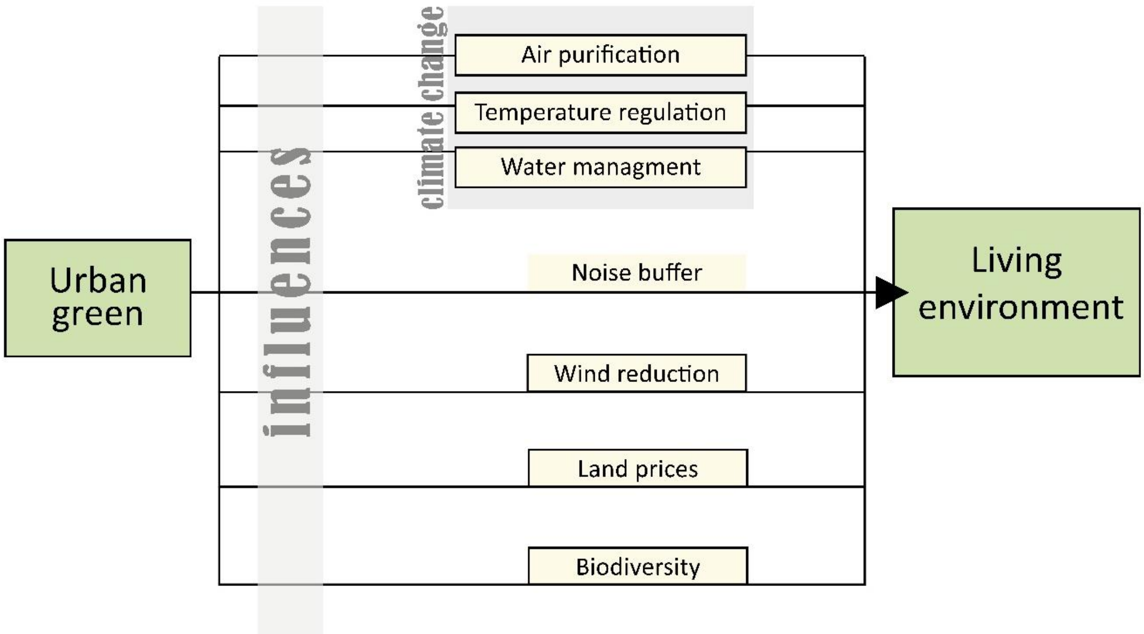


Figure 7. Objective effects of urban green on people's living environment

In figure 7, the visualisation shows which effects of urban green affects people's living environment. The figure shows also how the effect influences the living environment of people and the outcome of these effects. One effect, urban green blocks noise, is eliminated from this research because the impact of this effect is very small.

2.3.3 Subjective effects of urban green

Besides all the objective effects which are facts and measurable, urban green has a lot of effects that are based on opinions and how people perceive urban green. These effects are called subjective effects. The subjective effects can vary strongly per individual, some individuals will not even mention the effect, while others experience a lot of benefits and pleasure, or irritation and frustration from that same effect. The subjective urban green effects that will be explained in this section are related to people's psychological health and social health. But also, people could have different opinions about the placement of urban green relative to buildings and street layout.

Effects that influence people's psychological health

A subjective effect or urban green is that the appearances of urban green can influence people's psychological health. For instance, urban green reduces depression (McEachan, et al., 2016) and stress (Roe, Ward Thompson, & Aspinall, 2013). Urban green can function as a nearby resource for recreation purposes and relaxation. Urban green fosters contact with nature and provides an emotional warmth and softness to city life (Çay & Aşılıoğlu, 2014). When people are using urban green, it could be associated with psychological fitness. Psychological fitness is defined as "the integration and optimization of mental, emotional, and behavioural abilities and capacities to optimize performance in daily life" (Bates, et al., 2010). This means; using urban green influences people's mental state, life satisfaction, quality of life (WHO, 2017), memory and cognitive performance (Weuve, et al., 2004), and self-related health (Mather & Scommegna, 2017). Schroeder (1991) found that areas with vegetation and water reduces the stress level and induce relaxation by residents when compared to residents who do not have direct access to nature. Kuo and Sullivan (2001) found evidence that urban green reduces aggression and helps residents to relax and renew. According to Gies (2006), multiple researchers found evidence that residents with even a limited view on urban green had stronger mental health, less mental fatigue, less deferment when dealing with life issues, and feeling that their problems were more solvable when compared with residents who do not have a view on urban green. He also found that even the smallest amount of urban green, like a few trees or a bit of grass, showed the same impact. All the psychological effects can both be a direct as an indirect effect. Because by directly looking at urban green the psychological health of people improves, but also when using urban green during physical activities, the psychological health of people improves.

Other effects from urban green that could affect people's psychological health are sound, falling material, the pressure of roots on the pavement, and the presence of animals in urban green. These effects are subjective because per individual these effects can be experiences differently.

The sound of urban green can both be a beneficial effect as a detrimental effect. People could experience the sound of trees as nuisance, for example during heavy wind/storms trees could make a squeaking and groaning sound, but on the other hand, people could experience as a benefit because the wind through leaves have also a calming effect on people (Kuo, 2015), it provides a certain contact with nature (Çay & Aşılıoğlu, 2014). Since people can experience the sounds from urban green differently, this effect is considered subjective and is not related to the objective effect 'urban trees function as noise buffer'.

Another effect that can be experienced differently is the organic material that fall from trees and the root pressure of trees that could crack open the pavement. Both effects could cause nuisance during daily activities, especially less abled people are experiencing more nuisance. As previously explained these effects can cause injuries, but also residents can be bothered by the bad maintenance which decreases the appearance of the street (Wang, Zhoa, Meitner, Hu, & Xu, 2019). Others may enjoy the falling materials. For example, the falling leaves are perfect for children to play with (as previously explained with figure 2 and 3), or seeking nuts during the autumn which could be used for decoration or education of children would be associated as a beneficial effect.

The last effect that influences people's psychological health are the presence of animals in urban green. The presence of animals could create resistance to urban green in residential streets (Lohr, Pearson-Mims, Tarnai, & Dillman, 2004). For example, bird poo on cars creates irritation to the tree(s) that are placed nearby parking spots, or insects that are attracted to urban green could prevent citizens from going outside and using the urban green because they are afraid or allergic to them. This could cause irritation and frustration which increase the resistance to urban green in residential streets. But all these effects are subjective, some people experience these nuisances (allergic people) but others would not even mention it or do not characterize them as a nuisance. Or even enjoy the bird sounds in the streets, because it brings them closer to nature. So, once again how residents experience these effects varies strongly per individual.

Effects that influence people's social health

Urban green can also influence people's social health. Urban green functions as a community space. A community space that stimulates to go outside and when being outside urban green fosters contacts (Haaland & Konijnendijk van den Bosch, 2015), increases social cohesion (Roe, Ward Thompson, & Aspinall, 2013), ensures interaction and participation (WHO, 2017), and positively influences community attachment to that place (Seeland, Dübendorfer, & Hansmann, 2009). Urban green brings people together. For example, a vegetable garden which is maintained by neighbours. The social activity that comes along with this place creates vibrant and social neighbourhoods. Gies (2006) found that residents with urban green in their neighbourhood were more likely to experience stronger social ties with their neighbours than residents who lived in less green neighbourhoods. Umberson and Montez (2010) mention the importance of social ties, these stronger social relationships—both quantity and quality — affect people's mortality risk and their mental and physical health. They also found that people with a high involvement rate are likely to live longer than people with poor social interactions.

However, large urban green could also decrease the feeling of social control and social safety (Lohr, Pearson-Mims, Tarnai, & Dillman, 2004). The large vegetation blocks sight which impeded visibility which could decrease people's social health. Similarly, when (traffic) signs and lights are hidden behind large vegetation, the (traffic) safety decreases.

Effects that influence the appearances

Besides the psychological and social effects, urban green influences the appearance of the environment. Urban green can upgrade or deteriorate the living environment of people which partly influences the quality of the living environment (Streimikiene, 2015) and the image of the city (Lang, et al., 2008). Most residents associate the appearance with the quality of the maintenance (Wang, Zhoa, Meitner, Hu, & Xu, 2019). When urban green is well maintained, people found it pleasant for the eyes and they are enjoying urban nature. It also forms an indirect effect that urban green stimulates physical health. Thompson (2013) indicated that physical activity could be encouraged and supported when everyday environments are well maintained and designed. So, an attractive green space increases physical activity. When urban green is neglected, for instance, dead vegetation, trash from the vegetation on the street, damaged pavement, or spontaneous vegetation, people could experience some resistance against urban green in their living environment. But once again, everyone experiences appearance differently. Some do not even mention negligence while others resent it.

A good example is spontaneous vegetation. In urban green spontaneous vegetation could occur. Spontaneous vegetation is often perceived as weeds that could create an unpleasant street appearance for some people. Unpleasant urban green with a bad appearance could affect residents' emotional well-being by increased depression and gloominess (Riley, Perry, Ard, & Gardiner, 2018). However, spontaneous vegetation is not always a weed, it can also be a tulip (or another flower) that grows for some reason in a lane of grass. Tulips are generally not considered as weed, but because it grows in a place where it does not 'belong' in the first place, residents could experience this tulip as a weed. Next to that, other people do not experience weed as a bad thing but see it as wild nature in cities that they appreciate.

Influence of the placement of urban green

Other effects where the impact of the effect varies strongly per person is related to the placement of urban green relative to buildings and street layout. The placement of urban green affects the incidents of light (Akbari, Davis, Huang, Dorsano, & Winnett, 1992). The incidence of light can affect the living pleasure of people. As previously explained, the shadow from urban green reduces the temperature in streets and nearby placed building in the summer, while during the winter, when the leaves had fallen off it passes the sun, and the sun functions as a free heating system. On the other side, when having a large tree nearby a dwelling, the shadow could also negatively affect the light inside the home or the outcome of sustainable devices like solar panels. To conclude, urban green provides an organic shading effect in urban areas which create numerous indirect effects.

Another form of undesirable placement of urban green could lead to less space for pedestrians on sidewalks due to overhanging vegetation (Municipality Oss, 2016). This overhanging vegetation can block the accessibility. Or, the placement of urban green in residential streets reduces the parking space in the streets (Kronenberg, Łaszkiewicz, & Sziło, 2021). There is a continuous battle between public space and parking space. Everybody wants to park their car nearby but at the same time, they want to have a pleasant view from their home which could be created by placing urban green in a residential street.

Subjective effects - especially effects that decrease the quality of the living environment of residents – are relative problems. Every individual experience the effects differently. Also, it is well known that local authorities will rarely remove urban green in response to a complaint. Urban green serves a general interest because of all the positive effects they have, so the individual's complaint is quickly dismissed (Municipality De Ronde Venen, 2020).

Figure 8 shows the visualisation of the effects that influences the appreciation of trees. Once again, how the effect influences the appreciation of urban green, and the outcome of these effects are included in the figure.

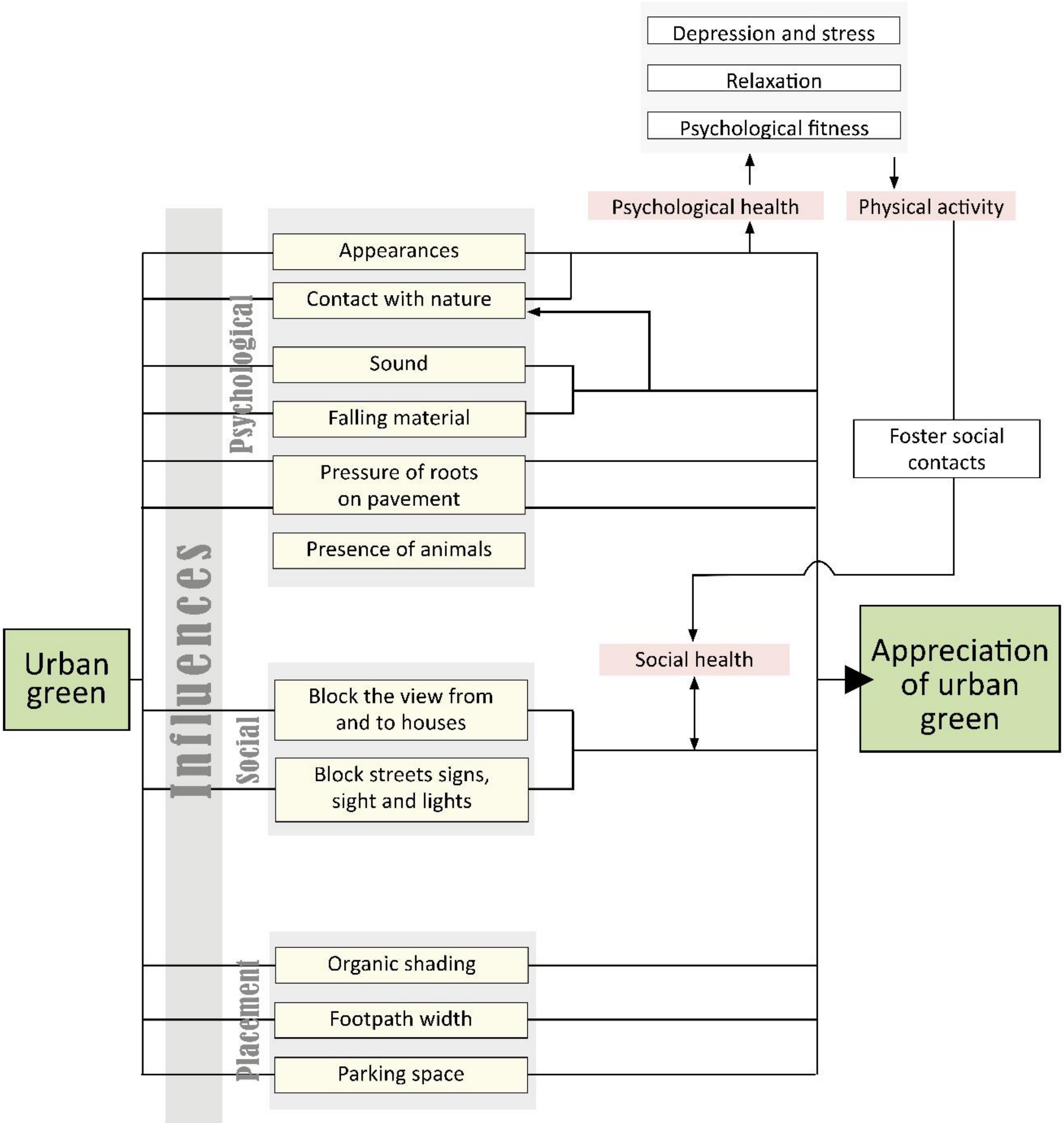


Figure 8. Subjective effects of urban green

2.4 Residents' assessment

All the effects of urban green are discussed in the previous section. This section will discuss how resident perceive all effects from urban green and how residents perceive the effects from trees in residential streets.

2.4.1 Residents' assessment of urban green

The literature study on urban green defined multiple effects. Objective effects that influence people's health and living environment, and subjective effects that are based on opinions and how people perceive urban green. As previously explain, residents may experience the effects of urban green differently. This section studies previous studies related to how people experience the effects of urban green.

Many studies are conducted about how residents perceive urban green. Madureira et al. (2015) found that social and cultural benefits (60%) – “Contact with nature”, “City image enhancement”, “Enhance neighbour social interaction” and “Opportunities for outdoor sport and recreation” - are globally more valued than environmental benefits (40%) – “CO_2 reduction”, “Biodiversity promotion”, Reduction in air temperature”, “Reduction of air pollution”. They studied the residents’ perceptions concerning the benefits of urban green spaces and concluded that “Enhanced health and well-being” was the most important benefit residents perceived from urban green and “Noise reduction” the least important benefit.

Jim and Chen (2006) researched the perception of ecosystem services generated by urban green spaces in Guangzhou, China. They ranked the importance of 25 ecosystem services which were divided into 6 groups. Jim and Chen concluded that ‘Environmental quality’ (including effects as air and noise absorption) had the highest group score. The ecosystem service ‘O2 release’ (included in the service group ‘amelioration of urban microclimate’) was ranked as most important ecosystem service of all 25 services. The environmental function group, which included services related to the improvement of environmental quality, scored low. This low score could be explained by the fact that these ecosystem services generated indirect effects which were less tangible than the more direct health and comfort benefits. The group ‘economic benefits’ was ranked as the least important group by residents. This low score could be explained by the lack of awareness of the actual or potential economic value of urban vegetation.

Jim and Chen (2006) also ranked the negative impacts of urban green spaces residents can experience. They identified eight negative impacts, 14,8% of the respondents stated that they did not experience negative impacts. The negative impact that was rated as most important is ‘liability’, individual citizens might worry about the potential financial burden because liability could incur financial responsibility. Other effects they measured were “Organic litter problem”, “Attracting insects or pests”, “Obstacles and intrusions”, “Security risk (darkness)”, ”Security risk (burglar access)”, and “Management costs”. The least important impact from urban green spaces is ‘Keeping out sunshine’.

We should consider that this survey was conducted in Guangzhou, China. Guangzhou has another climate and by studying other studies across the world, a difference in perception of urban green problems in different countries occurs. This is also confirmed by Schroeder et al. (2006), they found that differences in culture and climate zones can affect the way residents perceive urban green. When looking for instance to a city in Finland in Europe, the attraction of antisocial people, security, maintenance cost, shading, organic litter, and falling branches where the main negative effects residents could experience (Tyrvainen, 2001).

To conclude, residents' perceptions and beliefs about urban green spaces vary worldwide. Most studies that are conducted focussed on the level of importance of the benefits or the drawbacks of urban green. Some studied both the positive and negative effects, but none made the next step to study how residents perceive urban green by including them as effects and let the respondents assess how they perceived the effects of urban green. When including all effects as neutral effects, the relevance of all effects compared to each other can be measured.

2.4.2 Residents assessment of urban trees

As previously explained, there are a lot of definitions and types of urban green. All these types of green have different effects and their effectiveness varies per type. The urban green type 'trees' appears to be the most efficient urban green type according to Van Dongen & Timmermans (2019). They identified six types of urban green in residential streets - grass, flowerbeds, hedges, small trees, large trees, and vertical green - and investigated which green type in residential streets was most appreciated by residents. With a choice experiment, they concluded that trees - especially large trees - are the most appreciated urban green type under residents in the Netherlands. Other researchers who studied the preferences of urban green types across multiple US cities found the same evidence, larger trees are preferred over smaller trees (Kalmbach & Kielbaso, 1979; Summit & Sommer, 1999; Heimlich, Davis Sydnor, Bumgardner, & O'Brien, 2008).

The different types of urban green in residential streets have different effects and not all effects are related to all urban green types. Next to that, the weight of these effects can differ per urban green type. By taking into account the previously explained effects, there is a larger difference between urban green types when the climate change effects are studied. Multiple studies agreed on the fact that trees are the most efficient urban green type that combats the challenges resulting from climate change, like temperature regulation, air purification, and water storage.

In a research project during my study at the Tue, I identified per urban green type the drawbacks residents could experience in residential streets (de Jong, 2021). I included the six urban green types that were identified by van Dongen & Timmermans (2019) in their study about residents' urban green preferences in residential streets. With the use of the Fuzzy Delphi method, urban green experts were ask to identify the various drawbacks residents could experience per urban green type. The urban green experts concluded that the urban green type with the most drawbacks is trees, followed by the urban green type shrubs. Unfortunately, no scientifical evidence was found that could support this outcome. So, we must be careful when using this conclusion.

It can be concluded that trees are the most appreciated urban green type according to residents – especially large trees - and trees are the best urban green type to implement in residential streets to combat the challenges resulting from climate change.

Researchers that studied residents' perceptions of trees in urban areas concluded that aesthetics and practical attributes of trees in residential streets such as beautification, shade provision, increased property values, added privacy, and noise reduction are of high importance. The most important reason for wanting trees in residential streets are aesthetics and shade provision (Summit & McPherson, 1998; Zhang, Hussain, Deng, & Letson, 2007; Moskell & Broussard Allred, 2013).

Lohr et al (2004), studied the urban residents' level of agreement of the problems with trees in cities. They concluded that the leading problem with trees in cities is that they cause allergies followed by the fact that they should not be used in business districts because they block store signs. Remarkable is that 'the roots of trees which crack open sidewalks' is placed as third according to residents. In multiple studies, this drawback is the main reason why trees in cities should get removed (Mullaney, Lucke, & Trueman, 2015; Costello, McPherson, Burger, Perry, & Kelley, 2000-2001; Kirkpatrick, Davison, & Daniels, 2021). Other problems they mentioned in their study are that trees could cause damage, decrease social control and their sticky residue covers cars and other objects.

A study in New Orleans, USA, where both the public's perceptions of the benefits and annoyances of trees were studied, concluded that the most important benefits of trees are "Aesthetic/visual," “increases the sense of community,” and “trees attract birds and other wildlife,”. The most important negative effects of urban green were falling tree branches, roots clogging sewers, and tree diseases (Lorenzo, Blanche, Chi, & Guidry, 2000) which were more related to hazards and nuisances.

All these drawbacks of trees are causing resistance from residents against trees in residential streets. As previously explained trees are the most appreciated and the most effective urban green type to implement in residential streets to combat the challenges resulting from climate change and improve humans' health. To narrow the research field, trees in residential streets will be studied.

To get insight into how residents perceived trees, all the effects regarding the quality of the living environment concerning trees in residential streets should be studied. The level of importance and the affective response to the perceived effects of trees in residential streets must be measured. By recognizing the level of importance and communicating clearly about the benefits and drawbacks offered by trees in residential streets may help to identify the effects that forms and increase the appreciation and resistance of trees. With this insight strategies and guidelines can be given to optimize the appreciation of trees in residential streets and increase the quality of the living environment and people’s well-being.

2.5 The effects of trees

Section 2.3 identifies multiple effects from urban green, but some effects are not applicable for trees or are missing. This chapter will sum up the effects residents can experience from street trees and gives examples about how people could experience them.

The effects that will be used in this study are all direct natural effects from trees to people following from section 2.3 ‘The effect of urban green’ and section 2.4.2 ‘Residents’ assessment of urban trees’. In order to study both objective and subjective effects, people are asked how they experience and perceive the various effects. As the literature study concluded, effects could be experienced differently and to prevent misinterpretation of the effects it is important to clearly describe the definition of them.

In total the literature identified 21 direct effects of trees which are explained in table 1. The table shows the effects name, neutral statement (without an affective respond - positive or negative) and gives an example of how people can experience the effect. If the effect beneficial contributes to the appreciation of trees in streets or it has a detrimental effect on the appreciation of trees in streets.

Most of the effects are clearly explained with the neutral statement. But the effects ‘Trees provide habitat for animals’ (Birds, insects, pests, squirrels)’and ‘Trees increases the biodiversity (more flora and fauna species)’ are closely related. The difference between the two effects is, the effect ‘Trees increase the biodiversity’ refer to the improved ecology, while ‘Trees provide habitat for animals’ refer to the presence of animals nearby. These two can be mixed up by respondents, so in order to prevent bias, both effect must be explained clearly in the survey.

Table 1. The 21 perceived effects of trees in residential streets

	Effect	Neutral statement	Subjective	
			Positive	Negative
1	Influence appearances	Trees influence the appearances of the street	Beautiful	Neglected
2	Bring nature closer	Trees bring nature closer	Connection with nature	
3	Change of colour (leaves)	The leaves of trees may change colour	Feeling of season	
4	Falling of leaves	Trees may lose leaves (in autumn)	Children playing	Debris, blocked sewer, juries when become slippery
5	Drop organic products	Fruits, nuts, seeds may fall from trees	Food, use as decoration in home. Feeling of season	Debris, injuries when become slippery
6	Falling branches	Branches may fall from trees		Injuries or damage
7	Drip sticky juice	A sticky juice may drip from trees		Neglected, nuisance
8	Pressure of roots on pavement	The roots of trees can lift the pavement		Injuries or reduced accessibility
9	Cause allergic reactions	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)		Irritations and allergic reactions
10	Provide organic shade	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	Summer shade, winter sunlight penetration	Summer reduced incident of light Reduces output solar panels
11	Block wind	Trees slow wind speed	Reduce the wind tunnel effect	Block airflow
12	Water management	Trees block rain and retain water (e.g. on the leaves and in the soil)	Reduces water nuisance in direct living environment	
13	Air purification	Trees capture fine dust and convert CO_2 into oxygen	Fresh air	
14	Make sound	Trees can make sound (rustling of leaves)	Relaxation, closer to nature	Sound nuisance
15	Provide habitat for animals	Trees attracts animals (Birds, insects, pests, squirrels)	Relaxation sound of birds.	Bird poo, nuisance from insects and pests
16	Increase biodiversity	Trees increases the biodiversity (more flora and fauna species)	Improved ecology in direct environment	
17	Increase house prices	Trees in streets increases the prices of houses	Higher property value	Increase green gentrification
18	Take up parking space	Trees in streets take up space, which means there may be less parking space	More space for nature	Less parking spaces
19	Take up space on sidewalk	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)		Footpath narrower or less passable
20	Influence traffic safety	Trees can block streets signs, sights, and streetlights		Reduces traffic safety
21	Influence social safety	Trees block view from and to homes	Increases privacy	Reduces social control

2.6 Attitude towards streets trees

Now that all effects are identified, there are multiple features that influences people's perception to trees. This section will explain which features influences people's perception to trees and how they will be included in this research.

A feature that can influences people's perception of trees is people's attitude (Balram & Dragićević, 2005; Rossi, Byrne, Pickering, & Reseer, 2015). Lo, Byrne, & Jim (2017) found that people's emotional bond towards urban green influences their attitude and opinion to street trees. This emotional bond is based on their childhood experience and how they use urban green. Jim and Shan (2013) observed a strong influences of childhood experience with nature on the perception towards urban green spaces. People with more experience with nature during their childhood had a more positive attitude towards urban green (Bell, Thompson, & Travlou, 2003; Burgess, Harrison, & Limb, 1998; Sebba, 1991), and visited urban green spaces more often in adulthood (Ward Thompson, Aspinall, & Montarzino, 2008)

In this research the feature, place of growing up will be included. Jim and Shan (2013) identified three levels of areas; city, town, and suburbs. An extra level, city suburb, is added because there is a large difference between growing up in a high dense city centre and a town. City suburb is added to fill this gap and refers to a less dense urban area on the edge of a large city where mostly residents live (Cambridge University Press, 2017).

Another feature that influences people's perception is how people use urban green (Lo, Byrne, & Jim, 2017). People have multiple purposes for going to a green space or for using urban green. People often use urban green spaces for exercise and physical activities, but can also use a transport route to another location (Schipperijn, et al., 2010). Peschardt, Schipperijn, & Stigsdotter (2012) found that people use urban green for relaxation and stress reduction, to experience nature or to obtain peace and quiet. Next to that (Peschardt & Stigsdotter, 2013) found that people use urban green spaces to de-stress. Urban green can also be used for cultural activities. Mitchell (1995) and Roberts (2017) both agreed that urban green space is important because in urban green spaces different political, social and religious perspectives are happening and celebrated. Or other cultural activities like art, dance and music take place. Or people use urban green to socially interact with one another (Lo & Jim, 2010; Peschardt & Stigsdotter, 2013). Green spaces have different social meanings and understanding for different users. This meaning and understanding forms how people use the urban green space and form different types of social interaction. On the other hand, different types of green space enable different kinds of interactions between humans (Dinnie, Brown, & Morris, 2013). Parks which were used for passing through (to get to the bus or go to the supermarket) had fewer social interactions. Also, people had less social interactions when they used the park to seek quietness and relaxation. Parks with a higher level of everyday use and more social events have more social interaction. Connections are made accidentally or surprisingly, through proximity and shared interest in engaging with greenspace in particular ways. Smaller neighbourhood green space's function more as community space which increases social cohesion (Roe, Ward Thompson, & Aspinall, 2013), and positively influences community attachment to that place (Seeland, Dübendorfer, & Hansmann, 2009).

In this research the following use of urban green will be included, for physical activities/exercise, to relax, to enjoy nature, for social contacts, for cultural activities, and for recreation. An extra feature will be added which will ask how crucial urban green is in people neighbourhood for their quality of life. This one is added because section 2.1 explains the importance of urban green in people direct living environment. To find the relevance of respondents towards urban green this neutral statement is added.

Furthermore, research has found that social, economic and psychological factors (such as age, gender, education level, social and economic status, ethnic-racial origin) also influences the opinions and attitudes from residents towards street trees (Lo, Byrne, & Jim, 2017). Jim and Shan (2013) found that, woman, elderly and children are more likely to perceive urban green as risky places (Jim & Shan, 2013). They may have more worries about their personal safety which affects their attitude towards urban green. Barrera et al. (2016) found that people with a lower income valued urban green spaces more highly. Jim and Shan (2013) observed a strong relation between someone's level of education and their environmental awareness. People who are higher educated have a higher environmental awareness.

To conclude, in order to get insight into how residents perceive trees in residential streets the emotional factors (childhood experiences and usage of urban green) and the social factors (age, gender, education level, income, and origin) are taken into account in this research. With this information we can see what kind of respondents took part in this survey to see if there are differences between various social groups.

Chapter 3

Research design

In this chapter, the research design will be explained. This includes the data collection, research population, and how the data will be analysed.

3.1 Method of data collection

This section explains the content of the survey and how and with which method the data is collected.

This research will make use of an online survey to collect the data. An online survey is used to extend the number of respondents and make the preparation of the data less time-consuming. The survey will be developed in the online program LimeSurvey, a survey system used by the TU/e. The survey consists of three parts. The first part will ask respondents to indicate their affective response toward the various effects of trees in residential streets. The second part consists of a best-worst experiment, where multiple sets are given with various effects and respondents need to indicate which effect they consider the most important effect and which effect they consider the least important effect. The last part of the survey consists of some attitude and social demographic questions. The survey can be found in appendix 1, both the Dutch and English versions.

3.1.1 Value of the perceived effects

The survey will start with an indication scale where respondents are asked to identify on a 5-point Likert scale how positively or negatively they perceive the various effects of trees. As concluded from the literature study, effects can be perceived by residents differently. For example, people can experience the sound of trees as pleasant and relaxing while others may be bothered by it. So, asking the affective response of the perceived effects of trees in residential streets will give relevant information about how the various effects are actually perceived by the respondents. More specifically, with this question, we could determine to what extent respondents consider the effects of trees in residential streets as a benefit or as a drawback.

Respondents are asked to identify how they perceive the determined effect, by answering the following question:

How do you perceive the following effects of trees in residential streets on a 5-point scale?

Where 5 indicates that the respondent experience the effect as a benefit and 1 indicates that respondents experience the effect as a drawback. A score of 3 indicates a negative as well as a positive effect, essentially a 3 indicates neutral. Respondents can also indicate if they do not experience this effect from trees. This extra option is added because maybe someone does not experience this effect and is automatically considered the least important effect. A 5-point scale is used for this question to limit the choices but provides options to indicate if they predominantly find it a strongly positive or strongly negative effect, a neutral effect, or a positive or negative effect.

3.1.2 Best-Worst experiment

The next part of the survey will consist of the best-worst experiment. To measure which effects residents found most important when assessing trees in residential streets, a decision-making method must be selected. The most commonly used stated-preference format is the discrete choice experiment (de Bekker-Grob, Ryan, & Gerard, 2016). A discrete choice experiment provides results on a ratio scale where scale bias is prevented. In a discrete choice experiment, the respondents are asked to evaluate virtual choice situations., where respondents need to select an alternative from a set of various alternatives. The respondents select the alternative based on their preference or any other reason as specified. When multiple attributes are involved, it is called a multi-attribute decision. A multi-attribute decision method finds the weights of the criteria and the alternatives, based on the respondents' preferences.

Based on the respondents' choices, the probabilistic choice can be estimated. This type of experiment provides information on an individual- as well as on a group level and can predict new market situations (Timmermans & Oppewal, 1993). There are many different types and alternatives for a discrete choice experiment. To measure how respondents perceive the level of importance of the various effects of trees in residential streets, the experiment must provide information on an individual level and include the 21 issues derived from the literature study which reflects all the effects residents could perceive from trees in residential streets.

An alternative method for a discrete choice experiment is the best worst scaling method (BWS). The BWS method is a popular method for studying the importance of an issue to an individual or groups of individuals relative to other issues under consideration (Burke, Schunk, Aubusson, Buchanan, & Prescott, 2013). The method was for the first time introduced in 1992 by Finn and Louviere when measuring the public concern about food safety (Finn & Louviere, 1992).

The experiment typically consists of several sets of four or more issues and each participant needs to indicate which issue of the set they consider the most important issue and which the least important issue. When using sets with multiple issues it reduces the number of subsets and increases the compactness of the experiment. So, the number of subsets decreases when the number of issues in a set increases. Every issue is compared once with the other issues. By increasing the frequency, the issues are compared to others, the internal validity increases, and the experiment will be more comprehensive (Cohen E. , 2009).

The outcome of the Best-Worst method shows the level of importance of the effects residents perceive from trees in residential streets. The outcome will also show the scale and intensity of these effects. When the outcome is transformed into relative weights, the final weights of each effect can be assigned, and all effects can be ranked. The ranking will show which effects residents were mainly or barely taken into account when assessing trees in residential streets.

The advantage of this methodology is that it has greater discriminatory power than other scale measures (Sirieix, Remaud, Lockshin, Thach, & Lease, 2011) and allows for better comparisons among different subgroups (Cohen & Neira, 2004). Another advantage of this method is that the BWS is a simple method for respondents and less cognitively demanding compared to a Likert ratings (Burton, Burton, Rigby, Sutherland, & Rhodes, 2019). Agreed by multiple researchers, the method provides rich information about the individual-scale and by providing precise and comparable scales (Burke, Schunk, Aubusson, Buchanan, & Prescott, 2013; Jones, Jones, Edwards-Jones, & Cross, 2013; Louviere & Islam, 2008; Marti, 2012). Another advantage of this method is that it mitigates possible anchoring bias, by selecting two opposite references (best and worst) in a single optimization model (Rezaei, 2020; Cohen & Neira, 2003). Last, the BWS eliminates differences in the way respondents use rating scales and include in the rating style social demographic differences if they exist (Auger, Devinney, & Louviere, 2007).

To conclude, the BWS method is a great method to explore urban residents' perceptions about the perceived effects of trees in residential streets. The BWS also investigates whether similarities and differences can be found between different social demographic groups.

3.1.4 Experiment design

A Best-Worst experiment consists of various sets where respondents need to assess which issues in each set they perceive as the most and as the least important effect of trees in residential streets. But, there are multiple types of best-worst cases (sets), object case, profile case, and multiple profile cases (Flynn & Marley, 2014). Each type differs in nature and complexity. All types will be discussed shortly to demonstrate which one is chosen for this study.

Object-case

This BWS type is the simplest of the three. This type measures the relative weight of the issues compared with each other. It simply compares the issues relative to each other to measure which issue is most or least important. To clarify the differences between the various BWS types, an example is given on laptop choices. Possible issues of a laptop could be; price, speed, weight, size, brand, storage space, etc. The object case only compares the issues' preference and does not take into account the level of the issues, like the amount of storage space or different sizes.

Least preferred issue	Issue	Most preferred issue
X	Screen	
	weight	X
	Storage space	

Profile case

In the profile case, the level of issues is included. The issue's levels are only meaningful when they are forming a profile (Flynn & Marley, 2014). The respondent does not consider the value of the total set but the separate issues of the set to measure their preferences. So, issues have different levels, (amount of storage space, different size) which changes in the profile case. The different levels could be preferred differently by individuals. To illustrate, when a person is choosing a laptop and all the levels of the issues have a very common value, but the laptop is from a very famous brand, that person could argue that the brand is more preferred than a common brand. With the profile case, results could show if there is a specific minimum value required by some issues to satisfy consumers.

Least preferred issue	Issue	Most preferred issue
	Screen: 15 inches	
X	Weight: 5 kg	
	Storage space: 500GB	X
	Brand: Apple	

Multi-profile case

The last type of BWS is the multi-profile case. This type has the most similarities with the general discrete choice experiment (Flynn & Marley, 2014). In a multi-profile case, multiple profiles are shown to have different issues and levels and the respondent needs to select their most prefered profile and their least preferred profile. Here, it is not the issues (with their levels) that will be examined, but a total profile.

Factors	Laptop A	Laptop B	Laptop C
Screen	15 inches	13 inches	17 inches
Weight	5kg	2 KG	3KG
Storage space	500 GB	250 GB	500GB
Brand	Apple	HP	Acer
Least preferred profile	X		
Most preferred profile		X	

Cheung et al (2016) performed a review study on the use of Best-Worst Scaling in the healthcare sector. This study provided insight into and identified trends and systematic analysis of PREFS; Purpose, Respondents, Explanation, Findings, and Significance. Cheung et al. concluded that the object-case and profile-case were mostly used as BWS types.

For this study, the object case will be used to study the respondent's assessment of the importance of the various effects of trees in residential streets. The profile case is not chosen, because the number of issues, 21 effects, is really high and forming sets of 21 issues will result in large profiles, and not every issue contains levels. Next to that, the information that will be gathered is not relevant for the main goal to gain insight into how residents perceive the various effects of trees in residential streets.

In order to design the experiment, a software program needs to be used. Most researchers of the review study from Cheung et al (2016) (27% of the studies) used the Sawtooth software as a design tool for designing the experiment. For this experiment, the Sawtooth software will be used.

Sawtooth Software provides analytical tools that enable researchers to build predictive models of how respondents make decisions and what respondents value the most (Sawtooth, 2021). The company performed several studies on the best design form and the reliability of the BWS experiment (Orme, 2005, 2013). They found that in a BWS experiment, the most important point of interest is the number of issues shown in one choice set (# issues per set) and the number of sets a respondent must consider (# set). When having the right number of issues in a set and the number of sets, the experiment will provide a reliable and significant result. They found a relation between the number of sets, number of issues per set, the total number of issues, and the reliability of the study. Therefore, equation 1 shows the rule of thumb to ensure a reliable BWS experiment:

$$\frac{\#Sets * \#issues\ per\ set}{Total\ \#\ issues} > 3 \qquad (1)$$

They repeatedly ran tests on 300 simulated respondents with different numbers of issues (10, 20, and 30 issues), different issues per set (3, 5, and 7 issues per set), and a different number of sets per test (10, 20, and 30 sets). A total of 27 tests concluded that the minimum show-rate of an issue was distracted as 3 to get a reliable and significant result (Orme, 2005).

This thesis considers 21 issues to be estimated by the respondent. Orme (2005) found that within experiments with 21 issues, the optimal number of issues per set is four or five. More issues per set may lead to respondent fatigue (Sawtooth Software Inclusive, 2013). Every issue appears only once in each set and every issue will be compared the same number of times across all sets (at least 3 times, as shown in formula 1). A minimum of 15 sets is recommended. A higher number, like 20 to 30, sets will gain the best results, but the increased number of sets that respondents need to assess may decrease the value of the results due to the repeated sets respondents need to assess.

Block design

For the BWS experiment, 21 different sets must be created. Sawtooth Software is used to form these sets because it optimizes the BWS experiment according to four points of interest: (Sawtooth Software Inclusive, 2013)

1. Frequency balance: Each issue must appear the same number of times across all sets.
2. Orthogonality: Every issue will be compared to each other issue the same number of times across all sets.
3. Connectivity: A set of issues is connected if they cannot be separated into two groups. This means issues are interconnected if they can be linked through comparisons even though they are not paired as a comparison. For example, issues A, B, C, and D are tested. By testing AB and CD they can be divided into groups and are not connected. If AB, BC, and CD are paired, despite not testing AD interconnectivity is made through comparisons.
4. Positional balance: Each issue appears an equal number of times in every position of the sets.

The issues could simply be randomized across different blocks. But there must be enough blocks, when having a small number of blocks the chance of disconnected design increases.

A balanced incomplete block design (BIBD) is a design that estimates all issues differences with the same precision in order to create all confidence intervals for α_i - α_j with the same width (for any pair of *i,j*). In a BIBD, all pairs of issues occur for the same amount of time (λ). A BIBD is used in this thesis to create the various sets.

The BIBD uses the following notations (Sawtooth Software Inclusive, 2013), in this thesis, the formulations between the brackets are used:

g:	number of treatments	(number of issues)
b:	number of blocks	(number of sets)
k:	number of units per block (k<g)	(number of issues per set)
r:	number of replicates per treatment	(number of times the issues are repeated)
N:	total number of units	(total number of issues in the experiment)
λ:	all pairs of issues occur the same amount of time	

Where:

$$N = b * k = g * r \qquad (2)$$

There is a BIBD for every setting $k<g$ which create all possible subsets $\binom{g}{k}$. This is called an unreduced balanced incomplete block design.

For example:
g = 6 issues
k = 4 issues per set
When applying the binomial coefficient $\binom{6}{4}$ a design of 15 sets is created.

Unfortunately, the unreduced BIBD cannot always be used, the required number of sets might be too large. To create a correct BIBD for a certain desired number of issues, it must require the following condition (Eq. 3):

$$\frac{r * (k-1)}{g-1} = \lambda \qquad (3)$$

Where a treatment occurs in a total of r different sets. Where in each block there are *k – 1* available other issues which creates *r * (k – 1)* issues. This must be divided among the other available issues *(g – 1)* which must give an integer (λ) in order to create a balanced design.

From the literature, 21 effects of trees are found, which form the 21 issues of the survey. As previously explained, the optimal number of issues per set when there are 21 issues included, is four or five issues per set. Creating all possible sets with an unreduced BIBD does not gives an integer (eq. 4), which means that an unreduced BIBD cannot be used.

$$\binom{21}{4} = 5{,}985$$
$$\binom{21}{5} = 20{,}349 \qquad (4)$$

So, a BIBD must be applied. When testing four or five issues per set, where each issue is shown at least 3 times, a BIBD with five issues per set shows the optimal solution. When 5 issues are shown per set, only 21 sets have to be answered by respondents to equally frequent test all issues and pairs of issues to derive results with qualitative data (Table 2).

Table 2. Balanced Incomplete Block design for 21 issues.

Number of issues	*g*	21
Number of sets	*b*	21
Number of issues per set *(k<g)*	*k*	5
Number of times an issue is repeated	*r*	5
Total number of issues	*N*	105

The BIBD is created with the software program R-studio and the software package suppert.bws package (Appendix 2). This software constructs a BIBD that meets the first three-point of interest from Sawtooth Software Inclusive. Each issue appears 5 times across all sets (Frequency balance), every issue is compared to each other issue the same number of times across all sets (Orthogonality), and all sets of issues are connected and cannot be separated into two groups (Connectivity). The last point of interest (positional balance) is not met. Issue 1 is always on the first position and issue 21 is always displayed on the last position. In order to create a positional balance, all issues inside all sets are randomly shuffled to create a new design where all issues are assigned to a random position.

This optimized design meets now all four points of interest. In order to find the level of importance and the relative weight of the effects of trees in residential streets, the respondents need to answer in the survey the following question for all the 21 sets (appendix 1):

Which of the following effects of trees in residential streets do you perceive as the most important effect? And which effect do you perceive as the least important effect?

3.1.5 Attitude toward urban green

The last part of this experiment consists of exploring the features that determine the behaviour of people. Concluding from the literature, people's perception of trees can get influenced by their attitude. This could be determined by people's emotional bond (childhood experience and how people use urban green) and their social demographic characteristics.

The literature concludes that people use urban green in a variety of ways. They predominantly use it for physical activity / exercise, social interaction, cultural activities, and rest and restoration. To make vital and effective planning decisions for urban green it is relevant to investigate how the respondents used urban green.

The following question will be asked in the survey to identify how respondents assess multiple neutral statements that refer to their usage of urban green:

How would you scale the following statements on a 5-point scale?

(1 = strongly disagree and 5 = strongly agree)

I use urban green in my neighbourhood to relax
I use urban green in my neighbourhood for recreation
I use urban green in my neighbourhood for social contacts
I use urban green in my neighbourhood for cultural activities
I use urban green in my neighbourhood for physical activities/exercise
I use urban green in my neighbourhood to enjoy nature
Urban green in my neighbourhood is crucial to my quality of life

With this 5-point Likert scale, respondents can indicate how they assess various statements according to their attitude. Where 1 indicated that the respondent strongly disagrees with the statement and 5 indicated that they strongly agree with the statement. A 5-point Likert scale is used because it is a simple method to understand by providing enough options that give insight into how respondents are thinking and feeling about the statement and by including a neutral option, without becoming overwhelmed. A 5-point scale is also less time and effort conceiving to complete than higher-point scales.

Second, people's social demographic characteristics influence how people perceive trees and their level of importance. The social demographic characteristics gender, age, income level, education level, and migration will be asked. With this information the respondents data can be analysed according to their social demographic differences and differences between social groups in their assessment of trees in residential streets can be found. The categories of the Dutch Central Office of Statistics (in Dutch: Centraal Bureau van de Statistiek) are used to form the answer options. The questions can be found in the last part, part 3, of the survey in appendix 1.

The insight into how respondents use urban green and their social characteristics gives a deeper insight into the collected data. Relations can be researched and decisions and strategies can be formed that match people's different attitudes. In table 3, the variables with their description and their measurement scales are explained.

Table 3. Features that included influences the choice behaviour of residents when assessing trees.

Variable	Description	Measurement scale
Childhood experience	Place of growing up	Categorical
Usage of urban green	Measuring the scale of usefulness of urban green	Five-point Likert
Age	Number of years since birth	Categorical
Gender	Respondents' gender	Categorical
Income	Total annual household income before taxes	Categorical
Education level	Highest academic achievement	Categorical
Origin	Continent of origin	Categorical

3.2 Research population

The section describes the research population. First, the respondent's requirements will be described. Second, the respondent's recruitment will describe how the respondents are reached.

3.2.1 Respondents requirements

For this research, everyone that lives in an urban area is included to explore how urban residents perceived the effects of trees in residential streets. So, residents that live in an urban area in the Netherlands who are 18 years old or older are included in this research.

