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MASTERARBEIT

Titel der Masterarbeit

Attitude-Behavior Gap of Biology Students in Vienna Regarding Energy Behavior in the Household

Verfasserin

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With thanks to Ao. Univ.-Prof. Dr. Harald Wilfing, Ao. Univ.-Prof. Mag. Dr. Harald Krenn and my parents

Table of Contents

1. Introduction

1.1. Relevance of the Thesis

In the course of my Master's thesis, I would like to explore the attitude-behavior gap of Biology students regarding energy issues within the household (excluding the transportation sector). The purpose of the thesis is to determine whether there is such a thing as an attitude-behavior (value-action) gap within the student population, and what factors contribute to the discrepancy should there be one. In addition to the effect attitude has on behavior, other internal factors as well as external and demographic factors will be explored in their relation to energy behavior within the household. This is relevant as achieving progress toward the country's environmental goals, in this case mitigating climate change, is dependent on the adoption of pro-environmental behaviors (Barker, 1968; Blake, 2001; Hartig et al., 2001; Korfiatis et al., 2004 as noted in Brody et al., 2012). Pro-environmental behaviors are defined by Barker as

> "[…] any action that directly or indirectly contributes to environmental conservation and sustainability." (Barker, 1968, p. 3).

1.2. Climate Change: A super wicked problem

The emission of greenhouse gases into the atmosphere is a contributing factor to the problematic phenomenon referred to as climate change (IPCC, 2001). Climate change has often been described as a 'super wicked' problem, characterized by a pressing need to act swiftly, combined with a central authority failing to address or recognize the issue to the extent which is required (Levin, 2007). Seeing as super wicked problems are multi-causal, possess various interdependencies, are constantly evolving and having no clear solutions, they demand holistic thinking, flexible and innovative approaches from various different areas of expertise as well as stakeholders and a wide range of collaboration, communication and big picture thinking. Problems like these present a daunting challenge when attempting to formulate policy guidelines, as the overwhelming social complexity and the lack of clear right or wrong responses often result in unforeseen consequences and unpredictable emergent behavior of the system when addressed (Levin, 2012).

1.3. The Rise of Energy Consumption in Austria

In Austria, an increase of 39% of gross energy consumption can be documented since 1990, reaching a number of 1.458 PJ in the year 2010. Contributing factors to this great increase arise through the rising energy demand of the sectors transportation (+76%), the producing sector (+47%), private households (+18%) as well as public and private services (+66%). Around 71% of Austrian energy demand is met with fossil fuels, made up of 38% petroleum and petroleum products , 24% gas, and 10% coal. Renewable energies contribute to around 26% of the energy mix. Combustible waste makes up around 2%, leaving less than 1% to electricity imports (Umweltbundesamt a, 2013). According to the Institute of Technology Assessment in Vienna, 52% of private household energy demand is used on heating systems, followed by cars with 31%. Warm water, electric appliances and lighting collectively account for 17% of energy demand in Austrian households (Riedlinger, 2013).

1.4. Energy Interventions in Austria

The Umweltbundesamt -Environment Agency Austria- has ambitious goals for the year 2020, based on the 2 °C objective (Umweltbundesamt b, 2013). The 2 °C objective was part of the Copenhagen Accord of 2009, which does not represent a legally binding treaty, but underlined climate change as “one of the greatest challenges of our time” (Copenhagen Accord, 2009, p. 5), and recognized “the scientific view that the increase in global temperature should be below 2 degrees Celsius, on the basis of equity and in the context of sustainable development” (Copenhagen Accord, 2009, p. 5). In order to achieve this 2 °C objective, industrialized countries are to reduce emissions by 25-40% by 2020 and by 80-95% by 2050 relative to 1990. According to EU legislation, by the year 2020 Austria is to reduce greenhouse gas emissions by 16% in sectors outside of the EU-emissions trade, on the basis of 2005 (Umweltbundesamt b, 2013). Among the most important measures taken so far to achieve the 2020 goals are the legislative steps taken toward the implementation of smart meters, electrical meters recording electric energy consumption with feedback to a central system (EnergieStrategie, n.d.). The main purposes of introducing the smart metering systems in Austria as presented by the Austrian Energy Regulatory Authority, is improved information for customers with the hopes of improving energy efficiency, improved cost efficiency of metering and billing as well as efficient data exchange and market processes in the liberalized electricity market. In April of 2012, a decree was issued by the Minister of Economy which determined the rollout of smart metering services. The main rollout can be expected in the

years 2016 and 2017, with 95% of all metering points being equipped by the end of 2019 (ESMLR, 2012).

The Institute of Technology Assessment in Vienna tested the effect of smart meters on 250 Austrian households in Styria and Carinthia, in the course of a project called €CO2 Management, launched in August 2009. A new software was developed to enable visualization of energy demand on an iPod or a Tablet, and the households received consultation on energy demand in order to raise awareness and knowledge of the participants. Smart meters and eco-sockets were installed in the homes and three different electricity rates were offered depending on the time of day. The project results show that these measures achieved an average of 5% savings in energy demand, but changes in living arrangements and circumstances sometimes caused a rise in energy demand in some households during the span of the project (Riedlinger, 2013).

1.5. The Role of Households

The IPCC report on mitigation of climate change from 2007 lists “Changes in lifestyle and behavior patterns” as point seven under the section “Mitigation in the short and medium term (until 2030)” on page 12. According to this paragraph, lifestyle changes, as well as changes in consumption patterns, can lead to the reduction of greenhouse gases being emitted into the atmosphere. This includes the acceptance of energy efficient technologies (IPCC, 2007). Around 20% of global energy consumption can be traced to the residential sector (Brounen et al., 2013). Households are therefore considered an important target for policy agenda concerning energy issues, as mitigation of climate change cannot rely solely on technical advances, but must be accompanied by commitment from the consumers (Valkila and Saari, 2013).

2. Current Research

2.1. The Value-Action Gap

The value-action gap, also known as attitude-action gap, attitude-behavior gap and environmental values-behavior (EVB) gap, describes the discrepancy between awareness or concern about environmental issues, and pro-environmental action (Blake, 1999). In the past four decades, the value-action gap has been widely debated and explored in the fields of environmental and social psychology (Kollmuss and Agyeman, 2002; Blake, 1999). In more recent years, studies in the fields of environmental geography and human ecology have emerged exploring the phenomenon of the value-action gap, such as Lane and Potter (2007) and Kennedy et al. (2009) respectively. Seeing as direct and indirect environmental action has been a subject of interest for over forty years, there have been several different theoretical frameworks attempting to explain the value-action gap, summarized by Kollmuss and Agyeman (2002) as follows:

1. *Early US linear progression models*
2. *Altruism, empathy and prosocial behavior models*
3. *Sociological models*

2.1.1. Early US linear progression models

The early US linear progression models represent one of the oldest models for pro-environmental behavior from the early 1970s. The model is quite simple, showing a correlation between knowledge about environmental issues and pro-environmental behavior, bridged by environmental awareness and concern (attitudes). The relationship is portrayed as being linear, leading to the conclusion that pro-environmental behavior can be attained by educating the public about environmental issues (Kollmuss and Agyeman, 2002).

Fig.1: *Early US linear progression model for pro-environmental behavior (Kollmuss and Agyeman, 2002)*

In other words, the lack of pro-environmental behavior is caused by a lack of knowledge, or an "information deficit" as Blake (1999) would call it. Despite this model having been proven wrong time and time again, many environmental NGOs as well as policy-makers still today campaign on the expectation, that an increase in knowledge will lead people to exercise the desired behavior (Kollmuss and Agyeman, 2002). The reason that this approach continues to be applied by policy makers can be explained by the fact that it offers an easy and straightforward fix in a top-down manner. If the problem is an information deficit, the solution is to provide accessible information to the people and the problem will resolve itself. There are however several barriers between environmental concern and pro-environmental behavior, some of which may be structural and extremely resistant to change and therefore difficult to tackle (Blake, 1999). Many attempts have been made to explain the factors responsible for the discrepancy between environmental attitude and pro-environmental behavior (Kollmuss and Agyeman, 2002). Kollmuss and Agyeman (2002) refer to the attempts by Rajecki (1982) in the early 80s. Four different causes were determined, namely *direct vs. indirect experience* (direct experience having a larger impact on behavior than indirect experience), *normative influences* (made up of social norms, cultural traditions, family customs etc.), *temporal discrepancies* (failure of the research methodology, when there is much time between the assessment of attitude data and action data, as attitudes of people are subject to change) and *attitude-behavior measurements* (failure of the research methodology, when the attitudes are measured in much broader terms than the actions) (Rajecki, 1982 as quoted in Kollmuss and Agyeman, 2002). Schwartz et al. (2013) observed the Hawthorne effect in a large field experiment concerning the electricity use of residential consumers, whereby the Hawthorne effect describes the altered behavior of individuals participating in experiments, caused by the feeling of being observed.

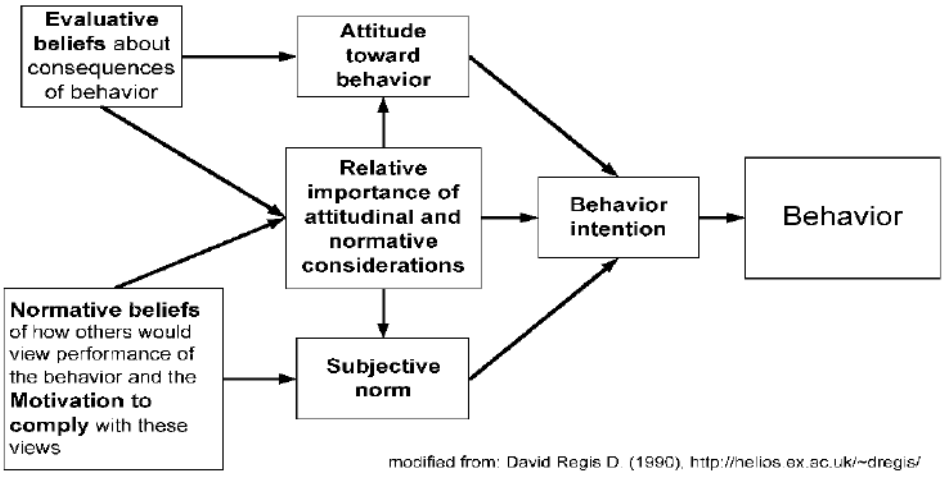

Fig.2: *Theory of reasoned action (Ajzen & Fishbein, 1980 as seen in Kollmuss and Agyeman, 2002)*

The next model Kollmuss and Agyeman present is the *theory of reasoned action* from Ajzen and Fishbein (1980), in which it is behavioral intentions which influence actions, and not attitudes. This model allowed for empirical studies through the use of a mathematical equation, making it very popular among social psychologists. As the name suggests, the base assumption is that people act on rational thoughts and decisions (Kollmuss and Agyeman, 2002). The last early US linear model described by Kollmuss and Agyeman is the *Model of Responsible Environmental Behavior* from Hines, Hungerford and Tomera (1986/87), developed in the mid to late 80s. According to this model, there are six variables correlated to pro-environmental behavior. These are *knowledge of issues*, *knowledge of action strategies*, *locus of control* (individual perception of being able to bring about change through own behavior), *attitudes*, *verbal commitment* and *individual sense of responsibility* (Kollmuss and Agyeman, 2002; Hines et. al., 1986/87).

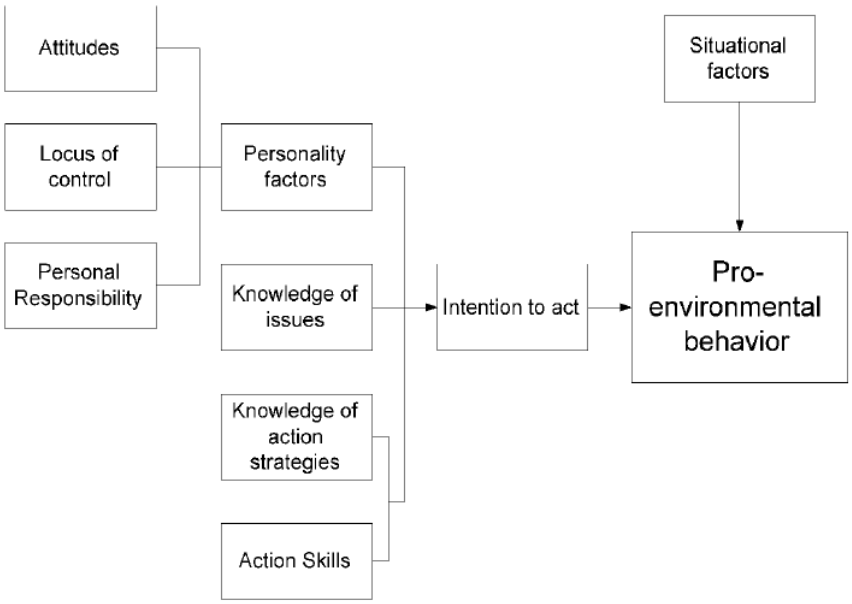

Fig.3: *Model of responsible environmental behavior (Hines et al., 1986 as seen in Kollmuss and Agyeman, 2002)*

In 2007 a paper was published by Bamberg and Möser, which replicated and expanded on the results from Hines et. al. (19867/87). According to them, pro-environmental behavior can be defined as

> "a mixture of self-interest (e.g., to pursue a strategy that minimizes one's own health risk) and of concern for other people, the next generation, other species, or whole ecosystems (e.g., preventing air pollution that may cause risks for others' health and/or the global climate.)" (Bamberg and Möser, 2007, p. 15).

They go on to describe models like the norm-activation model from Schwartz (1977) as assuming pro-environmental behavior is primarily pro-socially motivated, and rational choice models such as the theory of reasoned action by Ajzen and Fishbein (1980) as assuming it is primarily motivated by self-interest. In their analysis they managed to determine, that there have been many studies conducted in the past decade focusing on problem awareness/knowledge, attitude, perceived personal control, social norm, moral norm and intention in regards to pro-environmental behavior, but very few studies examining feelings such as shame, guilt or internal attribution despite these being relevant factors (Bamberg and Möser, 2007).

2.1.2. Altruism, Empathy and Prosocial Behavior Models

Lehmann (1999) notes Borden and Francis (1978) to have hypothesized that people are more likely to act in an ecological manner if they have satisfied their personal needs, due to having the resources to care about environmental issues (Kollmuss and Agyeman, 2002). There are however, they mention, several studies showing the difficulties of drawing the conclusion that less affluence goes hand-in-hand with less environmental concern, as one must differentiate between ranking pressing problems and rating the severity of problems. While individuals of less affluent countries tend to deem environmental issues not as pressing as other issues, the rating of how severe environmental problems are is independent of the affluence of a country. It is therefore not quite valid to conclude that environmental issues ranking low on a list of priorities is due to a lack of environmental concern (Diekmann and Franzen, 1999 as noted in Kollmuss and Agyeman, 2002). According to Kollmuss and Agyeman (2002), the altruism theory of Schwartz (1977) suggests that altruistic behavior is caused by the activation of a moral norm, such as an individual gaining awareness of the negative impacts their behavior have on others which in turn can cause a change in behavior if they feel personally responsible. Allen and Ferrand (1999) describe Heberlein (1972) to have claimed that Schwartz's moral norm activation model can also be applied to explain as well as predict pro-environmental behavior, as individuals can adopt pro-environmental behavior if they become aware of the negative consequences of their actions and experience a feeling of responsibility. Stern et al. (1993) are noted by Kollmuss and Agyeman (2002) to have drawn a similar conclusion, creating a model which operates under the assumption, that the awareness of other people's suffering and the feeling of responsibility of alleviating this suffering result in altruistic behavior. Their model states that each individual has three orientations which they

refer to as ‘egoistic orientation’, ‘social orientation’ and ‘biospheric orientation’. They are described as follows:

> “The social orientation is concerned with the removal of suffering and harm from oneself, and the biospheric orientation is concerned with the removal of destruction and suffering in the non-human world. Every person has all three orientations but in different strengths” (Kollmuss and Agyeman, 2002, p. 245).

Kollmuss and Agyeman (2002) note Stern et al. (1993) to have described environmental concern as resulting from a combination of all three orientations:

$$Motivation = V\,(egoistic\ orientation) + V\,(social\ orientation) + V\,(biospheric\ orientation)$$

(Kollmuss and Agyeman, 2002, p. 245).

Allen and Ferrand (1999) also make the assumption that altruism is a necessity, or at the very least a supporting factor, for pro-environmental behavior. They tested the ‘actively caring’ hypothesis of Geller (1995), which similar to altruism theory of Schwartz (1977), claims pro-environmental behaviors are motivated by a form of altruism Geller referred to as ‘actively caring’. In order to ‘actively care’, individuals must be concerned for the well-being of not just themselves, but the community as a whole (Kollmuss and Agyeman, 2002; Allen and Ferrand, 1999). According to Geller there are five factors which must be satisfied in order to stimulate active caring, which in turn stimulates environmental concern. These factors are self-esteem, belonging, personal control, self-efficacy and optimism. When these ‘self-needs’ are satisfied, an individual is more likely to show altruistic behavior (Geller, 1995, as seen in Allen and Ferrand, 1999). Geller, Roberts and Gilmore were further able to show, that self-esteem, group-cohesiveness, optimism and personal control contribute to the likelihood of an individual intervening in order to protect a coworker’s safety in industrial settings, supporting the assumption that these variables stimulate active caring, which in turn stimulate direct interventions, which could be applied to environmental issues (Geller et al., 1996; Allen and Ferrand, 1999).

2.1.3. Sociological models

Kollmuss and Agyeman present Fietkau and Kessel (1981) as well as Blake (1999) as representatives for sociological models explaining pro-environmental behavior. Fietkau and Kessel's model lists five variables which directly or indirectly influence pro-environmental behavior. These variables are as follows:

1. Attitudes and values
2. Possibilities to act ecologically (external infrastructural and economic factors)
3. Behavioral incentives (internal factors such as social desirability, quality of life, monetary savings)
4. Perceived feedback about ecological behavior (intrinsic as well as extrinsic)
5. Knowledge (indirect influence of pro-environmental behavior as a modifier of attitudes and values)

(Kollmuss and Agyeman, 2002, p. 246)

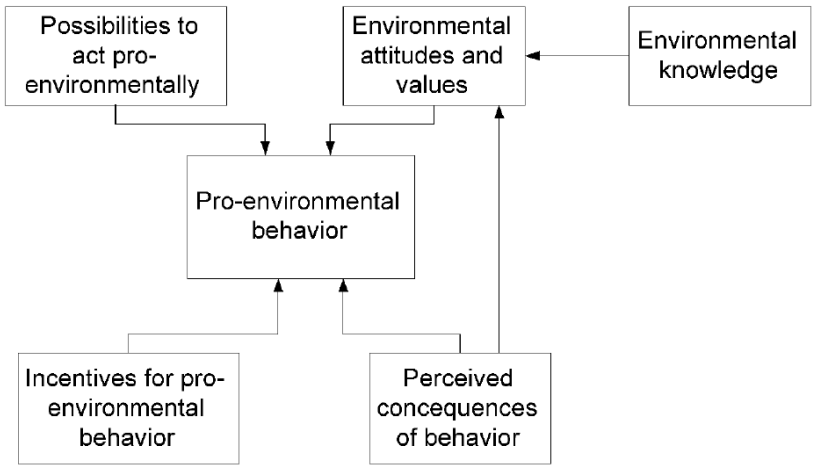

Fig.4: *Model of ecological behavior (Fietkau and Kessel, 1981 as seen in Kollmuss and Agyeman, 2002)*

Blake identified three main categories of responsible factors based on the self-evaluation of individuals. The first category is *Individuality* which summarizes individual attitudes. Attitudes which would counteract pro-environmental behavior are for example laziness, a lack of interest or the feeling of being the wrong person for the task. The second category is *Responsibility*, summarizing social and external factors. These include the feeling of not being responsible for environmental problems, and shifting the responsibility to other people or areas, the feeling of own actions lacking efficacy, lack of trust toward political bodies, the opinion that there is no need for action or the absence of own property can all contribute to

working as a barrier to pro-environmental action. The third category is *Practicality*, which summarizes all practical social or institutional constraints, such as lack of time, money, information, encouragement or facilities as well as storage difficulties or being physically unable (Blake, 1999; Kollmuss and Agyeman, 2002).

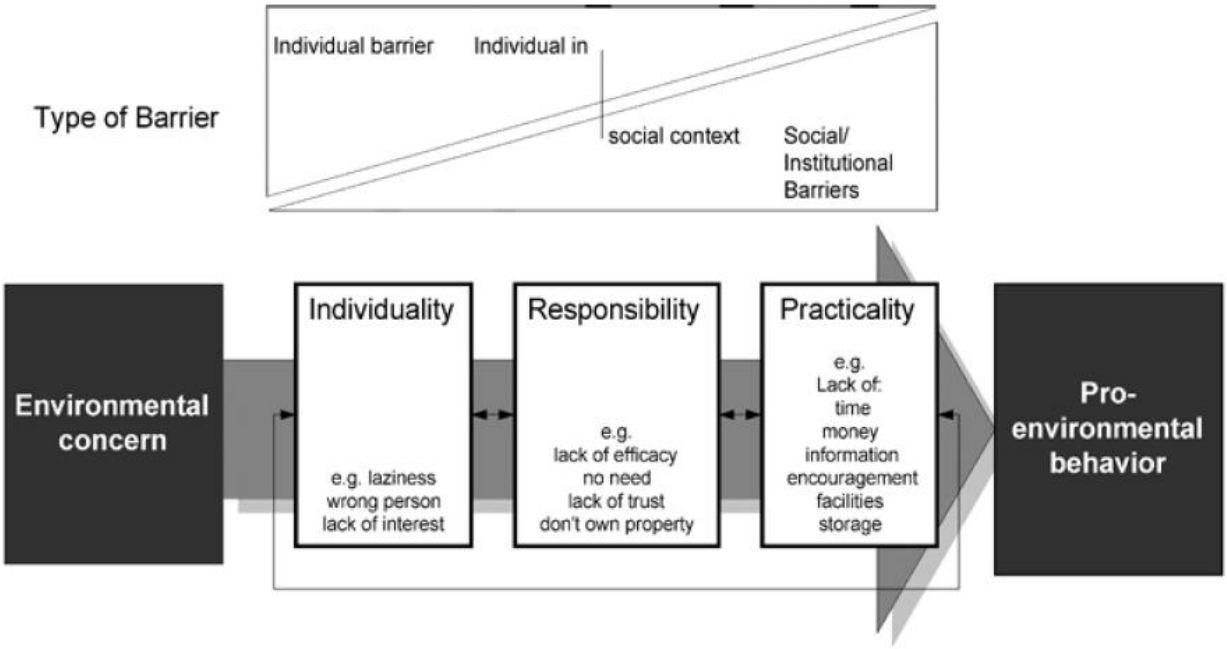

Fig.5: *Barriers between environmental concern and action (Blake, 1999 as seen in Kollmuss and Agyeman, 2002)*

2.2. Factors affecting pro-environmental and energy-saving behavior in context of this study:

Kollmuss and Agyeman (2002) determine that pro-environmental behavior is shaped by a very complex interplay of factors, which makes it impossible to visualize in a single framework or diagram. They distinguish between demographic factors, external factors and internal factors. I have taken the liberty of adopting their framework and complementing it with various results from research dedicated to the focus of this Master's thesis, namely energy-saving behavior in residential areas as a subcategory of pro-environmental behavior.

2.2.1. Demographic factors:

Gender and years of education seem to influence environmental attitudes as well as pro-environmental behavior. While men have shown more environmental knowledge, women have displayed more environmental concern and willingness to change behavior (Lehmann, 1999; Fliegenschnee and Schelakovsky, 1998 as both mentioned in Kollmuss and Agyeman, 2002). When comparing work patterns and gender roles between Norway and Japan, Wilhite et al. (1996) could determine that 80% of their sample of men in Oslo participated in household chores, while none of the men in Fukuoka households were involved with household chores. This division of work was believed to have an impact on knowledge, awareness and division of responsibility about energy issues in the home, with the results showing that Japanese women are much more knowledgeable about energy use than men. Lutzenhiser (1993) also notes gender differences within households, presenting the reports of Claxton, Ritchie and McDougall (1983) which claim that men are less willing to accept regulations in domains of traditional male competence, while women are more serious about energy conservation. Lutzenhiser (1993) also presents results from Wilhite and Wilk (1987), stating that there are distinct male and female spheres of energy-related activity to be observed in households which claim to have an equal division of labor. Klausner (1979) examined energy consumption in matrifocal households in urban New Jersey supported by welfare or the mother's earnings in relation to social order, and found energy consumption increases with size of the kinship network, social complexity and social activity as well as "disorder" within the household. The personality of the head of the household affects social intensity, in particular traits of aspiration and aggression. Interestingly, in Klausner's sample the presence of a man within the household resulted in less energy consumption, and it was concluded that within a society which is overwhelmingly patriarchal, the introduction of a male within the household will likely lead to a more ordered household, and therefore a decrease in energy demand. Lutzenhiser (1993) points out, that the results of Klausner could not be replicated by DeFronzo and Warkov (1979) when tested on higher income groups in Texas and compensating for other variables outside of gender. According to Brounen et al. (2013), men seem to have higher awareness of energy consumption, which is attributed to men having much higher financial literacy as documented by Lusardi and Mitchell (2008).

Yue et al. (2013) as well as Brounen et al. (2013) further show a high impact of socio-demographic factors such as age, income, household structure and educational background on energy behavior.

In order to evaluate the highest formal education of the participants in context of this study, the following terms of the Austrian education system must be introduced:

Pflichtschule: The term to describe compulsory school in Austria. Compulsory education usually spans from six to fifteen years of age.
Lehre: This term is used in the dual education system, also referred to as a "Berufsschule". The purpose of the dual education system is to combine the theoretical vocational education with practical apprenticeships.
Fachschule: The "Fachschule" is part of the "Berufsbildende mittlere Schule" and takes between one and four years to complete, depending on the specialization of the school. Vocational education is deemed complete when graduating from a school with a span of at least three years. This can then be seen as equivalent to a "Lehre".
Höhere Schule: Upon completion of a "Höhere Schule", one earns the right to study at a university.
Universität/Hochschule: These terms refer to a university or college which grants academic degrees.

2.2.2. External factors:

These factors refer to *institutional factors*, *economic factors*, and *social and cultural factors*.

Institutional factors: These include recycling facilities or an infrastructure allowing for public transport for example. In order to engage in pro-environmental and energy-saving behaviors the consumer must have the choice between different alternatives and an available infrastructure to act in (Kollmuss and Agyeman, 2002; Steg, 2008).

Economic factors: These factors appear to play an important role in influencing decisions, such as whether to invest in a more expensive but more energy-efficient appliance or not. They are however as of yet poorly understood, as people do not always make rational decisions (Kollmuss and Agyeman, 2002). Yamamoto et al. (2008) claim, that decision-making about electrical appliance use and consumption is determined by the characteristics of the particular electrical appliances, rather than price, this being due to the fact that there is low awareness of energy efficiency of appliances as well as a lack of knowledge about the costs of services and electricity rates. The results of Baird and Brier (1981) would support the

observation that there seems to be a very low awareness of energy efficiency of appliances with their study on the perceptual awareness of energy requirements of familiar objects within the home. Their study shows that people tend to perceive large objects as requiring much energy, and small objects as requiring little energy, despite this not necessarily being the case. Similar to the results of Yamamoto et al. (2008) in Japan, Brounen et al. (2013) documented low energy literacy among the residents of The Netherlands with only 56% of the respondents showing awareness of their monthly charges for energy consumption and only 40% being able to appropriately evaluate investment decisions concerning energy efficient equipment. It can be found that the effects of monetary rewards used as incentives to promote energy-saving behaviors in combination with feedback mechanisms such as smart meters are effective (Winett et al., 1978 as seen in Abrahamse et al., 2005). It would appear however, that these effects dwindle in the long-run (McClelland and Cook, 1980; Slavin et al., 1981 as both mentioned in Abrahamse et al., 2005). Lindén et al. (2006) document economic measures as being a successful policy instrument in Sweden for change in energy behavior in combination with other measures such as increasing information and energy labeling of appliances.

Social and Cultural Factors: Concerning social and cultural factors, Kollmuss and Agyeman (2002) have hypothesized, that cultures in small yet highly populated countries are generally more resource conscientious than cultures in large, resource-rich countries. This would tie in well with the results of Valikla and Saari (2013), who have observed that situational factors have a strong influence on energy attitudes and concerns as well as the perception of own energy behavior. Individuals living in districts with a high density of people were more concerned about energy issues and more willing to improve their energy efficiency on a voluntary basis. An explanation they offer for this lies in institutional factors, such as the presence of a public transport system. Yue et al. (2013) also note that different areas differ in motivation to promote energy efficiency of appliances, energy awareness and behavioral knowledge, and hypothesize that this may be due to different income levels and quality-of-life requirements among other things. Other factors that may include heavier work pressures in some regions as well as limitations of communication about household energy conservation.

2.2.3. Internal factors:

These factors refer to *motivation, environmental knowledge, values, attitudes, environmental awareness, emotional involvement, locus of control* and *responsibility and priorities*.

Motivation: Concerning motivation, Kollmuss and Agyeman (2002) distinguish between primary and motives and selective motives according to Moisander (1998), hypothesizing that primary motives (altruistic, social and environmental values) are often neglected due to the emergence of more immediate selective motives revolving around personal needs (comfort, saving money and time). This view is shared by Ma et al. (2011), who state that it is not likely for younger people to sacrifice comfort levels in favor of saving energy. Lindén et al. (2006) point out, that many energy-efficient behaviors can be attributed to a "perceived lack of time" rather than concern about energy conservation. Steg (2008) claims similarly to Kollmuss and Agyeman (2002) that energy-saving measures which demand high investment in terms of money, effort or convenience are less likely to be adopted than those measures, which demand only low cost. In addition to this, it is more likely for energy-efficient appliances to be adopted when they align with needs, wants and preferences of the individual (Steg, 2008). Vringer et al. (2007) determined that the factor "motivation to save energy" did have a small impact on energy requirements, as the group of individuals with the least motivation had an additional energy use of 10 GJ in comparison to the average and most motivated groups. There are however no strong ties between the motivation to save energy and the energy consumption patterns of individuals (Vringer et al., 2007). It would appear that the idea of curtailment is more appealing to people than investing in efficiency improvements, despite experts seeing more potential in the latter (Attari et al., 2010; Yue et al., 2013). There are however also observations, that policies which stress the purchase of energy-efficient appliances are more acceptable than those aimed at curtailment behavior (Poortinga et al., 2003; Steg et al., 2006; as both are seen in Steg, 2008).

Environmental Knowledge/Energy Literacy: It is largely agreed in the scientific community, that most pro-environmental behavior cannot be directly linked to environmental knowledge or awareness, an example being Kempton et al. (1995), showing a sample of environmentalists and anti-environmentalists in the US with the same amount of environmental knowledge. Kollmuss and Agyeman (2002) caution that there are however different levels of knowledge, which might influence pro-environmental behavior in different

ways. According to Ma et al. (2011) there is high awareness among Chinese citizens regarding the energy challenges they face as well as the government incentive policies, but the level of their knowledge on the particulars of these challenges or policies is very general and not enough to give them a clear idea on how their actions can contribute positively. It is however not certain whether or not higher levels of knowledge would really lead to a significant increase in energy-saving behavior. Steg (2008) makes a similar observation, that awareness of household energy use in combination with energy problems is high, but that there is little knowledge regarding the causal processes and relation to their own behavior. This is related to the problems of perceptual awareness of energy requirements of familiar objects as mentioned under "Economic Factors" (Baird and Brier, 1981; Steg, 2008). Abrahamse et al. (2005) claim that by increasing information you can raise the level of knowledge, but this does not necessarily lead to a change in behavior and energy-savings. When frequently given, feedback systems providing the user with information on energy usage in the house do however show positive effects on energy savings, though it is uncertain whether these effects are long-term (Abrahamse et al., 2005; Ueno et al., 2006; Giacomin and Bertola, 2012; Vassileva et al., 2013).

Values: These play a large role in shaping intrinsic motivation, but what shapes values? One can distinguish between a "microsystem", an "exosystem" and a "macrosystem" of factors which impact values, whereby the "microsystem" consists of the immediate social net, the "exosystem" consists of the media as well as political organizations and the "macrosystem" refers to the cultural context of the individual (Fuhrer et al., 1995, as quoted in Kollmuss and Agyeman, 2002). Chawla (1998) took an interest in what motivates and drives individuals to become environmentalists, more specifically, what influences people's environmental sensitivity. Environmental sensitivity is defined as a "a predisposition to take an interest in learning about the environment, feeling concern for it, and acting to conserve it, on the basis of formative experiences" (Chawla, 1998 as quoted in Kollmuss and Agyeman, 2002). She determined the following factors to be of relevance in sensitizing people, and therefore contributing to at least indirect pro-environmental behavior: Experiences of natural areas as a child, experiences of environmental destruction, a family with pro-environmental values, the presence of pro-environmental organizations, the presence of role models in friends or teachers, and lastly education (Chawla, 1999; Kollmuss and Agyeman, 2002). Vringer et al. (2007) claim that households which differ in value patterns do not necessarily differ in energy requirements.

Attitudes: When observing attitudes, defined as the psychological tendency to evaluate people, objects, places, activities or ideas (among other things) as positive or negative (Eagly and Chaiken, 1998), it is often concluded that they do not contribute greatly to pro-environmental behavior (Kollmuss and Agyeman, 2002). One model of explanation is offered by Diekmann and Preisendoerfer (1992), explaining that people engage in pro-environmental behaviors when the costs (money, time, effort) are relatively low, as is the case in recycling for example. If the costs rise too high, pro-environmental behavior is abandoned (Diekmann and Preisendoerfer, 1992, as quoted in Kollmuss and Agyeman, 2002).

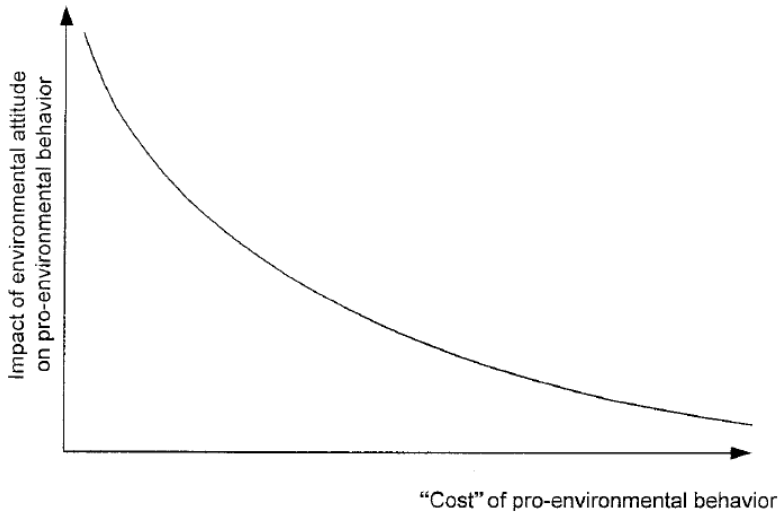

Fig.6: *Low-cost high-cost model of pro-environmental behavior (Diekmann and Preisendoerfer 1992 as seen in Kollmuss and Agyeman, 2002)*

Despite this, there seems to be a stronger willingness to accept policies meant to promote pro-environmental behavior at personal cost such as higher taxes (Diekmann and Franzen, 1996; Lehmann, 1999 as quoted in Kollmuss and Agyeman, 2002).

Kollmuss and Agyeman (2002) list several studies which show that individuals who believe technological advances will significantly contribute to solving today's environmental issues are less willing to make personal sacrifices in an effort to act pro-environmentally (Gigliotti, 1992, 1994; Grob, 1991, as quoted in Kollmuss and Agyeman, 2002). Viklund (2004) notes that people generally have a very positive attitude towards the environment and the concept of saving electricity, but that their energy-saving behavior is relatively weak. Attari et al. (2010) point out however, that individuals with stronger pro-environmental attitudes showed more accurate perceptions concerning energy consumption and savings.

Environmental Awareness: This is defined by Kollmuss and Agyeman (2002) as "knowing the impact of human behavior on the environment" (p. 253), limited by cognitive as well as emotional limitations. One of these cognitive limitations is the non-immediacy of ecological problems, caused by the fact that the effects of environmental degradation are often slow to appear in addition to becoming tangible only after severe damage has already been caused (Preuss, 1991 as quoted in Kollmuss and Agyeman, 2002). Additionally there is an emotional removal from the issue caused by the way scientific concepts are presented to the public. In the case of climate change, the issue is relatively abstract and uses mathematical models, which does not emotionally engage people as easily as issues concerning the protection of big mammals for example, which can easily be conveyed with provocative images. The fact that most environmental problems are highly complex forms another cognitive limitation, as it makes it difficult to predict outcomes of natural destruction and can lead to underestimating the impacts of our behavior (Preuss, 1991; Fliegenschnee and Schelakovsky, 1998 as quoted in Kollmuss and Agyeman, 2002). Tanaka and Ida (2013) show that electricity-saving awareness in households directly affected by electric power shortages caused by the Great East Japan Earthquake on March 11, 2011 is higher than of those households not impacted. Additionally, it is observed that the households in areas immediately affected also show a much higher potential voluntary reduction in electric power consumption than the unaffected households (Tanaka and Ida, 2013).

Emotional Involvement: This is defined by Kollmuss and Agyeman (2002) as the "extent to which we have an affective relationship to the natural world" (p. 254). Grob (1991), Kollmuss and Agyeman (2002) hypothesize that a person is more likely to engage in pro-environmental behavior if they have stronger emotional reactions to environmental degradation. The reasons why some people get more emotionally involved in some matters than others are however not fully understood. The lack of knowledge and awareness could be a contributing factor to emotional non-investment. As mentioned before, it is more difficult to invoke emotional reactions for issues with a high degree of abstraction (Kollmuss and Agyeman, 2002). One must also keep in mind, that simply providing knowledge on environmental issues does not necessarily result in emotional involvement, as there are phenomena such as the resistance against non-conforming information. People tend to selectively perceive information which is in line with their beliefs and mental frameworks, which often results in resistance against information regarding environmental problems as they are not in line with our idea of quality

of life, economic prosperity or material needs (Festinger, 1957; Kollmuss and Agyeman, 2002).

Simply experiencing an emotional reaction is also not automatically followed by pro-environmental behavior. Emotional reactions can include fear, sadness, anger, pain and guilt, some of which have a stronger likelihood of inducing pro-environmental behavior. These are referred to as primary emotional reactions which we experience when we are confronted with environmental degradation. Kollmuss and Agyeman (2002) hypothesize that guilt is less likely to lead to pro-environmental behavior than fear, sadness, pain and anger. There are also secondary emotional reactions which can inhibit pro-environmental behavior, as they are defense mechanisms working to relieve us from the negative primary emotional reactions. Denial, rational distancing, apathy and delegation are examples for secondary emotional reactions (Kollmuss and Agyeman, 2002).

Locus of Control: The locus of control "represents an individual's perception of whether he or she has the ability to bring about change through his or her own behavior" (Newhouse, 1991 as quoted in Kollmuss and Agyeman, 2002, p. 255). While people with an internal locus of control perceive their ability to bring about change through their own actions is strong, people with an external locus of control believe only powerful others can bring about change (Kollmuss and Agyeman, 2002).

Responsibility and Priorities: These are shaped by values and attitudes and affected by an individual's locus of control. A person's own well-being and the well-being of their family is usually their highest priority. Depending on whether or not pro-environmental behaviors align with or contradict these personal priorities, the motivation to do them will increase or sink (Kollmuss and Agyeman, 2002).

3. Methods

In order to investigate the phenomenon of the attitude-behavior gap, as well as the effects of external and demographic factors on behavior, I chose to focus this study on a group of individuals who I believed would show high environmental knowledge and concern. The target group of the thesis are Biology students from the University of Vienna.

In order to reach the intended audience, the data of this study was raised through an online questionnaire on www.soscisurvey.de, using the software package SoSci Survey. The questionnaire was sent to the Bachelor and Master students of Biology as well as the students of the Teacher Training Programme of Biology and Environmental Studies in an email through the Directorate of Life Science Studies. According to the information I received from the Directorate of Life Science Studies, the total of Bachelor and Master students of Biology as well as students of the Teacher Training Programme of Biology and Environmental Studies for the summer semester of 2014 is 4.913. The link to the questionnaire was open to all participants, allowing it to be forwarded to further individuals, and a total of 1.061 people responded with 928 of those filling out the survey to completion. It would appear the survey managed to reach just under 20% of the intended audience, meaning the results can be assumed to be representative for this group.

The participants remained anonymous throughout the entire data gathering and evaluation process, with the exception of those individuals who decided to contact me for further information on the contents or results of the study upon completion of the questionnaire.

The online questionnaire consisted of four main parts: demographic data, external factors, internal factors and energy behavior. During the pre-test conducted on 5 individuals, the completion of the questionnaire took around 10 minutes. An average time between 10-15 minutes to complete the survey could therefore be expected.

3.1. Calculating a Variable for Energy Behavior

The fourth and last part of the questionnaire was dedicated to energy behavior. Energy behavior was self-reported and participants were to rank how frequently they engage in a certain behavior from a scale from 1-5. There was no use of a CO_2 calculator or any other method of raising data on actual energy demand. This choice was made seeing as the actions and habits of the inhabitants are of interest to the thesis, and not total energy demand, which may be greatly dependent on various other factors such as size of the household, size of the building, year of build, type of heating system etc. By working with self-reported data, the survey is of course exposed to individuals systematically biasing their responses, exaggerating or playing down their actual behavior to conform to what they feel is expected from them.

In order to test the hypotheses of this thesis, a new variable had to be calculated to summarize and describe each participant's personal energy behavior. The program IBM SPSS Statistics 20 was used to handle the data throughout the entire study, with a few tables created in Microsoft Office Excel 2007.

As mentioned before, the fourth part of the questionnaire which was distributed to the participants was dedicated to their energy behavior, and originally consisted of 20 questions concerning energy behaviors within the household. These questions were to be answered on a scale from 1-5, usually going from least energy-saving behavior to most energy-saving behavior. The 20 questions concerning energy behavior were as follows:

EB1: Do you turn off the lights when leaving a room?
EB2: Do you wait for the dishwasher to be full before using it?
EB3: Would you consider washing dishes by hand if the dishwasher is less than half full?
EB4: Do you use the drying option on your dishwasher?
EB5: Do you wait for your laundry to be full before using the washing machine?
EB6: Do you wear the same clothes more than once before putting them in the laundry basket?
EB7: Do you wash your laundry on low heat settings (under 60ºC)?
EB8: Do you clean the lint screen of your dryer?
EB9: Do you remove clothes from the dryer while they're still damp?
EB10: Do you cook with lids?
EB11: Do you turn back the stove once the water is boiling?
EB12: Do you turn down the thermostat when leaving for a longer period of time?

EB13: Do you close curtains and blinds at night?
EB14: How often do you take baths alternatively to showers?
EB15: Do you use the microwave/toaster oven or similar devices instead of an oven when possible?
EB16: Do you open the oven door when in use?
EB17: Do you leave the refrigerator door open for long periods of time?
EB18: Do you pay attention to placing small pots on small burners?
EB19: Do you use lighting control devices like dimmers, motion detectors etc.?
EB20: Do you unplug electrical devices when they are not being used? (computers, televisions, VCRs etc.)

There were four questions in which the scale was reversed and ranked from most energy-saving behavior to least energy-saving behavior. This was the case in order to prevent the flow of filling out the survey to be disturbed. The values chosen by participants for these questions were mirrored in order to achieve a uniform scale from 1, the least energy-saving behavior, to 5, the most energy-saving behavior. Questions EB4, EB14, EB16 and EB17 were affected by this.

A new variable for energy behavior, "EBMean", is created by calculating the mean of these behavior questions for each individual, which results in the calculated data being a number between 1 and 5 on an interval scale. Individuals with higher values for EBMean have more energy-saving behaviors within the household as individuals with lower values for EBMean.

Before creating this new variable, the descriptive data of the questions concerning energy behavior was examined to locate possible errors in the survey. Certain questions which were vulnerable to misunderstandings and showed suspicious results were pulled from the calculation of EBMean completely, as was the case for question EB4. Question EB19 also was not used for the calculation of EBMean, as using lighting controls is directly dependent on the living spaces being fitted with such devices. This is something many college students can be assumed to have no control over.

Questions EB2 – EB4 involved the usage of a dishwasher, questions EB5 – EB7 the usage of a washing machine and EB8 and EB9 the usage of a dryer. Seeing as not all participants own these appliances, it is important to test if the participants who do own the appliance in question and those who do not, but chose to answer nonetheless, responded in the same way. A Mann-Whitney-U test is used to establish whether the groups differ. The questions which

show no differences between the groups can be used to calculate EBMean without further measures being taken. In the cases of differences being found, the distributions of the groups of individuals without said appliance must be inspected to determine whether this represents a pattern of behavior for a certain group of individuals, or if the distribution is random and doesn't reflect the behavior of a group of individuals. The case of a random distribution could occur if participants did not wish to leave questions unanswered, or clicked into the answering boxes on accident. Unfortunately the online questionnaire did not allow participants to remove an answer completely once one of the answering boxes was chosen, while it did allow a change in answer to be made. It is therefore possible that individuals clicked an answer-box before reading the question and could not remove an answer in retrospect, therefore choosing a random answer.

This problem could have been avoided if the questions of whether or not an appliance is owned were posed as filter-questions, hiding all following questions which involve said appliance for the respondents who do not have ownership. The choice not to use filter-questions was made however, seeing as the target audience was college students. This group of individuals can be expected not to own certain appliances such as a washing machine, but to still use one regularly, be it at a washroom or a parent's house.

In the case of random distributions being found for non-owners of appliances, these answers were removed for the calculation of EBMean, as not to falsify the EBMean values for these individuals. In the case of distributions differing, but not clearly through random answers, the values were left in for the calculation of EBMean, as they may very well reflect a different but valid behavior pattern for a certain group of individuals. For example, someone who is not at all willing to wash dishes by hand may sooner invest in a dishwasher than an individual who does not mind washing dishes by hand. There may also be an element of habit involved, such as individuals who did not own an appliance like a dishwasher for a long time actually showing different behavior when they do obtain ownership of one, as opposed to individuals who have always had such an appliance in the household.

3.2. Central Questions

The central questions of this Master's thesis are based on the factors affecting pro-environmental behavior as identified by Kollmuss and Agyeman (2002). These factors are tested for differences and correlations with the variable EBMean representing energy-saving behavior. The values for EBMean lie on an interval-scale, but are not normally distributed. Non-parametric tests were therefore used to analyze the data.

3.2.1. Energy behavior varies with different demographic factors

such as gender, age, years of education, income and household structure.

Gender:

The Mann-Whitney-U test is applied

H0: The distributions of EBMean are identical for women and men.

Age:

The Spearman correlation is applied.

H0: There is no association between age and energy behavior.

Formal Education:

The Kruskal-Wallis test is applied.

H0: Individuals with different types of highest formal education have the same distribution of values for energy behavior.

Field of Study:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals studying Biology and individuals not studying Biology.

Employment:

The Mann-Whitney-U test is applied

H0: The distributions of EBMean are identical for individuals who are employees and individuals who are not employees.

H0: The distributions of EBMean are identical for individuals who are self-employed and individuals who are not self-employed.

H0: The distributions of EBMean are identical for individuals who are unemployed and seeking employment and individuals who are not unemployed and seeking employment.

H0: The distributions of EBMean are identical for individuals who are unemployed and not seeking employment and individuals who are not unemployed and not seeking employment.

H0: The distributions of EBMean are identical for individuals who are homemakers and individuals who are not homemakers.

H0: The distributions of EBMean are identical for individuals who are college students and individuals who are not college students.

H0: The distributions of EBMean are identical for individuals who are in retirement and individuals who are not in retirement.

H0: The distributions of EBMean are identical for individuals who are unfit for work and individuals who are not unfit for work.

Income:

The Spearman correlation is applied.

H0: There is no association between income and energy behavior.

Amount of Individuals in the Household:

The Spearman correlation is applied.

H0: There is no association between the amount of individuals in the household and energy behavior.

Household Members:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals living with a spouse and individuals not living with a spouse.

H0: The distributions of EBMean are identical for individuals living with a partner and individuals not living with a partner.

H0: The distributions of EBMean are identical for individuals living with a parent and individuals not living with a parent.

H0: The distributions of EBMean are identical for individuals living with a sibling and individuals not living with a sibling.

H0: The distributions of EBMean are identical for individuals living with a roommate and individuals not living with a roommate.

H0: The distributions of EBMean are identical for individuals living with a child and individuals not living with a child.

Children:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who have children and individuals who do not have children.

Plan to have Children:

The Kruskal-Wallis test is applied.

H0: Individuals who plan to have children in the future, individuals who plan not to have children in the future and individuals who do not know if they plan to have children in the future have the same distribution of values for energy behavior.

3.2.2. Energy behavior varies with different external factors

such as social and cultural factors or economic factors

The second part consisted of questions revolving around external factors, such as the willingness to spend money on energy-efficient appliances, knowledge about energy-related expenses in the household and the perception of one's own energy consumption. This section

included the ranking of household appliances by wattage in order to determine how well the participants could gauge the electricity consumption of various appliances.

3.2.2.1.Social and Cultural Factors

City:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals living in Vienna and individuals not living in Vienna.

District:

The Kruskal-Wallis test is applied.

H0: The 23 different districts in Vienna have the same distribution of values for energy behavior.

Citizenship:

The Kruskal-Wallis test is applied.

H0: Individuals with different citizenships have the same distribution of values for energy behavior.

Childhood Home:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals from an urban environment and individuals from a rural environment.

3.2.2.2.Economic Factors

Perception of own Electricity Consumption:

Energy Consumption per month:

The Spearman correlation is applied.

H0: There is no association between awareness of personal energy consumption per month and energy behavior.

Change in Personal Energy Consumption:

The Spearman correlation is applied.

H0: There is no association between awareness of a change in personal energy consumption in the last five years and energy behavior.