3.2.2. Recruitment of respondents

The respondents for this research are reached by using social media; Linked In, Facebook, Whatsapp, and mail. I used my social and work network and distributed the survey to TU/e students and employees. By using my network, the data that will be gathered will come from a convenience sample. A convenience sample arises when the researcher selects respondents based on proximity and doesn't consider whether they represent the entire population or not. A convenience sample is selected because it is practically impossible to reach the entire population. A convenience sample has multiple benefits, data can be collected quicker, it is less expensive to create samples, easier to research, lower cost, and the sample is readily available. A convenience sample can be used to observe habits, opinions, and viewpoints in the easiest possible manner. A convenience sample has also a disadvantage, the data that will be collected will be biased. The bias will occur because the respondents in a convenience sample are likely to be the same. Therefore, we cannot state that the sample data reflect the Dutch population and we need to be careful with the interpretation of the data.

3.3 Analysis methods

There are different methods to analyse the data that is obtained with the questionnaire. In this section, the chosen methods are described.

With the best-worst method, the data of the survey can be analysed on an individual level as well as on a group level. The number of respondents is high, therefore it will be inconvenient to study all the data on an individual level. The data will be studied in its entirety and respondents will be clustered according to their social demographic characteristics to explore if differences can be found between various social groups.

3.3.1 Descriptive analysis

The first analysis that will be performed is a descriptive analysis. The descriptive analysis will describe the characteristics of the participants, the participants' affective response towards the various perceived effects of trees and what their attitude is toward urban green. Different graphics are used (bar charts, and frequency tables) to show the data.

From the data that is retrieved from the question *'How would you perceive the following effects of trees in residential streets?'*, an additional descriptive analysis will be performed to find the mean score of every effect. The effects will be clustered according to their value respondents assessed to them in the survey.

The cluster groups correspond to the 5-point likelihood categories; strongly positive, positive, neutral, negative, and strongly negative. The effects are arranged according to their mean score. When there are in total m groups, in this case 5, and their minimum and maximum score stretch from x to y, 1 to 5, the scores can range in every group between 5/(5-1)= 0,8. This means that the means scores in the first group range from 1 to 1,8, representing the strongly negative group. The means scores in the second group range from 1,8 to 2,6, representing the negative group. The other groups are explained in table 4. By clustering all the respondents according to their positiveness, it can be easily seen how the effects are perceived on average. This data can be combined with the importance level of all attributes to see how the effects are perceived in relation to the level of importance.

Table 4. Cluster groups according to their mean score

Group	Name	Mean score range
1	Strongly negative	1 to 1.8
2	Negative	1.8 to 2.6
3	Neutral	2.6 to 3.4
4	Positive	3.4 to 4.2
5	Strongly positive	4.2 to 5

3.3.2 Correlation analyses

The second analysis that will be performed is a correlation analysis. The correlation between respondents' affective response and respondents' attitudes and social demographic characteristics are analysed to find out if there are relations between the respondent's affective response towards the various effects of trees and how they used urban green or their emotional bond, or if there is a relation with the social characteristics. The statistic program SPSS is used for this analysis. Spearman's correlation is used in SPSS because both variables are ordinal, meaning they are not continuous. A correlation ranges from -1 to 1, meaning the closer relation to -1 or 1, the stronger the relation. A positive relationship can be assumed as followed; when respondents were more positive about effect x, respondents were more likely to use the urban green for usage y. Or, when respondents were more positive about effect x, respondents had a higher level of education. For the social characteristics group gender, dummy variables were used to analyse the correlations.

3.3.3 Analysis of the BWS

The last analysis that will be performed is the analysis to find the relative weight of the effect by determining their Best-Worst scores. All the participants were asked to assess all the 21 sets. Where they were asked to indicate which issue of the set they considered as the "most important" effect of trees in residential streets and which effect of trees in residential streets they considered as "least important”. Two methods will be used to strengthen the conclusion, the counting approach, and the modelling approach.

Counting approach

The easiest and most used method to analyse the Best-West scoring is the counting approach: Simple Summary Statistics (Flynn & Marley, 2014). With this method, the individual-level scale is calculated by taking the number of times an issue is considered “best” (most important effect) by that respondent and subtracting the number of times the respondent considered the issue as “worst” (least important effect) (Eq. 5). This method provides quick insight into the scores of the different issues.

The individual-level scales for each issue range from +5 to -5, because a respondent can only assess every issue 5 times. A positive score implies that the attribute is chosen more times as the most important one. The value of +4 appears when an individual selects an issue four times as the most important effect (best) and one time as the least important effect (worst). In contrast, a negative score shows that the respondents’ importance levels are not affected by it. -1 will appear when an individual selected an issue three times as the least important effect (worst) and two times as the most important effect (best). The following equations show how the best-worst scores are calculated:

$$BW_{ij} = B_{ij} - W_{ij} \tag{5}$$

$$BW_i = B_i - W_i \tag{6}$$

$$std.BW_i = \frac{BW_i}{Nr} \tag{7}$$

$$sqrt.BW_i = \sqrt{\frac{B_i}{W_i}} \tag{8}$$

$$std.sqrt.BW_i = \frac{sqrt.BW_i}{max.sqrt.BW} \tag{9}$$

Where:

B_i	=	number times issue i is chosen as the most important
B_{ij}	=	number times issue i is chosen as the most important by respondent j
W_i	=	number times attribute i is chosen as the least important
BW_i	=	mean-score of issue i
N	=	number of respondents
r	=	number of replications of each issue

As previously explained, analysing the data on an individual level is inconvenient. So, the overall score of all the participants is also calculated. The overall score is calculated by subtracting the times the issue is considered ‘least important’ from the times the issue is considered ‘most important’ by all respondents (Eq. 6). This score is called the B-W score.

A simple and quick examination of the relative values is to simply rank order the issues scores from high to low, it compared the average of the simple B-W scores. This score is easily comparable across the entire sample. For convenience, the scores will be standardized (Eq. 7) to make the BW-scores easy to understand. Here, the total number of respondents multiplied by the total number of times issue *i* is presented to the respondents, divided by the B-W mean score of issue *i*. This standardized score ranges from +1 to -1.

To determine the relative importance of different issues, the standardized square root (std.sqrt.BW_i) must be computed. This standardized square root gives per issue a score that can be compared across all issue scores. The std.sqrt.BW score can be interpreted as follows; when issue x has a score of 2 and is compared to issue *y* with a score of 0.5, you can say issue *x* is four times as important as issue *y*.

The modelling approach: Aggregate Conditional Logit

Aggregate Conditional Logit (ACL) is an additional method to the counting approach which assesses the quality of the experimental design. With the ACL the average level of importance of the respondents can be estimated. The ACL treats the data of all respondents as it was a single respondent who conducted one very long survey.

There are *m* issues in a choice set, in this study, there are five issues per choice set/questions. The number of possible pairs equals to *m*(m-1). Here,* issue *i* is selected as the most important and issue *j* as the least important in one choice set of *m* issues, wherein *i* is not equal to *j.* In this study, the total number of possible pairs, *5*(5-1),* is 20. The possibility to select an issue over another issue is expressed in the utility of each issue. The utility consists of two parts, the systematic utility, and the stochastic components. The higher the utility, the higher the change a respondent will choose this issue as most important (Flynn & Marley, 2014).

The analysis is based on two assumptions which form the condition that a conditional logit (CL) model (Eq. 10) can be expressed as the probability of selecting issue *i* as the most important and issue j as the least important. 1) The difference in utility between the two issues *i* and *j* represent the greatest utility difference *(exp* $(v_i - v_j)$ when a respondent selects *i* as most important and *j* as least important. 2) The stochastic components are Gumbel distributed.

$$Pr(i,j) = \frac{exp(v_i - v_j)}{\sum_{k=1}^{m} \sum_{t=1,l \neq k}^{m} exp(v_i - v_j)} \tag{10}$$

Within equation 10, the highest utility between the chosen most important effect and chosen least important effect is represented as $exp(v_i - v_j)$, the numerator. To estimate the utility with a Clogit model, an issue must be normalised. Meaning that the utility of that issue has to be fixed to zero. Now, the other issues can be compared to the normalized issue and the issues can be compared to each other. The issue that is most likely to be normalised is the issue with the most average utility score of all issues (Flynn & Marley, 2014). Each utility score is converted into a 'share of preference' score (SP). The share of preferences shows probability that an effect is chosen as the most important effect. With the share of preference, the reliability of the outcome can be checked. The share of preference of issue i (SP_i) is based on the CLogit model choice rule of Flynn & Marley (2014). In this thesis, not the preference is asked of the effects but their level of importance. Therefore, the term share of preference will be replaced by the share of importance (SI).

$$SP_i = \frac{exp(v_i)}{\sum_{j=1}^{m} exp(v_j)} \tag{11}$$

The Conditional Logit coefficient shows the relative importance of the issues, in this thesis the relative importance of the 21 effects. In addition to the standardized square root of the counting approach which can calculate the scores on an individual level, the modelling approach has two extra benefits while it can only provide the average scores of all respondents. The modelling approach test if each coefficient differs statistically from zero simultaneously while estimating the model. Second, the modelling approach can consider if the average response corresponds to the literature.

Chapter 4

Results & analyses

This chapter will present the gathered data and its analysis. First, the respondents will be analysed by their social demographic characteristics; gender, age, income level, educational level, and migration background. Second, their attitude towards urban green will be analysed, followed, by an analysis that shows the respondents' affective response and their relevance towards the perceived effects of trees in residential streets. The chapter ends with multiple analyses that studies the influences of the respondent's social characteristics and their attitude on the affective response and level of importance of the perceived effects of trees in streets.

4.1 Social-demographic descriptives

The questionnaire was distributed in February 2022. The questionnaire was spread by WhatsApp, LinkedIn, and Email to my social, work, and school network. In total, the online questionnaire was opened 375 times. Of the 375 respondents, 238 respondents answered all the questions of the survey, and none of these cases had any missing value. The 238 cases were included in this study, corresponding to an overall completion rate of 63.6%.

Table 5 shows the social-demographic descriptives of the data sample. Of the respondents that participated in the online survey, the number of males (123) slightly exceeded the number of females (112). 3 respondents did not prefer to indicate their gender. This led to a cover of 47.1% female and 51.7% male. The age groups 25-34 were represented the most (25.6%), followed by the age groups 55-65 (23.9%) and 45-54 (20.2%). The age groups 18-24 and ≥65 were almost equally represented with 10.9% and 10.5%. The least presented groups were the respondents with the age of 35 to 44 years old (8.8%). When looking at the income of the respondents, the income group ≥ 3,000 exceeded all other groups with 60.1%, followed by the income groups 2,000-3,000 with (12.2%). 10.5% did not want to give their income level. When looking at the standardised income per household in the Netherlands, which is €29,500 per year or €2,450 per month (CBS, 2018), 72.3% of the respondents exceeded that income which concludes that most of the respondents in this study had a high income.

Most of the respondents in this study had a higher education level. Almost 50% of the respondents has an HBO-, WO Master, or a PhD. 32.8% of the respondents have an HBO Bachelor. The education groups that were less represented are the Secondary education group (8.8%) MBO (5.0%) and the WO-Bachelor (3.8%). Almost all respondents have a Dutch nationality (97.5%), and only 2.5% had a migration background.

The Chi-square test is performed to check if the data sample represented the Dutch population. variables had an identical distributions in the two populations (sample data and Dutch population). This method is used because it can test whether two population are independent. When the data sample is compared to the total Dutch population, it can be concluded that the studied population does not represent the Dutch population. According to the Chi-square test (Table A4.1) the migration background between the sample data and the Dutch population were equal. For all the other groups, the two samples were not independent. Due to the fact that the sample population did not represent the Dutch population, we need to be careful with the interpretation of the results.

Table 5. Social-demographic descriptive

	Frequency	Percent	Valid Percent	Cumulative Percent	Dutch population percentage (CBS, 2021)	Chi-square test p-value
Gender						
Female	112	47.1	47.1	47.5	50.3	
Male	123	51.7	51.7	99.6	49.7	
Prefer Not To Say	3	1.2	1.2	100	-	
Total	*238*	*100*	*100*			*>0.1*
Age						
18-24	26	10.9	10.9	10.9	8.8	
25-34	61	25.6	25.6	36.5	12.9	
35-44	21	8.8	8.8	45.3	11.9	
45-54	48	20.2	20.2	65.5	13.8	
55-64	57	23.9	23.9	89.4	13.7	
≥ 65	25	10.5	10.5	100	38.7	
Total	*238*	*100*	*100*			*1.00*
Income						
< 1.000	10	4.2	4.2	4.2	5.1	
1.000 – 1.500	5	2.1	2.1	66.4	12.5	
1.500 – 2.000	5	2.1	2.1	68.5	19.2	
2.000 – 2.500	21	8.8	8.8	77.3	17.8	
2.500 – 3.000	29	12.2	12.2	89.5	16.0	
≥ 3.000	143	60.1	60.1	64.3	29.4	
No Answer	25	10.5	10.5	100	-	
Total	*238*	*100*	*100*			*1.00*
Education Level						
Secondary Education	21	8.8	8.8	8.8	8.7	
MBO	12	5.0	5.0	13.9	1.6	
HBO-Bachelor	78	32.8	32.8	46.6	35.8	
WO-Bachelor	9	3.8	3.8	50.4	21.5	
HBO-, WO Master, Dr	118	49.6	49.6	100.0	12.7	
Total	*238*	*100.0*	*100.0*		*100*	*1.00*
Migration background						
Dutch Origin	232	97.5	97.5	97.5	75.4	
Other	6	2.5	2.5	100.0	24.6	
Africa	1	0.4	0.4	97.9	4.5	
Asia	1	0.4	0.4	98.3	4.2	
Australia, New Zealand And Oceania	1	0.4	0.4	98.8	0.18	
Dutch Caribbean	1	0.4	0.4	99.2	-	
Europe (Exl The Netherlands)	2	0.8	0.8	100.0	10.3	
Total	*238*	*100.0*	*100.0*			*<0.01*

4.2 Attitude towards urban green

This section will analyse the respondents' attitude to urban green. The literature indicates that the respondents' attitude (their emotional bond and place of growing up) toward urban green influences the respondents' affective response to the effects of tress. This emotional bond is based on their childhood experience and usefulness of urban green (section 2.6). Respondents' attitude toward how they used (emotional bond) urban green was measured on a 5-point Likert scale with various statements. A statement from the survey is; I use the urban green spaces in my neighbourhood for relaxation. Next to that, the respondents needed to identify where they grew up. The data retrieved in this part of the survey is used to explore to what extent the respondents' attitudes towards urban green and their place of growing up influenced how respondents perceive the effects.

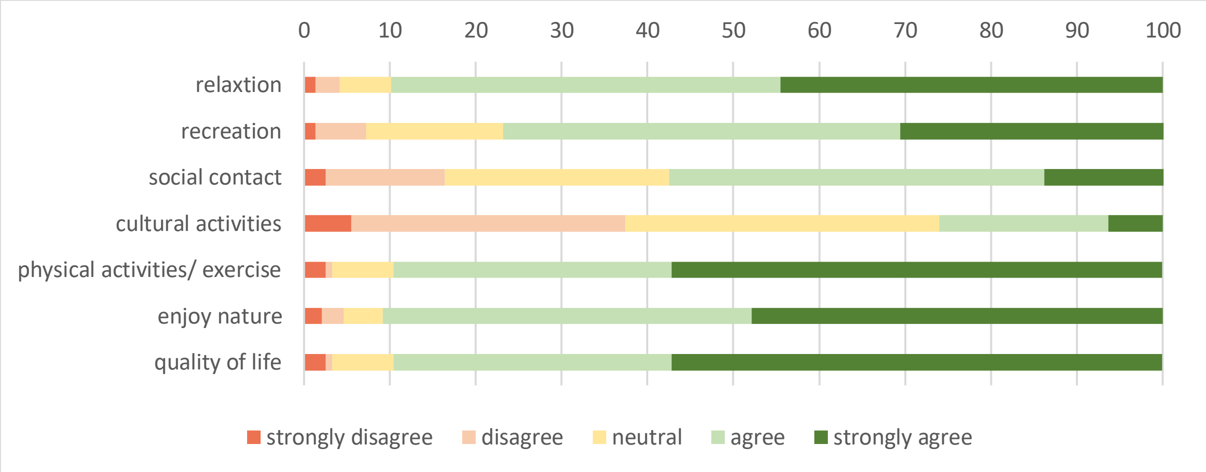


Figure 9. Respondent's usage of urban green in percentages

Figure 9 shows the respondents' usage of urban green in percentages of level of agreement with the statements. It can be concluded that the respondents prefer to enjoy nature (90.8% agree and strongly agree), to use urban green for relaxation (89.9% agree and strongly agree), for physical activities/ exercise (89.5% agree and strongly agree), and to increase their quality of life (89.5% agree and strongly agree). Less preferred reasons to use urban green are for recreation (76.9% agree and strongly agree) and social contact (57.6 % agree and strongly agree). The least preferred reason to use urban green is for cultural activities (26% agree and strongly agree).

Table 6. Respondents' place of raising

Grow Up				
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
City (Centre)	36	15.1	15.1	15.1
City (Suburb)	83	34.9	34.9	50
Town	94	39.5	39.5	89.5
Countryside	25	10.5	10.5	100
Total	*238*	*100*	*100*	

Secondly, the area respondents were raised is analysed. The literature indicates that when people were raised in a more rural environment, they would be more positive towards urban green. Table 6 shows the respondents' place of raising. Most of the respondents were raised in a town (39.5%) or the suburbs of a city (34.9%). The least represented group was the city (centre) (15.1%) followed by the countryside group with 10.5%. This means that most of the respondents grew up in a semi-urban environment. In the next section the correlation between the respondents' affective response, their usage of urban green, and their place of raising will be analysed.

4.3 Analysing the respondents' affective response toward the effects of trees

4.3.1 Affective response toward the perceived effects of trees

The first part of the survey consisted of questions that asked the respondents what their affective response was to the effects of trees in residential streets. This was measured on a 5-point Likert scale, ranging from strongly negative to strongly positive. The data that is retrieved from this part will be analysed in this section. First, a descriptive analysis is made of how the respondents perceived the 21 effects by taking into account their affective response to the effects of trees, followed by correlation analysis and a calculation of the average score which will be used in the best-worst experiment analysis.

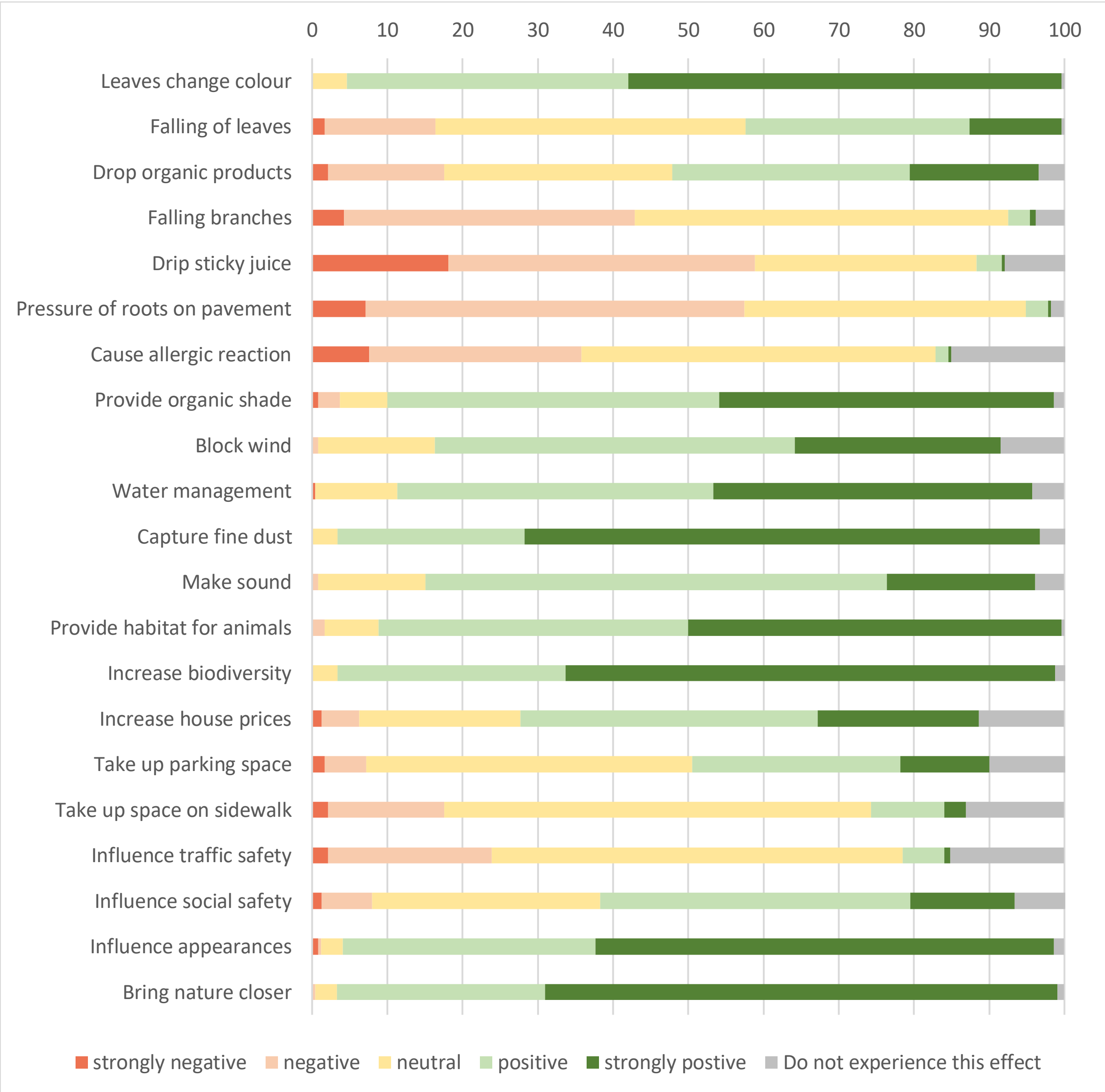


Figure 10. Respondent's affective response to the perceived effects of trees in residential streets in percentages.

The results are shown in figure 10 and show the respondent's affective response to the effects of trees in residential streets in percentages. Residents perceive the effect 'Trees bring nature closer' as the most positive effect of trees, 95.8% of the respondents perceived this effect as positive or strongly positive, followed by 'Trees increase biodiversity' (95.4%), 'The leaves of trees change colour' (95%), 'Trees influence the appearances' (94.5%), 'Trees capture fine dust' (93.3%), 'Trees provide an habitat for animals' (90.8%) and 'Trees provide organic shade' (88.6%). Effects that were perceived as generally positive were 'Trees influence the water management' (84.4%), 'Trees make sound' (81%), 'Trees block wind' (75.2%), 'Trees increase house prices' (60.9%) and 'Trees influence the social safety' (55.1%).

The respondents perceived 'The roots of trees exert pressure on pavement' (57.5% negative or strongly negative) and 'Branches fall from trees' (42.9%) as negative effects, with 'Trees drip sticky juice' (58.9%) as the most negative effect of trees. More neutral effects were 'Trees take up space on sidewalk' (56.7% neutral on the statement), 'Trees influence traffic safety' (54.6% neutral on the statement), 'Trees can release pollen' (47.1% neutral on the statement), 'Trees take up parking space' (43.3% neutral on the statement), and 'Leave fall from trees' (41.2% neutral on the statement).

4.3.2 Affective relevance score

In this study the effects affective response and level of importance will be analysed. To effectively combine these two variables, the affective response score should be transformed to an average affective response score (ARS). The program SPSS is used to find the average ARS of all respondents. The results are shown in Table 7. The respondents that did not experience any effect were left out of this analysis because they had no value. When a zero value or neutral value would be assigned to them, the average score will be affected the average ARS (positively or negatively). For example, the effect 'Trees cause an allergic reaction', will not affect all respondents because not everyone has hay fever. Moreover, in well-maintained streets, some effects do not apply. When including the respondents that did not experience an effect will affect the outcome. Therefore, in further analyses where the mean affected relevance score is used the respondents that did not experience an effect were excluded.

Table 7. Means affective response scores of the perceived effects of trees, including their meaning

Effects of trees	N	Minimum	Maximum	Mean	Std. Deviation	Value
Capture fine dust	237	3	5	4.67	0.539	Strongly positive
Bring nature closer	236	2	5	4.65	0.560	Strongly positive
Increase biodiversity	235	3	5	4.63	0.551	Strongly positive
Influence appearances	235	1	5	4.55	0.661	Strongly positive
Leaves change colour	237	3	5	4.53	0.586	Strongly positive
Provide habitat for animals	237	2	5	4.39	0.697	Positive
Water management	228	1	5	4.32	0.706	Positive
Provide organic shade	235	1	5	4.30	0.789	Positive
Block wind	218	2	5	4.11	0.703	Positive
Make sound	229	2	5	4.04	0.624	Positive
Increase house prices	211	1	5	3.84	0.905	Positive
Influence social safety	222	1	5	3.64	0.870	Positive
Drop organic products	230	1	5	3.48	1.031	Positive
Take up parking space	214	1	5	3.47	0.865	Positive
Falling leaves	237	1	5	3.36	0.936	Neutral
Take up space on sidewalk	207	1	5	2.95	0.722	Neutral
Influence traffic safety	202	1	5	2.78	0.643	Neutral
Falling branches	229	1	5	2.56	0.670	Negative
Cause allergic reaction	202	1	5	2.52	0.707	Negative
Pressure of roots on pavement	234	1	5	2.38	0.684	Negative
Drip sticky juice	219	1	5	2.21	0.814	Negative
Valid N (listwise)	132					

The higher the mean score of the effect, the more positive respondents were toward that effect of trees in residential streets. The effects with the highest score were 'Trees capture fine dust' (4.67), followed by 'Trees bring nature closer' (4.65) and 'Trees increase biodiversity' (4.63) meaning that these effects were perceived as strongly positive effects. The effects 'Trees drip sticky juice' (2.21) and 'The roots of trees exert pressure on pavement' (2.38) were perceived as the least positive effects from trees. When looking at the standard deviation, it seems that on the effects with the highest positivity level the respondents were also more in line with each other. The standard deviation for these effects is smaller, meaning that the respondents perceived the strongly positive effects more similarly.

The effects are also arranged into the 5-point Likert categories from section 3.3.2 by using their mean score, the last column in table 7. These results will be used in the next analyses where the affective response to the effects of trees is analysed in relation to their level of importance. What stands out is that 15 effects were perceived as positive or higher, and that there are no strongly negative effect, meaning that on average the respondents were positive about the effects of trees in residential streets.

4.4 Results Best-Worst Experiment

4.4.1 Relevance of the perceived effects of trees

The data from the best-worst questions, the second part of the survey, are analysed in this part. Here, the respondents needed to identify which effects they perceived as the most and the least important for all the 21 choice sets. The analysis will be performed as described in section 3.3.3, the R-studio code results can be found in appendix 3. First, the counting approach will be analysed by the simple summary statistics. Second, the modelling approach will be conducted and analysed.

All the 238 respondents have completed the stated-choice experiment with the 21 best-worst questions. The total data consist of 4998 best scores and 4998 worst scores. The R-package Support.bws is used to analyse this data which results in table 8. The Best column shows the number of times an effect is chosen as the most important effect of the 5 choice options as the Worst-column shows the number of times an effect is chosen as the least important effect of the 5 choice options. Every effect is shown 5 times to each respondent, resulting in a total of 1190 appearances in total.

The effects 'Trees provide organic shade' and 'Trees increase biodiversity' have been chosen 27.2% and 30.6% of the time as the most important effects when asking respondents which effects they perceived as the most important and least important effects of trees. The other scores in the table are calculated by using the formulas that were explained in section 3.3.2. The last column ranked the effects in importance, indicating that the effect in the first place is the most important effect of trees considered by residents and the effects in the 21ste place, the last place, is the least important effect from trees. As shown in the table 'Trees provide organic shade' is the most important effect of trees and 'Block wind' is the least important effect of trees in residential streets considered by residents.

In addition to table 8, a bar chart is made to show the standardized best-worst score combined with the affective response scores (Figure 11). The negative scores have less than average importance, while all positive scores are more important than average. 'Trees provide organic shade' (0.132) was the most important effect and is considered a positive effect of trees, and 'Trees increase biodiversity' (0.124) was perceived as a strongly positive effect. The least important effects were 'Trees block wind' (-0.153) and 'Trees make sound' (-0.113) and were both perceived as positive effects.

Table 8. Summary of aggregated best-worst scores of all respondents

Effects of trees	Best	Worst	% Best	% Worst	B-W score	std bw	sqr bw	st. sq. bw	Ranking (best)
Provide organic shade	324	167	27.2	14.0	157	0.132	1.393	1.000	1
Increase biodiversity	364	216	30.6	18.2	148	0.124	1.298	0.932	2
Influence appearances	305	229	25.6	19.2	76	0.064	1.154	0.829	3
Bring nature closer	306	232	25.7	19.5	74	0.062	1.148	0.825	4
Leaves change colour	266	202	22.4	17.0	64	0.054	1.148	0.824	5
Influence social safety	294	248	24.7	20.8	46	0.039	1.089	0.782	6
Provide habitat for animals	161	132	13.5	11.1	29	0.024	1.104	0.793	7
Take up space on sidewalk	266	240	22.4	20.2	26	0.022	1.053	0.756	8
Influence traffic safety	276	265	23.2	22.3	11	0.009	1.021	0.733	9
Falling branches	180	182	15.1	15.3	-2	-0.002	0.994	0.714	10
Increase house prices	223	227	18.7	19.1	-4	-0.003	0.991	0.712	11
Take up parking space	257	269	21.6	22.6	-12	-0.010	0.977	0.702	12
Pressure of roots on pavement	166	179	13.9	15.0	-13	-0.011	0.963	0.691	13
Drop organic products	181	197	15.2	16.6	-16	-0.013	0.959	0.688	14
Cause allergic reactions	154	188	12.9	15.8	-34	-0.029	0.905	0.650	15
Drip sticky juice	220	272	18.5	22.9	-52	-0.044	0.899	0.646	16
Water management	187	246	15.7	20.7	-59	-0.050	0.872	0.626	17
Air purification	270	331	22.7	27.8	-61	-0.051	0.903	0.648	18
Falling of leaves	181	243	15.2	20.4	-62	-0.052	0.863	0.620	19
Make sound	286	420	24.0	35.3	-134	-0.113	0.825	0.592	20
Block wind	131	313	11.0	26.3	-182	-0.153	0.647	0.464	21

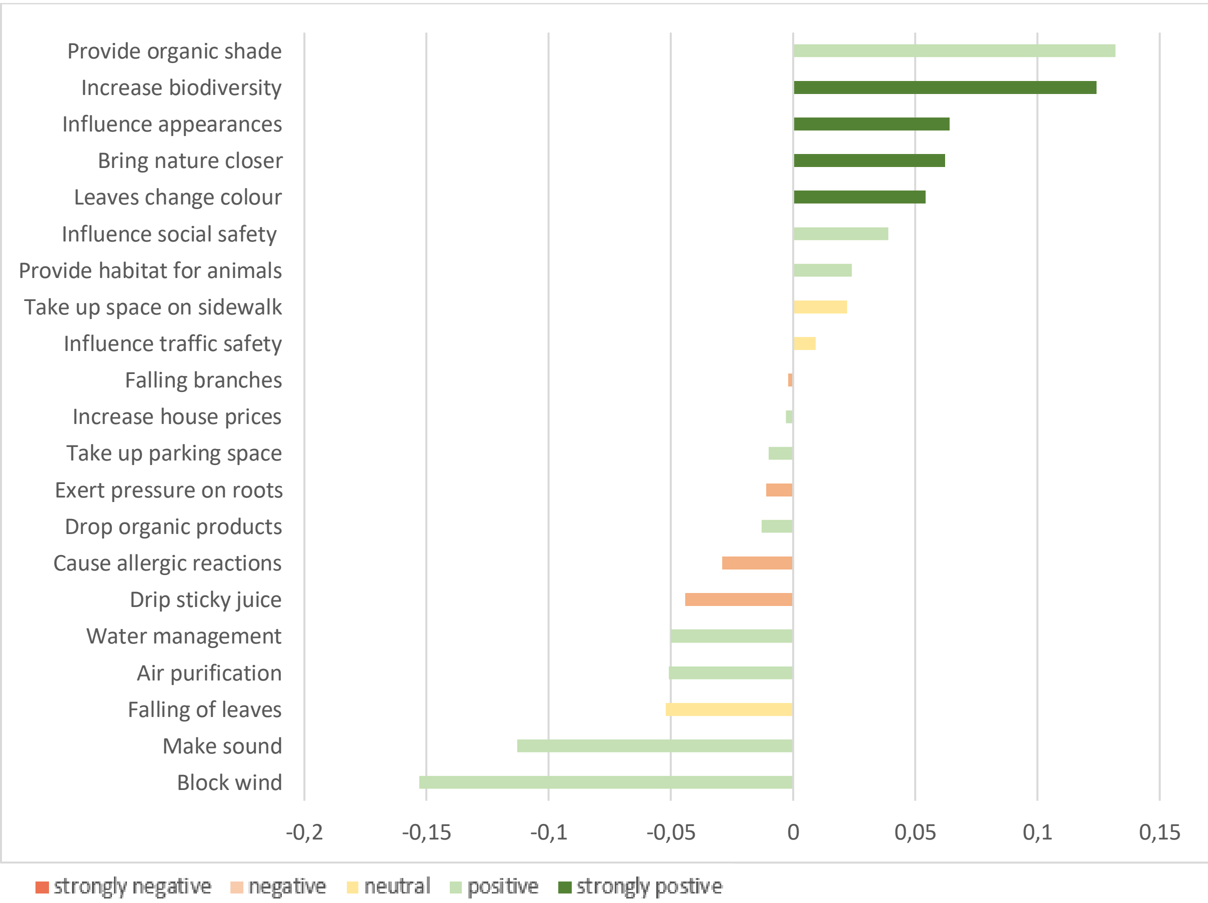


Figure 11. Importance and affective response per effect of urban trees based on the best-worst scores

With the Survival package in R-studio the modelling approach is performed. The modelling approach computes the C-logit and the share of importance. For this C-logit score, an effect must be normalized in order to compare all effects to each other. The most logical choice is to select the effect with the most average effect coefficient. In this case, it is the effect 'Increase house prices' that scores the most average and is therefore selected as a normalised score. All other scores will be compared to this effect.

The outcome of the modelling approach is shown in table 9. Here, the effects are displayed in the various rows, and the columns present data about the various effects. The coefficient represents the estimated coefficient calculated with equation 10. In addition to the coefficient, R studio gives the z-value and the p-value under the null hypothesis, in which the coefficient is zero. It shows if the effect is significantly different in importance than the normalised effect.

The effects with a positive coefficient suggest that these effects are more important than the normalized effect 'Trees increase house prices'. The effects 'Trees influence social safety', 'Trees provide an habitat for animals', 'Trees take up space on sidewalk', 'Trees influence traffic safety' and 'Branches fall from trees' are despite their positive coefficient not significantly different in importance than 'Trees increase house prices'. The negative coefficient suggests that the effects are less important than the normalized effect. Here, only the effects 'Trees make sound' and 'Trees block wind' significantly differ in importance from the effect 'Trees increase house prices'.

Table 9. Aggregate conditional logit of all respondents

Effects of trees		Coefficient	z	p
1	Provide organic shade	0.337	5.277	**0.000
2	Increase biodiversity	0.318	4.990	**0.000
3	Influence appearances	0.172	2.705	**0.007
4	Bring nature closer	0.168	2.643	**0.008
5	Leaves change colour	0.148	2.321	*0.020
6	Influence social safety	0.112	1.753	0.080
7	Provide habitat for animals	0.071	1.120	0.263
8	Take up space on sidewalk	0.046	0.727	0.467
9	Influence traffic safety	0.016	0.254	0.799
10	Falling branches	0.014	0.222	0.824
11	Increase house prices	0.000		
12	Take up parking space	-0.002	-0.037	0.971
13	Pressure of roots on pavement	-0.014	-0.216	0.829
14	Drop organic products	-0.041	-0.691	0.489
15	Cause allergic reactions	-0.050	-0.787	0.431
16	Drip sticky juice	-0.087	-1.359	0.174
17	Water management	-0.101	-1.579	0.114
18	Air purification	-0.105	-1.645	0.100
19	Falling of leaves	-0.107	-1.677	0.094
20	Make sound	-0.158	-2.274	*0.023
21	Block wind	-0.350	-5.487	**0.000
** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).				

Figure 12 shows the relation between de standardised best-worst score and the C-logit score. With the usage of the program SPSS the correlation between these two scores is computed. The counting approach has a positive correlation of 0.990 with a p-value of less than 0.01 with the modelling approach. This gives that there is a strong relationship between the scores, meaning that both methods support similar outcomes which strengthens the conclusions.

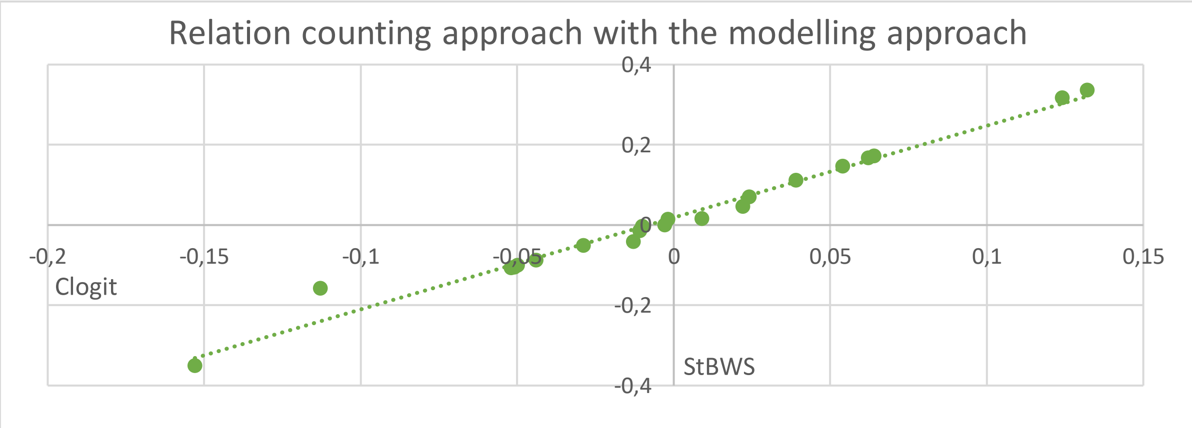


Figure 12. Relationship between the standardized BW scores and the conditional logit

Table 10. Share of importance of the effects

	Effects of trees	Share	%
1	Provide organic shade	0.065	6.5%
2	Increase biodiversity	0.064	6.4%
3	Influence appearances	0.055	5.5%
4	Bring nature closer	0.055	5.5%
5	Leaves change colour	0.054	5.4%
6	Influence social safety	0.052	5.2%
7	Provide habitat for animals	0.050	5.0%
8	Take up space on sidewalk	0.048	4.8%
9	Influence traffic safety	0.047	4.7%
10	Falling branches	0.047	4.7%
11	Increase house prices	0.046	4.6%
12	Take up parking space	0.046	4.6%
13	Pressure of roots on pavement	0.046	4.6%
14	Drop organic products	0.044	4.4%
15	Cause allergic reactions	0.044	4.4%
16	Drip sticky juice	0.042	4.2%
17	Water management	0.042	4.2%
18	Air purification	0.042	4.2%
19	Falling of leaves	0.042	4.2%
20	Make sound	0.039	3.9%
21	Block wind	0.033	3.3%

The share of importance of each effect is estimated with equation 11 from section 3.3.3. The share of importance for each effect can be calculated as the forecasted probability that each effect is chosen as the most important effect. The outcome is shown in table 10. The outcome of the share of importance follows the same rank order as the standardized BW-score which means that 'Trees provide organic shade' is with a share of importance of 6.4% on average the most important effect of trees in residential streets. The least important effects from the BW-score have also the least shares in importance. The effects 'Trees make sound' (3.9%) and 'Trees block wind' (3.3%) have less than 4% shares in judgement. The share of importance can be interpreted as; the effect 'Trees increases biodiversity' is approximately 2 times as likely to be selected as most important effect than the effect 'Trees block wind' (=0.065/0.033). And approximately 1,5 times likely to be selected as most important than the effect 'Trees drop organic products' (=0.065/0.044).

4.4.2 Relation between the affective response and importance level

In order to check if the affective response had a relation with the best-worst score, a correlation analysis was performed. The only effect that showed a relation between its affective response score and best-worst score was the effect 'Trees provide organic shade' (0.149) and 'Trees influence the social safety' (0.167)(Table A4.4). Meaning, that when the affective response score of the effects increases the importance level of these effects also increases. Both effects show a positive weak correlation, meaning that when an respondent were more positive about these effects, the relative importance increases as well.

4.5 The effect of storm Eunice.

During the execution of the survey, there was a storm in the Netherlands, called Eunice. This storm is one of the three heaviest storms in the past 50 years. The storm took place on Friday the 18th of February in 2022 with the heaviest gusts between 3 pm to 2 am on the 19th of February (KNMI, 2022). To see if people experience the effects of trees differently after a severe weather event like a storm, the data before the storm is separated from the data that was collected during / after the storm. The data during the storm and after the storm is combined because the effects from the storm could influence the perceived effects of trees in residential streets a lot longer than only during the storm. For example, the damage that was caused by trees during the storm could remain visible and influential in the streets, for instance in the form of fallen branches that can cause injuries.

To see if the storm affected how residents experienced the perceived effects of trees in residential streets, the data from before the storm will be compared with the data that is retrieved during and after the storm. Group 1 represents the respondents that filled in the survey before the storm and group 2 represents the respondents that filled in the survey during and after the storm. The same analysis techniques are used as described in section 3.3.3, and in addition, the difference between the groups will be analysed by conducting an independent sample t-test. Table A4.5 shows the outcomes of the counting approach and modelling approach were the best-worst scores, the coefficients from the C-logit score, the shares of importance (SI), and the mean affective response score (ARS) are shown. For the C-logit score, an effect must be normalised in order to compare the level of importance of all effects. The normalising effect is once again 'Trees increase housing price', to ensure a consequent normalized effect in the whole analysis. Two correlation analyses were performed between the counting and modelling approach of both groups to check the robustness of the outcome between both approaches. Group 1 shows a correlation of 0.555 and for group 2 there is a correlation found of 0.765. This shows that both groups, showed similar outcomes. Group 2 had a stronger relations, meaning that for group 2 both methods support more similar outcomes than group 1.

To check if the differences between the two groups are statistically significant, an independent sample t-test had to be performed. With an independent sample t-test the difference in average on some variable between two groups in a population can be checked. If the p-value of a variable, in this case an effect of trees, is less than the significance level of p ≤0.05 the null hypothesis can be rejected. The difference between the two means is statistically significant and the two groups are not equal. The affective response scores or the Best-Worst scores were used as dependent variable and the storm groups were the independent variable.

The effect of Eunice on the residents' affective response to the effects

For this analysis the affective response scores (ARS) of the effects of both groups are used to check if there are differences between the affective response scores of the two groups. The independent sample t-test showed that two effects had a statistically significant difference between the groups who filled in the survey before storm Eunice (group 1) and the respondents that filled in the survey during or after the storm (group 2)(Table A4.6). Based on the table's results, the following statement holds: there are significant differences in mean affective response score between the two groups for the effects 'Trees provide a habitat for animals' ($t_{-0.544}$=126.01, p = 0.008) and 'Trees drop organic products' ($t_{-0.973}$ = 137.12, p = 0.017). The average affective response score for group 1 was 0.089 higher than average effected response score for group 2 for the effect 'Trees provide a habitat for animals' and the average affective response score for group 1 was 0.075 higher than the average affective response score of group 2 for the effect 'Trees drop organic products'. Meaning that both effects were perceived as more positive before the storm then during / after the storm.

The effect of Eunice on the residents' level of importance of the effects

In addition, an analysis is performed to check if there are also differences between the level of importance of the two groups. For this analysis the standardized Best-Worst score (BWS) is used of both groups. Table A4.7 showed a significant difference in mean standardized best-worst score on the effects 'Trees take up place on sidewalks' ($t_{0.543}$ = 85.30, p = 0.029) and 'Trees drop organic products' ($t_{0.851}$ = 89.21, p = 0.001). The average BWS for group 1 was 0.029 lower than the average BWS for group 2 for the effect 'Trees take up place on sidewalks' and the average BWS for group 1 was 0.045 lower than the average BWS for group 2 for the effect 'Trees drop organic products'. Meaning, that both effects had a lower relevance before the storm, than during / after the storm.

To conclude, the storm Eunice did affect the outcome of some effect of trees. Only for two effects significant differences were found between the mean affective response scores of the two groups. Both effects were perceived as more positive before the storm then during / after the storm. Next to that, for the analysis that searched for significant differences between the mean standardized BWS of the two groups, two effect showed a significant difference. Both effects were perceived as more important during/after the storm. One effect that showed difference in outcome by both analyses, was the effect 'Trees drop organic products'. These differences can be explained because the organic products that were ripped off the trees by the storm cause debris on streetsThe debris can cause nuisance, injuries or negatively affect the appreciation of the streets. In addition, the importance level of the effect 'Trees take up place on sidewalks' increased, which can be explained because the storm could bend the branches which cause overhanging branches on the sidewalk and decreases the accessibility. However, the affective response score would also be likely to drop, but no significant difference was found between the groups' ARS.

4.6 The influence of people's attitude and social demographic characteristics

The literature states that people of different gender groups, age and education levels assess urban green differently (section 2.6). Next to that, it states that where residents grew up and how the use urban green could affect how residents perceive urban green. Therefore, extra analyses are performed to check if between the various features groups significant differences can be found. The same analysis technics as explained in section 3.3.3 will be used with an independent t-test as explain in section 4.5 or an ANOVA-test which will be explained in section 4.6.1 - Age.

To reduce the number the analyses, the age and education groups are regrouped into smaller groups. The age group is merged into three groups. Here, the three main different stages in life form the groups, where 18-34 represent the young adults, 35 to 55 represent the adults and the group elderly applies to the respondents with an age of 55 or higher. For this group, physical health issues may create limitations that could affect the outcome of this survey. Education will be limited to 3 groups; low, middle, and high level of education. Where, secondary education and MBO form the low education level group, HBO-Bachelor the middle education level group, and WO-Bachelor and HBO-, WO Master, Doctorate the high education level group. The gender group will consist of the two groups, female and male.