Feedback-Devices:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who own a feedback-device (such as a smart meter) and individuals who do not own a feedback-device.

Knowledge of Expenses:

Electricity Bill Awareness:

The Spearman correlation is applied.

H0: There is no association between awareness of how high the electricity bill is and energy behavior.

Changes in Electricity Prices:

The Spearman correlation is applied.

H0: There is no association between awareness of how the prices of electricity have changed over the years and energy behavior.

Willingness to spend money:

Willingness to Invest in Energy-Efficiency:

The Spearman correlation is applied.

H0: There is no association between the willingness to invest in energy-efficiency and energy behavior.

3.2.3. Energy behavior varies with different internal factors

such as motivation, attitudes, environmental awareness, emotional involvement, locus of control and responsibility

Changes in General Energy Consumption:

The Spearman correlation is applied.

H0: There is no association between the awareness of changes in general energy consumption and energy behavior.

Impact of Energy Consumption:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who believe the rise of energy consumption has a considerable impact on the environment and individuals who do not believe the rise of energy consumption has a considerable impact on the environment.

Man-induced Climate Change:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who believe there is a significant man-induced contribution to climate change and individuals who do not believe there is a significant man-induced contribution to climate change.

Responsibility toward Future Generations:

The Spearman correlation is applied.

H0: There is no association between the sense of responsibility toward future generations and energy behavior.

Impact of Ecological Issues:

The Spearman correlation is applied.

H0: There is no association between the perception of impact of ecological issues on economic and social areas and energy behavior.

Impact of Mankind:

The Spearman correlation is applied.

H0: There is no association between the perception of the negative impact mankind has had on the environment and energy behavior.

Role of Individual Households:

The Spearman correlation is applied.

H0: There is no association between the perception of the role of individual households in energy issues and energy behavior.

Electricity Prices:

The Spearman correlation is applied.

H0: There is no association between the perception of electricity prices being too high or too low and energy behavior.

Austrian Energy Demand:

The Spearman correlation is applied.

H0: There is no association between the perception of how much private households contribute to total Austrian energy demand and energy behavior.

Effective Energy Reduction Method:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who believe changes in behavior are the more effective energy reduction method and individuals who believe investing in energy-efficient appliances is the more effective energy reduction method.

Preferred Energy Reduction Method:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who would prefer to make changes in behavior in order to reduce energy consumption and individuals who would prefer investing in energy-efficient appliances in order to reduce energy consumption.

Energy-saving Deterrents:

The Kruskal-Wallis test is applied.

H0: Individuals with different factors preventing them from engaging in energy-saving behaviors have the same distribution of values for energy behavior.

Energy-saving Incentives:

The Kruskal-Wallis test is applied.

H0: Individuals with different factors driving them to engage in energy-saving behaviors have the same distribution of values for energy behavior.

Emotions:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who feel fear when confronted with reports of climate change and individuals who do not feel fear when confronted with reports of climate change.

H0: The distributions of EBMean are identical for individuals who feel sadness when confronted with reports of climate change and individuals who do not feel sadness when confronted with reports of climate change.

H0: The distributions of EBMean are identical for individuals who feel pain when confronted with reports of climate change and individuals who do not feel pain when confronted with reports of climate change.

H0: The distributions of EBMean are identical for individuals who feel anger when confronted with reports of climate change and individuals who do not feel anger when confronted with reports of climate change.

H0: The distributions of EBMean are identical for individuals who feel guilt when confronted with reports of climate change and individuals who do not feel guilt when confronted with reports of climate change.

H0: The distributions of EBMean are identical for individuals who feel apathy when confronted with reports of climate change and individuals who do not feel apathy when confronted with reports of climate change.

Environmental Degradation:

The Mann-Whitney-U test is applied.

H0: The distributions of EBMean are identical for individuals who have personally experienced a form of environmental degradation in their environment and individuals who have not personally experienced a form of environmental degradation in their environment.

Technical Advancements:

The Spearman correlation is applied.

H0: There is no association between the importance placed on technical advancements contributing to solving energy issues in the future and energy behavior.

Time Outdoors:

The Spearman correlation is applied.

H0: There is no association between the importance placed on spending time outdoors and energy behavior.

Responsibility for Climate Change:

The Spearman correlation is applied.

H0: There is no association between perceived personal responsibility for climate change and energy behavior.

Locus of Control:

The Spearman correlation is applied.

H0: There is no association between locus of control and energy behavior.

4. Results

4.1. Descriptive Statistics

4.1.1. Demographic Factors

A total of 1061 individuals started the online questionnaire with 928 individuals filling it out to completion. These 928 individuals consist of 649 females, 265 males and 14 individuals of unspecified gender as can be seen in *Table 4.1.1* and *Fig. 4.1.1*.

Gender

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Female	649	69,9	71,0	71,0
	Male	265	28,6	29,0	100,0
	Total	914	98,5	100,0	
Missing	Not answered	14	1,5		
Total		928	100,0		

Table 4.1.1

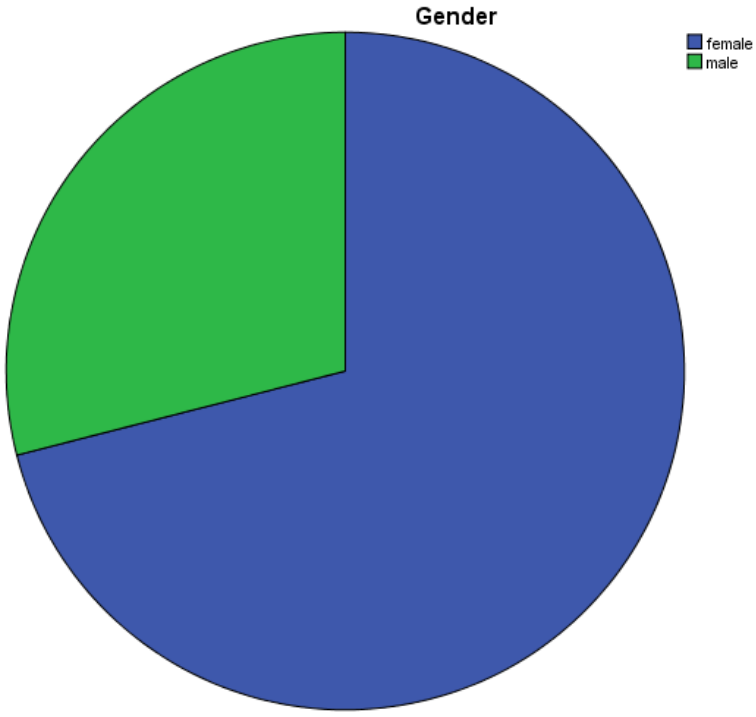

Fig. 4.1.1

Age

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	18	24	2,6	2,6	2,6
	19	72	7,8	7,8	10,4
	20	106	11,4	11,4	21,8
	21	103	11,1	11,1	32,9
	22	101	10,9	10,9	43,8
	23	100	10,8	10,8	54,6
	24	89	9,6	9,6	64,2
	25	74	8,0	8,0	72,2
	26	65	7,0	7,0	79,2
	27	30	3,2	3,2	82,4
	28	30	3,2	3,2	85,7
	29	23	2,5	2,5	88,1
	30	21	2,3	2,3	90,4
	31	15	1,6	1,6	92,0
	32	15	1,6	1,6	93,6
	33	17	1,8	1,8	95,5
	34	5	,5	,5	96,0
	35	8	,9	,9	96,9
	36	4	,4	,4	97,3
	37	3	,3	,3	97,6
	38	1	,1	,1	97,7
	40	2	,2	,2	98,0
	42	2	,2	,2	98,2
	43	1	,1	,1	98,3
	44	3	,3	,3	98,6
	45	2	,2	,2	98,8
	47	1	,1	,1	98,9
	48	1	,1	,1	99,0
	49	3	,3	,3	99,4
	52	3	,3	,3	99,7
	55	1	,1	,1	99,8
	57	1	,1	,1	99,9
	60	1	,1	,1	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.2

Age

N	Valid	927
	Missing	1
Mean		24,25
Std		5,324
Minimum		18
Maximum		60

Table 4.1.3

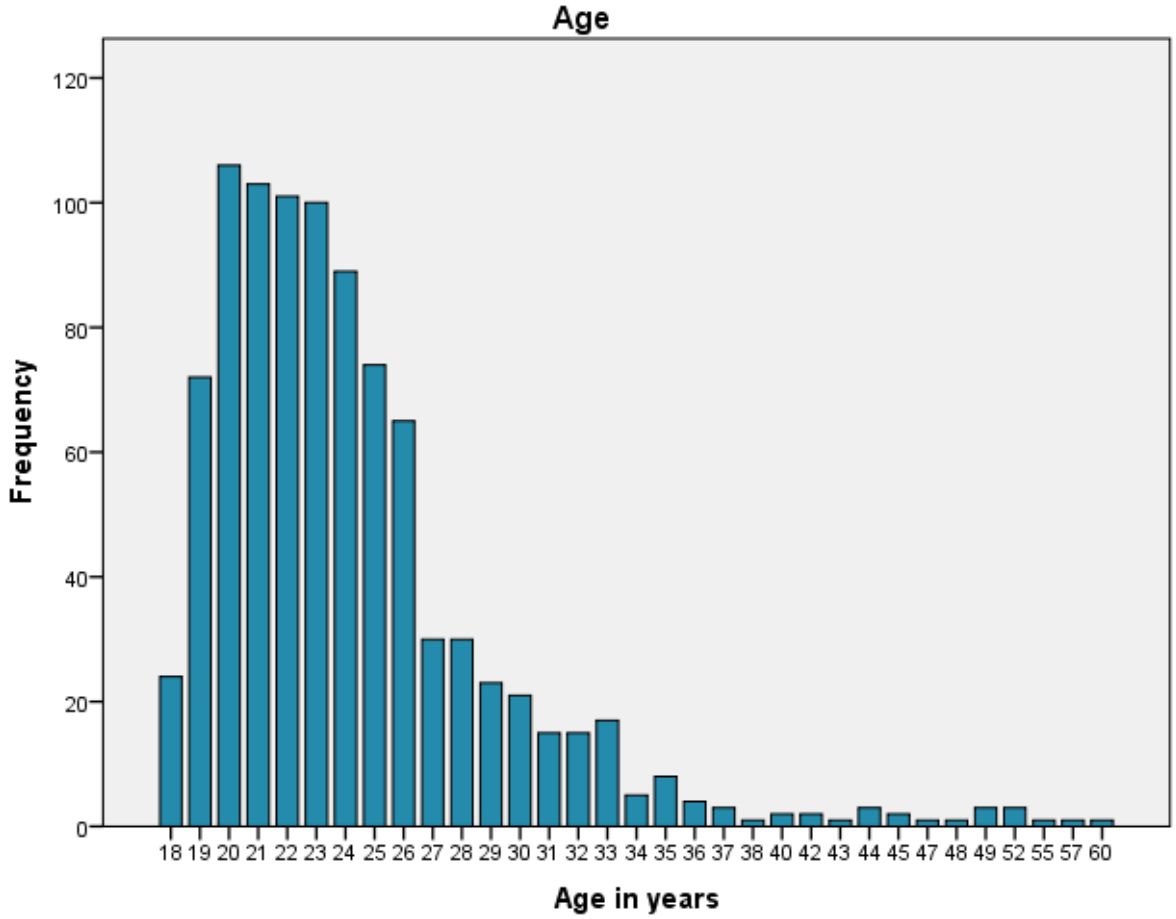

Fig. 4.1.2

The age of the participants ranges from 18 to 60 years old, with 82,4% lying within the 18-27 age range. On average the participants are 24,25 years old with a standard deviation of 5,324. 20 is the most frequent age with 106 individuals and 11,4% (*Table 4.1.2*, *Table 4.1.3*, *Fig. 4.1.2*).

Formal Education

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Compulsory School	19	2,0	2,0	2,0
	Lehre	8	,9	,9	2,9
	Fachschule	7	,8	,8	3,7
	Höhere Schule	559	60,2	60,3	64,0
	Universität, Hochschule	301	32,4	32,5	96,4
	None	2	,2	,2	96,7
	Other:	31	3,3	3,3	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.4

Employment

I am an employee

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	615	66,3	66,3	66,3
	chosen	313	33,7	33,7	100,0
	Total	928	100,0	100,0	

I am self-employed

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	898	96,8	96,8	96,8
	chosen	30	3,2	3,2	100,0
	Total	928	100,0	100,0	

I am unemployed and seeking employment

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	898	96,8	96,8	96,8
	chosen	30	3,2	3,2	100,0
	Total	928	100,0	100,0	

I am unemployed and not currently seeking employment

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	910	98,1	98,1	98,1
	chosen	18	1,9	1,9	100,0
	Total	928	100,0	100,0	

I am a homemaker

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	914	98,5	98,5	98,5
	chosen	14	1,5	1,5	100,0
	Total	928	100,0	100,0	

I am a college student

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	80	8,6	8,6	8,6
	chosen	848	91,4	91,4	100,0
	Total	928	100,0	100,0	

I am in retirement

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	926	99,8	99,8	99,8
	chosen	2	,2	,2	100,0
	Total	928	100,0	100,0	

I am unfit for work

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	927	99,9	99,9	99,9
	chosen	1	,1	,1	100,0
	Total	928	100,0	100,0	

Other

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	908	97,8	97,8	97,8
	chosen	20	2,2	2,2	100,0
	Total	928	100,0	100,0	

Table 4.1.5

As can be seen in Table 4.1.4, most participants have a high level of education. According to the survey, 60,2% have completed a “Höhere Schule” and 32,4% have stated to already have a university or equivalent degree. According to table 4.1.5 a total of 848 individuals, amounting to 91,4%, are currently college students. A notable amount, namely 313 individuals amounting to 33,7% are currently employed.

College: Biology

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	172	18,5	18,5	18,5
	chosen	756	81,5	81,5	100,0
	Total	928	100,0	100,0	

College: Molecular Biology

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Not chosen	855	92,1	92,1	92,1
	chosen	73	7,9	7,9	100,0
	Total	928	100,0	100,0	

College: Teacher Training Program

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	763	82,2	82,2	82,2
	chosen	165	17,8	17,8	100,0
	Total	928	100,0	100,0	

Table 4.1.6

The most prevalent direction of study is Biology, with 756 participants (81,5%) being Biology students. A total of 73 individuals (7,9%) are students of Molecular Biology, and 165 individuals (17,8%) indicated to be in the Teacher Training Program (*Table 4.1.6*).

Income

		Frequency	Percent	Valid Percent	Cum.Percent
Valid	Under 250 €	82	8,8	9,1	9,1
	Between 250 € and 500 €	185	19,9	20,5	29,6
	Between 500 € and 1000 €	251	27,0	27,9	57,5
	Between 1000 € and 1500 €	120	12,9	13,3	70,8
	Between 1500 € and 2000 €	75	8,1	8,3	79,1
	Between 2000 € and 3000 €	79	8,5	8,8	87,9
	Between 3000 € and 4000 €	22	2,4	2,4	90,3
	Between 4000 € and 5000 €	9	1,0	1,0	91,3
	5000 € and more	13	1,4	1,4	92,8
	I do not wish to answer	65	7,0	7,2	100,0
	Total	901	97,1	100,0	
Missing		27	2,9		
Total		928	100,0		

Table 4.1.7

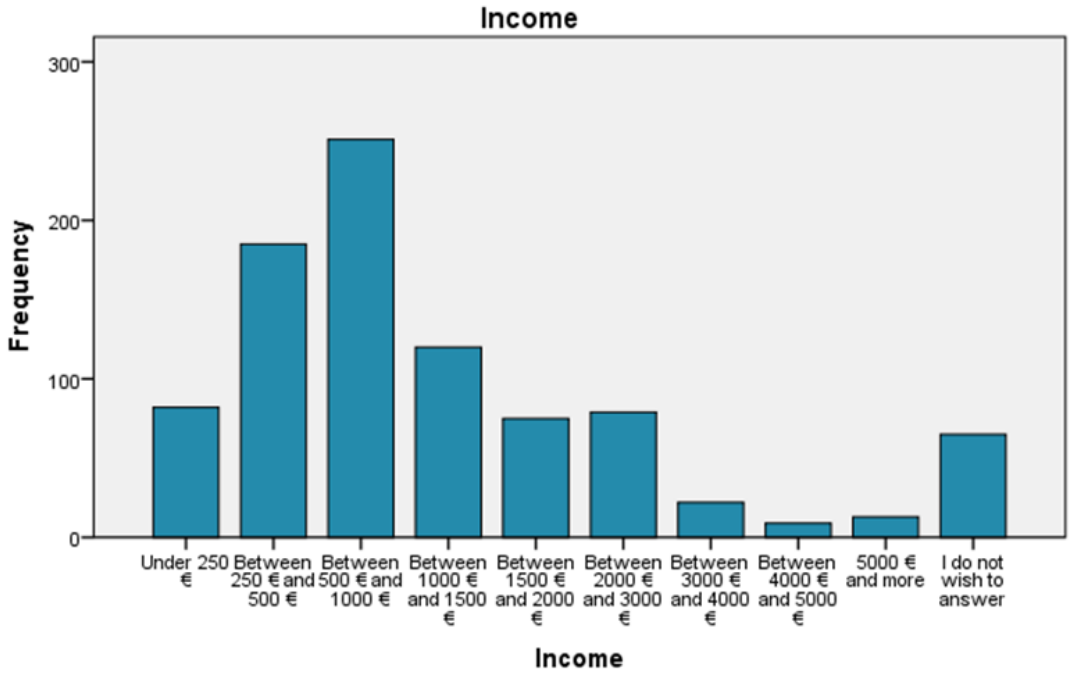

Fig. 4.1.3

A total of 70,8% of participants have a household net income ranging between under 250€ and up to 1500€, with the most common category being "between 500€ and 1000€" with 251 individuals at 27%. A high amount of participants chose not to answer this question with 65 choosing the option "I do not wish to answer" and 27 individuals not answering the question at all (*Table 4.1.7, Fig. 4.1.3*).

Amount of individuals in the household

N	Valid	887
	Missing	41
Mean		2,61
Std		1,398
Minimum		1
Maximum		19

Table 4.1.8

Amount of individuals in the household

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	1	159	17,1	17,9	17,9
	2	339	36,5	38,2	56,1

	3	198	21,3	22,3	78,5
	4	129	13,9	14,5	93,0
	5	33	3,6	3,7	96,7
	6	18	1,9	2,0	98,8
	7	8	,9	,9	99,7
	9	1	,1	,1	99,8
	10	1	,1	,1	99,9
	19	1	,1	,1	100,0
	Total	887	95,6	100,0	
Missing		41	4,4		
Total		928	100,0		

Table 4.1.9

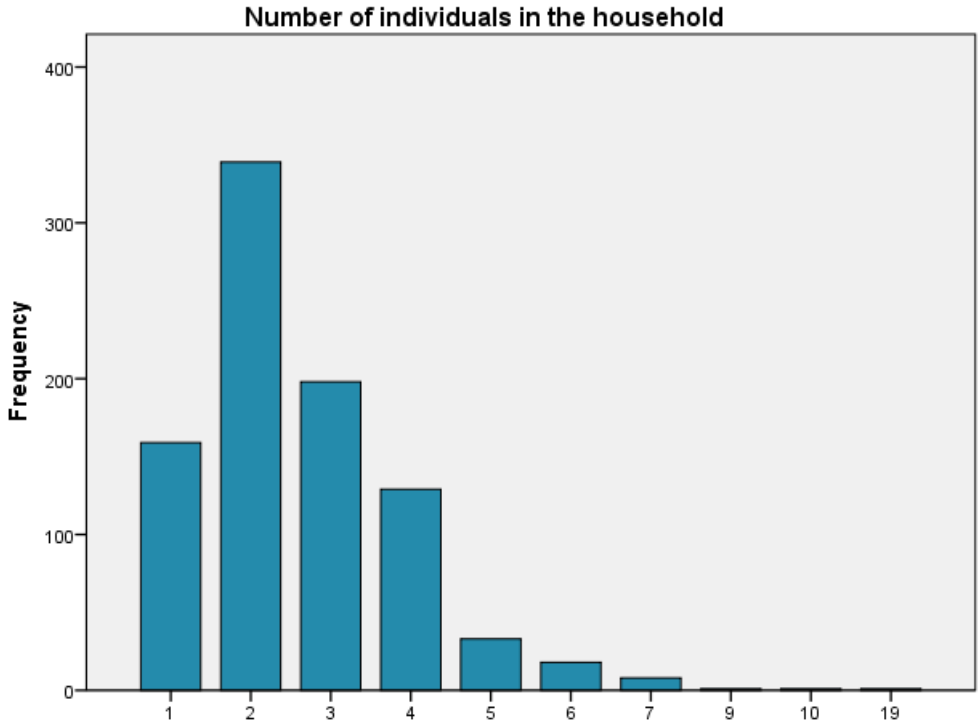

Fig.4.1.4

Household members

Spouse

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	887	95,6	95,6	95,6
	chosen	41	4,4	4,4	100,0
	Total	928	100,0	100,0	

Partner

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	680	73,3	73,3	73,3
	chosen	248	26,7	26,7	100,0
	Total	928	100,0	100,0	

Parent(s)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	695	74,9	74,9	74,9
	chosen	233	25,1	25,1	100,0
	Total	928	100,0	100,0	

Sibling(s)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	744	80,2	80,2	80,2
	chosen	184	19,8	19,8	100,0
	Total	928	100,0	100,0	

Roommate(s)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	682	73,5	73,5	73,5
	chosen	246	26,5	26,5	100,0
	Total	928	100,0	100,0	

Child(ren)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	not chosen	880	94,8	94,8	94,8
	chosen	48	5,2	5,2	100,0
	Total	928	100,0	100,0	

Table 4.1.10

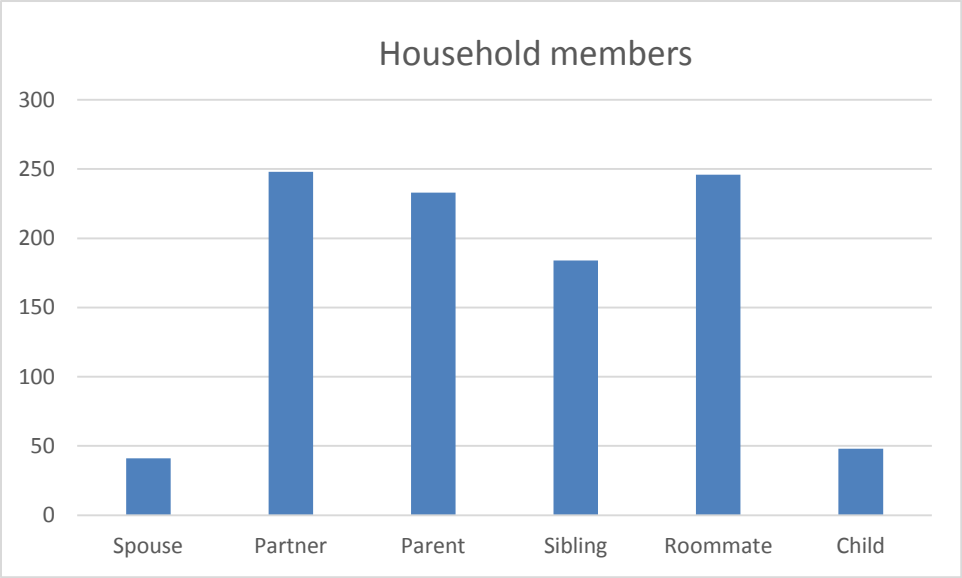

Fig. 4.1.5

Table 4.1.8 shows that the average amount of individuals within the household is 2,61 with a standard deviation of 1,398. The minimal amount of individuals in a household is 1, chosen by 159 of the participants amounting to 17,9%. The most common amount of individuals per household is 2, chosen by 339 individuals and making up 38,2%. The highest amount of individuals within a household was 19 as specified by one individual (*Table 4.1.9, Fig. 4.1.4*). Most participants with at least one more member in their household are housing with their partner (chosen by 248 individuals amounting to 26,7%), a roommate (chosen by 246 individuals amounting to 26,5%) or their parent(s) (chosen by 233 individuals amounting to 25,1%). There were 184 participants (19,8%) who were living with one or more siblings. Only 48 participants (5,2%) were living with children and 41 participants (4,4%) were living with their spouse (*Table 4.1.10, Fig. 4.1.5*).

Do you have children?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	38	4,1	4,1	4,1
	No	880	94,8	95,9	100,0
	Total	918	98,9	100,0	
Missing		10	1,1		
Total		928	100,0		

Table 4.1.11

Do you plan to have children?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	487	52,5	52,8	52,8
	No	174	18,8	18,9	71,7
	I don't know	261	28,1	28,3	100,0
	Total	922	99,4	100,0	
Missing		6	,6		
Total		928	100,0		

Table 4.1.12

According to Table 4.1.11, only 38 individuals (4,1%) had children at the point of the survey. More than half of the participants with 52,8% (487 individuals) however plan to have children in the future, with 18,9% (174 individuals) stating they do not plan for children and 28,3% (261 individuals) stating they do not yet know whether or not they plan to have children in the future (*Table 4.1.12*).

4.1.2. External Factors

Home energy audit

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	30	3,2	3,3	3,3
	No	872	94,0	96,7	100,0
	Total	902	97,2	100,0	
Missing		26	2,8		
Total		928	100,0		

Table. 4.1.13

According to Table 4.1.13, only 30 participants (3,3%) specified to having had a home energy audit done for their homes.

4.1.2.1. Social and Cultural Factors

City

	Frequency	Percent	Valid Percent	Cumulated Percent

Valid	Vienna	746	80,4	81,1	81,1
	Other:	174	18,8	18,9	100,0
	Total	920	99,1	100,0	
Missing	Not answered	8	,9		
Total		928	100,0		

Table 4.1.14

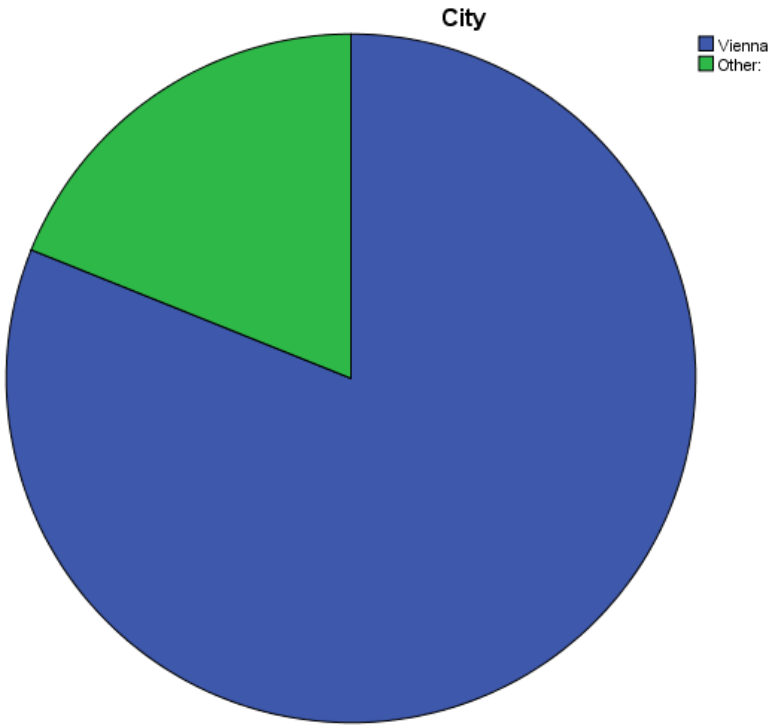

Fig. 4.1.6

District

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	1010	6	,6	,8	,8
	1020	49	5,3	6,6	7,5
	1030	54	5,8	7,3	14,8
	1040	15	1,6	2,0	16,8
	1050	21	2,3	2,8	19,6
	1060	20	2,2	2,7	22,4
	1070	25	2,7	3,4	25,7
	1080	28	3,0	3,8	29,5
	1090	51	5,5	6,9	36,4

	1100	41	4,4	5,6	42,0
	1110	28	3,0	3,8	45,8
	1120	41	4,4	5,6	51,4
	1130	19	2,0	2,6	53,9
	1140	39	4,2	5,3	59,2
	1150	32	3,4	4,3	63,6
	1160	48	5,2	6,5	70,1
	1170	30	3,2	4,1	74,1
	1180	42	4,5	5,7	79,8
	1190	20	2,2	2,7	82,5
	1200	40	4,3	5,4	87,9
	1210	38	4,1	5,1	93,1
	1220	26	2,8	3,5	96,6
	1230	25	2,7	3,4	100,0
	Total	738	79,5	100,0	
Missing		190	20,5		
Total		928	100,0		

Table 4.1.15

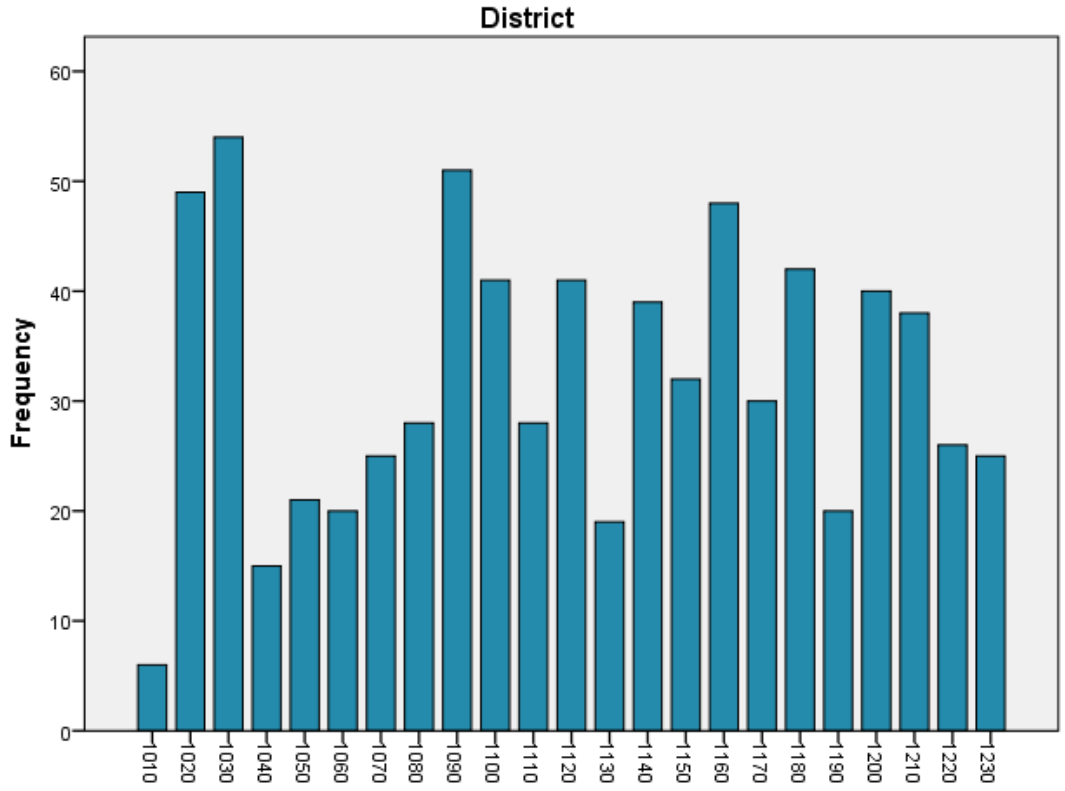

Fig. 4.1.7

Citizenship

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Not specified	16	1,7	1,7	1,7
	Austria	784	84,5	84,5	86,2
	Bosnia and Herzegovina	2	,2	,2	86,4
	Bulgaria	2	,2	,2	86,6
	China (People's Republic of China)	1	,1	,1	86,7
	Croatia	1	,1	,1	86,9
	Germany	80	8,6	8,6	95,5
	Greece	4	,4	,4	95,9
	Hungary	1	,1	,1	96,0
	Italy	17	1,8	1,8	97,8
	Japan	1	,1	,1	98,0
	Jordan	1	,1	,1	98,1
	Liechtenstein	1	,1	,1	98,2
	Luxembourg	3	,3	,3	98,5
	Mexico	1	,1	,1	98,6
	Poland	5	,5	,5	99,1
	Rumania	1	,1	,1	99,2
	Slovenia	2	,2	,2	99,5
	Spain	1	,1	,1	99,6
	Switzerland	1	,1	,1	99,7
	Turkey	1	,1	,1	99,8
	Ukraine	1	,1	,1	99,9
	United States of America	1	,1	,1	100,0
	Total	928	100,0	100,0	

Table 4.1.16

At the time of the survey, 80,4% of the participants were living in Vienna (*Table 4.1.14, Fig. 4.1.6*). The distribution of Viennese participants throughout districts can be seen in Table 4.1.15 and Fig. 5.1.7. Of the respondents, 84,5% possess Austrian citizenship, followed by 8,6% German citizens and 1,8% Italian citizens (*Table 4.1.16*).

Childhood Home

	Frequency	Percent	Valid Percent	Cumulated Percent

Valid	Rural (less than 150 people / km²)	482	51,9	52,0	52,0
	Urban (more than 150 people / km²)	445	48,0	48,0	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.17

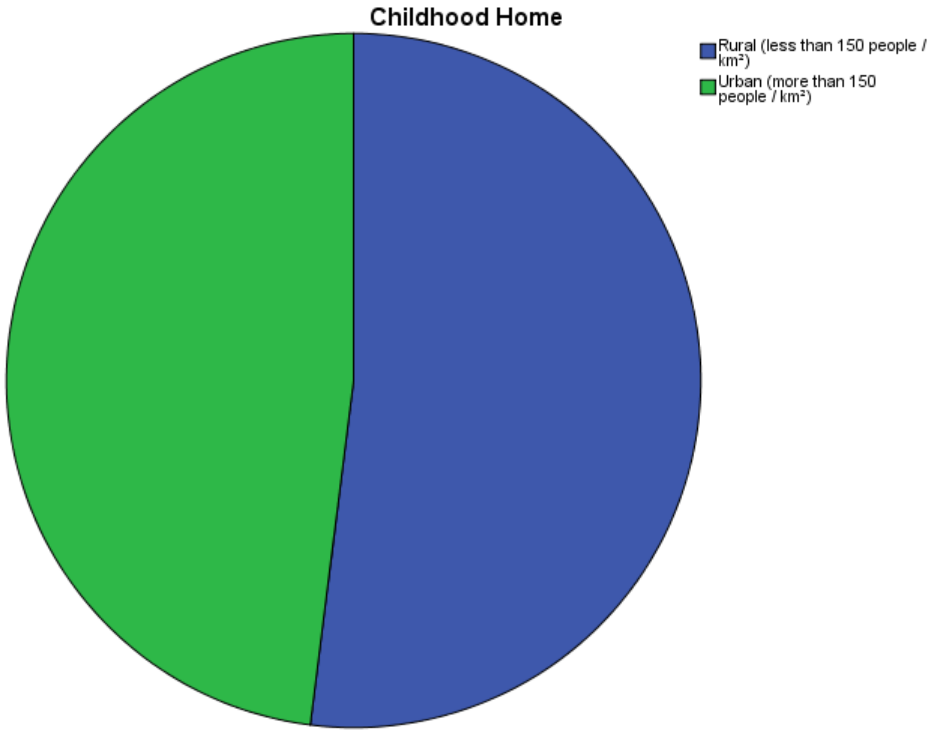

Fig. 4.1.8

The amount of participants who grew up in a rural environment is only slightly higher than the amount of participants from an urban environment, with rural being defined as an area with less than 150 people / km², and urban defined as an area with more than 150 people / km². A total of 482 individuals (51,9%) described the area they spent most of their childhood in as rural, with 445 individuals (48%) coming from an urban area. There was only one missing value for this question (*Table 4.1.17, Fig. 4.1.8*).

4.1.2.2. Economic Factors

Ranking: Factors influencing appliance purchase

	N	Mean
Durability (lifespan, guarantee)	916	2,09
Cost at purchase (special offers)	916	2,11
Energy Efficiency	915	2,32
Design	901	3,47
Valid values	897	

Table 4.1.18

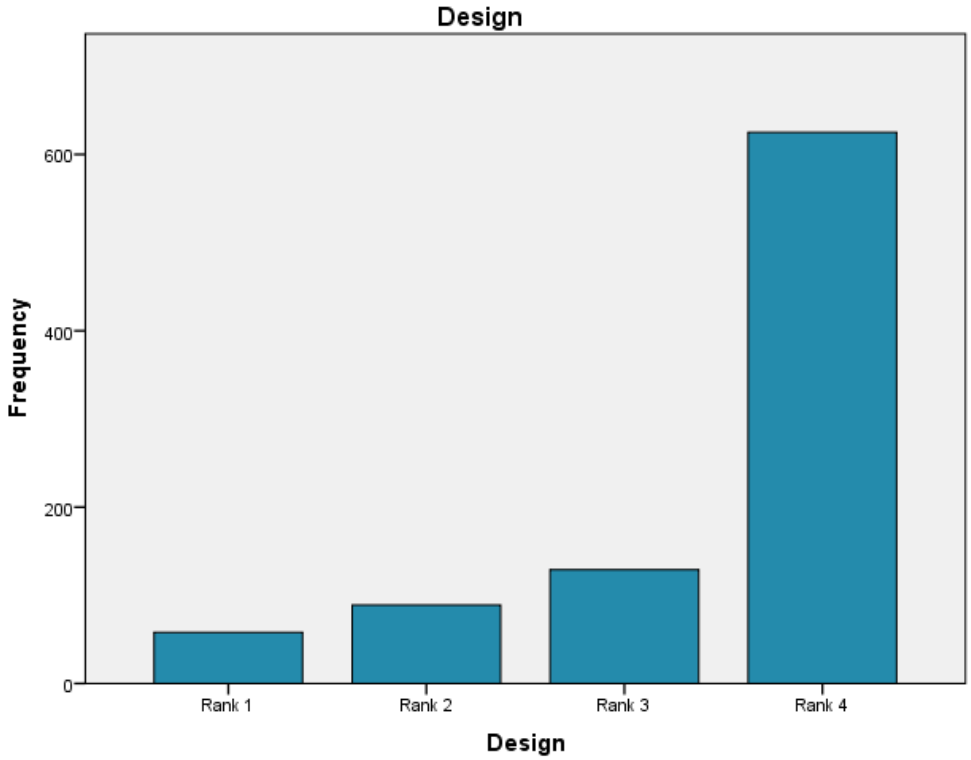

Fig. 4.1.9

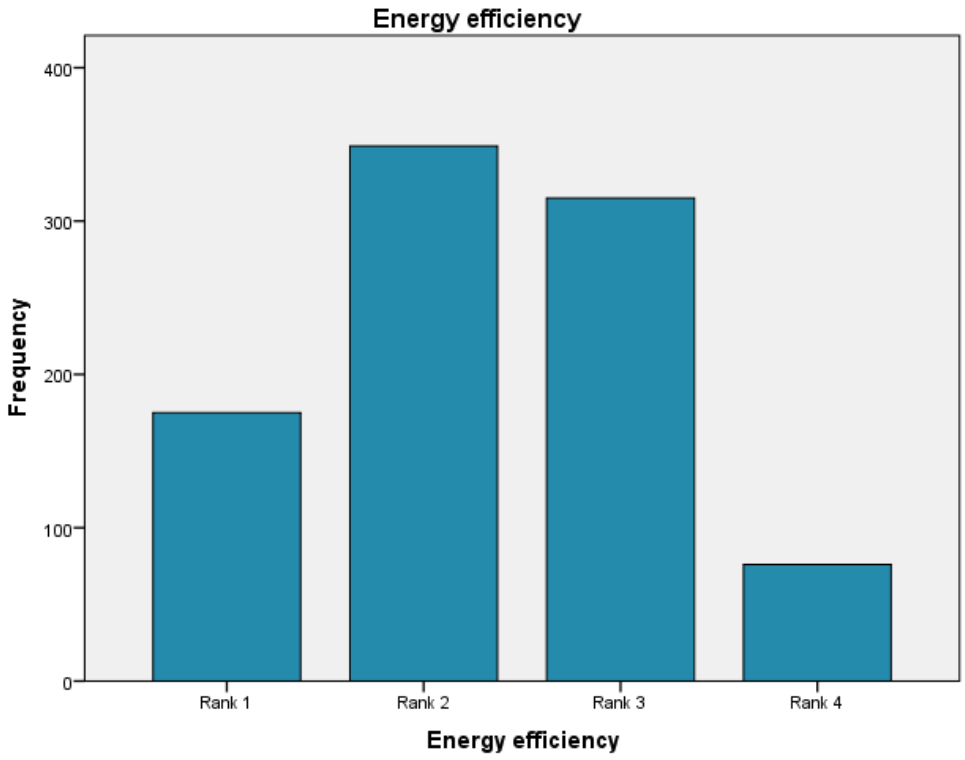

Fig. 4.1.10

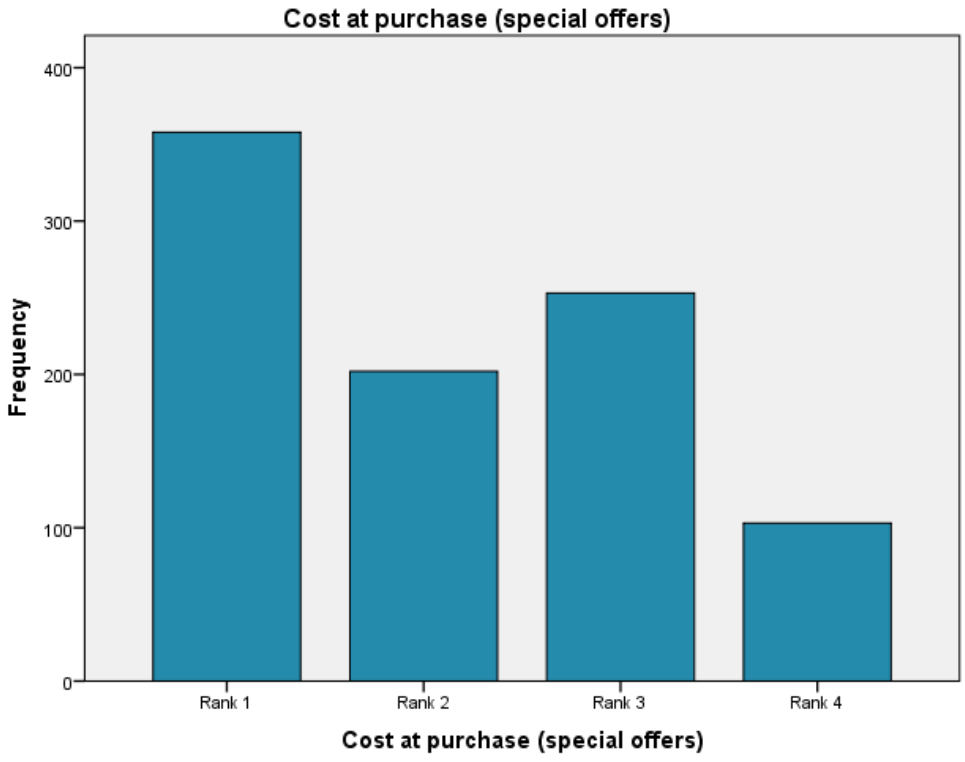

Fig. 4.1.11

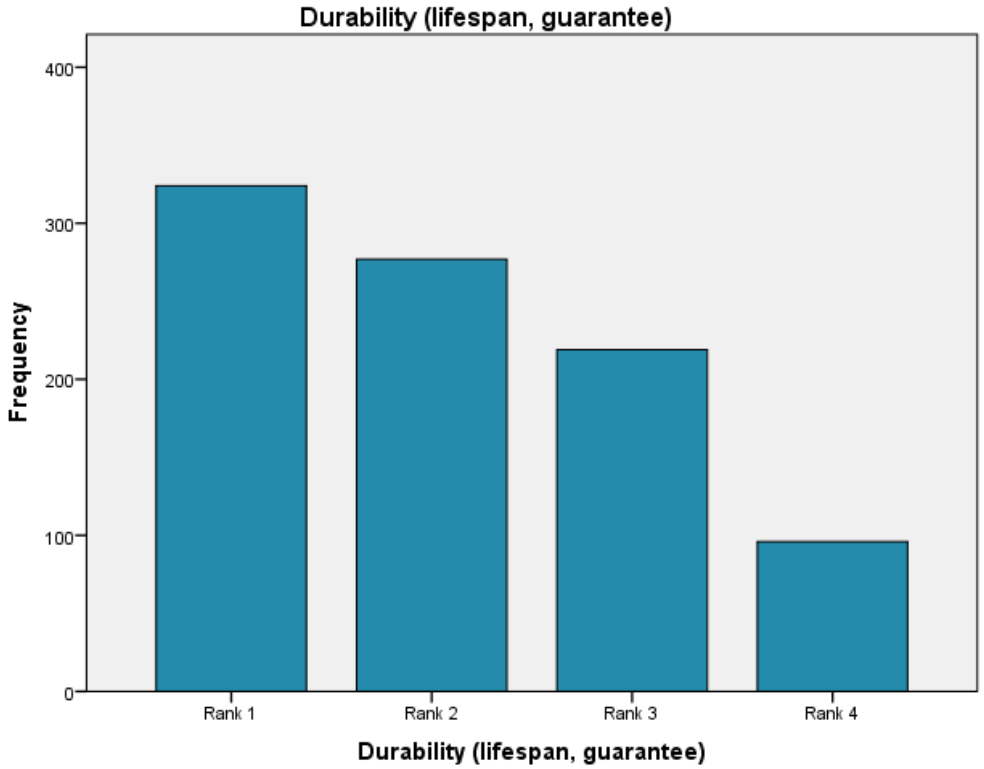

Fig. 4.1.12

Participants were asked to rank which factors contribute the most to their purchasing decisions concerning new appliances. The available factors were design, energy efficiency, durability and cost at purchase. In total the factor durability was rated as the most important factor with a mean of 2,09, closely followed by cost at purchase with a mean of 2,11 and energy efficiency with a mean of 2,32. The least important factor for most participants was design with a mean of 4,47 (*Table 4.1.18, Fig. 9-12*).

Do you have a gross idea, how high your average electricity consumption is per month?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	270	29,1	29,2	29,2
	2	236	25,4	25,5	54,7
	3	189	20,4	20,4	75,1
	4	165	17,8	17,8	93,0
	Yes, absolutely	65	7,0	7,0	100,0
	Total	925	99,7	100,0	
Missing		3	,3		
Total		928	100,0		

Table 4.1.19

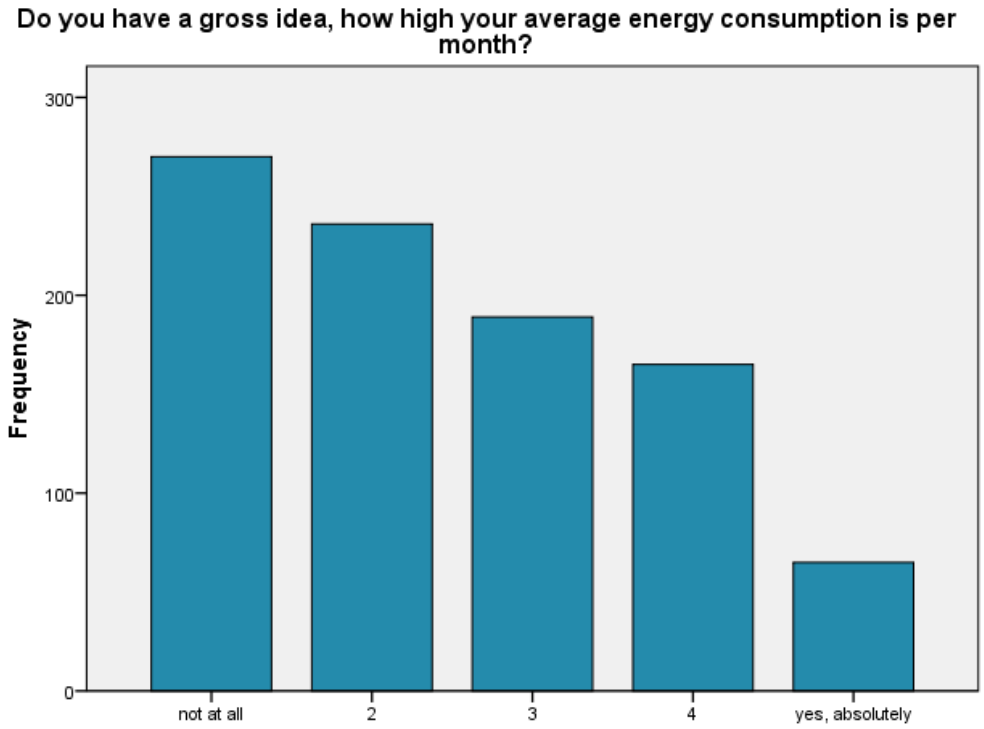

Fig. 4.1.13

As seen in Table 4.1.19 and Fig. 4.1.13, the most chosen option for the question whether they have a gross idea how high their average energy consumption is per month is option 1 (270 individuals amounting to 29,2%), meaning that these participants believe to have no idea at all concerning their monthly average energy consumption. The second most chosen option is option 2 (236 individuals amounting to 25,5%) followed by option 3 (189 individuals at 20,4%) and option 4 (165 individuals at 17,8%). The least chosen option for this question was option 5, with 65 individuals (7%) stating they feel they absolutely have an idea how high their monthly average energy consumption is.