4.6.1 The influence on the residents' affective response

This section search for significant differences in the residents' affective response to the effect of trees in streets between in various social characteristics groups (gender, age, education level), and place of growing up.

Gender

To find if the affective response of the two different gender groups are significantly different, an independent sample t-test was performed. Table A4.8 shows the affective response scores of the gender groups which were used as dependent variable and the gender groups were the independent variable. The independent sample t-test of the affective response (Table A4.9) shows that on 5 effects the average score of the affective response between the gender groups is significant different. This is the case on the effects 'Trees influence the appearances' ($t_{1.954} = 215.14$, $p = 0{,}011$), 'Trees bring nature closer' ($t_{2.985} = 217.02$, $p < 0.001$), 'The leaves of trees change colour' ($t_{3.155}$=226.83, $p <0.001$), 'Branches fall from trees' ($t_{0.972} = 191.81$, $p =0.025$) and 'Trees capture fine dust' ($t_{1.799} = 222.96$, $p =0.001$). The average score of the affective response for group 1 (female) was lower than the average score of the affective response for group 2, (male) for the effects 'Trees influence the appearances' (0.167), 'Trees bring nature closer' (0.213), 'The leaves of trees change colour' (0.235) 'Branches fall from trees' (0.089), and 'Trees capture fine dust' (0.127). This concludes that the male respondents perceive the aesthetic effects as more positively than the female respondents. The female respondents perceive the effect 'Branches fall from trees' as more negatively which is in line with the literature which concludes that females found safety-related effects more negatively.

Age

The next analysis that was performed showed if there were differences between the affective response of the three age groups. The respondents with the age between 18 and 34 years old were placed in the age group named 'young adults'. Respondents with the age between 35 and 54 years old were placed in the age group named ‘adults’. And respondents with the age of 55 or older were named the elderly. Table A4.11 shows the affective response scores of the age groups.

An ANOVA test is performed to find if there is a difference in average between the affective response scores of the age groups (Table A4.12). With an ANOVA test more than 2 variables can be compared. An independent t-test can only performed a comparison between two groups. The dependent variable is the affective response score of the effects and independent variable is the age group. The ANOVA test is performed with an alpha-level of 0.05. If the p-value is lower than the alpha the null-hypothesis is rejected which means that there is a difference in average between the age groups.

The ANOVA test shows that between the three age groups, 12 effects significant differences were found. In order to find out between which groups differences were found the post hoc test - Games-Howell, was performed. The tests show that on the effect ‘Trees provide organic shade’ the young adults had a lower mean than the adult group. Young adults had on average a lower mean affective response scores of 0.289 than the adults. The adults had a 0.332 difference in average of the affective response scores with the elderly.

On the effect ‘Trees increases the biodiversity’ young adults had on average a lower affective respond scores than the adults (0.237) and between the young adults had on average a lower affective respond scores than elderly, there was a difference on average of 0.282. Looking at their mean score it can be concluded that the higher the age the more positive respondents were about this effect. There was only no difference in average found between adults and elderly. For the effect ‘Trees influence the appearances’ adults had on average higher affective response scores than the young adults (0.284).

Next, on the effect ‘Trees bring nature closer’ the young adults had on average lower affective response scores than de adults (0.276), and between the young adults and the elderly an average lower affective response score was found of 0.231 for the young adults. Also, on the effect ‘Trees may change colour’ the young adults had on average lower mean difference than the adults (-0.278) and the elderly (-0.309). On the effect ‘Trees influence the social safety’ was only between the adults and elderly a difference in mean affective response score found. Here, the adults had a higher mean difference of 0.392 than the elderly. The young adults had on average a lower mean difference than the adults (-0.349) and the elderly (-0.208) on the effect ‘Trees provide habitat for animals’. Also, the young adults had a lower mean difference than the adults (0.401) on the effect ‘Trees increase house prises’. On the effect ‘Trees drop organic products’ the young adults had on average a lower mean difference than the adults (-0.557) and the elderly (-0.666). So, the higher the age the more positive the respondents were about the effect ‘Trees drop organic products’. There was no significant difference found between adults and elderly. The last effect with a significant difference between the age groups was the effect ‘Trees losses leaves’. On this effect, the group of young adults had on average a 0.514 lower mean difference than the elderly.

Between the age groups and the affective response score of the effects ‘Branches fall from trees’ and ‘Trees release pollen’ significant differences were found with the ANOVA test. Between the various age groups no difference was found. For these two effects it remains unclear between which groups a significant differences were found.

Education

Another analysis that was performed was to explore if respondents with different education levels perceived the affective response of the various effects of trees in residential streets differently. Table A4.14 shows the outcome affective response scores of the education groups.

Next to that, an ANOVA test was performed to find if there is a difference in average between the affective response scores of the education groups, because more than 2 variables are included (low, middle, and high education level). When more than 2 variables are included an ANOVA test had to be performed instead of an independent sample t-test. This ANOVA test concludes (Table A4.15) that only on the effects 'Trees influence the appearances', 'Trees take up parking space', and 'Trees drop organic products' a difference in average between the age groups is found.

In advance of the ANOVA that shows if there are difference between the education groups, the post hoc test - Games-Howell is performed to find between which education groups the differences are found. On the effect 'Trees influence the appearances' the high educated group had a higher affective response score than the low educated group (0.359). On the effect 'Trees take up parking space' the middle-educated group had a lower affective respond score than the higher educated group (-0.357). And, on the effect 'Trees drop organic products' the low educated group had a higher affective response score than the middle-educated group (0.308).

Place of growing up

The last analysis that was performed was to explore if respondents who grew up in a more rural environment perceived the affective response of the various effects of trees in residential streets differently than residents that grew up in a more urban environment. The ANOVA test (Table A4.17) showed no significant outputs so there is no difference found in average between the affective response of any effect and the place of growing up groups.

Usage of urban green

To find if there is a relation between the respondents' affective response to the perceived effects of trees and respondents' attitude and social demographic characteristics a correlation analysis is performed to explore if there is a relations between the respondents' affective response and how the respondents used urban green. A Spearman's correlation analysis is used because both variables are ordinal.

Table A4.2 shows all the correlations. All significant correlations in the table are positive and relatively weak, less than 0.391, meaning that both variables tend to increase in response to one another but they do not imply a strong relationship. The effects that were positively correlated to several usages of urban green were the effects 'The leaves of trees change colours', 'Trees drop organic products', and 'Trees provide organic shade'. Meaning that the more positive respondents were about trees, the more likely they were to use urban green for that reason. What stands out is that the effects 'Trees increase biodiversity' and 'Trees bring nature closer' showed the highest correlation with all usages except for the cultural activity usage.

To conclude, a few differences were found between the various social characteristics' groups, gender age and education, and their affective response to certain effects of trees. Between the age group, the most differences were found. However, there were no differences found between the affective response and the place of growing up groups. The correlation analysis showed a few weak relations between the respondents' usage of urban green and the affected response scores.

4.6.2 The influence on the relevance of the effects

The previous analyses showed that are relations between people's attitude and their affective response, and people social characteristics and their affective response. In addition, multiple analyses were performed to check if there were also relation between the assessed relevance of the perceived effects and respondents' attitude and social demographic characteristics. This next section studies if various social characteristics groups (gender, age, education level), and people's attitude (place of growing up and usage of urban green) influences the residents' level of importance of the effect of trees in streets.

Gender

To find the differences between the age groups first the correlations between the counting approach and the modelling approach had to be performed to check if both methods support similar outcomes. To conduct the c-logit score in the modelling approach, an effect must be normalized. The normalized effect is the same effect as in the previous computed analysis from section 4.3, 'Trees increase housing price'. This effect is chosen to ensure a consequent normalized effect in all the analyses. Table A4.8 show the outcome of the counting and the modelling approach. The approaches show an extremely high correlation of 0.87 for females and 1.00 for males. This shows that there is a strong relationship between the scores, meaning that both methods support similar outcomes which strengthens the conclusions.

In order to see if the differences between the two gender groups are statistically significantan independent t-test is used, because only two variables are included (female and male). The independent sample t-test showed that none of the effects had any statistically significant difference between the two gender groups, female and males (Table A4.10). To conclude, the BWS of both groups is not different from each other.

Age

When analysing if there are difference between the various age groups, an extremely high correlation of 0.929 for young adults, 1.00 for adults and 0.998 for the elderly was found between the counting approach and the modelling approach. Within the age groups, the approaches show strong relationships. To conclude, both methods support similar outcomes which strengthen the conclusions. Once again, the normalized effect is 'Trees increase housing price'. An ANOVA test had to be performed to find if there is a difference in average of the BWS between the age groups. The ANOVA test indicated (Table A4.13) that only on the effects 'Trees increase the house price' and 'Trees make sound' have a significant difference in average between the age groups is present.

The post hoc test - Games-Howell, which does not assume equal variances and sample sizes, shows which age group differ from each other. On the effect 'Trees increase the house price' young adult had a lower mean BWS than the elderly (-0.144) and on the effect 'Trees make sound' young adults had a lower mean BWS than the adults (0.190).

Education

Next, an analysis was performed to explore if there are BWS differences between the various education groups. Both the approaches that determine the BWS scores for the three education groups show high correlations. A correlation of 0.999 for the low educated respondents, 0.994 for the middle-educated respondents and 0.954 for the high educated respondents.

Another ANOVA test is performed to find if there is a difference in average between the BWS of the education groups. The ANOVA test (Table A4.16) showed no significant outputs so there is no difference found in average between BWS of any effect and the education's groups.

Place of growing up

The last analysis that was performed was to explore if respondents who grew up in a more rural environment perceived the relevance of the various effects of trees in residential streets differently than residents that grew up in a more urban environment. The ANOVA test (Table A4.18) showed no significant outputs so there is no difference found in average between the BWS of any effect and the place of growing up groups.

Usage of urban green

To find if the usage of urban green affected the relevance of the perceived effects of trees in streets, a Spearman's correlation analysis was performed. Table A4.3 shows the correlations. A few relations found between the importance level of some effects and the usage of urban green. When the relevance of the effect 'The leave of trees change colour' increased respondents were more likely to use urban green for relaxation (0.152) and to enjoy nature (0.129). There was also a positive relation between the importance level of the effects 'Trees drop organic products' (0.134) and 'Trees provide organic shade' and the urban green usage relaxation, while the importance level of the effect 'Trees provide an habitat for animals' had a negative relation with the usage relaxation (-0.137). When the importance level of the effect 'Trees block wind' increased the respondents' use of urban green to improve their quality of life increased. Last, the importance level of the effect 'Trees influence biodiversity' had a negative relation with the urban green usage social contacts (-0.150). All significant correlations in the table are relatively low, less than 0.167, which does not imply a strong relationship. Meaning that we must be careful with the interpretation of the relations.

To conclude, there were a few differences found between the various social characteristics groups, gender and age. However, no differences were found between the mean Best-Worst score of the social characteristic group; education level and between the mean BWS of the place of growing up. A few correlations were found between the respondents' usage of urban green and the relevance of the effects.

Chapter 5

Discussion and policy implications

In this chapter, the performed research is evaluated with a discussion. It discusses the limitation of this research and provides recommendation for further research and policy implications for urban green planners.

5.1 Discussion

When studying how citizens perceived the importance of the effects of trees in relation to their affective response towards those effects, it can be concluded that people were mostly positive about the perceived effects of trees. The effects that influence the aesthetic value or some climate change effects were perceived as strongly positive. Respondents perceived the more positive perceived more similar than the other effects. Only a few effects were perceived negatively and revered as effects that could cause physical health problems or nuisance. Some effects were not experienced by some respondents. When excluding these responses only from this analysis, it can be concluded that most respondents perceived the effects of trees overall more positively. According to their affective response scores, 'Trees capture fine dust' was considered the most positive effect, while 'Trees drip sticky juice' was considered the most negative effect.

The Best-Worst experiment was used to study how Dutch residents perceive the importance of the effects of trees in residential streets. The most important effects of trees in residential streets are 'Trees provide organic shade' and 'Trees increase the biodiversity'. After that, the effects 'Trees influence the appearances of the street' and 'Trees bring nature closer' were perceived as most important. The least important effects of trees are 'Trees block wind' and 'Trees make sound'. The results are in line with the studies of Summit & McPherson (1998), Zhang, Hussain, Deng, & Letson (2007), and Moskell & Broussard Allred (2013), which found that the most important reasons for wanting trees in residential streets are shade provision and aesthetics. Noteworthy is that the effect 'The roots of trees exert pressure on the pavement' is ranked in place 13, wherein multiple studies, this effect was the main reason why trees in cities should get removed (Mullaney, Lucke, & Trueman, 2015; Costello, McPherson, Burger, Perry, & Kelley, 2000-2001; Kirkpatrick, Davison, & Daniels, 2021).

When looking at the overall relationship between the level of importance and the affective response scores, it can be concluded that citizens valued most of the positive effects as more important effects than those effects that were perceived as more negative. The negative effects were not ranked as the least important effects but mostly ranged just below average.

According to the literature, the parameters that influence how residents perceive trees in residential streets are people's attitudes toward urban green and their social demographic characteristics. Respondents' attitude is based on their childhood experience with urban green and the usefulness of urban green. People who were more likely to use urban green for various reasons or grew up in a more rural environment were assumed to be more positive about urban green. Several positive correlations were found between how people use urban green and their ARS towards the effects of trees. An additional correlation analysis showed a few, positive and negative, relationships between the importance level of some effects and the usage of urban green. All the correlations were weak, meaning no strong relations should be assumed. It seems this research does not show high support for the claim of Lo, Byrne, & Jim (2017) that concluded that the usage of urban green influenced residents' perception of the effects of trees in residential streets.

Multiple analyses are performed to check if there are significant differences in the residents' ARS and BWS of the effect of trees in streets between various social characteristics groups (gender, age, education level), and place of growing up. A few differences were found in the level of importance and the affective response between the various social characteristics' groups, and places of growing up. More differences were found between the affective response to the effects of trees than between their level of importance. Noteworthy, between the three age groups the effects of trees had the most significant differences. No differences were found between the mean ARS and BWS of the place of growing up groups. In addition, no differences were found between the mean BWS of the social characteristic groups; gender, and education. The results are in line with multiple studies (Barrera et al., 2016; Jim & Shan, 2013; Lo, Byrne, & Jim, 2017) that concluded that there were differences in perceptions between the social characteristic groups, gender, age and income. However, the results contradict the claim of Lo, Byrne, & Jim (2017) that conclude that people's attitudes and place of growing up, affected their perception of the effects of trees.

An extra feature appeared during the execution of the experiment. The results indicates significant differences between the respondents' level of importance and the affective response of both groups. One of the differences was found by the effect 'Trees drop organic products'. Before the storm, the effect was perceived as more positive and less important than during and after the storm. Schroeder et al. (2006) concluded that climate differences could affect people's perception of urban green. This experiment supports this claim. These results build on existing evidence that weather events, like heavy storms, affect people's perception of trees in residential streets.

In order to conclude the discussion, it is good to take in consideration that this thesis studied the residents' perception of the effects of trees in residential streets, which is a subjective research. Subjective research refers to the subjective experiences of the research respondents, which my diver when other respondents conducted the survey. This diversity in assessment affects the outcome of this research.

The outcome of this study shows that the balance between the beneficial and detrimental effects leans more towards the positive side. This concludes that trees should be kept and keep implemented in residential streets. The relevance that trees should be kept is also aligned by the University of Leuven. Recently, they found that large, old trees in urban environments have more benefits for human health (Dengkai, et al., 2022). The findings from Dengkai et al. (2022) support the claim that trees should be preserved and remain planted.

5.2 Limitations and recommendations

Several limitations are affecting the interpretations and applications of the results and conclusions. The first limitation that occurred was within the research population. The research population consisted of a convenience sample. A convenience sample has a very high risk of bias, because respondents are selected based on their proximity and do not necessarily accurately represent the entire Dutch population. Therefore, we need to be careful with the interpretation of the data. Increasing the sample size and/or using other networks to more widely distribute the survey, could reach a more diverse audience that may also be more in line with the Dutch population. This would increases the validity of this research.

A second limitation that occurred was within the 21 effects. The smell of trees, was left out. Some trees smell very pleasant, like blossom or pine trees, while others smell awful. In Valkenswaard, there is a street where during the autumn months, a poo smell appears, which is caused by a row of Ginkgo Biloba trees (NOS, 2019). There are multiple trees that have a specific smell. In this research the multi-sensual effects were not included. This research focussed on the direct visual effects. For future research, multi-sensual effects like smell, taste, or feeling of trees can be included.

Next, the effect 'Trees drip sticky juice' could be misinterpreted. In this thesis, the tree resin was meant. It falls from the tree in tiny drops and cause a direct effect on the surface below the tree. This seems not explained well enough. People could think that the sticky juice was caused by insects that live in trees. Or, we could argue that the difference between the resin of trees and the insect's excrement are difficult to distinguished. This misinterpretation of the effect could cause a bias. In future research, the effect 'Trees drip sticky juice' must be better explained or deleted from this research because the effect is hard to measure for residents.

A limitation occurred, as well as an opportunity arose during the research when the storm Eunice blew over and affected the outcome of this survey. The storm raised the awareness that weather events or seasons could affect the affective response to and importance of effects of trees in residential streets and thereby also the outcome of this survey. For future research, it is recommended to perform the survey multiple times per year, preferably 4 times, to check if people experience the effect of trees differently in different seasons or during various weather events.

Besides the recommendations based on the limitations of this research, other recommendations for further research can be pointed out. In future research, the placement of trees and type of tree respondents are assessing can be included. The placement, relative to buildings and street, or the type of tree, small or large tree, can affect the respondents' importance level and affective response to trees in residential streets.

Another recommendation for future research is that this design layout could be used for the other types of urban green in residential streets. An adjustment in effects needs to be made because not all effects of trees apply to the other urban green types and additional effects need to be included. When studying the effects of all kinds of urban green, an overall appreciation of urban green in residential streets can be estimated. Better and more comprehensive strategies and design principles can be implemented.

5.3 Policy implications

The findings from chapter 4 indicate that the balance between effects that are considered positive or beneficial and those that are considered negative or detrimental leans towards the positive side. Only 6 of the 21 effects of trees were perceived as negative, while the other 15 were considered positive. Combined with the level of importance, a pattern shows that negative effects tend to be considered of less importance, while positive effects are considered of high importance (also see figure 13).

This suggests that existing trees should be kept/maintained and new ones should be implemented in residential streets. In order to do that, a strategy can be made where for each level of importance and for each affective response can be seen what needs to be done to increase the overall appreciation of trees in residential streets. This strategy can be used by urban green decision-makers and urban green planners to improve trees in streets.

This framework shows per effect what needs to be done concerning the level of importance and the affective response. The figure shows that 'Trees increase biodiversity', 'Trees bring nature closer', and 'Trees capture fine dust' Are three positive effects of trees. However, urban green planners and decision-makers should focus on the effects with a higher importance level to gain the most yield. The effects that were already positive and relatively less important, like 'Trees capture fine dust', it is harder to increase the appreciation of trees than for instance a more important effect like 'Trees increase biodiversity'. For the effects 'Trees influence traffic safety' and 'Trees take up space on sidewalks', both negative effects with a semi-high relevance, it is essential to improve the affective response to increase the overall appreciation of trees in residential streets. Or, for the less important negative effects such as 'Trees drip sticky juice' and 'Pressure of roots on the pavement', it is recommended to meet the minimal needs to improve the affective response. However, since their importance level is below average, more attention should be paid to the more important effects, because more yield can be gained.

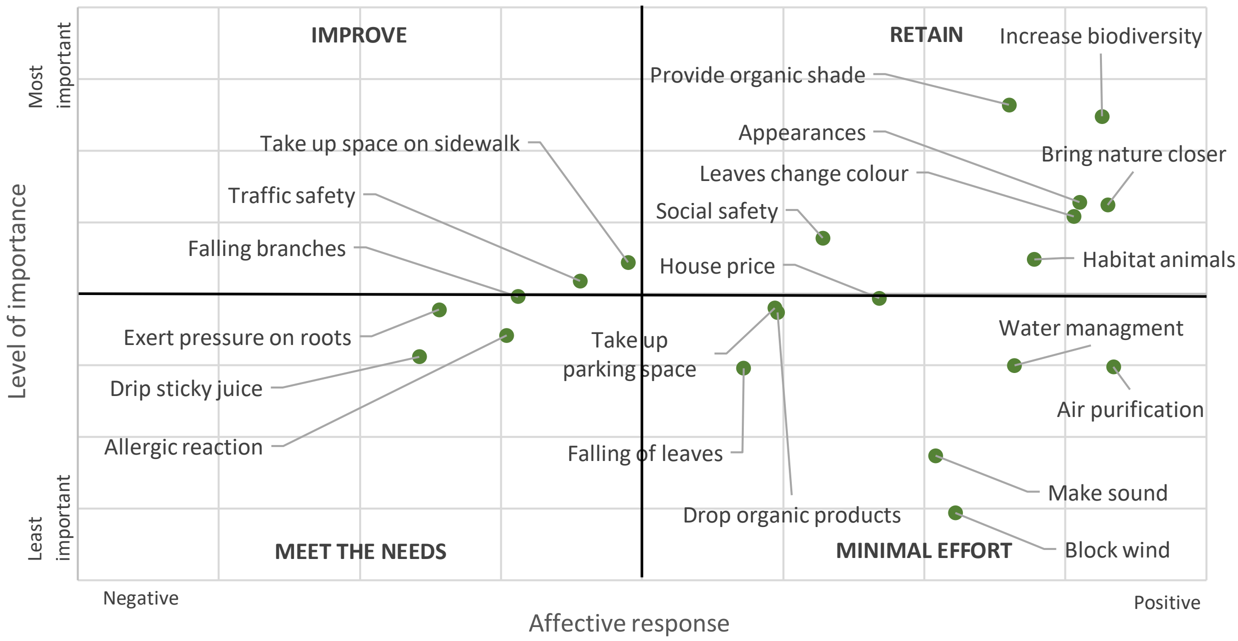


Figure 13. Urban trees strategy according to their level of importance and their affective response

This figure suggests that urban green decision-makers and urban green planners should switch the focus from the negative effects to the effects with the highest importance level to increase the overall appreciation of trees in residential streets. It is recommended for them to first secure the most important positive effects which gain to most yield. Then improve the most important negative effects. Third, urban green decision-makers and planners should meet the needs of the less important negative effect. Last, they should pay minimal effort to the less important positive effects.

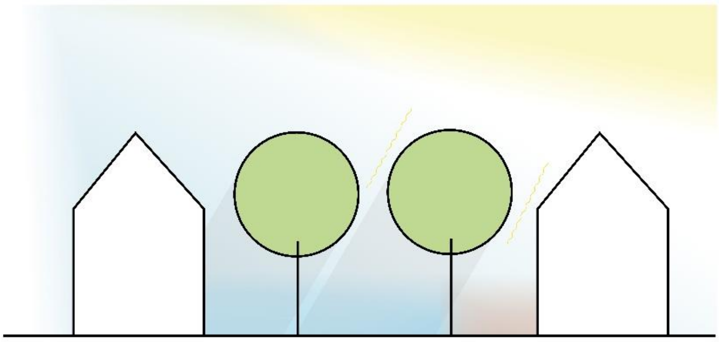
In addition to the framework, a second component can be implemented which is a checklist per kind of tree. This checklist can estimate the overall appreciation per tree depending on its characteristics. Tree nurseries have all kinds of books, tables, and excel sheets in which the characteristics of trees are displayed per type of tree. If the characteristics in these books can be integrated into this framework, urban green planners can easily see the impact of their urban tree design and how it will affect the appreciation of that tree. The scheme in figure 14 shows that a tree with an open canopy (second column) scores lower than a tree with a closed canopy that provides a lot of shade when the effect 'Trees provide organic shade' is assessed. Since the temperature in residential streets reduces when the percentage of tree cover increases. Another example, figure 14 shows that when a tree change colour during the year or absorb more water are more preferred. His refers to a +1 score in the checklist.

	Size			Light transmission			Winter period		Water		Colour		Organic products	
Score	1	2	3	1	2	3	1	2	1	2	1	2	1	1
TREE A		x		x				x	x			x		
TREE B			x			x		x	x	x	x		x	x
TREE C		x		x			x			x				
TREE D	x				x			x		x		x		x
TREE E	x					x	x		x				x	

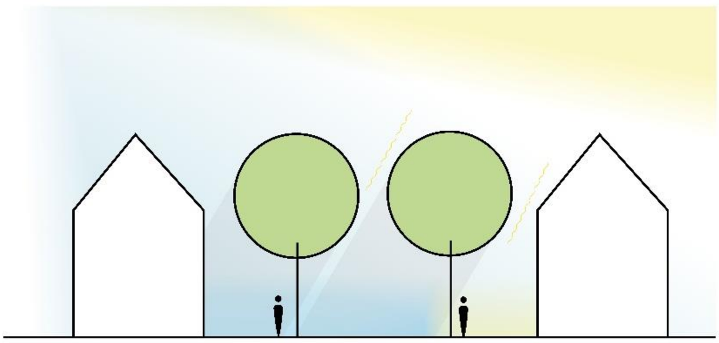
Figure 14. A scheme that scores the tree characteristics

Besides the specific effects of trees, the placement of trees also matters. Placing trees close to each other has a positive influence on the temperature, but a negative impact in streets with a lot of traffic, as trees placed close to each other can create a tunnel effect which reduces wind circulation. This has a negative influence on the air quality in the street. Design rules for trees in residential streets need to be formed that guide urban green planners on how they should implement trees concerning their level of importance and their value. When correctly placing trees in residential streets, taking into account these design rules, the affective response towards trees in residential streets will become more positive.

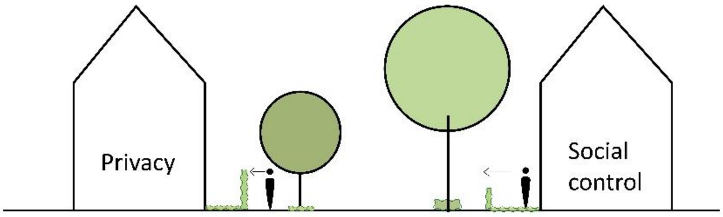
Below are some suggested design rules:



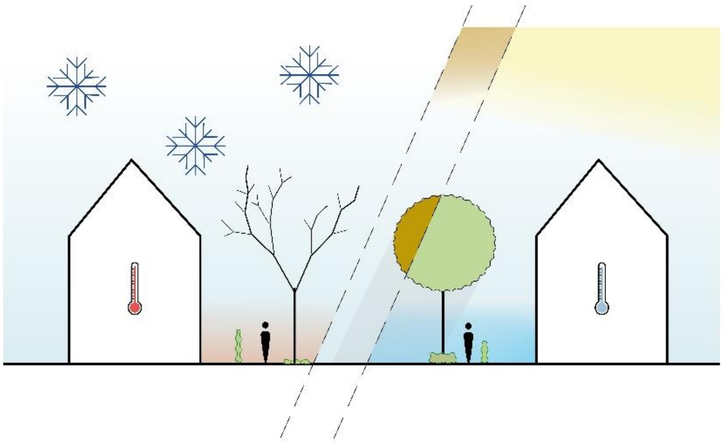
Trees with a larger crown are more apricated because they reduce the temperature in streets. Therefore, position trees with a large tree crown in streets with high radiation to reduce the temperature.



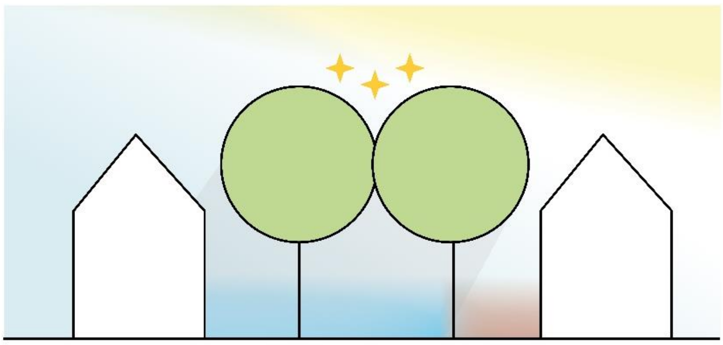
Diversify micro-climates (sun/ shade) so that people can choose for themselves whether they would walk on the side where the sun shines or on the shade side. Create vegetation with trees of



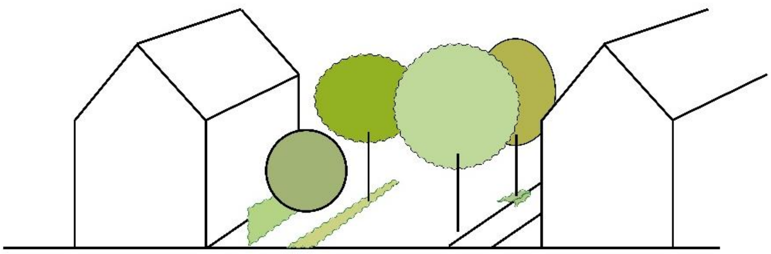
Create vegetation with trees of different heights in public/ private separation areas or combine it with other urban greenery to ensure social control.



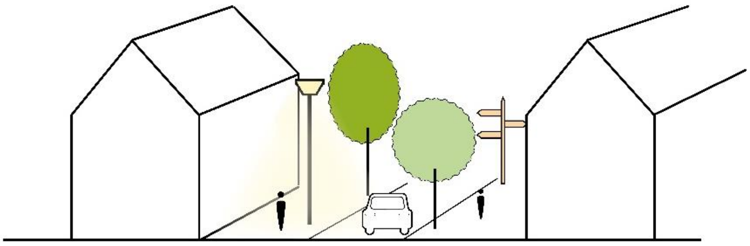
The most preferred effect of trees is 'Trees provide an organic shade'. To ensure this, place deciduous trees in streets. These provide shade in the summer, while during the winter season the sun will work as a free heater. Also deciduous trees change colour, which promotes the sense of seasonal change. This is the third most important and strongly positive effect.



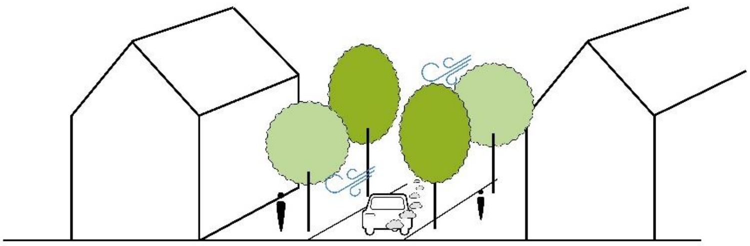
Use large trees because they provide a higher aesthetic value, more shade, more cooling, more air cleaning effect, more mental health benefits, etc. This means that urban design should design with and around existing trees rather than plant new trees.



Use a combination of trees, or a mixture of trees with other vegetation, to ensure biodiversity in residential streets, which was perceived by residents as the second most important and strongly positive effect of trees.



Placed trees in an order that they do not cover street sight, signs, and streetlights to ensure traffic safety.



In streets with a lot of traffic, avoid the tunnel effect to promote wind circulation, which improves the air quality in residential streets.

To conclude, residents perceive the effect on average very positively. The most important effects of trees are also assessed as the most positive effects of trees in residential streets by residents. Nowadays, urban green planning focuses on the detrimental effects. However, this research concluded that these negative effects were perceived as less relevant effects. This suggests that the urban green planners and decision-makers should switch their focus to the more important effects of trees to increase the appreciation of trees and increase residents' well-being.

Chapter 6
Conclusion

The last chapter discusses the outcome of this thesis by taking into account the studied literature and the Best-Worst experiment. The research goal was to determine how Dutch residents perceive the various effects of trees in their immediate living environment. Based on the literature study and the data gained from the Best-Worst experiment, the sub-questions are addressed, leading to answering the main question:

What are urban residents' perceptions of the effects of trees in residential streets on the quality of the living environment by taking into account residents´ affective response to and relevance of the effects of trees?

Due to the changing climate and the densification of cities, the well-being of urban residents is threatened, which increases the demand for healthy cities. The literature concludes that urban green in residential streets improves residents physical and mental health and living conditions and counteracts the challenges of climate change. When improving residents health and living conditions, it is essential to include residents perceptions of urban green. This thesis focused on the urban green type trees and studied the 21 perceived effects of trees in residential streets by including residents affective response to and their level of importance to the effects of trees.

The main finding of this research concludes that the most important effects of trees in residential streets were also perceived as the most positive. Effects that were perceived as neutral were considered slightly more important than the effect of the average importance 'Trees increase the house price', or was the third last important effect. The negative effects were not ranked as the least important effects but mostly ranged just below average. When looking at the overall relationship between the effect's level of importance and affective response it can be concluded that citizens valued most of the positive effects as more important effects of trees in residential streets than the effects that were perceived as more negative. Effects that were hard to recognize, such as effects that influenced the broader living environment (e.g. trees block wind or trees capture fine dust) were perceived as the least important effects of trees.

According to the literature, residents' perception of trees in residential streets is influenced by people's attitudes toward urban green and their social demographic characteristics. This research performed multiple analyses to check this hypothesis and found multiple relations, suggesting that there are differences between different social groups. Within the social characteristic group age, the most differences were found.

The outcome of this study shows that the balance between the beneficial effects and the detrimental effects leans more towards the positive side. This concludes that trees should be preserved and remain planted in residential streets. In order to preserve and remain planting trees, a strategy was made. This strategy shows for each level of importance and affective response what urban green planners need to undertake to increase the overall appreciation of trees in residential streets. It is recommended for urban green decision-makers and planners to first secure the most important positive effects. Then, improve the most important negative effects. Third, meet the needs of the less important negative effect. Last, pay minimal effort to the less important positive effects to increase the overall appreciation of trees in residential streets.

To conclude, this research shows the relevance of the effects relative to their affective response to trees. It shows which effects of trees in streets create a resistance against trees and which effects contribute to the appreciation of trees. With the level of importance, a strategy was made to increase the appreciation of trees. The increased appreciation positively influences the well-being of residents which is currently threatened due to the changing climate and the densification of cities.

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8. Appendixes

Appendix 1 – Survey

1.1 Survey English

Part 1 - Effects of trees in residential streets

How would do you perceive the following effects of trees in residential streets?

1 = Strongly Negative
2 = Negative
3 = Neutral
4 = positive
5 = Strongly positive
6 = Do not experience this effect

	1	2	3	4	5	6
The leaves of trees may change colour	o	o	o	o	o	o
Trees may lose leaves, in autumn	o	o	o	o	o	o
Fruits, nuts, seeds may fall from trees	o	o	o	o	o	o
Branches may fall from trees	o	o	o	o	o	o
A sticky juice may drip from trees	o	o	o	o	o	o
The roots of trees can lift the pavement	o	o	o	o	o	o
Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o	o	o	o	o	o
Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o	o	o	o	o	o
Trees slow wind speed	o	o	o	o	o	o
Trees block rain and retain water (e.g. on the leaves and in the soil)	o	o	o	o	o	o
Trees capture fine dust and convert CO2 into oxygen	o	o	o	o	o	o
Trees can make sound (rustling of leaves)	o	o	o	o	o	o
Trees attracts animals (Birds, insects, pests, squirrels)	o	o	o	o	o	o
Trees increases the biodiversity (more flora and fauna species)	o	o	o	o	o	o
Trees in streets increases the prices of houses	o	o	o	o	o	o
Trees in streets take up space, which means there may be less parking space	o	o	o	o	o	o
Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o	o	o	o	o	o
Trees can block streets signs, sights, and streetlights	o	o	o	o	o	o
Trees block view from and to homes	o	o	o	o	o	o
Trees influence the appearances of the street	o	o	o	o	o	o
Trees bring nature closer	o	o	o	o	o	o

Part 2 - Stated choice experiment

For the following 21 choice blocks the same question will be repeated:

Which perceived effect is for you the most important effect when assessing trees in residential streets? And, which effect is the least important?

Most important effect	Effects	Least important effect
o	Trees bring nature closer	o
o	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o
o	The roots of trees can lift the pavement	o
o	Trees increases the biodiversity (more flora and fauna species)	o
o	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o

Most important effect	Effects	Least important effect
o	A sticky juice may drip from trees	o
o	Trees can make sound (rustling of leaves)	o
o	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o
o	Trees block rain and retain water (e.g. on the leaves and in the soil)	o
o	Branches may fall from trees	o

Most important effect	Effects	Least important effect
o	Fruits, nuts, seeds may fall from trees	o
o	Trees capture fine dust and convert CO into oxygen	o
o	Branches may fall from trees	o
o	The leaves of trees may change colour	o
o	The roots of trees can lift the pavement	o

Most important effect	Effects	Least important effect
o	Trees can make sound (rustling of leaves)	o
o	Trees influence the appearances of the street	o
o	Trees attracts animals (Birds, insects, pests, squirrels)	o
o	Trees bring nature closer	o
o	Trees capture fine dust and convert CO into oxygen	o

Most important effect	Effects	Least important effect
o	Trees increases the biodiversity (more flora and fauna species)	o
o	Trees block rain and retain water (e.g. on the leaves and in the soil)	o
o	Trees influence the appearances of the street	o
o	Fruits, nuts, seeds may fall from trees	o
o	Trees can block streets signs, sights, and streetlights	o

Most important effect	Effects	Least important effect
o	Trees bring nature closer	o
o	Trees in streets increases the prices of houses	o
o	The leaves of trees may change colour	o
o	Trees block rain and retain water (e.g. on the leaves and in the soil)	o
o	Trees block view from and to homes	o

Most important effect	Effects	Least important effect
o	Trees in streets take up space, which means there may be less parking space	o
o	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o
o	Trees capture fine dust and convert CO into oxygen	o
o	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o
o	Trees block rain and retain water (e.g. on the leaves and in the soil)	o

Most important effect	Effects	Least important effect
o	The leaves of trees may change colour	o
o	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o
o	Trees slow wind speed	o
o	Trees can make sound (rustling of leaves)	o
o	Trees increases the biodiversity (more flora and fauna species)	o

Most important effect	Effects	Least important effect
o	The roots of trees can lift the pavement	o
o	Trees can make sound (rustling of leaves)	o
o	Trees can block streets signs, sights, and streetlights	o
o	Trees in streets increases the prices of dwellings	o
o	Trees in streets take up space, which means there may be less parking space	o

Most important effect	Effects	Least important effect
o	Trees block view from and to homes	o
o	Trees slow wind speed	o
o	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o
o	Trees capture fine dust and convert CO into oxygen	o
o	Trees can block streets signs, sights, and streetlights	o

Most important effect	Effects	Least important effect
o	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o
o	Trees attracts animals (Birds, insects, pests, squirrels)	o
o	Fruits, nuts, seeds may fall from trees	o
o	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o
o	Trees in streets increases the prices of houses	o

Most important effect	Effects	Least important effect
o	A sticky juice may drip from trees	o
o	The leaves of trees may change colour	o
o	Trees can make sound (rustling of leaves)	o
o	Trees can block streets signs, sights, and streetlights	o
o	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o

Most important effect	Effects	Least important effect
o	The roots of trees can lift the pavement	o
o	Trees block view from and to homes	o
o	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o
o	Trees influence the appearances of the street	o
o	A sticky juice may drip from trees	o

Most important effect	Effects	Least important effect
o	Trees slow wind speed	o
o	Branches may fall from trees	o
o	Trees influence the appearances of the street	o
o	Trees in streets increases the prices of houses	o
o	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o

Most important effect	Effects	Least important effect
o	Fruits, nuts, seeds may fall from trees	o
o	Trees bring nature closer	o
o	A sticky juice may drip from trees	o
o	Trees in streets take up space, which means there may be less parking space	o
o	Trees slow wind speed	o

Most important effect	Effects	Least important effect
o	Trees block view from and to homes	o
o	Branches may fall from trees	o
o	Trees increases the biodiversity (more flora and fauna species)	o
o	Trees attracts animals	o
o	rees in streets take up space, which means there may be less parking space	o

Most important effect	Effects	Least important effect
o	Trees slow wind speed	o
o	Trees may lose leaves (in autumn)	o
o	Trees attracts animals (Birds, insects, pests, squirrels)	o
o	Trees block rain and retain water (e.g. on the leaves and in the soil)	o
o	The roots of trees can lift the pavement	o

Most important effect	Effects	Least important effect
o	Trees increases the biodiversity (more flora and fauna species)	o
o	Trees capture fine dust and convert CO into oxygen	o
o	Trees in streets increases the prices of houses	o
o	Trees may lose leaves (in autumn)	o
o	A sticky juice may drip from trees	o

Most important effect	Effects	Least important effect
o	Trees may lose leaves (in autumn)	o
o	Trees provide organic shade in streets and houses (summer shade, winter sunlight penetration)	o
o	Trees can block streets signs, sights, and streetlights	o
o	Trees bring nature closer	o
o	Branches may fall from trees	o

Most important effect	Effects	Least important effect
o	Trees can make sound (rustling of leaves)	o
o	Trees in streets take up space, which can make the footpath narrower or less passable (e.g. due to overhanging branches)	o
o	Fruits, nuts, seeds may fall from trees	o
o	Trees block view from and to homes	o
o	Trees may lose leaves (in autumn)	o

Most important effect	Effects	Least important effect
o	Trees influence the appearances of the street	o
o	The leaves of trees may change colour	o
o	Trees may lose leaves (in autumn)	o
o	Trees in streets take up space, which means there may be less parking space	o
o	Trees may spread pollen which can cause an allergic reaction by humans (e.g. hay fever)	o

Part 3 - Attitude and social-demographic

Urban green attitude questions

How would you scale the following statements?

1 = Strongly disagree
2 = disagree
3 = Neutral
4 = agree
5 = Strongly agree

	1	**2**	**3**	**4**	**5**
I use urban green in my neighborhood to relax	o	o	o	o	o
I use urban green in my neighborhood for recreation	o	o	o	o	o
I use urban green in my neighbourhood for social contacts	o	o	o	o	o
I use urban green in my neighborhood for cultural activities	o	o	o	o	o
I use urban green in my neighborhood for physical activities/exercise	o	o	o	o	o
I use urban green in my neighborhood to enjoy nature	o	o	o	o	o
Urban green in my neighborhood is crucial to my quality of life	o	o	o	o	o

Where did you grow up?

- City (centre)
- City (suburb)

- Town
- Countryside

Social-demographic questions

What is your gender?

- Female
- Male
- Other
- Prefer not to say

What is your age? (in years)

- 18-24
- 25-34
- 35-44
- 45-54
- 55-65
- ≥ 65

What is your household bruto mothly income? (in euros)

- < 1.000 1.000 – 1.500
- 1.500 – 2.000
- 2.000 – 2.500
- 2.500 – 3.000
- ≥ 3.000
- No answer

What is your highest completed level of education?

- Elementary school
- Secondary education
- MBO
- HBO-bachelor
- WO-bachelor
- HBO-, WO Master, docter
- Other

What is your migration background?

- ○ Dutch origin
- ○ With migration background:

  In which part of the world did you grow up?

  - ○ Europe (exl The Netherlands)
  - ○ Dutch Caribbean
  - ○ Africa
  - ○ North America
  - ○ South America
  - ○ Asia
  - ○ Australia, New Zealand and Oceania

1.2 Survey Dutch

Deel 1 - Effecten van bomen in woonstraten

1 = Sterk negatief
2 = Negatief
3 = Neutraal
4 = Positief
5 = Sterk positief
6 = Ik ervaar dit effect niet

	1	2	3	4	5	6
De bladeren van bomen kunnen van kleur veranderen	o	o	o	o	o	o
Bomen verliezen bladeren (in de herfst)	o	o	o	o	o	o
Uit bomen kunnen vruchten, noten, zaden vallen	o	o	o	o	o	o
Er kunnen takken van bomen vallen	o	o	o	o	o	o
Uit bomen kan een kleverig sap druppelen	o	o	o	o	o	o
De wortels van bomen kunnen de bestrating optillen	o	o	o	o	o	o
Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o	o	o	o	o	o
Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o	o	o	o	o	o
Bomen vertragen de windsnelheid	o	o	o	o	o	o
Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o	o	o	o	o	o
Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o	o	o	o	o	o
Bomen kunnen geluid maken (ritselen van bladeren)	o	o	o	o	o	o
Bomen trekken dieren aan (Vogels, insecten, ongedierte, eekhoorns)	o	o	o	o	o	o
Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o	o	o	o	o	o
Bomen in straten verhogen de prijzen van woningen	o	o	o	o	o	o
Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o	o	o	o	o	o
Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o	o	o	o	o	o
Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o	o	o	o	o	o
Bomen blokkeren het zicht van en naar woningen	o	o	o	o	o	o
Bomen beïnvloeden het aanzicht van de straat	o	o	o	o	o	o
Bomen brengen de natuur dichterbij	o	o	o	o	o	o

Part 2 – Keuze experiment

Voor de volgende 21 keuze blokken zal de volgende vraag steeds gevraagd worden:

Welk waargenomen effect is voor u het belangrijkste bij de beoordeling van bomen in woonstraten? En, welk effect is het minst belangrijk?

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen brengen de natuur dichterbij	o
o	Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o
o	De wortels van bomen kunnen de bestrating optillen	o
o	Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o
o	Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Uit bomen kan een kleverig sap druppelen	o
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o
o	Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o
o	Er kunnen takken van bomen vallen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Uit bomen kunnen vruchten, noten, zaden vallen	o
o	Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o
o	Er kunnen takken van bomen vallen	o
o	De bladeren van bomen kunnen van kleur veranderen	o
o	De wortels van bomen kunnen de bestrating optillen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen beïnvloeden het aanzicht van de straat	o
o	Bomen trekken dieren aan (Vogels, insecten, ongedierte, eekhoorns)	o
o	Bomen brengen de natuur dichterbij	o
o	Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o
o	Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o
o	Bomen beïnvloeden het aanzicht van de straat	o
o	Uit bomen kunnen vruchten, noten, zaden vallen	o
o	Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen brengen de natuur dichterbij	o
o	Bomen in straten verhogen de prijzen van woningen	o
o	De bladeren van bomen kunnen van kleur veranderen	o
o	Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o
o	Bomen blokkeren het zicht van en naar woningen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o
o	Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o
o	Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o
o	Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o
o	Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	De bladeren van bomen kunnen van kleur veranderen	o
o	Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o
o	Bomen vertragen de windsnelheid	o
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	De wortels van bomen kunnen de bestrating optillen	o
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o
o	Bomen in straten verhogen de prijzen van woningen	o
o	Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen blokkeren het zicht van en naar woningen	o
o	Bomen vertragen de windsnelheid	o
o	Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o
o	Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o
o	Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o
o	Bomen trekken dieren aan (Vogels, insecten, ongedierte, eekhoorns)	o
o	Uit bomen kunnen vruchten, noten, zaden vallen	o
o	Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o
o	Bomen in straten verhogen de prijzen van woningen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Uit bomen kan een kleverig sap druppelen	o
o	De bladeren van bomen kunnen van kleur veranderen	o
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o
o	Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	De wortels van bomen kunnen de bestrating optillen	o
o	Bomen blokkeren het zicht van en naar woningen	o
o	Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o
o	Bomen beïnvloeden het aanzicht van de straat	o
o	Uit bomen kan een kleverig sap druppelen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen vertragen de windsnelheid	o
o	Er kunnen takken van bomen vallen	o
o	Bomen beïnvloeden het aanzicht van de straat	o
o	Bomen in straten verhogen de prijzen van woningen	o
o	Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Uit bomen kunnen vruchten, noten, zaden vallen	o
o	Bomen brengen de natuur dichterbij	o
o	Uit bomen kan een kleverig sap druppelen	o
o	Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o
o	Bomen vertragen de windsnelheid	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen blokkeren het zicht van en naar woningen	o
o	Er kunnen takken van bomen vallen	o
o	Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o
o	Bomen trekken dieren aan (Vogels, insecten, ongedierte, eekhoorns)	o
o	Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen vertragen de windsnelheid	o
o	Bomen verliezen bladeren (in de herfst)	o
o	Bomen trekken dieren aan (Vogels, insecten, ongedierte, eekhoorns)	o
o	Bomen houden regen tegen en houden water vast (bijv. op de bladeren en in de bodem)	o
o	De wortels van bomen kunnen de bestrating optillen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen verhogen de biodiversiteit (meer planten- en diersoorten)	o
o	Bomen vangen fijnstof op en zetten CO_2 om in zuurstof	o
o	Bomen in straten verhogen de prijzen van woningen	o
o	Bomen verliezen bladeren (in de herfst)	o
o	Uit bomen kan een kleverig sap druppelen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen verliezen bladeren (in de herfst)	o
o	Bomen zorgen voor een organische schaduw in straten en huizen (zomer schaduw, 's winters zon doorlatend)	o
o	Bomen kunnen straatnaamborden, straatverlichting en het zicht in de straat blokkeren	o
o	Bomen brengen de natuur dichterbij	o
o	Er kunnen takken van bomen vallen	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen kunnen geluid maken (ritselen van bladeren)	o
o	Bomen in straten nemen ruimte in, waardoor het voetpad smaller kan worden, of minder begaanbaar (bijv. door overhangende takken)	o
o	Uit bomen kunnen vruchten, noten, zaden vallen	o
o	Bomen blokkeren het zicht van en naar woningen	o
o	Bomen verliezen bladeren (in de herfst)	o

Meest belangrijke effect	Effecten	Minst belangrijke effect
o	Bomen beïnvloeden het aanzicht van de straat	o
o	De bladeren van bomen kunnen van kleur veranderen	o
o	Bomen verliezen bladeren (in de herfst)	o
o	Bomen in straten nemen ruimte in beslag, wat betekent dat er minder parkeerruimte kan zijn	o
o	Bomen kunnen pollen verspreiden die bij mensen een allergische reactie kunnen veroorzaken (hooikoorts)	o

Deel 3 - Houding en sociaal-demografie

Vragen over uw houding ten opzichte van stedelijk groen

Hoe zou u de volgende uitspraken beoordelen?

1 = Sterk oneens
2 = Oneens
3 = Neutraal
4 = Mee eens
5 = Sterk mee eens

	1	2	3	4	5
Ik gebruik stedelijk groen in mijn buurt om te ontspannen	o	o	o	o	o
Ik gebruik stedelijk groen in mijn buurt voor recreatie	o	o	o	o	o
Ik gebruik stedelijk groen in mijn buurt voor sociale contacten	o	o	o	o	o
Ik gebruik stedelijk groen in mijn buurt voor culturele activiteiten	o	o	o	o	o
Ik gebruik stedelijk groen in mijn buurt voor fysieke activiteiten/ lichaamsbeweging	o	o	o	o	o
Ik gebruik stedelijk groen in mijn buurt om van de natuur te genieten	o	o	o	o	o
Stedelijk groen in mijn buurt is cruciaal voor de kwaliteit van mijn leven	o	o	o	o	o

Waar bent u opgegroeid?

- Stad (centrum)
- Stad (buitenwijk)
- Dorp
- Platteland

Sociaal demografische vragen

Wat is uw geslacht?

- Vrouw
- Man
- Anders
- Wil ik liever niet zeggen

Wat is uw leeftijd? (in jaren)

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- ≥ 65

Wat is uw bruto maandelijks inkomen van uw huishouden? (in euro's)

- < 1.000
- – 1.500
- 1.500 – 2.000
- 2.000 – 2.500
- 2.500 – 3.000
- ≥ 3.000
- Geen antwoord

Wat is uw hoogste afgeronde onderwijsniveau? *

- Basisschool
- Middelbare school
- VMBO
- HBO-bachelor
- WO- bachelor
- HBO-, WO master, docter
- Overige

Wat is uw migratie achtergrond?

- Nederlandse achtergrond
- Met migratie achtergrond

In welk werelddeel ben je opgegroeid?

- Europa (exl Nederland)
- Nederlands Caraïbisch gebied
- Afrika
- Noord-Amerika
- Zuid-Amerika
- Azië
- Australië, Nieuw-Zeeland en Oceanië

Appendix 2 – R studio BIDB

2.1 R-code BIBD

```
library(ibd)


#set the working directory and read in data

setwd("C:\\Users\\hanne\\OneDrive\\Bureaublad\\Rstudio")


#Note vr must equal bk

#v<= b

#Lamba(v-1) = r(k-1)

v <- 21 #Number of treatments

b <- 21 # Number of subjects

r <- 5 #Number of times each treatment is tested

k <- 5 #number of treatments for each block/subject

lamba <- 1 #Number of patients examined by any pair of treatments

#ntrial <-  #optional Total number of trials


#design <- bibd(v,b,r,k,lamba,ntrial)

des <- bibd(v,b,r,k,lamba)


des


# generate and show all possible combinations of blocks

blocks <- des$design  #rename design to des to be able to access the actual design frame from the greater concept des.

print(blocks)


# randomize the columns (blocks) to which each sub-group is assigned

blocks <- blocks[,sample(nrow(blocks))]

blocks
```

```
# in each column (block), shuffle by row so that treatments are assigned to random positions in a given block

for (i in 1:nrow(blocks)) {

  blocks[i,] <- blocks[i, sample(ncol(blocks), replace=FALSE)]

}


# show the randomized block design

blocks


#look for this file in your working directory

  sink("Balanced incomplete block design4.txt")

 print ("treatments assigned to each subject")

 print (des["N"])

 print ("Another way of looking at treatments assigned to each subject")

 print (t(des["N"]))

 print ("Diagnols are the number of reps for each treatment")

 print ("The off diagnols are the number of reps per treatment pair")

 print (des["NNP"])

 print (blocks)

 sink()
```

2.1 BIBD results

```
[1] "treatments assigned to each subject"
$N
      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]
[,13] [,14]
 [1,]    0    0    1    0    0    1    0    1    0     0     0     1
0     0
 [2,]    0    0    0    0    0    0    0    0    0     0     0     0
0     0
 [3,]    0    0    1    0    1    0    0    0    0     0     1     0
0     0
 [4,]    0    1    1    0    0    0    0    0    0     0     0     0
0     1
 [5,]    0    1    0    0    0    0    0    0    0     0     0     1
1     0
 [6,]    1    0    1    0    0    0    0    0    1     0     0     0
1     0
 [7,]    1    1    0    0    0    0    0    0    0     1     1     0
0     0
 [8,]    0    0    0    0    0    0    1    1    0     0     1     0
1     0
 [9,]    0    0    0    0    0    0    0    1    0     1     0     0
0     1
[10,]    0    1    0    0    1    1    1    0    0     0     0     0
0     0
[11,]    0    0    1    1    0    0    1    0    0     1     0     0
0     0
[12,]    0    1    0    1    0    0    0    1    1     0     0     0
0     0
[13,]    0    0    0    1    0    0    0    0    0     0     1     1
0     0
[14,]    1    0    0    0    1    0    0    1    0     0     0     0
0     0
[15,]    0    0    0    0    0    1    0    0    1     0     1     0
0     1
[16,]    0    0    0    0    0    0    1    0    1     0     0     0
0     0
[17,]    1    0    0    0    0    0    1    0    0     0     0     1
0     1
[18,]    0    0    0    0    1    0    0    0    1     1     0     1
0     0
[19,]    0    0    0    0    0    1    0    0    0     1     0     0
1     0
[20,]    0    0    0    1    1    0    0    0    0     0     0     0
1     1
[21,]    1    0    0    1    0    1    0    0    0     0     0     0
0     0
      [,15] [,16] [,17] [,18] [,19] [,20] [,21]
 [1,]     0     0     0     0     0     0     1
 [2,]     0     0     1     1     1     1     1
 [3,]     1     0     0     0     0     1     0
 [4,]     0     1     0     0     1     0     0
 [5,]     1     0     0     1     0     0     0
 [6,]     0     0     1     0     0     0     0
 [7,]     0     0     0     0     0     0     1
 [8,]     0     0     0     0     1     0     0
 [9,]     1     0     1     0     0     0     0
[10,]     0     0     1     0     0     0     0
```

```
[11,]     0     0     0     1     0     0     0
[12,]     0     0     0     0     0     1     0
[13,]     0     1     1     0     0     0     0
[14,]     0     1     0     1     0     0     0
[15,]     0     0     0     1     0     0     0
[16,]     1     1     0     0     0     0     1
[17,]     0     0     0     0     0     1     0
[18,]     0     0     0     0     1     0     0
[19,]     0     1     0     0     0     1     0
[20,]     0     0     0     0     0     0     1
[21,]     1     0     0     0     1     0     0

[1] "Another way of looking at treatments assigned to each subject"
     N
[1,] numeric,441
[1] "Diagnols are the number of reps for each treatment"
[1] "The off diagnols are the number of reps per treatment pair"
$NNP
      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]
[,13] [,14]
 [1,]    5    1    1    1    1    1    1    1    1     1     1     1
1     1
 [2,]    1    5    1    1    1    1    1    1    1     1     1     1
1     1
 [3,]    1    1    5    1    1    1    1    1    1     1     1     1
1     1
 [4,]    1    1    1    5    1    1    1    1    1     1     1     1
1     1
 [5,]    1    1    1    1    5    1    1    1    1     1     1     1
1     1
 [6,]    1    1    1    1    1    5    1    1    1     1     1     1
1     1
 [7,]    1    1    1    1    1    1    5    1    1     1     1     1
1     1
 [8,]    1    1    1    1    1    1    1    5    1     1     1     1
1     1
 [9,]    1    1    1    1    1    1    1    1    5     1     1     1
1     1
[10,]    1    1    1    1    1    1    1    1    1     5     1     1
1     1
[11,]    1    1    1    1    1    1    1    1    1     1     5     1
1     1
[12,]    1    1    1    1    1    1    1    1    1     1     1     5
1     1
[13,]    1    1    1    1    1    1    1    1    1     1     1     1
5     1
[14,]    1    1    1    1    1    1    1    1    1     1     1     1
1     5
[15,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
[16,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
[17,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
[18,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
[19,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
```

```
[20,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
[21,]    1    1    1    1    1    1    1    1    1     1     1     1
1     1
      [,15] [,16] [,17] [,18] [,19] [,20] [,21]
 [1,]     1     1     1     1     1     1     1
 [2,]     1     1     1     1     1     1     1
 [3,]     1     1     1     1     1     1     1
 [4,]     1     1     1     1     1     1     1
 [5,]     1     1     1     1     1     1     1
 [6,]     1     1     1     1     1     1     1
 [7,]     1     1     1     1     1     1     1
 [8,]     1     1     1     1     1     1     1
 [9,]     1     1     1     1     1     1     1
[10,]     1     1     1     1     1     1     1
[11,]     1     1     1     1     1     1     1
[12,]     1     1     1     1     1     1     1
[13,]     1     1     1     1     1     1     1
[14,]     1     1     1     1     1     1     1
[15,]     5     1     1     1     1     1     1
[16,]     1     5     1     1     1     1     1
[17,]     1     1     5     1     1     1     1
[18,]     1     1     1     5     1     1     1
[19,]     1     1     1     1     5     1     1
[20,]     1     1     1     1     1     5     1
[21,]     1     1     1     1     1     1     5

         [,1] [,2] [,3] [,4] [,5]
Block-1    21    6    7   14   17
Block-2     5   12    7   10    4
Block-3     3   11    4    1    6
Block-4    12   20   13   21   11
Block-5    14   20    3   10   18
Block-6    21   15    1   10   19
Block-7    16    8   11   10   17
Block-8     1    8    9   12   14
Block-9     6   12   18   15   16
Block-10   19    9    7   11   18
Block-11    8   13    3   15    7
Block-12    5    1   13   17   18
Block-13    6   19   20    8    5
Block-14    9    4   20   15   17
Block-15    3   21    5   16    9
Block-16   19    4   14   13   16
Block-17    9    2   13   10    6
Block-18   14   11   15    2    5
Block-19    2    8   18   21    4
Block-20   12   17    3    2   19
Block-21   20    1    7    2   16
```

Appendix 3 – R studio BWS

2.2 R-code analysing results

```
library (DoE.base) # include oa.design() #used to generate a two-level OMED

library (crossdes) # include find.BIB() #used to generate a BIBD

library (survival) # include clogit() #used to analyze responses

library (support.BWS)


A <- c("Block-1", "Block-2", "Block-3", "Block-4","Block-5", "Block-6", "Block-7", "Block-8", "Block-
9","Block-10", "Block-11", "Block-12", "Block-13", "Block-14","Block-15", "Block-16", "Block-17",
"Block-18", "Block-19","Block-20", "Block-12")

B <- c(21, 5, 3, 12, 14, 21, 16, 1, 6, 19, 8, 5, 6, 9, 3, 19, 9, 14, 2, 12, 20)

C <- c(7, 12, 11, 20, 10, 15, 8, 8, 13, 9, 13, 1, 19, 4, 21, 4, 2, 11, 8, 17, 1)

D <- c(6, 7, 4, 13, 20, 1, 11, 9, 18, 7, 3, 13, 8, 20, 5, 14, 13, 15, 18, 3, 2)

E <- c(14, 10, 1, 21, 3, 10, 17, 12, 15, 11, 7, 18, 20, 15, 16, 13, 10, 2, 21, 19, 16)

F <- c(17, 4, 6, 11, 18, 19, 10, 14, 16, 18, 15, 17, 5, 17, 9, 16, 6, 5, 4, 2, 7)

des2 <- data.frame(B, C, D, E, F)


items2 <- letters[1:21]

# create questions for BWS

bws.questionnaire(

  choice.sets = des2,

  design.type = 2, # BIBD

  item.names = items2)

# set a respondent data set in a row number format

res2 <- data.frame(

  ID = c(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28,
29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55,
56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82,
83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107,
108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127,
128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147,
148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167,
168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187,
188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207,
208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227,
228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238), # id variable
```

```
B1 = c(3, 5, 3, 1, 5, 2, 2, 3, 4, 1, 4, 5, 4, 3, 3, 1, 5, 2, 4, 5, 2, 5, 3, 4, 5, 2, 2, 4, 5, 3, 4, 1, 1, 1, 1, 5, 5, 2,
2, 5, 4, 5, 4, 1, 1, 1, 2, 1, 5, 1, 5, 3, 5, 1, 1, 4, 4, 2, 4, 2, 1, 3, 5, 2, 5, 2, 3, 5, 5, 5, 4, 3, 3, 1, 4, 4, 5, 5, 3, 5,
2, 5, 1, 2, 2, 5, 4, 5, 4, 4, 1, 5, 1, 1, 3, 5, 1, 4, 4, 1, 1, 5, 3, 5, 5, 3, 1, 1, 3, 5, 2, 1, 2, 5, 1, 4, 5, 5, 3, 2, 5, 2,
5, 1, 4, 5, 1, 4, 3, 3, 3, 5, 4, 5, 2, 1, 3, 4, 5, 1, 2, 5, 1, 1, 5, 2, 3, 2, 5, 3, 3, 5, 1, 5, 2, 5, 4, 4, 5, 5, 5, 4, 2, 1,
5, 5, 3, 3, 5, 2, 1, 1, 5, 5, 3, 1, 5, 4, 5, 2, 4, 5, 3, 5, 3, 4, 4, 4, 5, 3, 2, 4, 4, 4, 2, 4, 2, 5, 5, 3, 5, 5, 5, 4, 5, 4,
5, 1, 4, 5, 4, 1, 5, 5, 3, 3, 4, 4, 2, 5, 1, 3, 3, 5, 5, 3, 1, 3, 1, 1, 4, 4, 4, 1, 4, 5, 1, 4), # worst item in
question 1

W1 = c(1, 2, 1, 3, 4, 1, 5, 2, 5, 5, 2, 2, 3, 1, 5, 2, 1, 3, 5, 1, 3, 1, 1, 5, 2, 1, 1, 3, 4, 2, 5, 3, 4, 3, 5, 2, 4, 1,
4, 1, 5, 1, 5, 2, 2, 3, 1, 4, 4, 4, 1, 1, 4, 5, 5, 5, 2, 5, 3, 5, 5, 4, 4, 5, 1, 5, 5, 4, 3, 1, 3, 1, 1, 3, 2, 2, 2, 1, 1, 1,
5, 1, 3, 4, 4, 1, 5, 4, 5, 2, 5, 1, 5, 5, 5, 1, 3, 5, 3, 2, 5, 2, 5, 4, 4, 4, 2, 3, 1, 1, 4, 2, 5, 2, 5, 5, 1, 1, 4, 5, 1, 4,
1, 3, 5, 1, 3, 2, 5, 5, 4, 1, 5, 4, 5, 3, 1, 5, 4, 5, 5, 4, 5, 3, 1, 1, 5, 1, 1, 1, 1, 1, 5, 4, 1, 4, 2, 5, 1, 1, 4, 5, 4, 2,
1, 4, 4, 5, 2, 3, 2, 5, 1, 1, 5, 2, 1, 5, 4, 1, 5, 2, 5, 2, 5, 3, 2, 5, 4, 5, 5, 2, 5, 5, 4, 2, 1, 4, 1, 1, 1, 4, 1, 2, 1, 2,
4, 5, 1, 1, 5, 5, 2, 1, 1, 1, 5, 5, 5, 4, 3, 1, 5, 2, 4, 5, 5, 2, 5, 2, 3, 5, 3, 2, 5, 1, 3, 5), # best item in question
1

B2 = c(5, 1, 2, 4, 3, 5, 5, 4, 4, 4, 4, 1, 2, 2, 1, 4, 2, 3, 4, 1, 2, 5, 2, 4, 3, 3, 5, 4, 5, 1, 4, 4, 4, 4, 2, 5, 5, 2,
1, 2, 4, 1, 4, 2, 3, 4, 3, 4, 2, 2, 2, 4, 1, 2, 4, 4, 4, 5, 1, 2, 4, 2, 5, 4, 5, 1, 5, 2, 1, 5, 4, 1, 3, 2, 1, 2, 1, 5, 1, 2,
1, 1, 2, 1, 3, 5, 4, 5, 4, 1, 4, 1, 1, 2, 3, 1, 1, 4, 4, 1, 4, 2, 3, 2, 5, 1, 1, 5, 3, 2, 3, 1, 3, 2, 4, 4, 2, 5, 1, 1, 5, 1,
1, 4, 4, 2, 4, 4, 3, 1, 5, 1, 4, 2, 1, 4, 1, 2, 5, 4, 5, 5, 4, 2, 1, 3, 2, 5, 2, 1, 1, 2, 1, 1, 3, 2, 4, 5, 2, 5, 5, 5, 2, 5,
1, 5, 2, 3, 2, 3, 2, 4, 5, 1, 3, 5, 1, 2, 2, 5, 2, 2, 3, 3, 2, 4, 4, 4, 2, 2, 2, 4, 4, 4, 1, 1, 5, 5, 2, 1, 2, 2, 1, 4, 5, 4,
5, 4, 1, 2, 4, 4, 1, 2, 1, 5, 4, 4, 2, 2, 4, 5, 2, 2, 5, 1, 4, 2, 4, 1, 4, 4, 1, 5, 4, 1, 4, 4), # worst item in
question 2

W2 = c(3, 3, 4, 1, 4, 4, 4, 2, 2, 2, 3, 5, 5, 4, 5, 3, 4, 5, 2, 4, 1, 4, 1, 2, 2, 2, 1, 3, 4, 4, 2, 5, 5, 1, 1, 2, 4, 1,
4, 3, 1, 2, 1, 1, 4, 2, 4, 1, 4, 4, 4, 2, 4, 1, 2, 5, 2, 2, 2, 5, 5, 4, 4, 2, 4, 5, 2, 4, 5, 4, 1, 4, 1, 4, 3, 4, 2, 4, 4, 4,
5, 4, 5, 4, 4, 4, 3, 4, 5, 2, 5, 4, 5, 1, 5, 4, 5, 2, 5, 3, 1, 5, 5, 4, 4, 4, 2, 2, 2, 1, 1, 5, 5, 1, 2, 2, 4, 4, 2, 5, 2, 4,
4, 2, 5, 4, 2, 1, 5, 5, 4, 4, 2, 4, 3, 5, 4, 5, 4, 2, 4, 4, 2, 1, 4, 4, 5, 2, 4, 4, 4, 4, 2, 3, 1, 4, 3, 3, 4, 4, 3, 2, 4, 1,
4, 4, 4, 5, 5, 4, 5, 5, 2, 4, 5, 1, 4, 5, 4, 4, 1, 5, 5, 2, 5, 2, 2, 1, 3, 5, 4, 1, 2, 1, 4, 5, 4, 1, 1, 4, 4, 4, 2, 3, 4, 3,
4, 2, 2, 1, 5, 2, 4, 1, 2, 2, 1, 5, 5, 3, 5, 2, 5, 4, 4, 5, 1, 4, 5, 2, 5, 2, 3, 1, 2, 4, 1, 2), # best item in question
2

B3 = c(5, 4, 5, 4, 4, 3, 4, 5, 4, 2, 2, 4, 2, 4, 1, 2, 3, 1, 4, 3, 1, 3, 4, 2, 1, 5, 3, 2, 5, 3, 2, 4, 2, 2, 2, 3, 5, 4,
1, 1, 4, 3, 2, 2, 1, 2, 4, 5, 1, 4, 1, 5, 5, 2, 2, 2, 2, 3, 2, 4, 2, 3, 3, 1, 3, 4, 2, 3, 1, 4, 2, 5, 1, 4, 2, 2, 5, 1, 1, 3,
5, 4, 2, 1, 5, 5, 2, 3, 4, 2, 2, 1, 4, 4, 1, 5, 2, 2, 2, 2, 2, 1, 1, 5, 5, 3, 5, 4, 3, 5, 4, 1, 2, 4, 4, 2, 1, 3, 1, 1, 3, 3,
3, 2, 5, 4, 2, 2, 5, 5, 5, 5, 2, 1, 3, 2, 1, 5, 4, 2, 4, 1, 2, 4, 1, 4, 5, 5, 4, 4, 4, 2, 1, 4, 3, 4, 2, 4, 5, 5, 4, 3, 1, 2,
5, 5, 1, 1, 5, 4, 4, 2, 5, 1, 5, 4, 4, 3, 1, 3, 2, 4, 3, 4, 4, 2, 2, 2, 1, 5, 3, 2, 2, 1, 1, 1, 1, 5, 4, 5, 4, 5, 1, 2, 5, 2,
5, 1, 2, 1, 2, 2, 5, 5, 1, 5, 2, 2, 5, 1, 1, 4, 4, 5, 5, 1, 2, 4, 2, 2, 2, 4, 2, 4, 2, 4, 2, 2), # worst item in
question 3

W3 = c(4, 2, 2, 5, 2, 2, 5, 3, 1, 3, 4, 3, 1, 2, 3, 1, 2, 3, 2, 4, 3, 2, 2, 1, 5, 4, 2, 5, 4, 2, 4, 2, 4, 1, 1, 1, 4, 2,
2, 2, 2, 2, 3, 5, 3, 4, 2, 4, 2, 2, 2, 2, 2, 1, 4, 1, 1, 4, 5, 3, 4, 2, 2, 5, 2, 3, 1, 4, 2, 5, 4, 2, 2, 2, 5, 4, 4, 2, 2, 2,
3, 2, 5, 2, 2, 4, 1, 2, 5, 4, 1, 4, 1, 5, 5, 2, 3, 4, 5, 5, 3, 2, 3, 2, 4, 2, 4, 5, 2, 2, 2, 3, 4, 3, 3, 1, 2, 2, 4, 5, 2, 2,
2, 4, 3, 2, 1, 4, 3, 4, 2, 2, 4, 2, 5, 5, 4, 3, 5, 1, 5, 2, 4, 2, 2, 1, 3, 4, 2, 2, 2, 4, 4, 3, 2, 2, 4, 5, 2, 2, 2, 5, 2, 5,
2, 4, 2, 3, 3, 2, 1, 1, 4, 3, 2, 1, 2, 5, 2, 2, 1, 2, 5, 2, 3, 5, 1, 1, 2, 3, 2, 4, 4, 3, 2, 3, 2, 2, 2, 4, 2, 2, 4, 1, 2, 3,
4, 4, 3, 4, 1, 1, 3, 2, 2, 2, 5, 3, 3, 4, 3, 2, 3, 3, 4, 3, 1, 3, 1, 4, 5, 3, 5, 2, 1, 2, 5, 4), # best item in question
3

B4 = c(3, 3, 1, 3, 1, 1, 1, 2, 2, 4, 5, 1, 2, 1, 1, 5, 1, 1, 4, 1, 1, 2, 1, 5, 1, 2, 4, 5, 3, 2, 5, 2, 5, 4, 4, 5, 1, 1,
1, 1, 1, 1, 5, 2, 4, 5, 5, 4, 1, 1, 1, 2, 1, 4, 4, 2, 2, 3, 2, 1, 3, 1, 1, 3, 1, 1, 5, 1, 1, 1, 3, 2, 2, 1, 5, 2, 4, 1, 1, 1,
1, 1, 4, 1, 1, 1, 2, 1, 3, 3, 2, 1, 4, 4, 1, 1, 5, 5, 3, 3, 5, 1, 1, 1, 3, 1, 4, 4, 3, 1, 1, 3, 1, 1, 4, 5, 1, 1, 1, 3, 4, 1,
```

1, 2, 5, 1, 4, 2, 2, 2, 1, 1, 5, 1, 1, 4, 1, 2, 3, 5, 1, 1, 3, 2, 1, 3, 1, 5, 1, 3, 3, 1, 4, 1, 1, 1, 5, 4, 1, 1, 2, 2, 1, 5, 1, 2, 1, 1, 1, 1, 2, 5, 1, 2, 1, 2, 1, 1, 1, 1, 4, 2, 3, 1, 1, 5, 5, 4, 1, 2, 1, 3, 5, 2, 1, 5, 1, 1, 1, 1, 1, 1, 5, 2, 1, 2, 1, 2, 5, 1, 3, 5, 1, 1, 3, 1, 3, 5, 1, 1, 4, 3, 1, 1, 1, 1, 4, 1, 2, 2, 5, 2, 5, 2, 5, 1, 4, 4), # worst item in question 4

W4 = c(5, 5, 5, 1, 4, 5, 5, 5, 1, 1, 1, 3, 1, 3, 5, 1, 4, 5, 3, 2, 5, 5, 5, 1, 4, 1, 2, 3, 5, 3, 1, 5, 1, 1, 1, 1, 5, 5, 5, 4, 3, 3, 1, 1, 2, 1, 2, 3, 5, 2, 2, 1, 3, 1, 3, 1, 1, 4, 1, 4, 1, 3, 5, 2, 2, 5, 1, 5, 5, 2, 1, 5, 4, 5, 1, 1, 3, 4, 2, 4, 5, 5, 3, 2, 2, 4, 1, 4, 4, 1, 1, 3, 1, 2, 5, 5, 1, 1, 1, 1, 1, 2, 5, 5, 2, 5, 1, 1, 2, 2, 5, 2, 3, 5, 1, 1, 4, 5, 2, 1, 3, 3, 5, 1, 2, 4, 1, 4, 5, 5, 3, 5, 1, 5, 4, 2, 2, 4, 5, 1, 5, 2, 1, 5, 2, 2, 5, 2, 2, 5, 5, 2, 2, 5, 5, 2, 1, 1, 3, 3, 5, 1, 5, 1, 2, 5, 3, 4, 3, 2, 5, 1, 4, 5, 5, 1, 5, 5, 5, 3, 1, 5, 5, 3, 5, 1, 1, 1, 4, 5, 5, 1, 1, 1, 2, 1, 5, 5, 3, 2, 2, 5, 2, 1, 2, 1, 5, 1, 1, 5, 1, 2, 5, 2, 2, 4, 1, 1, 5, 3, 1, 2, 4, 3, 5, 5, 1, 4, 1, 1, 1, 1, 1, 5, 1, 5, 1, 1), # best item in question 4

B5 = c(5, 5, 5, 2, 5, 5, 5, 4, 3, 2, 2, 5, 2, 5, 5, 2, 5, 5, 1, 5, 4, 3, 2, 1, 3, 3, 4, 1, 5, 3, 2, 3, 1, 1, 3, 5, 5, 4, 4, 4, 1, 5, 1, 3, 5, 3, 5, 4, 5, 4, 5, 3, 5, 1, 1, 1, 2, 5, 1, 5, 1, 5, 5, 5, 5, 4, 5, 5, 4, 5, 1, 5, 3, 5, 1, 3, 5, 4, 4, 5, 5, 1, 1, 4, 5, 5, 2, 5, 5, 3, 3, 5, 1, 1, 4, 5, 1, 1, 1, 3, 2, 1, 4, 4, 5, 5, 5, 3, 1, 5, 3, 3, 1, 4, 1, 1, 5, 5, 5, 4, 5, 4, 4, 3, 5, 5, 3, 1, 5, 3, 5, 5, 1, 5, 5, 1, 4, 3, 5, 2, 5, 4, 1, 3, 4, 3, 5, 4, 5, 5, 5, 4, 1, 4, 5, 4, 2, 2, 5, 5, 3, 3, 5, 3, 5, 5, 4, 5, 5, 4, 1, 1, 5, 4, 5, 3, 4, 5, 5, 5, 1, 3, 5, 5, 4, 2, 2, 1, 5, 3, 5, 1, 1, 2, 4, 3, 4, 5, 5, 5, 1, 5, 5, 3, 4, 2, 5, 1, 1, 5, 2, 2, 4, 5, 5, 5, 1, 1, 5, 5, 1, 4, 5, 5, 5, 5, 1, 4, 2, 3, 2, 1, 1, 3, 1, 5, 1, 1), # worst item in question 5

W5 = c(1, 1, 1, 4, 1, 2, 4, 2, 5, 5, 4, 2, 5, 1, 1, 3, 2, 4, 5, 3, 1, 1, 3, 5, 2, 2, 3, 5, 3, 5, 5, 1, 2, 4, 5, 4, 4, 5, 1, 3, 4, 1, 5, 5, 4, 4, 3, 2, 1, 1, 1, 5, 1, 5, 5, 4, 4, 2, 5, 2, 5, 1, 1, 3, 1, 1, 4, 2, 2, 2, 4, 3, 1, 2, 2, 2, 3, 1, 1, 2, 1, 3, 5, 3, 1, 1, 4, 1, 3, 4, 4, 1, 4, 5, 3, 2, 5, 3, 5, 5, 5, 3, 3, 2, 3, 1, 4, 1, 4, 2, 1, 2, 5, 3, 5, 5, 3, 2, 3, 1, 1, 2, 1, 5, 4, 3, 5, 5, 2, 5, 2, 1, 5, 1, 2, 5, 1, 2, 3, 5, 3, 3, 5, 5, 2, 1, 2, 3, 3, 2, 2, 3, 3, 1, 1, 3, 3, 5, 1, 1, 1, 4, 2, 4, 3, 4, 1, 3, 4, 3, 5, 4, 1, 1, 3, 4, 1, 3, 2, 1, 5, 1, 3, 1, 3, 4, 5, 4, 3, 2, 3, 4, 5, 5, 3, 5, 1, 3, 1, 3, 2, 3, 1, 5, 2, 5, 3, 5, 5, 3, 4, 5, 2, 3, 3, 2, 5, 5, 3, 1, 5, 2, 2, 3, 4, 2, 5, 2, 5, 4, 4, 5, 5, 4, 3, 1, 5, 5), # best item in question 5

B6 = c(5, 5, 3, 4, 5, 2, 5, 5, 4, 1, 4, 3, 3, 3, 5, 4, 2, 2, 1, 2, 3, 5, 3, 4, 2, 5, 1, 1, 4, 2, 4, 1, 1, 1, 1, 5, 5, 4, 5, 2, 1, 3, 1, 1, 2, 1, 5, 4, 5, 5, 3, 4, 5, 1, 1, 1, 4, 2, 1, 5, 1, 2, 5, 5, 2, 2, 5, 2, 5, 5, 1, 5, 2, 2, 1, 1, 4, 3, 3, 5, 5, 5, 1, 5, 5, 5, 5, 5, 5, 1, 1, 2, 1, 1, 3, 5, 1, 1, 1, 3, 1, 5, 2, 5, 5, 2, 5, 3, 4, 2, 3, 4, 1, 3, 1, 1, 2, 3, 2, 2, 2, 5, 5, 1, 1, 5, 1, 2, 5, 2, 2, 5, 4, 3, 5, 1, 5, 3, 5, 4, 5, 5, 1, 5, 2, 3, 2, 5, 5, 5, 5, 3, 1, 3, 2, 2, 1, 4, 3, 5, 3, 4, 5, 2, 3, 5, 5, 2, 3, 3, 1, 1, 5, 4, 5, 1, 3, 3, 3, 2, 1, 2, 5, 2, 3, 4, 4, 1, 2, 2, 2, 1, 1, 4, 2, 4, 2, 5, 3, 5, 3, 5, 5, 4, 5, 4, 3, 1, 1, 2, 4, 3, 5, 5, 5, 5, 1, 1, 3, 5, 1, 2, 3, 3, 5, 5, 1, 5, 1, 1, 4, 5, 1, 3, 4, 5, 1, 1), # worst item in question 6

W6 = c(4, 1, 1, 5, 1, 4, 4, 4, 2, 5, 3, 2, 5, 1, 1, 3, 1, 5, 5, 5, 2, 4, 1, 5, 4, 3, 4, 5, 2, 4, 3, 5, 5, 5, 5, 2, 4, 3, 1, 1, 5, 1, 5, 3, 5, 3, 1, 2, 1, 4, 1, 5, 4, 2, 5, 5, 3, 5, 3, 2, 3, 1, 1, 3, 1, 5, 2, 1, 4, 1, 3, 4, 1, 4, 2, 5, 2, 1, 1, 3, 1, 1, 5, 4, 1, 1, 2, 1, 4, 3, 5, 1, 2, 3, 5, 4, 5, 5, 2, 2, 5, 2, 5, 1, 1, 4, 3, 2, 3, 1, 2, 2, 2, 5, 5, 5, 1, 4, 1, 1, 3, 4, 4, 2, 5, 1, 5, 5, 2, 4, 4, 4, 3, 4, 2, 5, 1, 1, 4, 5, 4, 1, 5, 4, 4, 1, 5, 1, 1, 4, 4, 2, 3, 1, 1, 4, 5, 5, 1, 4, 1, 2, 4, 5, 1, 4, 4, 5, 2, 4, 5, 5, 1, 1, 4, 4, 1, 5, 4, 1, 2, 1, 4, 1, 5, 5, 3, 5, 1, 5, 5, 2, 5, 5, 4, 5, 4, 1, 1, 1, 4, 4, 1, 5, 1, 5, 5, 3, 3, 1, 2, 5, 2, 1, 1, 1, 5, 3, 5, 3, 5, 1, 5, 5, 4, 2, 5, 2, 2, 3, 5, 1, 2, 2, 3, 1, 5, 3), # best item in question 6

B7 = c(5, 4, 1, 2, 4, 1, 1, 1, 2, 2, 3, 1, 2, 4, 1, 3, 1, 4, 2, 4, 2, 1, 4, 3, 4, 1, 1, 3, 1, 1, 2, 2, 3, 3, 2, 2, 4, 5, 1, 5, 3, 4, 3, 3, 4, 3, 1, 3, 1, 1, 4, 1, 1, 3, 3, 3, 5, 3, 5, 1, 2, 1, 4, 4, 1, 1, 3, 1, 1, 1, 3, 4, 1, 1, 3, 3, 5, 1, 1, 1, 1, 1, 2, 1, 1, 1, 3, 1, 4, 2, 3, 1, 2, 2, 1, 1, 2, 3, 2, 2, 3, 4, 1, 1, 4, 1, 2, 5, 1, 1, 1, 4, 5, 1, 2, 2, 1, 2, 1, 1, 1, 1, 1, 2, 5, 4, 2, 3, 1, 1, 1, 4, 3, 1, 1, 2, 1, 2, 4, 2, 4, 1, 2, 2, 4, 1, 1, 1, 1, 2, 2, 3, 1, 4, 1, 1, 3, 2, 4, 4, 1, 2, 1, 4, 1, 4, 1, 1, 1, 1, 5, 5, 1, 1, 4, 2, 1, 5, 1, 1, 2, 5, 4, 1, 4, 2, 5, 2, 4, 1, 1, 5, 3, 2, 2, 3, 1, 1, 1, 4, 4, 4, 4, 3, 4, 2, 4, 2, 3, 1, 5, 2, 1, 4, 1, 4, 3, 3, 1, 3, 3, 1, 1, 1, 4, 1, 3, 2, 5, 3, 3, 2, 3, 5, 3, 4, 3, 3), # worst item in question 7

W7 = c(3, 3, 2, 4, 3, 2, 5, 4, 4, 1, 1, 4, 4, 2, 3, 1, 3, 5, 4, 2, 3, 3, 3, 1, 3, 5, 3, 1, 2, 3, 4, 3, 1, 1, 5, 5, 5, 3, 3, 3, 4, 3, 1, 2, 2, 2, 5, 2, 2, 5, 2, 5, 5, 1, 4, 1, 4, 1, 1, 4, 1, 3, 2, 2, 2, 4, 2, 3, 3, 2, 1, 5, 3, 3, 1, 5, 3, 3, 3, 2, 4, 3, 1, 3, 3, 5, 4, 2, 5, 1, 4, 5, 1, 1, 5, 3, 4, 1, 1, 4, 1, 2, 4, 5, 2, 3, 1, 1, 4, 2, 3, 2, 1, 3, 1, 1, 2, 3, 2, 4, 2, 3, 3, 1, 4, 5, 1, 1, 4, 5, 2, 3, 1, 2, 3, 1, 2, 4, 5, 1, 5, 3, 1, 5, 5, 4, 4, 2, 3, 3, 3, 2, 2, 2, 3, 2, 1, 1, 3, 3, 3, 4, 3, 5, 3, 5, 3, 4, 4, 3, 1, 1, 5, 4, 5, 1, 3, 4, 3, 2, 1, 4, 5, 5, 3, 1, 1, 4, 3, 4, 5, 2, 1, 1, 3, 4, 3, 2, 3, 5, 2, 5, 2, 4, 3, 1, 5, 1, 1, 4, 4, 1, 4, 2, 2, 3, 1, 1, 5, 2, 5, 2, 4, 3, 3, 4, 4, 4, 1, 4, 1, 1, 4, 1, 4, 3, 1, 1), # best item in question 7

B8 = c(1, 4, 3, 5, 2, 5, 2, 1, 2, 2, 5, 2, 5, 4, 4, 1, 5, 2, 3, 4, 3, 4, 4, 1, 5, 5, 5, 4, 1, 3, 2, 1, 5, 5, 5, 2, 2, 4, 4, 4, 5, 2, 2, 1, 5, 2, 3, 5, 5, 1, 3, 5, 2, 1, 4, 3, 1, 1, 4, 3, 5, 1, 1, 2, 2, 1, 2, 2, 3, 3, 1, 1, 1, 4, 5, 2, 2, 4, 1, 2, 3, 2, 4, 3, 2, 1, 5, 2, 1, 2, 2, 5, 4, 2, 5, 2, 2, 1, 2, 5, 1, 5, 3, 2, 2, 5, 5, 1, 5, 3, 4, 1, 3, 1, 2, 2, 4, 2, 3, 3, 2, 4, 2, 2, 5, 2, 5, 5, 5, 5, 4, 1, 1, 5, 2, 5, 2, 5, 2, 2, 4, 3, 2, 2, 1, 2, 3, 1, 1, 1, 1, 1, 2, 4, 4, 5, 2, 5, 1, 3, 3, 2, 1, 4, 1, 5, 4, 4, 5, 3, 5, 5, 1, 3, 5, 2, 1, 4, 3, 2, 4, 3, 1, 2, 1, 2, 4, 2, 5, 5, 2, 2, 1, 5, 3, 2, 1, 2, 1, 1, 5, 2, 2, 4, 4, 2, 5, 2, 3, 5, 1, 3, 5, 2, 2, 2, 1, 2, 5, 3, 5, 1, 4, 1, 4, 4, 5, 1, 5, 2, 5, 2, 2, 1, 5, 1, 5, 5), # worst item in question 8

W8 = c(3, 5, 1, 3, 4, 4, 4, 3, 3, 5, 4, 4, 3, 5, 3, 3, 3, 4, 5, 5, 5, 3, 3, 3, 3, 3, 3, 2, 5, 2, 1, 3, 3, 4, 3, 4, 1, 3, 5, 3, 4, 4, 4, 3, 3, 5, 5, 3, 1, 5, 4, 1, 4, 4, 5, 2, 3, 5, 5, 1, 4, 3, 3, 4, 4, 3, 4, 3, 2, 2, 3, 5, 3, 3, 4, 4, 4, 2, 3, 4, 2, 1, 5, 1, 4, 3, 4, 4, 3, 4, 3, 3, 5, 5, 4, 4, 4, 3, 4, 1, 5, 3, 4, 3, 4, 3, 3, 4, 1, 5, 5, 5, 1, 3, 4, 4, 2, 5, 4, 2, 4, 3, 4, 4, 3, 4, 3, 3, 1, 1, 5, 5, 3, 3, 4, 3, 4, 1, 4, 4, 5, 5, 4, 3, 4, 4, 5, 3, 5, 3, 3, 3, 4, 2, 5, 4, 4, 3, 4, 2, 5, 1, 3, 3, 3, 3, 2, 5, 4, 5, 3, 1, 5, 4, 1, 4, 4, 3, 5, 1, 5, 1, 3, 4, 3, 4, 5, 5, 4, 4, 4, 4, 5, 3, 4, 3, 4, 3, 3, 3, 4, 4, 4, 2, 5, 5, 4, 4, 5, 1, 5, 4, 1, 4, 4, 4, 3, 4, 4, 5, 3, 3, 3, 3, 5, 3, 4, 3, 3, 4, 4, 4, 4, 3, 1, 5, 3, 1), # best item in question 8

B9 = c(5, 5, 2, 4, 3, 4, 4, 1, 4, 3, 4, 4, 2, 5, 2, 1, 4, 4, 5, 5, 4, 2, 3, 3, 4, 1, 4, 2, 3, 4, 5, 1, 4, 4, 1, 3, 5, 2, 4, 3, 1, 2, 4, 1, 4, 3, 5, 1, 3, 3, 3, 4, 3, 5, 5, 4, 5, 3, 4, 2, 1, 1, 1, 4, 4, 1, 2, 4, 4, 4, 5, 3, 1, 3, 1, 2, 3, 2, 1, 3, 4, 5, 4, 2, 2, 1, 4, 4, 1, 2, 4, 4, 5, 3, 4, 4, 4, 1, 2, 3, 3, 2, 3, 4, 3, 4, 4, 5, 3, 4, 5, 3, 2, 3, 2, 4, 2, 3, 3, 4, 4, 2, 2, 4, 4, 3, 4, 1, 3, 4, 5, 3, 1, 4, 3, 2, 3, 4, 4, 4, 5, 5, 2, 4, 5, 4, 4, 5, 3, 1, 3, 1, 4, 2, 5, 4, 2, 2, 5, 4, 4, 5, 1, 3, 3, 4, 2, 5, 4, 5, 1, 3, 3, 3, 4, 3, 5, 2, 4, 5, 4, 2, 3, 4, 1, 4, 5, 3, 4, 4, 4, 2, 3, 2, 3, 4, 5, 4, 5, 1, 1, 4, 4, 2, 5, 3, 4, 4, 5, 3, 3, 3, 4, 3, 2, 4, 1, 4, 4, 5, 1, 5, 2, 1, 4, 3, 1, 1, 4, 3, 4, 4, 4, 1, 3, 3, 2, 4), # worst item in question 9