How do you perceive your electricity consumption has changed over the past five years?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Strong fall	16	1,7	1,7	1,7
	2	163	17,6	17,6	19,4
	3	458	49,4	49,6	68,9
	4	250	26,9	27,1	96,0
	Strong rise	37	4,0	4,0	100,0
	Total	924	99,6	100,0	

Missing	4	,4		
Total	928	100,0		

Table 4.1.20

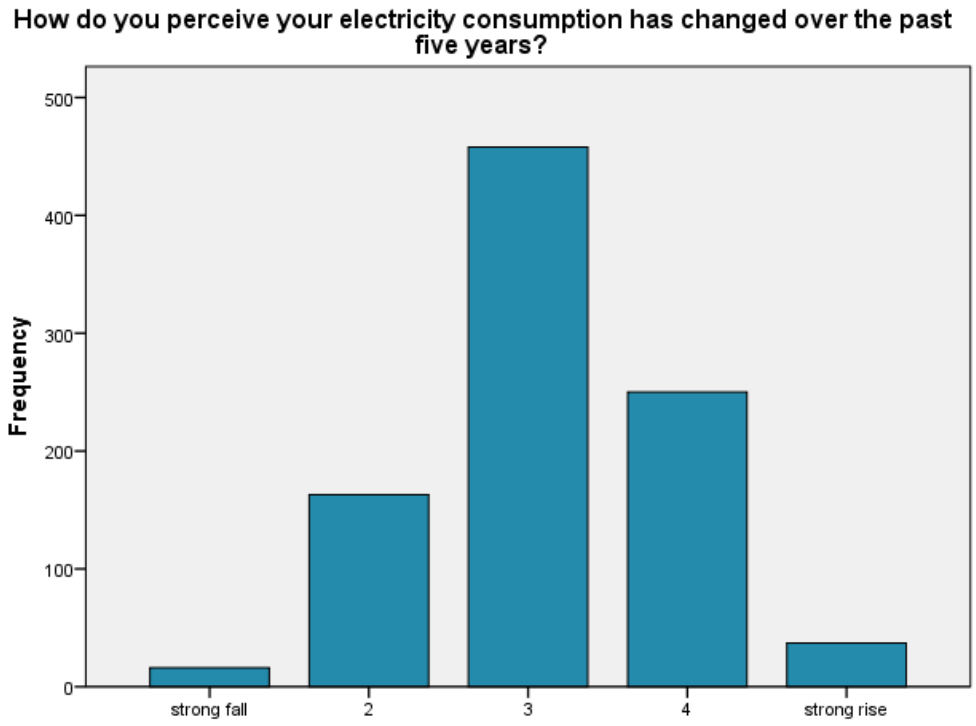

Fig. 4.1.14

When asked to estimate how their personal electricity consumption has changed over the past five years, almost half the participants chose option 3 (458 individuals amounting to 49,6%), indicating no change in their electricity consumption. The second most chosen option was option 4 (250 individuals amounting to 27,1%), indicating a rise in electricity consumption, followed by option 2 (163 individuals amounting to 17,6%) indicating a fall in electricity consumption. Option 5 was chosen by 37 individuals (4%) indicating a strong rise in electricity consumption, and only 16 individuals (1,7%) chose option 1, indicating a strong fall (*Table 4.1.20, Fig. 4.1.14*).

Do you own a feedback device (such as a smart meter)?

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Yes	38	4,1	4,1	4,1
	No	883	95,2	95,9	100,0
	Total	921	99,2	100,0	

Missing	7	,8		
Total	928	100,0		

Table 4.1.21

A total of 38 participants (4,1%) own a feedback-device (*Table 4.1.21*).

Are you aware how high your electricity bill is on average?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	148	15,9	16,0	16,0
	2	140	15,1	15,1	31,1
	3	137	14,8	14,8	45,9
	4	222	23,9	24,0	69,9
	Yes, absolutely	279	30,1	30,1	100,0
	Total	926	99,8	100,0	
Missing		2	,2		
Total		928	100,0		

Table 4.1.22

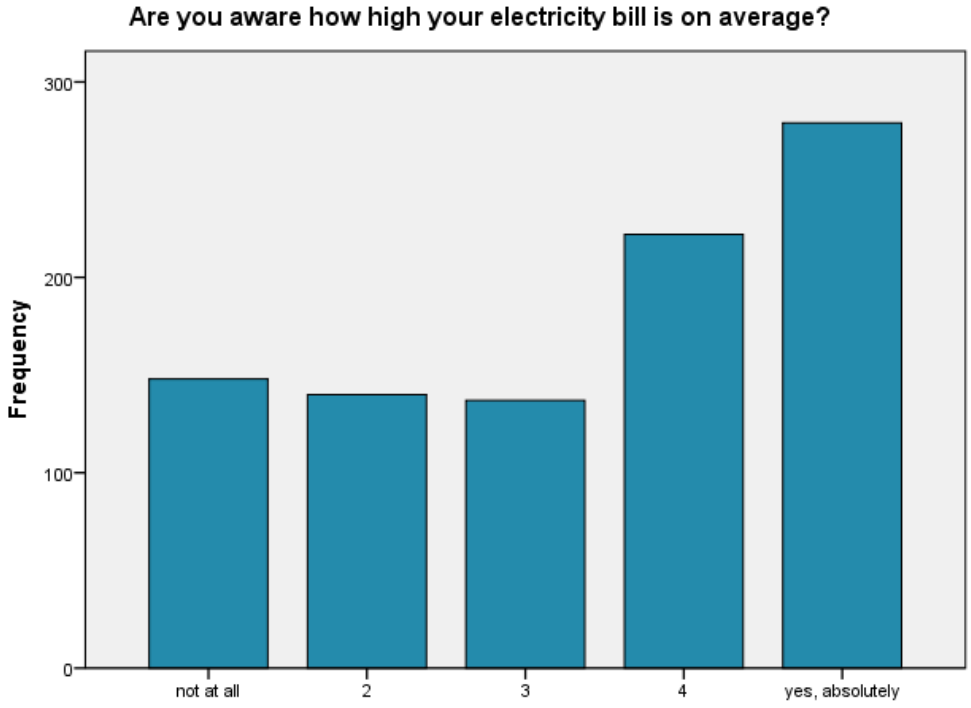

Fig. 4.1.15

According to Table 4.1.22, 279 participants (30,1%) chose option 5, claiming to have a very good idea of how high their average electricity bill is. This number is followed by 222 participants (24%) choosing option 4. Option 1 is the third most commonly chosen answer with 148 participants (16%) feeling they have absolutely no idea how high their average electricity bill is. Option 2 was chosen by 140 participants (15,1%) and option 3 by 137 participants (14,8%).

Would you be able to tell how the prices have changed in comparison to five years ago?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	467	50,3	50,4	50,4
	2	247	26,6	26,7	77,1
	3	105	11,3	11,3	88,4
	4	84	9,1	9,1	97,5
	Yes, absolutely	23	2,5	2,5	100,0
	Total	926	99,8	100,0	
Missing		2	,2		
Total		928	100,0		

Table 4.1.23

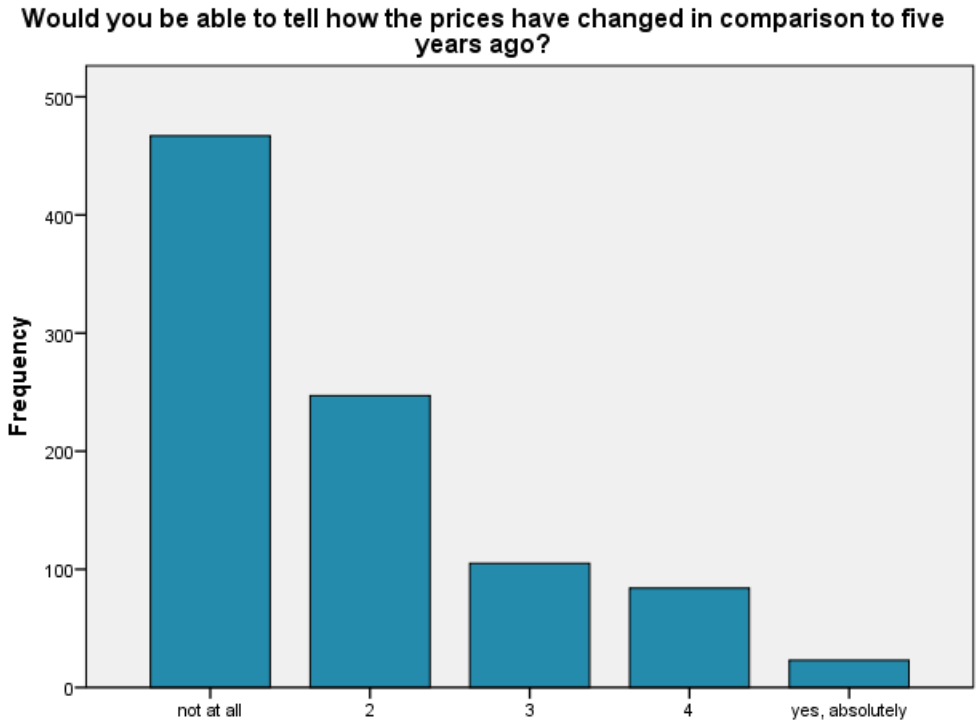

Fig. 4.1.16

When asked to what extent they were aware of changes in electricity prices in the last five years, the majority of participants (467 individuals amounting to 50,4%) chose option 1, claiming they had no idea at all about the nature of such changes. The second most chosen option was option 2, with 247 individuals (26,7%), followed by option 3 with 105 individuals (11,3%). A total of 84 participants (9,1%) chose option 4, indicating they had a relatively good idea about the nature of changes in electricity prices with 23 participants (2,5%) choosing option 5 and claiming to have a very good idea about the changes (*Table 4.1.23, Fig. 4.1.16*).

Would you be willing to invest more money for energy-efficient technologies (all else being equal)?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	18	1,9	1,9	1,9
	2	68	7,3	7,3	9,3
	3	252	27,2	27,2	36,5
	4	460	49,6	49,7	86,2
	Yes, absolutely	128	13,8	13,8	100,0
	Total	926	99,8	100,0	
Missing		2	,2		
Total		928	100,0		

Table 4.1.24

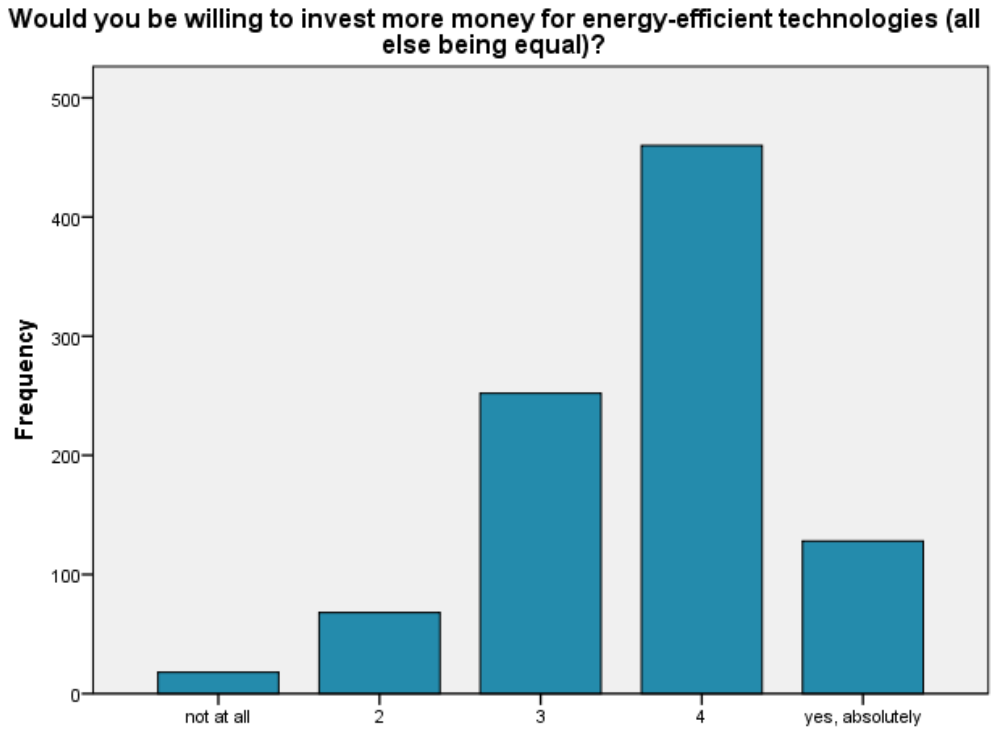

Fig. 4.1.17

As can be seen in Table 4.1.24, when asked about willingness to invest more money for more energy-efficient technologies, almost half of the participants (460 individuals amounting to 49,7%) chose option 4, indicating relatively high willingness. The second most chosen option was option 3 with 252 individuals (27,2%). Option 5, indicating the highest possible option for willingness was chosen by 128 participants (13,4%). A total of 68 participants (7,3%) chose option 2 with only 18 participants (1,9%) choosing option 1, indicating no willingness to invest more money for more energy-efficient technologies.

Ranking: Household appliances by wattage

	N	Mean
Washing machine	894	3,65
Refrigerator	896	4,06
Dishwasher	891	4,30
Computer (on)	891	5,80
Television (color)	891	5,91
Television (flatscreen)	892	6,61
Microwave	893	6,68
Vacuum cleaner	892	7,29
Laptop	895	8,18
Hair dryer	888	8,72

Coffee machine	890	9,82
Toaster	890	10,50
Computer (standby)	884	10,81
Radio	890	12,50
Valid values	876	

Table 4.1.25

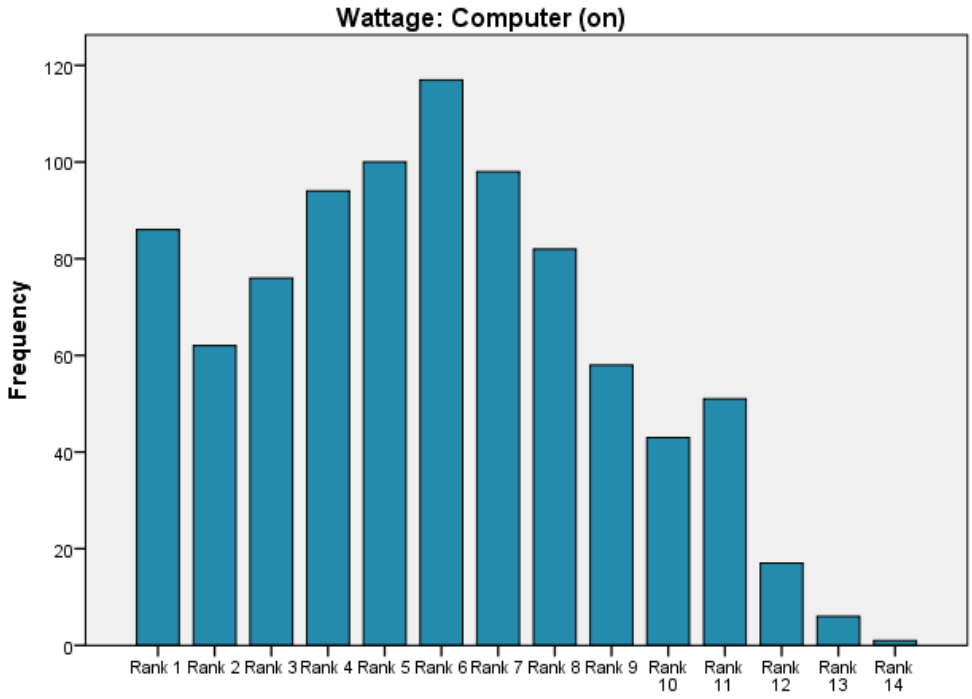

Fig. 4.1.18

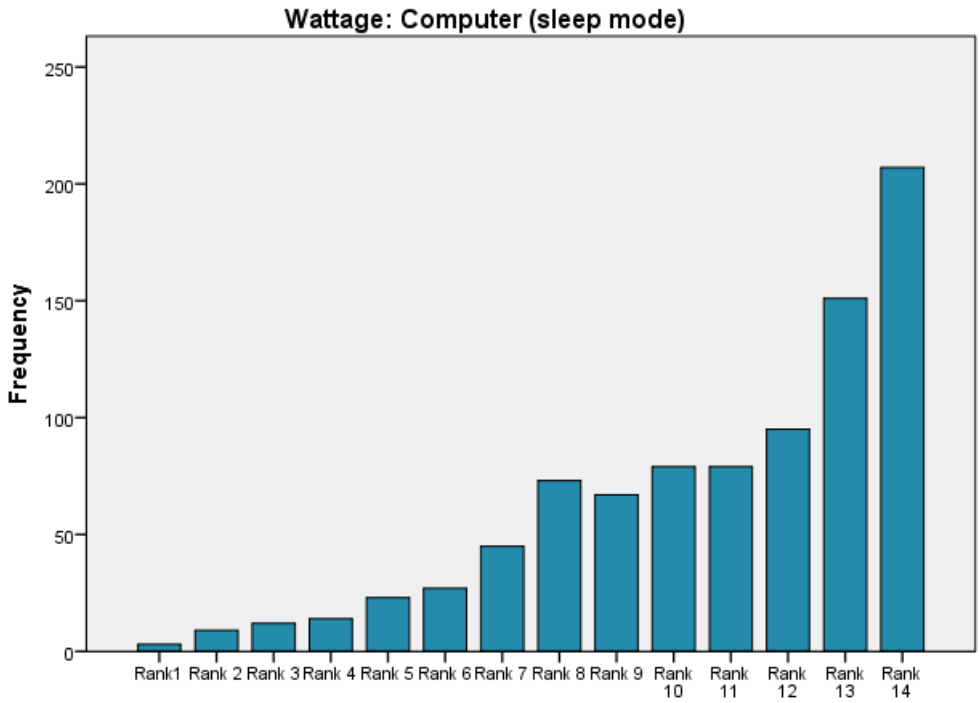

Fig. 4.1.19

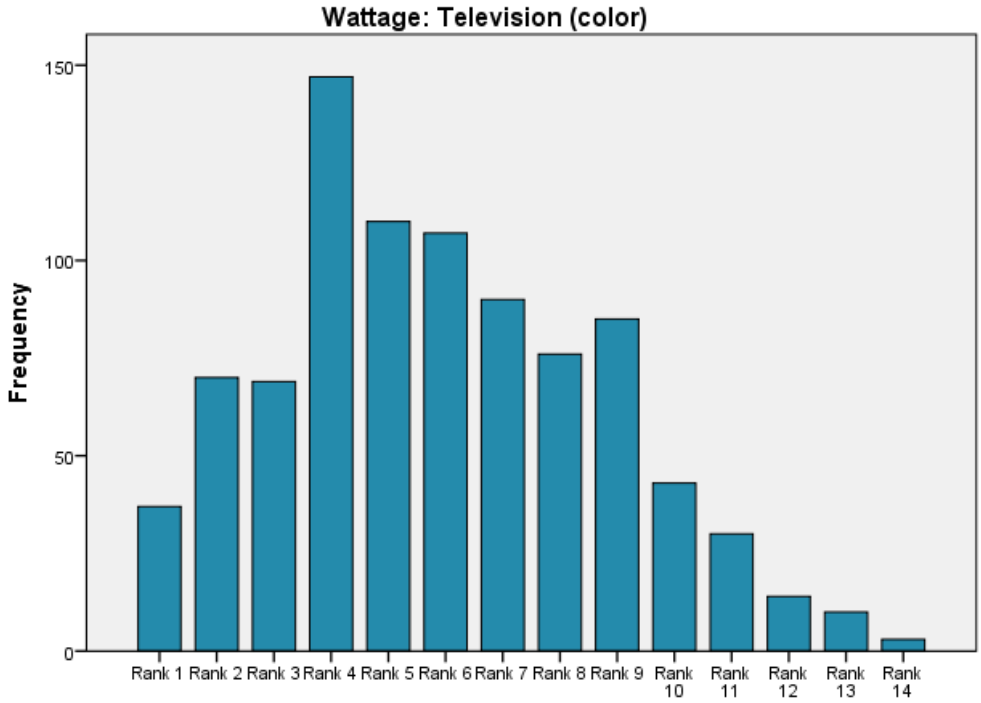

Fig. 4.1.20

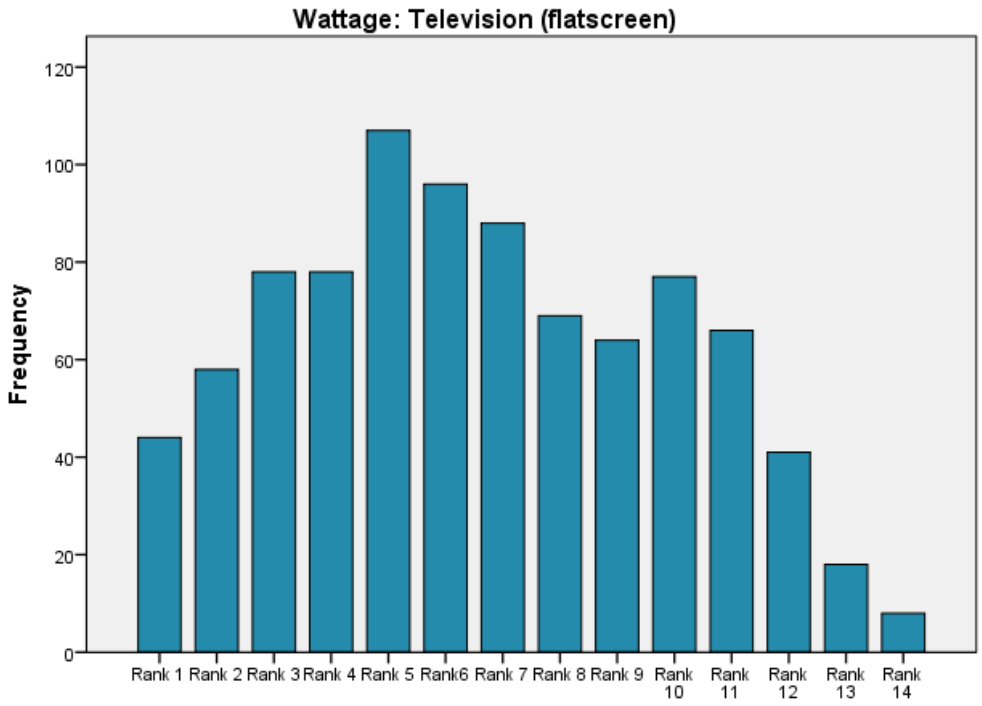

Fig. 4.1.21

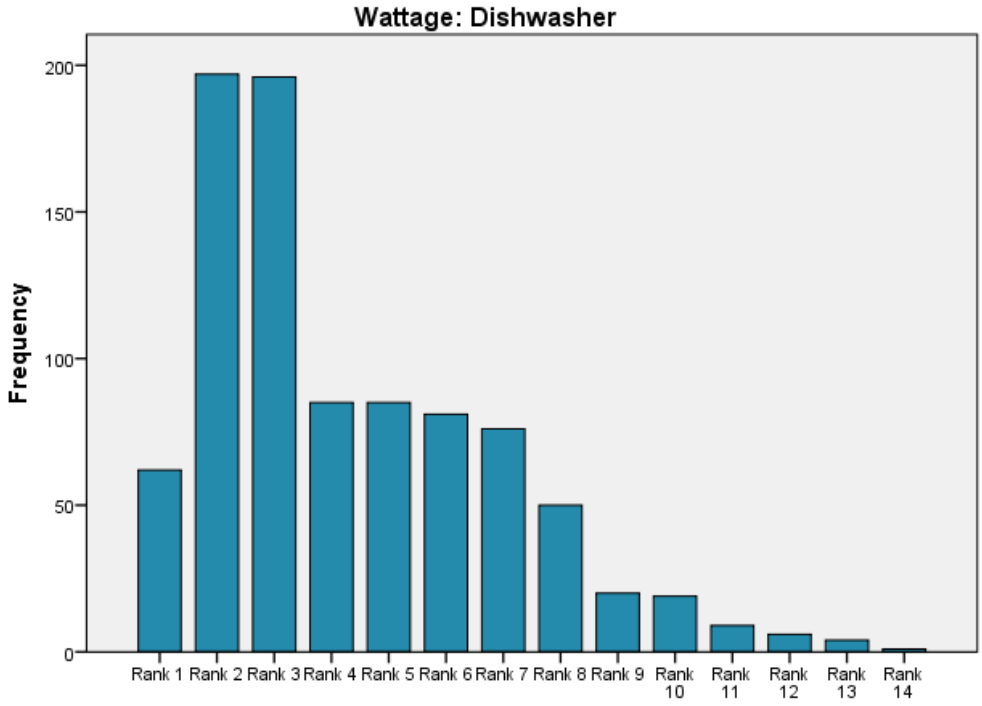

Fig. 4.1.22

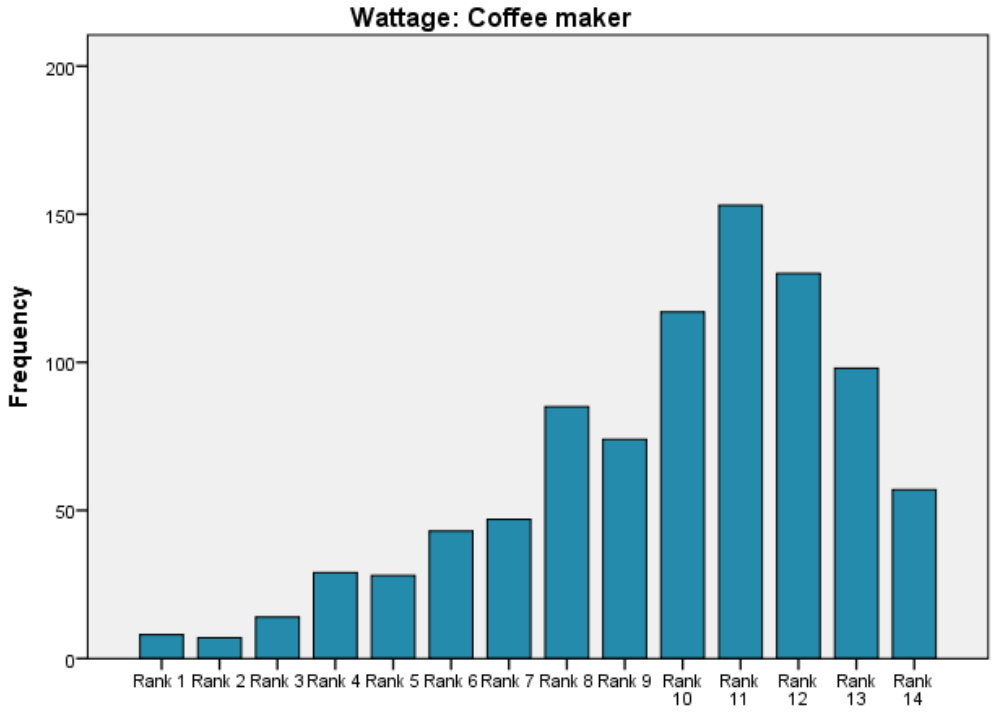

Fig. 4.1.23

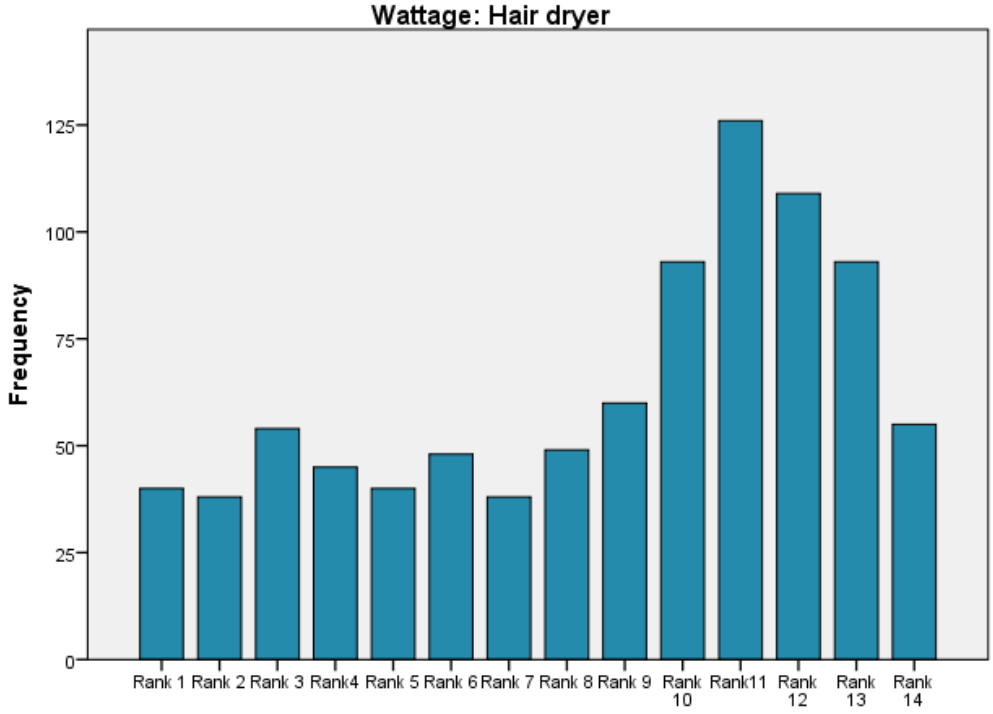

Fig. 4.1.24

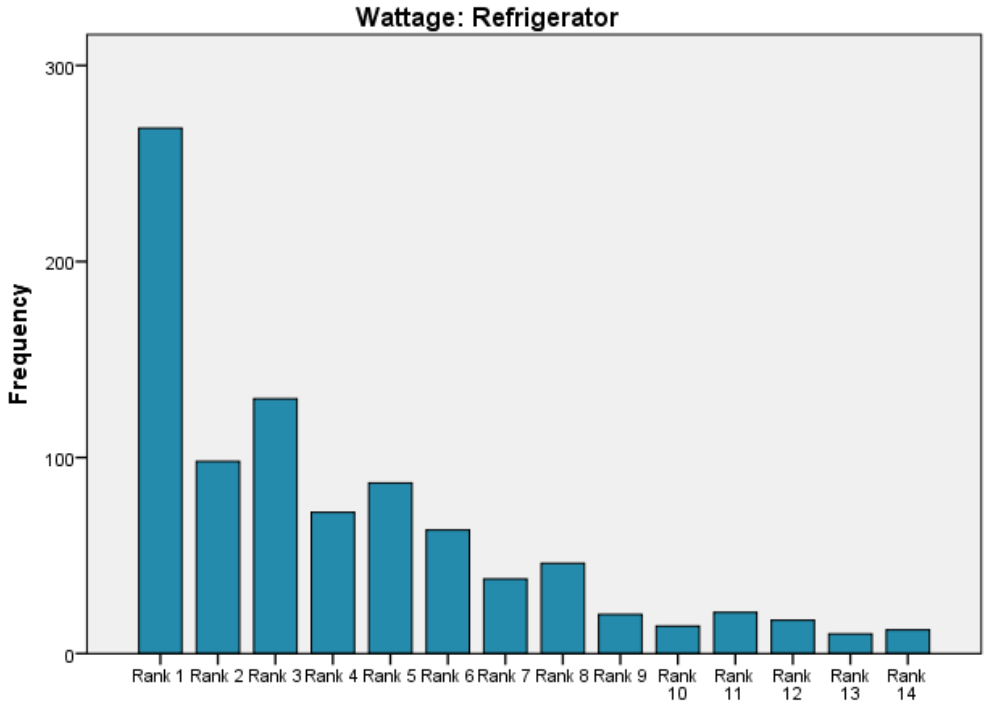

Fig. 4.1.25

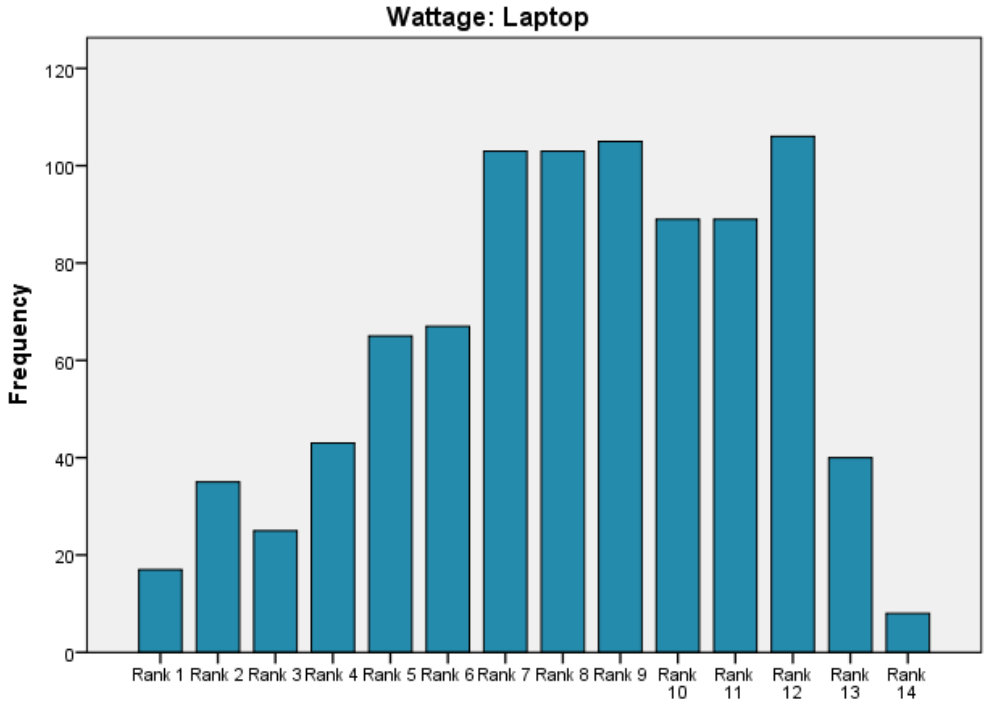

Fig. 4.1.26

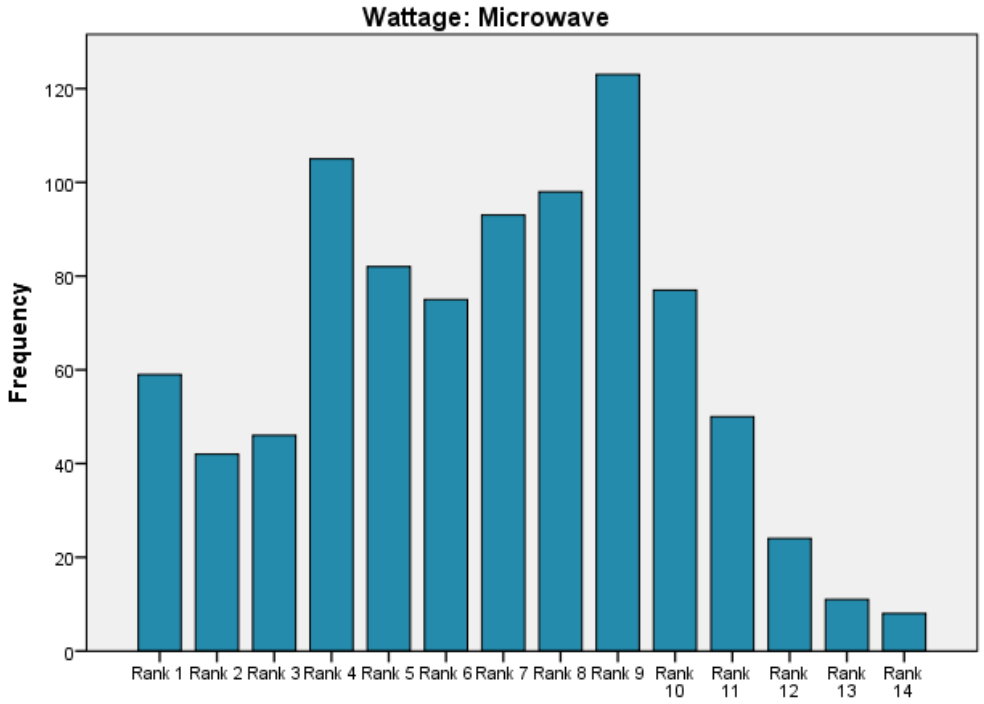

Fig. 4.1.27

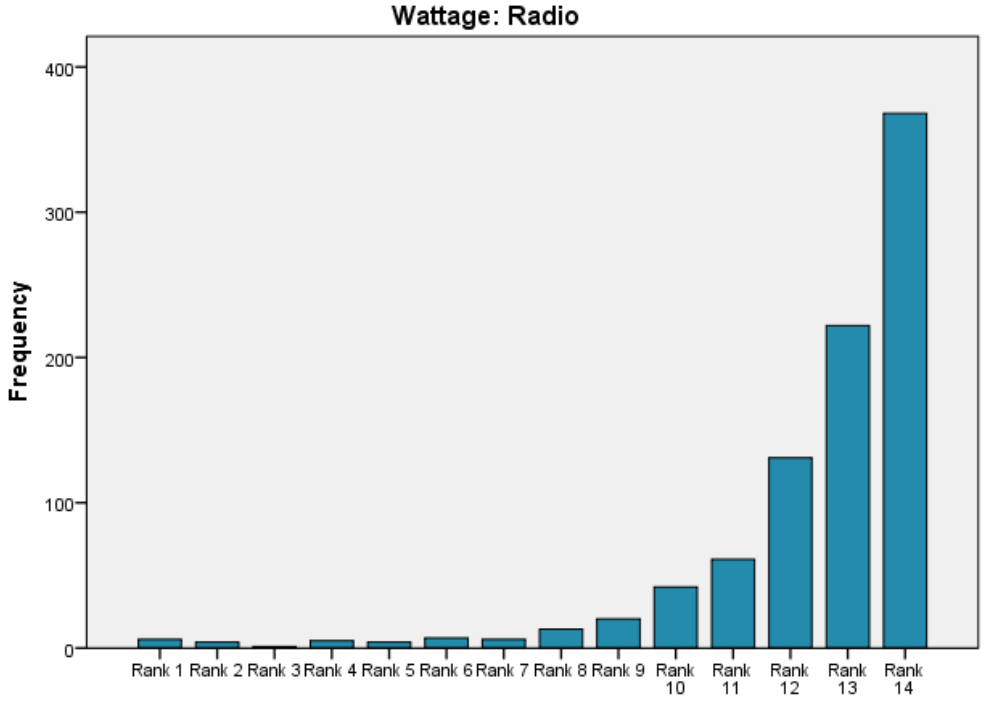

Fig. 4.1.28

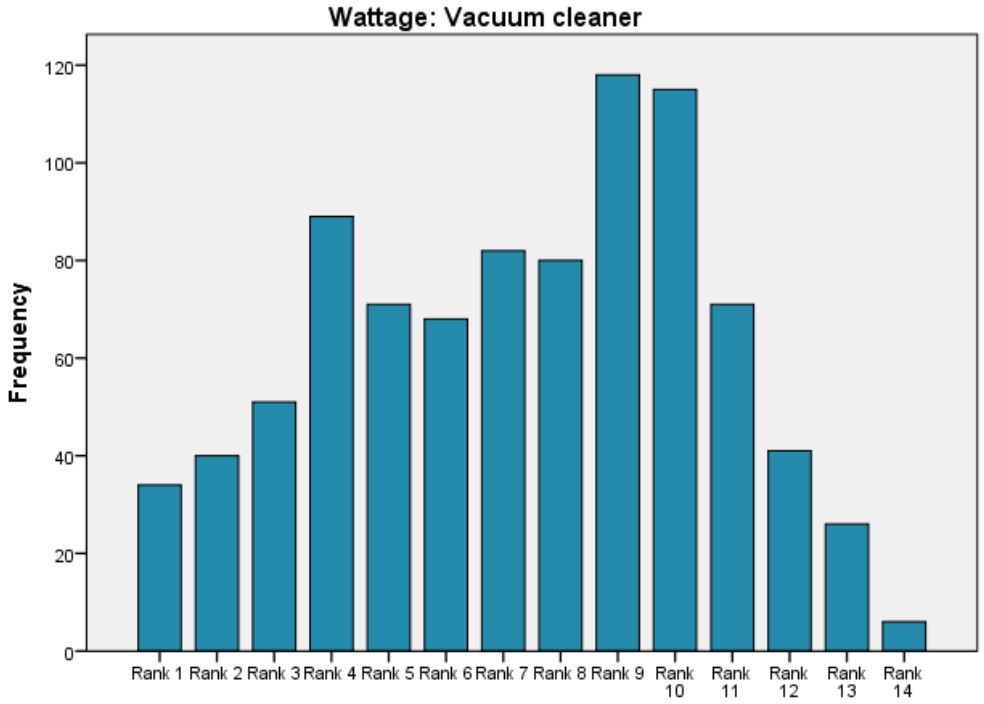

Fig. 4.1.29

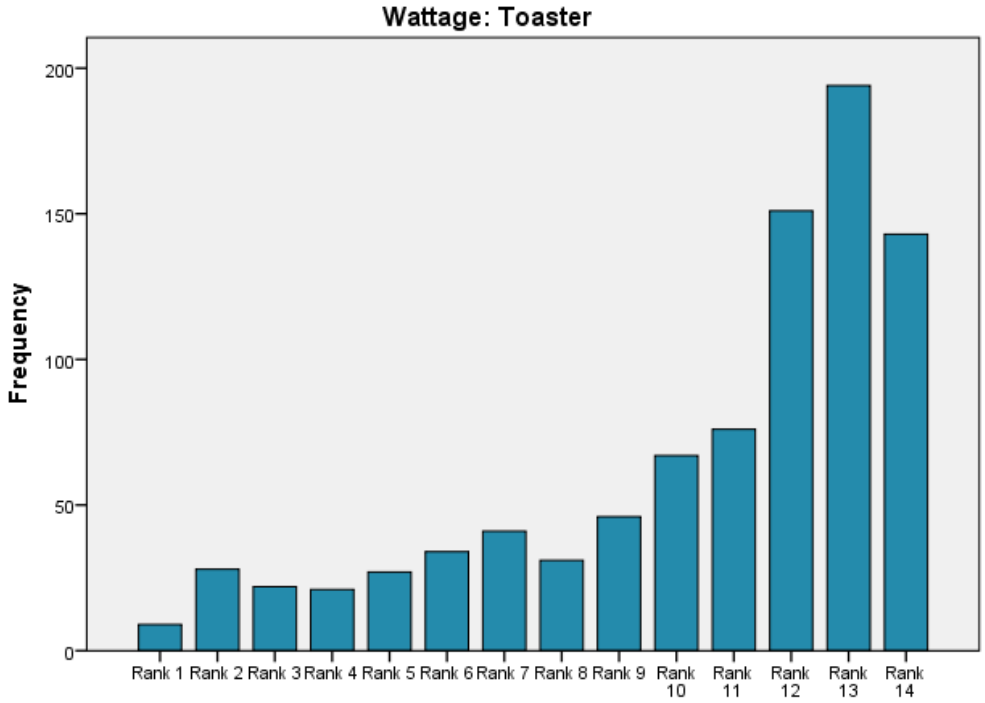

Fig. 4.1.30

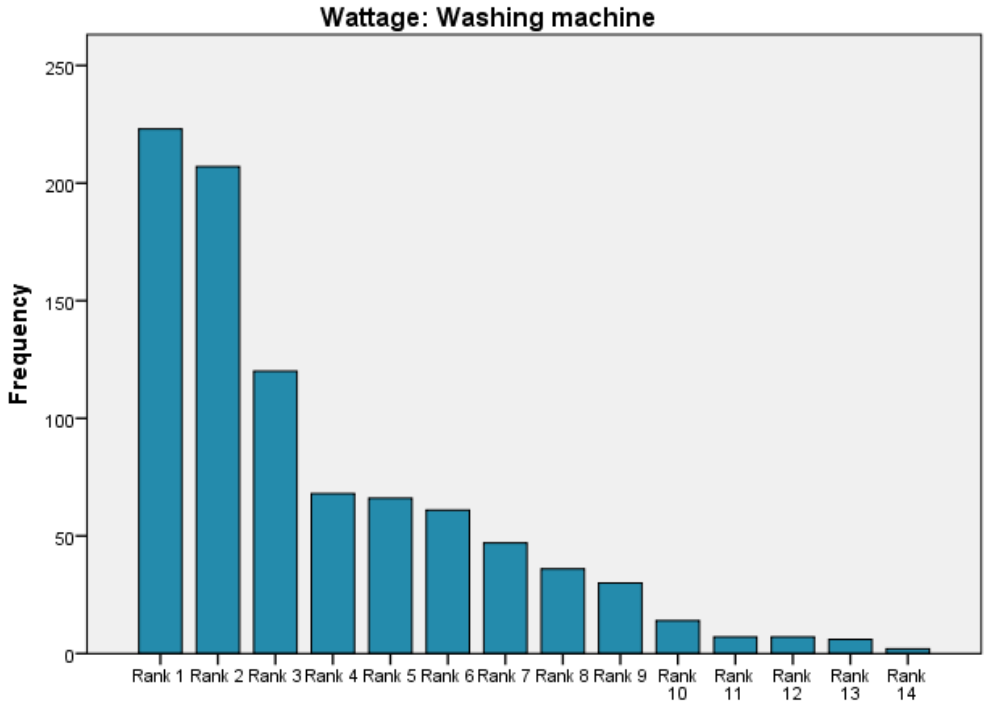

Fig. 4.1.31

Participants were asked to rank 14 household appliances by wattage. Table 4.1.25 displays the ranking calculated by using means, while Figures 4.1.18 – 4.1.31 display the ranking frequencies of each individual appliance. According to the table, the appliance believed to consume the most energy per time unit is the washing machine, followed by the refrigerator, the dishwasher, the computer (when turned on), the television (color), the flatscreen television, the microwave, the vacuum cleaner, the laptop, the hairdryer, the coffee machine, the toaster, the computer on standby and the radio in that order.

4.1.3. Internal Factors

How do you believe energy-consumption has changed in the past ten years?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Strong fall	2	,2	,2	,2
	2	9	1,0	1,0	1,2
	3	24	2,6	2,7	3,9
	4	272	29,3	30,2	34,0

	Strong rise	595	64,1	66,0	100,0
	Total	902	97,2	100,0	
Missing		26	2,8		
Total		928	100,0		

Table 4.1.26

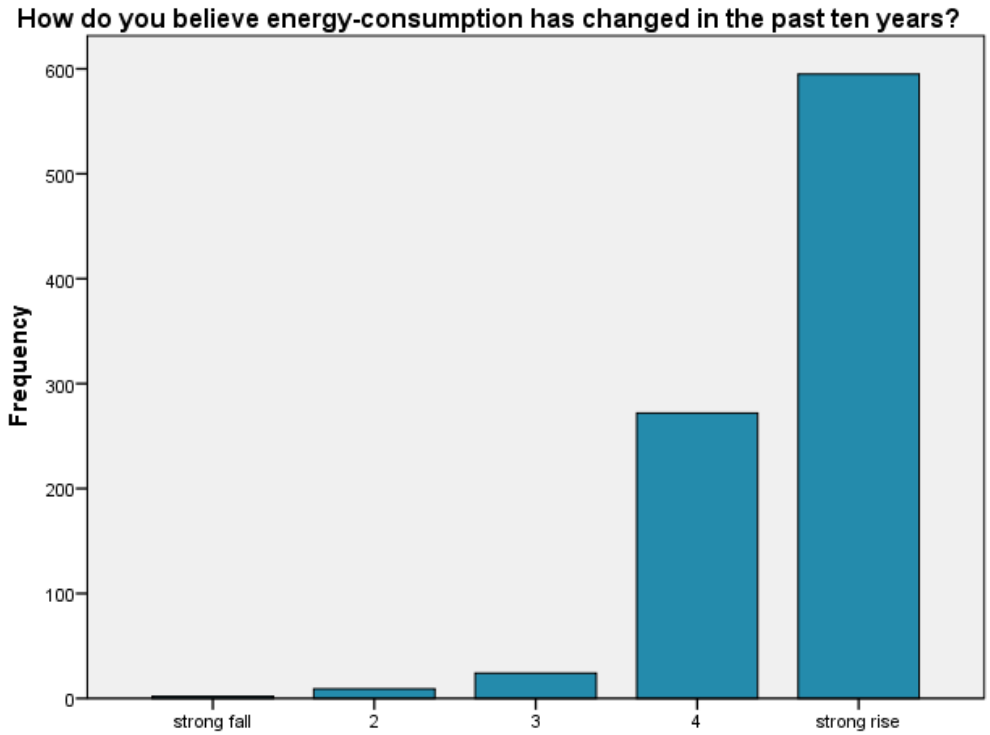

Fig. 4.1.32

Figure 4.1.32 shows that most participants believe there has been a strong rise in energy consumption in the past ten years. Table 4.1.26 specifies that 595 individuals (66%) chose 5, meaning they believe there has been a strong rise. There are 272 individuals (30,2%) who chose 4, believing there has been a rise in energy consumption. Only 2 individuals feel there has been a strong fall, and 9 individuals believe there has been a fall in energy consumption in the past ten years.

Does an increase in energy-consumption have a significant impact on the environment?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	900	97,0	98,7	98,7
	No	12	1,3	1,3	100,0
	Total	912	98,3	100,0	

Missing	16	1,7		
Total	928	100,0		

Table 4.1.27

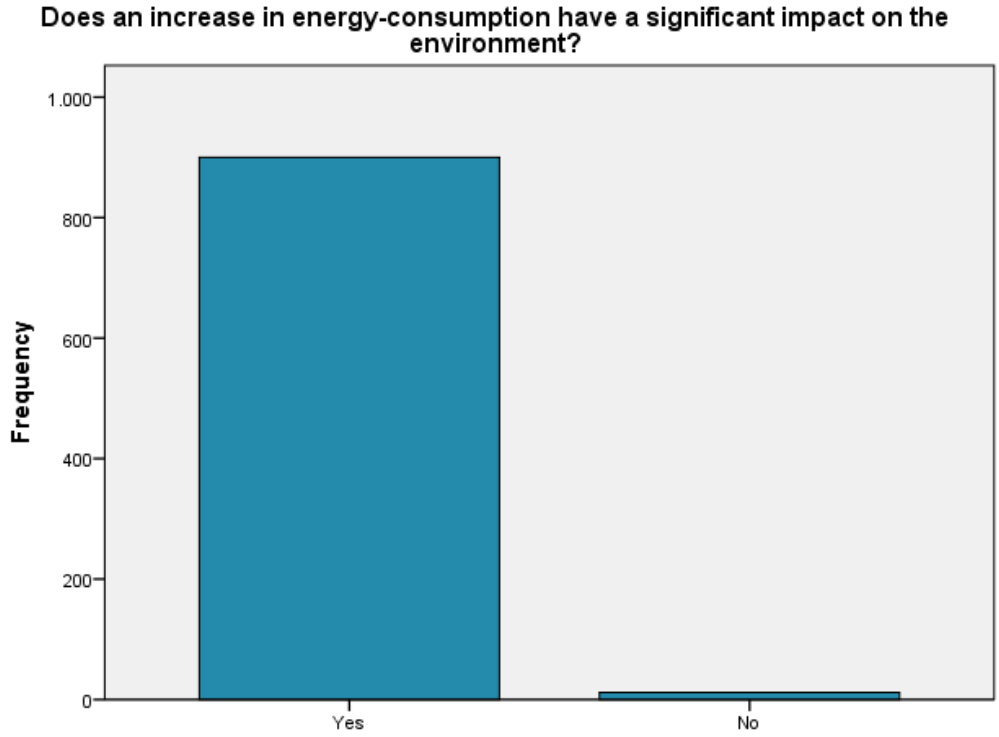

Fig. 4.1.33

One can see in Figure 4.1.33 that a considerable amount of the participants do believe that the increase of energy-consumption has a significant impact on the environment. As Table 4.1.27 shows, only 12 out of 912 individuals who answered this question answered with "no". Therefore there is almost complete agreement on this issue, with 98,7% of participants having answered "yes".

Is there a significant man-induced contribution to climate change?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	872	94,0	95,5	95,5
	No	41	4,4	4,5	100,0
	Total	913	98,4	100,0	
Missing		15	1,6		
Total		928	100,0		

Table 4.1.28

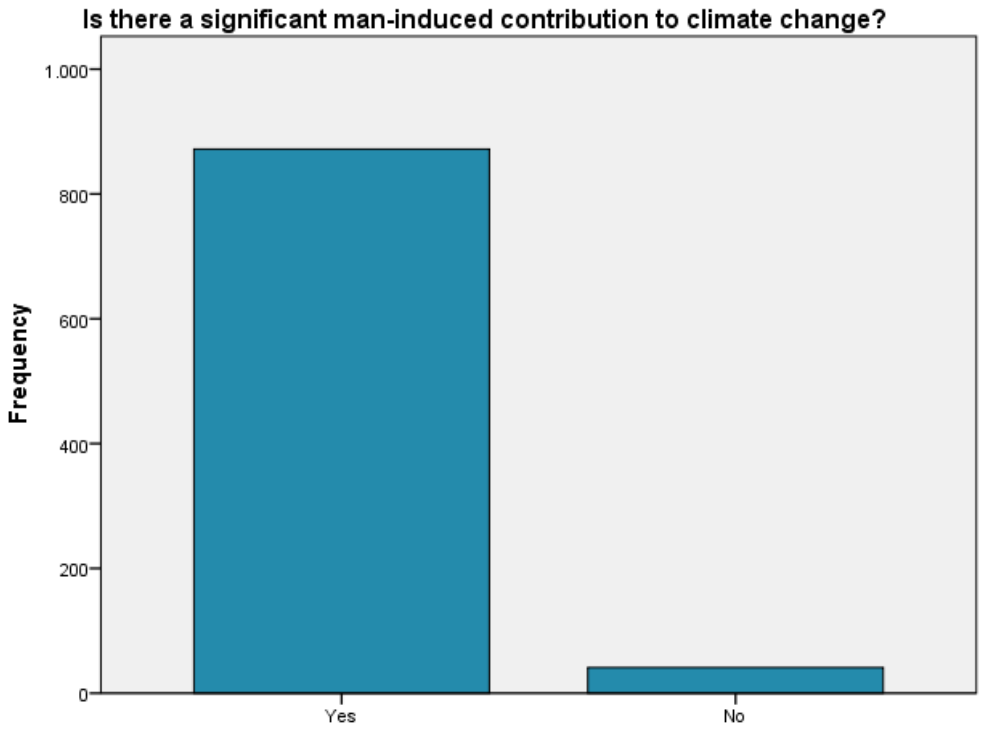

Fig. 4.1.34

As shown in Table 4.1.28, 95,5% (comprised of 872 individuals) believe that there is a significant man-induced contribution to climate change, with 4,5% (41 individuals) believing there is not (*Fig. 4.1.34*).

Do we as a society hold a responsibility toward future generations to leave behind an economically, ecologically and socially safe and stable environment?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	5	,5	,5	,5
	2	5	,5	,5	1,1
	3	16	1,7	1,7	2,8
	4	74	8,0	8,0	10,8
	Yes, absolutely	828	89,2	89,2	100,0
	Total	928	100,0	100,0	

Table 4.1.29

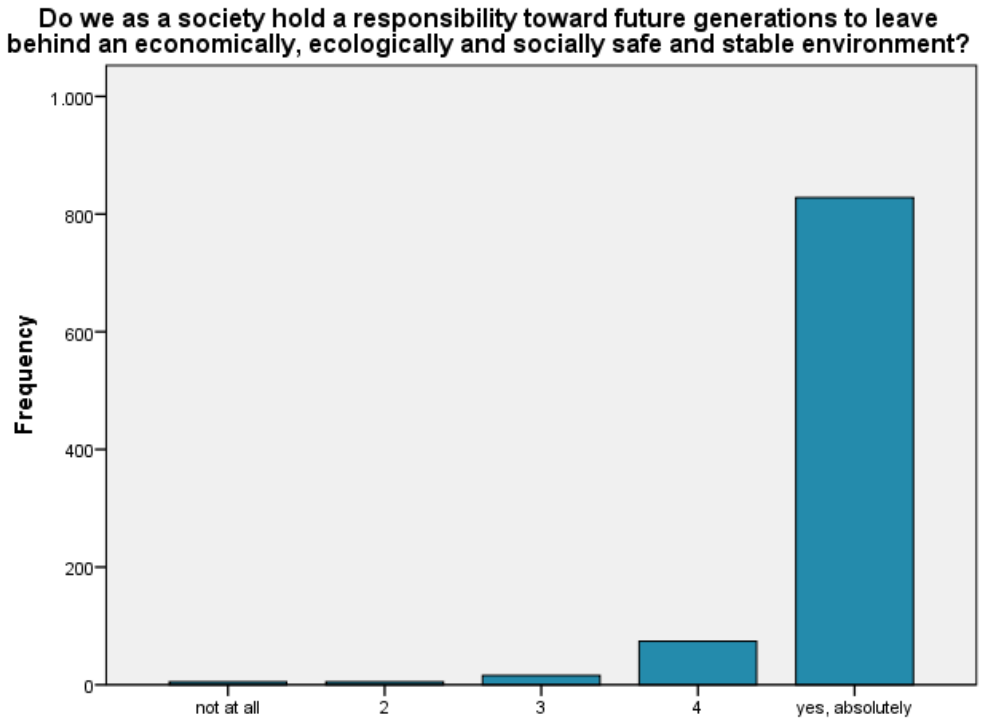

Fig. 4.1.35

Table 4.1.29 shows that 89,2% (828 individuals) chose option 5 for this question. Seeing as more than 80% chose the highest extreme, one can assume that this is a Ceiling-Effect (*Fig. 4.1.35*). The question should perhaps have been posed as a yes-no question.

Do ecological issues have an impact on economic and social well-being?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	2	,2	,2	,2
	2	15	1,6	1,6	1,8
	3	64	6,9	6,9	8,7
	4	254	27,4	27,4	36,1
	Yes, absolutely	592	63,8	63,9	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.30

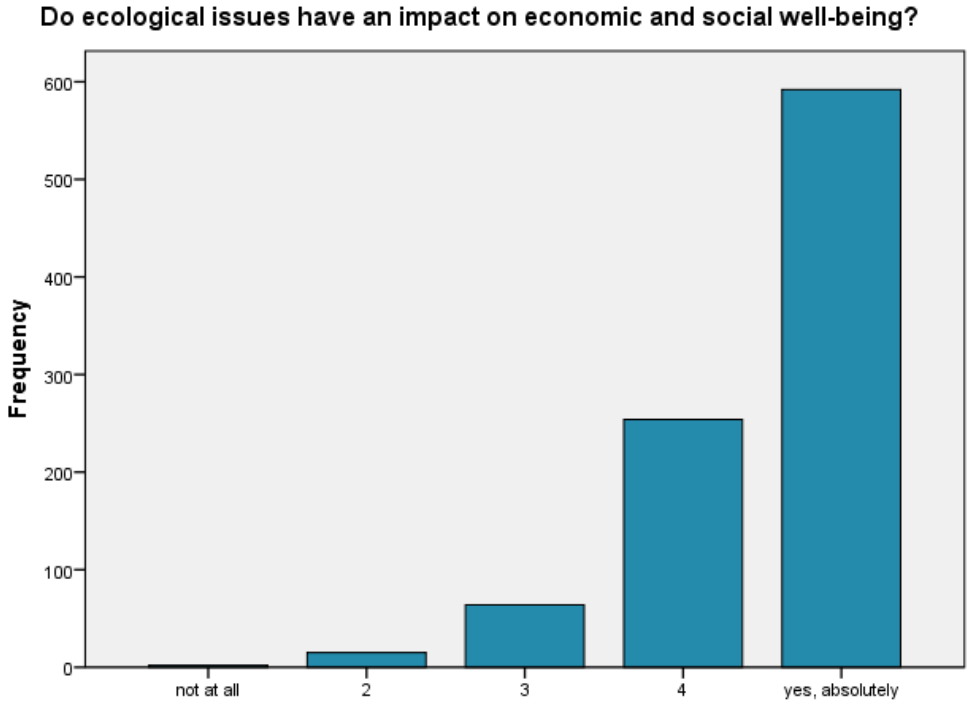

Fig. 4.1.36

As seen in Table 4.1.30, 63,9% (592 individuals) chose option 5, believing there absolutely is an impact of ecological issues on economic and social well-being. Option number 4 was chosen by 27,4% (254 individuals) while option number 1 was only chosen by 2 individuals, and option 2 only by 15 individuals (*Fig. 4.1.36*).

Do you believe mankind has already had a severe negative impact on the environment?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	8	,9	,9	,9
	2	16	1,7	1,7	2,6
	3	55	5,9	5,9	8,5
	4	190	20,5	20,5	29,0
	Yes, absolutely	659	71,0	71,0	100,0
	Total	928	100,0	100,0	

Table 4.1.31

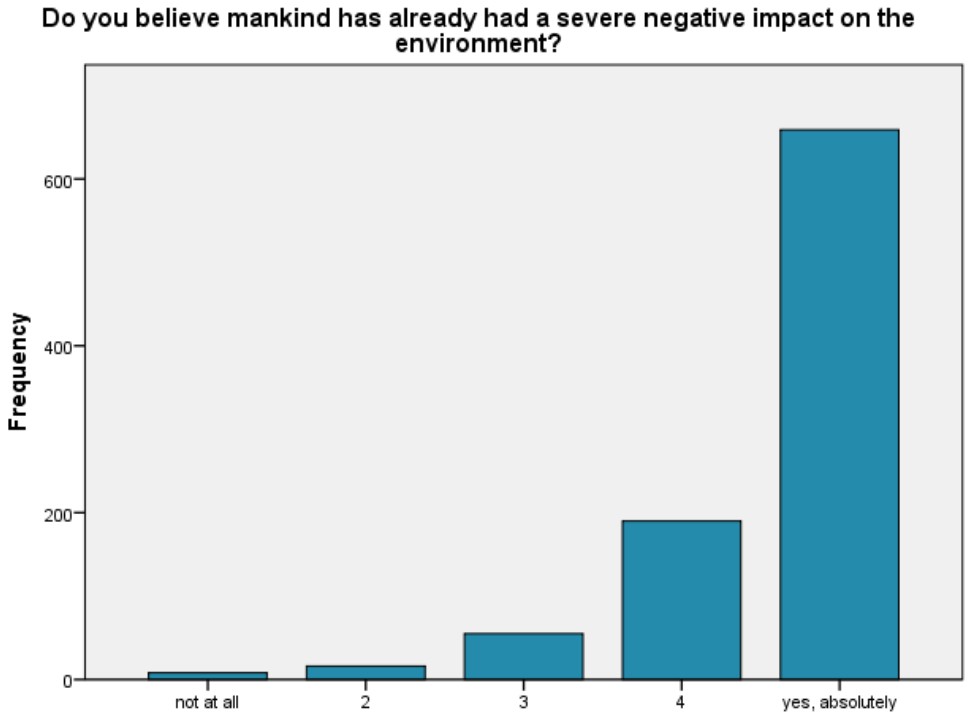

Fig. 4.1.37

Table 4.1.31 shows that 71% (659 individuals) chose option number 5, believing that mankind has already had a severe negative impact on the environment. Option number 4 was chosen by 20,5% (190 individuals). Only 8 participants chose option number 1, believing that mankind has not had a severe negative impact on the environment at all, with 16 participants having chosen option 2 (*Fig. 4.1.37*).

How important do you feel is the role of individual households in energy issues?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not important at all	4	,4	,4	,4
	2	49	5,3	5,3	5,8
	3	221	23,8	24,0	29,8
	4	350	37,7	38,1	67,9
	Very important	295	31,8	32,1	100,0
	Total	919	99,0	100,0	
Missing		9	1,0		
Total		928	100,0		

Table 4.1.32

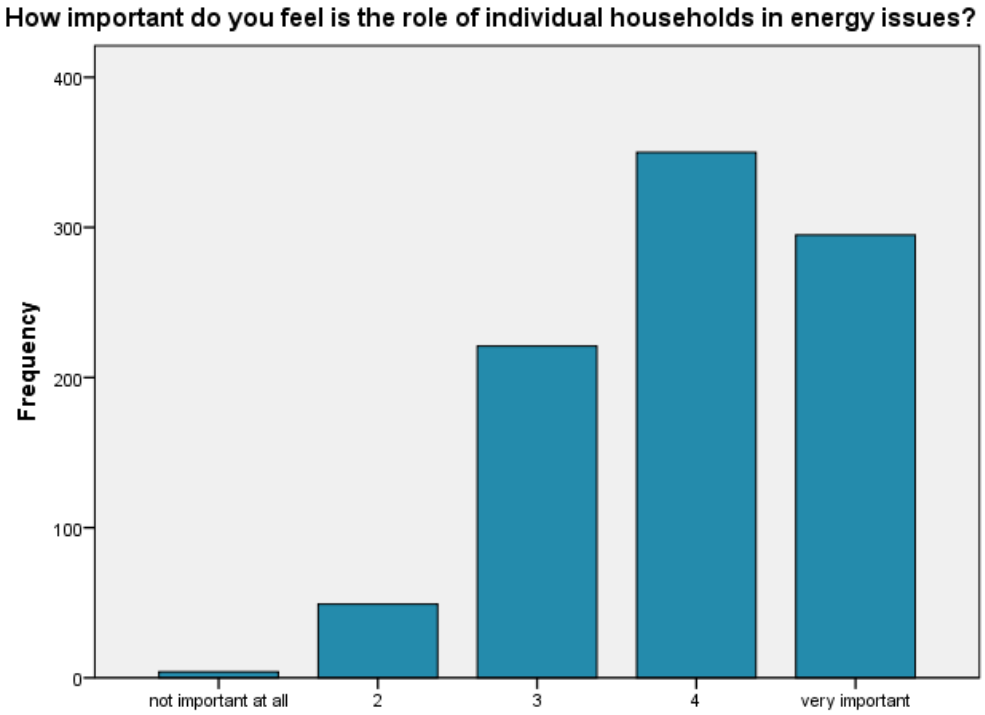

Fig. 4.1.38

According to Table 4.1.32, most participants (38,1% comprised of 350 individuals) chose option 4 for this question. A total of 295 individuals (32,1%) chose option 5, believing the role of individual households plays a very important part in energy issues. Option 3 was chosen by 221 participants (24%), and option 2 by 49 participants (5,3%), while only 4 participants (0,4%) opted for option 1, believing that the role of individual households is not important at all concerning energy issues (*Fig. 4.1.38*).

Do you believe the current electricity prices are adequate?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Much too low	10	1,1	1,1	1,1
	2	58	6,3	6,3	7,4
	3	614	66,2	67,2	74,6
	4	200	21,6	21,9	96,5
	Much too high	32	3,4	3,5	100,0
	Total	914	98,5	100,0	
Missing		14	1,5		
Total		928	100,0		

Table 4.1.33

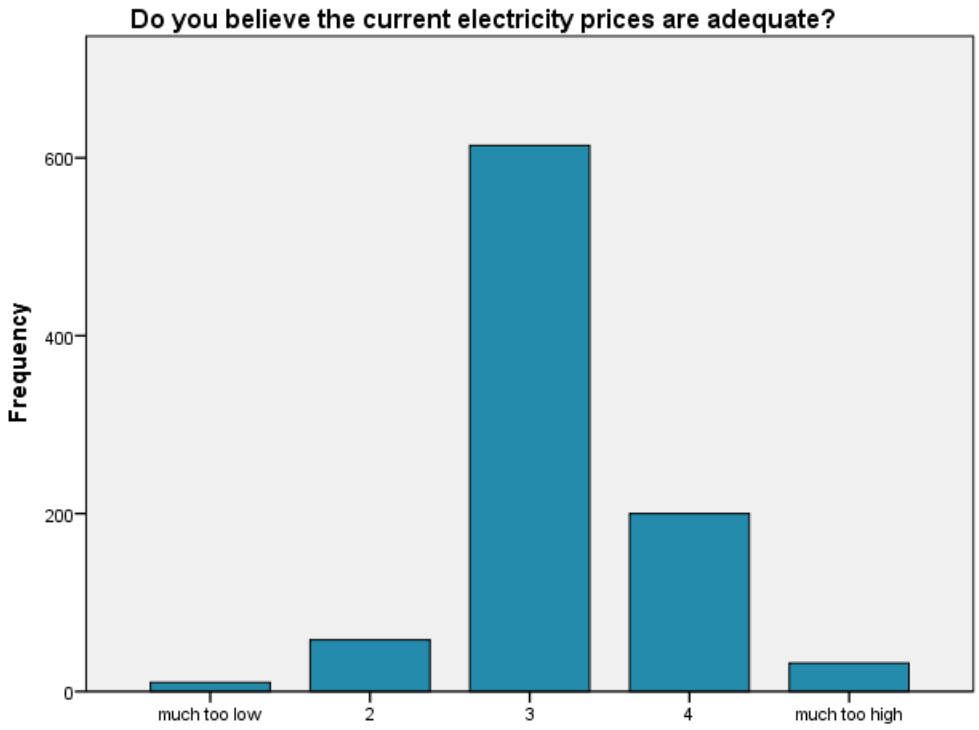

Fig. 4.1.39

A total of 614 participants, amounting to 67,2%, chose option 3 for this question, indicating that they feel the current electricity prices are adequate. Only 10 individuals (1,1%) chose option 1, believing the electricity prices are much too low, and 58 participants (6,3%) chose option 2, believing electricity prices are too low. A total of 200 participants (21,9%) chose option 4, believing the electricity prices are too high, with 32 participants (3,5%) believing electricity prices are much too high (*Table 4.1.33, Fig. 4.1.39*).

How high would you estimate is the contribution of private households to total Austrian energy demand?

N	Valid	907
	Missing	21
Mean		42,21
Std		18,981
Minimum		1
Maximum		100

Table 4.1.34

How high would you estimate is the contribution of private households to total Austrian energy demand?

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	1	,1	,1	,1
	2	2	,2	,2	,3
	5	11	1,2	1,2	1,5
	7	1	,1	,1	1,7
	10	22	2,4	2,4	4,1
	12	3	,3	,3	4,4
	13	1	,1	,1	4,5
	14	2	,2	,2	4,7
	15	22	2,4	2,4	7,2
	18	2	,2	,2	7,4
	20	87	9,4	9,6	17,0
	24	1	,1	,1	17,1
	25	37	4,0	4,1	21,2
	26	1	,1	,1	21,3
	27	3	,3	,3	21,6
	28	1	,1	,1	21,7
	30	130	14,0	14,3	36,1
	31	1	,1	,1	36,2
	32	1	,1	,1	36,3
	33	6	,6	,7	36,9
	34	1	,1	,1	37,0
	35	43	4,6	4,7	41,8
	36	2	,2	,2	42,0
	38	2	,2	,2	42,2
	40	146	15,7	16,1	58,3
	42	3	,3	,3	58,7
	44	1	,1	,1	58,8
	45	28	3,0	3,1	61,9
	47	1	,1	,1	62,0
	48	2	,2	,2	62,2
	49	1	,1	,1	62,3
	50	78	8,4	8,6	70,9
	52	2	,2	,2	71,1
	53	1	,1	,1	71,2
	55	11	1,2	1,2	72,4
	56	1	,1	,1	72,5

	57	1	,1	,1	72,7
	58	1	,1	,1	72,8
	60	110	11,9	12,1	84,9
	61	1	,1	,1	85,0
	62	2	,2	,2	85,2
	63	1	,1	,1	85,3
	64	2	,2	,2	85,6
	65	26	2,8	2,9	88,4
	66	2	,2	,2	88,6
	67	1	,1	,1	88,8
	68	1	,1	,1	88,9
	70	50	5,4	5,5	94,4
	75	14	1,5	1,5	95,9
	77	1	,1	,1	96,0
	78	1	,1	,1	96,1
	80	20	2,2	2,2	98,3
	85	7	,8	,8	99,1
	86	1	,1	,1	99,2
	90	2	,2	,2	99,4
	95	1	,1	,1	99,6
	98	1	,1	,1	99,7
	99	1	,1	,1	99,8
	100	2	,2	,2	100,0
	Total	907	97,7	100,0	
Missing		21	2,3		
Total		928	100,0		

Fig. 4.1.35

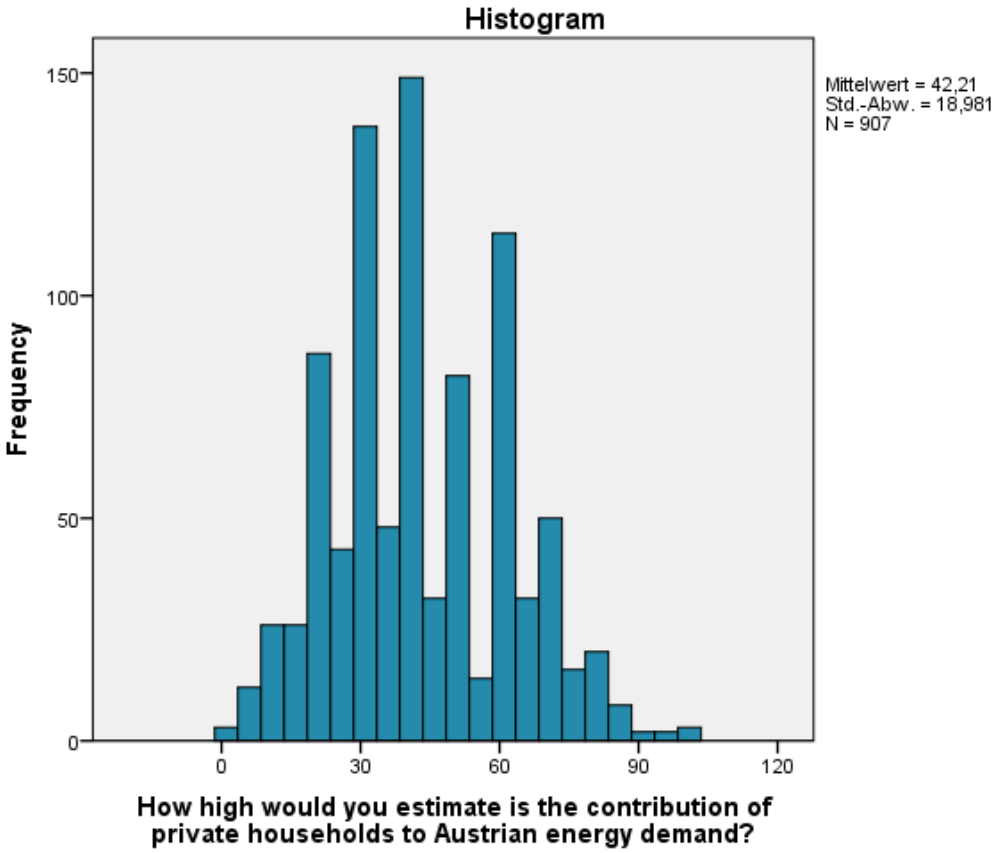

Fig. 4.1.40

When asked to estimate how high the contribution of private households to Austrian energy demand is in percent, most participants estimated 40% (146 individuals amounting to 16,1%). The second most speculated number was 30% by 130 participants (amounting to 14,3%). The third most speculated number was 60% by 110 participants (amounting to 12,1%) (*Table 4.1.35*, *Fig. 4.1.40*). The mean is 42,21 with a very high standard deviation of 18,981. The estimates ranged from 1% to 100% (*Table 4.1.34*).

Which option would be the more effective way to reduce energy consumption?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Changing behavior	633	68,2	68,3	68,3
	Investing in energy efficient appliances	294	31,7	31,7	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.36

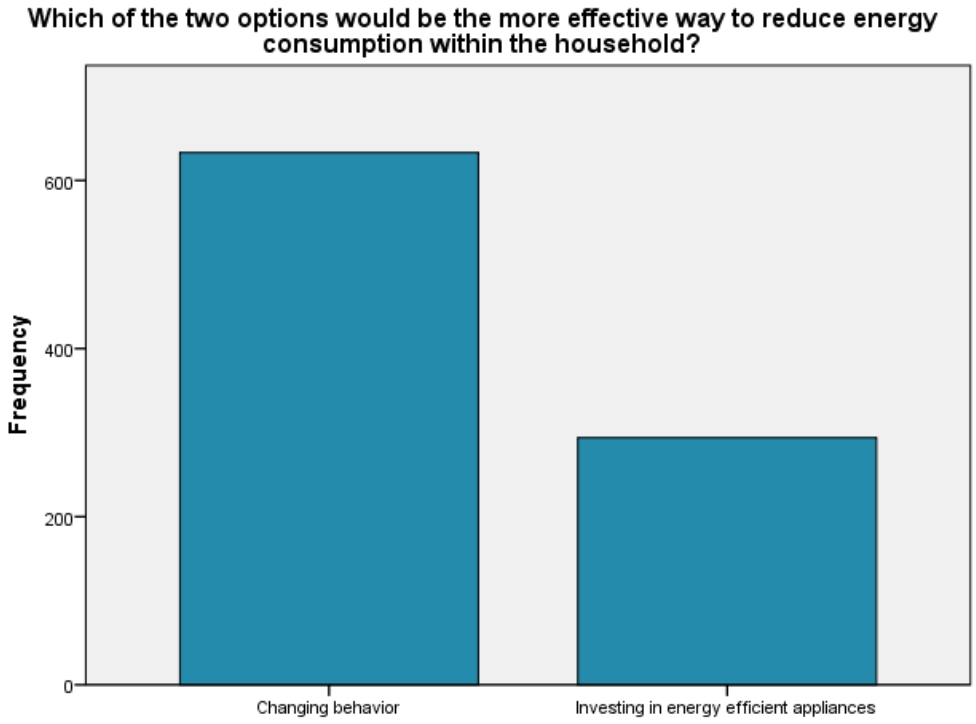

Fig. 4.1.41

Which of the options would you be more willing to realize in order to reduce energy consumption?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Changing behavior	677	73,0	73,2	73,2
	Investing in energy efficient appliances	248	26,7	26,8	100,0
	Total	925	99,7	100,0	
Missing		3	,3		
Total		928	100,0		

Table 4.1.37

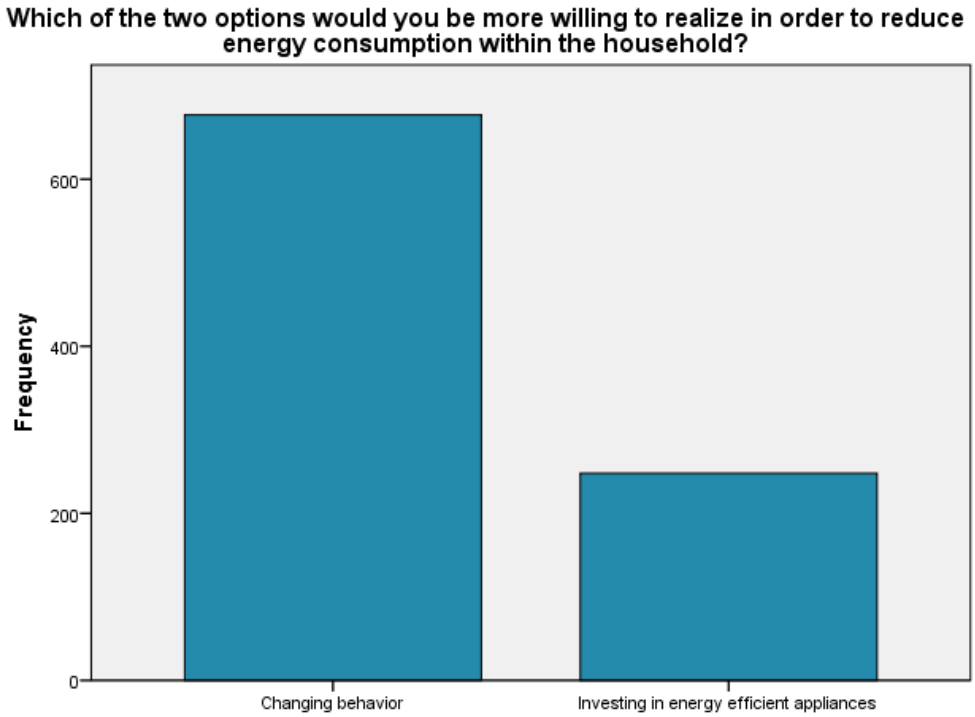

Fig. 4.1.42

The participants of this survey were more likely to believe that changing behavior is the more effective way to reduce electricity consumption within the household, with 633 participants (68,3%) choosing this option. A total of 294 individuals, amounting to 31,7%, believed investing in energy efficient appliances is the more effective way to reduce electricity consumption within the household (*Table 4.1.36, Fig. 4.1.41*). When asked about which of the two options they are more willing to realize, a total of 677 individuals making up 73,2% of the participants chose the option of changing behavior, with 248 participants (26,8%) choosing the option of investing in energy efficient appliances (*Table 4.1.37, Fig. 4.1.42*).

Which of the following is most likely to deter you from exercising energy-saving behaviors?

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Monetary costs	212	22,8	23,2	23,2
	Lack of time	67	7,2	7,3	30,6
	Sacrifice of comfort	444	47,8	48,6	79,2
	No motivation	13	1,4	1,4	80,6
	My own actions will not make a difference	52	5,6	5,7	86,3

	I don't have enough information to engage in effective energy-saving behavior	100	10,8	11,0	97,3
	Other	25	2,7	2,7	100,0
	Total	913	98,4	100,0	
Missing		15	1,6		
Total		928	100,0		

Table 4.1.38

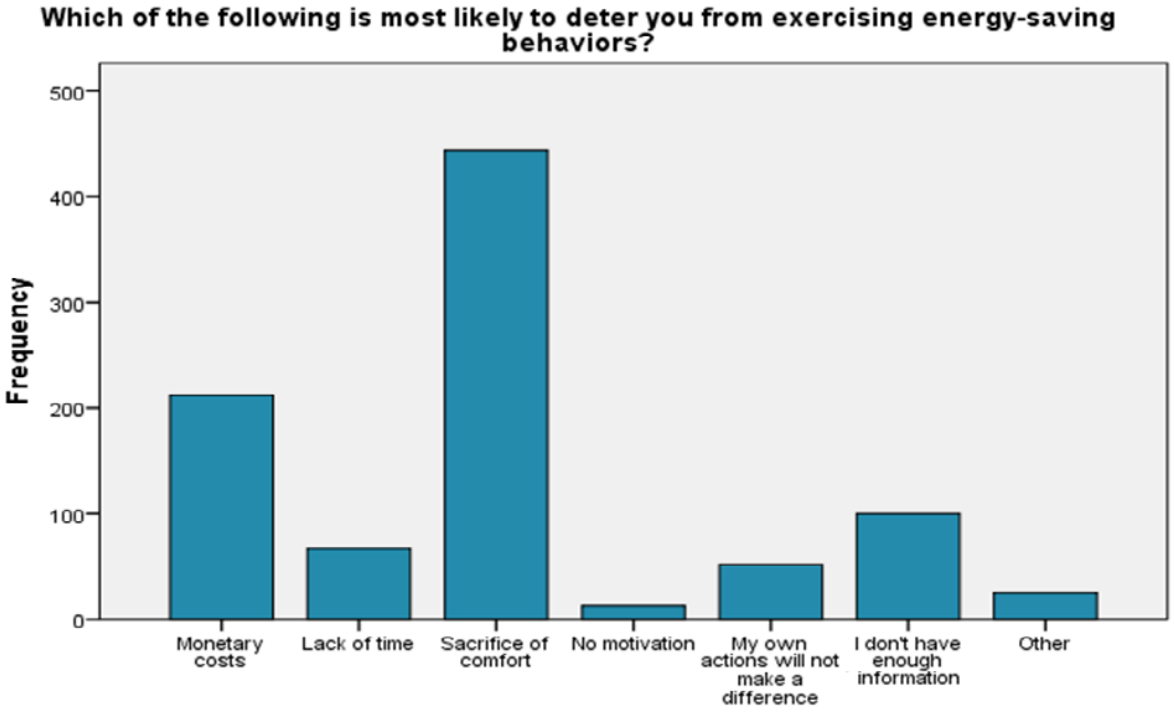

Fig. 4.1.43

When asked what is most likely to deter them from exercising energy-saving behaviors most participants (444 individuals amounting to 48,6%) answered with "sacrifice of comfort". The second most chosen response was "monetary costs", with 212 participants (23,2%) choosing this option. The third most common response was "I don't have enough information to effectively engage in energy-saving behaviors" with 100 participants (11%) choosing this option. The fourth most common response was "lack of time", chosen by 67 individuals amounting to 7,3%, followed closely by "my own actions will not make a difference" chosen by 52 individuals amounting to 5,7%. The least commonly chosen options were "Other factors" with 25 individuals choosing this option and "no motivation" chosen by only 13 individuals (*Table 4.1.38, Fig. 4.1.43*).

What is your energy-saving behavior primarily driven by?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Saving money	386	41,6	42,0	42,0
	Environmental concerns	465	50,1	50,6	92,6
	Convenience	33	3,6	3,6	96,2
	Other	35	3,8	3,8	100,0
	Total	919	99,0	100,0	
Missing		9	1,0		
Total		928	100,0		

Table 4.1.39

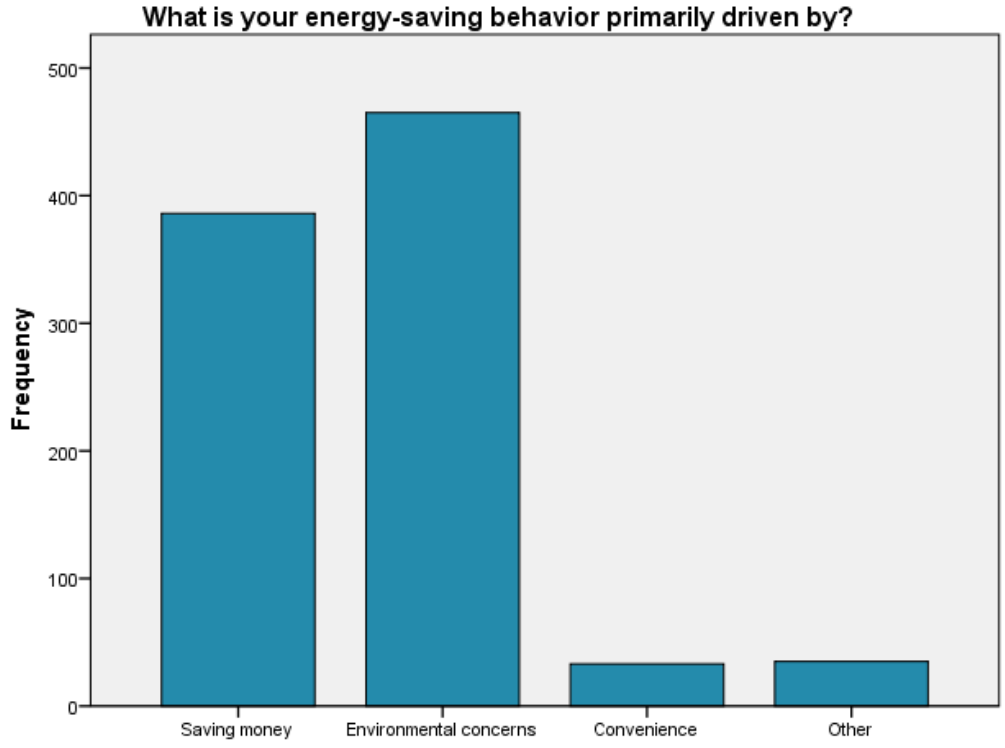

Fig. 4.1.44

When asked which factor is the primary driver of their energy behavior half of the participants (465 individuals amounting to 50,6%) chose the option "environmental concerns". The second most commonly chosen factor (386 participants amounting to 42%) was "saving money". A total of 35 participants (3,8%) chose the option "other", and only 33 participants (3,6%) chose the option "convenience" (*Table 4.1.39, Fig. 4.1.44*). Among the other factors specified by the participants were habits and upbringing.

Do you experience any of the following when confronted with reports of climate change?

Fear

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	666	71,8	71,8	71,8
	Yes	262	28,2	28,2	100,0
	Total	928	100,0	100,0	

Sadness

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	367	39,5	39,5	39,5
	Yes	561	60,5	60,5	100,0
	Total	928	100,0	100,0	

Pain

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	816	87,9	87,9	87,9
	Yes	112	12,1	12,1	100,0
	Total	928	100,0	100,0	

Anger

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	459	49,5	49,5	49,5
	Yes	469	50,5	50,5	100,0
	Total	928	100,0	100,0	

Guilt

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	696	75,0	75,0	75,0
	Yes	232	25,0	25,0	100,0
	Total	928	100,0	100,0	

Apathy

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	837	90,2	90,2	90,2
	Yes	91	9,8	9,8	100,0
	Total	928	100,0	100,0	

Other

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	No	828	89,2	89,2	89,2

Yes	100	10,8	10,8	100,0
Total	928	100,0	100,0	

Table 4.1.40

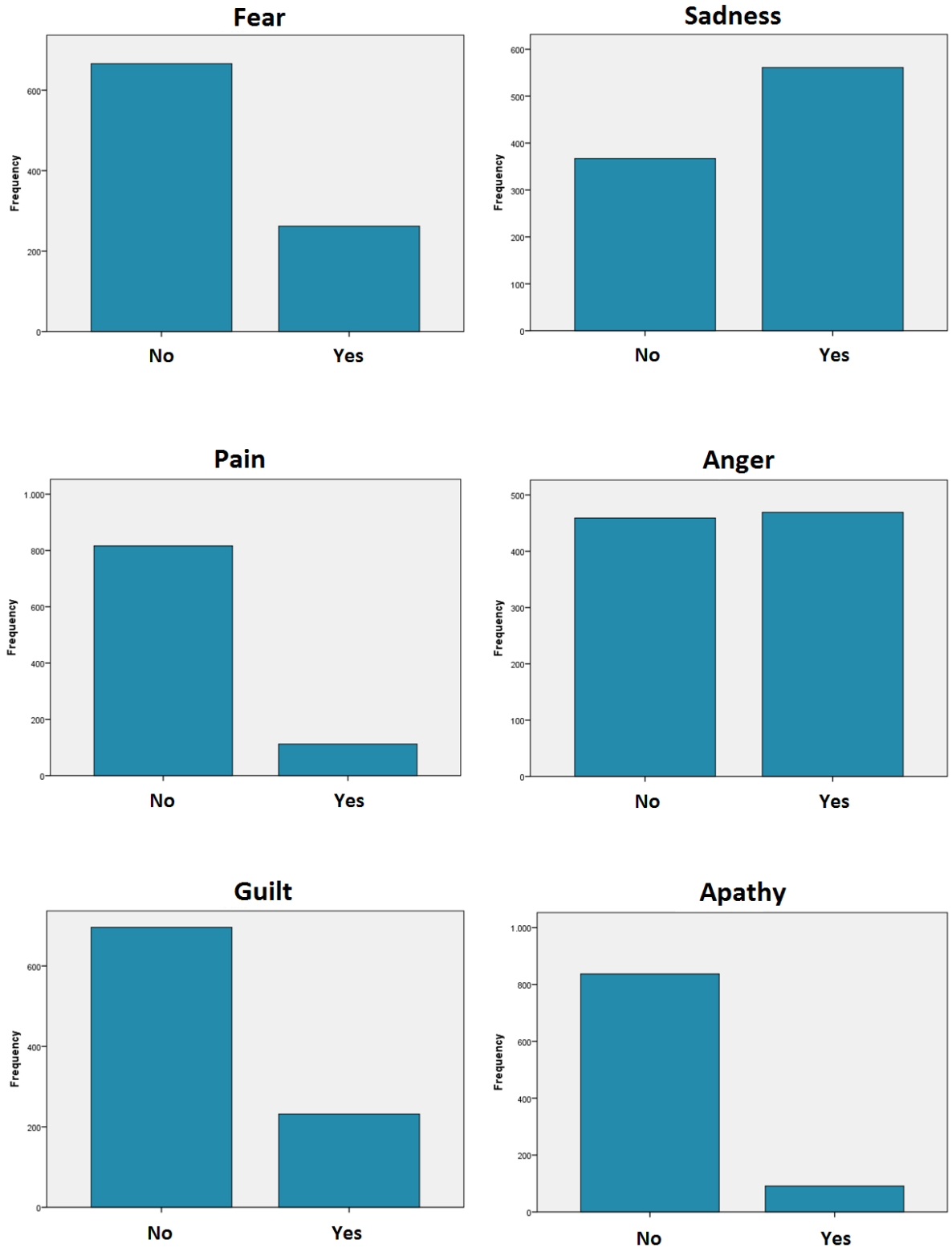

Fig. 4.1.45

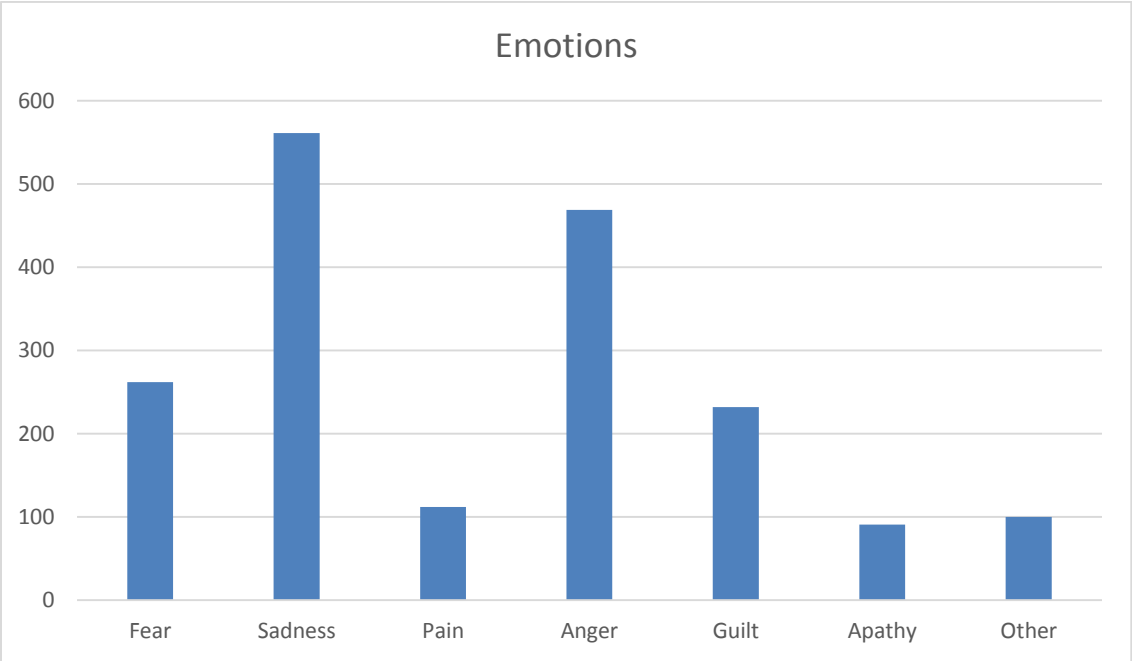

Fig. 4.1.46

When asked what emotions they experience when confronted with reports of climate change, the most chosen emotion was sadness (561 participants amounting to 60,5%) followed closely by anger (469 participants amounting to 50,5%). The next two most commonly chosen options were fear (262 participants amounting to 28,2%) and guilt (232 participants amounting to 25%), with only around a quarter of the participants experiencing these emotions. A total of 112 individuals (12,1%) reported feeling pain when confronted with reports of climate change, and 91 individuals (9,8%) reported apathy, not feeling any emotions at such reports. A total of 100 individuals (10,8%) reported feeling other emotions *Table 4.1.40, Fig. 4.1.45, Fig. 4.1.46*). Among these other emotions they specified feelings of aggression, regret, concern, thoughtfulness, depression, disappointment, engagement, shock, relief, frustration, annoyance, irritation, helplessness, hopelessness, irony, powerlessness, skepticism, resignation, shame, stress, astonishment, displeasure, uncertainty, the will to change things, doubtfulness and cynicism.

Have you ever personally experienced a form of environmental degradation in your surroundings?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	418	45,0	45,4	45,4
	No	502	54,1	54,6	100,0
	Total	920	99,1	100,0	
Missing		8	,9		
Total		928	100,0		

Table 4.1.41

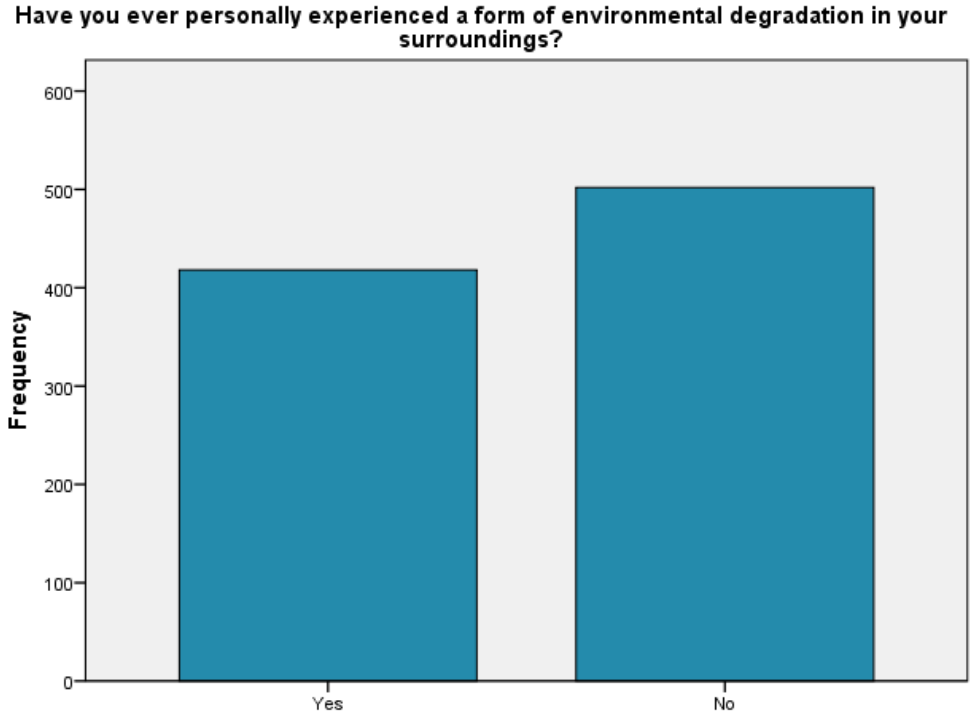

Fig. 4.1.47

In this survey, 45,4% of the participants (418 individuals) reported to have personally experienced a form of environmental degradation in their surroundings (*Table 4.1.41, Fig. 4.1.47*). When asked to specify, the following forms of environmental degradation were often named: Destruction of (micro)habitats within the city, monocultures and pesticides in gardens and agriculture, asphalting and building on green areas, urbanization, improper disposal of garbage, exhaust fumes from traffic and factory plants, deforestation, polluted creeks, streams, oceans and groundwater, draining of ponds, water wastage, the amount of bee and

butterfly deaths, usage of genetically modified seeds, floods, illegal waste disposal, mass animal husbandry, river regulation and the consequences of Chernobyl.

Do you believe technical advancements (such as new energy sources, higher energy efficiency etc.) will contribute to solving problems caused by energy consumption?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	12	1,3	1,3	1,3
	2	57	6,1	6,2	7,5
	3	220	23,7	23,8	31,2
	4	374	40,3	40,4	71,6
	Yes, absolutely	263	28,3	28,4	100,0
	Total	926	99,8	100,0	
Missing		2	,2		
Total		928	100,0		

Table 4.1.42

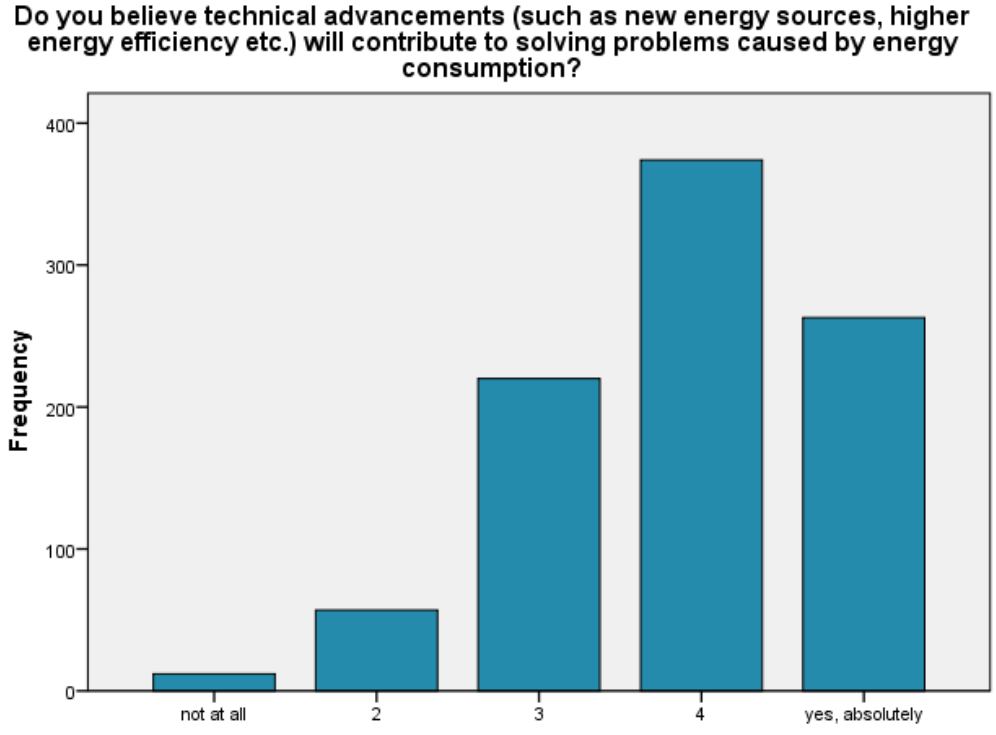

Fig. 4.1.48

When asked about what role technical advancements will have to contributing to solving problems caused by energy consumption, a high percentage of participants (374 individuals amounting to 40,4%) chose option 4, believing that there technical advancements will

contribute to solving these problems. A total of 263 participants (28,4%) chose option 5, this being the most optimistic outlook. Only 12 participants (1,3%) chose option 1, this being the most pessimistic outlook (*Table 4.1.42, Fig. 4.1.48*).