W9 = c(3, 1, 3, 2, 2, 2, 2, 5, 1, 4, 2, 2, 1, 1, 5, 4, 3, 2, 4, 1, 2, 5, 5, 5, 3, 4, 2, 3, 4, 1, 3, 2, 2, 2, 4, 2, 3, 5, 5, 5, 5, 5, 2, 2, 3, 4, 4, 4, 2, 4, 2, 5, 2, 2, 1, 1, 3, 5, 5, 3, 5, 4, 2, 5, 3, 5, 4, 1, 1, 1, 3, 5, 5, 5, 5, 5, 2, 3, 5, 2, 1, 3, 5, 3, 5, 2, 2, 3, 5, 4, 1, 3, 4, 4, 2, 3, 2, 5, 4, 2, 4, 1, 2, 1, 2, 2, 3, 2, 2, 2, 1, 5, 3, 5, 5, 2, 3, 4, 2, 1, 3, 5, 5, 2, 3, 2, 2, 4, 2, 5, 1, 5, 4, 2, 2, 1, 2, 5, 5, 5, 4, 4, 4, 1, 2, 5, 2, 3, 5, 5, 5, 4, 5, 3, 4, 2, 4, 1, 2, 1, 2, 3, 5, 5, 5, 2, 3, 4, 2, 4, 4, 2, 4, 2, 5, 2, 2, 5, 2, 3, 5, 3, 5, 2, 2, 5, 4, 4, 2, 2, 3, 4, 4, 1, 2, 1, 2, 1, 3, 5, 5, 2, 5, 3, 4, 4, 2, 2, 4, 2, 4, 2, 5, 2, 5, 2, 2, 2, 5, 2, 4, 4, 3, 5, 5, 5, 5, 5, 4, 3, 2, 2, 3, 2, 5, 2, 4, 1, 5), # best item in question 9

B10 = c(3, 3, 3, 4, 4, 4, 4, 1, 1, 1, 4, 4, 4, 3, 1, 2, 4, 4, 2, 3, 5, 1, 1, 1, 4, 4, 4, 1, 5, 1, 1, 5, 4, 4, 4, 1, 1, 1, 5, 1, 4, 4, 4, 5, 4, 1, 2, 4, 4, 5, 5, 4, 1, 4, 3, 1, 3, 3, 5, 3, 4, 2, 5, 4, 4, 1, 1, 1, 1, 1, 1, 3, 3, 2, 1, 4, 4, 4, 1, 1, 1, 1, 1, 5, 3, 4, 5, 4, 4, 1, 1, 1, 4, 5, 1, 4, 4, 4, 1, 1, 4, 5, 4, 5, 1, 1, 4, 4, 4, 4, 5, 3, 3, 3, 1, 4, 4, 1, 1, 5, 1, 4, 1, 4, 4, 4, 4, 4, 4, 4, 4, 3, 3, 2, 4, 4, 4, 4, 4, 4, 4, 5, 2, 1, 1, 4, 4, 5, 3, 3, 2, 1, 2, 4, 1, 5, 4, 1, 4, 4, 1, 5, 1, 2, 1, 1, 4, 1, 5, 4, 2, 4, 4, 5, 5, 4, 1, 4, 1, 5, 1, 5, 3, 1, 4, 5, 4, 5, 1, 4, 4, 4, 1, 5, 4, 5, 1, 4, 1, 3, 2, 4, 4, 4, 1, 5, 1, 4, 4, 2, 4, 5, 5, 4, 1, 4, 4, 5, 4, 4, 2, 4, 3, 1, 2, 5, 1, 4, 2, 4, 4, 4, 4, 4, 1, 4, 5, 4, 4), # worst item in question 10

W10 = c(2, 4, 5, 2, 3, 2, 5, 3, 5, 4, 3, 5, 1, 4, 5, 4, 1, 5, 4, 4, 3, 5, 5, 5, 1, 5, 2, 3, 4, 3, 5, 2, 2, 3, 5, 2, 5, 5, 4, 5, 5, 5, 1, 2, 1, 4, 4, 5, 2, 4, 1, 5, 2, 2, 4, 3, 2, 5, 4, 5, 5, 4, 2, 1, 5, 3, 3, 5, 3, 3, 2, 5, 4, 5, 5, 5, 3, 3, 3, 2, 3, 5, 4, 5, 5, 2, 3, 5, 3, 3, 5, 1, 4, 4, 3, 5, 5, 3, 3, 2, 4, 1, 1, 5, 2, 2, 1, 2, 2, 3, 4, 5, 5, 5, 5, 1, 3, 4, 1, 3, 5, 5, 5, 1, 1, 3, 2, 5, 2, 5, 4, 5, 4, 2, 3, 1, 3, 5, 1, 1, 4, 4, 3, 5, 2, 1, 3, 2, 5, 4, 5, 4, 1, 3, 4, 3, 3, 1, 2, 3, 3, 5, 4, 5, 5, 2, 3, 4, 2, 4, 5, 2, 4, 1, 5, 2, 2, 5, 3, 5, 4, 5, 5, 1, 2, 1, 4, 4, 3, 2, 5, 3, 4, 1, 1, 5, 2, 5, 2, 4, 5, 1, 1, 3, 4, 4, 2, 5, 4, 2, 4, 1, 5, 2, 5, 1, 2, 1, 2, 4, 5, 2, 5, 4, 4, 5, 5, 4, 1, 3, 2, 5, 5, 3, 2, 4, 1, 5), # best item in question 10

B11 = c(5, 4, 4, 5, 1, 1, 1, 2, 1, 1, 2, 1, 2, 4, 4, 1, 2, 1, 4, 4, 5, 4, 3, 5, 2, 2, 5, 3, 3, 3, 5, 3, 5, 2, 2, 1, 5, 4, 5, 3, 1, 2, 2, 3, 2, 1, 4, 2, 4, 3, 3, 2, 1, 1, 4, 3, 5, 4, 5, 4, 1, 1, 3, 2, 1, 2, 2, 1, 3, 3, 5, 4, 3, 3, 1, 2, 1, 3, 2, 1, 3, 5, 5, 4, 2, 3, 2, 1, 2, 2, 1, 2, 4, 1, 2, 1, 1, 2, 2, 4, 3, 2, 3, 1, 1, 5, 2, 1, 4, 5, 4, 4, 4, 5, 2, 2, 3, 1, 3, 3, 1, 4, 2, 2, 2, 1, 5, 2, 4, 2, 4, 4, 1, 5, 1, 2, 1, 2, 2, 2, 4, 4, 2, 1, 1, 2, 5, 5, 4, 3, 5, 1, 2, 3, 4, 2, 2, 2, 1, 3, 5, 5, 3, 3, 5, 5, 3, 4, 1, 4, 2, 4, 3, 3, 2, 1, 1, 4, 5, 5, 5, 4, 5, 2, 3, 2, 4, 1, 2, 1, 1, 2, 3, 2, 3, 1, 1, 1, 5, 3, 1, 2, 2, 3, 4, 1, 1, 1, 4, 4, 3, 3, 2, 1, 2, 2, 3, 2, 1, 4, 2, 5, 4, 3, 5, 3, 1, 1, 2, 1, 1, 1, 1, 2, 4, 3, 2, 2), # worst item in question 11

W11 = c(1, 5, 1, 2, 4, 3, 4, 4, 3, 2, 4, 4, 5, 5, 3, 2, 5, 4, 5, 5, 1, 3, 2, 3, 5, 5, 2, 1, 1, 2, 2, 5, 2, 4, 5, 4, 2, 3, 4, 2, 3, 4, 3, 5, 5, 2, 5, 5, 3, 1, 1, 4, 4, 3, 5, 2, 1, 2, 4, 1, 3, 2, 5, 5, 3, 4, 4, 3, 2, 2, 1, 2, 1, 2, 3, 4, 4, 1, 4, 4, 2, 2, 4, 1, 4, 5, 4, 3, 4, 4, 3, 5, 5, 2, 4, 3, 4, 4, 4, 3, 1, 5, 1, 3, 4, 2, 5, 3, 3, 1, 5, 2, 1, 3, 4, 3, 1, 2, 1, 2, 3, 3, 4, 3, 5, 4, 2, 5, 3, 4, 5, 2, 2, 2, 4, 5, 4, 4, 5, 5, 5, 5, 4, 3, 3, 5, 1, 1, 2, 1, 3, 2, 5, 1, 5, 4, 4, 5, 3, 2, 1, 2, 1, 2, 3, 2, 1, 5, 3, 5, 5, 3, 1, 1, 4, 4, 3, 3, 1, 2, 4, 1, 3, 3, 5, 5, 5, 2, 4, 3, 3, 4, 1, 5, 1, 3, 3, 3, 1, 1, 3, 3, 5, 1, 5, 2, 3, 4, 5, 3, 1, 1, 4, 4, 4, 3, 5, 5, 3, 5, 5, 1, 3, 1, 4, 2, 3, 2, 5, 4, 3, 3, 4, 4, 3, 1, 5, 4), # best item in question 11

B12 = c(5, 3, 1, 1, 1, 2, 1, 5, 2, 4, 2, 1, 2, 3, 4, 4, 2, 1, 1, 3, 4, 4, 4, 2, 2, 5, 1, 3, 2, 4, 1, 2, 1, 2, 5, 4, 1, 4, 5, 4, 2, 2, 2, 2, 2, 4, 1, 5, 4, 2, 4, 3, 4, 2, 3, 4, 5, 1, 5, 1, 2, 4, 2, 2, 2, 5, 2, 2, 4, 4, 5, 1, 3, 4, 2, 2, 1, 3, 5, 4, 4, 1, 5, 1, 2, 2, 2, 2, 5, 2, 2, 2, 5, 4, 2, 2, 1, 5, 2, 4, 2, 2, 4, 2, 4, 1, 2, 2, 4, 4, 3, 1, 1, 2, 2, 2, 3, 4, 4, 4, 2, 4, 2, 2, 2, 1, 1, 5, 4, 3, 3, 1, 4, 1, 1, 2, 1, 3, 2, 2, 5, 1, 2, 2, 2, 2, 4, 5, 1, 3, 2, 4, 2, 3, 5, 2, 2, 2, 2, 4, 4, 1, 3, 4, 2, 1, 3, 5, 2, 1, 5, 4, 2, 4, 3, 4, 2, 4, 4, 1, 5, 1, 2, 2, 2, 2, 5, 4, 2, 2, 2, 2, 2, 2, 4, 2, 2, 2, 5, 3, 2, 2, 2, 3, 5, 4, 2, 1, 1, 4, 2, 4, 3, 4, 2, 2, 2, 2, 2, 1, 5, 5, 4, 3, 5, 4, 2, 4, 2, 1, 2, 2, 1, 5, 4, 2, 2, 3), # worst item in question 12

W12 = c(2, 1, 4, 3, 3, 4, 3, 1, 4, 2, 4, 3, 1, 1, 2, 2, 1, 3, 2, 1, 1, 2, 3, 1, 1, 1, 3, 2, 5, 2, 2, 3, 3, 4, 1, 3, 2, 2, 1, 3, 1, 4, 3, 3, 1, 2, 2, 1, 1, 5, 3, 1, 3, 1, 1, 2, 2, 5, 1, 4, 1, 2, 3, 5, 4, 1, 4, 4, 2, 2, 2, 5, 1, 3, 1, 4, 3, 2, 1, 3, 2, 2, 1, 4, 4, 3, 4, 4, 1, 4, 4, 1, 5, 2, 4, 4, 3, 1, 4, 1, 5, 1, 3, 4, 3, 3, 1, 1, 1, 1, 1, 5, 4, 1, 4, 3, 2, 2, 3, 2, 4, 2, 4, 3, 1, 3, 3, 1, 1, 1, 1, 5, 2, 3, 3, 1, 3, 1, 5, 5, 1, 2, 4, 4, 1, 5, 1, 2, 5, 1, 1, 2, 5, 2, 3, 4, 4, 1, 1, 2, 1, 2, 1, 3, 1, 3, 2, 2, 4, 2, 1, 1, 5, 3, 1, 3, 1, 2, 1, 2, 1, 4, 1, 3, 3, 5, 4, 2, 4, 4, 4, 4, 5, 1, 3, 4, 1, 4, 2, 1, 1, 3, 5, 2, 4, 2, 4, 3, 2, 1, 5, 3, 1, 3, 4, 3, 3, 5, 4, 2, 1, 2, 2, 1, 1, 3, 1, 2, 1, 3, 4, 4, 3, 1, 1, 5, 1, 1), # best item in question 12

B13 = c(5, 2, 5, 5, 4, 3, 3, 4, 3, 5, 4, 3, 3, 2, 2, 2, 4, 3, 5, 2, 1, 2, 2, 2, 4, 1, 5, 5, 5, 2, 4, 4, 5, 4, 1, 2, 4, 2, 2, 2, 1, 3, 3, 4, 4, 5, 5, 1, 2, 5, 5, 3, 2, 4, 2, 2, 5, 3, 2, 5, 1, 2, 4, 3, 3, 4, 3, 3, 2, 2, 5, 3, 1, 2, 1, 3, 4, 5, 4, 2, 2, 4, 2, 5, 3, 4, 4, 3, 4, 3, 3, 4, 5, 5, 4, 3, 3, 4, 3, 2, 5, 3, 5, 3, 2, 5, 4, 4, 2, 1, 2, 3, 5, 2, 3, 3, 5, 5, 5, 2, 3, 2, 3, 3, 4, 4, 5, 1, 2, 3, 2, 3, 2, 5, 4, 3, 4, 3, 3, 3, 5, 5, 3, 3, 4, 3, 1, 5, 3, 1, 2, 2, 3, 5, 5, 4, 3, 3, 4, 2, 1, 4, 1, 2, 2, 5, 5, 5, 3, 5, 1, 2, 5, 5, 3, 2, 4, 2, 1, 4, 2, 5, 2, 3, 4, 3, 5, 5, 4, 3, 3, 3, 5, 3, 5, 3, 4, 3, 5, 1, 1, 3, 3, 5, 5, 5, 3, 3, 5, 2, 5, 5, 3, 2, 3, 3, 4, 3, 3, 5, 1, 5, 2, 1, 2, 2, 1, 2, 4, 4, 3, 3, 3, 4, 2, 5, 3, 3), # worst item in question 13

W13 = c(3, 5, 1, 2, 1, 5, 1, 5, 1, 4, 1, 1, 5, 5, 4, 4, 1, 1, 4, 5, 3, 4, 5, 4, 1, 5, 2, 3, 4, 4, 1, 2, 2, 1, 5, 3, 1, 4, 5, 5, 5, 2, 2, 2, 1, 4, 4, 5, 5, 4, 4, 5, 3, 5, 5, 4, 3, 2, 5, 1, 5, 4, 2, 2, 2, 5, 1, 1, 4, 4, 3, 2, 4, 5, 5, 2, 1, 3, 5, 3, 4, 1, 5, 1, 2, 2, 1, 2, 5, 1, 1, 1, 4, 4, 1, 2, 1, 5, 1, 5, 4, 5, 4, 1, 3, 2, 1, 5, 5, 3, 5, 2, 1, 4, 2, 2, 3, 4, 4, 4, 2, 4, 2, 2, 1, 1, 2, 5, 5, 5, 5, 2, 4, 2, 1, 5, 1, 5, 2, 2, 4, 4, 1, 1, 5, 2, 3, 3, 2, 4, 4, 4, 2, 3, 4, 1, 1, 5, 5, 4, 3, 1, 4, 5, 4, 2, 3, 4, 5, 4, 5, 5, 4, 4, 5, 3, 5, 4, 3, 1, 5, 1, 4, 2, 2, 2, 4, 4, 1, 5, 2, 1, 4, 5, 4, 1, 5, 1, 3, 4, 5, 2, 2, 3, 4, 4, 5, 1, 4, 5, 4, 4, 5, 3, 2, 2, 2, 2, 5, 4, 5, 3, 4, 4, 5, 5, 5, 4, 1, 1, 5, 2, 1, 5, 5, 4, 5, 5), # best item in question 13

B14 = c(2, 2, 1, 4, 3, 3, 1, 3, 3, 5, 4, 1, 3, 2, 2, 5, 3, 1, 2, 2, 2, 2, 5, 5, 3, 3, 4, 1, 5, 4, 4, 3, 4, 4, 3, 2, 4, 2, 5, 5, 5, 3, 1, 3, 3, 5, 2, 3, 4, 5, 1, 3, 2, 2, 2, 4, 2, 4, 5, 1, 5, 5, 3, 1, 2, 3, 3, 3, 4, 4, 2, 4, 1, 5, 5, 3, 3, 1, 3, 2, 4, 4, 5, 1, 3, 3, 4, 2, 3, 3, 3, 3, 5, 5, 4, 2, 1, 3, 3, 4, 5, 3, 1, 3, 2, 4, 3, 2, 4, 2, 2, 4, 1, 5, 3, 1, 1, 5, 1, 4, 2, 2, 3, 1, 3, 3, 4, 3, 4, 3, 2, 4, 5, 4, 3, 3, 3, 3, 1, 1, 5, 2, 3, 3, 2, 1, 2, 2, 4, 1, 5, 5, 1, 1, 5, 4, 3, 3, 2, 4, 2, 4, 1, 5, 5, 4, 1, 5, 3, 2, 3, 4, 5, 1, 3, 2, 2, 2, 2, 4, 5, 1, 5, 1, 3, 1, 5, 5, 4, 3, 2, 3, 5, 3, 1, 3, 2, 3, 2, 1, 5, 1, 1, 1, 5, 5, 3, 1, 2, 4, 5, 1, 3, 2, 3, 1, 3, 1, 3, 2, 3, 2, 2, 1, 5, 5, 5, 5, 3, 3, 3, 2, 1, 3, 4, 5, 3, 3), # worst item in question 14

W14 = c(1, 4, 5, 1, 5, 5, 5, 4, 1, 3, 1, 5, 1, 4, 5, 2, 2, 5, 3, 4, 3, 5, 4, 4, 2, 4, 1, 3, 3, 2, 5, 1, 1, 1, 4, 1, 5, 5, 1, 4, 1, 5, 5, 1, 2, 3, 3, 4, 1, 3, 3, 5, 1, 5, 4, 2, 1, 3, 1, 5, 1, 2, 1, 5, 1, 4, 4, 1, 2, 2, 1, 3, 4, 4, 1, 5, 5, 3, 4, 1, 2, 5, 1, 5, 5, 1, 1, 1, 4, 4, 1, 2, 4, 3, 1, 1, 5, 4, 4, 1, 3, 1, 3, 1, 1, 1, 2, 5, 1, 3, 4, 3, 5, 4, 5, 5, 3, 3, 3, 2, 1, 5, 5, 5, 2, 5, 1, 4, 1, 5, 4, 3, 2, 1, 5, 1, 5, 5, 5, 5, 4, 3, 4, 1, 5, 5, 3, 1, 3, 4, 4, 2, 5, 3, 4, 1, 4, 1, 5, 2, 3, 5, 4, 4, 4, 1, 3, 4, 5, 3, 4, 1, 3, 3, 5, 1, 5, 5, 3, 5, 1, 5, 4, 5, 1, 5, 4, 3, 1, 5, 1, 4, 3, 1, 3, 1, 5, 1, 1, 4, 1, 5, 5, 3, 4, 3, 5, 5, 3, 1, 3, 3, 5, 1, 5, 5, 1, 5, 5, 3, 4, 1, 5, 4, 1, 4, 1, 2, 2, 5, 5, 1, 5, 4, 1, 3, 1, 5), # best item in question 14

B15 = c(1, 4, 3, 3, 2, 2, 2, 2, 2, 4, 2, 2, 2, 4, 4, 2, 2, 2, 4, 4, 4, 4, 4, 4, 2, 2, 3, 4, 1, 4, 3, 2, 3, 2, 2, 3, 3, 4, 4, 4, 2, 2, 2, 2, 2, 4, 4, 2, 4, 1, 5, 2, 3, 2, 4, 4, 1, 1, 4, 3, 2, 3, 2, 2, 2, 2, 2, 2, 4, 4, 1, 1, 1, 4, 2, 2, 2, 4, 2, 3, 4, 3, 4, 3, 2, 2, 2, 2, 2, 2, 2, 2, 2, 4, 2, 2, 2, 2, 2, 4, 1, 2, 5, 2, 3, 3, 2, 2, 4, 4, 4, 1, 3, 4, 2, 2, 4, 4, 5, 4, 2, 4, 2, 2, 2, 2, 3, 2, 4, 2, 4, 1, 2, 3, 2, 2, 2, 2, 2, 2, 2, 4, 2, 2, 2, 2, 4, 1, 1, 1, 4, 3, 2, 4, 2, 2, 2, 2, 2, 4, 4, 3, 1, 4, 4, 3, 4, 2, 2, 4, 2, 4, 1, 5, 2, 3, 2, 4, 4, 3, 4, 3, 4, 2, 2, 2, 2, 4, 2, 2, 2, 2, 1, 2, 5, 2, 2, 2, 1, 1, 2, 2, 2, 4, 2, 4, 2, 2, 4, 4, 1, 5, 2, 3, 2, 2, 2, 2, 2, 4, 2, 1, 4, 1, 4, 4, 2, 2, 2, 2, 2, 2, 2, 2, 4, 1, 2, 2), # worst item in question 15

W15 = c(2, 3, 4, 5, 4, 1, 1, 5, 3, 1, 3, 1, 3, 3, 3, 1, 1, 1, 2, 3, 2, 3, 3, 3, 1, 3, 5, 2, 2, 2, 2, 5, 5, 3, 3, 5, 2, 3, 5, 3, 1, 4, 1, 5, 1, 1, 2, 3, 1, 2, 2, 4, 5, 5, 3, 2, 2, 5, 5, 4, 1, 5, 5, 4, 5, 5, 4, 4, 2, 2, 2, 5, 2, 3, 1, 4, 4, 2, 5, 5, 2, 2, 5, 4, 4, 5, 3, 5, 5, 4, 4, 1, 1, 1, 3, 5, 1, 5, 4, 1, 2, 3, 2, 5, 5, 5, 1, 5, 1, 2, 3, 5, 4, 3, 4, 1, 2, 1, 2, 2, 5, 3, 4, 1, 1, 4, 5, 3, 1, 4, 3, 5, 5, 5, 4, 3, 4, 4, 4, 4, 4, 2, 4, 3, 5, 4, 2, 2, 5, 2, 3, 5, 4, 2, 5, 3, 4, 3, 5, 2, 2, 2, 2, 2, 3, 3, 5, 2, 5, 1, 2, 3, 1, 2, 2, 4, 5, 5, 3, 2, 2, 5, 4, 3, 1, 5, 4, 1, 1, 3, 1, 5, 4, 2, 3, 2, 5, 5, 5, 2, 2, 1, 1, 4, 2, 4, 1, 1, 1, 2, 1, 2, 2, 4, 5, 4, 1, 5, 4, 1, 2, 3, 2, 3, 2, 5, 3, 1, 4, 1, 4, 1, 5, 1, 5, 1, 2, 3, 4), # best item in question 15

B16 = c(5, 5, 3, 3, 1, 3, 3, 4, 3, 1, 3, 3, 3, 5, 1, 3, 3, 3, 5, 5, 2, 1, 1, 2, 3, 4, 3, 1, 5, 1, 2, 3, 3, 3, 4, 2, 2, 1, 5, 1, 3, 3, 3, 3, 3, 1, 5, 4, 3, 5, 2, 3, 2, 2, 5, 1, 5, 2, 5, 3, 3, 3, 3, 3, 3, 4, 3, 3, 1, 1, 5, 2, 2, 1, 3, 3, 1, 1, 4, 2, 1, 2, 5, 3, 3, 3, 3, 3, 4, 3, 3, 3, 3, 1, 3, 3, 3, 4, 3, 3, 5, 3, 2, 3, 2, 3, 3, 2, 3, 2, 5, 2, 3, 2, 3, 3, 1, 1, 2, 1, 3, 1, 3, 3, 3, 1, 3, 4, 3, 3, 5, 2, 3, 3, 1, 3, 1, 3, 3, 3, 1, 5, 3, 3, 2, 3, 2, 5, 2, 2, 1, 3, 3, 1, 3, 3, 3, 3, 2, 1, 2, 2, 2, 1, 5, 3, 1, 3, 3, 5, 4, 3, 5, 2, 3, 2, 2, 1, 2, 2, 5, 3, 3, 3, 3, 3, 3, 1, 3, 3, 3, 3, 5, 3, 2, 3, 2, 3, 5, 2, 3, 3, 3, 1, 3, 1, 3, 3, 5, 3, 5, 2, 3, 2, 3, 3, 3, 3, 3, 5, 4, 5, 1, 2, 5, 1, 3, 3, 3, 1, 3, 3, 3, 4, 3, 5, 3, 3), # worst item in question 16

W16 = c(3, 3, 5, 1, 2, 1, 2, 5, 1, 3, 2, 2, 1, 3, 4, 1, 2, 2, 3, 3, 3, 4, 4, 1, 2, 5, 1, 3, 3, 4, 5, 4, 1, 2, 5, 5, 5, 4, 4, 4, 5, 5, 1, 4, 2, 3, 3, 5, 2, 3, 3, 5, 5, 4, 3, 4, 3, 5, 4, 5, 5, 1, 4, 1, 2, 5, 5, 5, 4, 4, 3, 5, 1, 4, 5, 5, 2, 3, 5, 5, 4, 5, 4, 5, 5, 4, 2, 2, 5, 5, 5, 2, 1, 3, 2, 2, 2, 5, 5, 2, 3, 1, 3, 4, 5, 1, 2, 4, 2, 3, 3, 5, 5, 5, 5, 1, 3, 3, 3, 4, 2, 4, 5, 1, 2, 2, 1, 5, 2, 5, 3, 5, 4, 1, 2, 1, 2, 5, 1, 1, 2, 3, 5, 1, 4, 1, 3, 3, 5, 1, 4, 1, 1, 3, 2, 2, 5, 1, 4, 4, 3, 5, 1, 4, 4, 1, 3, 2, 1, 3, 5, 2, 3, 3, 5, 5, 4, 4, 3, 5, 4, 5, 5, 1, 4, 1, 1, 3, 2, 1, 2, 5, 3, 1, 3, 4, 4, 4, 3, 1, 5, 1, 1, 3, 1, 3, 1, 2, 3, 2, 3, 3, 5, 5, 5, 1, 4, 1, 1, 3, 5, 3, 4, 1, 4, 4, 5, 1, 2, 2, 1, 2, 2, 5, 2, 3, 1, 5), # best item in question 16

B17 = c(2, 2, 1, 4, 2, 4, 3, 3, 3, 2, 3, 3, 3, 2, 2, 1, 3, 3, 1, 2, 2, 2, 5, 1, 3, 3, 4, 2, 2, 2, 4, 5, 4, 3, 3, 5, 4, 2, 5, 5, 4, 3, 1, 5, 3, 2, 1, 3, 4, 2, 1, 3, 5, 4, 2, 2, 2, 1, 5, 1, 4, 4, 5, 4, 4, 3, 3, 3, 2, 2, 2, 1, 1, 5, 4, 3, 2, 2, 3, 5, 2, 4, 5, 1, 3, 5, 3, 4, 3, 3, 3, 3, 4, 2, 3, 4, 3, 3, 3, 4, 2, 3, 1, 5, 5, 4, 3, 4, 4, 2, 2, 1, 1, 1, 3, 1, 2, 2, 1, 2, 4, 2, 3, 1, 3, 2, 4, 3, 4, 3, 2, 1, 5, 4, 2, 3, 2, 3, 4, 4, 2, 1, 3, 3, 4, 4, 2, 2, 1, 1, 5, 4, 4, 2, 4, 3, 3, 3, 4, 2, 2, 4, 1, 5, 5, 4, 2, 4, 4, 1, 3, 4, 2, 1, 3, 5, 4, 2, 2, 4, 5, 1, 1, 1, 5, 4, 1, 2, 3, 4, 4, 3, 2, 3, 1, 5, 4, 5, 2, 1, 4, 1, 4, 2, 4, 2, 4, 3, 1, 4, 2, 1, 3, 5, 3, 1, 5, 4, 4, 1, 3, 2, 2, 1, 5, 5, 4, 4, 3, 2, 4, 4, 3, 3, 4, 2, 3, 3), # worst item in question 17

W17 = c(4, 3, 2, 2, 5, 5, 5, 1, 1, 3, 1, 5, 1, 3, 5, 2, 2, 5, 4, 3, 4, 5, 4, 4, 2, 1, 2, 1, 1, 3, 3, 1, 2, 1, 1, 2, 3, 5, 4, 4, 2, 5, 2, 1, 2, 3, 4, 1, 2, 1, 4, 2, 2, 1, 3, 3, 4, 5, 4, 2, 2, 2, 1, 5, 1, 1, 1, 2, 3, 3, 4, 5, 4, 4, 2, 5, 5, 1, 1, 2, 3, 3, 4, 2, 5, 1, 1, 1, 1, 1, 1, 2, 5, 3, 1, 1, 5, 1, 1, 2, 1, 1, 4, 1, 2, 2, 2, 1, 2, 4, 3, 5, 2, 5, 5, 2, 1, 3, 4, 3, 1, 5, 5, 2, 2, 5, 2, 1, 2, 2, 3, 5, 1, 2, 5, 1, 5, 2, 5, 5, 5, 4, 1, 1, 1, 5, 4, 4, 5, 4, 4, 2, 5, 1, 1, 1, 1, 1, 1, 3, 4, 3, 4, 4, 4, 2, 1, 1, 5, 4, 1, 2, 1, 4, 2, 2, 1, 5, 4, 3, 4, 2, 2, 2, 1, 5, 2, 3, 1, 5, 1, 1, 1, 1, 4, 1, 1, 1, 4, 4, 2, 2, 5, 1, 5, 3, 5, 5, 4, 2, 1, 4, 2, 2, 5, 2, 1, 5, 5, 4, 1, 4, 5, 4, 4, 4, 2, 5, 2, 5, 5, 1, 5, 1, 2, 1, 1, 2), # best item in question 17

B18 = c(3, 4, 5, 5, 2, 2, 2, 1, 1, 4, 1, 2, 1, 4, 4, 2, 1, 2, 5, 4, 3, 4, 5, 4, 1, 1, 5, 4, 5, 3, 3, 1, 5, 1, 1, 5, 3, 4, 4, 5, 1, 1, 2, 1, 1, 4, 5, 1, 1, 5, 5, 1, 5, 4, 4, 3, 3, 3, 4, 5, 1, 5, 1, 1, 1, 1, 1, 1, 3, 3, 3, 3, 4, 5, 1, 1, 2, 4, 1, 5, 3, 3, 4, 5, 1, 1, 1, 1, 1, 1, 1, 2, 4, 1, 1, 2, 1, 1, 1, 5, 1, 5, 1, 5, 5, 1, 4, 1, 3, 4, 3, 5, 3, 1, 2, 4, 4, 5, 3, 1, 4, 1, 2, 1, 2, 5, 1, 1, 1, 4, 3, 1, 5, 2, 1, 2, 1, 1, 1, 2, 5, 1, 1, 4, 1, 3, 3, 3, 4, 5, 5, 1, 4, 1, 1, 1, 1, 4, 3, 3, 3, 4, 5, 4, 5, 4, 1, 2, 5, 1, 1, 5, 5, 1, 5, 4, 4, 3, 3, 4, 5, 5, 2, 1, 1, 2, 1, 1, 2, 1, 1, 5, 1, 5, 1, 4, 1, 3, 4, 1, 2, 1, 4, 1, 4, 2, 2, 5, 1, 5, 5, 1, 5, 1, 2, 1, 1, 2, 5, 1, 3, 4, 4, 4, 5, 1, 1, 1, 2, 2, 1, 2, 1, 1, 5, 1, 1), # worst item in question 18

W18 = c(2, 2, 3, 4, 3, 5, 4, 5, 5, 2, 5, 4, 5, 2, 2, 4, 4, 4, 1, 2, 2, 2, 3, 3, 4, 3, 4, 1, 2, 2, 1, 2, 4, 5, 3, 4, 1, 2, 2, 3, 5, 3, 4, 2, 4, 2, 1, 3, 5, 2, 1, 5, 4, 1, 2, 2, 2, 2, 2, 3, 5, 4, 2, 3, 5, 5, 3, 5, 2, 2, 2, 2, 3, 3, 5, 3, 3, 1, 5, 4, 2, 1, 2, 3, 3, 2, 5, 5, 5, 3, 3, 4, 5, 2, 5, 5, 4, 5, 3, 5, 2, 5, 1, 2, 4, 4, 4, 1, 5, 2, 2, 2, 3, 2, 3, 4, 1, 2, 1, 2, 5, 2, 3, 4, 4, 3, 4, 3, 5, 5, 2, 2, 2, 4, 3, 5, 3, 5, 3, 3, 3, 1, 3, 5, 1, 3, 2, 2, 2, 3, 3, 4, 3, 1, 5, 5, 3, 5, 1, 2, 2, 1, 3, 3, 2, 4, 1, 5, 5, 1, 3, 5, 2, 1, 5, 4, 1, 2, 2, 1, 2, 3, 3, 4, 2, 3, 4, 2, 5, 5, 5, 3, 2, 5, 1, 2, 1, 2, 2, 3, 5, 4, 3, 1, 3, 2, 5, 4, 1, 5, 2, 1, 5, 4, 3, 4, 2, 3, 5, 1, 3, 2, 2, 3, 2, 3, 5, 3, 4, 3, 5, 5, 4, 5, 5, 2, 5, 5), # best item in question 18

B19 = c(5, 1, 4, 4, 2, 2, 2, 4, 4, 1, 4, 2, 4, 1, 5, 2, 2, 2, 1, 1, 5, 5, 3, 1, 2, 4, 4, 1, 3, 3, 2, 4, 4, 4, 4, 5, 2, 5, 3, 3, 4, 2, 2, 4, 2, 1, 1, 4, 3, 3, 3, 2, 5, 2, 1, 3, 5, 1, 3, 4, 4, 4, 4, 2, 2, 4, 2, 2, 3, 3, 5, 1, 1, 3, 4, 2, 2, 1, 4, 5, 3, 2, 3, 4, 2, 4, 4, 2, 4, 2, 2, 2, 2, 1, 4, 2, 2, 4, 2, 3, 3, 4, 3, 4, 5, 4, 2, 2, 3, 5, 1, 1, 4, 1, 2, 2, 1, 1, 3, 3, 2, 5, 2, 2, 2, 2, 4, 4, 3, 2, 1, 1, 4, 4, 2, 4, 2, 2, 2, 2, 2, 1, 2, 4, 2, 2, 5, 5, 1, 1, 3, 4, 2, 1, 2, 4, 2, 4, 2, 3, 5, 2, 1, 3, 3, 4, 1, 2, 2, 1, 4, 3, 3, 3, 2, 5, 2, 5, 5, 2, 3, 4, 4, 2, 4, 2, 2, 2, 4, 2, 2, 2, 3, 4, 3, 4, 2, 4, 5, 1, 4, 2, 2, 1, 2, 1, 2, 2, 1, 3, 3, 3, 2, 5, 2, 2, 4, 2, 2, 1, 4, 5, 5, 1, 3, 3, 4, 2, 2, 2, 2, 2, 2, 4, 3, 3, 4, 2), # worst item in question 19

W19 = c(2, 4, 3, 1, 1, 1, 5, 2, 3, 4, 5, 5, 3, 4, 3, 1, 1, 5, 4, 4, 2, 3, 5, 3, 1, 5, 1, 2, 2, 2, 4, 1, 1, 5, 5, 1, 4, 3, 2, 5, 3, 3, 1, 1, 1, 4, 4, 5, 1, 2, 2, 3, 1, 3, 4, 2, 2, 4, 2, 3, 3, 1, 1, 1, 5, 2, 3, 3, 2, 2, 2, 4, 3, 5, 3, 3, 1, 2, 2, 1, 2, 4, 2, 3, 3, 1, 5, 5, 2, 3, 3, 1, 1, 4, 5, 5, 5, 2, 3, 1, 2, 3, 2, 1, 1, 1, 1, 3, 1, 2, 4, 4, 3, 4, 3, 1, 2, 4, 2, 2, 5, 3, 3, 1, 1, 1, 1, 5, 1, 3, 4, 4, 1, 1, 1, 3, 1, 3, 1, 1, 1, 4, 3, 3, 3, 1, 2, 2, 4, 3, 5, 1, 1, 2, 5, 5, 3, 3, 3, 2, 2, 4, 3, 5, 2, 1, 2, 5, 1, 4, 5, 1, 2, 2, 3, 1, 3, 3, 2, 4, 2, 3, 3, 1, 1, 1, 1, 5, 5, 1, 5, 3, 2, 3, 2, 1, 3, 1, 2, 3, 3, 1, 1, 2, 1, 4, 1, 5, 4, 1, 2, 2, 3, 1, 3, 1, 1, 1, 1, 4, 5, 2, 3, 3, 2, 5, 3, 1, 1, 1, 1, 5, 5, 2, 1, 2, 3, 3), # best item in question 19

B20 = c(2, 5, 5, 2, 4, 4, 4, 2, 2, 5, 4, 4, 2, 5, 5, 2, 4, 4, 2, 5, 2, 5, 4, 1, 4, 4, 2, 1, 5, 2, 3, 2, 2, 4, 4, 4, 3, 5, 5, 4, 2, 3, 2, 2, 4, 5, 2, 4, 2, 5, 3, 1, 4, 3, 5, 2, 2, 1, 5, 5, 2, 2, 2, 3, 4, 2, 4, 1, 2, 2, 2, 1, 1, 4, 2, 3, 4, 1, 2, 4, 2, 3, 5, 5, 3, 2, 4, 4, 2, 4, 4, 4, 4, 5, 4, 4, 4, 2, 4, 2, 5, 2, 3, 2, 4, 2, 4, 3, 2, 2, 5, 1, 5, 1, 3, 2, 1, 5, 3, 2, 4, 5, 3, 2, 4, 4, 2, 4, 2, 1, 5, 1, 2, 2, 4, 2, 4, 1, 3, 3, 4, 2, 4, 2, 3, 3, 2, 2, 1, 1, 4, 2, 3, 1, 4, 4, 4, 2, 3, 2, 2, 3, 1, 4, 5, 2, 1, 4, 4, 2, 4, 2, 5, 3, 1, 4, 3, 5, 2, 3, 5, 5, 5, 2, 2, 3, 2, 5, 4, 4, 4, 4, 5, 2, 3, 2, 3, 2, 2, 1, 2, 2, 3, 1, 3, 5, 4, 4, 2, 2, 5, 3, 1, 4, 3, 2, 2, 3, 4, 2, 4, 2, 5, 1, 5, 4, 2, 3, 4, 4, 4, 4, 4, 2, 2, 5, 2, 1), # worst item in question 20

W20 = c(4, 4, 2, 1, 1, 3, 1, 3, 1, 3, 3, 1, 1, 4, 3, 1, 5, 1, 4, 4, 1, 3, 2, 4, 5, 1, 1, 2, 2, 5, 2, 1, 1, 3, 1, 1, 2, 3, 3, 2, 5, 2, 1, 1, 5, 3, 4, 1, 1, 2, 1, 4, 1, 4, 4, 5, 4, 4, 5, 2, 5, 1, 1, 4, 1, 3, 1, 4, 5, 5, 4, 4, 4, 2, 5, 2, 1, 2, 3, 1, 5, 2, 4, 2, 2, 1, 3, 1, 3, 1, 1, 5, 3, 3, 3, 4, 1, 3, 1, 1, 2, 1, 1, 1, 1, 1, 5, 4, 1, 1, 4, 4, 2, 4, 2, 1, 2, 3, 1, 5, 1, 3, 2, 1, 5, 1, 1, 1, 1, 4, 4, 4, 1, 1, 1, 1, 1, 4, 4, 4, 1, 4, 1, 1, 4, 4, 1, 4, 4, 4, 2, 1, 4, 2, 1, 3, 1, 1, 4, 5, 1, 2, 4, 2, 2, 1, 2, 1, 3, 4, 1, 1, 2, 1, 4, 1, 4, 3, 1, 2, 4, 2, 2, 4, 1, 4, 1, 3, 3, 3, 1, 1, 2, 1, 1, 1, 4, 1, 4, 4, 5, 1, 4, 2, 4, 3, 3, 1, 4, 1, 2, 1, 4, 1, 2, 1, 1, 4, 3, 4, 1, 4, 3, 4, 4, 2, 5, 4, 5, 1, 3, 1, 1, 3, 1, 2, 1, 4), # best item in question 20

B21 = c(1, 5, 5, 5, 1, 1, 1, 1, 1, 5, 1, 1, 1, 5, 3, 2, 1, 1, 5, 5, 4, 3, 4, 1, 1, 1, 5, 3, 2, 1, 4, 1, 5, 1, 1, 1, 4, 3, 4, 4, 5, 1, 2, 1, 1, 5, 5, 1, 4, 2, 4, 1, 1, 2, 5, 1, 1, 1, 4, 5, 5, 5, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 4, 5, 1, 1, 3, 1, 1, 1, 4, 4, 5, 1, 1, 1, 1, 1, 1, 1, 1, 1, 5, 1, 1, 1, 1, 1, 4, 2, 1, 4, 1, 1, 5, 1, 2, 4, 4, 5, 1, 5, 1, 1, 2, 3, 5, 4, 1, 1, 3, 1, 2, 1, 1, 5, 1, 4, 1, 5, 1, 1, 5, 1, 1, 1, 1, 2, 2, 1, 5, 1, 1, 2, 2, 4, 1, 1, 1, 4, 5, 2, 3, 1, 1, 1, 1, 2, 1, 4, 4, 1, 4, 4, 5, 3, 1, 1, 5, 1, 4, 2, 4, 1, 1, 2, 3, 4, 4, 4, 5, 5, 2, 1, 2, 2, 5, 1, 1, 1, 1, 2, 1, 4, 1, 2, 1, 1, 1, 5, 2, 2, 3, 2, 5, 1, 1, 5, 4, 2, 4, 1, 1, 1, 2, 1, 2, 1, 5, 1, 1, 3, 1, 4, 4, 5, 2, 1, 1, 1, 1, 1, 1, 4, 2, 1, 1), # worst item in question 21

W21 = c(2, 4, 4, 3, 2, 4, 3, 5, 3, 1, 5, 3, 3, 4, 2, 3, 4, 3, 1, 4, 5, 2, 2, 2, 4, 3, 3, 1, 1, 2, 2, 3, 3, 5, 3, 3, 2, 2, 1, 2, 2, 4, 3, 3, 4, 1, 1, 3, 2, 1, 1, 4, 3, 5, 4, 2, 2, 5, 1, 4, 2, 3, 3, 4, 3, 5, 5, 4, 2, 2, 2, 5, 2, 2, 2, 4, 2, 1, 5, 3, 2, 2, 1, 4, 4, 3, 5, 3, 5, 5, 5, 4, 4, 1, 5, 3, 3, 5, 5, 2, 1, 3, 1, 3, 3, 3, 4, 5, 2, 5, 4, 5, 4, 5, 4, 3, 1, 1, 1, 2, 3, 2, 4, 3, 4, 2, 3, 3, 2, 4, 4, 5, 3, 3, 2, 3, 2, 4, 4, 4, 2, 1, 5, 3, 5, 4, 5, 2, 5, 2, 2, 3, 4, 1, 3, 5, 5, 3, 5, 2, 5, 2, 2, 2, 1, 3, 1, 3, 4, 1, 3, 2, 1, 1, 4, 3, 5, 2, 5, 2, 1, 4, 4, 3, 3, 4, 3, 1, 5, 4, 3, 5, 1, 3, 1, 3, 5, 3, 2, 2, 2, 3, 4, 1, 4, 1, 4, 3, 1, 2, 1, 1, 4, 3, 4, 3, 3, 4, 4, 1, 3, 2, 2, 2, 1, 2, 2, 4, 4, 2, 4, 3, 3, 5, 2, 1, 3, 4)) # best item in question 21

create a data set for the maxdiff model analysis

by combining the choice sets and respondent data set

dat2 <- bws.dataset(

respondent.dataset = res2,

response.type = 1, # row number format

choice.sets = des2,

design.type = 2, # BIBD

item.names = items2) # state variables are labeled using item names

analyze responses to BWS questions

counting approach

bws2 <- bws.count(dat2)

bws2

```
# the argument cl is set to 2 to generaet a data set
# of the S3 class 'bws.count2'
bws2.2 <- bws.count(dat2, cl = 2)
plot(bws2.2, score = "bw")
barplot(bws2.2, score = "bw")
sum(bws2.2)
summary(bws2.2)
# modelling approach
# note: O is excluded from fr2 to normalized its coefficient to zero
fr2 <- RES ~ a + b + c + d + e + f + g + h + i + j + k + l + m + n + o + q + r + s + t + u + strata(STR)
clg2 <- clogit(fr2, data = dat2)
clg2
bws.sp(clg2, base = "p", order = TRUE)
## End(Not run)

#look for this file in your working directory
sink("Share of preference.txt")
print (bws.sp("N"))
print (clg2("clg2"))
print (summary("bws2.2"))
print (blocks)
sink()
```