How important is spending time outdoors/in nature to you?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not important at all	3	,3	,3	,3
	2	17	1,8	1,8	2,2
	3	65	7,0	7,0	9,2
	4	198	21,3	21,5	30,7
	Very important	639	68,9	69,3	100,0
	Total	922	99,4	100,0	
Missing		6	,6		
Total		928	100,0		

Table 4.1.43

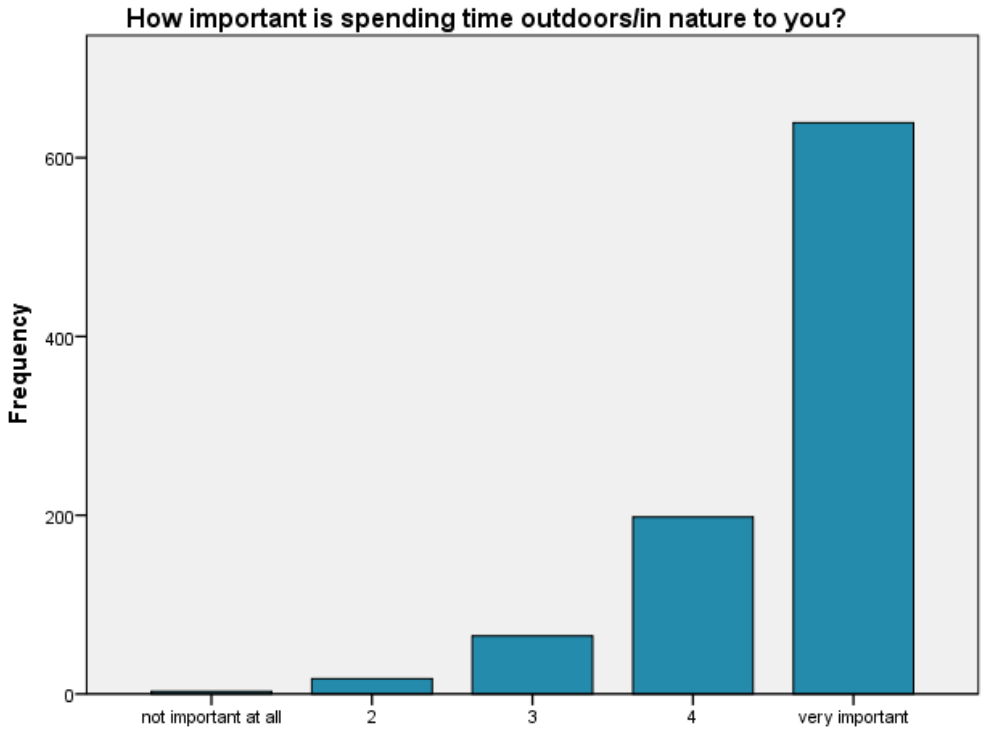

Fig. 4.1.49

As can be seen in Table 4.1.43, the majority of participants (639 individuals amounting to 69,3%) chose option 5 when asked how important spending time outdoors or in nature is to

them. Only 3 individuals (0,3%) opted for the other extreme, claiming that time outdoors or in nature is not at all of importance to them. Option 4 was chosen by 198 individuals (21,5%), option 3 by 65 individuals (7%) and option 2 by only 17 individuals (1,8%) (*Fig. 4.1.49*).

Do you feel responsible for the consequences of climate change?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	52	5,6	5,6	5,6
	2	136	14,7	14,7	20,3
	3	358	38,6	38,7	59,1
	4	284	30,6	30,7	89,8
	Yes, absolutely	94	10,1	10,2	100,0
	Total	924	99,6	100,0	
Missing		4	,4		
Total		928	100,0		

Table 4.1.44

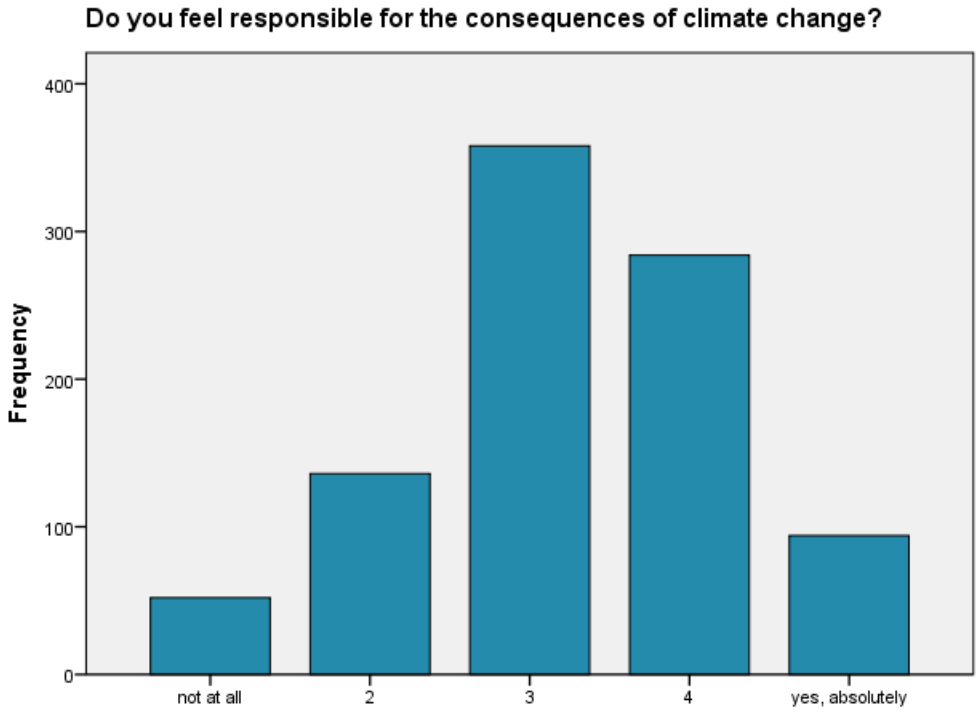

Fig. 4.1.50

The most commonly chosen answer when asked about feelings of responsibility for the consequences of climate change was option 3 with 358 participants (38,7%). The next most

frequently chosen answer was option 4 with 284 participants (30,7%) followed by option 2 with 136 participants (14,7%). Only 94 participants (10,2%) chose option 5, showing the highest feelings of responsibility. A total of 52 participants (5,6%) did not feel any responsibility at all (*Table 4.1.44*, *Fig. 4.1.50*).

Do you feel you have the ability to bring about change through your own actions?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Not at all	65	7,0	7,0	7,0
	2	196	21,1	21,2	28,2
	3	243	26,2	26,2	54,4
	4	274	29,5	29,6	84,0
	Yes, absolutely	148	15,9	16,0	100,0
	Total	926	99,8	100,0	
Missing		2	,2		
Total		928	100,0		

Table 4.1.45

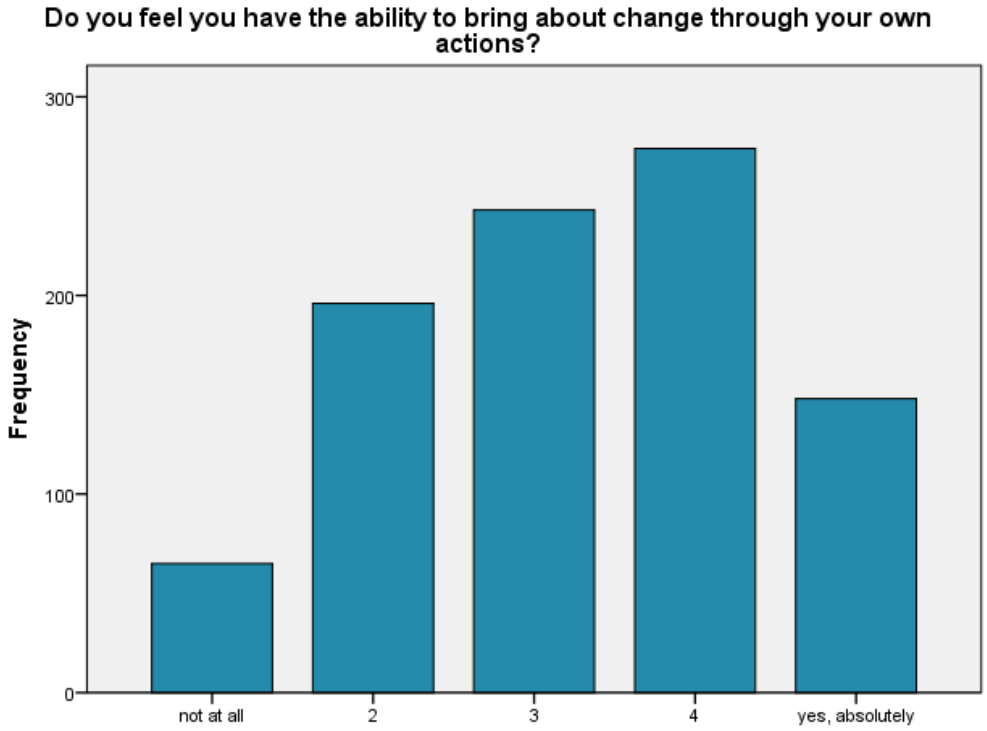

Fig. 4.1.51

The most commonly chosen answer when asked whether they feel they have the ability to bring about change through their own actions was option 4 with a total of 274 participants (29,6%). Option 3 was the second most commonly chosen option with a total of 243 participants (26,2%). A total of 196 participants (21,2%) chose option 2, while 148 participants (16%) chose the most optimistic response, stating they absolutely feel they have the ability to bring about change. Only 65 participants (7%) chose option 1, stating they do not feel they have the ability to bring about change at all (*Table 4.1.45, Fig. 4.1.51*).

4.1.4. Energy Behavior

Dishwasher

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Yes	632	68,1	69,2	69,2
	No	281	30,3	30,8	100,0
	Total	913	98,4	100,0	
Missing		15	1,6		
Total		928	100,0		

Table 4.1.46

Washing machine

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Yes	823	88,7	89,7	89,7
	No	95	10,2	10,3	100,0
	Total	918	98,9	100,0	
Missing		10	1,1		
Total		928	100,0		

Table 4.1.47

Dryer

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Yes	164	17,7	17,8	17,8
	No	757	81,6	82,2	100,0
	Total	921	99,2	100,0	
Missing		7	,8		
Total		928	100,0		

Table 4.1.48

A dishwasher is owned by 632 participants (69,2%) (*Table 4.1.46*), a washing machine by 823 participants (89,7%) (*Table 4.1.47*) and a clothes dryer by 164 participants (17,8%) (*Table 4.1.48*).

Do you turn off the lights when leaving a room?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	4	,4	,4	,4
	2	15	1,6	1,6	2,0
	3	73	7,9	7,9	9,9
	4	379	40,8	40,8	50,8
	always	457	49,2	49,2	100,0
	Total	928	100,0	100,0	

Table 4.1.49

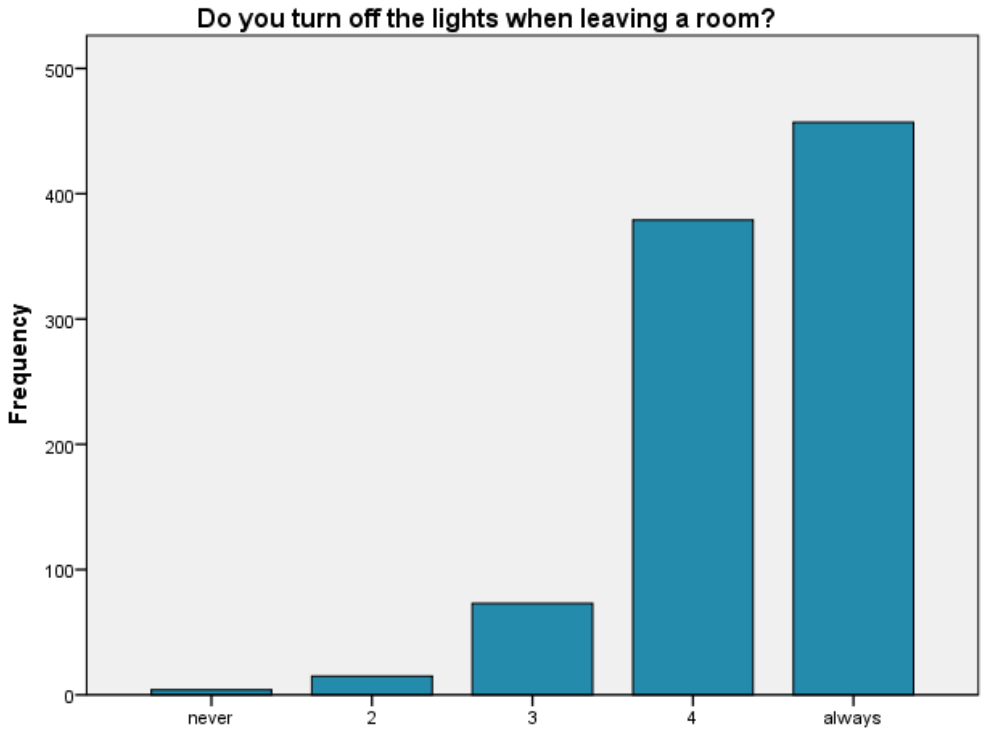

Fig. 4.1.52

According to Table 4.1.49, almost half of the participants (457 individuals amounting to 49,2%) claimed to always turn off the lights when leaving a room (option 5). A total of 379 individuals (40,8%) chose option 4, indicating they usually turn off the lights. Option 3 was chosen by 73 individuals (7,9%) indicating they only sometimes turn off the lights, while

option 2 was chosen by only 15 individuals (1,6) indicating they only rarely turn off the lights when leaving the room. There were only 4 individuals (0,4%) who claimed never to turn off the lights when leaving the room (*Fig. 4.1.52*).

Do you wait for the dishwasher to be full before using it?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	4	,4	,5	,5
	2	2	,2	,3	,8
	3	31	3,3	4,1	4,8
	4	129	13,9	16,9	21,7
	always	599	64,5	78,3	100,0
	Total	765	82,4	100,0	
Missing		163	17,6		
Total		928	100,0		

Table 4.1.50

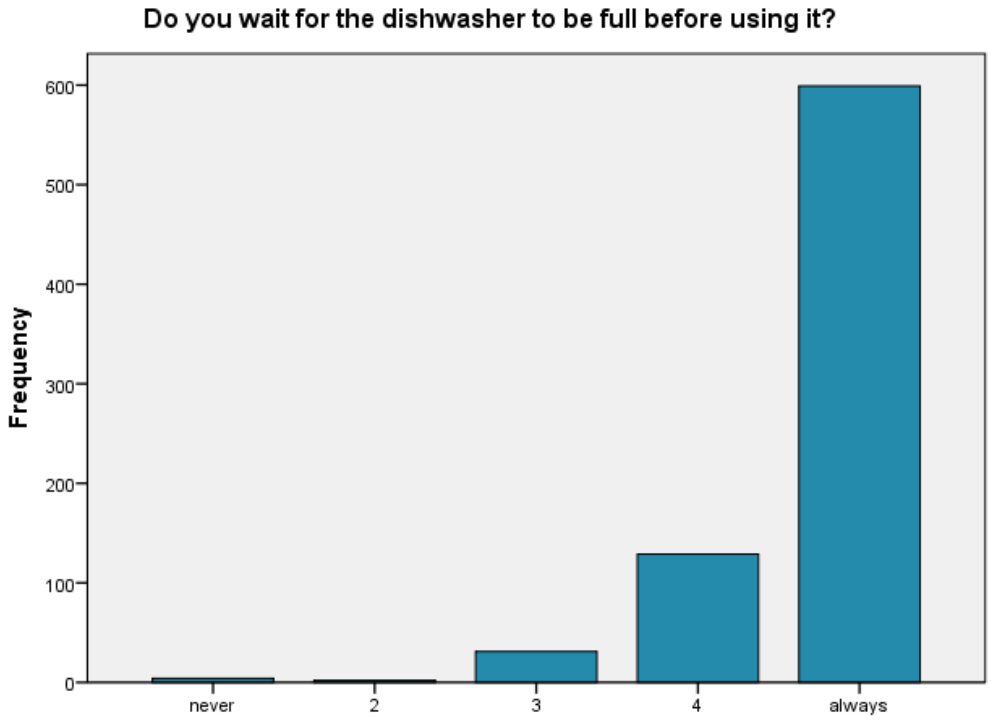

Fig. 4.1.53

When asked about how frequently they wait for the dishwasher to be full before turning it on the majority of participants answered with option 5 (599 individuals amounting to 78,3%), claiming that they always wait for the dishwasher to be full. The second most commonly

chosen option is option 4 (129 individuals amounting to 16,9%), indicating they usually wait for the dishwasher to be full. Only 31 individuals (4,1%) chose option 3 indicating they only sometimes wait for a full dishwasher. The least chosen option is option 2 with only 2 individuals (0,3%) indicating they rarely wait, outnumbered slightly by option 1 with 4 individuals (0,5%) claiming never to wait for the dishwasher to be full before usage (*Table 4.1.50. Fig. 4.1.53*).

Would you consider washing dishes by hand if the dishwasher is less than half full?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	98	10,6	12,7	12,7
	2	139	15,0	18,0	30,7
	3	178	19,2	23,1	53,8
	4	165	17,8	21,4	75,2
	always	191	20,6	24,8	100,0
	Total	771	83,1	100,0	
Missing		157	16,9		
Total		928	100,0		

Table 4.1.51

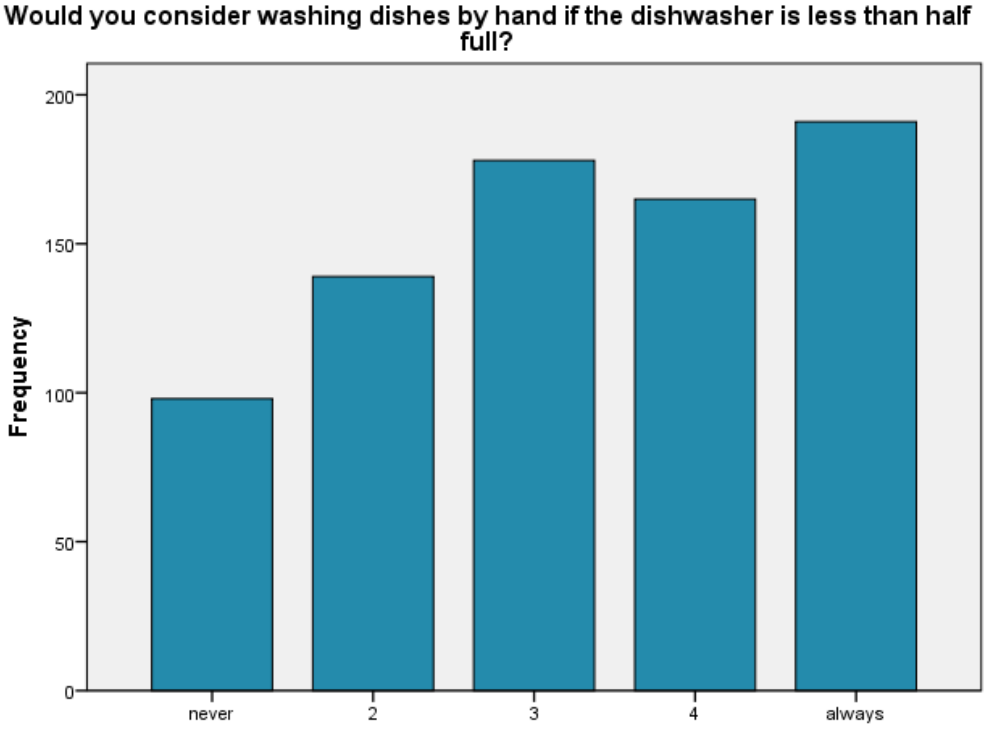

Fig. 4.1.54

When asked whether they would consider washing dishes by hand if the dishwasher is less than half full, a total of 191 participants (24,8%) chose option 5, indicating they would always consider it, followed very closely by option 3 chosen by 178 participants (23,1%), indicating they would sometimes consider it. Option 4 was chosen by 165 individuals (21,4%), indicating they would usually consider washing the dishes by hand. Option 2 was chosen by 139 individuals (18%), indicating they would rarely wash dishes by hand, and option 1 was chosen by 98 individuals (12,7%) claiming they would never consider washing dishes by hand if the dishwasher were only half full (*Table 4.1.51, Fig. 4.1.54*).

Do you use the drying option on your dishwasher?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	289	31,1	42,1	42,1
	2	62	6,7	9,0	51,2
	3	140	15,1	20,4	71,6
	4	65	7,0	9,5	81,0
	always	130	14,0	19,0	100,0
	Total	686	73,9	100,0	
Missing		242	26,1		
Total		928	100,0		

Table 4.1.52

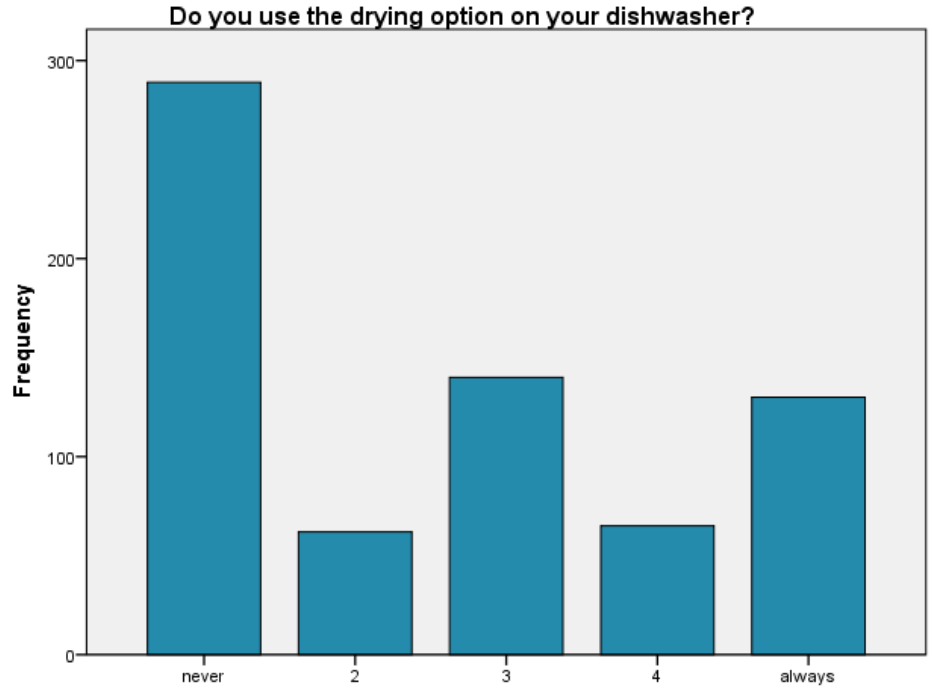

Fig. 4.1.55

When asked whether they use the drying option on their dishwasher the most commonly chosen answer was option 1 (289 individuals amounting to 42,1%), claiming they never use the drying-option. The second most commonly chosen answer was option 3 with 140 individuals (20,4%), followed closely by option 5 chosen by 130 individuals (19%) who claim always to use the drying-option on their dishwasher. Option 4 was chosen by 65 individuals (9,5%) followed closely by option 2 chosen by 62 individuals (9%) (*Table 4.1.52, Fig. 4.1.55*).

Do you wait for your laundry to be full before using the washing machine?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	2	,2	,2	,2
	2	6	,6	,7	,9
	3	48	5,2	5,4	6,3
	4	210	22,6	23,6	29,9
	always	624	67,2	70,1	100,0
	Total	890	95,9	100,0	
Missing		38	4,1		
Total		928	100,0		

Table 4.1.53

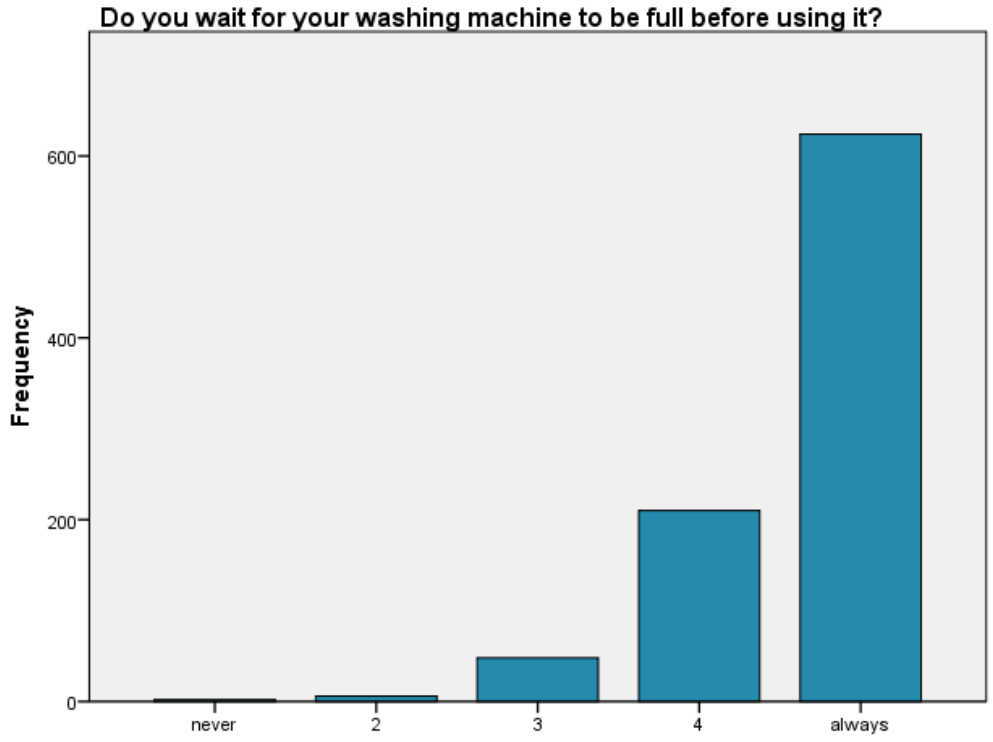

Fig. 4.1.56

As can be seen in Table 4.1.53, the majority of participants (624 individuals amounting to 70,1%) chose option 5 when asked whether they wait for the washing machine to be full before usage, claiming they always wait. The next most commonly chosen answer is option 4 (210 individuals amounting to 23,6%), indicating they usually wait. Option 3 was chosen by 48 individuals (5,4%), indicating they sometimes wait for the washing machine to be full before usage. Only 6 individuals (0,7%) chose option 2 indicating they rarely wait, and 2 individuals (0,2%) chose option 1, claiming they never wait for the washing machine to be full before usage (*Fig. 4.1.56*).

Do you wear the same clothes more than once before putting them in the laundry basket?

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	never	13	1,4	1,4	1,4
	2	37	4,0	4,0	5,4
	3	129	13,9	14,0	19,4
	4	332	35,8	36,0	55,4
	always	412	44,4	44,6	100,0
	Total	923	99,5	100,0	
Missing		5	,5		
Total		928	100,0		

Table 4.1.54

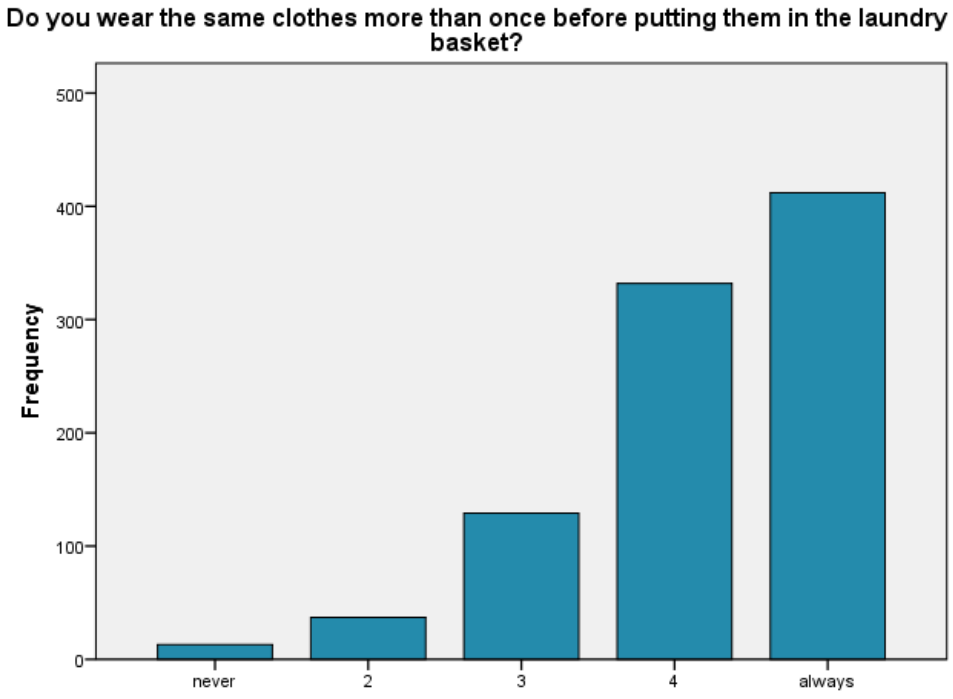

Fig. 4.1.57

A total of 412 individuals (44,6%) chose option 5, claiming to always wear the same clothes more than once before putting them in the laundry. Option 4 was chosen by 332 individuals (36%), indicating they usually wear their clothes more than once. The third most commonly chosen answer was option 3 with 129 individuals (14%), indicating they would sometimes wear the same clothes more than once before throwing them in the laundry. Only 37 individuals (4%) chose option 2, indicating they only rarely wear the same clothes more than once. Option 1 was only chosen by 13 individuals (1,4%) claiming they never wear the same clothes more than once before throwing them in the laundry basket (*Table 4.1.54, Fig. 4.1.57*).

Do you wash your laundry on low heat settings (under 60ºC)?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	7	,8	,8	,8
	2	17	1,8	1,9	2,6
	3	118	12,7	13,0	15,7
	4	309	33,3	34,1	49,7
	always	456	49,1	50,3	100,0
	Total	907	97,7	100,0	
Missing		21	2,3		
Total		928	100,0		

Table 4.1.55

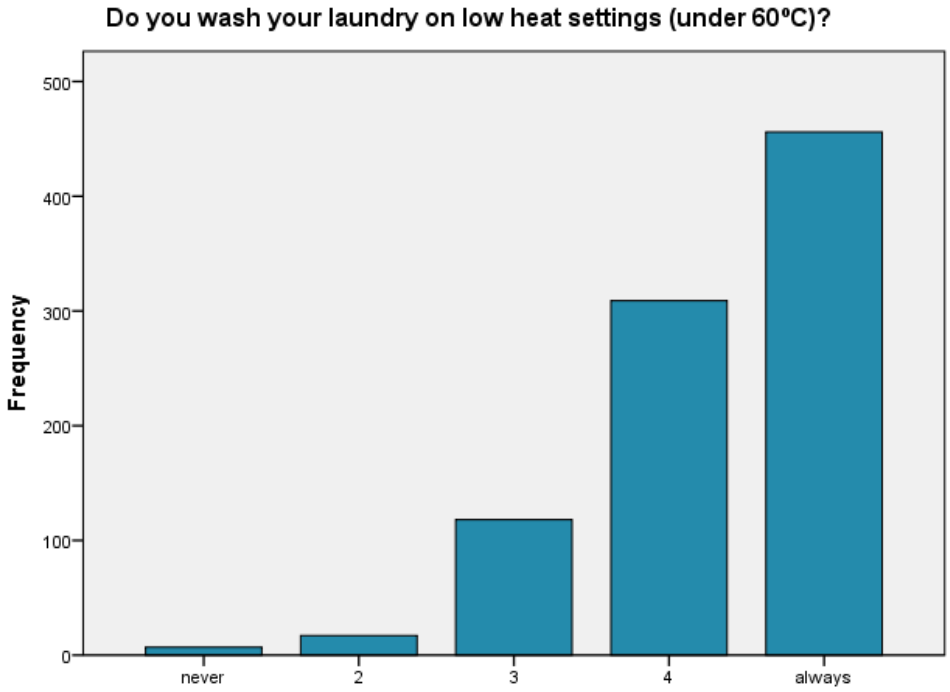

Fig. 4.1.58

When asked how frequently they wash their laundry under 60ºC, around half of the participants (456 individuals amounting to 50,3%) chose option 5, claiming to always wash their laundry under 60ºC. Option 4 was chosen by 456 individuals (34,1%), indicating they usually wash their laundry on low settings, followed by option 3 with 118 individuals (13%), indicating they sometimes wash their laundry on low settings. Only 17 individuals (1,9%) chose option 2, indicating they rarely wash their laundry on low settings, and only 7 individuals (0,8%) chose option 1, claiming to never wash their laundry below 60ºC (*Table 4.1.55, Fig. 4.1.58*).

Do you clean the lint screen of your dryer?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	59	6,4	12,4	12,4
	2	44	4,7	9,2	21,6
	3	118	12,7	24,8	46,4
	4	74	8,0	15,5	62,0
	always	181	19,5	38,0	100,0
	Total	476	51,3	100,0	
Missing		452	48,7		
Total		928	100,0		

Table 4.1.56

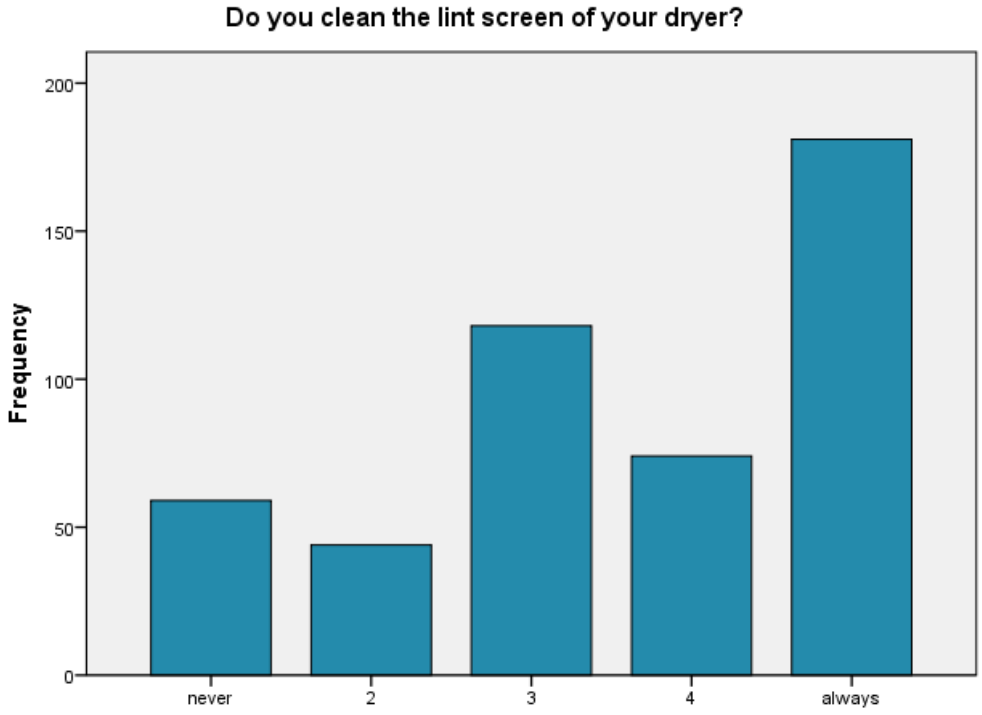

Fig. 4.1.59

A total of 181 individuals (38%) of the participants who answered this question chose option 5, claiming to always clean the lint screen of their dryer. Option 3 was chosen by 118 individuals (24,8%) making it the second most chosen answer. Option 4 was chosen by 74 individuals (8%), option 1 by 59 individuals (12,4%) and option 2 by 44 individuals (9,2%). Considering that 476 participants answered this question while only 164 participants claimed to have a dryer, these results are not reliable (*Table 4.1.56, Fig. 4.1.59*).

Do you remove clothes from the dryer while they're still damp?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	103	11,1	26,5	26,5
	2	51	5,5	13,1	39,6
	3	116	12,5	29,8	69,4
	4	62	6,7	15,9	85,3
	always	57	6,1	14,7	100,0
	Total	389	41,9	100,0	
Missing		539	58,1		
Total		928	100,0		

Table 4.1.57

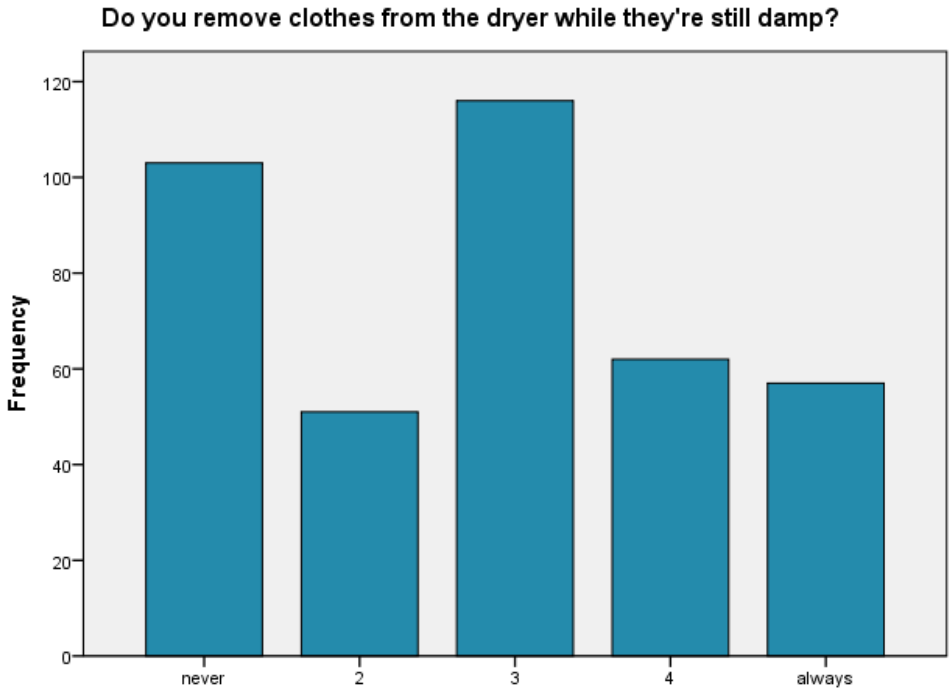

Fig. 4.1.60

Concerning the question of how frequently they remove their clothes from the dryer while they're still damp, option 3 was the most commonly chosen answer with 29,8% (116 individuals). Option 1 is the second most common answer with 103 individuals (26,5%) choosing this option, claiming that they never remove their clothes from the dryer while they're still damp. A total of 62 individuals (15,9%) chose option 4, followed by 57 individuals (14,7%) choosing option 5 and 51 individuals (13,1%) choosing option 2. Similar to the former question, a lot more participants answered this question than have ownership of a dryer (389 to 164), making the results unreliable (*Table 4.1.57. Fig. 4.1.60*).

Do you use lids when you cook?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	11	1,2	1,2	1,2
	2	57	6,1	6,1	7,3
	3	156	16,8	16,8	24,2
	4	324	34,9	35,0	59,1
	always	379	40,8	40,9	100,0
	Total	927	99,9	100,0	
Missing		1	,1		
Total		928	100,0		

Table 4.1.58

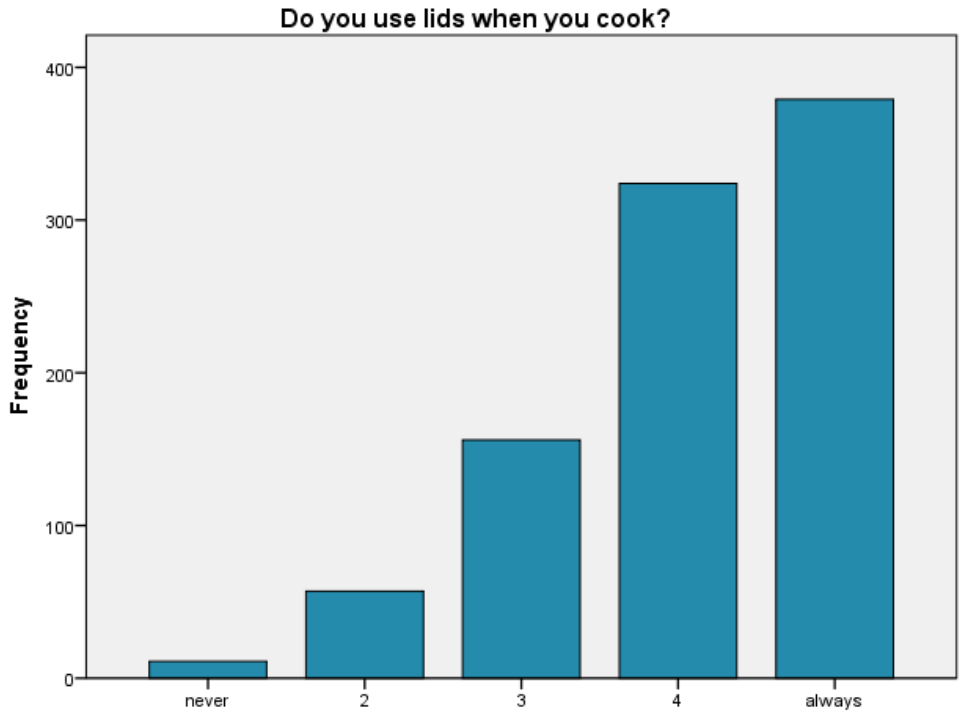

Fig. 4.1.61

When asked how frequently they cover their pots with lids while cooking, the most commonly chosen answer was option 5, with a total of 379 individuals (40,9%) claiming they always cover pots while cooking. Option 4 is close second, chosen by 324 individuals (35%), indicating they usually use lids while cooking. A total of 156 individuals (16,8%) chose option 3, indicating they sometimes use lids while they cook, followed by 57 individuals (6,1%) choosing option 2, indicating they rarely use lids. Only 11 individuals (1,2%) chose option 1, claiming to never use lids while cooking (*Table 4.1.58, Fig. 4.1.61*).

Do you turn back the heat on your stove once the water is boiling?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	19	2,0	2,1	2,1
	2	47	5,1	5,1	7,2
	3	113	12,2	12,3	19,4
	4	258	27,8	28,0	47,4
	always	484	52,2	52,6	100,0
	Total	921	99,2	100,0	
Missing		7	,8		
Total		928	100,0		

Table 4.1.59

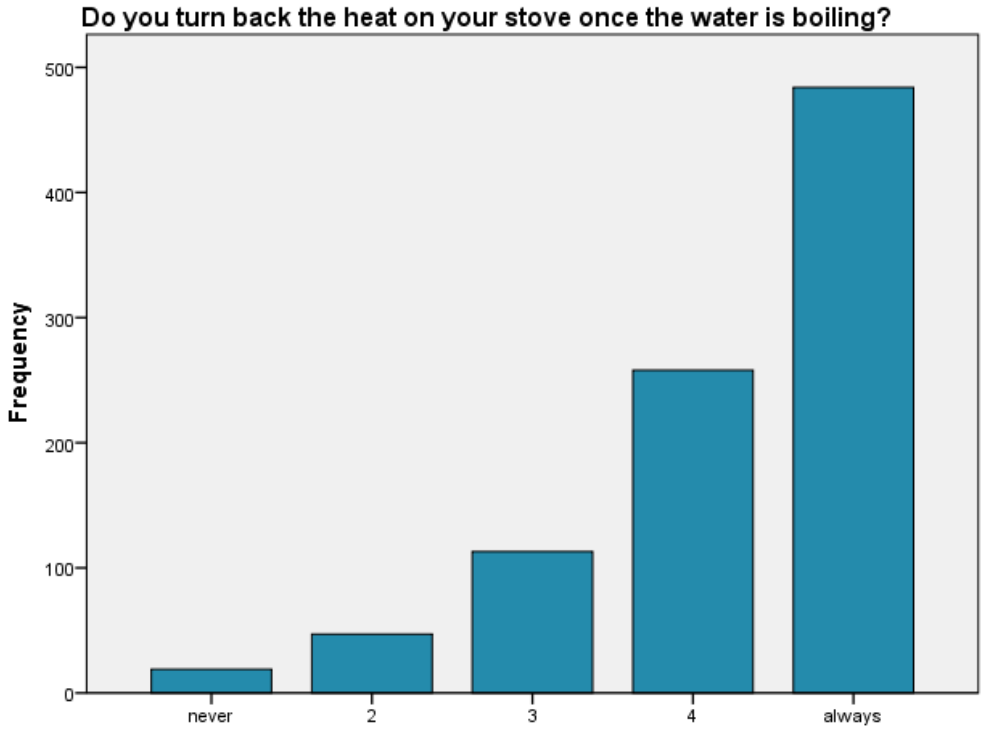

Fig. 4.1.62

Concerning the question how frequently they turn back the heat on their stove as soon as the water is boiling, around half the participants (484 individuals amounting to 52,6%) responded with option 5, claiming they always turn back the heat. Option 4 is the second most commonly chosen answer with 258 individuals (28%) indicating they usually turn back the heat as soon as the water is boiling. A total of 113 individuals (12,3%) chose option 3, indicating they sometimes turn back the heat, followed by 47 individuals (5,1%) having chosen option 2, indicating they rarely turn back the heat as soon as water starts boiling. Only 19 individuals (2,1%) chose option 1, claiming they never turn back the heat on their stove (*Table 4.1.59, Fig. 4.1.62*).

Do you turn down the thermostat when leaving for a longer period of time?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	29	3,1	3,4	3,4
	2	28	3,0	3,2	6,6
	3	87	9,4	10,1	16,7
	4	135	14,5	15,6	32,3
	always	584	62,9	67,7	100,0
	Total	863	93,0	100,0	

Missing	65	7,0		
Total	928	100,0		

Table 4.1.60

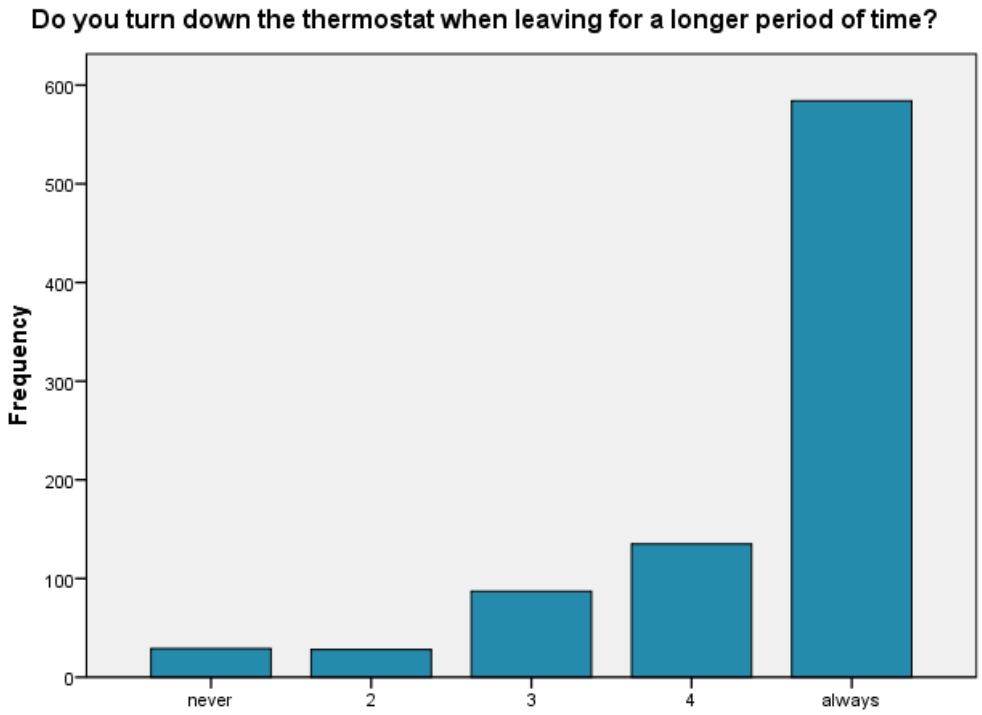

Fig. 4.1.63

When asked how frequently they turn down the thermostat when leaving the building for a longer period of time more than half the participants (584 individuals amounting to 67,7%) chose option 5, claiming to always turn down the thermostat. The second most commonly chosen answer is option 4 with quite some distance, chosen by 135 individuals (15,6%), indicating they usually turn down the thermostat. Option 3 was chosen by 87 individuals (10,1%), indicating they sometimes turn down the thermostat upon longer departures. Almost the same amount of participants chose option 1 (29 individuals amounting to 3,4%) as option 2 (28 individuals amounting to 3,1%), indicating they never or rarely turn down the thermostat when leaving the building for a longer period of time respectively (*Table 4.1.60, Fig. 4.1.63*).