3.2 Results BWS and SP of the total respondents group

```
         i          l          b          k          j          e
g          m          c          f          p          d          o
r          q          s
0.03253780 0.03944308 0.04151243 0.04159340 0.04177373 0.04235871
0.04393233 0.04432113 0.04555982 0.04608237 0.04619019 0.04684797
0.04694347 0.04837599 0.04960935 0.05164831
         a          u          t          n          h
0.05355303 0.05465265 0.05487704 0.06350662 0.06468055
Call:
clogit(fr2, data = dat2)

       coef exp(coef)  se(coef)      z        p
a  0.147905  1.159403  0.063720  2.321  0.02028
b -0.106775  0.898728  0.063679 -1.677  0.09359
c -0.013741  0.986353  0.063729 -0.216  0.82928
d  0.014140  1.014241  0.063656  0.222  0.82421
e -0.086593  0.917050  0.063722 -1.359  0.17417
f -0.002337  0.997666  0.063531 -0.037  0.97066
g -0.050117  0.951118  0.063653 -0.787  0.43108
h  0.336693  1.400309  0.063799  5.277 1.31e-07
i -0.350365  0.704431  0.063855 -5.487 4.09e-08
j -0.100500  0.904385  0.063657 -1.579  0.11439
k -0.104826  0.900481  0.063709 -1.645  0.09989
l -0.157909  0.853928  0.069432 -2.274  0.02295
m -0.041306  0.959535  0.059767 -0.691  0.48949
n  0.318377  1.374894  0.063799  4.990 6.03e-07
o  0.016177  1.016308  0.063585  0.254  0.79918
q  0.071412  1.074023  0.063754  1.120  0.26267
r  0.046236  1.047322  0.063574  0.727  0.46705
s  0.111690  1.118166  0.063706  1.753  0.07957
t  0.172328  1.188067  0.063706  2.705  0.00683
u  0.168230  1.183209  0.063659  2.643  0.00823

Likelihood ratio test=242.6  on 20 df, p=< 2.2e-16
n= 99960, number of events= 4995
Number of respondents = 238

    B   W   BW Rank  meanB  meanW    meanBW mean.stdBW sqrtBW
std.sqrtBW
a 266 202   64    5 1.1176 0.8487  0.268908   0.053782 1.1475
0.8239
b 180 242  -62   19 0.7563 1.0168 -0.260504  -0.052101 0.8624
0.6192
c 181 197  -16   13 0.7605 0.8277 -0.067227  -0.013445 0.9585
0.6882
d 180 182   -2    9 0.7563 0.7647 -0.008403  -0.001681 0.9945
0.7140
e 220 272  -52   16 0.9244 1.1429 -0.218487  -0.043697 0.8993
0.6457
f 166 179  -13   12 0.6975 0.7521 -0.054622  -0.010924 0.9630
0.6914
g 154 188  -34   14 0.6471 0.7899 -0.142857  -0.028571 0.9051
0.6498
h 324 167  157    1 1.3613 0.7017  0.659664   0.131933 1.3929
1.0000
i 131 313 -182   21 0.5504 1.3151 -0.764706  -0.152941 0.6469
0.4645
```

j	187	246	-59	17	0.7857	1.0336	-0.247899	-0.049580	0.8719	0.6259
k	270	331	-61	18	1.1345	1.3908	-0.256303	-0.051261	0.9032	0.6484
l	228	298	-70	20	0.9580	1.2521	-0.294118	-0.073529	0.8747	0.6280
m	219	254	-35	15	0.9202	1.0672	-0.147059	-0.024510	0.9285	0.6666
n	364	216	148	2	1.5294	0.9076	0.621849	0.124370	1.2981	0.9320
o	223	227	-4	10	0.9370	0.9538	-0.016807	-0.003361	0.9912	0.7116
p	257	269	-12	11	1.0798	1.1303	-0.050420	-0.010084	0.9774	0.7017
q	265	239	26	7	1.1134	1.0042	0.109244	0.021849	1.0530	0.7560
r	276	265	11	8	1.1597	1.1134	0.046218	0.009244	1.0205	0.7327
s	293	247	46	6	1.2311	1.0378	0.193277	0.038655	1.0891	0.7819
t	305	229	76	3	1.2815	0.9622	0.319328	0.063866	1.1541	0.8285
u	306	232	74	4	1.2857	0.9748	0.310924	0.062185	1.1485	0.8245

Appendix 4 – Result tables

Table A4.1. Outcome of the Chi-square test

	Sample		Total	% Dutch population	Expected numbers		O-E		(O-E)2/E	
Gender	Data sample	Dutch population			Data sample	Dutch	Data sample	Dutch	Data sample	
Female	112	8790134	8790246	50,4%	118,2	8790127,5	-6,205	6,205	0,326	0,000
Male	123	8685281	8685404	49,8%	116,8	8685287,5	6,205	-6,205	0,330	0,000
	235	17475415	17475650		235,0	17475415,0	0,000	0,000	0,655	0,000

Df = 1
X^2 = 0,655
p-value = >0.1

	Sample		Total	% Dutch population	Expected numbers		O-E		(O-E)2/E	
Age	Data sample	Dutch			Data sample	Dutch	Data sample	Dutch	Data sample	Dutch
18-24	26	1537837	1537863	8,8%	21,0	1537841,5	5,014	-5,014	1,198	0,000
25-34	61	2254329	2254390	12,9%	30,8	2254358,8	30,236	-30,236	29,717	0,000
35-44	21	2079574	2079595	11,9%	28,4	2079567,0	-7,379	7,379	1,919	0,000
45-54	48	2411607	2411655	13,8%	32,9	2411622,4	15,090	-15,090	6,919	0,000
55-64	57	2394132	2394189	13,7%	32,7	2394156,2	24,328	-24,328	18,116	0,000
≥ 65	25	6762986	6763011	38,8%	92,3	6762918,3	-67,290	67,290	49,062	0,001
	238	17440464	17440702		238,0	17440464,2	0,000	0,000	0,000	0,000

Df = 5
X^2 = 0,000
p-value = 1,000

	Sample		Total	% Dutch population	Expected numbers		O-E		(O-E)2/E	
Income	Data sample	Dutch			Data sample	Dutch	Data sample	Dutch	Data sample	Dutch
< 1.000	10	891246	891256	5,1%	10,9	891245,3	-0,863	0,863	0,069	0,000
1.000 – 1.500	5	2184427	2184432	12,5%	26,6	2184405,3	-21,625	21,625	17,564	0,000
1.500 – 2.000	5	3355280	3355285	19,2%	40,9	3355243,8	-35,896	35,896	31,507	0,000
2.000 – 2.500	21	3110624	3110645	17,8%	37,9	3110607,0	-16,914	16,914	7,545	0,000
2.500 – 3.000	29	2796066	2796095	16,0%	34,1	2796061,3	-5,080	5,080	0,757	0,000
≥ 3.000	143	5137772	5137915	29,5%	62,6	5137852,4	80,377	-80,377	103,164	0,001
	213	17475415	17475628		213,0	17475415,0	0,000	0,000	0,000	0,000

Df = 5
X^2 = 0,000
p-value = 1,000

	Sample		Total	% Dutch population	Expected numbers		O-E		(O-E)2/E	
education	Data sample	Dutch			Data sample	Dutch	Data sample	Dutch	Data sample	Dutch
Secondary Education	21	1520361	1520382	8,7%	25,8	1520356,3	-4,786	4,786	0,888	0,000
MBO	12	279607	279619	1,6%	4,7	279613,9	7,258	-7,258	11,107	0,000
HBO-Bachelor	78	6256199	6256277	35,9%	106,1	6256170,5	-28,107	28,107	7,445	0,000
WO-Bachelor	9	3757214	3757223	21,5%	63,7	3757159,5	-54,723	54,723	46,994	0,001
HBO-, WO Master, Dr	118	2219378	2219496	12,7%	37,6	2219458,1	80,357	-80,357	171,542	0,003
	238	14032758	14032996		238,0	14032758,2	0,000	0,000	0,000	0,000

Df = 4
X2 = 0,000
p-value = 1,000

	Sample		Total	% Dutch population	Expected numbers		O-E		(O-E)2/E	
Migration	Data sample	Dutch			Data sample	Dutch	Data sample	Dutch	Data sample	Dutch
Dutch	232	13176463	13176695	75,6%	179,5	13176515,5	52,547	-52,547	15,387	0,000
Migration	6	4298952	4298958	24,6%	58,5	4298899,5	-52,547	52,547	47,162	0,001
	238	17475415	17475653		238,0	17475415,0	0	0	62,549	0,001

Df = 1
X^2 = 62,549
p-value = <0.01

Table A4.2. Correlations residents' affective response and their usage of urban green and their social demographic characteristics

		Relax	Recreation	Social contacts	Cultural activities	Physical activities/exercise	Enjoy nature	Quality of life
Leaves change colour	Spearman's rho	.338**	.293**	.234**	.132*	.245**	.265**	.352**
	Sig. (2-tailed)	0.000	0.000	0.000	0.043	0.000	0.000	0.000
	N	237	237	237	237	237	237	237
Falling leaves	Spearman's rho	.253**	.213**	.222**	0.091	.274**	.195**	.182**
	Sig. (2-tailed)	0.000	0.001	0.001	0.162	0.000	0.003	0.005
	N	237	237	237	237	237	237	237
Drop organic products	Spearman's rho	.311**	.282**	.222**	.156*	.257**	.328**	.299**
	Sig. (2-tailed)	0.000	0.000	0.001	0.018	0.000	0.000	0.000
	N	230	230	230	230	230	230	230
Falling branches	Spearman's rho	.140*	0.129	0.039	.160*	0.053	0.105	.163*
	Sig. (2-tailed)	0.035	0.051	0.558	0.015	0.428	0.112	0.013
	N	229	229	229	229	229	229	229
Drip sticky juice	Spearman's rho	0.097	0.056	0.054	0.113	0.086	0.075	0.129
	Sig. (2-tailed)	0.155	0.410	0.426	0.096	0.205	0.272	0.057
	N	219	219	219	219	219	219	219
Pressure of roots on pavement	Spearman's rho	0.107	0.058	.162*	0.113	0.060	0.091	.135*
	Sig. (2-tailed)	0.101	0.376	0.013	0.086	0.359	0.164	0.038
	N	234	234	234	234	234	234	234
Cause allergic reaction	Spearman's rho	0.097	-0.029	-0.009	-0.004	0.011	0.047	.174*
	Sig. (2-tailed)	0.168	0.685	0.896	0.953	0.874	0.506	0.013
	N	202	202	202	202	202	202	202
Provide organic shade	Spearman's rho	.166*	.211**	0.119	0.121	.154*	.149*	.145*
	Sig. (2-tailed)	0.011	0.001	0.069	0.065	0.018	0.023	0.026
	N	235	235	235	235	235	235	235
Blonk wind	Spearman's rho	.228**	.173*	.137*	0.004	0.092	.140*	.145*
	Sig. (2-tailed)	0.001	0.010	0.043	0.953	0.174	0.039	0.033
	N	218	218	218	218	218	218	218
Water mangement	Spearman's rho	.254**	.210**	0.130	0.045	.135*	.169*	.235**
	Sig. (2-tailed)	0.000	0.001	0.050	0.501	0.041	0.011	0.000
	N	228	228	228	228	228	228	228
Capture fine dust	Spearman's rho	.260**	.192**	0.111	-0.002	.177**	.295**	.233**
	Sig. (2-tailed)	0.000	0.003	0.092	0.971	0.007	0.000	0.000
	N	230	230	230	230	230	230	230
Make sound	Spearman's rho	.223**	0.106	0.110	-0.055	.143*	.189**	0.121
	Sig. (2-tailed)	0.001	0.109	0.096	0.410	0.030	0.004	0.069
	N	229	229	229	229	229	229	229
Provide habitat to animals	Spearman's rho	.181**	.202**	.134*	0.087	.144*	.242**	.215**
	Sig. (2-tailed)	0.005	0.002	0.039	0.181	0.026	0.000	0.001
	N	237	237	237	237	237	237	237
Increase biodiversity	Spearman's rho	.272**	.290**	.130*	0.049	.163*	.278**	.340**
	Sig. (2-tailed)	0.000	0.000	0.046	0.458	0.012	0.000	0.000
	N	235	235	235	235	235	235	235
Increase house price	Spearman's rho	.200**	.228**	.157*	0.085	.170*	.162*	0.125
	Sig. (2-tailed)	0.004	0.001	0.022	0.218	0.013	0.019	0.070
	N	211	211	211	211	211	211	211
Take up parking space	Spearman's rho	.245**	.210**	.151*	0.093	.260**	.182**	.274**
	Sig. (2-tailed)	0.000	0.002	0.027	0.174	0.000	0.007	0.000
	N	214	214	214	214	214	214	214
Take up space on sidewalk	Spearman's rho	0.088	0.125	0.124	0.133	0.022	0.064	0.096
	Sig. (2-tailed)	0.209	0.072	0.076	0.056	0.749	0.360	0.169
	N	207	207	207	207	207	207	207
Influence traffic safety	Spearman's rho	0.118	0.108	0.095	0.136	0.043	0.008	0.109
	Sig. (2-tailed)	0.096	0.125	0.181	0.053	0.547	0.915	0.124
	N	202	202	202	202	202	202	202
Influence social safety	Spearman's rho	.219**	.209**	.232**	0.049	.137*	.136*	.205**
	Sig. (2-tailed)	0.001	0.002	0.001	0.467	0.041	0.043	0.002
	N	222	222	222	222	222	222	222
Influence appearances	Spearman's rho	.246**	.217**	0.122	0.038	.178**	.221**	.319**

	Sig. (2-tailed)	0.000	0.001	0.061	0.563	0.006	0.001	0.000
	N	235	235	235	235	235	235	235
Bring nature closer	Spearman's rho	.381**	.391**	.154*	0.040	.301**	.371**	.390**
	Sig. (2-tailed)	0.000	0.000	0.018	0.540	0.000	0.000	0.000
	N	236	236	236	236	236	236	236

Table A4.3. Correlations residents' best-worst score and their usage of urban green and their social demographic characteristics

		Relax	Recreation	Social contacts	Cultural activities	Physical activities/exercise	Enjoy nature	Quality of life
Leaves change colour	Spearman's rho	0,038	,152*	0,028	0,105	0,096	,129*	0,078
	Sig. (2-tailed)	0,559	0,019	0,666	0,105	0,139	0,047	0,229
	N	238	238	238	238	238	238	238
Falling leaves	Spearman's rho	0,003	-0,027	0,087	-0,018	-0,035	0,003	-0,035
	Sig. (2-tailed)	0,958	0,684	0,179	0,788	0,591	0,963	0,586
	N	238	238	238	238	238	238	238
Drop organic products	Spearman's rho	,134*	0,066	0,099	0,118	0,067	0,060	0,040
	Sig. (2-tailed)	0,039	0,309	0,126	0,068	0,304	0,356	0,537
	N	238	238	238	238	238	238	238
Falling branches	Spearman's rho	0,056	-0,018	0,123	-0,020	-0,029	0,045	0,014
	Sig. (2-tailed)	0,394	0,777	0,058	0,756	0,659	0,492	0,834
	N	238	238	238	238	238	238	238
Drip sticky juice	Spearman's rho	0,108	0,095	0,094	0,113	0,075	0,070	0,009
	Sig. (2-tailed)	0,096	0,145	0,148	0,083	0,251	0,280	0,895
	N	238	238	238	238	238	238	238
Pressure of roots on pavement	Spearman's rho	-0,001	-0,054	0,065	0,052	-0,011	0,013	-0,044
	Sig. (2-tailed)	0,987	0,410	0,322	0,421	0,865	0,841	0,503
	N	238	238	238	238	238	238	238
Cause allergic reaction	Spearman's rho	0,038	-0,017	0,028	0,020	-0,086	0,021	0,005
	Sig. (2-tailed)	0,563	0,792	0,666	0,760	0,188	0,746	0,935
	N	238	238	238	238	238	238	238
Provide organic shade	Spearman's rho	-0,059	0,015	-0,080	-0,032	-0,054	0,051	-0,060
	Sig. (2-tailed)	0,362	0,822	0,219	0,627	0,407	0,433	0,355
	N	238	238	238	238	238	238	238
Blonk wind	Spearman's rho	-0,094	-0,008	-0,053	0,016	-0,020	0,018	-,133*
	Sig. (2-tailed)	0,149	0,904	0,414	0,808	0,760	0,786	0,041
	N	238	238	238	238	238	238	238
Water mangement	Spearman's rho	-0,060	-0,019	-0,021	-0,039	-0,062	-0,091	-0,003
	Sig. (2-tailed)	0,358	0,770	0,748	0,547	0,337	0,164	0,968
	N	238	238	238	238	238	238	238
Capture fine dust	Spearman's rho	-0,078	0,031	-0,091	-0,043	0,036	-0,070	-0,024
	Sig. (2-tailed)	0,233	0,635	0,160	0,508	0,577	0,279	0,709
	N	238	238	238	238	238	238	238
Make sound	Spearman's rho	0,046	0,018	0,001	0,035	0,028	0,054	0,036
	Sig. (2-tailed)	0,483	0,782	0,990	0,591	0,666	0,408	0,578
	N	238	238	238	238	238	238	238
Provide habitat to animals	Spearman's rho	-,137*	0,024	-0,124	-0,021	-0,089	-0,026	-0,080
	Sig. (2-tailed)	0,035	0,709	0,055	0,746	0,170	0,692	0,220
	N	238	238	238	238	238	238	238
Increase biodiversity	Spearman's rho	-0,112	-0,047	-,150*	-0,052	-0,028	-0,079	0,024
	Sig. (2-tailed)	0,086	0,474	0,021	0,423	0,668	0,222	0,708
	N	238	238	238	238	238	238	238
Increase house price	Spearman's rho	0,046	-0,057	0,049	-0,007	0,028	0,018	0,040
	Sig. (2-tailed)	0,476	0,382	0,448	0,920	0,669	0,786	0,539
	N	238	238	238	238	238	238	238
Take up parking space	Spearman's rho	0,074	-0,066	0,078	0,001	0,002	0,035	0,011
	Sig. (2-tailed)	0,255	0,310	0,228	0,990	0,981	0,589	0,867
	N	238	238	238	238	238	238	238
Take up space on sidewalk	Spearman's rho	0,020	-0,054	-0,003	-0,081	0,011	-0,090	-0,054
	Sig. (2-tailed)	0,761	0,404	0,969	0,213	0,866	0,167	0,409
	N	238	238	238	238	238	238	238

Influence traffic safety	Spearman's rho	0,069	0,040	0,043	0,091	-0,010	0,046	0,061
	Sig. (2-tailed)	0,289	0,543	0,508	0,163	0,881	0,480	0,347
	N	238	238	238	238	238	238	238
Influence social safety	Spearman's rho	-0,009	-0,028	-0,043	-0,024	0,006	-0,030	-0,028
	Sig. (2-tailed)	0,888	0,671	0,505	0,711	0,928	0,650	0,663
	N	238	238	238	238	238	238	238
Influence appearances	Spearman's rho	-0,053	0,018	-0,027	-0,100	0,003	-0,088	-0,013
	Sig. (2-tailed)	0,417	0,787	0,676	0,126	0,965	0,175	0,836
	N	238	238	238	238	238	238	238
Bring nature closer	Spearman's rho	-0,074	-0,080	-0,115	-0,085	0,001	-0,122	0,019
	Sig. (2-tailed)	0,253	0,221	0,078	0,192	0,984	0,060	0,775
	N	238	238	238	238	238	238	238

Table A4.4. Correlation between the effect affective response and best-worst score

	Correlation BWS with ARS	
The leaves of trees change colour	Correlation Coefficient	-0,006
	Sig. (2-tailed)	0,928
	N	237
Trees lose leaves	Correlation Coefficient	-0,018
	Sig. (2-tailed)	0,781
	N	237
Trees drop organic products	Correlation Coefficient	-0,031
	Sig. (2-tailed)	0,638
	N	230
Branches fall from trees	Correlation Coefficient	-0,002
	Sig. (2-tailed)	0,970
	N	229
Trees drip sticky juice	Correlation Coefficient	-0,071
	Sig. (2-tailed)	0,295
	N	219
Trees exert pressure on roots	Correlation Coefficient	0,123
	Sig. (2-tailed)	0,061
	N	234
Trees release pollen	Correlation Coefficient	0,122
	Sig. (2-tailed)	0,083
	N	202
Trees provide organic shade	Correlation Coefficient	,149*
	Sig. (2-tailed)	0,023
	N	235
Trees block the wind	Correlation Coefficient	-0,064
	Sig. (2-tailed)	0,345
	N	218
Trees influence the water management	Correlation Coefficient	0,074
	Sig. (2-tailed)	0,265
	N	228
Trees capture fine dust	Correlation Coefficient	-0,032
	Sig. (2-tailed)	0,630
	N	230
Trees make sound	Correlation Coefficient	-0,035
	Sig. (2-tailed)	0,595
	N	229
Trees provide a habitat for animals	Correlation Coefficient	-0,026
	Sig. (2-tailed)	0,692
	N	237
Trees influence biodiversity	Correlation Coefficient	-0,009
	Sig. (2-tailed)	0,888
	N	235
Trees increase the house price	Correlation Coefficient	-0,009
	Sig. (2-tailed)	0,901
	N	211
Trees take up parking space	Correlation Coefficient	-0,092
	Sig. (2-tailed)	0,182
	N	214
Trees take up space on sidewalks	Correlation Coefficient	-0,088
	Sig. (2-tailed)	0,205
	N	207

Trees influence the traffic safety	Correlation Coefficient	0,029
	Sig. (2-tailed)	0,678
	N	202
Trees influence the social safety	Correlation Coefficient	,167*
	Sig. (2-tailed)	0,013
	N	222
Trees influence the appearances	Correlation Coefficient	-0,032
	Sig. (2-tailed)	0,629
	N	235
Trees bring nature closer	Correlation Coefficient	0,032
	Sig. (2-tailed)	0,621
	N	236

Table A4.5. Summary of the counting approach, modelling approach, share of importance and the affective response collecting before or during and after storm Eunice.

	Effects of trees	Before the storm				During and after the storm			
		BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR
1	Provide organic shade	0,110	0,227*	0,061	4,28	0,204	0,628*	0.076	4,38
2	Increase biodiversity	0,090	0,179*	0,058	4,61	0,235	0,706*	0.082	4,68
3	Influence appearances	0,076	0,144*	0,056	4,54	0,028	0,200	0.049	4,60
4	Bring nature closer	0,050	0,085	0,053	4,65	0,098	0,370*	0.059	4,63
5	Leaves change colour	0,036	0,051	0,051	4,53	0,109	0,394*	0.060	4,55
6	Influence social safety	0,072	0,136	0,056	3,67	-0,067	-0,032	0.039	3,55
7	Provide habitat for animals	-0,031	-0,110	0,044	4,37	-0,003	0,112	0.045	4,45
8	Take up space on sidewalk	0,028	0,030	0,050	2,94	-0,004	0,137	0.047	2,98
9	Influence traffic safety	0,019	0,011	0,049	2,77	-0,021	0,094	0.045	2,80
10	Falling branches	0,018	0,005	0,049	2,55	-0,063	-0,024	0.040	2,59
11	Increase house prices	0,014	0,000	0,049	3,86	-0,060	0,000	0.041	3,79
12	Take up parking space	0,011	0,008	0,048	3,51	-0,082	-0,042	0.039	3,35
13	Pressure of roots on pavement	-0,020	-0,082	0,045	2,36	0,018	0,188	0.049	2,43
14	Drop organic products	-0,002	-0,043	0,047	3,46	-0,049	0,011	0.041	3,53
15	Cause allergic reactions	-0,024	-0,095	0,044	2,50	-0,042	0,028	0.042	2,57
16	Drip sticky juice	-0,033	-0,117	0,043	2,19	-0,077	-0,058	0.038	2,27
17	Water management	-0,081	-0,231*	0,039	4,29	0,049	0,249	0.052	4,38
18	Air purification	-0,085	-0,242*	0,038	4,67	0,056	0,268*	0.053	4,68
19	Falling of leaves	-0,036	-0,125	0,043	3,39	-0,102	-0,120	0.036	3,29
20	Make sound	-0,051	-0,164*	0,041	4,04	-0,144	-0,206	0.033	4,04
21	Block wind	-0,162	-0,428*	0,032	4,12	-0,123	-0,173	0.034	4,07
	* significant at the 0.05 level								

Table A4.6. Independent sample t-test impact Storm Eunice affective response

	Storm	N	Mean	Std. Deviation	Std. Error Mean
Trees provide organic shade	Before Eunice	176	4,27	0,810	0,061
	During and after Eunice	59	4,39	0,720	0,094
Trees influence biodiversity	Before Eunice	177	4,60	0,556	0,042
	During and after Eunice	58	4,69	0,537	0,070
Trees influence the appearances	Before Eunice	177	4,54	0,699	0,053
	During and after Eunice	58	4,60	0,528	0,069
Trees bring nature closer	Before Eunice	178	4,65	0,574	0,043
	During and after Eunice	58	4,64	0,520	0,068
The leaves of trees change colour	Before Eunice	178	4,52	0,594	0,045
	During and after Eunice	59	4,56	0,565	0,074
Trees influence the social safety	Before Eunice	165	3,67	0,851	0,066
	During and after Eunice	57	3,56	0,926	0,123
Trees provide a habitat for animals	Before Eunice	178	4,37	0,742	0,056
	During and after Eunice	59	4,46	0,536	0,070
Trees take up space on sidewalks	Before Eunice	154	2,94	0,743	0,060
	During and after Eunice	53	2,98	0,665	0,091
Trees influence the traffic safety	Before Eunice	148	2,77	0,629	0,052
	During and after Eunice	54	2,80	0,683	0,093

Branches fall from trees	Before Eunice	172	2,55	0,652	0,050
	During and after Eunice	57	2,60	0,728	0,096
Trees increase the house price	Before Eunice	159	3,86	0,903	0,072
	During and after Eunice	52	3,79	0,915	0,127
Trees take up parking space	Before Eunice	161	3,51	0,874	0,069
	During and after Eunice	53	3,36	0,834	0,115
Trees Pressure of roots on pavement	Before Eunice	175	2,37	0,705	0,053
	During and after Eunice	59	2,42	0,622	0,081
Trees drop organic products	Before Eunice	172	3,46	1,089	0,083
	During and after Eunice	58	3,53	0,842	0,111
Trees release pollen	Before Eunice	147	2,50	0,734	0,061
	During and after Eunice	55	2,58	0,629	0,085
Trees drip sticky juice	Before Eunice	163	2,19	0,805	0,063
	During and after Eunice	56	2,27	0,842	0,113
Trees influence the water management	Before Eunice	169	4,30	0,737	0,057
	During and after Eunice	59	4,37	0,613	0,080
Trees capture fine dust	Before Eunice	172	4,67	0,529	0,040
	During and after Eunice	58	4,67	0,574	0,075
Trees lose leaves	Before Eunice	178	3,38	0,968	0,073
	During and after Eunice	59	3,31	0,836	0,109
Trees make sound	Before Eunice	173	4,03	0,628	0,048
	During and after Eunice	56	4,05	0,616	0,082
Trees block the wind	Before Eunice	163	4,13	0.686	0,054
	During and after Eunice	55	4,05	0.756	0.102

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Trees provide organic shade	Equal variances assumed	0,262	0,609	-0,987	233	0,162	0,325	-0,117	0,119	-0,351	0,117
	Equal variances not assumed			-1,047	111,134	0,149	0,297	-0,117	0,112	-0,339	0,105
Trees influence biodiversity	Equal variances assumed	2,259	0,134	-1,021	233	0,154	0,308	-0,085	0,083	-0,249	0,079
	Equal variances not assumed			-1,039	100,068	0,151	0,301	-0,085	0,082	-0,248	0,077
Trees influence the appearances	Equal variances assumed	2,067	0,152	-0,667	233	0,253	0,505	-0,067	0,100	-0,264	0,130
	Equal variances not assumed			-0,767	127,700	0,222	0,444	-0,067	0,087	-0,239	0,105
Trees bring nature closer	Equal variances assumed	0,064	0,800	0,162	234	0,436	0,871	0,014	0,085	-0,154	0,181
	Equal variances not assumed			0,170	106,000	0,432	0,865	0,014	0,081	-0,146	0,174
The leaves of trees change colour	Equal variances assumed	0,540	0,463	-0,418	235	0,338	0,676	-0,037	0,088	-0,211	0,137
	Equal variances not assumed			-0,428	103,620	0,335	0,669	-0,037	0,086	-0,207	0,134
The leaves of trees change colour	Equal variances assumed	1,112	0,293	0,787	220	0,216	0,432	0,105	0,134	-0,158	0,369
	Equal variances not assumed			0,755	90,762	0,226	0,452	0,105	0,139	-0,172	0,382
Trees provide a habitat for animals	Equal variances assumed	5,806	0,017	-0,829	235	0,204	0,408	-0,087	0,105	-0,293	0,119
	Equal variances not assumed			-0,973	137,120	0,166	0,332	-0,087	0,089	-0,263	0,090
Trees take up space on sidewalks	Equal variances assumed	2,132	0,146	-0,343	205	0,366	0,732	-0,040	0,115	-0,267	0,188
	Equal variances not assumed			-0,362	100,042	0,359	0,718	-0,040	0,109	-0,256	0,177
	Equal variances assumed	0,000	0,986	-0,254	200	0,400	0,800	-0,026	0,102	-0,228	0,176

Trees influence the traffic safety	Equal variances not assumed			-0,245	87,812	0,404	0,807	-0,026	0,106	-0,238	0,185
Branches fall from trees	Equal variances assumed	0,050	0,824	-0,487	227	0,313	0,627	-0,050	0,103	-0,252	0,152
	Equal variances not assumed			-0,460	87,625	0,323	0,646	-0,050	0,109	-0,266	0,166
Trees increase the house price	Equal variances assumed	0,235	0,629	0,505	209	0,307	0,614	0,073	0,145	-0,212	0,359
	Equal variances not assumed			0,502	85,907	0,308	0,617	0,073	0,146	-0,216	0,363
Trees take up parking space	Equal variances assumed	0,978	0,324	1,102	212	0,136	0,272	0,151	0,137	-0,119	0,421
	Equal variances not assumed			1,128	92,450	0,131	0,262	0,151	0,134	-0,115	0,416
Trees Pressure of roots on pavement	Equal variances assumed	1,104	0,294	-0,562	232	0,287	0,575	-0,058	0,103	-0,261	0,145
	Equal variances not assumed			-0,599	112,262	0,275	0,551	-0,058	0,097	-0,250	0,134
Trees drop organic products	Equal variances assumed	7,267	0,008	-0,479	228	0,316	0,632	-0,075	0,157	-0,384	0,234
	Equal variances not assumed			-0,544	126,010	0,294	0,588	-0,075	0,138	-0,349	0,198
Trees release pollen	Equal variances assumed	2,329	0,129	-0,762	200	0,223	0,447	-0,085	0,112	-0,306	0,135
	Equal variances not assumed			-0,817	112,283	0,208	0,415	-0,085	0,104	-0,292	0,121
Trees drip sticky juice	Equal variances assumed	0,169	0,682	-0,615	217	0,269	0,539	-0,078	0,126	-0,326	0,171
	Equal variances not assumed			-0,602	91,946	0,274	0,549	-0,078	0,129	-0,334	0,179
Trees influence the water management	Equal variances assumed	1,782	0,183	-0,720	226	0,236	0,472	-0,077	0,107	-0,288	0,134
	Equal variances not assumed			-0,787	120,661	0,216	0,433	-0,077	0,098	-0,271	0,117
Trees capture fine dust	Equal variances assumed	0,152	0,697	0,024	228	0,490	0,981	0,002	0,082	-0,160	0,164
	Equal variances not assumed			0,023	91,760	0,491	0,981	0,002	0,085	-0,168	0,172
Trees lose leaves	Equal variances assumed	2,563	0,111	0,546	235	0,293	0,585	0,077	0,141	-0,201	0,354
	Equal variances not assumed			0,588	113,745	0,279	0,558	0,077	0,131	-0,182	0,336
Trees make sound	Equal variances assumed	0,041	0,840	-0,197	227	0,422	0,844	-0,019	0,096	-0,208	0,170
	Equal variances not assumed			-0,199	94,837	0,421	0,843	-0,019	0,095	-0,208	0,170
Trees block the wind	Equal variances assumed	0,134	0,714	0,676	216	0,250	0,499	0,074	0,110	-0,142	0,291
	Equal variances not assumed			0,645	86,016	0,260	0,521	0,074	0,115	-0,155	0,303

Table A4.7. Independent sample t-test impact Storm Eunice BWS score

	Storm	N	Mean	Std. Deviation	Std. Error Mean
Trees provide organic shade	Before Eunice	179	0,1095	0,43249	0,03233
	During and after Eunice	59	0,2	0,42508	0,05534
Trees influence biodiversity	Before Eunice	179	0,0916	0,44125	0,03298
	During and after Eunice	59	0,2237	0,44425	0,05784
Trees influence the appearances	Before Eunice	179	0,076	0,42563	0,03181
	During and after Eunice	59	0,0271	0,43858	0,0571
Trees bring nature closer	Before Eunice	179	0,0536	0,42111	0,03148
	During and after Eunice	59	0,0881	0,40899	0,05325
The leaves of trees change colour	Before Eunice	179	0,0402	0,33546	0,02507
	During and after Eunice	59	0,0949	0,35303	0,04596
Trees influence the social safety	Before Eunice	179	0,0715	0,39806	0,02975
	During and after Eunice	59	-0,0610	0,37371	0,04865

Trees provide a habitat for animals	Before Eunice	179	0,0168	0,31364	0,02344
	During and after Eunice	59	0,0475	0,26087	0,03396
Trees take up space on sidewalks	Before Eunice	179	0,0291	0,3051	0,0228
	During and after Eunice	59	0	0,37139	0,04835
Trees influence the traffic safety	Before Eunice	179	0,019	0,4043	0,03022
	During and after Eunice	59	-0,0203	0,40291	0,05245
Branches fall from trees	Before Eunice	179	0,0145	0,33855	0,0253
	During and after Eunice	59	-0,0508	0,29147	0,03795
Trees increase the house price	Before Eunice	179	0,0089	0,38384	0,02869
	During and after Eunice	59	-0,0407	0,3558	0,04632
Trees take up parking space	Before Eunice	179	0,0078	0,3824	0,02858
	During and after Eunice	59	-0,0644	0,3759	0,04894
Trees Pressure of roots on pavement	Before Eunice	179	-0,0201	0,28842	0,02156
	During and after Eunice	59	0,0169	0,29546	0,03847
Trees drop organic products	Before Eunice	179	-0,0022	0,3194	0,02387
	During and after Eunice	59	-0,0475	0,36453	0,04746
Trees release pollen	Before Eunice	179	-0,0246	0,34941	0,02612
	During and after Eunice	59	-0,0407	0,27236	0,03546
Trees drip sticky juice	Before Eunice	179	-0,0324	0,42567	0,03182
	During and after Eunice	59	-0,078	0,42994	0,05597
Trees influence the water management	Before Eunice	179	-0,0804	0,34218	0,02558
	During and after Eunice	59	0,0441	0,37337	0,04861
Trees capture fine dust	Before Eunice	179	-0,0838	0,44205	0,03304
	During and after Eunice	59	0,0475	0,44464	0,05789
Trees lose leaves	Before Eunice	179	-0,0391	0,44169	0,03301
	During and after Eunice	59	-0,0915	0,39361	0,05124
Trees make sound	Before Eunice	179	-0,0939	0,4845	0,03621
	During and after Eunice	59	-0,1695	0,47243	0,06151
Trees block the wind	Before Eunice	179	-0,162	0,39192	0,02929
	During and after Eunice	59	-0,1254	0,42491	0,05532

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Trees provide organic shade	Equal variances assumed	0,001	0,971	-1,400	236,000	0,081	0,163	-0,091	0,065	-0,218	0,037
	Equal variances not assumed			-1,412	100,518	0,081	0,161	-0,091	0,064	-0,218	0,037
Trees influence biodiversity	Equal variances assumed	0,034	0,855	-1,991	236,000	0,024	0,048	-0,132	0,066	-0,263	-0,001
	Equal variances not assumed			-1,984	98,461	0,025	0,050	-0,132	0,067	-0,264	0,000
Trees influence the appearances	Equal variances assumed	0,128	0,721	0,759	236,000	0,224	0,449	0,049	0,064	-0,078	0,176
	Equal variances not assumed			0,748	96,567	0,228	0,457	0,049	0,065	-0,081	0,179
Trees bring nature closer	Equal variances assumed	0,491	0,484	-0,550	236,000	0,292	0,583	-0,035	0,063	-0,158	0,089
	Equal variances not assumed			-0,558	101,575	0,289	0,578	-0,035	0,062	-0,157	0,088
The leaves of trees change colour	Equal variances assumed	0,261	0,610	-1,072	236,000	0,142	0,285	-0,055	0,051	-0,155	0,046
	Equal variances not assumed			-1,045	94,921	0,149	0,299	-0,055	0,052	-0,159	0,049
Trees influence the soical safety	Equal variances assumed	0,589	0,444	2,251	236	0,013	0,025	0,13253	0,05888	0,01653	0,24852
	Equal variances not assumed			2,324	104,719	0,011	0,022	0,13253	0,05703	0,01944	0,24561
	Equal variances assumed	2,772	0,097	-0,678	236,000	0,249	0,498	-0,031	0,045	-0,120	0,058

Trees provide a habitat for animals	Equal variances not assumed			-0,744	117,725	0,229	0,458	-0,031	0,041	-0,112	0,051
Trees take up space on sidewalks	Equal variances assumed	4,829	0,029	0,600	236,000	0,275	0,549	0,029	0,048	-0,066	0,124
	Equal variances not assumed			0,543	85,298	0,294	0,588	0,029	0,053	-0,077	0,135
Trees influence the traffic safety	Equal variances assumed	0,046	0,830	0,649	236,000	0,259	0,517	0,039	0,061	-0,080	0,159
	Equal variances not assumed			0,650	99,322	0,259	0,517	0,039	0,061	-0,081	0,159
Branches fall from trees	Equal variances assumed	1,067	0,303	1,329	236,000	0,093	0,185	0,065	0,049	-0,032	0,162
	Equal variances not assumed			1,433	113,726	0,077	0,155	0,065	0,046	-0,025	0,156
Trees increase the house price	Equal variances assumed	0,359	0,550	0,876	236,000	0,191	0,382	0,050	0,057	-0,062	0,161
	Equal variances not assumed			0,911	105,954	0,182	0,365	0,050	0,054	-0,058	0,158
Trees take up parking space	Equal variances assumed	0,010	0,918	1,263	236,000	0,104	0,208	0,072	0,057	-0,040	0,185
	Equal variances not assumed			1,274	100,508	0,103	0,205	0,072	0,057	-0,040	0,185
Trees Pressure of roots on pavement	Equal variances assumed	1,275	0,260	-0,851	236,000	0,198	0,396	-0,037	0,044	-0,123	0,049
	Equal variances not assumed			-0,840	97,039	0,201	0,403	-0,037	0,044	-0,125	0,050
Trees drop organic products	Equal variances assumed	4,471	0,036	0,910	236,000	0,182	0,364	0,045	0,050	-0,053	0,143
	Equal variances not assumed			0,851	89,207	0,198	0,397	0,045	0,053	-0,060	0,151
Trees release pollen	Equal variances assumed	3,639	0,058	0,323	236,000	0,374	0,747	0,016	0,050	-0,082	0,114
	Equal variances not assumed			0,366	125,923	0,358	0,715	0,016	0,044	-0,071	0,103
Trees drip sticky juice	Equal variances assumed	0,002	0,969	0,711	236,000	0,239	0,478	0,046	0,064	-0,081	0,172
	Equal variances not assumed			0,708	98,192	0,240	0,481	0,046	0,064	-0,082	0,173
Trees influence the water management	Equal variances assumed	0,398	0,529	-2,369	236,000	0,009	0,019	-0,125	0,053	-0,228	-0,021
	Equal variances not assumed			-2,267	92,255	0,013	0,026	-0,125	0,055	-0,234	-0,015
Trees capture fine dust	Equal variances assumed	0,007	0,934	-1,975	236,000	0,025	0,049	-0,131	0,066	-0,262	0,000
	Equal variances not assumed			-1,969	98,538	0,026	0,052	-0,131	0,067	-0,264	0,001
Trees lose leaves	Equal variances assumed	0,300	0,585	0,811	236,000	0,209	0,418	0,052	0,065	-0,075	0,180
	Equal variances not assumed			0,860	109,966	0,196	0,392	0,052	0,061	-0,068	0,173
Trees make sound	Equal variances assumed	0,390	0,533	1,046	236,000	0,148	0,297	0,076	0,072	-0,067	0,218
	Equal variances not assumed			1,060	101,219	0,146	0,292	0,076	0,071	-0,066	0,217
Trees block the wind	Equal variances assumed	0,477	0,491	-0,609	236,000	0,272	0,543	-0,037	0,060	-0,155	0,082
	Equal variances not assumed			-0,584	92,714	0,280	0,560	-0,037	0,063	-0,161	0,088

Table A4.8. Summary of the counting approach, modelling approach, share of importance and the affective response of females and males.