Do you close curtains and blinds at night?

	Frequency	Percent	Valid Percent	Cumulated Percent

Valid	never	111	12,0	12,4	12,4
	2	65	7,0	7,3	19,7
	3	115	12,4	12,9	32,6
	4	162	17,5	18,1	50,7
	always	441	47,5	49,3	100,0
	Total	894	96,3	100,0	
Missing		34	3,7		
Total		928	100,0		

Table 4.1.61

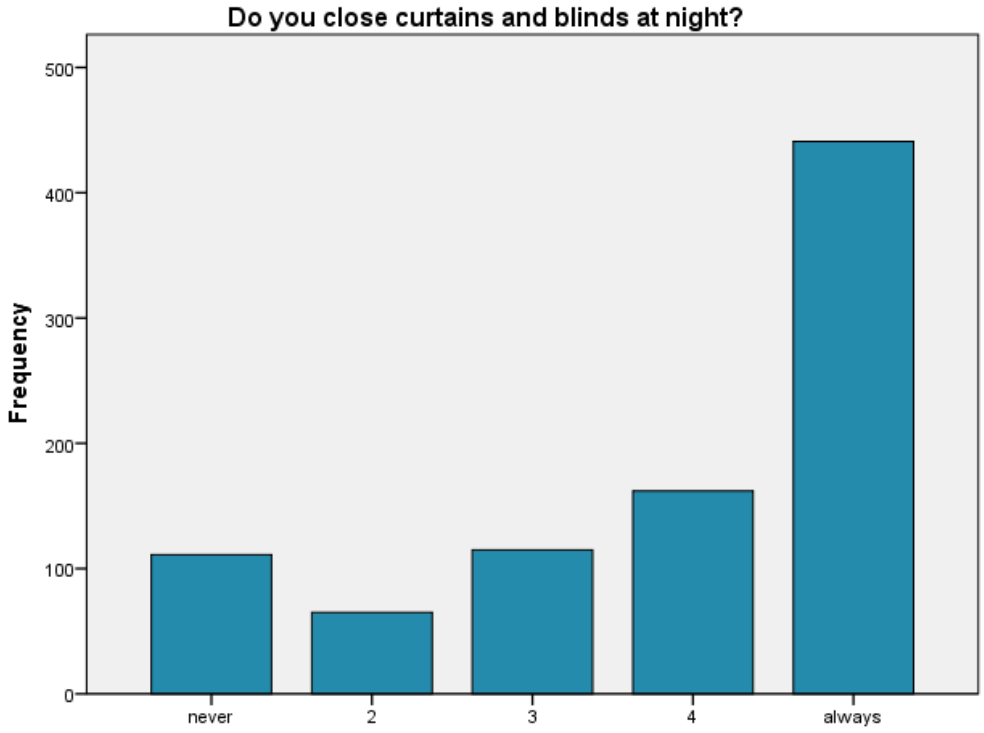

Fig. 4.1.64

As depicted in Table 4.1.61, when asked how frequently they close curtains and blinds at night, almost half of the participants (441 individuals amounting to 49,3%) chose for option 5, claiming to always close them. A total of 162 individuals (18,1%) chose option 4, indicating they usually close their curtains and blinds. Option 3 was chosen by 115 individuals (12,9%), followed closely by option 1, chosen by 111 individuals (12,4%). A total of 65 individuals (7,3%) chose option 2, indicating they only rarely close curtains and blinds at night (*Fig. 4.1.64*).

How often do you take baths alternatively to showers?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	385	41,5	42,8	42,8
	2	366	39,4	40,7	83,4
	3	80	8,6	8,9	92,3
	4	44	4,7	4,9	97,2
	always	25	2,7	2,8	100,0
	Total	900	97,0	100,0	
Missing		28	3,0		
Total		928	100,0		

Table 4.1.62

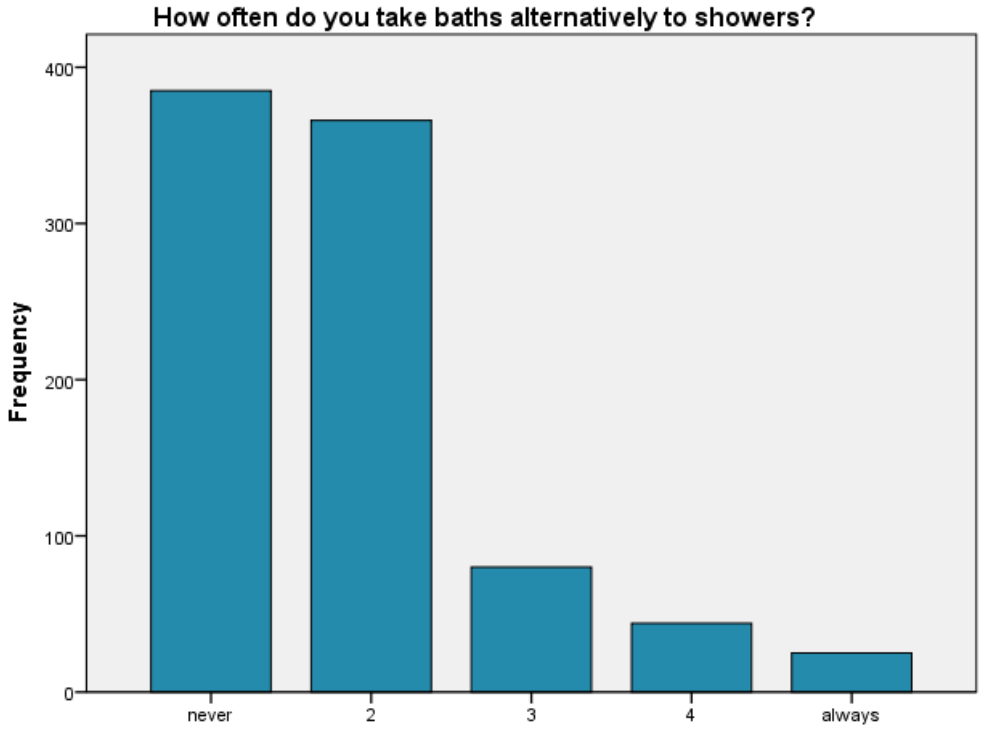

Fig. 4.1.65

When asked how frequently they bathe instead of taking a shower, a total of 385 individuals (42,8%) chose option 1, claiming to never bathe instead of showering, followed closely by 366 individuals (40,7%) choosing option 4, indicating they rarely take baths as an alternative to a shower. A total of 80 individuals (8,6%) chose option 3, followed by 44 individuals (4,9%) choosing option 4 and only 25 individuals (2,8%) choosing option 5, claiming always to take baths instead of showers (*Table 4.1.62, Fig. 4.1.65*).

Do you use the microwave/toaster oven or similar devices instead of an oven when possible?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	145	15,6	16,5	16,5
	2	121	13,0	13,8	30,3
	3	209	22,5	23,8	54,2
	4	252	27,2	28,7	82,9
	always	150	16,2	17,1	100,0
	Total	877	94,5	100,0	
Missing		51	5,5		
Total		928	100,0		

Table 4.1.63

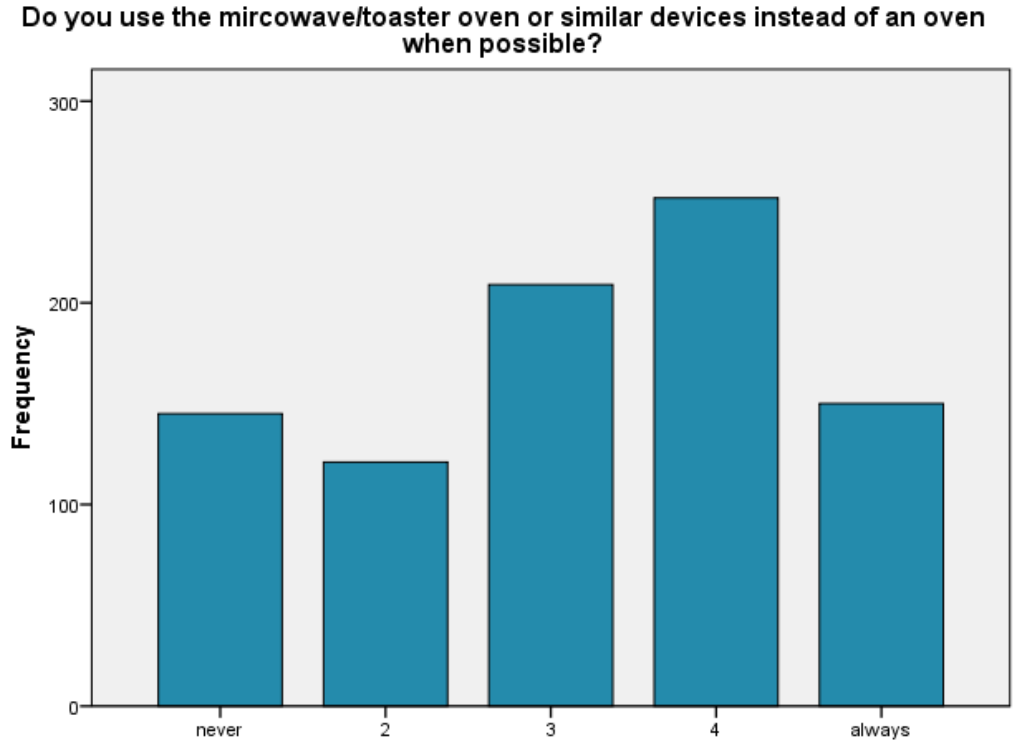

Fig. 4.1.66

Concerning the question how frequently they use a microwave or toaster-oven instead of a regular oven, the most frequently chosen answer was option 4 with a total of 252 individuals (28,7%) indicating they usually choose to use a microwave or toaster-oven. The second most commonly chosen answer was option 3 with 209 individuals (23,8%) indicating they sometimes use a microwave or toaster-oven instead of a regular oven. Interestingly the two

extremes option 5 and option 1 were very close to each other, with 150 individuals (17,1%) having chosen option 5 and 145 individuals (16,5%) having chosen option 1. The least chosen answer was option 2 with 121 individuals (13,8%), indicating they rarely use an alternative to a regular oven (*Table 4.1.63, Fig. 4.1.66*).

Do you open the oven door when in use?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	109	11,7	12,0	12,0
	2	333	35,9	36,5	48,5
	3	291	31,4	31,9	80,4
	4	157	16,9	17,2	97,6
	always	22	2,4	2,4	100,0
	Total	912	98,3	100,0	
Missing		16	1,7		
Total		928	100,0		

Table 4.1.64

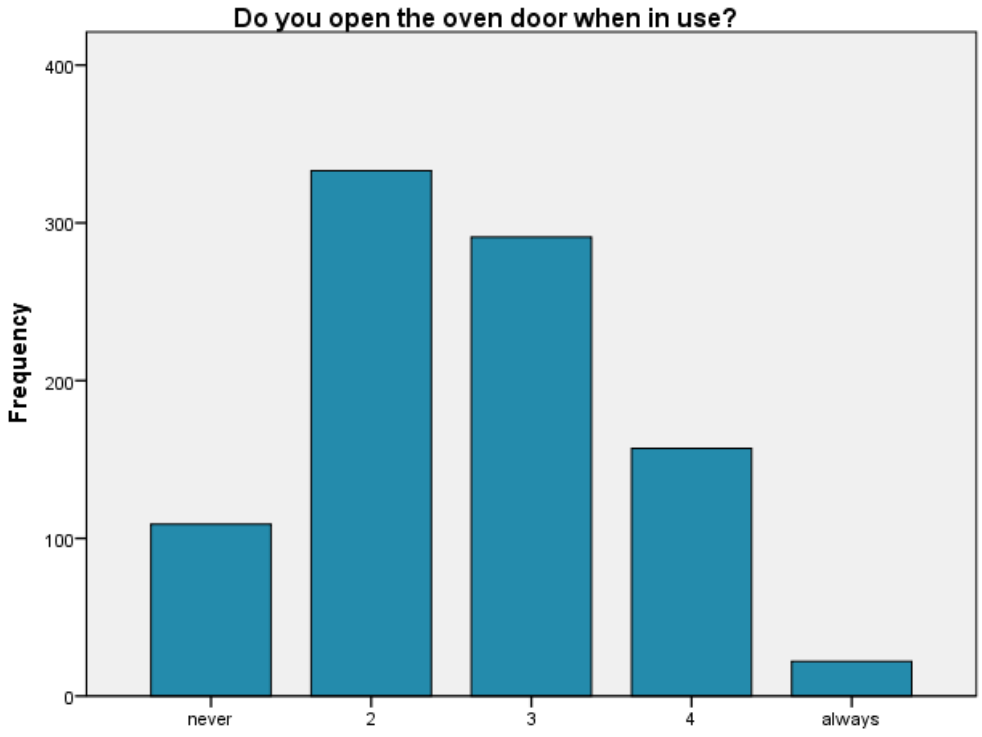

Fig. 4.1.67

When asked how frequently they open the oven door during usage, option 2 was most commonly chosen with 333 participants (36,5%) indicating they rarely open the oven door, followed by option 3 chosen by 291 participants (31,9%) indicating they sometimes open the oven door. A total of 157 individuals (17,2%) chose option 4, indicating they often open the oven door. Option 1, claiming never to open the oven door was chosen by a total of 109 participants (12%), while only 22 participants (2,4%) answered with option 5 (*Table 4.1.64, Fig. 4.1.67*).

Do you leave the refrigerator door open for long periods of time?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	548	59,1	59,5	59,5
	2	262	28,2	28,4	87,9
	3	57	6,1	6,2	94,1
	4	40	4,3	4,3	98,5
	always	14	1,5	1,5	100,0
	Total	921	99,2	100,0	
Missing		7	,8		
Total		928	100,0		

Table 4.1.65

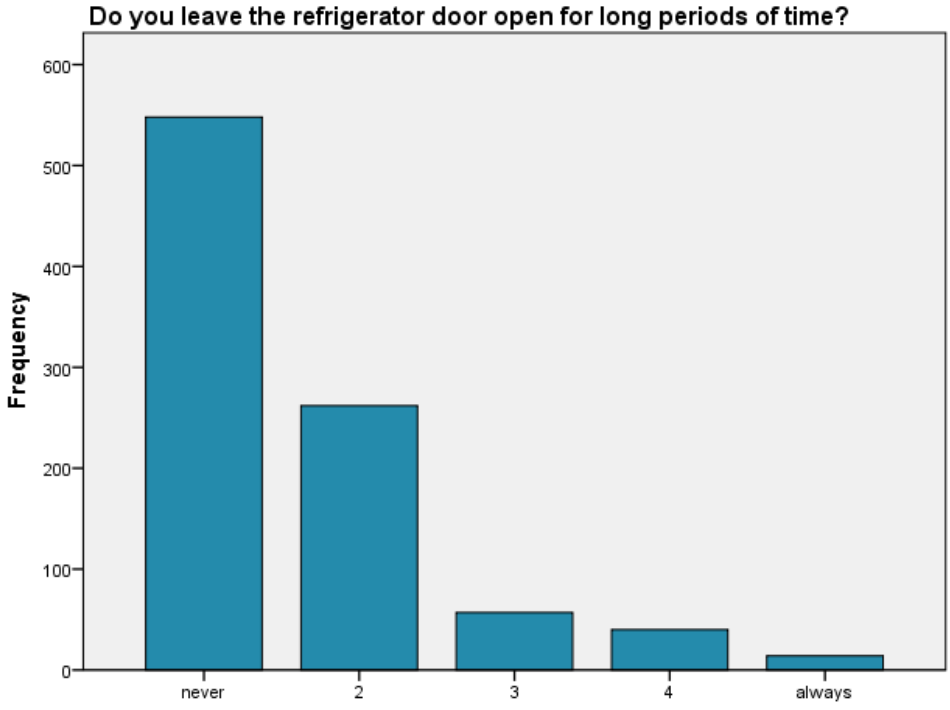

Fig. 4.1.68

The majority of respondents (548 individuals amounting to 59,5%) chose option 1 when asked how frequently they leave the refrigerator door open for longer periods of time, claiming never to leave it open. The second most commonly chosen answer is option 2 with 262 respondents (28,4%) indicating they only rarely open the refrigerator door for longer periods of time. Option 3 was chosen by 57 individuals (6,2%), indicating they only sometimes leave the refrigerator door open. A total of 40 individuals (4,3%) chose option 4, indicating that they often leave the refrigerator door open, with only 14 individuals (1,5%) claiming to always leave it open for longer periods of time (*Table 4.1.65, Fig. 4.1.68*).

Do you pay attention to placing small pots on small burners?

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	niemals	13	1,4	1,4	1,4
	2	9	1,0	1,0	2,4
	3	25	2,7	2,7	5,1
	4	110	11,9	12,0	17,1
	immer	762	82,1	82,9	100,0
	Gesamt	919	99,0	100,0	
Fehlend	nicht beantwortet	9	1,0		
Gesamt		928	100,0		

Table 4.1.66

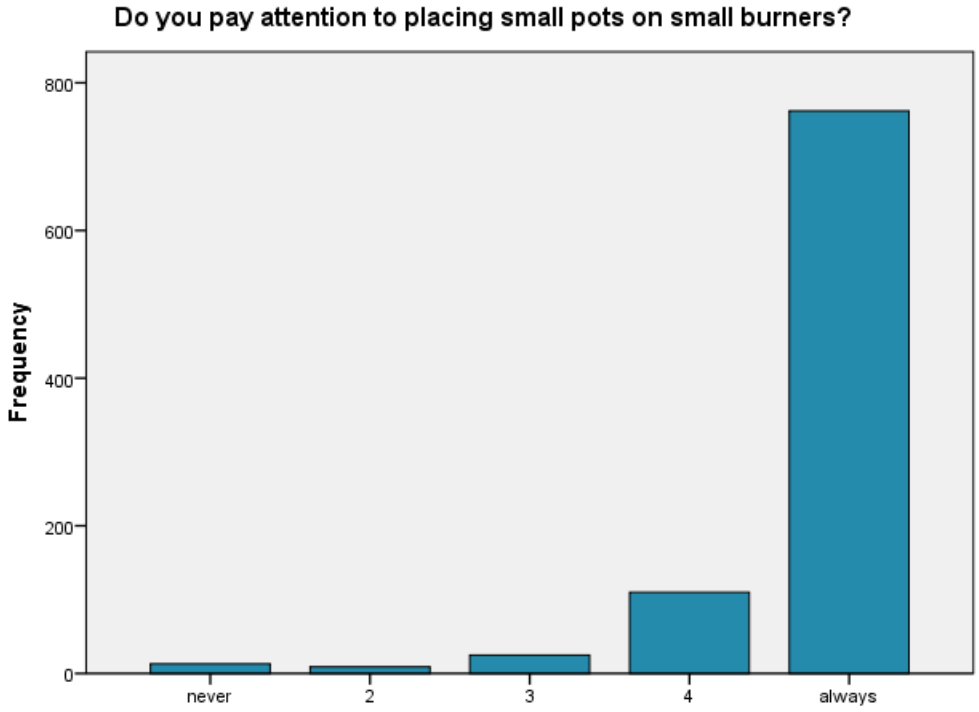

Fig. 4.1.69

When asked how frequently they pay attention to placing small pots on small burners, the vast majority of participants (762 individuals amounting to 82,9%) chose option 5, claiming to always pay attention to this. Option 4 was chosen by 110 individuals (12%), indicating they often pay attention to burner-size in relation to the pot they are using. Options 3, 2 and 1 were only scarcely chosen, with option 3 being picked by 25 individuals (2,7%), option 1 by 13 individuals (1,4%) and option 2 by 9 individuals (1%) (*Table 4.1.66, Fig. 4.1.69*).

Do you use lighting control devices like dimmers, motion detectors etc.?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	565	60,9	65,2	65,2
	2	111	12,0	12,8	78,0
	3	87	9,4	10,0	88,0
	4	71	7,7	8,2	96,2
	always	33	3,6	3,8	100,0
	Total	867	93,4	100,0	
Missing		61	6,6		
Total		928	100,0		

Table 4.1.67

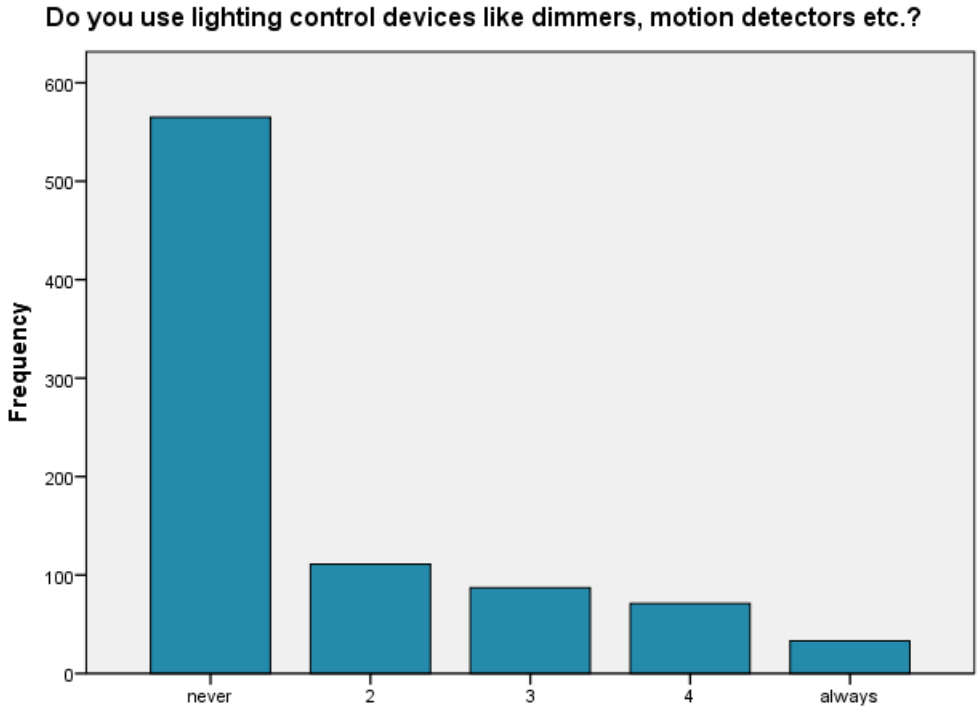

Fig. 4.1.70

A total of 565 participants (65,1%) chose option 1 when asked how frequently they use lighting control devices such as dimmers or motion detectors, meaning they never use them. Option 2 was chosen by 111 individuals (12,8%), indicating they rarely use lighting control devices, and option 3 was chosen by 87 individuals (10%), indicating they sometimes use lighting control devices. A total of 71 individuals (8,2%) chose option 4, indicating they often use lighting control devices, and a total of 33 individuals (3,8%) chose option 5, claiming to always use such devices (*Table 4.1.67*, *Fig. 4.1.70*).

Do you unplug electrical devices when they are not being used? (computers, televisions, VCRs etc.)

		Frequency	Percentt	Valid Percent	Cumulated Percent
Valid	never	155	16,7	16,8	16,8
	2	184	19,8	19,9	36,7
	3	188	20,3	20,3	57,0
	4	185	19,9	20,0	77,1
	always	212	22,8	22,9	100,0
	Total	924	99,6	100,0	
Missing		4	,4		

Total	928	100,0		

Table 4.1.68

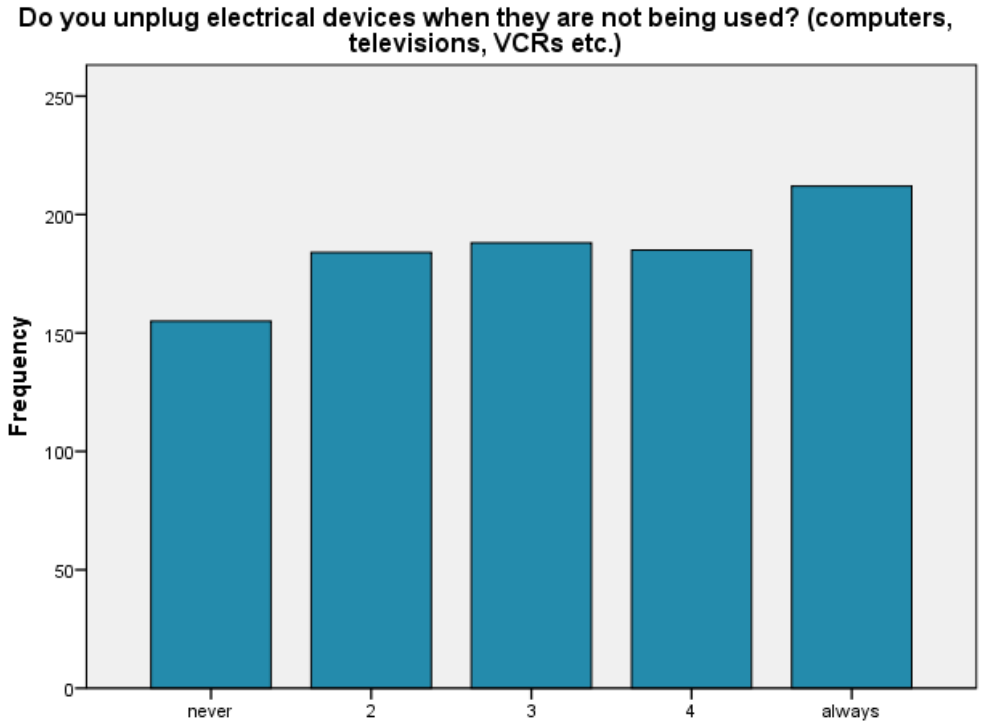

Fig. 4.1.71

When asked how frequently they unplug electrical devices when they are not in use, all options were chosen to a similar degree. A total of 212 participants (22,9%) chose option 5, claiming to always unplug them. Option 3 was chosen by a total of 188 participants (20,3%), indicating they sometimes unplug electrical devices when not in use, followed very closely by option 4 with 185 individuals (20%) and option 2 with 184 individuals (19,9%). A total of 155 participants (16,8%) chose option 1, claiming never to unplug their electrical devices when they are not in use (*Table 4.1.68, Fig. 4.1.71*).

How high do you usually turn your thermostat during winter (in degrees Celsius)

N	Valid	793
	Missing	135
Mean		20,89
Std		2,063
Minimum		10

Maximum	29

Table 4.1.69

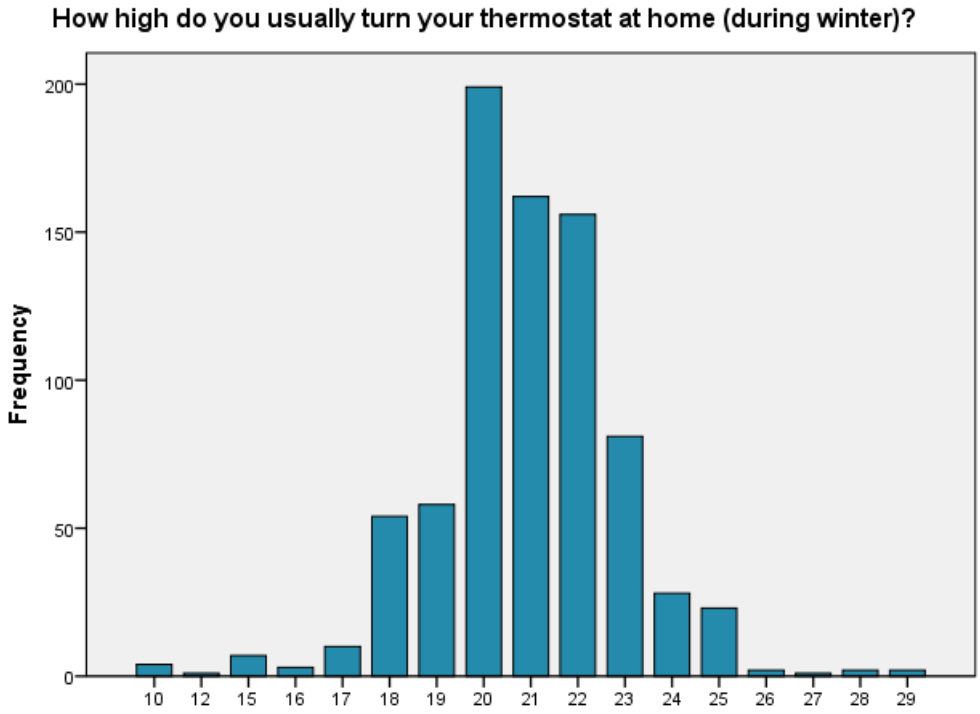

Fig. 4.1.72

Do you have furniture blocking the heaters?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	203	21,9	22,2	22,2
	No	712	76,7	77,8	100,0
	Total	915	98,6	100,0	
Missing		13	1,4		
Total		928	100,0		

Table 4.1.70

When asked how high they usually turn their thermostat during the winter, most participants chose 20°C (199 individuals amounting to 25,1%), followed by 21°C (162 individuals amounting to 20,4%) and 22°C (156 individuals amounting to 19,7%). The mean for thermostat settings within the household is 20,89 with a standard deviation of 2,063 (*Table 4.1.69, Fig. 4.1.72*). As seen in Table 4.1.70, a total of 203 individuals (22,2%) claim to have furniture blocking the heaters. This question does not take into consideration the usage of underfloor heating systems.

Do you consciously exercise any other kind of energy-saving behaviors?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Yes	438	47,2	47,9	47,9
	No	477	51,4	52,1	100,0
	Total	915	98,6	100,0	
Missing		13	1,4		
Total		928	100,0		

Table 4.1.71

When asked if they consciously exercise any other kind of energy-saving behaviors other than those specified in the survey, around half of the participants answered with "yes" (438 individuals amounting to 47,9%) and about half answered with "no" (477 individuals amounting to 52,1%) (*Table 4.1.71*). The following additional energy-saving behaviors were listed by the participants: Letting in cool air at night instead of using air conditioning during the day, using fresh food instead of frozen foods, using sparse lighting in the areas it is needed instead of lighting up entire rooms, pre-boiling water in a water heater before pouring it into a pot and cooking, hot water from cooking pots is left to stand and emit heat to the environment before being poured away, taking short showers, cleaning dishes with cold water if they are not fatty, airing rooms in short bursts instead of over longer periods of time, turning off heating systems when windows are open, separating waste, sockets which allow themselves to be switched off to avoid standby modes, unplugging chargers when not in use, wearing more layers of clothes instead of turning up the heat, using the balcony as a freezer during the winter, turn off flowing water when it is not being used (while brushing teeth or shampooing hair), purchasing few electrical appliances, investing in good insulation, using energy-saving light bulbs, exchanging broken/old appliances with new energy-efficient models, turning off the heater in rooms not frequently in use, air-drying hair, using clothes lines to dry clothes during the summer, use cold water for washing hands, only buying new gadgets and appliances when needed, not cooking twice a day but warming up leftovers. By far one of the most commonly listed behaviors was avoiding standby modes of electrical equipment.

4.2. Calculating a Variable for Energy Behavior

As explained in Chapter 3.1. Calculating a Variable for Energy Behavior in the Methods section, the values for questions EB4 (*Table 4.1.52; Fig. 4.1.55*), EB14 (*Table 4.1.62; Fig. 4.1.65),* EB16 (*Table 4.1.64; Fig. 4.1.67*) and EB17 (*Table 4.1.65; Fig. 4.1.68)* were mirrored. A formulation of all the questions can be found on page 23-24.

Question EB19 was removed from the calculation of EBMean as lighting controls depend on structural factors such as living spaces being fitted with these devices (See page 24).

When examining the results for question EB4 in Table 4.1.52 and Fig. 4.1.55, one can see that the distribution looks unusual. Distributions which follow a "W" pattern warrant closer inspection, as options 1, 3 and 5 being chosen most often on a 5-point scale can indicate random answering patterns. The question was formulated as: "Do you use the drying option on your dishwasher?". It is possible, that there were misunderstandings due to this formulation. The way the question was posed made it sound as if a drying option is something you actively choose, while in actuality it is most often the default setting on a dishwasher. In addition, many appliances do not even provide this option, or combine it with other features under a different name, such as "eco-mode". The choice is therefore made to remove this question from the calculation of EBMean, as the risk is considered too high that these answers do not reflect actual energy behavior and could falsify results.

The next step which must be taken before calculating EBMean, is to test whether or not the groups of individuals who do not own the appliances mentioned in the survey questions differ from the groups of individuals who do own said appliances.

Dishwasher:

As explained on pages 24-25, the Mann-Whitney-U test is applied to determine whether the group of participants who own a dishwasher and the group of participants who do not own a dishwasher answered questions EB2 and EB3 in the same manner. EB4 is not taken into consideration as it has already been removed from the calculation of EBMean.

H0: The distributions are identical for individuals who own a dishwasher and individuals who do not own a dishwasher.

Ranks

	Dishwasher Ownership	N	Mean Rank	Sum of Ranks
EB2: Do you wait for the dishwasher to be full before using it?	Yes	632	393,44	248657,00
	No	122	294,90	35978,00
	Total	754		
EB3: Would you consider washing dishes by hand if the dishwasher is less than half full?	Yes	625	368,59	230366,00
	No	135	435,66	58814,00
	Total	760		

Table 4.2.1

	EB2: Do you wait for the dishwasher to be full before using it?	EB3: Would you consider washing dishes by hand if the dishwasher is less than half full?
Mann-Whitney-U	28475,000	34741,000
Wilcoxon-W	35978,000	230366,000
Z	-6,355	-3,295
Asymp. Sig. (2-tailed)	,000	,001

Table 4.2.2

Table 4.2.2 shows that there are significant differences in distribution between the group of individuals who own a dishwasher and the group of individuals who do not own a dishwasher, concerning questions EB2 and EB3 with p-values of 0,000 and 0,001 respectively.

In order to take a closer look at these differences, descriptive statistics were calculated for both groups separately.

Dishwasher Ownership: Yes

EB2: Do you wait for the dishwasher to be full before using it?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	3	6	,9	,9	,9
	4	110	17,4	17,4	18,4
	always	516	81,6	81,6	100,0
	Total	632	100,0	100,0	

Table 4.2.3

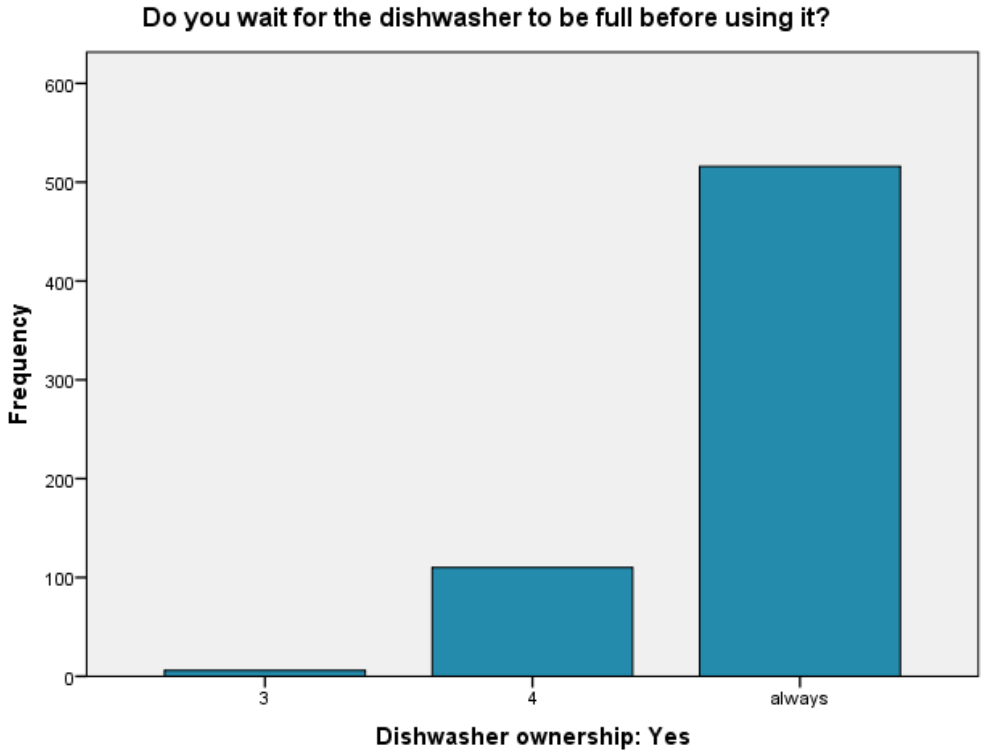

Fig. 4.2.1

Dishwasher Ownership: No

EB2: Do you wait for the dishwasher to be full before using it?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	4	1,4	3,3	3,3
	2	2	,7	1,6	4,9
	3	25	8,9	20,5	25,4
	4	18	6,4	14,8	40,2
	always	73	26,0	59,8	100,0
	Total	122	43,4	100,0	
Missing		159	56,6		
Total		281	100,0		

Table 4.2.4

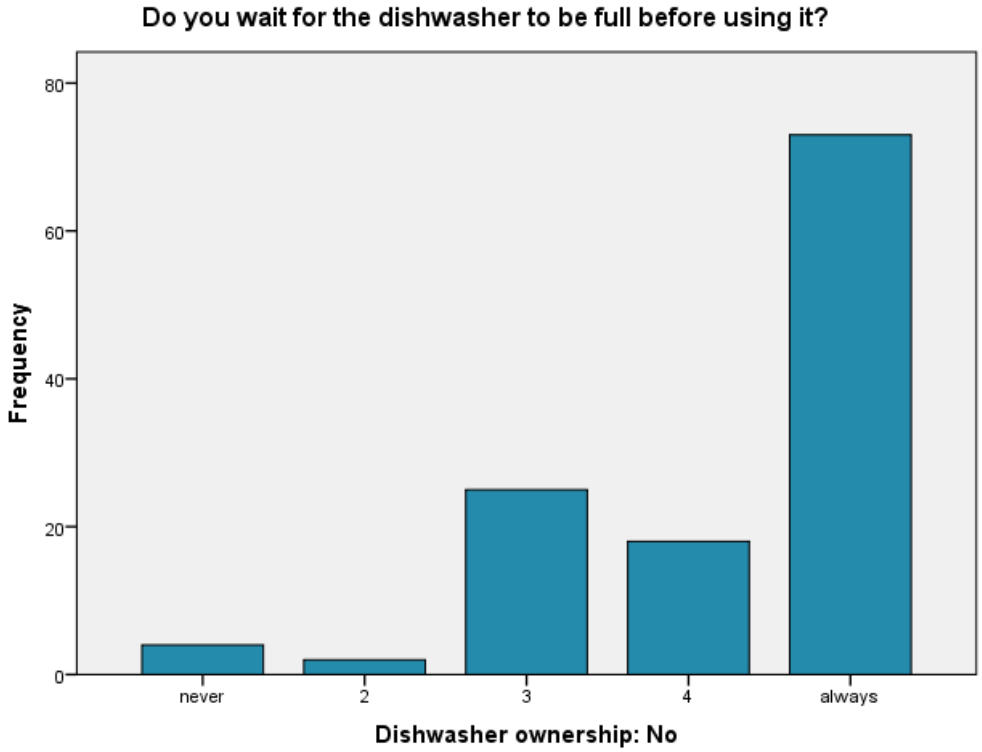

Fig. 4.2.2

Individuals who own a dishwasher and individuals who do not own a dishwasher both chose option 5 the most frequently. While 81,6% participants with a dishwasher chose option 5, only 59,8% of participants without a dishwasher chose this option. For participants with a dishwasher, option 4 was the next most frequently chosen option with 17,4%, followed by option 3 with 0,9%. Options 2 and 1 were not chosen by any participants who owned a dishwasher. For participants without a dishwasher, option 3 was the second most chosen option with 20,5%, followed by option 4 with 14,8%, option 1 with 3,3% and option 2 with 1,6% (*Table 4.2.3*, *Table 4.2.4*).

The question one must now pose, is whether or not the distribution for participants who do not own a dishwasher is random, or if it represents a valid distribution of behavior for this group. One can assume that most people are familiar with the dishwasher as an appliance, and have operated the device before despite not currently owning one. Differences in distributions can be explained with habits for example being different between these two groups. When looking at Fig. 4.2.2, the distribution does however strike one as slightly unusual, with options 2 and 4 seeming a little low in relation to options 1, 3 and 5. While there may have been some random selections involved for this group, the pattern does not clearly indicate a large percentage of random selections to me. It is therefore believed that there is a valid distribution of behavior reflected in the data for the group of individuals not owning a dishwasher, which differs from

the distribution of behavior reflected in the group of individuals owning a dishwasher. The values for EB2 were used to calculate EBMean for both groups for the reasons stated on page 25.

Dishwasher Ownership: Yes

EB3: Would you consider washing dishes by hand if the dishwasher is less than half full?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	80	12,7	12,8	12,8
	2	117	18,5	18,7	31,5
	3	153	24,2	24,5	56,0
	4	145	22,9	23,2	79,2
	always	130	20,6	20,8	100,0
	Total	625	98,9	100,0	
Missing		7	1,1		
Total		632	100,0		

Table 4.2.5

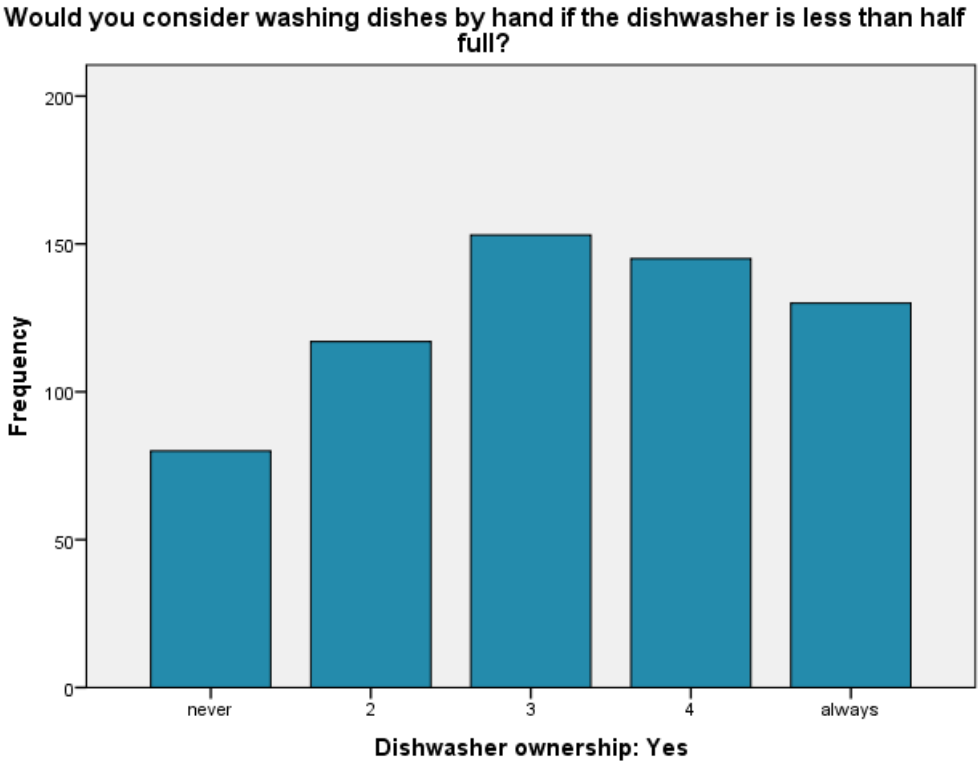

Fig. 4.2.3

Dishwasher Ownership: No

EB3: Would you consider washing dishes by hand if the dishwasher is less than half full?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	16	5,7	11,9	11,9
	2	19	6,8	14,1	25,9
	3	25	8,9	18,5	44,4
	4	18	6,4	13,3	57,8
	always	57	20,3	42,2	100,0
	Total	135	48,0	100,0	
Missing		146	52,0		
Total		281	100,0		

Table 4.2.6

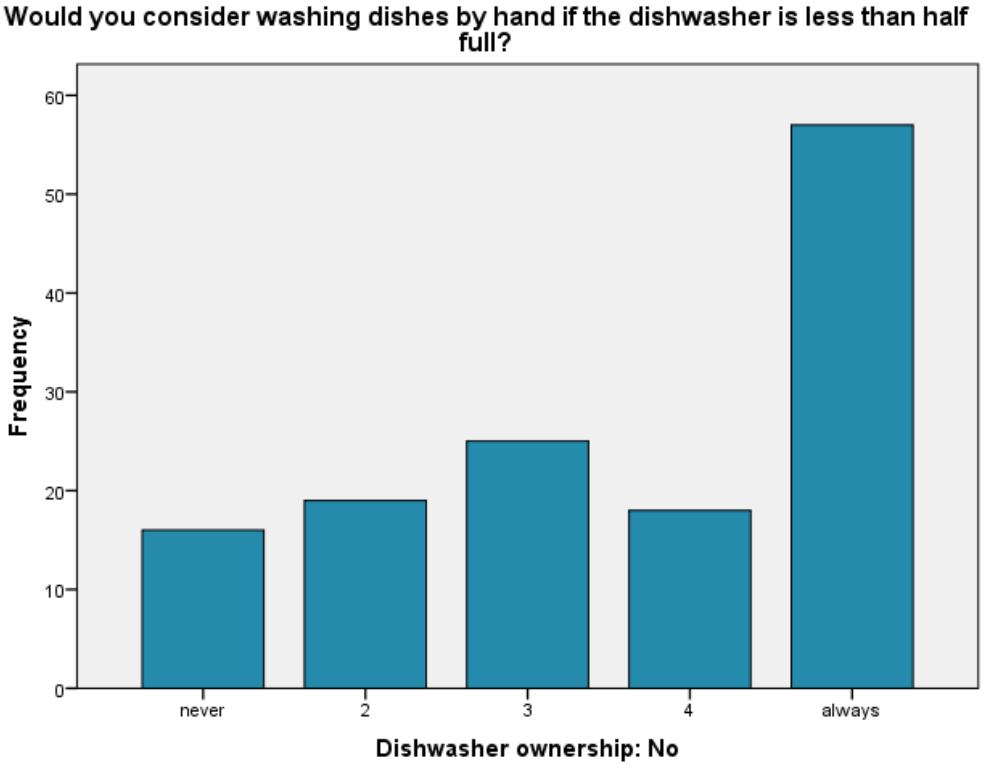

Fig. 4.2.4

Individuals who own a dishwasher and individuals who do not own a dishwasher have clearly different distributions concerning question EB3. As can be seen in Table 4.2.5, option 3 is the most chosen answer with 24,5%, followed closely by option 4 with 23,2%, option 5 with 20,8%, and option 2 with 18,7%. Option 1 is the least commonly chosen answer with 12,8%. Table 4.2.6 shows that for participants who do not own a dishwasher, option 5 was by far the

most chosen answer with 42,2%, followed by option 3 with 18,5%, option 2 with 14,1%, option 4 with 13,3% and option 1 with 11,9%.

When looking at Fig. 4.2.4 this distribution does not appear to be random and can be assumed to represent the behavior of this group. Question EB3 is therefore included in the calculation of EBMean for both groups.

Washing Machine:

As explained on pages 24-25, the Mann-Whitney-U test is applied to determine whether the group of participants who own a washing machine and the group of participants who do not own a washing machine answered questions EB5, EB6 and EB7 in the same manner.

H0: The distributions are identical for individuals who own a washing machine and individuals who do not own a washing machine.

Ranks

	Washing Machine Ownership	N	Mean Rank	Sum of Ranks
EB5: Do you wait for your laundry to be full before using the washing machine?	Yes	818	438,83	358963,50
	No	62	462,52	28676,50
	Total	880		
EB6: Do you wear the same clothes more than once before putting them in the laundry basket?	Yes	820	454,30	372522,00
	No	93	480,85	44719,00
	Total	913		
EB7: Do you wash your laundry on low heat settings (under 60ºC)?	Yes	821	448,62	368313,00
	No	76	453,16	34440,00
	Total	897		

Table 4.2.7

As can be seen in Table 4.2.8, questions EB5, EB6 and EB7 show that the distributions are identical for individuals who own a washing machine and individuals who do not own a washing machine, with the Mann-Whitney-U test resulting in p-values of 0,378, 0,321 and 0,873 respectively. This result can be explained by the assumption that individuals who do not own a washing machine still do their laundry using this appliance instead of washing laundry with their hands. This is in contrast to the ownership of a dishwasher for example, where

individuals can be expected to wash their dishes by hand when the appliance is not owned, and therefore result in different distributions of behavior.
Questions EB5, EB6 and EB7 can be used for both groups for the calculation of EBMean.

Test Statistics[a]

	EB5: Do you wait for your laundry to be full before using the washing machine?	EB6: Do you wear the same clothes more than once before putting them in the laundry basket?	EB7: Do you wash your laundry on low heat settings(under 60ºC)?
Mann-Whitney-U	23992,500	35912,000	30882,000
Wilcoxon-W	358963,500	372522,000	368313,000
Z	-,881	-,992	-,160
Asymp. Sig. (2-tailed)	,378	,321	,873

Table 4.2.8

<u>Clothes Dryer</u>:

As explained on pages 24-25, the Mann-Whitney-U test is applied to determine whether the group of participants who own a dryer and the group of participants who do not own a dryer answered questions EB8 and EB9 in the same manner.

H0: The distributions are identical for individuals who own a dryer and individuals who do not own a dryer.

Ranks

	Dryer Ownership	N	Mean Rank	Sum of Ranks
EB8: Do you clean the lint screen of your dryer?	Yes	159	289,47	46026,00
	No	312	208,75	65130,00
	Total	471		
EB9: Do you remove clothes from the dryer while they're still damp?	Yes	155	201,55	31241,00
	No	229	186,37	42679,00
	Total	384		

Table 4.2.9

Test Statistics[a]

	EB8: Do you clean the lint screen of your dryer?	EB9: Do you remove clothes from the dryer while they're still damp?
Mann-Whitney-U	16302,000	16344,000
Wilcoxon-W	65130,000	42679,000
Z	-6,330	-1,353
Asymp. Sig.(2-tailed)	,000	,176

a. Grouping Variable: Dryer Ownership

Table 4.2.10

Table 4.2.10 shows that there are significant differences in distribution between the group of individuals who own a dryer and the group of individuals who do not own a dryer, concerning question EB8 with a p-value of 0,000. According to this table, the groups do not differ concerning question EB9 with the Mann-Whitney-U test resulting with a p-value of 0,176.