	Effects of trees	Female				Male			
		BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR
1	Provide organic shade	0.093	0.245*	0.059	4,24	0.159	0.392*	0.069	4,35
2	Increase biodiversity	0.070	0.188*	0.056	4,66	0.174	0.427*	0.071	4,58
3	Influence appearances	0.061	0.167	0.054	4,63	0.063	0.159	0.055	4,47
4	Bring nature closer	0.002	0.025	0.047	4,76	0.117	0.289*	0.062	4,55
5	Leaves change colour	0.060	0.167	0.055	4,66	0.054	0.134	0.053	4,42
6	Influence social safety	0.084	0.224	0.058	3,77	-0.003	-0.003	0.046	3,51
7	Provide habitat for animals	-0.037	-0.058	0.044	4,36	-0.008	-0.026	0.045	4,42
8	Take up space on sidewalk	0.038	0.111	0.052	2,99	0.013	0.037	0.048	2,92
9	Influence traffic safety	0.070	0.194*	0.056	2,70	-0.044	-0.095	0.042	2,83
10	Falling branches	0.016	0.059	0.049	2,61	-0.016	-0.035	0.045	2,52
11	Increase house prices	-0.011	0.000	0.046	3,86	-0.005	0.000	0.046	3,86
12	Take up parking space	-0.048	0.142	0.053	3,55	-0.067	-0.150	0.040	3,41
13	Pressure of roots on pavement	-0.004	0.017	0.047	2,43	-0.011	-0.016	0.046	2,33
14	Drop organic products	-0.107	-0.005	0.046	3,61	-0.013	-0.026	0.045	3,34
15	Cause allergic reactions	-0.073	-0.155	0.040	2,52	0.011	0.048	0.048	2,51
16	Drip sticky juice	-0.041	-0.078	0.043	2,30	-0.047	-0.109	0.042	2,11
17	Water management	-0.068	-0.142	0.040	4,34	-0.034	-0.077	0.043	4,28
18	Air purification	-0.093	-0.203*	0.038	4,74	-0.015	-0.030	0.045	4,61
19	Falling of leaves	-0.107	-0.005	0.046	3,54	-0.091	-0.216*	0.037	3,20
20	Make sound	-0.069	-0.161	0.039	4,10	-0.075	-0.162	0.040	3,97
21	Block wind	-0.130	-0.293*	0.034	4,11	-0.176	-0.421*	0.031	4,10
*significant at the 0.05 level									

Table A4.9. Independent sample t-test Gender groups

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Trees provide organic shade	Female	110	4,24	0,834	0,080
	Male	122	4,35	0,749	0,068
Trees influence biodiversity	Female	112	4,66	0,546	0,052
	Male	120	4,58	0,559	0,051
Trees influence the appearances	Female	112	4,63	0,537	0,051
	Male	120	4,47	0,755	0,069
Trees bring nature closer	Female	112	4,76	0,450	0,043
	Male	121	4,55	0,632	0,057
The leaves of trees change colour	Female	111	4,66	0,495	0,047
	Male	123	4,42	0,640	0,058
Trees influence the social safety	Female	105	3,77	0,869	0,085
	Male	114	3,51	0,854	0,080
Trees provide a habitat for animals	Female	112	4,36	0,733	0,069
	Male	122	4,42	0,666	0,060
Trees take up space on sidewalks	Female	93	2,99	0,744	0,077
	Male	111	2,92	0,715	0,068
Trees influence the traffic safety	Female	88	2,70	0,609	0,065
	Male	111	2,83	0,659	0,063
Branches fall from trees	Female	105	2,61	0,766	0,075
	Male	121	2,52	0,579	0,053
Trees increase the house price	Female	95	3,86	0,930	0,095
	Male	113	3,86	0,854	0,080
Trees take up parking space	Female	98	3,55	0,801	0,081
	Male	113	3,41	0,922	0,087
Trees Pressure of roots on pavement	Female	110	2,43	0,697	0,066
	Male	121	2,33	0,663	0,060
Trees drop organic products	Female	111	3,61	0,974	0,092
	Male	117	3,34	1,068	0,099
Trees release pollen	Female	94	2,52	0,772	0,080
	Male	105	2,51	0,652	0,064
Trees drip sticky juice	Female	102	2,30	0,806	0,080
	Male	114	2,11	0,817	0,077
	Female	109	4,34	0,723	0,069

Trees influence the water management	Male	116	4,28	0,695	0,065
Trees capture fine dust	Female	108	4,74	0,481	0,046
	Male	119	4,61	0,584	0,054
Trees lose leaves	Female	112	3,54	0,869	0,082
	Male	122	3,20	0,976	0,088
Trees make sound	Female	108	4,10	0,640	0,062
	Male	118	3,97	0,606	0,056
Trees block the wind	Female	101	4,11	0,733	0,073
	Male	114	4,10	0,678	0,063

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Trees provide organic shade	Equal variances assumed	0,001	0,981	-1,117	230	0,133	0,265	-0,116	0,104	-0,321	0,089
	Equal variances not assumed			-1,111	220,205	0,134	0,268	-0,116	0,105	-0,322	0,090
Trees influence biodiversity	Equal variances assumed	1,676	0,197	1,066	230	0,144	0,288	0,077	0,073	-0,066	0,220
	Equal variances not assumed			1,066	229,509	0,144	0,287	0,077	0,073	-0,066	0,220
Trees influence the appearances	Equal variances assumed	6,513	0,011	1,932	230	0,027	0,055	0,167	0,087	-0,003	0,338
	Equal variances not assumed			1,954	215,136	0,026	0,052	0,167	0,086	-0,001	0,336
Trees bring nature closer	Equal variances assumed	26,135	0,000	2,947	231	0,002	0,004	0,213	0,072	0,071	0,356
	Equal variances not assumed			2,985	217,017	0,002	0,003	0,213	0,072	0,073	0,354
The leaves of trees change colour	Equal variances assumed	17,429	0,000	3,114	232	0,001	0,002	0,235	0,075	0,086	0,383
	Equal variances not assumed			3,155	226,830	0,001	0,002	0,235	0,074	0,088	0,382
Trees influence the social safety	Equal variances assumed	0,118	0,731	2,254	217	0,013	0,025	0,263	0,117	0,033	0,492
	Equal variances not assumed			2,253	214,877	0,013	0,025	0,263	0,117	0,033	0,492
Trees provide a habitat for animals	Equal variances assumed	0,395	0,531	-0,666	232	0,253	0,506	-0,061	0,091	-0,241	0,119
	Equal variances not assumed			-0,663	224,598	0,254	0,508	-0,061	0,092	-0,242	0,120
Trees take up space on sidewalks	Equal variances assumed	0,023	0,879	0,687	202	0,247	0,493	0,070	0,102	-0,132	0,272
	Equal variances not assumed			0,684	192,851	0,247	0,495	0,070	0,103	-0,132	0,273
Trees influence the traffic safety	Equal variances assumed	0,284	0,595	-1,366	197	0,087	0,174	-0,124	0,091	-0,304	0,055
	Equal variances not assumed			-1,378	192,318	0,085	0,170	-0,124	0,090	-0,302	0,054
Branches fall from trees	Equal variances assumed	5,092	0,025	0,991	224	0,161	0,323	0,089	0,090	-0,088	0,266
	Equal variances not assumed			0,972	191,810	0,166	0,332	0,089	0,091	-0,091	0,269
Trees increase the house price	Equal variances assumed	0,599	0,440	0,038	206	0,485	0,969	0,005	0,124	-0,239	0,249
	Equal variances not assumed			0,038	193,151	0,485	0,970	0,005	0,125	-0,241	0,251
Trees take up parking space	Equal variances assumed	1,165	0,282	1,201	209	0,116	0,231	0,144	0,120	-0,092	0,380
	Equal variances not assumed			1,213	208,999	0,113	0,226	0,144	0,119	-0,090	0,378

Trees Pressure of roots on pavement	Equal variances assumed	1,106	0,294	1,080	229	0,141	0,281	0,097	0,090	-0,080	0,273
	Equal variances not assumed			1,078	224,287	0,141	0,282	0,097	0,090	-0,080	0,273
Trees drop organic products	Equal variances assumed	1,112	0,293	1,997	226	0,024	0,047	0,271	0,136	0,004	0,538
	Equal variances not assumed			2,002	225,652	0,023	0,047	0,271	0,135	0,004	0,537
Trees release pollen	Equal variances assumed	2,221	0,138	0,069	197	0,472	0,945	0,007	0,101	-0,192	0,206
	Equal variances not assumed			0,069	182,968	0,473	0,945	0,007	0,102	-0,194	0,208
Trees drip sticky juice	Equal variances assumed	0,079	0,778	1,716	214	0,044	0,088	0,190	0,111	-0,028	0,408
	Equal variances not assumed			1,717	211,989	0,044	0,087	0,190	0,111	-0,028	0,408
Trees influence the water management	Equal variances assumed	0,001	0,975	0,581	223	0,281	0,562	0,055	0,095	-0,131	0,241
	Equal variances not assumed			0,581	220,738	0,281	0,562	0,055	0,095	-0,132	0,242
Trees capture fine dust	Equal variances assumed	10,790	0,001	1,783	225	0,038	0,076	0,127	0,071	-0,013	0,268
	Equal variances not assumed			1,799	222,957	0,037	0,073	0,127	0,071	-0,012	0,267
Trees lose leaves	Equal variances assumed	0,313	0,576	2,870	232	0,002	0,004	0,348	0,121	0,109	0,587
	Equal variances not assumed			2,885	231,784	0,002	0,004	0,348	0,121	0,110	0,586
Trees make sound	Equal variances assumed	1,858	0,174	1,535	224	0,063	0,126	0,127	0,083	-0,036	0,291
	Equal variances not assumed			1,532	219,424	0,064	0,127	0,127	0,083	-0,037	0,291
Trees block the wind	Equal variances assumed	1,331	0,250	0,129	213	0,449	0,897	0,012	0,096	-0,177	0,202
	Equal variances not assumed			0,128	204,825	0,449	0,898	0,012	0,097	-0,178	0,203

Table A4.10. Independent sample t-test Gender groups BWS

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Trees provide organic shade	Female	112	0,0929	0,43115	0,04074
	Male	123	0,1593	0,42999	0,03877
Trees influence biodiversity	Female	112	0,0696	0,43925	0,04151
	Male	123	0,1740	0,45083	0,04065
Trees influence the appearances	Female	112	0,0607	0,41315	0,03904
	Male	123	0,0634	0,44524	0,04015
Trees bring nature closer	Female	112	0,0018	0,39134	0,03698
	Male	123	0,1171	0,43602	0,03931
The leaves of trees change colour	Female	112	0,0607	0,34468	0,03257
	Male	123	0,0537	0,33591	0,03029
Trees influence the social safety	Female	112	0,0839	0,40416	0,03819
	Male	123	-0,0033	0,38918	0,03509
Trees provide a habitat for animals	Female	112	0,0143	0,30339	0,02867
	Male	123	0,0374	0,30011	0,02706
Trees take up space on sidewalks	Female	112	0,0375	0,30198	0,02853
	Male	123	0,0130	0,33558	0,03026
Trees influence the traffic safety	Female	112	0,0696	0,40689	0,03845
	Male	123	-0,0439	0,39715	0,03581
Branches fall from trees	Female	112	0,0161	0,34290	0,03240
	Male	123	-0,0163	0,30578	0,02757
Trees increase the house price	Female	112	-0,0107	0,38046	0,03595
	Male	123	-0,0049	0,37588	0,03389
Trees take up parking space	Female	112	0,0482	0,38648	0,03652
	Male	123	-0,0667	0,37343	0,03367
Trees Pressure of roots on pavement	Female	112	-0,0036	0,29160	0,02755
	Male	123	-0,0114	0,28550	0,02574

Trees drop organic products	Female	112	-0,0107	0,35599	0,03364
	Male	123	-0,0130	0,31125	0,02806
Trees release pollen	Female	112	-0,0732	0,33423	0,03158
	Male	123	0,0114	0,32824	0,02960
Trees drip sticky juice	Female	112	-0,0411	0,41079	0,03882
	Male	123	-0,0472	0,44137	0,03980
Trees influence the water management	Female	112	-0,0679	0,35060	0,03313
	Male	123	-0,0341	0,35824	0,03230
Trees capture fine dust	Female	112	-0,0929	0,44351	0,04191
	Male	123	-0,0146	0,45026	0,04060
Trees lose leaves	Female	112	-0,0107	0,42519	0,04018
	Male	123	-0,0911	0,43476	0,03920
Trees make sound	Female	112	-0,1143	0,46399	0,04384
	Male	123	-0,1073	0,50134	0,04520
Trees block the wind	Female	112	-0,1304	0,38877	0,03674
	Male	123	-0,1756	0,41258	0,03720

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Trees provide organic shade	Equal variances assumed	0,062	0,803	-1,182	233,000	0,119	0,238	-0,066	0,056	-0,177	0,044
	Equal variances not assumed			-1,182	230,836	0,119	0,238	-0,066	0,056	-0,177	0,044
Trees influence biodiversity	Equal variances assumed	0,023	0,879	-1,794	233,000	0,037	0,074	-0,104	0,058	-0,219	0,010
	Equal variances not assumed			-1,796	231,924	0,037	0,074	-0,104	0,058	-0,219	0,010
Trees influence the appearances	Equal variances assumed	0,487	0,486	-0,048	233,000	0,481	0,962	-0,003	0,056	-0,113	0,108
	Equal variances not assumed			-0,048	232,913	0,481	0,962	-0,003	0,056	-0,113	0,108
Trees bring nature closer	Equal variances assumed	3,372	0,068	-2,125	233,000	0,017	0,035	-0,115	0,054	-0,222	-0,008
	Equal variances not assumed			-2,136	232,954	0,017	0,034	-0,115	0,054	-0,222	-0,009
The leaves of trees change colour	Equal variances assumed	0,220	0,639	0,159	233,000	0,437	0,874	0,007	0,044	-0,080	0,095
	Equal variances not assumed			0,159	229,702	0,437	0,874	0,007	0,044	-0,081	0,095
Trees influence the social safety	Equal variances assumed	0,832	0,363	1,684	233	0,047	0,094	0,08718	0,05177	-0,0148	0,18918
	Equal variances not assumed			1,681	229,025	0,047	0,094	0,08718	0,05186	-0,0150	0,18937
Trees provide a habitat for animals	Equal variances assumed	0,988	0,321	-0,587	233,000	0,279	0,558	-0,023	0,039	-0,101	0,055
	Equal variances not assumed			-0,586	230,460	0,279	0,558	-0,023	0,039	-0,101	0,055
Trees take up space on sidewalks	Equal variances assumed	0,352	0,554	0,586	233,000	0,279	0,558	0,024	0,042	-0,058	0,107
	Equal variances not assumed			0,589	232,970	0,278	0,557	0,024	0,042	-0,057	0,106
Trees influence the traffic safety	Equal variances assumed	0,852	0,357	2,164	233,000	0,016	0,032	0,114	0,052	0,010	0,217
	Equal variances not assumed			2,161	229,785	0,016	0,032	0,114	0,053	0,010	0,217
Branches fall from trees	Equal variances assumed	1,598	0,208	0,764	233,000	0,223	0,446	0,032	0,042	-0,051	0,116
	Equal variances not assumed			0,760	223,387	0,224	0,448	0,032	0,043	-0,052	0,116
Trees increase the house price	Equal variances assumed	0,040	0,842	-0,118	233,000	0,453	0,906	-0,006	0,049	-0,103	0,091

	Equal variances not assumed			-0,118	230,401	0,453	0,906	-0,006	0,049	-0,103	0,092
Trees take up parking space	Equal variances assumed	0,172	0,678	2,316	233,000	0,011	0,021	0,115	0,050	0,017	0,213
	Equal variances not assumed			2,313	229,224	0,011	0,022	0,115	0,050	0,017	0,213
Trees Pressure of roots on pavement	Equal variances assumed	0,071	0,790	0,207	233,000	0,418	0,836	0,008	0,038	-0,066	0,082
	Equal variances not assumed			0,207	229,946	0,418	0,836	0,008	0,038	-0,066	0,082
Trees drop organic products	Equal variances assumed	1,532	0,217	0,053	233,000	0,479	0,958	0,002	0,044	-0,083	0,088
	Equal variances not assumed			0,052	221,615	0,479	0,958	0,002	0,044	-0,084	0,089
Trees release pollen	Equal variances assumed	2,297	0,131	-1,956	233,000	0,026	0,052	-0,085	0,043	-0,170	0,001
	Equal variances not assumed			-1,955	230,104	0,026	0,052	-0,085	0,043	-0,170	0,001
Trees drip sticky juice	Equal variances assumed	0,257	0,613	0,109	233,000	0,457	0,913	0,006	0,056	-0,104	0,116
	Equal variances not assumed			0,109	232,884	0,456	0,913	0,006	0,056	-0,103	0,116
Trees influence the water management	Equal variances assumed	0,103	0,748	-0,728	233,000	0,234	0,467	-0,034	0,046	-0,125	0,058
	Equal variances not assumed			-0,729	231,779	0,233	0,467	-0,034	0,046	-0,125	0,057
Trees capture fine dust	Equal variances assumed	0,072	0,788	-1,340	233,000	0,091	0,182	-0,078	0,058	-0,193	0,037
	Equal variances not assumed			-1,341	231,554	0,091	0,181	-0,078	0,058	-0,193	0,037
Trees lose leaves	Equal variances assumed	0,430	0,513	1,430	233,000	0,077	0,154	0,080	0,056	-0,030	0,191
	Equal variances not assumed			1,431	231,803	0,077	0,154	0,080	0,056	-0,030	0,191
Trees make sound	Equal variances assumed	0,648	0,422	-0,110	233,000	0,456	0,912	-0,007	0,063	-0,131	0,118
	Equal variances not assumed			-0,111	232,935	0,456	0,912	-0,007	0,063	-0,131	0,117
Trees block the wind	Equal variances assumed	0,296	0,587	0,863	233,000	0,194	0,389	0,045	0,052	-0,058	0,149
	Equal variances not assumed			0,866	232,720	0,194	0,388	0,045	0,052	-0,058	0,148

Table A4.11.Summary of the counting approach, modelling approach, share of importance and the affective response of the age groups

	Effects of trees	Young adults				Adults				Elderly			
		BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR
1	Provide organic shade	0.106	0.426*	0.061	4,15	0.180	0.414*	0.072	4,52	0.121	0.132	0.063	4,10
2	Increase biodiversity	0.080	0.365*	0.057	4,40	0.142	0.322*	0.066	4,65	0.152	0.221*	0.068	4,71
3	Influence appearances	0.078	0.359*	0.057	4,34	0.064	0.133	0.055	4,66	0.048	-0.038	0.053	4,58
4	Bring nature closer	0.092	0.392*	0.059	4,48	0.049	0.097	0.053	4,75	0.043	-0.056	0.052	4,72
5	Leaves change colour	0.046	0.282*	0.052	4,36	0.064	0.131	0.055	4,61	0.050	-0.027	0.053	4,62
6	Influence social safety	0.087	0.382*	0.058	3,51	0.009	-0.001	0.048	3,91	0.016	-0.126	0.048	3,46
7	Provide habitat for animals	-0.019	0.120	0.045	4,16	-0.005	-0.039	0.046	4,55	-0.057	-0.262*	0.042	4,48
8	Take up space on sidewalk	0.016	0.209*	0.049	3,05	0.052	0.105	0.053	2,97	0.002	-0.150	0.047	2,83
9	Influence traffic safety	0.032	0.266*	0.052	2,66	-0.078	-0.210	0.039	2,94	0.064	-0.018	0.054	2,83
10	Falling branches	0.046	0.281*	0.052	2,43	-0.032	-0.099	0.043	2,60	-0.030	-0.221*	0.044	2,63
11	Increase house prices	-0.078	0.000	0.040	3,45	0.009	0.000	0.048	4,10	0.070	0.000	0.055	3,91

12	Take up parking space	0.007	0.205	0.049	3,36	-0.041	-0.119	0.042	3,44	-0.006	-0.165	0.047	3,55
13	Pressure of roots on pavement	-0.030	0.116	0.044	2,46	0.049	0.097	0.053	2,35	-0.040	-0.259*	0.042	2,27
14	Drop organic products	-0.030	0.098	0.044	3,16	-0.012	-0.050	0.046	3,62	0.004	-0.150	0.047	3,73
15	Cause allergic reactions	0.064	0.015	0.040	2,31	-0.017	-0.064	0.045	2,62	<0.000	-0.156	0.047	2,61
16	Drip sticky juice	-0.055	0.037	0.041	2,23	-0.035	-0.106	0.043	2,15	-0.039	-0.251*	0.043	2,23
17	Water management	0.009	0.192	0.048	4,25	-0.084	-0.225	0.038	4,37	-0.083	-0.355*	0.038	4,28
18	Air purification	0.002	0.176	0.047	4,61	-0.102	-0.267	0.037	4,59	-0.060	-0.315*	0.040	4,78
19	Falling of leaves	-0.030	0.098	0.044	3,17	-0.043	-0.127*	0.042	3,29	-0.086	-0.356*	0.038	3,61
20	Make sound	-0.181	-0.260*	0.030	4,04	-0.015	-0.050	0.045	4,01	-0.008	-0.190	0.045	4,03
21	Block wind	-0.147	-0.187	0.033	4,11	-0.157	-0.400*	0.032	4,11	-0.165	-0.532*	0.032	4,07

*significant at the 0.05 level

Table A4.12. ANOVA-test difference between and within the age groups – Affective response

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Trees provide organic shade	Young adult	85	4,25	0,688	0,075	4,10	4,40	2	5
	Adult	68	4,51	0,658	0,080	4,36	4,67	2	5
	Elderly	82	4,18	0,944	0,104	3,98	4,39	1	5
	Total	235	4,30	0,789	0,051	4,20	4,40	1	5
Trees influence biodiversity	Young adult	85	4,46	0,589	0,064	4,33	4,59	3	5
	Adult	69	4,70	0,523	0,063	4,57	4,82	3	5
	Elderly	81	4,74	0,494	0,055	4,63	4,85	3	5
	Total	235	4,63	0,551	0,036	4,55	4,70	3	5
Trees influence the appearances	Young adult	87	4,40	0,784	0,084	4,24	4,57	1	5
	Adult	67	4,69	0,528	0,065	4,56	4,82	3	5
	Elderly	81	4,60	0,585	0,065	4,48	4,73	2	5
	Total	235	4,55	0,661	0,043	4,47	4,64	1	5
Trees bring nature closer	Young adult	86	4,49	0,664	0,072	4,35	4,63	2	5
	Adult	68	4,76	0,427	0,052	4,66	4,87	4	5
	Elderly	82	4,72	0,504	0,056	4,61	4,83	3	5
	Total	236	4,65	0,560	0,036	4,58	4,72	2	5
The leaves of trees change colour	Young adult	87	4,34	0,644	0,069	4,21	4,48	3	5
	Adult	69	4,62	0,488	0,059	4,51	4,74	4	5
	Elderly	81	4,65	0,551	0,061	4,53	4,78	3	5
	Total	237	4,53	0,586	0,038	4,46	4,61	3	5
Trees influence the social safety	Young adult	83	3,57	0,913	0,100	3,37	3,77	1	5
	Adult	65	3,89	0,793	0,098	3,70	4,09	2	5
	Elderly	74	3,50	0,848	0,099	3,30	3,70	1	5
	Total	222	3,64	0,870	0,058	3,52	3,75	1	5
Trees provide a habitat for animals	Young adult	87	4,20	0,819	0,088	4,02	4,37	2	5
	Adult	68	4,54	0,584	0,071	4,40	4,69	3	5
	Elderly	82	4,48	0,593	0,065	4,35	4,61	3	5
	Total	237	4,39	0,697	0,045	4,30	4,48	2	5
Trees take up space on sidewalks	Young adult	77	3,00	0,858	0,098	2,81	3,19	1	5
	Adult	56	2,96	0,660	0,088	2,79	3,14	1	5
	Elderly	74	2,89	0,610	0,071	2,75	3,03	1	5
	Total	207	2,95	0,722	0,050	2,85	3,05	1	5
Trees influence the traffic safety	Young adult	77	2,68	0,751	0,086	2,50	2,85	1	5
	Adult	54	2,89	0,604	0,082	2,72	3,05	2	5
	Elderly	71	2,80	0,524	0,062	2,68	2,93	1	4
	Total	202	2,78	0,643	0,045	2,69	2,87	1	5
Branches fall from trees	Young adult	86	2,41	0,742	0,080	2,25	2,57	1	5
	Adult	65	2,65	0,513	0,064	2,52	2,77	2	4
	Elderly	78	2,65	0,680	0,077	2,50	2,81	1	5
	Total	229	2,56	0,670	0,044	2,47	2,65	1	5
Trees increase the house price	Young adult	74	3,65	1,116	0,130	3,39	3,91	1	5
	Adult	61	4,05	0,762	0,098	3,85	4,24	2	5
	Elderly	76	3,87	0,737	0,084	3,70	4,04	3	5
	Total	211	3,84	0,905	0,062	3,72	3,97	1	5
Trees take up parking space	Young adult	79	3,38	0,965	0,109	3,16	3,60	1	5

	Adult	60	3,48	0,770	0,099	3,28	3,68	2	5
	Elderly	75	3,56	0,826	0,095	3,37	3,75	1	5
	Total	214	3,47	0,865	0,059	3,36	3,59	1	5
Trees Pressure of roots on pavement	Young adult	87	2,41	0,756	0,081	2,25	2,57	1	5
	Adult	66	2,39	0,605	0,074	2,25	2,54	1	3
	Elderly	81	2,33	0,671	0,075	2,19	2,48	1	4
	Total	234	2,38	0,684	0,045	2,29	2,47	1	5
Trees drop organic products	Young adult	83	3,08	1,073	0,118	2,85	3,32	1	5
	Adult	67	3,64	0,933	0,114	3,41	3,87	2	5
	Elderly	80	3,75	0,948	0,106	3,54	3,96	1	5
	Total	230	3,48	1,031	0,068	3,34	3,61	1	5
Trees release pollen	Young adult	71	2,34	0,861	0,102	2,13	2,54	1	5
	Adult	59	2,63	0,584	0,076	2,47	2,78	1	4
	Elderly	72	2,61	0,595	0,070	2,47	2,75	1	4
	Total	202	2,52	0,707	0,050	2,42	2,62	1	5
Trees drip sticky juice	Young adult	81	2,14	0,919	0,102	1,93	2,34	1	5
	Adult	62	2,24	0,717	0,091	2,06	2,42	1	4
	Elderly	76	2,26	0,772	0,089	2,09	2,44	1	4
	Total	219	2,21	0,814	0,055	2,10	2,32	1	5
Trees influence the water management	Young adult	82	4,28	0,653	0,072	4,14	4,42	3	5
	Adult	67	4,37	0,624	0,076	4,22	4,53	3	5
	Elderly	79	4,30	0,822	0,092	4,12	4,49	1	5
	Total	228	4,32	0,706	0,047	4,22	4,41	1	5
Trees capture fine dust	Young adult	84	4,63	0,555	0,061	4,51	4,75	3	5
	Adult	67	4,64	0,542	0,066	4,51	4,77	3	5
	Elderly	79	4,75	0,518	0,058	4,63	4,86	3	5
	Total	230	4,67	0,539	0,036	4,60	4,74	3	5
Trees lose leaves	Young adult	87	3,10	0,965	0,103	2,90	3,31	1	5
	Adult	69	3,39	0,911	0,110	3,17	3,61	1	5
	Elderly	81	3,62	0,860	0,096	3,43	3,81	2	5
	Total	237	3,36	0,936	0,061	3,24	3,48	1	5
Trees make sound	Young adult	82	4,04	0,554	0,061	3,91	4,16	2	5
	Adult	66	4,06	0,699	0,086	3,89	4,23	2	5
	Elderly	81	4,02	0,632	0,070	3,88	4,16	3	5
	Total	229	4,04	0,624	0,041	3,96	4,12	2	5
Trees block the wind	Young adult	78	4,14	0,697	0,079	3,98	4,30	2	5
	Adult	65	4,09	0,723	0,090	3,91	4,27	3	5
	Elderly	75	4,09	0,701	0,081	3,93	4,25	3	5
	Total	218	4,11	0,703	0,048	4,02	4,20	2	5

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	4,496	2	2,248	3,697	0,026
	Within Groups	141,053	232	0,608		
	Total	145,549	234			
Trees influence biodiversity	Between Groups	3,777	2	1,888	6,512	0,002
	Within Groups	67,270	232	0,290		
	Total	71,047	234			
Trees influence the appearances	Between Groups	3,390	2	1,695	3,984	0,020
	Within Groups	98,695	232	0,425		
	Total	102,085	234			
Trees bring nature closer	Between Groups	3,537	2	1,768	5,864	0,003
	Within Groups	70,272	233	0,302		
	Total	73,809	235			
The leaves of trees change colour	Between Groups	4,834	2	2,417	7,424	0,001
	Within Groups	76,179	234	0,326		
	Total	81,013	236			
Trees influence the social safety	Between Groups	6,039	2	3,020	4,104	0,018
	Within Groups	161,132	219	0,736		
	Total	167,171	221			
Trees provide a habitat for animals	Between Groups	5,509	2	2,755	5,914	0,003
	Within Groups	108,997	234	0,466		
	Total	114,506	236			
Trees take up space on sidewalks	Between Groups	0,453	2	0,227	0,432	0,650
	Within Groups	107,064	204	0,525		
	Total	107,517	206			
Trees influence the traffic safety	Between Groups	1,519	2	0,760	1,856	0,159
	Within Groups	81,456	199	0,409		

	Total	82,975	201			
Branches fall from trees	Between Groups	3,183	2	1,591	3,623	0,028
	Within Groups	99,271	226	0,439		
	Total	102,454	228			
Trees increase the house price	Between Groups	5,437	2	2,719	3,398	0,035
	Within Groups	166,402	208	0,800		
	Total	171,839	210			
Trees take up parking space	Between Groups	1,261	2	0,630	0,842	0,432
	Within Groups	158,071	211	0,749		
	Total	159,332	213			
Trees Pressure of roots on pavement	Between Groups	0,289	2	0,144	0,306	0,737
	Within Groups	108,861	231	0,471		
	Total	109,150	233			
Trees drop organic products	Between Groups	20,579	2	10,289	10,483	0,000
	Within Groups	222,813	227	0,982		
	Total	243,391	229			
Trees release pollen	Between Groups	3,626	2	1,813	3,727	0,026
	Within Groups	96,795	199	0,486		
	Total	100,421	201			
Trees drip sticky juice	Between Groups	0,724	2	0,362	0,544	0,581
	Within Groups	143,614	216	0,665		
	Total	144,338	218			
Trees influence the water management	Between Groups	0,334	2	0,167	0,333	0,717
	Within Groups	112,929	225	0,502		
	Total	113,263	227			
Trees capture fine dust	Between Groups	0,644	2	0,322	1,110	0,331
	Within Groups	65,899	227	0,290		
	Total	66,543	229			
Trees lose leaves	Between Groups	11,154	2	5,577	6,670	0,002
	Within Groups	195,640	234	0,836		
	Total	206,793	236			
Trees make sound	Between Groups	0,048	2	0,024	0,061	0,941
	Within Groups	88,598	226	0,392		
	Total	88,646	228			
Trees block the wind	Between Groups	0,116	2	0,058	0,117	0,890
	Within Groups	107,242	215	0,499		
	Total	107,358	217			

Multiple Comparisons

Games-Howell

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Trees provide organic shade	Young adult	Adult	-,268*	0,109	0,041	-0,53	-0,01
		Elderly	0,064	0,128	0,871	-0,24	0,37
	Adult	Young adult	,268*	0,109	0,041	0,01	0,53
		Elderly	,332*	0,131	0,033	0,02	0,64
	Elderly	Young adult	-0,064	0,128	0,871	-0,37	0,24
		Adult	-,332*	0,131	0,033	-0,64	-0,02
Trees influence biodiversity	Young adult	Adult	-,237*	0,090	0,025	-0,45	-0,02
		Elderly	-,282*	0,084	0,003	-0,48	-0,08
	Adult	Young adult	,237*	0,090	0,025	0,02	0,45
		Elderly	-0,045	0,084	0,852	-0,24	0,15
	Elderly	Young adult	,282*	0,084	0,003	0,08	0,48
		Adult	0,045	0,084	0,852	-0,15	0,24
Trees influence appearances	Young adult	Adult	-,284*	0,106	0,022	-0,54	-0,03
		Elderly	-0,203	0,106	0,140	-0,45	0,05
	Adult	Young adult	,284*	0,106	0,022	0,03	0,54
		Elderly	0,082	0,092	0,647	-0,14	0,30
	Elderly	Young adult	0,203	0,106	0,140	-0,05	0,45
		Adult	-0,082	0,092	0,647	-0,30	0,14
Trees bring nature closer	Young adult	Adult	-,276*	0,088	0,006	-0,49	-0,07
		Elderly	-,231*	0,091	0,031	-0,45	-0,02
	Adult	Young adult	,276*	0,088	0,006	0,07	0,49

		Elderly	0,045	0,076	0,823	-0,13	0,23
	Elderly	Young adult	,231*	0,091	0,031	0,02	0,45
		Adult	-0,045	0,076	0,823	-0,23	0,13
The leaves of trees change colour	Young adult	Adult	-,278*	0,091	0,007	-0,49	-0,06
		Elderly	-,309*	0,092	0,003	-0,53	-0,09
	Adult	Young adult	,278*	0,091	0,007	0,06	0,49
		Elderly	-0,031	0,085	0,929	-0,23	0,17
	Elderly	Young adult	,309*	0,092	0,003	0,09	0,53
		Adult	0,031	0,085	0,929	-0,17	0,23
Trees influence social safety	Young adult	Adult	-0,326	0,140	0,056	-0,66	0,01
		Elderly	0,066	0,141	0,885	-0,27	0,40
	Adult	Young adult	0,326	0,140	0,056	-0,01	0,66
		Elderly	,392*	0,139	0,015	0,06	0,72
	Elderly	Young adult	-0,066	0,141	0,885	-0,40	0,27
		Adult	-,392*	0,139	0,015	-0,72	-0,06
Trees provide a habitat for animals	Young adult	Adult	-,349*	0,113	0,007	-0,62	-0,08
		Elderly	-,280*	0,110	0,031	-0,54	-0,02
	Adult	Young adult	,349*	0,113	0,007	0,08	0,62
		Elderly	0,069	0,096	0,758	-0,16	0,30
	Elderly	Young adult	,280*	0,110	0,031	0,02	0,54
		Adult	-0,069	0,096	0,758	-0,30	0,16
Trees influence house price	Young adult	Adult	-,401*	0,162	0,039	-0,79	-0,02
		Elderly	-0,220	0,155	0,334	-0,59	0,15
	Adult	Young adult	,401*	0,162	0,039	0,02	0,79
		Elderly	0,181	0,129	0,344	-0,13	0,49
	Elderly	Young adult	0,220	0,155	0,334	-0,15	0,59
		Adult	-0,181	0,129	0,344	-0,49	0,13
Trees drop organic products	Young adult	Adult	-,557*	0,164	0,002	-0,95	-0,17
		Elderly	-,666*	0,158	0,000	-1,04	-0,29
	Adult	Young adult	,557*	0,164	0,002	0,17	0,95
		Elderly	-0,108	0,156	0,767	-0,48	0,26
	Elderly	Young adult	,666*	0,158	0,000	0,29	1,04
		Adult	0,108	0,156	0,767	-0,26	0,48
Leaves fall from trees	Young adult	Adult	-0,288	0,151	0,140	-0,64	0,07
		Elderly	-,514*	0,141	0,001	-0,85	-0,18
	Adult	Young adult	0,288	0,151	0,140	-0,07	0,64
		Elderly	-0,226	0,145	0,269	-0,57	0,12
	Elderly	Young adult	,514*	0,141	0,001	0,18	0,85
		Adult	0,226	0,145	0,269	-0,12	0,57

*. The mean difference is significant at the 0.05 level.

Table A4.13. ANOVA-test difference between and within the age groups - BWS

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Trees provide organic shade	Young adult	87	0,1057	0,41912	0,04493	0,0164	0,1951	-1,00	0,80
	Adult	69	0,1797	0,45133	0,05433	0,0713	0,2881	-1,00	1,00
	Elderly	82	0,1195	0,42960	0,04744	0,0251	0,2139	-0,80	1,00
	Total	238	0,1319	0,43155	0,02797	0,0768	0,1870	-1,00	1,00
Trees influence biodiversity	Young adult	87	0,0805	0,46301	0,04964	-0,0182	0,1791	-0,80	1,00
	Adult	69	0,1420	0,45127	0,05433	0,0336	0,2504	-0,80	1,00
	Elderly	82	0,1561	0,42049	0,04644	0,0637	0,2485	-1,00	0,80
	Total	238	0,1244	0,44475	0,02883	0,0676	0,1812	-1,00	1,00
Trees influence the appearances	Young adult	87	0,0782	0,47481	0,05091	-0,0230	0,1794	-1,00	1,00
	Adult	69	0,0638	0,42633	0,05132	-0,0386	0,1662	-1,00	0,80
	Elderly	82	0,0488	0,38046	0,04202	-0,0348	0,1324	-1,00	1,00
	Total	238	0,0639	0,42847	0,02777	0,0092	0,1186	-1,00	1,00
Trees bring nature closer	Young adult	87	0,0920	0,43004	0,04611	0,0003	0,1836	-0,80	1,00
	Adult	69	0,0493	0,44113	0,05311	-0,0567	0,1552	-0,80	1,00
	Elderly	82	0,0415	0,38585	0,04261	-0,0433	0,1262	-0,80	1,00
	Total	238	0,0622	0,41755	0,02707	0,0089	0,1155	-0,80	1,00
The leaves of trees change colour	Young adult	87	0,0460	0,35790	0,03837	-0,0303	0,1223	-1,00	1,00
	Adult	69	0,0638	0,33518	0,04035	-0,0168	0,1443	-0,60	1,00
	Elderly	82	0,0537	0,32818	0,03624	-0,0185	0,1258	-0,80	0,80
	Total	238	0,0538	0,33997	0,02204	0,0104	0,0972	-1,00	1,00

Trees influence the social safety	Young adult	87	0,0874	0,38664	0,04145	0,0050	0,1698	-1,00	1,00
	Adult	69	0,0087	0,35386	0,04260	-0,0763	0,0937	-0,80	0,80
	Elderly	82	0,0122	0,43586	0,04813	-0,0836	0,1080	-1,00	1,00
	Total	238	0,0387	0,39557	0,02564	-0,0119	0,0892	-1,00	1,00
Trees provide a habitat for animals	Young adult	87	0,0483	0,29407	0,03153	-0,0144	0,1110	-0,80	0,60
	Adult	69	0,0087	0,30183	0,03634	-0,0638	0,0812	-0,80	0,60
	Elderly	82	0,0122	0,31007	0,03424	-0,0559	0,0803	-0,60	0,80
	Total	238	0,0244	0,30118	0,01952	-0,0141	0,0628	-0,80	0,80
Trees take up space on sidewalks	Young adult	87	0,0161	0,30987	0,03322	-0,0499	0,0821	-0,80	0,60
	Adult	69	0,0522	0,34068	0,04101	-0,0297	0,1340	-0,60	0,80
	Elderly	82	0,0024	0,32125	0,03548	-0,0681	0,0730	-0,80	0,80
	Total	238	0,0218	0,32222	0,02089	-0,0193	0,0630	-0,80	0,80
Trees influence the traffic safety	Young adult	87	0,0322	0,41358	0,04434	-0,0560	0,1203	-1,00	1,00
	Adult	69	-0,0783	0,41191	0,04959	-0,1772	0,0207	-0,80	0,80
	Elderly	82	0,0585	0,37776	0,04172	-0,0245	0,1415	-0,60	0,80
	Total	238	0,0092	0,40346	0,02615	-0,0423	0,0608	-1,00	1,00
Branches fall from trees	Young adult	87	0,0460	0,34869	0,03738	-0,0283	0,1203	-0,60	1,00
	Adult	69	-0,0319	0,28825	0,03470	-0,1011	0,0374	-0,80	0,60
	Elderly	82	-0,0268	0,33520	0,03702	-0,1005	0,0468	-0,80	0,80
	Total	238	-0,0017	0,32814	0,02127	-0,0436	0,0402	-0,80	1,00
Trees increase the house price	Young adult	87	-0,0782	0,40503	0,04342	-0,1645	0,0082	-1,00	0,80
	Adult	69	0,0087	0,32072	0,03861	-0,0684	0,0857	-0,60	0,80
	Elderly	82	0,0659	0,37980	0,04194	-0,0176	0,1493	-0,80	0,80
	Total	238	-0,0034	0,37696	0,02443	-0,0515	0,0448	-1,00	0,80
Trees take up parking space	Young adult	87	0,0069	0,37658	0,04037	-0,0734	0,0872	-0,80	0,80
	Adult	69	-0,0406	0,36875	0,04439	-0,1292	0,0480	-1,00	0,60
	Elderly	82	-0,0024	0,39937	0,04410	-0,0902	0,0853	-0,80	0,80
	Total	238	-0,0101	0,38129	0,02472	-0,0588	0,0386	-1,00	0,80
Trees Pressure of roots on pavement	Young adult	87	-0,0299	0,25614	0,02746	-0,0845	0,0247	-0,80	0,60
	Adult	69	0,0493	0,31325	0,03771	-0,0260	0,1245	-0,60	0,80
	Elderly	82	-0,0415	0,29936	0,03306	-0,1072	0,0243	-0,60	0,60
	Total	238	-0,0109	0,29000	0,01880	-0,0480	0,0261	-0,80	0,80
Trees drop organic products	Young adult	87	-0,0299	0,32354	0,03469	-0,0988	0,0391	-0,80	0,80
	Adult	69	-0,0116	0,33057	0,03980	-0,0910	0,0678	-0,80	0,80
	Elderly	82	0,0024	0,34210	0,03778	-0,0727	0,0776	-0,80	0,80
	Total	238	-0,0134	0,33094	0,02145	-0,0557	0,0288	-0,80	0,80
Trees release pollen	Young adult	87	-0,0644	0,40862	0,04381	-0,1515	0,0227	-1,00	1,00
	Adult	69	-0,0174	0,30047	0,03617	-0,0896	0,0548	-0,80	0,80
	Elderly	82	0,0000	0,25724	0,02841	-0,0565	0,0565	-0,80	0,80
	Total	238	-0,0286	0,33151	0,02149	-0,0709	0,0138	-1,00	1,00
Trees drip sticky juice	Young adult	87	-0,0552	0,45309	0,04858	-0,1517	0,0414	-0,80	0,80
	Adult	69	-0,0348	0,44716	0,05383	-0,1422	0,0726	-1,00	1,00
	Elderly	82	-0,0390	0,38160	0,04214	-0,1229	0,0448	-0,80	1,00
	Total	238	-0,0437	0,42628	0,02763	-0,0981	0,0107	-1,00	1,00
Trees influence the water management	Young adult	87	0,0092	0,36588	0,03923	-0,0688	0,0872	-0,80	0,80
	Adult	69	-0,0841	0,33503	0,04033	-0,1645	-0,0036	-0,80	0,60
	Elderly	82	-0,0829	0,35130	0,03879	-0,1601	-0,0057	-0,80	0,80
	Total	238	-0,0496	0,35349	0,02291	-0,0947	-0,0044	-0,80	0,80
Trees capture fine dust	Young adult	87	0,0023	0,47101	0,05050	-0,0981	0,1027	-1,00	1,00
	Adult	69	-0,1014	0,45195	0,05441	-0,2100	0,0071	-1,00	0,80
	Elderly	82	-0,0659	0,40982	0,04526	-0,1559	0,0242	-0,80	1,00
	Total	238	-0,0513	0,44539	0,02887	-0,1081	0,0056	-1,00	1,00
Trees lose leaves	Young adult	87	-0,0299	0,43298	0,04642	-0,1222	0,0624	-0,80	0,80
	Adult	69	-0,0435	0,44967	0,05413	-0,1515	0,0645	-0,80	0,80
	Elderly	82	-0,0829	0,41330	0,04564	-0,1737	0,0079	-0,80	0,80
	Total	238	-0,0521	0,43006	0,02788	-0,1070	0,0028	-0,80	0,80
Trees make sound	Young adult	87	-0,2161	0,47663	0,05110	-0,3177	-0,1145	-1,20	1,00
	Adult	69	-0,0261	0,51325	0,06179	-0,1494	0,0972	-1,20	1,20
	Elderly	82	-0,0756	0,44404	0,04904	-0,1732	0,0220	-1,20	0,80
	Total	238	-0,1126	0,48166	0,03122	-0,1741	-0,0511	-1,20	1,20
Trees block the wind	Young adult	87	-0,1471	0,39113	0,04193	-0,2305	-0,0638	-1,00	0,80
	Adult	69	-0,1565	0,41709	0,05021	-0,2567	-0,0563	-1,00	0,80
	Elderly	82	-0,1561	0,39879	0,04404	-0,2437	-0,0685	-1,00	0,80
	Total	238	-0,1529	0,39975	0,02591	-0,2040	-0,1019	-1,00	0,80

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	0,23	2	0,115	0,615	0,542
	Within Groups	43,908	235	0,187		
	Total	44,137	237			
Trees influence biodiversity	Between Groups	0,272	2	0,136	0,685	0,505
	Within Groups	46,607	235	0,198		
	Total	46,879	237			
Trees influence the appearances	Between Groups	0,036	2	0,018	0,098	0,906
	Within Groups	43,473	235	0,185		
	Total	43,509	237			
Trees bring nature closer	Between Groups	0,124	2	0,062	0,353	0,703
	Within Groups	41,196	235	0,175		
	Total	41,32	237			
The leaves of trees change colour	Between Groups	0,012	2	0,006	0,052	0,949
	Within Groups	27,379	235	0,117		
	Total	27,392	237			
Trees influence the social safety	Between Groups	0,326	2	0,163	1,041	0,355
	Within Groups	36,759	235	0,156		
	Total	37,084	237			
Trees provide a habitat for animals	Between Groups	0,079	2	0,039	0,432	0,649
	Within Groups	21,42	235	0,091		
	Total	21,499	237			
Trees take up space on sidewalks	Between Groups	0,097	2	0,049	0,466	0,628
	Within Groups	24,509	235	0,104		
	Total	24,606	237			
Trees influence the traffic safety	Between Groups	0,773	2	0,387	2,404	0,093
	Within Groups	37,806	235	0,161		
	Total	38,58	237			
Branches fall from trees	Between Groups	0,312	2	0,156	1,456	0,235
	Within Groups	25,207	235	0,107		
	Total	25,519	237			
Trees increase the house price	Between Groups	0,89	2	0,445	3,188	0,043
	Within Groups	32,788	235	0,14		
	Total	33,677	237			
Trees take up parking space	Between Groups	0,094	2	0,047	0,322	0,725
	Within Groups	34,362	235	0,146		
	Total	34,456	237			
Trees Pressure of roots on pavement	Between Groups	0,358	2	0,179	2,148	0,119
	Within Groups	19,574	235	0,083		
	Total	19,932	237			
Trees drop organic products	Between Groups	0,044	2	0,022	0,202	0,818
	Within Groups	25,913	235	0,11		
	Total	25,957	237			
Trees release pollen	Between Groups	0,187	2	0,094	0,85	0,429
	Within Groups	25,859	235	0,11		
	Total	26,046	237			
Trees drip sticky juice	Between Groups	0,019	2	0,009	0,051	0,95
	Within Groups	43,047	235	0,183		
	Total	43,066	237			
Trees influence the water management	Between Groups	0,474	2	0,237	1,91	0,15
	Within Groups	29,141	235	0,124		
	Total	29,615	237			
Trees capture fine dust	Between Groups	0,441	2	0,22	1,112	0,331
	Within Groups	46,574	235	0,198		
	Total	47,015	237			
Trees lose leaves	Between Groups	0,126	2	0,063	0,339	0,713
	Within Groups	43,708	235	0,186		
	Total	43,834	237			
Trees make sound	Between Groups	1,56	2	0,78	3,432	0,034
	Within Groups	53,422	235	0,227		
	Total	54,982	237			
Trees block the wind	Between Groups	0,005	2	0,002	0,014	0,986
	Within Groups	37,868	235	0,161		
	Total	37,873	237			

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Trees increase the house price	Based on Mean	1,843	2	235	0,161
	Based on Median	1,455	2	235	0,235
	Based on Median and with adjusted df	1,455	2	216,037	0,236
	Based on trimmed mean	1,950	2	235	0,145
Trees make sound	Based on Mean	1,051	2	235	0,351
	Based on Median	1,042	2	235	0,354
	Based on Median and with adjusted df	1,042	2	234,387	0,354
	Based on trimmed mean	1,062	2	235	0,348

Games-Howell **Multiple comparisons**

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Trees increase the house price	Young adult	Adult	-0,08686	0,05811	0,296	-0,2244	0,0507
		Elderly	-,14401*	0,06037	0,048	-0,2868	-0,0012
	Adult	Young adult	0,08686	0,05811	0,296	-0,0507	0,2244
		Elderly	-0,05716	0,05701	0,576	-0,1921	0,0778
	Elderly	Young adult	,14401*	0,06037	0,048	0,0012	0,2868
		Adult	0,05716	0,05701	0,576	-0,0778	0,1921
Trees make sound	Young adult	Adult	-,19000*	0,08018	0,05	-0,3799	-0,0001
		Elderly	-0,14048	0,07082	0,119	-0,308	0,027
	Adult	Young adult	,19000*	0,08018	0,05	0,0001	0,3799
		Elderly	0,04952	0,07888	0,805	-0,1374	0,2365
	Elderly	Young adult	0,14048	0,07082	0,119	-0,027	0,308
		Adult	-0,04952	0,07888	0,805	-0,2365	0,1374

*. The mean difference is significant at the 0.05 level.