In order to take a closer look at these differences, descriptive statistics were calculated for both groups separately. Question EB9 is also examined in more detail despite the Mann-Whitney-U test result. This is due to the fact that 155 individuals who owned a dryer answered this question, which is considerably less than the 229 individuals who answered without owning a dryer. Seeing as a dryer is not an appliance everyone can be assumed to have experience using, the distributions may be worth looking at in more detail.

Dryer Ownership: Yes

EB8: Do you clean the lint screen of your dryer?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	9	5,5	5,7	5,7
	2	10	6,1	6,3	11,9
	3	19	11,6	11,9	23,9
	4	35	21,3	22,0	45,9
	always	86	52,4	54,1	100,0
	Total	159	97,0	100,0	
Missing		5	3,0		
Total		164	100,0		

Table 4.2.11

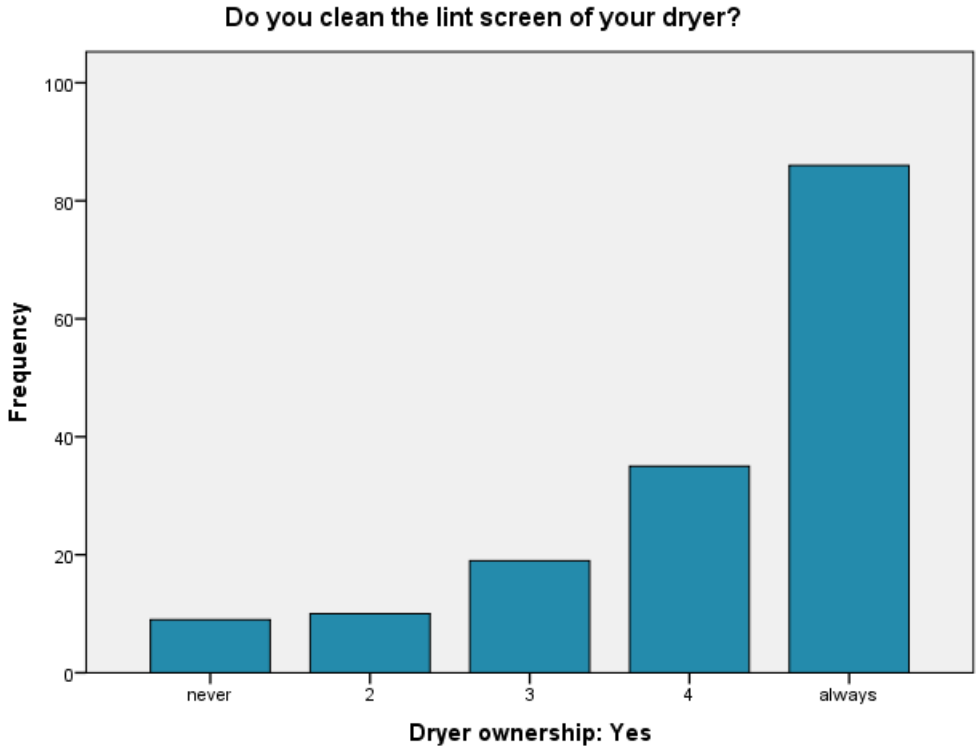

Fig. 4.2.5

Dryer Ownership: No

EB8: Do you clean the lint screen of your dryer?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	50	6,6	16,0	16,0
	2	34	4,5	10,9	26,9
	3	97	12,8	31,1	58,0
	4	39	5,2	12,5	70,5
	always	92	12,2	29,5	100,0
	Total	312	41,2	100,0	
Missing		445	58,8		
Total		757	100,0		

Tab. 4.2.12

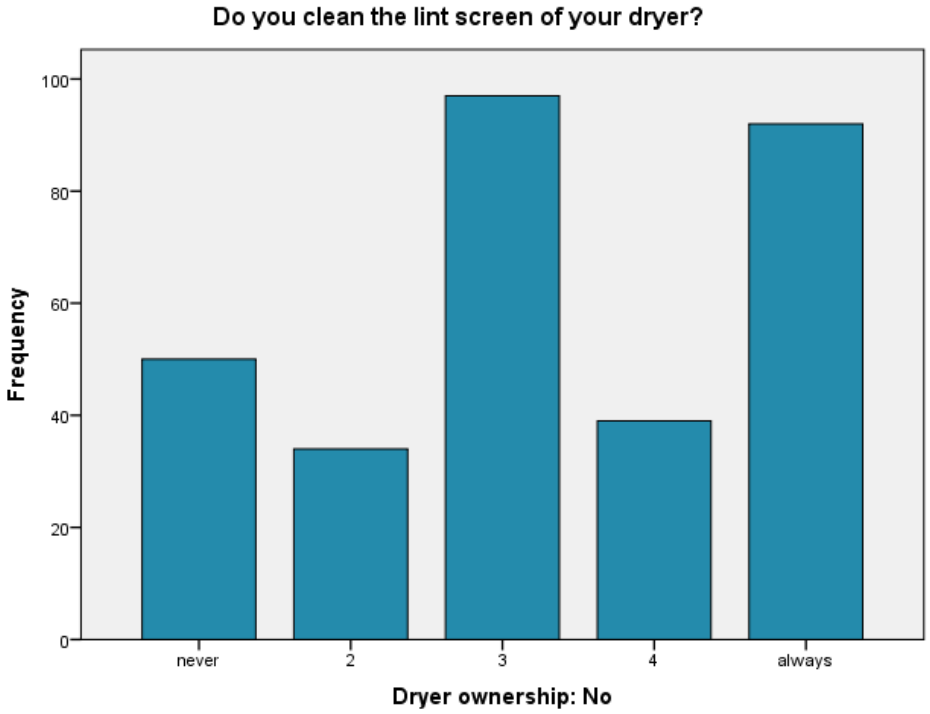

Fig. 4.2.6

Concerning question EB8, a total of 159 individuals who own a dryer in their household answered while almost twice the amount of individuals (315) who do not own a dryer answered this question. When looking at Fig. 4.2.5, the distribution for participants who own a dryer is in accordance with what one would expect, with option 5 being chosen by 54,1%, option 4 by 22%, option 3 by 11,9%, option 2 by 6,3% and option 1 by 5,7% (*Table 4.2.11*). Fig. 4.2.6 however shows a strong W-shaped distribution for individuals who do not own a dryer, which strongly indicates a random distribution of answers. In addition to these results, a number of participants commented at the end of the survey, that they simply chose a random answer (many specifying it as option 3), as they accidentally clicked into the question without the option of clicking back out.

The values for EB8 of the group of individuals who do not own a dryer are therefore excluded for the calculation of EBMean.

Dryer Ownership: Yes

EB9: Do you remove clothes from the dryer while they're still damp?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	29	17,7	18,7	18,7
	2	29	17,7	18,7	37,4

	3	44	26,8	28,4	65,8
	4	35	21,3	22,6	88,4
	always	18	11,0	11,6	100,0
	Total	155	94,5	100,0	
Missing		9	5,5		
Total		164	100,0		

Table 4.2.13

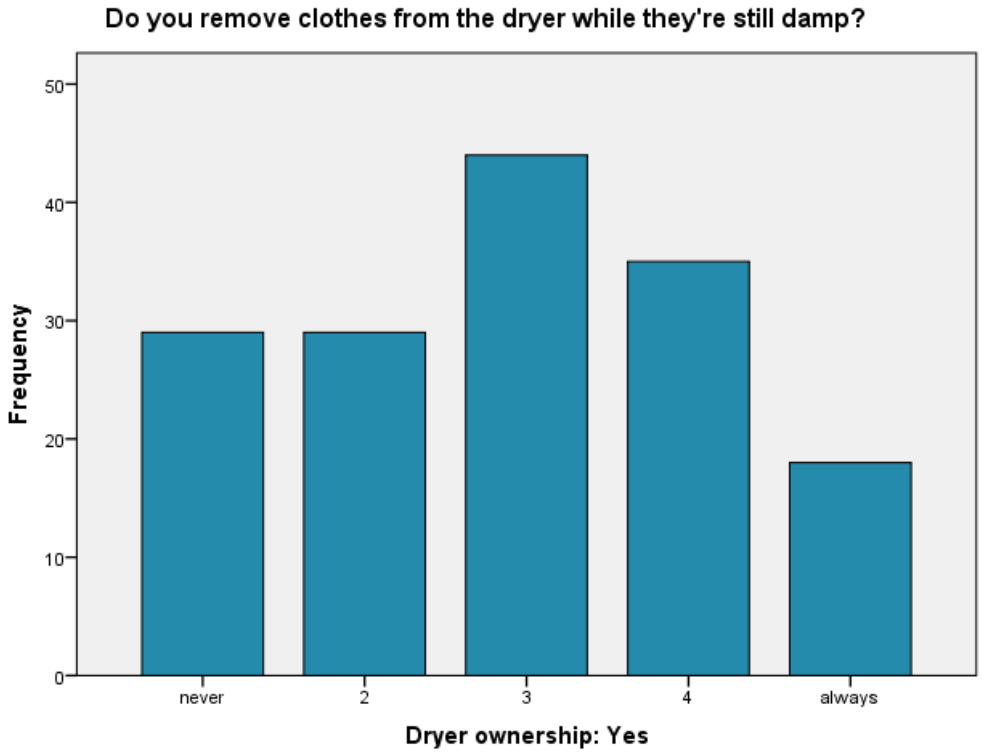

Fig. 4.2.7

Dryer Ownership: No

Do you remove clothes from the dryer while they're still damp?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	never	74	9,8	32,3	32,3
	2	20	2,6	8,7	41,0
	3	70	9,2	30,6	71,6
	4	26	3,4	11,4	83,0
	always	39	5,2	17,0	100,0
	Total	229	30,3	100,0	
Missing		528	69,7		
Total		757	100,0		

Table 4.2.14

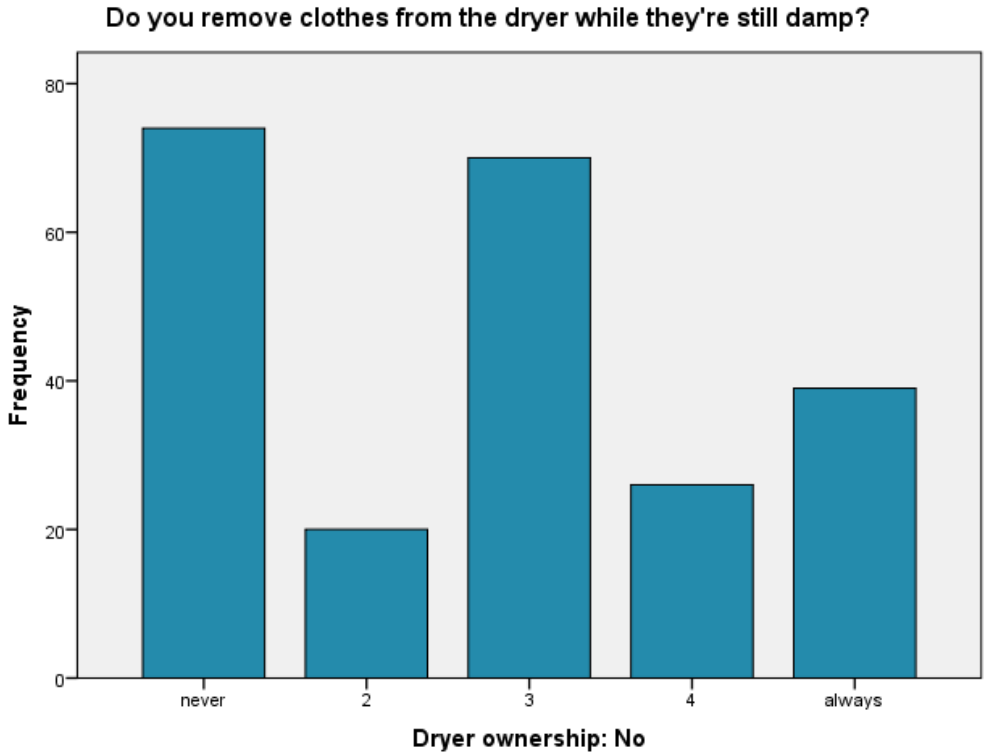

Fig. 4.2.8

Concerning question EB9, a total of 155 individuals who own a dryer in their household answered while a total of 229 who do not own a dryer answered this question. According to Table 4.2.13, 28,4% of the participants who do own a dryer chose option 3, followed by 22,6% choosing option 4, options 1 and 2 tying with 18,7% each, and only 11,6% choosing option 5. When looking at the results for individuals who do not own a dryer, Fig. 4.2.8 shows a strong W-shaped distribution, strongly indicating a random distribution of answers. In addition to these results there are the before mentioned number of participants, who commented at the end of the survey that they simply chose a random answer.

The values for EB9 of the group of individuals who do not own a dryer are therefore excluded for the calculation of EBMean.

4.2.1. EBMean

EBMean was created by calculating the mean of 18 questions concerning energy behavior, as explained in more detail in the previous section and chapter 3.1. Calculating a Variable for Energy Behavior.

Descriptive Statistics

	N	Mean	Standard Deviation	Minimum	Maximum
EBMean	928	4,0599	,36383	2,25	5,00

Table 4.2.15

Kolmogorov-Smirnov Test

		EBMean
N		928
Parameters of normal distribution[b]	Mean	4,0599
	Standard Deviation	,36383
Most extreme differences	Absolute	,051
	Positive	,027
	Negative	-,051
Test Statistic		,051
Asymp. Sig. (2-tailed)		,000[c]

a. Test of Normality

b. Calculated from the data.

c. Lilliefors Significance Correction

Table 4.2.16

As to be seen in Table 4.2.16, the Kolmogorov-Smirnov Test results in a p-value of 0,000, meaning that EBMean does not follow a normal distribution.

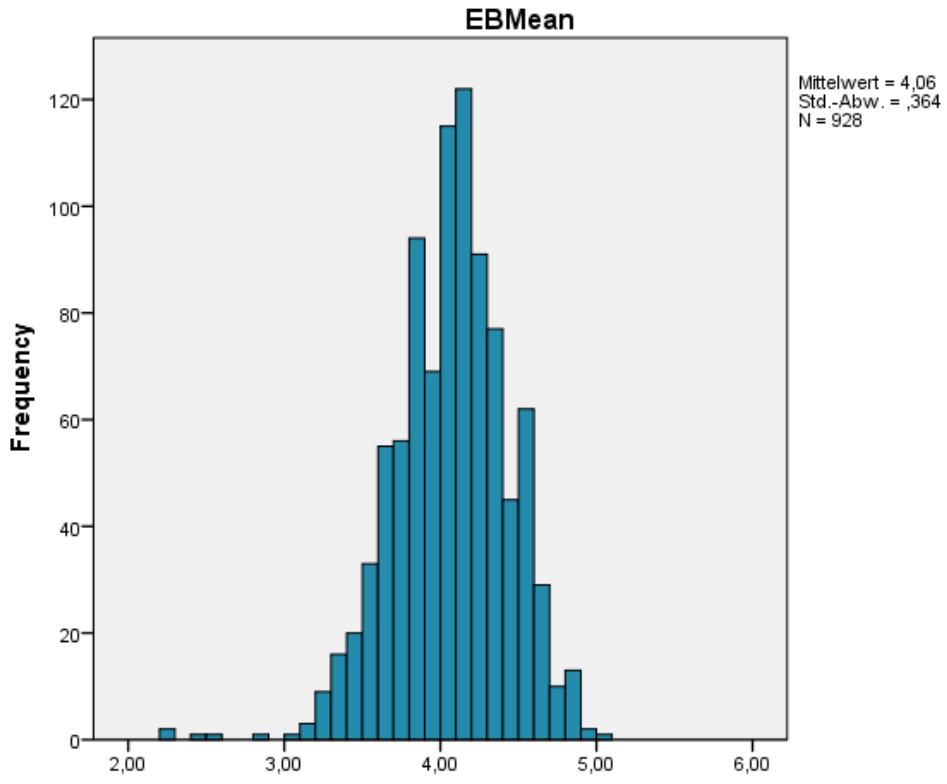

Fig. 4.2.9

4.3. Correlations

4.3.1. Demographic Factors

In order to explore the relation between demographic factors and energy behavior, the new variable for energy behavior EBMean was tested for differences and correlations with the assessed demographic data.

Energy Behavior and Gender:

Ranks

	Gender	N	Mean Rank	Sum of Ranks
EBMean	female	649	468,00	303729,50
	male	265	431,79	114425,50
	Total	914		

Table 4.3.1

Test Statistics[a]

	EBMean
Mann-Whitney-U	79180,500
Wilcoxon-W	114425,500
Z	-1,882
Asymp. Sig. (2-tailed)	,060

a. Grouping Variable: Gender

Table 4.3.2

As can be seen in Table 4.3.1, the ranking results of the Mann-Whitney-U test show that concerning the variable EBMean, the females have a higher mean rank than the males. A higher mean rank means that the values for EBMean are also higher with females in comparison to males, suggesting stronger energy-saving behavior. The sum of ranks is higher for the female group as a result of the total amount of females being higher than the total amount of male participants in the test. Table 4.3.2 shows that with a significance of p = 0,06, the 0,05 level threshold is not met. The margin of error therefore lies at 6%, which can still be considered very low. Despite the test results not meeting the requirements of being considered significant, I would not claim there is absolutely no correlation between age and energy behavior.

Energy Behavior and Age:

Correlations

			Age	EBMean
Spearman's-Rho	Age	Correlation Coefficient	1,000	,006
		Sig. (2-tailed)	.	,845
		N	927	927
	EBMean	Correlation Coefficient	,006	1,000
		Sig. (2-tailed)	,845	.
		N	927	928

Table 4.3.3

Table 4.3.3 shows the Spearman Correlation for Age and EBMean, resulting in a correlation coefficient r_s of 0,006 and a significance of p = 0,845, meaning the results are not significant and there is no correlation between age and energy behavior.

Energy Behavior and Formal Education:

Ranks

	Formal Education	N	Mean Rank
EBMean	Pflichtschule	19	419,66
	Lehre	8	388,38
	Fachschule	7	442,86
	Höhere Schule	559	458,76
	Universität, Hochschule	301	483,43
	Keine	2	297,00
	anderer Schulabschluss:	31	432,13
	Gesamt	927	

Table 4.3.10

Test Statistics[a,b]

	EBMean
Chi-square	4,223
df	6
Asymp. Sig.	,647

a. Kruskal-Wallis-Test

b. Grouping Variable: Formal Education

Table 4.3.11

As can be seen in Table 4.3.11, the Kruskal-Wallis-Test performed for the variables Formal Education and EBMean has a p of 0,647, meaning there are no significant differences between the different levels of formal education and the energy behavior of these groups.

Energy Behavior and Employment:

Ranks

	Employment: I am an employee	N	Mean Rank	Sum of Ranks
EBMean	not chosen	615	465,66	286383,00
	chosen	313	462,21	144673,00
	Total	928		

Table 4.3.12

Test Statistics[a]

	EBMean
Mann-Whitney-U	95532,000
Wilcoxon-W	144673,000
Z	-,185
Asymp. Sig. (2-tailed)	,853

a. Grouping Variable: Employment: I am an employee

Table 4.3.13

Table 4.3.13 shows the Mann-Whitney-U test concludes there is no significant result with p = 0,853 for the grouping variable "Employment: I am an employee". This means that there are no significant differences between the participants who specified working as an employee and the participants who are not currently employees. Table 4.3.12 shows that the mean ranks of these two groups barely differ.

Ranks

	Employment: I am self-employed	N	Mean Rank	Sum of Ranks
EBMean	not chosen	898	464,52	417143,00
	chosen	30	463,77	13913,00
	Total	928		

Table 4.3.14

Test Statistics[a]

	EBMean
Mann-Whitney-U	13448,000
Wilcoxon-W	13913,000
Z	-,015
Asymp. Sig. (2-tailed)	,988

a. Grouping Variable: Employment: I am self-employed

Table 4.3.15

As seen in Table 4.3.15, there are no significant differences between the group of participants who are self-employed, and those who aren't. The Mann-Whitney-U test results in a significance of p = 0,988. When examining Table 4.3.14 one can see that the mean ranks between the two groups barely differ.

Ranks

	Employment: I am unemployed and seeking employment	N	Mean Rank	Sum of Ranks
EBMean	not chosen	898	463,15	415910,50
	chosen	30	504,85	15145,50
	Total	928		

Table 4.3.16

Test Statistics[a]

	EBMean
Mann-Whitney-U	12259,500
Wilcoxon-W	415910,500
Z	-,839
Asymp. Sig. (2-tailed)	,402

a. Grouping Variable: Employment: I am unemployed and seeking employment

Table 4.3.17

As can be seen in Table 4.3.17, the Mann-Whitney-U test concludes that there is no significant difference in energy behavior between the participants who are currently unemployed and seeking employment, and those who aren't. The p-value is 0,402.

Ranks

	Employment: I am unemployed and not currently seeking employment	N	Mean Rank	Sum of Ranks
EBMean	not chosen	910	464,23	422451,00
	chosen	18	478,06	8605,00
	Total	928		

Table 4.3.18

Test Statistics[a]

	EBMean
Mann-Whitney-U	7946,000
Wilcoxon-W	422451,000
Z	-,217

Asymp. Sig. (2-tailed)	,828

a. Grouping Variable: Employment: I am unemployed and not currently seeking employment

Table 4.3.19

Table 4.3.19 shows a significance value of p = 0,828 for the grouping variable "Employment: I am unemployed and not currently seeking employment". This means that there are no significant differences between the participants who are unemployed and not seeking employment, and those who are not. Table 4.3.18 shows that the mean ranks of these two groups barely differ.

Ranks

	Employment: I am a homemaker	N	Mean Rank	Sum of Ranks
EBMean	not chosen	914	465,51	425475,50
	chosen	14	398,61	5580,50
	Total	928		

Table 4.3.20

Test Statistics[a]

	EBMean
Mann-Whitney-U	5475,500
Wilcoxon-W	5580,500
Z	-,927
Asymp. Sig. (2-tailed)	,354

a. Grouping Variable: Employment: I am a homemaker

Table 4.3.21

As can be seen in Table 4.3.21, the significance value of the Mann-Whitney-U test concerning the grouping Variable "Employment: I am a homemaker" is p = 0,354. This means that there are no significant differences between the participants who are homemakers and those who are not. Table 4.3.20 shows that the mean rank of the group of participants who are homemakers is lower than the second group.

Ranks

	Employment: I am a college student	N	Mean Rank	Sum of Ranks
EBMean	not chosen	80	432,11	34568,50

	chosen	848	467,56	396487,50
	Total	928		

Table 4.3.22

Test Statistics[a]

	EBMean
Mann-Whitney-U	31328,500
Wilcoxon-W	34568,500
Z	-1,131
Asymp. Sig. (2-tailed)	,258

a. Grouping Variable: Employment: I am a college student

Table 4.3.23

Table 4.3.23 shows a significance value of p = 0,258 for the grouping variable "Employment: I am a college student". This means that there are no significant differences between the participants who are currently college students and those who are not. Table 4.3.22 shows that the mean ranks of these two groups barely differ.

Ranks

	Employment: I am in retirement	N	Mean Rank	Sum of Ranks
EBMean	not chosen	926	465,35	430910,50
	chosen	2	72,75	145,50
	Total	928		

Table 4.3.24

Test Statistics[a]

	EBMean
Mann-Whitney-U	142,500
Wilcoxon-W	145,500
Z	-2,070
Asymp. Sig. (2-tailed)	,038

a. Grouping Variable: Employment: I am in retirement

Table 4.3.25

The Mann-Whitney-U test in Table 4.3.25 yields a significant result with p = 0,038. This result would indicate that individuals who are in retirement show different energy behavior from the other groups. One must however point out that of the 928 individuals participating in

this study, only 2 were currently in retirement. This number is too low to represent all retired individuals. Table 4.3.24 shows a difference in mean rank, with the two retired individuals having a mean rank of 72,75 and all non-retired individuals having a mean rank of 465,35. This would suggest that the retired individuals have a lower EBMean than the other participants and therefore engage in less energy-saving behavior.

Ranks

	Employment: I am unfit for work	N	Mean Rank	Sum of Ranks
EBMean	not chosen	927	464,21	430326,00
	chosen	1	730,00	730,00
	Total	928		

Table 4.3.26

Test Statistics[a]

	EBMean
Mann-Whitney-U	198,000
Wilcoxon-W	430326,000
Z	-,991
Asymp. Sig. (2-tailed)	,321

a. Grouping Variable: Employment: I am unfit for work

Table 4.3.27

Table 4.3.27 shows a significance value of p = 0,321 for the grouping variable "Employment: I am unfit for work". This means that there are no significant differences between the participants who are currently unfit for work and those who are not. One must point out that only one individual specified themselves as being unfit for work, therefore one cannot represent this group of individuals.

Energy Behavior and Field of Study:

Ranks

	College: Biology	N	Mean Rank	Sum of Ranks
EBMean	not chosen	172	451,22	77610,50
	chosen	756	467,52	353445,50
	Total	928		

Table 4.3.30

Test Statistics[a]

	EBMean
Mann-Whitney-U	62732,500
Wilcoxon-W	77610,500
Z	-,720
Asymp. Sig. (2-tailed)	,472

a. Grouping Variable: College: Biology

Table 4.3.31

Table 4.3.31 shows the Mann-Whitney-U test does not provide a significant result with p = 0,472 for the grouping variable "College: Biology". This means that there are no significant differences between the participants who listed Biology as their field of study, and those who are studying other subjects. Table 4.3.30 shows that the mean ranks of these two groups barely differ with the Biology group having a mean rank of 467,52 and the non-biology group having a mean rank of 451,22.

Energy Behavior and Income:

Correlations

			EBMean	Income
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	-,076*
		Sig. (2-tailed)	.	,022
		N	928	901
	Income	Correlation Coefficient	-,076*	1,000
		Sig. (2-tailed)	,022	.
		N	901	901

*. Correlation is significant at the 0,05 level (2-tailed).

Table 4.3.32

When testing energy behavior and income for correlations, the Spearman's-rho produced a correlation coefficient of r_s = -0,076. The 2-tailed test is significant with p = 0,022, meaning that there is a correlation between income and energy behavior (*Table 4.3.32*). Seeing as the correlation coefficient is negative, the correlation between the two variables is negative. The value for EBMean sinks with rising income, suggesting sinking energy-saving behavior with increasing wealth.

Energy Behavior and Amount of Individuals in the Household:

Correlations

			EBMean	Amount of individuals in the household
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	-,093**
		Sig. (2-tailed)	.	,005
		N	928	887
	Amount of individuals in the household	Correlation Coefficient	-,093**	1,000
		Sig. (2-tailed)	,005	.
		N	887	887

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.35

There is a significant correlation between EBMean and the amount of individuals living in a household. As can be seen in Table 4.3.35, the correlation coefficient has a value of r_s = -0,093, making it a negative correlation. The more individuals are in a household, the lower the value for EBMean gets.

Energy Behavior and Household Members:

Ranks

	Household members: Spouse	N	Mean Rank	Sum of Ranks
EBMean	Not chosen	887	466,83	414080,50
	chosen	41	414,04	16975,50
	Total	928		

Table 4.3.36

Test Statistics[a]

	EBMean
Mann-Whitney-U	16114,500
Wilcoxon-W	16975,500
Z	-1,234
Asymp. Sig.(2-tailed)	,217

a. Grouping Variable: Household members: Spouse

Table 4.3.37

Table 4.3.36 shows that individuals who specified living with a spouse have a lower mean rank than those not living with a spouse, which indicates lower values for EBMean and less energy-saving behaviors. As shown in Table 4.3.37 however, the Mann-Whitney U test concludes that there are no significant differences in energy behavior between participants living with a spouse and participants not living with a spouse with p = 0,217.

Ranks

	Household members: Partner	N	Mean Rank	Sum of Ranks
EBMean	not chosen	680	460,11	312874,50
	chosen	248	476,54	118181,50
	Total	928		

Table 4.3.38

Test Statistics[a]

	EBMean
Mann-Whitney-U	81334,500
Wilcoxon-W	312874,500
Z	-,827
Asymp. Sig. (2-tailed)	,408

a. Grouping Variable: Household members: Partner

Table 4.3.39

As can be seen in Table 4.3.38, participants who specified living with their partner have a slightly higher mean rank than those not living with a partner, which indicates higher values for EBMean. As shown in Table 4.3.39 however, the Mann-Whitney U test concludes that there are no significant differences in energy behavior between participants living with or without a partner with p = 0,408.

Rank

	Household members: Parent(s)	N	Mean Rank	Sum of Ranks
EBMean	not chosen	695	480,85	334192,00
	chosen	233	415,73	96864,00
	Total	928		

Table 4.3.40

Test Statistics[a]

	EBMean
Mann-Whitney-U	69603,000
Wilcoxon-W	96864,000
Z	-3,211
Asymp. Sig. (2-tailed)	,001

a. Grouping Variable: Household members: Parent(s)

Table 4.3.41

As Table 4.3.41 shows, the Mann-Whitney U test concludes that there are significant differences between energy behavior of participants living with one or both of their parents, and those living in a household without a parent. When comparing the mean ranks of each group in Table 4.3.40, one can see that the group of participants who specified living with their parent(s) have a much lower mean rank that the group living without their parent(s). A lower mean rank translates to a lower EBMean, which stands for less energy-saving behavior.

Ranks

	Household members: Sibling(s)	N	Mean Rank	Sum of Ranks
EBMean	not chosen	744	474,70	353176,50
	chosen	184	423,26	77879,50
	Total	928		

Table 4.3.42

Test Statistics[a]

	EBMean
Mann-Whitney-U	60859,500
Wilcoxon-W	77879,500
Z	-2,332
Asymp. Sig. (2-tailed)	,020

a. Grouping Variable: Household members: Sibling(s)

Table 4.3.43

The Mann-Whitney U test conducted for the grouping variable "Household members: Sibling(s)" shows there are significant differences with p = 0,02 (*Table 4.3.43*). When regarding Table 4.3.42, one can see that the group of participants who specified living with

their sibling(s) have a lower mean rank than those not living with their sibling(s). A lower mean rank translates to a lower EBMean, which leads to conclude that an individual sharing a household with one or more siblings is less likely to engage in energy-saving behaviors.

Ranks

	Household members: Roommate(s)	N	Mean Rank	Sum of Ranks
EBMean	not chosen	682	455,25	310477,50
	chosen	246	490,16	120578,50
	Total	928		

Table 4.3.44

Test Statistics[a]

	EBMean
Mann-Whitney-U	77574,500
Wilcoxon-W	310477,500
Z	-1,752
Asymp. Sig. (2-tailed)	,080

a. Grouping Variable: Household members: Roommate(s)

Table 4.3.45

Concerning roommates, Table 4.3.45 shows that with p = 0,08 there is no significant difference in energy behavior between the group of participants living with one or more roommates, and the group of participants not living with a roommate. The p-value is however still very low and close to the 5% threshold. When examining Table 4.3.44 the group of participants with roommates shows a higher mean rank than those without, translating to a higher EBmean and more energy-saving behavior.

Ranks

	Household members: Child(ren)	N	Mean Rank	Sum of Ranks
EBMean	not chosen	880	468,77	412518,00
	chosen	48	386,21	18538,00
	Total	928		

Table 4.3.46

Test Statistics[a]

	EBMean
Mann-Whitney-U	17362,000
Wilcoxon-W	18538,000
Z	-2,079
Asymp. Sig. (2-tailed)	,038

a. Grouping Variable: Household members: Child(ren)

Table 4.3.47

As Table 4.3.47 shows, the Mann-Whitney U test concludes that there are significant differences between energy behavior of participants living with children, and those living in a household without children. When comparing the mean ranks of each group in Table 4.3.46, one can see that the group of participants who specified living with children have a much lower mean rank that the group living without children. A lower mean rank translates to a lower EBMean, which stands for less energy-saving behavior.

Energy Behavior and Children:

Ranks

	Children	N	Mean Rank	Sum of Ranks
EBMean	Yes	38	389,11	14786,00
	No	880	462,54	407035,00
	Total	918		

Table 4.3.48

Test Statistics[a]

	EBMean
Mann-Whitney-U	14045,000
Wilcoxon-W	14786,000
Z	-1,672
Asymp. Sig. (2-tailed)	,094

a. Grouping Variable: Children

Table 4.3.49

As can be seen in Table 4.3.48, participants who specified having a child or children of their own have a lower mean rank than those who do not have children, which indicates lower values for EBMean. As shown in Table 4.3.49 however, the Mann-Whitney U test concludes that there are no significant differences in energy behavior between participants with or without children with p = 0,094, which can be considered a relatively low p-value despite this.

Ranks

	Do you plan to have children	N	Mean Rank
EBMean	Yes	487	455,46
	No	174	462,95
	I don't know	261	471,81
	Total	922	

Table 4.3.50

Test Statistics[a,b]

	EBMean
Chi-square	,648
df	2
Asymp. Sig.	,723

a. Kruskal-Wallis-Test

b. Grouping Variable: Do you plan to have children

Table 4.3.51

When dividing the participants into groups depending on their desire to have children in the future, no differences in energy behavior could be seen with the Mann-Whitney U test resulting with a significance of p = 0,723 (*Table 4.3.51*).

4.3.2. External Factors

4.3.2.1. Social and Cultural Factors

Energy Behavior and City:

Ranks

	City	N	Mean Rank	Sum of Ranks
EBMean	Vienna	746	465,93	347583,50

	Other	174	437,22	76076,50
	Total	920		

Table 4.3.4

Test Statistics[a]

	EBMean
Mann-Whitney-U	60851,500
Wilcoxon-W	76076,500
Z	-1,284
Asymp. Sig. (2-tailed)	,199

a. Grouping Variable: City

Table 4.3.5

According to Table 4.3.4, participants not living in Vienna have a lower mean rank than participants living in Vienna, which translates to lower EBMean values and less energy-saving behaviors. Due to the fact that much more participants live in Vienna than in other cities, the sum of ranks is much higher for this group. Table 4.3.5 shows that with p = 0,199, these results are not significant. One can therefore not claim that there is a significant difference in energy behavior between individuals living in Vienna or in other cities.

Energy Behavior and District:

Ranks

	District	N	Mean Rank
EBMean	1010	6	182,67
	1020	49	336,28
	1030	54	348,38
	1040	15	476,17
	1050	21	465,52
	1060	20	308,10
	1070	25	299,06
	1080	28	412,73
	1090	51	348,82
	1100	41	381,68
	1110	28	388,77
	1120	41	380,62
	1130	19	258,55
	1140	39	381,22

	1150	32	415,88
	1160	48	391,07
	1170	30	435,35
	1180	42	350,42
	1190	20	382,53
	1200	40	373,39
	1210	38	405,45
	1220	26	347,02
	1230	25	304,34
	Total	738	

Table 4.3.6

Test Statistics[a,b]

	EBMean
Chi-square	35,131
df	22
Asymp. Sig.	,038

a. Kruskal-Wallis-Test

b. Grouping Variable: District

Table 4.3.7

Table 4.3.7 shows that the Kruskal-Wallis-Test ranking energy behavior by districts has a significance of p = 0,038, meaning that there are significant differences in energy behavior between the districts. As can be seen in Table 4.3.6, the lowest mean rank is held by district 1010 and the highest mean rank by district 1040. A low mean rank translates to low values of EBMean, suggesting that the district 1010 shows the least energy-saving behavior in contrast to district 1040 with the most energy-saving behavior. One must keep in mind that there were only 6 individuals representing the district 1010, which is not necessarily a representative amount.

The districts can be sorted by mean rank, starting from the lowest:

1010 Innere Stadt, 1130 Hietzing, 1070 Neubau, 1230 Liesing, 1060 Mariahilf, 1020 Leopoldstadt, 1220 Donaustadt, 1030 Landstraße, 1090 Alsergrund, 1180 Währing, 1200 Brigittenau, 1120 Meidling, 1140 Penzing, 1100 Favoriten, 1190 Döbling, 1110 Simmering, 1160 Ottakring, 1210 Floridsdorf, 1080 Josefstadt, 1150 Rudolfsheim-Fünfhaus, 1170 Hernals, 1050 Margareten, 1040 Wieden

Energy Behavior and Citizenship:

Ranks

	Citizenship	N	Mean Rank
EBMean	Austria	784	458,63
	Bosnia and Herzegovina	2	130,00
	Bulgaria	2	111,50
	China (People's Republic of China)	1	183,00
	Croatia	1	528,00
	Germany	80	424,75
	Greece	4	258,00
	Hungary	1	118,50
	Italy	17	587,24
	Japan	1	635,50
	Jordan	1	383,00
	Liechtenstein	1	793,50
	Luxembourg	3	585,50
	Mexico	1	172,00
	Poland	5	542,00
	Rumania	1	724,50
	Slovenia	2	481,25
	Spain	1	492,50
	Switzerland	1	71,50
	Turkey	1	761,00
	Ukraine	1	327,00
	United States of America	1	663,00
	Total	912	

Table 4.3.8

Test Statistics[a,b]

	EBMean
Chi-square	26,986
df	21
Asymp. Sig.	,171

a. Kruskal-Wallis-Test

b. Grouping Variable: Citizenship

Table 4.3.9

Table 4.3.9 shows that the Kruskal-Wallis-Test ranking energy behavior by citizenship does not yield significant results with p = 0,171, meaning that there are no differences between energy behavior of individuals of different countries. One must note that aside from Austria, Germany and Italy, the amount of individuals representing the other countries is extremely low, making such a comparison meaningless. One can however look at the mean ranks of Austria, Germany and Italy. Of these three countries Italy has the highest mean rank with 587,34, followed by Austria with 458,63 and Germany with 424,75 (*Table 4.3.8*). A high mean rank translates to high values for EBMean, meaning that participants from Italy showed more energy-saving behavior than Austria and Germany.

Energy Behavior and Childhood Home:

Ranks

	Childhood Home	N	Mean Rank	Sum of Ranks
EBMean	rural (less than 150 people / km²)	482	494,77	238477,00
	urban (more than 150 people / km²)	445	430,68	191651,00
	Total	927		

Table 4.3.33

Test Statistics[a]

	EBMean
Mann-Whitney-U	92416,000
Wilcoxon-W	191651,000
Z	-3,643
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Childhood Home

Table 4.3.34

As can be seen in Table 4.3.34, there is a significant difference between the participants who grew up in a rural environment and those who grew up in an urban environment concerning their energy behavior: p = 0,000. Table 4.3.33 shows a mean rank of 430,68 for the participants from the urban group, while the rural group shows a much higher mean rank of 494,77. A higher mean rank translates to higher values for EBMean, which lets the conclusion be drawn that individuals who grew up in a rural environment have stronger energy-saving behaviors than those which grew up in an urban environment.

4.3.2.2. Economic Factors

Perception of own electricity consumption:

Energy Behavior and Personal Energy Consumption per Month:

Correlations

			EBMean	Personal energy consumption
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,192**
		Sig. (2-tailed)	.	,000
		N	928	925
	Personal energy consumption	Correlation Coefficient	,192**	1,000
		Sig. (2-tailed)	,000	.
		N	925	925

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.89

Respondents were asked to rate how aware they are of their personal energy consumption per month on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.89 shows, the Spearman correlation coefficient is 0,192, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising awareness of personal energy consumption.

Energy Behavior and Changes in Personal Energy Consumption:

Correlations

			EBMean	Change personal electricity consumption
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	-,152**
		Sig. (2-tailed)	.	,000
		N	928	924
	Change personal electricity consumption	Correlation Coefficient	-,152**	1,000
		Sig. (2-tailed)	,000	.

	N	924	924

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.90

Respondents were asked to rate how they perceive their personal energy consumption has changed over the past five years on a scale from 1 – 5 (strong fall – strong rise). As Table 4.3.90 shows, the Spearman correlation coefficient is -0,152, and the test is significant with p = 0,000. One can therefore conclude that there is a negative correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, decrease with rising belief of personal energy consumption having increased over the years.

Energy Behavior and Feedback-Devices:

Ranks

	Feedback-Device	N	Mean Rank	Sum of Ranks
EBMean	Yes	38	450,87	17133,00
	No	883	461,44	407448,00
	Total	921		

Table 4.3.91

Test Statistics[a]

	EBMean
Mann-Whitney-U	16392,000
Wilcoxon-W	17133,000
Z	-,240
Asymp. Sig. (2-tailed)	,810

a. Grouping Variable: Feedback-Device

Table 4.3.92

As can be seen in Table 4.3.92, there is no significant difference in energy behavior between participants who claimed to possess a feedback-device such as a smart meter and those who do not own such a device (p = 0,810).

Knowledge of expenses:

Energy Behavior and Electricity Bill Awareness:

Correlations

			EBMean	Electricity bill awareness
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,148**

		Sig. (2-tailed)	.	,000
		N	928	926
	Electricity bill awareness	Correlation Coefficient	,148**	1,000
		Sig. (2-tailed)	,000	.
		N	926	926

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.93

Respondents were asked to rate how aware they are of their average electricity bills on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.93 shows, the Spearman correlation coefficient is 0,148, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising awareness of the height of electricity bills.

Energy Behavior and Changes in Electricity Bills:

Correlations

			EBMean	Changes electricity bill
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,154**
		Sig. (2-tailed)	.	,000
		N	928	926
	Changes electricity bill	Correlation Coefficient	,154**	1,000
		Sig. (2-tailed)	,000	.
		N	926	926

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.94

Respondents were asked to rate how electricity prices have changed over the past five years on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.94 shows, the Spearman correlation coefficient is 0,154, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising awareness of how electricity prices have changed over time.

Willingness to spend money:

Energy Behavior and Willingness to Invest in Energy-Efficiency:

Correlations

			EBMean	Willingness investing in energy-efficiency
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,137**
		Sig. (2-tailed)	.	,000
		N	928	926
	Willingness investing in energy-efficiency	Correlation Coefficient	,137**	1,000
		Sig. (2-tailed)	,000	.
		N	926	926

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.95

Respondents were asked to rate how willing they are to invest in energy-efficient technologies on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.95 shows, the Spearman correlation coefficient is 0,137, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising willingness to invest in energy-efficient technologies.

4.3.3. Internal Factors

Energy Behavior and Changes in General Energy Consumption:

Correlations

			Change general energy consumption	EBMean
Spearman's-Rho	Change general energy consumption	Correlation Coefficient	1,000	,049
		Sig. (2-tailed)	.	,138
		N	902	902
	EBMean	Correlation Coefficient	,049	1,000
		Sig. (2-tailed)	,138	.
		N	902	928

Table 4.3.52

Respondents were asked to rate how they believed energy-consumption has changed in the past ten years on a scale from 1 – 5 (strong fall – strong rise). As Table 4.3.52 shows, the Spearman correlation coefficient is 0,049, the test is however not significant with p = 0,138. There is therefore no correlation between these variables.

Energy Behavior and Impact of Energy Consumption:

Ranks

	Impact energy consumption	N	Mean Rank	Sum of Ranks
EBMean	Yes	900	458,12	412304,00
	No	12	335,33	4024,00
	Total	912		

Table 4.3.53

Test Statistics[a]

	EBMean
Mann-Whitney-U	3946,000
Wilcoxon-W	4024,000
Z	-1,605
Asymp. Sig. (2-tailed)	,109

a. Grouping Variable: Impact energy consumption

Table 4.3.54

As Table 4.3.54 shows, the Mann-Whitney-U test concludes that there are no differences concerning energy behavior between the group of participants who believe an increase in energy-consumption has a significant impact on the environment, and those who don't.

Energy Behavior and Man-induced Climate Change:

Ranks

	Man-induced	N	Mean Rank	Sum of Ranks
EBMean	Yes	872	460,73	401757,00
	No	41	377,66	15484,00
	Total	913		

Table 4.3.55

Test Statistics[a]

	EBMean

Mann-Whitney-U	14623,000
Wilcoxon-W	15484,000
Z	-1,972
Asymp. Sig. (2-tailed)	,049

a. Grouping Variable: Man-induced

Table 4.3.56

Table 4.3.56 shows that there is a significant difference concerning energy behavior between the group of individuals who believe there is a significant man-induced contribution to climate change and those who don't with p = 0,049. When comparing the mean ranks, the group of participants who do not believe there is a significant man-induced contribution have a lower mean rank than those who do, translating to a lower EBMean and less energy-saving behaviors (*Table 4.3.55*).

Energy Behavior and Responsibility toward Future Generations:

Correlations

			EBMean	Responsibility toward future generations
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,147**
		Sig. (2-tailed)	.	,000
		N	928	928
	Responsibility toward future generations	Correlation Coefficient	,147**	1,000
		Sig. (2-tailed)	,000	.
		N	928	928

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.57

Respondents were asked to rate how strongly they believed we as a society hold a responsibility toward future generations to leave behind an economically, ecologically and socially safe and stable environment on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.57 shows, the Spearman correlation coefficient is 0,147, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with a rising feeling of responsibility toward future generations.

Energy Behavior and Impact of Ecological Issues:

Correlations

			EBMean	Impact ecological issues
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,126**
		Sig. (2-tailed)	.	,000
		N	928	927
	Impact ecological issues	Correlation Coefficient	,126**	1,000
		Sig. (2-tailed)	,000	.
		N	927	927

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.58

Respondents were asked to rate how strongly they believe ecological issues have an impact on economic and social well-being on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.58 shows, the Spearman correlation coefficient is 0,126, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with a rising feeling of ecological issues having an impact.

Energy Behavior and Impact of Mankind:

Correlations

			EBMean	Impact mankind
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,099**
		Sig. (2-tailed)	.	,003
		N	928	928
	Impact mankind	Correlation Coefficient	,099**	1,000
		Sig. (2-tailed)	,003	.
		N	928	928

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.59

Respondents were asked to rate how strongly they believe mankind has already had a severe negative impact on the environment on a scale from 1 – 5 (not at all – yes, absolutely). As

Table 4.3.59 shows, the Spearman correlation coefficient is 0,099, and the test is significant with p = 0,003. One can therefore conclude that there is a small positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with a rising feeling of mankind having already had a severe negative impact on the environment.

Energy Behavior and Role of Individual Households:

Correlations

			Role of households	EBMean
Spearman's-Rho	Role of households	Correlation Coefficient	1,000	,188**
		Sig. (2-tailed)	.	,000
		N	919	919
	EBMean	Correlation Coefficient	,188**	1,000
		Sig. (2-tailed)	,000	.
		N	919	928

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.60

Respondents were asked to rate how important they believe the role of individual households to be in energy issues on a scale from 1 – 5 (not important at all – very important). As Table 4.3.60 shows, the Spearman correlation coefficient is 0,188, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with a rising feeling of importance of individual households in energy issues.

Energy Behavior and Electricity Prices:

Correlations

			EBMean	Electricity prices
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	-,045
		Sig. (2-tailed)	.	,174
		N	928	914
	Electricity prices	Correlation Coefficient	-,045	1,000
		Sig. (2-tailed)	,174	.
		N	914	914

Table 4.3.61

Respondents were asked to rate how adequate they believed current electricity prices to be on a scale from 1 – 5 (much too low – much too high). As Table 4.3.61 shows, the Spearman correlation coefficient is -0,045 , and the test is not significant with p = 0,174. One can therefore conclude that there is no correlation between the two variables.

Energy Behavior and Austrian Energy Demand:

Correlations

			EBMean	Austrian energy demand
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,002
		Sig. (2-tailed)	.	,956
		N	928	907
	Austrian energy demand	Correlation Coefficient	,002	1,000
		Sig. (2-tailed)	,956	.
		N	907	907

Table 4.3.62

Respondents were asked to estimate how high the contribution of private households is to Austrian energy demand, ranging from 0-100%. As Table 4.3.62 shows, the Spearman correlation coefficient is 0,002, and the test is not significant with p = 0,956. One can therefore conclude that there is no correlation between the two variables.

Energy Behavior and Effective Energy Reduction Method:

Ranks

	Effective energy reduction method	N	Mean Rank	Sum of Ranks
EBMean	Changing behavior	633	486,24	307790,50
	Investing in energy efficient appliances	294	416,11	122337,50
	Total	927		

Table 4.3.63

Test Statistics[a]

	EBMean
Mann-Whitney-U	78972,500
Wilcoxon-W	122337,500

Z	-3,713
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Effective energy reduction method

Table 4.3.64

As seen in Table 4.3.63, there is a significant difference between the group of participants who believe changing behavior would be the more effective way to reduce energy consumption within the household, and the group of participants believing that investing in energy efficient appliances is the more effective method (p = 0,000). When examining Table 4.3.64 one can see that the mean rank of the group which specified changing behavior is more effective is higher than that of the other group. They therefore have higher values for EBMean which translates to them displaying more energy-saving behaviors.

Energy Behavior and Preferred Energy Reduction Method:

Ranks

	Preferred energy reduction method	N	Mean Rank	Sum of Ranks
EBMean	Changing behavior	677	482,74	326815,50
	Investing in energy efficient appliances	248	409,11	101459,50
	Total	925		

Table 4.3.65

Test Statistics[a]

	EBMean
Mann-Whitney-U	70583,500
Wilcoxon-W	101459,500
Z	-3,714
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Preferred energy reduction method

Table 4.3.66

As seen in Table 4.3.66, there is a significant difference between the group of participants who specified changing behavior would personally be the more preferred way to reduce energy consumption within the household, and the group of participants who stated that they would rather invest in energy efficient appliances (p = 0,000). When examining Table 4.3.65

one can see that the mean rank of the group which specified changing behavior is more preferable is higher than that of the other group. They therefore have higher values for EBMean which translates to them displaying more energy-saving behaviors.