Table A4.14. Summary of the counting approach, modelling approach, share of importance and the affective response of the education groups - BWS

	Effects of trees	Low education level				Middle education level				High education level			
		BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR	BW-score	C-logit score	SI	AR
1	Provide organic shade	0.152	0.497*	0.067	4.14	0.123	0.222*	0.063	4.35	0.132	0.336*	0.065	4.27
2	Increase biodiversity	0.127	0.439*	0.064	4.33	0.121	0.216	0.063	4.62	0.126	0.321*	0.064	4.52
3	Influence appearances	0.067	0.290	0.055	4.25	0.082	0.123	0.057	4.55	0.052	0.142	0.053	4.60
4	Bring nature closer	0.133	0.452*	0.064	4.53	0.046	0.036	0.053	4.65	0.054	0.146	0.054	4.66
5	Leaves change colour	0.036	0.217	0.051	4.47	0.067	0.085	0.055	4.49	0.050	0.139	0.053	4.56
6	Influence social safety	0.024	0.187	0.049	3.48	-0.003	-0.081	0.047	3.67	0.068	0.181*	0.055	3.55
7	Provide habitat for animals	0.000	0.137	0.047	4.32	-0.039	-0.170	0.043	4.32	-0.022	-0.038	0.045	4.29
8	Take up space on sidewalk	0.012	0.157	0.048	3.20	0.018	-0.032	0.049	2.85	0.027	0.082	0.050	2.87
9	Influence traffic safety	0.061	0.293	0.055	2.69	-0.023	-0.130	0.045	2.84	0.016	0.061	0.049	2.62
10	Falling branches	0.000	0.128	0.047	2.79	-0.026	-0.057	0.048	2.46	-0.008	-0.002	0.046	2.41
11	Increase house prices	-0.061	0.000	0.041	3.47	0.031	0.000	0.051	3.79	-0.010	-	0.046	4.05
12	Take up parking space	0.036	0.237	0.052	3.40	-0.010	-0.099	0.046	3.26	-0.022	-0.030	0.045	3.79
13	Pressure of roots on pavement	0.024	0.205	0.050	2.53	-0.026	-0.136	0.044	2.29	-0.011	-0.004	0.046	2.37
14	Drop organic products	-0.079	-0.063	0.038	3.76	0.000	-0.075	0.047	3.24	-0.005	0.006	0.047	3.76

15	Cause allergic reactions	-0.036	0.040	0.043	2.58	0.010	-0.050	0.048	2.43	-0.050	-0.104	0.042	2.53
16	Drip sticky juice	-0.140	-0.210	0.033	2.57	-0.041	-0.174	0.043	2.09	-0.021	-0.032	0.045	2.26
17	Water management	-0.036	0.040	0.043	4.15	-0.033	-0.155	0.043	4.42	-0.063	-0.134	0.040	4.31
18	Air purification	-0.006	0.113	0.046	4.56	-0.046	-0.186	0.042	4.76	-0.066	-0.142	0.040	4.64
19	Falling of leaves	-0.006	0.114	0.046	3.45	-0.059	-0.217	0.041	3.16	-0.060	-0.127	0.041	3.50
20	Make sound	-0.152	-0.252	0.032	4.07	-0.048	-0.188	0.042	4.00	-0.069	-0.146	0.040	4.07
21	Block wind	-0.188	-0.331	0.029	3.93	-0.180	-0.508*	0.031	4.15	-0.128	-0.290*	0.035	4.29
*significant at the 0.05 level												

Table A4.15. ANOVA-test difference between and within the education groups - affective response

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Trees provide organic shade	Low educated	33	4,18	0,846	0,147	3,88	4,48	2	5
	Middle educated	77	4,35	0,703	0,080	4,19	4,51	2	5
	High educated	125	4,30	0,825	0,074	4,16	4,45	1	5
	Total	235	4,30	0,789	0,051	4,20	4,40	1	5
Trees influence biodiversity	Low educated	33	4,42	0,708	0,123	4,17	4,68	3	5
	Middle educated	77	4,62	0,539	0,061	4,50	4,75	3	5
	High educated	125	4,68	0,502	0,045	4,59	4,77	3	5
	Total	235	4,63	0,551	0,036	4,55	4,70	3	5
Trees influence the appearances	Low educated	33	4,27	0,761	0,133	4,00	4,54	2	5
	Middle educated	77	4,55	0,680	0,077	4,39	4,70	1	5
	High educated	125	4,63	0,603	0,054	4,53	4,74	1	5
	Total	235	4,55	0,661	0,043	4,47	4,64	1	5
Trees bring nature closer	Low educated	33	4,61	0,556	0,097	4,41	4,80	3	5
	Middle educated	77	4,65	0,532	0,061	4,53	4,77	3	5
	High educated	126	4,66	0,582	0,052	4,56	4,76	2	5
	Total	236	4,65	0,560	0,036	4,58	4,72	2	5
The leaves of trees change colour	Low educated	33	4,48	0,566	0,098	4,28	4,69	3	5
	Middle educated	78	4,49	0,619	0,070	4,35	4,63	3	5
	High educated	126	4,57	0,572	0,051	4,47	4,67	3	5
	Total	237	4,53	0,586	0,038	4,46	4,61	3	5
Trees influence the social safety	Low educated	30	3,53	0,900	0,164	3,20	3,87	2	5
	Middle educated	73	3,67	0,898	0,105	3,46	3,88	1	5
	High educated	119	3,65	0,850	0,078	3,49	3,80	1	5
	Total	222	3,64	0,870	0,058	3,52	3,75	1	5
Trees provide a habitat for animals	Low educated	33	4,36	0,653	0,114	4,13	4,60	3	5
	Middle educated	78	4,32	0,712	0,081	4,16	4,48	2	5
	High educated	126	4,44	0,699	0,062	4,32	4,57	2	5
	Total	237	4,39	0,697	0,045	4,30	4,48	2	5
Trees take up space on sidewalks	Low educated	30	3,20	0,714	0,130	2,93	3,47	2	5
	Middle educated	67	2,85	0,680	0,083	2,68	3,02	1	5
	High educated	110	2,95	0,740	0,071	2,81	3,09	1	5
	Total	207	2,95	0,722	0,050	2,85	3,05	1	5
Trees influence the traffic safety	Low educated	29	2,69	0,660	0,123	2,44	2,94	1	4
	Middle educated	68	2,84	0,614	0,074	2,69	2,99	1	4
	High educated	105	2,76	0,658	0,064	2,63	2,89	1	5
	Total	202	2,78	0,643	0,045	2,69	2,87	1	5
Branches fall from trees	Low educated	32	2,75	0,762	0,135	2,48	3,02	1	5
	Middle educated	76	2,46	0,642	0,074	2,31	2,61	1	4
	High educated	121	2,57	0,656	0,060	2,45	2,69	1	5
	Total	229	2,56	0,670	0,044	2,47	2,65	1	5
Trees increase the house price	Low educated	29	3,52	1,022	0,190	3,13	3,91	1	5
	Middle educated	71	3,79	1,013	0,120	3,55	4,03	1	5
	High educated	111	3,96	0,774	0,073	3,82	4,11	2	5
	Total	211	3,84	0,905	0,062	3,72	3,97	1	5
Trees take up parking space	Low educated	30	3,43	0,774	0,141	3,14	3,72	2	5
	Middle educated	70	3,26	0,879	0,105	3,05	3,47	1	5
	High educated	114	3,61	0,857	0,080	3,45	3,77	1	5
	Total	214	3,47	0,865	0,059	3,36	3,59	1	5
Trees Pressure of roots on pavement	Low educated	32	2,53	0,879	0,155	2,21	2,85	1	5
	Middle educated	78	2,29	0,705	0,080	2,14	2,45	1	4

	High educated	124	2,40	0,609	0,055	2,29	2,50	1	4
	Total	234	2,38	0,684	0,045	2,29	2,47	1	5
Trees drop organic products	Low educated	31	3,77	0,884	0,159	3,45	4,10	2	5
	Middle educated	75	3,24	1,089	0,126	2,99	3,49	1	5
	High educated	124	3,55	1,007	0,090	3,37	3,73	1	5
	Total	230	3,48	1,031	0,068	3,34	3,61	1	5
Trees release pollen	Low educated	29	2,59	0,907	0,168	2,24	2,93	1	5
	Middle educated	68	2,43	0,759	0,092	2,24	2,61	1	4
	High educated	105	2,56	0,603	0,059	2,45	2,68	1	4
	Total	202	2,52	0,707	0,050	2,42	2,62	1	5
Trees drip sticky juice	Low educated	31	2,52	0,962	0,173	2,16	2,87	1	5
	Middle educated	74	2,09	0,830	0,097	1,90	2,29	1	4
	High educated	114	2,20	0,743	0,070	2,06	2,34	1	4
	Total	219	2,21	0,814	0,055	2,10	2,32	1	5
Trees influence the water management	Low educated	32	4,19	0,693	0,122	3,94	4,44	3	5
	Middle educated	74	4,42	0,619	0,072	4,28	4,56	3	5
	High educated	122	4,29	0,755	0,068	4,15	4,42	1	5
	Total	228	4,32	0,706	0,047	4,22	4,41	1	5
Trees capture fine dust	Low educated	32	4,59	0,615	0,109	4,37	4,82	3	5
	Middle educated	74	4,76	0,491	0,057	4,64	4,87	3	5
	High educated	124	4,65	0,544	0,049	4,55	4,74	3	5
	Total	230	4,67	0,539	0,036	4,60	4,74	3	5
Trees lose leaves	Low educated	33	3,48	1,034	0,180	3,12	3,85	1	5
	Middle educated	77	3,16	0,919	0,105	2,95	3,36	1	5
	High educated	127	3,46	0,906	0,080	3,30	3,62	1	5
	Total	237	3,36	0,936	0,061	3,24	3,48	1	5
Trees make sound	Low educated	31	4,13	0,619	0,111	3,90	4,36	3	5
	Middle educated	75	4,00	0,593	0,068	3,86	4,14	2	5
	High educated	123	4,04	0,645	0,058	3,93	4,16	2	5
	Total	229	4,04	0,624	0,041	3,96	4,12	2	5
Trees block the wind	Low educated	33	4,00	0,750	0,131	3,73	4,27	2	5
	Middle educated	74	4,15	0,676	0,079	3,99	4,31	2	5
	High educated	111	4,12	0,710	0,067	3,98	4,25	3	5
	Total	218	4,11	0,703	0,048	4,02	4,20	2	5

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	0,659	2	0,330	0,528	0,591
	Within Groups	144,890	232	0,625		
	Total	145,549	234			
Trees influence biodiversity	Between Groups	1,708	2	0,854	2,858	0,059
	Within Groups	69,339	232	0,299		
	Total	71,047	234			
Trees influence the appearances	Between Groups	3,377	2	1,688	3,968	0,020
	Within Groups	98,708	232	0,425		
	Total	102,085	234			
Trees bring nature closer	Between Groups	0,073	2	0,036	0,115	0,892
	Within Groups	73,737	233	0,316		
	Total	73,809	235			
The leaves of trees change colour	Between Groups	0,426	2	0,213	0,618	0,540
	Within Groups	80,587	234	0,344		
	Total	81,013	236			
Trees influence the social safety	Between Groups	0,418	2	0,209	0,275	0,760
	Within Groups	166,753	219	0,761		
	Total	167,171	221			
Trees provide a habitat for animals	Between Groups	0,772	2	0,386	0,794	0,453
	Within Groups	113,735	234	0,486		
	Total	114,506	236			
Trees take up space on sidewalks	Between Groups	2,537	2	1,268	2,465	0,088
	Within Groups	104,980	204	0,515		
	Total	107,517	206			
Trees influence the traffic safety	Between Groups	0,500	2	0,250	0,603	0,548
	Within Groups	82,475	199	0,414		
	Total	82,975	201			
Branches fall from trees	Between Groups	1,920	2	0,960	2,158	0,118
	Within Groups	100,534	226	0,445		
	Total	102,454	228			
	Between Groups	4,911	2	2,455	3,059	0,049

Trees increase the house price	Within Groups	166,928	208	0,803		
	Total	171,839	210			
Trees take up parking space	Between Groups	5,576	2	2,788	3,826	0,023
	Within Groups	153,756	211	0,729		
	Total	159,332	213			
Trees Pressure of roots on pavement	Between Groups	1,326	2	0,663	1,420	0,244
	Within Groups	107,824	231	0,467		
	Total	109,150	233			
Trees drop organic products	Between Groups	7,582	2	3,791	3,650	0,028
	Within Groups	235,809	227	1,039		
	Total	243,391	229			
Trees release pollen	Between Groups	0,906	2	0,453	0,906	0,406
	Within Groups	99,514	199	0,500		
	Total	100,421	201			
Trees drip sticky juice	Between Groups	3,898	2	1,949	2,998	0,052
	Within Groups	140,439	216	0,650		
	Total	144,338	218			
Trees influence the water management	Between Groups	1,416	2	0,708	1,424	0,243
	Within Groups	111,848	225	0,497		
	Total	113,263	227			
Trees capture fine dust	Between Groups	0,816	2	0,408	1,409	0,246
	Within Groups	65,727	227	0,290		
	Total	66,543	229			
Trees lose leaves	Between Groups	4,909	2	2,455	2,845	0,060
	Within Groups	201,884	234	0,863		
	Total	206,793	236			
Trees make sound	Between Groups	0,366	2	0,183	0,468	0,627
	Within Groups	88,281	226	0,391		
	Total	88,646	228			
Trees block the wind	Between Groups	0,515	2	0,258	0,519	0,596
	Within Groups	106,842	215	0,497		
	Total	107,358	217			

Games-Howell **Multiple comparisons**

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Trees influence the appearances	Low educated	Middle educated	-0,273	0,153	0,187	-0,64	0,10
		High educated	-,359*	0,143	0,041	-0,71	-0,01
	Middle educated	Low educated	0,273	0,153	0,187	-0,10	0,64
		High educated	-0,087	0,094	0,630	-0,31	0,14
	High educated	Low educated	,359*	0,143	0,041	0,01	0,71
		Middle educated	0,087	0,094	0,630	-0,14	0,31
Trees take up parking space	Low educated	Middle educated	0,176	0,176	0,579	-0,25	0,60
		High educated	-0,181	0,162	0,511	-0,57	0,21
	Middle educated	Low educated	-0,176	0,176	0,579	-0,60	0,25
		High educated	-,357*	0,132	0,021	-0,67	-0,04
	High educated	Low educated	0,181	0,162	0,511	-0,21	0,57
		Middle educated	,357*	0,132	0,021	0,04	0,67

*. The mean difference is significant at the 0.05 level.

Table A4.16. ANOVA-test difference between and within the education groups -BWS

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Trees provide organic shade	Low educated	33	0,1515	0,42729	0,07438	0,0000	0,3030	-0,80	0,80
	Middle educated	78	0,1231	0,46289	0,05241	0,0187	0,2274	-1,00	1,00
	High educated	127	0,1323	0,41574	0,03689	0,0593	0,2053	-1,00	1,00
	Total	238	0,1319	0,43155	0,02797	0,0768	0,1870	-1,00	1,00
Trees influence biodiversity	Low educated	33	0,1273	0,46588	0,08110	-0,0379	0,2925	-0,60	1,00
	Middle educated	78	0,1205	0,48171	0,05454	0,0119	0,2291	-0,80	1,00
	High educated	127	0,1260	0,41847	0,03713	0,0525	0,1995	-1,00	1,00
	Total	238	0,1244	0,44475	0,02883	0,0676	0,1812	-1,00	1,00

Trees influence the appearances	Low educated	33	0,0667	0,48391	0,08424	-0,1049	0,2383	-1,00	1,00
	Middle educated	78	0,0821	0,39927	0,04521	-0,0080	0,1721	-0,80	0,80
	High educated	127	0,0520	0,43367	0,03848	-0,0242	0,1281	-1,00	1,00
	Total	238	0,0639	0,42847	0,02777	0,0092	0,1186	-1,00	1,00
Trees bring nature closer	Low educated	33	0,1333	0,50662	0,08819	-0,0463	0,3130	-0,80	1,00
	Middle educated	78	0,0462	0,37717	0,04271	-0,0389	0,1312	-0,60	0,80
	High educated	127	0,0535	0,41744	0,03704	-0,0198	0,1268	-0,80	1,00
	Total	238	0,0622	0,41755	0,02707	0,0089	0,1155	-0,80	1,00
The leaves of trees change colour	Low educated	33	0,0364	0,27136	0,04724	-0,0599	0,1326	-0,60	0,40
	Middle educated	78	0,0667	0,34516	0,03908	-0,0112	0,1445	-1,00	1,00
	High educated	127	0,0504	0,35453	0,03146	-0,0119	0,1127	-0,80	1,00
	Total	238	0,0538	0,33997	0,02204	0,0104	0,0972	-1,00	1,00
Trees influence the social safety	Low educated	33	0,0242	0,39924	0,06950	-0,1173	0,1658	-0,60	0,80
	Middle educated	78	-0,0026	0,37242	0,04217	-0,0865	0,0814	-1,00	0,80
	High educated	127	0,0677	0,40881	0,03628	-0,0041	0,1395	-1,00	1,00
	Total	238	0,0387	0,39557	0,02564	-0,0119	0,0892	-1,00	1,00
Trees provide a habitat for animals	Low educated	33	0,0545	0,32891	0,05726	-0,0621	0,1712	-0,80	0,60
	Middle educated	78	0,0179	0,24798	0,02808	-0,0380	0,0739	-0,40	0,60
	High educated	127	0,0205	0,32449	0,02879	-0,0365	0,0775	-0,80	0,80
	Total	238	0,0244	0,30118	0,01952	-0,0141	0,0628	-0,80	0,80
Trees take up space on sidewalks	Low educated	33	0,0121	0,26898	0,04682	-0,0833	0,1075	-0,60	0,60
	Middle educated	78	0,0179	0,32423	0,03671	-0,0552	0,0911	-0,80	0,80
	High educated	127	0,0268	0,33558	0,02978	-0,0322	0,0857	-0,80	0,80
	Total	238	0,0218	0,32222	0,02089	-0,0193	0,0630	-0,80	0,80
Trees influence the traffic safety	Low educated	33	0,0606	0,38886	0,06769	-0,0773	0,1985	-0,60	0,80
	Middle educated	78	-0,0231	0,43602	0,04937	-0,1214	0,0752	-1,00	0,80
	High educated	127	0,0157	0,38759	0,03439	-0,0523	0,0838	-0,80	1,00
	Total	238	0,0092	0,40346	0,02615	-0,0423	0,0608	-1,00	1,00
Branches fall from trees	Low educated	33	0,0000	0,26926	0,04687	-0,0955	0,0955	-0,60	0,60
	Middle educated	78	0,0077	0,33098	0,03748	-0,0669	0,0823	-0,80	0,80
	High educated	127	-0,0079	0,34217	0,03036	-0,0680	0,0522	-0,80	1,00
	Total	238	-0,0017	0,32814	0,02127	-0,0436	0,0402	-0,80	1,00
Trees increase the house price	Low educated	33	-0,0606	0,44296	0,07711	-0,2177	0,0965	-0,80	0,80
	Middle educated	78	0,0308	0,36478	0,04130	-0,0515	0,1130	-1,00	0,80
	High educated	127	-0,0094	0,36676	0,03254	-0,0739	0,0550	-0,80	0,80
	Total	238	-0,0034	0,37696	0,02443	-0,0515	0,0448	-1,00	0,80
Trees take up parking space	Low educated	33	0,0364	0,36213	0,06304	-0,0920	0,1648	-0,80	0,80
	Middle educated	78	-0,0103	0,39857	0,04513	-0,1001	0,0796	-0,80	0,60
	High educated	127	-0,0220	0,37732	0,03348	-0,0883	0,0442	-1,00	0,80
	Total	238	-0,0101	0,38129	0,02472	-0,0588	0,0386	-1,00	0,80
Trees Pressure of roots on pavement	Low educated	33	0,0242	0,29478	0,05131	-0,0803	0,1288	-0,60	0,60
	Middle educated	78	-0,0256	0,28350	0,03210	-0,0896	0,0383	-0,80	0,60
	High educated	127	-0,0110	0,29418	0,02610	-0,0627	0,0406	-0,60	0,80
	Total	238	-0,0109	0,29000	0,01880	-0,0480	0,0261	-0,80	0,80
Trees drop organic products	Low educated	33	-0,0788	0,35334	0,06151	-0,2041	0,0465	-0,80	0,60
	Middle educated	78	0,0000	0,30579	0,03462	-0,0689	0,0689	-0,80	0,80
	High educated	127	-0,0047	0,34037	0,03020	-0,0645	0,0550	-0,80	0,80
	Total	238	-0,0134	0,33094	0,02145	-0,0557	0,0288	-0,80	0,80
Trees release pollen	Low educated	33	-0,0364	0,31006	0,05397	-0,1463	0,0736	-0,60	0,80
	Middle educated	78	0,0103	0,34850	0,03946	-0,0683	0,0888	-0,80	1,00
	High educated	127	-0,0504	0,32657	0,02898	-0,1077	0,0070	-1,00	0,80
	Total	238	-0,0286	0,33151	0,02149	-0,0709	0,0138	-1,00	1,00
Trees drip sticky juice	Low educated	33	-0,1394	0,41378	0,07203	-0,2861	0,0073	-0,80	0,60
	Middle educated	78	-0,0410	0,48922	0,05539	-0,1513	0,0693	-1,00	1,00
	High educated	127	-0,0205	0,38614	0,03426	-0,0883	0,0473	-1,00	0,80
	Total	238	-0,0437	0,42628	0,02763	-0,0981	0,0107	-1,00	1,00
Trees influence the water management	Low educated	33	-0,0364	0,32193	0,05604	-0,1505	0,0778	-0,60	0,80
	Middle educated	78	-0,0333	0,35223	0,03988	-0,1127	0,0461	-0,80	0,80
	High educated	127	-0,0630	0,36402	0,03230	-0,1269	0,0009	-0,80	0,80
	Total	238	-0,0496	0,35349	0,02291	-0,0947	-0,0044	-0,80	0,80
Trees capture fine dust	Low educated	33	-0,0061	0,47298	0,08234	-0,1738	0,1617	-1,00	0,80
	Middle educated	78	-0,0462	0,46923	0,05313	-0,1519	0,0596	-1,00	1,00
	High educated	127	-0,0661	0,42543	0,03775	-0,1408	0,0086	-1,00	1,00
	Total	238	-0,0513	0,44539	0,02887	-0,1081	0,0056	-1,00	1,00
Trees lose leaves	Low educated	33	-0,0061	0,38563	0,06713	-0,1428	0,1307	-0,80	0,80
	Middle educated	78	-0,0590	0,45937	0,05201	-0,1625	0,0446	-0,80	0,80
	High educated	127	-0,0598	0,42487	0,03770	-0,1345	0,0148	-0,80	0,80
	Total	238	-0,0521	0,43006	0,02788	-0,1070	0,0028	-0,80	0,80

Trees make sound	Low educated	33	-0,1758	0,46303	0,08060	-0,3399	-0,0116	-1,20	1,00
	Middle educated	78	-0,1026	0,49385	0,05592	-0,2139	0,0088	-1,20	1,00
	High educated	127	-0,1024	0,48131	0,04271	-0,1869	-0,0178	-1,20	1,20
	Total	238	-0,1126	0,48166	0,03122	-0,1741	-0,0511	-1,20	1,20
Trees block the wind	Low educated	33	-0,1879	0,38059	0,06625	-0,3228	-0,0529	-1,00	0,80
	Middle educated	78	-0,1795	0,37809	0,04281	-0,2647	-0,0942	-1,00	0,80
	High educated	127	-0,1276	0,41836	0,03712	-0,2010	-0,0541	-1,00	0,80
	Total	238	-0,1529	0,39975	0,02591	-0,2040	-0,1019	-1,00	0,80

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	0,019	2	0,009	0,050	0,951
	Within Groups	44,119	235	0,188		
	Total	44,137	237			
Trees influence biodiversity	Between Groups	0,002	2	0,001	0,004	0,996
	Within Groups	46,877	235	0,199		
	Total	46,879	237			
Trees influence the appearances	Between Groups	0,044	2	0,022	0,119	0,888
	Within Groups	43,465	235	0,185		
	Total	43,509	237			
Trees bring nature closer	Between Groups	0,197	2	0,098	0,562	0,571
	Within Groups	41,123	235	0,175		
	Total	41,320	237			
The leaves of trees change colour	Between Groups	0,024	2	0,012	0,105	0,901
	Within Groups	27,367	235	0,116		
	Total	27,392	237			
Trees influence the social safety	Between Groups	0,247	2	0,123	0,787	0,457
	Within Groups	36,838	235	0,157		
	Total	37,084	237			
Trees provide a habitat for animals	Between Groups	0,035	2	0,018	0,193	0,825
	Within Groups	21,463	235	0,091		
	Total	21,499	237			
Trees take up space on sidewalks	Between Groups	0,007	2	0,004	0,035	0,965
	Within Groups	24,599	235	0,105		
	Total	24,606	237			
Trees influence the traffic safety	Between Groups	0,174	2	0,087	0,532	0,588
	Within Groups	38,406	235	0,163		
	Total	38,580	237			
Branches fall from trees	Between Groups	0,012	2	0,006	0,054	0,947
	Within Groups	25,508	235	0,109		
	Total	25,519	237			
Trees increase the house price	Between Groups	0,204	2	0,102	0,715	0,490
	Within Groups	33,474	235	0,142		
	Total	33,677	237			
Trees take up parking space	Between Groups	0,089	2	0,045	0,306	0,737
	Within Groups	34,366	235	0,146		
	Total	34,456	237			
Trees Pressure of roots on pavement	Between Groups	0,058	2	0,029	0,341	0,711
	Within Groups	19,874	235	0,085		
	Total	19,932	237			
Trees drop organic products	Between Groups	0,165	2	0,082	0,750	0,473
	Within Groups	25,792	235	0,110		
	Total	25,957	237			
Trees release pollen	Between Groups	0,180	2	0,090	0,818	0,443
	Within Groups	25,866	235	0,110		
	Total	26,046	237			
Trees drip sticky juice	Between Groups	0,371	2	0,186	1,022	0,362
	Within Groups	42,694	235	0,182		
	Total	43,066	237			
Trees influence the water management	Between Groups	0,049	2	0,025	0,196	0,823
	Within Groups	29,566	235	0,126		
	Total	29,615	237			
Trees capture fine dust	Between Groups	0,098	2	0,049	0,244	0,783
	Within Groups	46,917	235	0,200		
	Total	47,015	237			
Trees lose leaves	Between Groups	0,081	2	0,041	0,218	0,804
	Within Groups	43,753	235	0,186		
	Total	43,834	237			

Trees make sound	Between Groups	0,153	2	0,076	0,327	0,721
	Within Groups	54,829	235	0,233		
	Total	54,982	237			
Trees block the wind	Between Groups	0,177	2	0,089	0,552	0,577
	Within Groups	37,696	235	0,160		
	Total	37,873	237			

Table A4.17. ANOVA-test difference between and within the place of growing up groups – Affective response

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Trees provide organic shade	City (centre)	35	4,31	0,832	0,141	4,03	4,60	2	5
	City (suburb)	81	4,35	0,793	0,088	4,17	4,52	1	5
	Town	94	4,23	0,822	0,085	4,07	4,40	1	5
	Rural	25	4,40	0,577	0,115	4,16	4,64	3	5
Trees influence biodiversity	Total	235	4,30	0,789	0,051	4,20	4,40	1	5
	City (centre)	36	4,58	0,604	0,101	4,38	4,79	3	5
	City (suburb)	82	4,66	0,549	0,061	4,54	4,78	3	5
	Town	93	4,63	0,527	0,055	4,53	4,74	3	5
Trees influence the appearances	Rural	24	4,54	0,588	0,120	4,29	4,79	3	5
	Total	235	4,63	0,551	0,036	4,55	4,70	3	5
	City (centre)	36	4,67	0,586	0,098	4,47	4,86	3	5
	City (suburb)	81	4,46	0,742	0,082	4,29	4,62	1	5
Trees bring nature closer	Town	93	4,61	0,511	0,053	4,51	4,72	3	5
	Rural	25	4,48	0,918	0,184	4,10	4,86	1	5
	Total	235	4,55	0,661	0,043	4,47	4,64	1	5
	City (centre)	36	4,78	0,485	0,081	4,61	4,94	3	5
The leaves of trees change colour	City (suburb)	83	4,57	0,628	0,069	4,43	4,70	2	5
	Town	92	4,67	0,494	0,052	4,57	4,78	3	5
	Rural	25	4,64	0,638	0,128	4,38	4,90	3	5
	Total	236	4,65	0,560	0,036	4,58	4,72	2	5
Trees influence the social safety	City (centre)	36	4,42	0,692	0,115	4,18	4,65	3	5
	City (suburb)	83	4,61	0,537	0,059	4,50	4,73	3	5
	Town	93	4,49	0,583	0,060	4,37	4,61	3	5
	Rural	25	4,56	0,583	0,117	4,32	4,80	3	5
Trees provide a habitat for animals	Total	237	4,53	0,586	0,038	4,46	4,61	3	5
	City (centre)	34	3,76	0,855	0,147	3,47	4,06	2	5
	City (suburb)	81	3,54	0,895	0,099	3,35	3,74	1	5
	Town	84	3,67	0,855	0,093	3,48	3,85	1	5
Trees take up space on sidewalks	Rural	23	3,70	0,876	0,183	3,32	4,07	1	5
	Total	222	3,64	0,870	0,058	3,52	3,75	1	5
	City (centre)	36	4,36	0,723	0,121	4,12	4,61	3	5
	City (suburb)	83	4,42	0,718	0,079	4,26	4,58	2	5
Trees influence the traffic safety	Town	93	4,34	0,699	0,073	4,20	4,49	2	5
	Rural	25	4,52	0,586	0,117	4,28	4,76	3	5
	Total	237	4,39	0,697	0,045	4,30	4,48	2	5
	City (centre)	29	2,79	0,675	0,125	2,54	3,05	2	5
Branches fall from trees	City (suburb)	78	2,92	0,679	0,077	2,77	3,08	1	5
	Town	78	3,03	0,720	0,082	2,86	3,19	1	5
	Rural	22	3,00	0,926	0,197	2,59	3,41	1	5
	Total	207	2,95	0,722	0,050	2,85	3,05	1	5
Trees increase the house price	City (centre)	28	2,68	0,670	0,127	2,42	2,94	1	4
	City (suburb)	75	2,79	0,552	0,064	2,66	2,91	1	4
	Town	80	2,85	0,677	0,076	2,70	3,00	1	5
	Rural	19	2,58	0,769	0,176	2,21	2,95	1	4
Trees take up parking space	Total	202	2,78	0,643	0,045	2,69	2,87	1	5
	City (centre)	34	2,50	0,663	0,114	2,27	2,73	1	4
	City (suburb)	82	2,62	0,696	0,077	2,47	2,77	1	5
	Town	89	2,52	0,659	0,070	2,38	2,66	1	5
Trees Pressure of roots on pavement	Rural	24	2,58	0,654	0,133	2,31	2,86	1	4
	Total	229	2,56	0,670	0,044	2,47	2,65	1	5
	City (centre)	34	4,15	0,892	0,153	3,84	4,46	2	5
	City (suburb)	74	3,81	0,871	0,101	3,61	4,01	1	5
Trees drop organic products	Town	81	3,79	0,918	0,102	3,59	3,99	1	5
	Rural	22	3,68	0,945	0,202	3,26	4,10	1	5

	Total	211	3,84	0,905	0,062	3,72	3,97	1	5
	City (centre)	32	3,63	0,871	0,154	3,31	3,94	2	5
Trees release pollen	City (suburb)	75	3,41	0,755	0,087	3,24	3,59	2	5
	Town	84	3,56	0,923	0,101	3,36	3,76	1	5
	Rural	23	3,13	0,920	0,192	2,73	3,53	1	4
	Total	214	3,47	0,865	0,059	3,36	3,59	1	5
Trees drip sticky juice	City (centre)	36	2,28	0,566	0,094	2,09	2,47	1	3
	City (suburb)	82	2,40	0,768	0,085	2,23	2,57	1	5
	Town	92	2,41	0,649	0,068	2,28	2,55	1	4
	Rural	24	2,33	0,702	0,143	2,04	2,63	1	4
Trees influence the water management	Total	234	2,38	0,684	0,045	2,29	2,47	1	5
	City (centre)	35	3,49	0,951	0,161	3,16	3,81	2	5
	City (suburb)	78	3,41	1,062	0,120	3,17	3,65	1	5
	Town	92	3,57	1,051	0,110	3,35	3,78	1	5
Trees capture fine dust	Rural	25	3,36	0,995	0,199	2,95	3,77	1	5
	Total	230	3,48	1,031	0,068	3,34	3,61	1	5
	City (centre)	30	2,50	0,682	0,125	2,25	2,75	1	3
	City (suburb)	72	2,50	0,769	0,091	2,32	2,68	1	5
Trees lose leaves	Town	76	2,50	0,721	0,083	2,34	2,66	1	4
	Rural	24	2,67	0,482	0,098	2,46	2,87	2	3
	Total	202	2,52	0,707	0,050	2,42	2,62	1	5
	City (centre)	35	2,34	0,873	0,147	2,04	2,64	1	4
Trees make sound	City (suburb)	77	2,25	0,891	0,102	2,04	2,45	1	5
	Town	84	2,12	0,701	0,077	1,97	2,27	1	4
	Rural	23	2,22	0,850	0,177	1,85	2,59	1	4
	Total	219	2,21	0,814	0,055	2,10	2,32	1	5
Trees block the wind	City (centre)	36	4,44	0,652	0,109	4,22	4,67	3	5
	City (suburb)	78	4,21	0,795	0,090	4,03	4,38	1	5
	Town	89	4,40	0,616	0,065	4,27	4,53	3	5
	Rural	25	4,16	0,746	0,149	3,85	4,47	3	5

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	0,83	3	0,278	0,444	0,722
	Within Groups	144,71	231	0,626		
	Total	145,55	234			
Trees influence biodiversity	Between Groups	0,33	3	0,110	0,359	0,783
	Within Groups	70,72	231	0,306		
	Total	71,05	234			
Trees influence the appearances	Between Groups	1,68	3	0,561	1,290	0,279
	Within Groups	100,40	231	0,435		
	Total	102,09	234			
Trees bring nature closer	Between Groups	1,22	3	0,408	1,304	0,274
	Within Groups	72,59	232	0,313		
	Total	73,81	235			
The leaves of trees change colour	Between Groups	1,19	3	0,398	1,161	0,326
	Within Groups	79,82	233	0,343		
	Total	81,01	236			
Trees influence the social safety	Between Groups	1,42	3	0,473	0,622	0,602
	Within Groups	165,75	218	0,760		
	Total	167,17	221			
Trees provide a habitat for animals	Between Groups	0,73	3	0,244	0,499	0,684
	Within Groups	113,78	233	0,488		
	Total	114,51	236			
Trees take up space on sidewalks	Between Groups	1,27	3	0,424	0,810	0,490
	Within Groups	106,25	203	0,523		
	Total	107,52	206			
Trees influence the traffic safety	Between Groups	1,45	3	0,483	1,174	0,321
	Within Groups	81,53	198	0,412		
	Total	82,98	201			
Branches fall from trees	Between Groups	0,62	3	0,205	0,453	0,715
	Within Groups	101,84	225	0,453		
	Total	102,45	228			
Trees increase the house price	Between Groups	4,02	3	1,339	1,652	0,179
	Within Groups	167,82	207	0,811		
	Total	171,84	210			
Trees take up parking space	Between Groups	4,33	3	1,445	1,957	0,121
	Within Groups	155,00	210	0,738		
	Total	159,33	213			

Trees Pressure of roots on pavement	Between Groups	0,57	3	0,190	0,403	0,751
	Within Groups	108,58	230	0,472		
	Total	109,15	233			
Trees drop organic products	Between Groups	1,41	3	0,469	0,438	0,726
	Within Groups	241,98	226	1,071		
	Total	243,39	229			
Trees release pollen	Between Groups	0,59	3	0,196	0,388	0,762
	Within Groups	99,83	198	0,504		
	Total	100,42	201			
Trees drip sticky juice	Between Groups	1,42	3	0,473	0,711	0,546
	Within Groups	142,92	215	0,665		
	Total	144,34	218			
Trees influence the water management	Between Groups	2,86	3	0,953	1,933	0,125
	Within Groups	110,41	224	0,493		
	Total	113,26	227			
Trees capture fine dust	Between Groups	0,42	3	0,142	0,484	0,694
	Within Groups	66,12	226	0,293		
	Total	66,54	229			
Trees lose leaves	Between Groups	1,66	3	0,552	0,627	0,598
	Within Groups	205,14	233	0,880		
	Total	206,79	236			
Trees make sound	Between Groups	0,64	3	0,213	0,544	0,653
	Within Groups	88,01	225	0,391		
	Total	88,65	228			
Trees block the wind	Between Groups	0,59	3	0,197	0,395	0,756
	Within Groups	106,77	214	0,499		
	Total	107,36	217			

Table A4.18. ANOVA-test difference between and within the place of growing up groups – Best-worst scores

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Trees provide organic shade	City (centre)	36	0,044	0,471	0,079	-0,115	0,204	-1,00	0,80
	City (suburb)	83	0,157	0,402	0,044	0,069	0,245	-1,00	1,00
	Town	94	0,145	0,430	0,044	0,057	0,233	-0,80	1,00
	Rural	25	0,128	0,479	0,096	-0,070	0,326	-0,80	0,80
Trees influence biodiversity	Total	238	0,132	0,432	0,028	0,077	0,187	-1,00	1,00
	City (centre)	36	0,083	0,502	0,084	-0,087	0,253	-0,80	1,00
	City (suburb)	83	0,161	0,422	0,046	0,069	0,254	-0,80	1,00
	Town	94	0,104	0,446	0,046	0,013	0,196	-1,00	1,00
Trees influence the appearances	Rural	25	0,136	0,442	0,088	-0,047	0,319	-0,60	0,80
	Total	238	0,124	0,445	0,029	0,068	0,181	-1,00	1,00
	City (centre)	36	0,083	0,423	0,071	-0,060	0,227	-0,80	1,00
	City (suburb)	83	0,036	0,410	0,045	-0,053	0,126	-1,00	0,80
Trees bring nature closer	Town	94	0,057	0,438	0,045	-0,032	0,147	-1,00	1,00
	Rural	25	0,152	0,474	0,095	-0,043	0,347	-1,00	1,00
	Total	238	0,064	0,428	0,028	0,009	0,119	-1,00	1,00
	City (centre)	36	0,011	0,485	0,081	-0,153	0,175	-0,80	1,00
The leaves of trees change colour	City (suburb)	83	0,101	0,409	0,045	0,012	0,190	-0,80	1,00
	Town	94	0,036	0,398	0,041	-0,045	0,118	-0,80	1,00
	Rural	25	0,104	0,425	0,085	-0,071	0,279	-0,60	1,00
	Total	238	0,062	0,418	0,027	0,009	0,116	-0,80	1,00
Trees influence the social safety	City (centre)	36	0,078	0,374	0,062	-0,049	0,204	-1,00	0,60
	City (suburb)	83	0,099	0,331	0,036	0,026	0,171	-0,80	1,00
	Town	94	0,030	0,352	0,036	-0,042	0,102	-0,60	0,80
	Rural	25	-0,040	0,252	0,050	-0,144	0,064	-0,60	0,40
Trees provide a habitat for animals	Total	238	0,054	0,340	0,022	0,010	0,097	-1,00	1,00
	City (centre)	36	0,022	0,419	0,070	-0,120	0,164	-0,60	0,80
	City (suburb)	83	0,019	0,401	0,044	-0,068	0,107	-1,00	0,80
	Town	94	0,068	0,382	0,039	-0,010	0,146	-1,00	1,00
Trees take up space on sidewalks	Rural	25	0,016	0,412	0,082	-0,154	0,186	-0,80	0,80
	Total	238	0,039	0,396	0,026	-0,012	0,089	-1,00	1,00
	City (centre)	36	0,011	0,298	0,050	-0,090	0,112	-0,60	0,80

	City (suburb)	83	0,024	0,308	0,034	-0,043	0,091	-0,80	0,60
Trees influence the traffic safety	Town	94	0,015	0,292	0,030	-0,045	0,075	-0,60	0,60
	Rural	25	0,080	0,327	0,065	-0,055	0,215	-0,80	0,60
	Total	238	0,024	0,301	0,020	-0,014	0,063	-0,80	0,80
	City (centre)	36	0,044	0,314	0,052	-0,062	0,151	-0,80	0,60
Branches fall from trees	City (suburb)	83	0,039	0,341	0,037	-0,036	0,113	-0,60	0,80
	Town	94	0,026	0,316	0,033	-0,039	0,090	-0,80	0,80
	Rural	25	-0,080	0,289	0,058	-0,199	0,039	-0,80	0,40
	Total	238	0,022	0,322	0,021	-0,019	0,063	-0,80	0,80
Trees increase the house price	City (centre)	36	0,094	0,413	0,069	-0,045	0,234	-0,80	0,80
	City (suburb)	83	0,039	0,397	0,044	-0,048	0,125	-0,80	1,00
	Town	94	-0,047	0,386	0,040	-0,126	0,032	-1,00	0,80
	Rural	25	0,000	0,465	0,093	-0,192	0,192	-0,60	1,00
Trees take up parking space	Total	238	0,009	0,403	0,026	-0,042	0,061	-1,00	1,00
	City (centre)	36	0,044	0,325	0,054	-0,065	0,154	-0,60	0,80
	City (suburb)	83	-0,039	0,334	0,037	-0,112	0,034	-0,80	1,00
	Town	94	0,009	0,325	0,034	-0,058	0,075	-0,80	0,80
Trees Pressure of roots on pavement	Rural	25	0,016	0,331	0,066	-0,121	0,153	-0,60	0,80
	Total	238	-0,002	0,328	0,021	-0,044	0,040	-0,80	1,00
	City (centre)	36	0,017	0,339	0,057	-0,098	0,131	-0,80	0,60
	City (suburb)	83	-0,017	0,388	0,043	-0,102	0,068	-1,00	0,60
Trees drop organic products	Town	94	-0,021	0,377	0,039	-0,099	0,056	-0,80	0,80
	Rural	25	0,080	0,400	0,080	-0,085	0,245	-0,60	0,80
	Total	238	-0,003	0,377	0,024	-0,051	0,045	-1,00	0,80
	City (centre)	36	-0,028	0,414	0,069	-0,168	0,112	-1,00	0,60
Trees release pollen	City (suburb)	83	-0,007	0,366	0,040	-0,087	0,073	-0,80	0,80
	Town	94	0,009	0,371	0,038	-0,067	0,084	-0,80	0,80
	Rural	25	-0,064	0,435	0,087	-0,243	0,115	-0,80	0,60
	Total	238	-0,010	0,381	0,025	-0,059	0,039	-1,00	0,80
Trees drip sticky juice	City (centre)	36	0,000	0,310	0,052	-0,105	0,105	-0,60	0,60
	City (suburb)	83	-0,019	0,282	0,031	-0,081	0,042	-0,60	0,80
	Town	94	-0,015	0,279	0,029	-0,072	0,042	-0,80	0,60
	Rural	25	0,016	0,341	0,068	-0,125	0,157	-0,60	0,60
Trees influence the water management	Total	238	-0,011	0,290	0,019	-0,048	0,026	-0,80	0,80
	City (centre)	36	-0,011	0,364	0,061	-0,134	0,112	-0,80	0,60
	City (suburb)	83	-0,017	0,326	0,036	-0,088	0,054	-0,80	0,80
	Town	94	-0,023	0,325	0,034	-0,090	0,043	-0,80	0,80
Trees capture fine dust	Rural	25	0,032	0,335	0,067	-0,106	0,170	-0,60	0,80
	Total	238	-0,013	0,331	0,021	-0,056	0,029	-0,80	0,80
	City (centre)	36	-0,044	0,271	0,045	-0,136	0,047	-0,60	0,60
	City (suburb)	83	-0,041	0,306	0,034	-0,108	0,026	-0,80	0,80
Trees lose leaves	Town	94	-0,009	0,376	0,039	-0,085	0,068	-1,00	1,00
	Rural	25	-0,040	0,332	0,066	-0,177	0,097	-0,60	0,80
	Total	238	-0,029	0,332	0,021	-0,071	0,014	-1,00	1,00
	City (centre)	36	-0,139	0,347	0,058	-0,256	-0,021	-0,80	0,40
Trees make sound	City (suburb)	83	-0,077	0,437	0,048	-0,173	0,018	-1,00	0,80
	Town	94	0,028	0,432	0,045	-0,061	0,116	-0,80	1,00
	Rural	25	-0,064	0,454	0,091	-0,251	0,123	-1,00	0,80
	Total	238	-0,044	0,426	0,028	-0,098	0,011	-1,00	1,00
Trees block the wind	City (centre)	36	-0,033	0,356	0,059	-0,154	0,087	-0,60	0,80
	City (suburb)	83	-0,031	0,346	0,038	-0,107	0,044	-0,80	0,80
	Town	94	-0,051	0,363	0,037	-0,125	0,023	-0,80	0,80
	Rural	25	-0,128	0,351	0,070	-0,273	0,017	-0,80	0,60

		Sum of Squares	df	Mean Square	F	Sig.
Trees provide organic shade	Between Groups	0,342	3	0,114	0,609	0,610
	Within Groups	43,795	234	0,187		
	Total	44,137	237			
Trees influence biodiversity	Between Groups	0,216	3	0,072	0,361	0,781
	Within Groups	46,663	234	0,199		
	Total	46,879	237			
Trees influence the appearances	Between Groups	0,275	3	0,092	0,497	0,685
	Within Groups	43,234	234	0,185		
	Total	43,509	237			
Trees bring nature closer	Between Groups	0,328	3	0,109	0,623	0,601
	Within Groups	40,992	234	0,175		
	Total	41,320	237			

The leaves of trees change colour	Between Groups	0,463	3	0,154	1,341	0,262
	Within Groups	26,929	234	0,115		
	Total	27,392	237			
Trees influence the social safety	Between Groups	0,135	3	0,045	0,285	0,836
	Within Groups	36,949	234	0,158		
	Total	37,084	237			
Trees provide a habitat for animals	Between Groups	0,092	3	0,031	0,336	0,800
	Within Groups	21,407	234	0,091		
	Total	21,499	237			
Trees take up space on sidewalks	Between Groups	0,302	3	0,101	0,970	0,408
	Within Groups	24,304	234	0,104		
	Total	24,606	237			
Trees influence the traffic safety	Between Groups	0,630	3	0,210	1,295	0,277
	Within Groups	37,950	234	0,162		
	Total	38,580	237			
Branches fall from trees	Between Groups	0,207	3	0,069	0,638	0,591
	Within Groups	25,312	234	0,108		
	Total	25,519	237			
Trees increase the house price	Between Groups	0,233	3	0,078	0,545	0,652
	Within Groups	33,444	234	0,143		
	Total	33,677	237			
Trees take up parking space	Between Groups	0,117	3	0,039	0,266	0,850
	Within Groups	34,339	234	0,147		
	Total	34,456	237			
Trees Pressure of roots on pavement	Between Groups	0,030	3	0,010	0,116	0,950
	Within Groups	19,902	234	0,085		
	Total	19,932	237			
Trees drop organic products	Between Groups	0,062	3	0,021	0,187	0,905
	Within Groups	25,895	234	0,111		
	Total	25,957	237			
Trees release pollen	Between Groups	0,063	3	0,021	0,189	0,904
	Within Groups	25,983	234	0,111		
	Total	26,046	237			
Trees drip sticky juice	Between Groups	0,908	3	0,303	1,680	0,172
	Within Groups	42,158	234	0,180		
	Total	43,066	237			
Trees influence the water management	Between Groups	0,191	3	0,064	0,507	0,678
	Within Groups	29,424	234	0,126		
	Total	29,615	237			
Trees capture fine dust	Between Groups	0,214	3	0,071	0,357	0,784
	Within Groups	46,801	234	0,200		
	Total	47,015	237			
Trees lose leaves	Between Groups	0,228	3	0,076	0,408	0,748
	Within Groups	43,606	234	0,186		
	Total	43,834	237			
Trees make sound	Between Groups	0,438	3	0,146	0,627	0,598
	Within Groups	54,544	234	0,233		
	Total	54,982	237			
Trees block the wind	Between Groups	0,556	3	0,185	1,162	0,325
	Within Groups	37,317	234	0,159		
	Total	37,873	237			