Energy Behavior and Energy-saving Deterrents:

Ranks

	Energy-saving deterrent	N	Mean Rank
EBMean	Monetary costs	212	489,74
	Lack of time	67	466,95
	Sacrifice of comfort	444	431,78
	No motivation	13	399,50
	My own actions will not make a difference	52	471,94
	I don't have enough information to engage in effective energy-saving behavior	100	462,25
	Other:	25	578,36
	Total	913	

Table 4.3.67

Test Statistics[a,b]

	EBMean
Chi-square	13,555
df	6
Asymp. Sig.	,035

a. Kruskal-Wallis-Test

b. Grouping Variable: Energy-saving deterrent

Table 4.3.68

As seen in Table 4.3.68, there are significant differences in energy behavior depending on which factor the participants specified as being most likely to deter them from exercising energy-saving behaviors (p = 0,035). When examining Table 4.3.67 one can see that the lowest mean rank is held by the group which chose the factor "No motivation", translating to the lowest values for EBMean and the least energy-saving behaviors. Interestingly the factor chosen by most participants, "Sacrifice of comfort", shows the second lowest mean rank,

followed by “I don’t have enough information”, “Lack of time”, “My own actions will not make a difference”, “Monetary costs” and “Other factors” in that order.

Energy Behavior and primary Energy-saving Incentives:

Ranks

	Energy-saving Incentives	N	Mean Rank
EBMean	Saving Money	386	442,34
	Environmental Concerns	465	479,95
	Convenience	33	299,14
	Other:	35	541,49
	Total	919	

Table 4.3.69

Test Statistics[a,b]

	EBMean
Chi-Quadrat	19,770
df	3
Asymptotische Signifikanz	,000

a. Kruskal-Wallis-Test

b. Grouping Variable: Energy-saving Incentives

Table 4.3.70

As seen in Table 4.3.70, there are significant differences in energy behavior depending on which factor the participants specified as being the primary driver for energy-saving behaviors (p = 0,000). When examining Table 4.3.69 one can see that the lowest mean rank is held by the group which chose the factor “Convenience”, translating to the lowest values for EBMean and the least energy-saving behaviors. The participants who specified “Other” factors driving their energy-saving behaviors had the highest mean rank, and therefore the most energy-saving behaviors. “Environmental concerns” is the factor with the second highest mean rank, followed by “Saving money”.

Energy Behavior and Emotions:

Ranks

	Climate change: Fear	N	Mean Rank	Sum of Ranks
EBMean	not chosen	666	467,82	311569,00

	chosen	262	456,06	119487,00
	Total	928		

Table 4.3.69

Test Statistics[a]

	EBMean
Mann-Whitney-U	85034,000
Wilcoxon-W	119487,000
Z	-,602
Asymp. Sig. (2-tailed)	,547

a. Grouping Variable: Climage change: Fear

Table 4.3.70

As Table 4.3.70 shows, the Mann-Whitney-U test concludes that there are no differences concerning energy behavior between the group of participants which specified feeling fear when confronted with reports of climate change, and those who didn't (p = 0,547).

Ranks

	Climate change: Sadness	N	Mean Rank	Sum of Ranks
EBMean	not chosen	367	410,90	150801,50
	chosen	561	499,56	280254,50
	Total	928		

Table 4.3.71

Test Statistics[a]

	EBMean
Mann-Whitney-U	83273,500
Wilcoxon-W	150801,500
Z	-4,929
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Climate change: Sadness

Table 4.3.72

As Table 4.3.72 shows, the Mann-Whitney-U test concludes that there are significant differences concerning energy behavior between the group of participants which specified feeling sadness when confronted with reports of climate change, and those who didn't (p = 0,000). When examining Table 4.3.71 one can see that the group of participants which

specified feeling sadness have a higher mean rank in comparison to the group which didn't, translating to higher values for EBMean and more energy-saving behaviors.

Ranks

	Climate change: Pain	N	Mean Rank	Sum of Ranks
EBMean	not chosen	816	456,88	372813,00
	chosen	112	520,03	58243,00
	Total	928		

Table 4.3.73

Test Statistics[a]

	EBMean
Mann-Whitney-U	39477,000
Wilcoxon-W	372813,000
Z	-2,339
Asymp. Sig. (2-tailed)	,019

a. Grouping Variable: Climate change: Pain

Table 4.3.74

As Table 4.3.74 shows, the Mann-Whitney-U test concludes that there are significant differences concerning energy behavior between the group of participants which specified feeling pain when confronted with reports of climate change, and those who didn't (p = 0,019). When examining Table 4.3.73 one can see that the group of participants which specified feeling pain have a higher mean rank in comparison to the group which didn't, translating to higher values for EBMean and more energy-saving behaviors.

Ranks

	Climate change: Anger	N	Mean Rank	Sum of Ranks
EBMean	not chosen	459	449,19	206178,50
	chosen	469	479,48	224877,50
	Total	928		

Table 4.3.75

Test Statistics[a]

	EBMean
Mann-Whitney-U	100608,500
Wilcoxon-W	206178,500
Z	-1,722
Asymp. Sig. (2-tailed)	,085

a. Grouping Variable: Climate change: Anger

Table 4.3.76

As Table 4.3.76 shows, the Mann-Whitney-U test concludes that there are no differences concerning energy behavior between the group of participants which specified feeling anger when confronted with reports of climate change, and those who didn't (p = 0,085). The p-value is however relatively low and not far from the 5% threshold.

Ranks

	Climate change: Guilt	N	Mean Rank	Sum of Ranks
EBMean	not chosen	696	458,59	319179,00
	chosen	232	482,23	111877,00
	Total	928		

Table 4.3.77

Test Statistics[a]

	EBMean
Mann-Whitney-U	76623,000
Wilcoxon-W	319179,000
Z	-1,164
Asymp. Sig. (2-tailed)	,245

a. Grouping Variable: Climate change: Guilt

Table 4.3.78

As Table 4.3.78 shows, the Mann-Whitney-U test concludes that there are no differences concerning energy behavior between the group of participants which specified feeling guilt when confronted with reports of climate change, and those who didn't (p = 0,245).

Ranks

	Climate change: Apathy	N	Mean Rank	Sum of Ranks
EBMean	not chosen	837	475,05	397617,50
	chosen	91	367,46	33438,50
	Total	928		

Table 4.3.79

Test Statistics[a]

	EBMean
Mann-Whitney-U	29252,500
Wilcoxon-W	33438,500
Z	-3,638
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Climate change: Apathy

Table 4.3.80

As Table 4.3.80 shows, the Mann-Whitney-U test concludes that there are significant differences concerning energy behavior between the group of participants which specified feeling apathy when confronted with reports of climate change, and those who didn't (p = 0,000). When examining Table 4.3.79 one can see that the group of participants which specified feeling apathy has a lower mean rank in comparison to the group which didn't, translating to lower values for EBMean and less energy-saving behaviors.

Energy Behavior and Experience of Environmental Degradation:

Ranks

	Experience environmental degradation	N	Mean Rank	Sum of Ranks
EBMean	Yes	418	484,41	202482,00
	No	502	440,59	221178,00
	Total	920		

Table 4.3.83

Test Statistics[a]

	EBMean
Mann-Whitney-U	94925,000
Wilcoxon-W	221178,000
Z	-2,491
Asymp. Sig.(2-tailed)	,013

a. Grouping Variable: Experience environmental degradation

Table 4.3.84

As can be seen in Table 4.3.84, there is a significant difference between the group of participants who have personally experienced a form of environmental degradation in their surroundings, and the group of participants who haven't (p = 0,013). When examining Table 4.3.83 one can see that the individuals who have experienced environmental degradation in their environment have a higher mean rank than those who haven't, translating to higher values for EBMean and more energy-saving behaviors.

Energy Behavior and Technical Advancements:

Correlations

			EBMean	Technical advancements
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,021
		Sig. (2-tailed)	.	,527
		N	928	926
	Technical advancements	Correlation Coefficient	,021	1,000
		Sig. (2-tailed)	,527	.
		N	926	926

Table 4.3.85

Respondents were asked to rate how they believed technical advancements would contribute to solving problems caused by energy consumption on a scale from 1 – 5 (not at all – yes absolutely). As Table 4.3.85 shows, the Spearman correlation coefficient is 0,021, and the test is not significant with p = 0,527. One can therefore conclude that there is no correlation between the two variables.

Energy Behavior and Time Outdoors:

Correlations

			EBMean	Time outdoors
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,245**
		Sig. (2-tailed)	.	,000
		N	928	922
	Time outdoors	Correlation Coefficient	,245**	1,000
		Sig. (2-tailed)	,000	.
		N	922	922

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.86

Respondents were asked to rate how important spending time outdoors and in nature was to them on a scale from 1 – 5 (not important at all – very important). As Table 4.3.86 shows, the Spearman correlation coefficient is 0,245, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that

EBMean, and therefore energy-saving behaviors, increase with rising importance of spending time outdoors.

Energy Behavior and Responsibility for Climate Change:

Correlations

			EBMean	Responsibility climate change
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,084*
		Sig. (2-tailed)	.	,010
		N	928	924
	Responsibility climate change	Correlation Coefficient	,084*	1,000
		Sig. (2-tailed)	,010	.
		N	924	924

*. Correlation significant at the 0,05 level (2-tailed).

Table 4.3.87

Respondents were asked to rate how responsible they feel for the consequences of climate change on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.87 shows, the Spearman correlation coefficient is 0,084, and the test is significant with p = 0,010. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising sense of responsibility for the consequences of climate change.

Energy Behavior and Locus of Control:

Correlations

			EBMean	Locus of control
Spearman's-Rho	EBMean	Correlation Coefficient	1,000	,198**
		Sig. (2-tailed)	.	,000
		N	928	926
	Locus of control	Correlation Coefficient	,198**	1,000
		Sig. (2-tailed)	,000	.
		N	926	926

**. Correlation is significant at the 0,01 level (2-tailed).

Table 4.3.88

Respondents were asked to rate how strongly they feel they have the ability to bring about change through their own actions on a scale from 1 – 5 (not at all – yes, absolutely). As Table 4.3.88 shows, the Spearman correlation coefficient is 0,198, and the test is significant with p = 0,000. One can therefore conclude that there is a positive correlation between the two variables, meaning that EBMean, and therefore energy-saving behaviors, increase with rising locus of control.

5. Discussion

The survey lets us conclude that Biology students at the University of Vienna tend to have very strong positive attitudes about pro-environmental behavior concerning energy use in the household. Even when taking into consideration the bias you can expect from self-reported data, this group of participants showed very strong energy-saving behaviors, and an "attitude-behavior gap" as such cannot be identified for these individuals. This raises the question how the lack of an attitude-behavior gap can be interpreted for this very homogenous group. It remains unlikely, that attitudes have a particularly strong impact on energy behavior despite both attitudes being positive and energy-saving behavior being high. Many different factors have been identified in the course of this Master's thesis as having impact on promoting and deterring energy-saving behaviors, and it can be concluded that the sample population of Biology students represents a community defined by high energy-saving behaviors, high levels of knowledge and awareness, low income and typically living in childless households. The lack of an "attitude-behavior gap" can be seen as a trait of this community, caused by the group's properties.

Demographic Factors

The choice was made to examine a very uniform group of individuals concerning socio-demographic factors by questioning Biology students of the University of Vienna.
The results of the survey show that gender does not have a statistically significant effect on energy behavior for Biology students at the University of Vienna on the 5% threshold, though this mark is only barely missed. Due to the large sample size of this survey, this lets us conclude that there are tendencies for women to engage in more energy-saving behavior, but that these differences are not strong enough to yield results with high statistical power. The results let us further conclude that gender does not have a strong impact on energy behavior, if the sample population is relatively homogenous in education, knowledge, awareness and social status. When examining literature on gender differences in energy knowledge, attitudes and behavior, one is often presented with varying results, depending on the sample population and focus of the study. Lehmann (1999) and Fliegenschnee and Schelakovsky (1998) found men to have higher environmental knowledge and women to have higher emotional concern and willingness to change behavior. Brounen et al. (2013) found men to be more aware of

energy consumption in Dutch households, a result of men having far higher financial literacy as documented by Lusardi and Mitchell (2008). When comparing work patterns and gender roles between Norway and Japan, Wilhite et al. (1996) found Japanese women to have much higher knowledge of energy use than men, due to none of the men in the examined Fukuoka households participating in household chores. According to Lutzenhiser (1993), Claxton, Ritchie and McDougall (1983) report women to be more concerned about energy conservation, while men are less accepting of certain regulations which touch upon traditionally male domains. Klausner (1979) hypothesized, that within a patriarchal society, matrifocal households tend to have less order, which leads to higher energy consumption. His results showed that the introduction of a man to a matrifocal household did lead to significant decreases in energy use within low-income and welfare households in New Jersey. DeFronzo and Warkov (1979) tested Klausner's hypothesis on higher income groups in Texas and could not replicate these results, not identifying gender differences in energy demand after compensating for other variables.

I believe these short examples of gender differences in energy attitudes and energy use in literature clearly support the results of this thesis and the conclusion that gender differences are caused primarily by differences in social status, education, knowledge, experience and awareness. These are in turn related to cultural factors, such as division of work and gender roles. One can therefore alleviate gender differences by targeted efforts to raise equality between the genders.

There appear to be no differences in energy behavior between students of different ages, which contradicts results of Yue et al. (2013) and Brounen et al. (2013). The group of individuals chosen for this thesis is however for the most part very close in age, with 88,1% of the participants being under 30 years old. In total there were 89 individuals in their 30s, 15 individuals in their 40s, 5 individuals in their 50s, and one individual in their 60s. A strong correlation between age and energy behavior should therefore have still sent a signal, which was certainly not the case in these survey results. One can conclude that a homogenous population in social status, education, knowledge and awareness can also contribute to alleviating differences in age groups. An important age-group which was not included in this study is the group of individuals above 60, which can be expected to have retired from the working world and have entered a new stage in their life. It is conceivable that this change has a significant impact on energy behavior as seen in Brounen et al. (2013), as leaving the working world inevitably brings changes in social interactions and lifestyle.

Differences in energy behavior between individuals of different educational background could not be properly be established, as focusing the study on Biology students already excludes the possibility of variety within the target group.

When examining energy behavior differences for various forms of employment, individuals who are in retirement appear to have lower energy-saving behaviors than the rest. This result is based on only two participants who were in retirement at the time of the survey, and therefore cannot be assumed to be a representative result. It does however support the previous hypothesis, that reported differences in energy behavior with age are related to different stages of life, which bring with them many changes in other areas.

Interestingly, no differences between participants who study Biology and participants who did not choose Biology as their field of study could be found. This would imply that specialized knowledge does not automatically entail a change in behavior, supported by the fact that answers to purely factual questions never yielded significant differences in energy behavior,. It appears it is not so much knowledge about numbers and percentages that makes a difference in energy behavior, but more the understanding of basic relationships between the environment and influencing factors, such as human involvement. This type of knowledge naturally comes with and is affected by certain personal opinions and associations, and questions aimed at this kind of knowledge typically showed differences in energy behavior.

In accordance with results shown by Yue et al. (2013) and Brounen et al. (2013), income seems to affect energy behavior, with an increase in wealth entailing a decrease in energy-saving behaviors. The effect can be explained by the fact that energy is not free, and individuals seeking to minimize their electricity bills will automatically be engaging in energy-saving behavior, independent of attitudes or concerns. Members of low-income households under high economic pressure will engage in more energy-saving behaviors than individuals with higher income. When formulating energy policies, one must take into consideration that these low-income households have little room for additional curtailment measures, but one can expect these households to hold much potential for energy savings in structural improvements such as in insulation or investment in new more energy-efficient appliances. On the other side of the spectrum, high-income households hold much potential for curtailment behavior as well as investments in energy-efficient technologies, as the highest income classes in particular show dramatically less energy-saving behaviors from middle- and

low income households. One must of course consider that the value for energy-saving behavior used in this study does not include the investment in energy-efficient appliances, and that energy-saving behavior cannot be directly translated to household energy demand. The difference in energy behavior between middle and high income households is however striking and no longer as easily explained by economic pressure alone. It is inconceivable that only the top tier earners with a large amount of dispensable income can afford to neglect energy-saving behaviors, as the curtailment behaviors examined in the survey do not result in a drastic change in costs. There must be differences in motivating and deterring factors such as awareness, values, habits or sense of responsibility, that prevent high income households from engaging in these pro-environmental behaviors while middle income households maintain them. It is possible to describe low, middle and high income households as three different communities or groups, defined by amount of energy use as well as by their influencing factors. When formulating energy policies, one must take these different communities, with different means and motivations, into consideration in order to achieve the best response.

There appears to be a connection between the amount of members living in a household and energy behavior. The amount of energy-saving behaviors decreases with increasing number of household members. Differences could also be found in individuals living with one or more parents as well as siblings, as they showed less energy-saving behaviors. This might be related to economic factors again, as living with parents may indicate that these individuals are not yet confronted with certain costs such as paying rent. Even in the cases of individuals paying rent at their parent's home, one can imagine this value to be fixed and independent of the amount of energy they use in the household. This can also be true for larger households, as it is then no longer possible to determine how much each individual contributed to total energy demand. In addition to the economic factor, in these situations one can also assume awareness of one's own energy use to be very low. Habits may also factor in, as one is conceivably more likely to adjust and develop new behaviors in a new environment than in the home one grew up in. Households with children seem to show less energy-saving behaviors, which may be related to individuals in these households being in a different stage of life from your average college student, and may represent a different type of household from your average university student. When comparing the energy behavior of participants who have children of their own with those who are childless, no significant differences could be found. This supports the idea, that when sharing households with children, which are not

necessarily the children of the participants, this may be a household led by individuals with different financial means than the focus group of Biology students. The results of Yue et al. (2013) and Brounen et al. (2013) could therefore be replicated in this study, that household structure has a strong impact on energy behavior.

External Factors

Energy behavior varies between the districts of Vienna, with the districts "Innere Stadt" and "Hietzing" noticeably being the two districts with the lowest energy-saving behaviors. It is not a coincidence, that these districts are known for having the highest average net income in Vienna, income levels playing an important part in energy behavior as discussed above.

According to Valikla and Saari (2013), situational factors have a strong influence on energy attitudes and concerns, and the perception of own energy behavior with individuals in high density districts being more willing to adopt energy-saving behaviors. In addition to this, Yue et al. (2013) note that differences in communication about household energy conservation could also differ between areas. It is feasible that these factors also play a part in energy behavior differences between districts in Vienna.

The fact that individuals in high density areas are more willing to adopt energy-saving behaviors than individuals in low density areas, as claimed by Valikla and Saari (2013), could not be tested, as it is expected that most students of the University of Vienna spend most of the week within Vienna. The question was however posed, if there are differences between individuals who grew up in a rural environment, and those who grew up in an urban environment. As the results show, it would appear individuals from a rural environment, with a lower population density, show more energy-saving behaviors than individuals originally from an urban environment. This does not directly contradict Valikla and Saari (2013), as their observation is not about where individuals spent the formative years of their lives, but about where they are living at the time, and it must be considered that institutional factors can play a strong part in promoting or hindering pro-environmental behavior. One must however note that there must be a reason why participants whose childhoods were spent in rural areas are engaging in more energy-saving behaviors. Perhaps they have stronger emotional ties to the environment, and are quicker to perceive it as being destroyed through fumes and asphalting. There may be significant differences in values and environmental awareness which in turn affect energy behavior.

The results of this thesis clearly show that social and cultural factors have an impact on energy behavior of Biology students from the University of Vienna. When examining the results for economic factors, one finds that these too seem to play a large role in promoting or inhibiting energy-saving behaviors within the household.

Baird and Brier (1981) observed that there is very low awareness of energy efficiency of energy requirements of familiar objects within the home, with individuals perceiving large objects as requiring much energy and small objects as requiring little energy. The survey of this study could replicate those results, with the largest three appliances the washing machine, refrigerator and dishwasher, being chosen as the top three appliances with highest energy requirements out of fourteen. These were typically followed by the options for television and computers. While the dishwasher does tend to be the most energy-consuming appliance within a household along with the hair-dryer, the refrigerator and washing machine are typically outranked by the microwave, coffee machine, toaster, vacuum cleaner and the hair dryer. It is of course difficult to create these kind of rankings, as the age of an appliance and the model can make energy requirements vary, but it does show that the average person does not have a very good sense of how much energy is being used by the appliances they deal with on a day-to-day basis. Size seems to affect our idea of energy-usage more than for example generated heat.

When asked how aware they are of how high their personal energy consumption is per month, most participants answered to not really have a good idea. The higher awareness was the more energy-saving behaviors the participants showed. Most participants seemed to believe their energy-demand has stayed the same over the past five years, with a similar amount of individuals noting perceived increases as individuals noting perceived decreases. One can assume that these perceived changes in energy consumption do not necessarily reflect reality, as awareness of own energy consumption seems to be quite low. Interestingly, when believing their energy consumption has increased over the years, participants tended to show less energy-saving behaviors. It is possible to imagine that participants actively engaging in energy-saving behaviors are more likely to perceive their energy consumption to have gone down.

When asked about awareness of their average electricity bill, there was a slight tendency for participants to respond with being able to estimate about how high their electricity bills are. Again there is a positive correlation, with higher awareness being connected to higher energy-saving behaviors. While awareness about monthly electricity bills does appear to be higher

than awareness about personal monthly energy consumption, it is still surprisingly low. When asked about awareness on changes in electricity prices over the past five years, an overwhelming amount of participants stated to have no idea at all, or to have little idea on how these have changed. This could possibly be explained by college students not having kept track of electricity bills and prices five years ago, as many of them could have still been at school and living at home at the time. The individuals who did claim awareness of changes in electricity price did also show higher energy-saving behaviors.

This study concludes that knowledge of expenses and knowledge of own energy consumption can be considered relatively low for Biology students, but to have an impact on energy behavior. These results are in compliance with results of Yamamoto et al. (2008) and Brounen et al. (2013).

The willingness to invest more money for energy-efficient technologies appears to be relatively high, with only a small group of participants stating they would not be prepared to make such an investment. A higher willingness to invest in energy-efficient technology also signifies more energy-saving behaviors for participants of this study. Despite so many participants declaring they are willing to make investments in energy-efficiency, when asked to rank what factors affect the purchase of new appliances, energy-efficiency landed on slot three out of four, only being deemed more important than design. Durability was the most important factor for participants, followed by the cost at purchase.

A total of 38 participants had an electrical feedback-device, such as a smart meter fitted in their home, but no differences in energy behavior could be found between the households with or without such a device. The €CO2 Management project launched in Austria in 2009 noted an average of 5% savings in energy demand after installation of monitoring devices, personal consultation and the choice between three different electricity rates depending on the time of day (Riedlinger, 2013). Smart metering devices do not seem to strongly affect energy-saving behaviors as examined in this study, which consist of things like turning off lights when leaving a room or wearing clothes more than once before throwing them in the laundry basket. The fact that the households with smart meters did not show changes in energy behavior in comparison to households without for this sample population can be attributed to the fact that the student population already shows very high curtailment behavior to begin with and there is not very much room for positive changes in this regard. The data does not show whether or not energy demand has gone down for these households, as adjustments to electricity rates for example can still have been made. These feedback systems probably show

the strongest results concerning behavior changes in other communities, such as in middle or high income households or households of families with children, where there is much potential for improvement.

Internal Factors

Concerning motivation, the thesis can support the view of Ma et al. (2011), that comfort is the most likely factor to deter young individuals from engaging in energy-saving behavior. The second most likely factor was listed as monetary costs. While some energy-saving behaviors are also the more economic option, such as reducing the usage of electricity or warm water, there is also the aspect of investing in more energy-efficient technologies, which may reduce costs in the long-run but are more expensive upon purchase in comparison to other options. When asked what their energy-saving behavior is primarily driven by, most participants chose the option "environmental concerns", followed closely by "saving money". Environmental concerns and saving money seem to be the overwhelming drivers and motivators for the energy behavior of Biology students at the University of Vienna, with comfort and convenience being a strong deterring factor.

This can also explain why, in accordance with the results of Attari et al. (2010) and Yue et al. (2013), participants are more prepared to change energy behavior in order to save energy than to invest in more efficient appliances. Changing behavior through curtailment does not conflict with the desire to save money, and in fact helps achieve this goal. Investing in more energy-efficient appliances and technologies does however, as mentioned above, hold an initial conflict of interests. The results of the thesis show that the participants who chose changes in behavior to be the more preferred method of reducing energy-demand within the household tend to already show a higher amount of energy-saving behaviors. Interestingly, almost the same distribution of choosing between "changing behavior" and "investing in energy efficient appliances" can be found when asked what the more effective energy reduction methods would be. A total of 68% of the participants chose "changing behavior" to be the more effective option, while experts see more potential in investing in efficiency improvements. It would be interesting to discover why it is perceived that curtailment behavior is the more effective method when this is not the case. There does seem to be a general positive attitude concerning the contribution of technical advancements, such as new energy sources and higher energy efficiencies, to solving problems of energy-demand in the

future. These attitudes do not seem to have an impact on energy behavior however, in contrast to the results described by Gigliotti (1992; 1994) and Grob (1991) as quoted by Kollmuss and Agyeman (2002), where belief in technological advances is connected to less willingness to make personal sacrifices to act pro-environmentally.

The results of this thesis have shown that emotional involvement does affect the energy behavior of participants. Individuals who have experienced a form of environmental degradation in their surroundings show more energy-saving behaviors in the evaluation of the data. When regarding the forms of environmental degradation that were listed, one should think it is impossible for any of the participants to be untouched by this phenomenon. Destruction of (micro)habitats within the city, monocultures and pesticides in gardens and agriculture, asphalting and building on green areas, urbanization, improper disposal of garbage, exhaust fumes from traffic, deforestation, water pollution, mass animal husbandry, illegal waste disposal… these were some of the things listed as encounters with environmental degradation. For the fact that everyone of us has been exposed to at least some of these things, only 45,4% of the participants indicated they have been confronted with environmental degradation. The difference perhaps lies less in the exposure to these circumstances, but in the way they are perceived. The individuals who perceive degradation of the environment in their surroundings show stronger energy-saving behaviors than those individuals who do not perceive degradation of the environment, while possibly living in a similar environment. The one group seems to feel personally and immediately affected by these problems, while the other group seems to be more emotionally removed. This can be seen in relation to the results showing individuals who place higher importance on spending time outdoors showing more energy-saving behaviors, as they both have to do with environmental sensitivity. Heightened environmental sensitivity, which describes "a predisposition to take an interest in learning about the environment, feeling concern for it, and acting to conserve it on the basis of formative experiences" (Chawla, 1998 as quoted in Kollmuss and Agyeman, 2002) seems to have a positive effect on energy-saving behavior.

A closer look at the relationship between emotional involvement and energy behavior showed that individuals who specified feeling sadness and pain when confronted with reports of climate change generally display stronger energy-saving behaviors than those who don't. No differences in behavior could be found concerning fear, anger and guilt, while feelings of apathy show a connection to less energy-saving behaviors. Kollmuss and Agyeman (2002) hypothesized that fear, sadness, anger and pain have a stronger likelihood to lead to pro-

environmental behavior than guilt, and that apathy can inhibit pro-environmental behavior as a defense mechanism working to relieve us from negative emotional reactions. The thesis can therefore support this hypothesis, with the possible exception of fear and anger, as these emotions did not show strong enough differences.

Environmental awareness and environmental knowledge are broadly claimed to have no direct link to most pro-environmental behavior, with Kollmuss and Agyeman (2002) cautioning that different levels of knowledge may influence pro-environmental behavior in different ways. The study group of this thesis shows high level of environmental knowledge and awareness concerning general energy challenges we are facing today. When moving beyond the point of general challenges and asked about the more specific role of individual households within the complex of energy demand, ideas and opinions started varying, with a general tendency to overestimate the contribution of private households in total energy demand. The estimation of how high in percentage the contribution of households is to general Austrian energy demand appears to have no connection to energy behavior. There is however a connection between how important an individual feels the role of households is in energy issues, with energy-saving behaviors increasing as feeling of importance rises. This is slightly puzzling at first, as the contribution of household to total energy-demand can be seen as equivalent to the importance of households in energy issues. One must rethink this simplification though, as the first question is purely asking for factual information from the participant, while the latter question concerning importance involves their personal opinion and values. Even if one believes the statistical impact of households to be low, they can still feel their role in the system is an important one.

There seems to be no connection between energy behavior and the perception of how general energy consumption has changed over the past ten years. Whether or not individuals believe an increase in energy demand has an impact on the environment also does not seem to have an effect on energy behavior. A difference in behavior could however be seen in individuals who believe there is a significant man-induced contribution to climate change, and individuals who believed there was none. Participants who did not see a significant man-induced contribution showed less energy-saving behaviors. Similarly, individuals who see an impact of ecological issues on economic and social issues also showed more energy-saving behaviors. The stronger participants felt mankind has already had a negative impact on the environment, the stronger their energy-saving behaviors tended to get. This question may be related to the emotional involvement mentioned before, that the perception of environmental degradation being

present or not seems to have an effect on energy behavior. This question is also tied to feelings of responsibility toward the environment.

A rising sense in responsibility toward future generation and for problems caused by high energy demand, such as climate change, also appears to be tied to an increase in energy-saving behavior. It is possible, that with a stronger feeling of having control over the situation there is also a stronger sense of responsibility. Kollmuss and Agyeman (2002) hypothesized that locus of control is one of the factors influencing energy behavior. This thesis can support this idea, showing a positive correlation between locus of control and energy-saving behaviors. The more an individual believes she or he has the power to bring about change through their own behavior, the stronger their pro-environmental behavior is.

Concluding Remarks

So what lessons can we take from these results? In general one can conclude that differences in the demographic factors gender and age can be alleviated if knowledge and awareness are raised to the same level. A homogenous group of individuals concerning social status is also less likely to show differences in energy behavior. Income has a very strong impact on energy behavior, and differences between income classes cannot be alleviated by making the group more homogenous in knowledge and awareness. Energy policies can however direct different measures at different income classes, adjusting to their means and potential. Similarly, changes in behavior caused by household structure, which are also resistant to homogenization of factors such as knowledge and awareness, can also be addressed by formulating specific energy policies for various different types of households.

I believe another important measure that can be taken to promote energy-saving behaviors within households is to promote the investment in energy-efficient technologies. As can be seen above, individuals do not seem to be aware that investing in energy-efficient appliances has the potential to outperform savings achieved by changing behavior. This knowledge alone cannot be relied on to change the purchase behavior of individuals however, and more emphasis on the long-term financial benefits must be made.

Another pair of factors which could be addressed is locus of control and sense of responsibility. If these are increased within the population, one may not only perceive a change in energy-saving behavior, but in pro-environmental behavior in general. I believe

actively involving the population in political and environmental affairs can help dramatically increase their feelings of responsibility and having the ability to bring about positive changes, which in turn will lead to more pro-environmental behaviors. Participatory projects can be a useful tool in achieving this goal if participants get the feedback that their voices and ideas have been heard and processed in some way. In Vienna the "Lokale Agenda 21 Plus" is an important platform to allow the population to engage in multiple projects aimed to improve the quality of life in their district. I believe it is beneficial for a country to promote the involvement of their citizens in such projects, as a high sense of locus of control and responsibility are very important attributes for citizens to have in a healthy democracy.

While there is still much room for improvement concerning energy-saving behavior within the household, one must also recognize the limits we face, many of which are caused by structural and cultural constraints. In this day and age it is difficult to choose a lifestyle without the use of mobile phones or computers. Many of our information systems need electricity to function, and many modern cultural values lead us to engage in certain behaviors we can no longer think to do without, such as the frequency with which we shower or change our clothes.

Implementing feedback devices such as smart meters in Austria could be an important step to raising knowledge and awareness of one's own energy demand, and has the potential to further increase curtailment behavior, particularly in middle and high income households. Steps like this help homogenize the general population and alleviate differences in energy behavior between some socio-demographic factors. In order for more positive changes in behavior to occur, it is important to make additional efforts in promoting energy-efficient technologies, as well as engaging the population emotionally in the environment and energy issues. Locus of control and a sense of responsibility toward the community as well as the environment should be raised by encouraging the population of all ages and backgrounds to participate in local projects aiming to improve life in their city. Lastly, energy policies must recognize and adjust to the existence of multiple household types and communities, defined by energy demand as well as socio-demographic and socio-economic factors such as income and household structure.

6. Index

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7. Appendix

7.1. Questionnaire (German Original)

Energieeinstellungen und -verhalten

Liebe Teilnehmer/innen!

Ich studiere Humanökologie an der Universität Wien und arbeite aktuell an meiner Masterarbeit. Im Rahmen dieser Arbeit sollen Energieinstellungen und Verhaltensweisen im Haushalt untersucht werden.

Das Ausfüllen des Fragebogens dauert ca. 10 Minuten. Die Daten sind anonym und werden ausschließlich für meine Forschung verwendet.

Vielen Dank für Ihre Teilnahme!

1. Welches Geschlecht haben Sie?

- ◯ weiblich
- ◯ männlich

2. Wie alt sind Sie?

Ich bin _____ Jahre

3. In welchem Ort leben Sie derzeit?

- ◯ Wien
- ◯ Andere: _____

4. In welchem Bezirk wohnen Sie?

(Bei Wohnsitz in Wien)

Meine Postleitzahl lautet _____

5. Welche Staatsbürgerschaft besitzen Sie?

Land: _____ ☐ Keine Angabe

6. Welcher ist der höchste Bildungsabschluss, den Sie haben?

- ◯ Pflichtschule
- ◯ Lehre
- ◯ Fachschule
- ◯ Höhere Schule
- ◯ Universität, Hochschule
- ◯ Keine
- ◯ anderer Schulabschluss: _____

7. Sind Sie momentan erwerbstätig?

Mehrfachnennungen sind möglich

- [ ] Ich bin Arbeitnehmer
- [ ] Ich bin Selbstständig
- [ ] Ich bin arbeitslos und auf Arbeitssuche
- [ ] Ich bin arbeitslos und zur Zeit nicht auf Arbeitssuche
- [ ] Ich bin Hausmann/Hausfrau
- [ ] Ich bin Student/in
- [ ] Ich bin im Ruhestand
- [ ] Ich bin arbeitsunfähig
- [ ] Sonstiges:

8. Was studieren Sie bzw. haben Sie studiert?

Mehrfachnennungen möglich. Die Frage ist zu überspringen wenn Sie nicht studieren/studiert haben

- [ ] Agrarwissenschaften
- [ ] Archäologie/Altertumswissenschaften
- [ ] Bildungswissenschaft
- [ ] Biologie
- [ ] Chemie
- [ ] Erdwissenschaften, Meteorologie-Geophysik und Astronomie
- [ ] Ernährungswissenschaften
- [ ] Geographie
- [ ] Geschichte
- [ ] Informatik
- [ ] Kultur- und Sozialanthropologie
- [ ] Kunstgeschichte
- [ ] Lehramt
- [ ] Mathematik
- [ ] Molekulare Biologie
- [ ] Musikwissenschaft & Sprachwissenschaft
- [ ] Pharmazie
- [ ] Philologie/Linguistik & div. Kulturwissenschaften
- [ ] Philosophie
- [ ] Physik
- [ ] Politikwissenschaft
- [ ] Psychologie
- [ ] Publizistik- und Kommunikationswissenschaft
- [ ] Rechtswissenschaften
- [ ] Soziologie
- [ ] Sportwissenschaften
- [ ] Technik
- [ ] Theater-, Film-, und Medienwissenschaft
- [ ] Theologie
- [ ] Translationswissenschaften
- [ ] Wirtschaftswissenschaften
- [ ] Sonstiges

9. Wie hoch ist ungefähr Ihr monatliches Nettoeinkommen?

Gemeint ist der Betrag, der sich im Gesamthaushalt (also von allen im Haushalt lebenden Personen) aus allen Einkünften zusammensetzt und nach Abzug der Steuern und Sozialversicherungen übrig bleibt.

[Bitte auswählen]

10. Was beschreibt am ehesten die Gegend in der Sie aufgewachsen sind / in der Sie den Großteil Ihrer Kindheit verbracht haben?

- ländlich (weniger als 150 Menschen / km²)
- städtisch (mehr als 150 Menschen / km²)

11. Wieviele Personen umfasst Ihr Haushalt?

Bitte inkludieren Sie sich selbst in der Angabe

Es befinden sich insgesamt _____ Personen in meinem Haushalt

12. Aus welchen Mitgliedern besteht Ihr Haushalt?

Mehrfachnennungen sind möglich. Bitte Anzahl der Mitglieder wenn nötig vermerken.

- ☐ Ehepartner
- ☐ Partner
- ☐ Elternteil: _____
- ☐ Geschwister: _____
- ☐ Zimmergenosse: _____
- ☐ Kind: _____

13. Haben Sie ein Kind bzw. Kinder?

- Ja
- Nein

14. Planen Sie in Zukunft ein Kind bzw. Kinder zu haben?

- Ja
- Nein
- Weiß nicht

15. Besitzt Ihre Wohnung ein elektrisches Feedback-Gerät?

Zum Beispiel ein Smart Meter

- Ja
- Nein

16. Wie glauben Sie, hat sich der globale Energieverbrauch in den vergangenen zehn Jahren verändert?

	starken Abfall				starken Anstieg
Es gab einen	○	○	○	○	○

17. Hat die Steigerung des Energiekonsums eine erhebliche Auswirkung auf die Umwelt?

(Nur bei Vermutung eines Anstiegs des globalen Energieverbrauchs zu beantworten)

- ○ Ja
- ○ Nein

18. Gibt es einen signifikanten von Menschen verursachten Beitrag zum Klimawandel?

(Nur bei Vermutung eines Anstiegs des globalen Energieverbrauchs zu beantworten)

- ○ Ja
- ○ Nein

19. Im folgenden Abschnitt geht es um Ihre Meinungen und Erfahrungen in Umwelt- und Energiefragen:

	überhaupt nicht				ja, absolut
Haben wir als Gesellschaft eine Verantwortung gegenüber zukünftigen Generationen eine ökonomisch, ökologisch und sozial sichere und stabile Umwelt zu hinterlassen?	○	○	○	○	○
Haben ökologische Belange eine Auswirkung auf das wirtschaftliche und soziale Wohlbefinden?	○	○	○	○	○
Glauben Sie, dass die Menschheit bis zum heutigen Tag schon schwerwiegenden negativen Einfluss auf die Umwelt gehabt hat?	○	○	○	○	○

	überhaupt nicht wichtig				sehr wichtig
Wie wichtig glauben Sie ist in Energiefragen die Rolle der einzelnen Haushalte?	○	○	○	○	○

	viel zu niedrig				viel zu hoch
Glauben Sie, dass die derzeitigen Strompreise angemessen sind?	○	○	○	○	○

Wie hoch würden Sie schätzen ist der Anteil von Haushalten an dem gesamten österreichischen Energiebedarf? (Wählen Sie von 1-100%) _____ %

20. Was wäre Ihrer Meinung nach die effektivere Option um Energieverbrauch im Haushalt zu reduzieren?

- ◯ Verhaltensänderungen (Im Umgang mit Elektrogeräten z.B.)
- ◯ Investitionen in energieeffiziente Geräte

21. Für welche der beiden Möglichkeiten wären Sie eher bereit um Energieverbrauch im Haushalt zu reduzieren?

- ◯ Verhaltensänderungen (Im Umgang mit Elektrogeräten z.B.)
- ◯ Investitionen in energieeffiziente Geräte

22. Welches der folgenden Punkte ist am ehesten zutreffend, Sie von energiesparenden Verhalten abzuhalten?

- ◯ Monetäre Kosten
- ◯ Zeitmangel
- ◯ Bequemlichkeit
- ◯ Keine Motivation
- ◯ Mein Verhalten ist nicht genug um einen Unterschied zu machen
- ◯ Ich besitze nicht genügend Informationen um effektiv Energie zu sparen
- ◯ Sonstiges:

23. Erleben Sie eine oder mehrere der folgenden Emotionen, wenn Sie mit Berichten des Klimawandels konfrontiert werden?

(Mehrfachnennungen möglich)

- ☐ Angst
- ☐ Traurigkeit
- ☐ Schmerz
- ☐ Zorn
- ☐ Schuld
- ☐ Keine Gefühlsregung
- ☐ Sonstiges

24. Haben Sie je eine Form der Umweltzerstörung in Ihrer Umgebung persönlich erlebt?

- ◯ Ja
- ◯ Nein

Wenn ja, in welcher Form?

	überhaupt nicht				ja, absolut
Glauben Sie, dass technische Fortschritte (sowie z.B. neue Energiequellen, höhere Effizienzraten) zur Lösung von Energieproblemen beitragen werden?	○	○	○	○	○

	überhaupt nicht wichtig				sehr wichtig
Wie wichtig ist es für Sie, Zeit im Grünen / in der Natur zu verbringen?	○	○	○	○	○

	überhaupt nicht				ja, absolut
Fühlen Sie sich für die Konsequenzen des Klimawandels verantwortlich?	○	○	○	○	○
Haben Sie das Gefühl, dass Ihre eigenen Aktionen Veränderungen hervorrufen können?	○	○	○	○	○

25. Welche Faktoren sind für Sie beim Gerätekauf von höchster Bedeutung?

Bitte werten Sie von 1 (am wichtigsten) zu 4 (am unwichtigsten) indem Sie die Kästchen in die Rangordnung ziehen (click-and-drag)

Design	**Energieeffizienz**	1
Kosten beim Kauf (Sonderangebote)	**Langlebigkeit**	2
		3
		4

	überhaupt nicht				ja, absolut
Haben Sie eine ungefähre Idee, wie hoch Ihr durchschnittlicher Energieverbrauch im Monat ist?	○	○	○	○	○

	starker Abfall				starker Anstieg
Wie würden Sie schätzen, hat sich Ihr Stromverbrauch in den letzten fünf Jahren verändert?	○	○	○	○	○

	überhaupt nicht				ja, absolut
Sind Sie sich bewusst, wie hoch Ihre durchschnittliche Stromrechnung ist?	○	○	○	○	○
Könnten Sie (ohne nachzusehen) feststellen, wie sich die Strompreise im Vergleich zu vor fünf Jahren verändert haben?	○	○	○	○	○
Wären Sie bereit mehr Geld für energieeffizientere Technologien auszugeben?	○	○	○	○	○

26. Reihen Sie bitte die folgenden Geräte nach ihrer Leistung (Arbeit pro Zeit in Watt)

Reihung von 1 (höchste Leistung / am meisten Watt) bis 14 (geringste Leistung / am wenigsten Watt) indem Sie die Kästchen in die Rangordnung ziehen (click-and-drag)

Computer (an)	Computer (Schlafmodus)	1
Fernseher (Farbe)	Fernseher (Flachbild)	2
Geschirrspülmaschine	Kaffeemaschine	3
Haartrockner	Kühlschrank	4
Laptop	Mikrowelle	5
Radio	Staubsauger	6
Toaster	Waschmaschine	7
		8
		9
		10
		11
		12
		13
		14

27. Besitzen Sie eine Geschirrspülmaschine?

- ○ Ja
- ○ Nein

28. Besitzen Sie eine Waschmaschine?

- Ja
- Nein

29. Besitzen Sie einen Wäschetrockner?

- Ja
- Nein

30. Der letzte Abschnitt der Befragung beschäftigt sich mit Ihrem Energieverhalten und Gewohnheiten im Alltag.

Wenn Sie das betroffene Gerät nicht besitzen ist die Frage zu überspringen

	niemals				immer
Schalten Sie die Lichter aus, wenn sie ein Zimmer verlassen?	○	○	○	○	○
Warten Sie bis die Geschirrspülmaschine voll ist, bevor Sie sie verwenden?	○	○	○	○	○
Würden Sie Ihr Geschirr mit der Hand waschen, wenn die Geschirrspülmaschine nur halbvoll ist?	○	○	○	○	○
Verwenden Sie die Trocknen-Option an ihrer Geschirrspülmaschine?	○	○	○	○	○
Warten Sie bis die Waschmaschine voll ist, bevor Sie sie verwenden?	○	○	○	○	○
Tragen Sie dasselbe Gewand mehr als einmal, bevor es in den Wäschekorb kommt?	○	○	○	○	○
Waschen Sie Ihre Wäsche auf niedrigen Einstellungen (unter 60ºC)?	○	○	○	○	○
Reinigen Sie das Flusensieb/Trocknerfilter Ihres Wäschetrockners?	○	○	○	○	○
Entfernen Sie Ihre Wäsche vom Wäschetrockner während sie noch feucht ist?	○	○	○	○	○
Decken Sie beim Kochen die Töpfe zu?	○	○	○	○	○
Drehen Sie die Hitze zurück sobald das Wasser kocht?	○	○	○	○	○
Drehen Sie das Thermostat herunter, wenn Sie für einen längeren Zeitraum die Wohnung verlassen?	○	○	○	○	○
Verschließen Sie nachts Vorhänge und Jalousien?	○	○	○	○	○
Wie oft baden Sie anstelle einer Dusche?	○	○	○	○	○
Verwenden Sie wenn möglich anstelle des Backofens eine Mikrowelle/Toasterofen oder Ähnliches?	○	○	○	○	○
Öffnen Sie die Ofentür während des Gebrauchs?	○	○	○	○	○
Lassen Sie für längere Zeit die Kühlschranktür offen?	○	○	○	○	○
Achten Sie darauf, für kleinere Töpfe kleine Herdplatten zu verwenden?	○	○	○	○	○
Verwenden Sie Lichtsteuerungen wie Dimmer, Bewegungsmelder etc.?	○	○	○	○	○
Stecken Sie elektrische Geräte aus, wenn sie sich nicht in Verwendung befinden? (Computer, Fernseher)	○	○	○	○	○

Wie hoch ist Ihr Thermostat durchschnittlich aufgedreht (Winterzeit)?	____ Grad Celsius

31. Stehen Möbel in Ihrer Wohnung direkt vor den Heizungen?

- ◯ Ja
- ◯ Nein

32. Welcher der folgenden Punkte ist der hauptverantwortliche Auslöser Ihres energiesparenden Verhaltens?

- ◯ Kosten-Ersparnisgedanke
- ◯ Umweltbedenken
- ◯ Bequemlichkeit
- ◯ Sonstiges:

33. Haben Sie je für Ihre Wohnung ein Energieaudit durchführen lassen?

- ◯ Ja
- ◯ Nein

34. Üben Sie bewusst weitere energiesparende Verhaltensweisen aus?

- ◯ Ja
- ◯ Nein

(Wenn ja) Welche weiteren energiesparende Verhaltensweisen üben Sie aus?

35. Haben Sie Anmerkungen oder Fragen zu den Inhalten oder der Gestaltung des Fragebogens?

Anmerkungen:

7.2. Questionnaire (English Translation)

Energy Attitudes and Behavior

Dear participants!

I am studying Human Ecology at the University of Vienna and am currently working on my Master's thesis. In the course of this study, I wish to explore energy attitudes and behavior within the household.

The completion of the survey takes about 10 minutes. All data is treated confidentially and will only be used for my research.

Thank you very much for your participation!

1. Gender

- female
- male

2. How old are you?

I am

3. Where do you currently live?

- Vienna
- Other:

4. In which district do you live?

(If currently living in Vienna)

My zip code is:

5. What is your nationality?

Nationality:

6. What is your highest level of education?

- Compulsory School
- Lehre
- Fachschule
- Höhere Schule
- Universität, Hochschule
- None
- Other:

7. Employment status:

Multiple answers are possible

- [ ] I am employed for wages
- [ ] I am self-employed
- [ ] I am out of work and looking for work
- [ ] I am out of work and not currently looking for work
- [ ] I am a homemaker
- [ ] I am a college student
- [ ] I am retired
- [ ] I am unfit to work
- [ ] Other:

8. What field do you study?

Multiple answers are possible. Please skip this question if you aren't going to/have never gone to college.

- [ ] Agricultural Sciences
- [ ] Archaeology
- [ ] Art History
- [ ] Biology
- [ ] Chemistry
- [ ] Computer Science
- [ ] Cultural and Social Anthropology
- [ ] Earth Sciences, Meteorology, Geophysics and Astronomy
- [ ] Economics
- [ ] Education Sciences
- [ ] Geography
- [ ] History
- [ ] Journalism and Communication Sciences
- [ ] Law
- [ ] Mathematics
- [ ] Molecular Biology
- [ ] Musicology & Linguistics
- [ ] Nutritional Sciences
- [ ] Pharmacy
- [ ] Philology, Linguistics & Cultural Sciences
- [ ] Philosophy
- [ ] Physics
- [ ] Political Science
- [ ] Psychology
- [ ] Sociology
- [ ] Sports Science
- [ ] Teaching Program
- [ ] Technology
- [ ] Theatre, Film and Media Studies
- [ ] Theology
- [ ] Translation Studies
- [ ] Other

9. What is your total household income?

[Please choose]

10. Which of the two options best describes the area in which you grew up / spent most of your childhood in?

- rural (less than 150 people / km²)
- urban (more than 150 people / km²)

11. How many individuals live in your household?

Please include yourself in your household

A total of

12. What household members is your household comprised of?

More than one answer is possible.

- Spouse
- Partner
- Parent/s:
- Sibling/s:
- Roommate/s:
- Child/ren:

13. Do you have a child/children?

- Yes
- No

14. Do you plan to have a child/children in the future?

- Yes
- No
- I do not know

15. Does your household own an electric feedback-device?

For example a Smart Meter

- Yes
- No

16. How do you believe energy-consumption has changed in the past ten years?

	strong fall				strong rise
There has been a					

17. Does an increase in energy-consumption have a significant impact on the environment?

- Yes
- No

18. Is there a significant man-induced contribution to climate change?

- Yes
- No

	Not at all				Yes, absolutely
Do we as a society hold a responsibility toward future generations to leave behind an economically, ecologically and socially safe and stable environment?					
Do ecological issues have an impact on economic and social well-being?					
Do you believe mankind has already had a severe negative impact on the environment?					

	Not important at all				Very important
How important do you feel is the role of individual households in energy issues?					

	Much too low				Much too high
Do you believe the current electricity prices are adequate?					

19. Which option would be the more effective way to reduce energy consumption?

- Changing behavior
- Investing in energy efficient appliances

20. Which of the options would you be more willing to realize in order to reduce energy consumption?

- Changing behavior
- Investing in energy efficient appliances

21. Which of the following is most likely to deter you from exercising energy-saving behaviors?

- Monetary costs
- Lack of time
- Sacrifice of comfort
- No motivation
- My actions will not make a difference
- I don't have enough information to engage in effective energy-saving behavior
- Other:

22. Do you experience any of the following when confronted with reports of climate change?

More than one answer is possible

- ☐ Fear
- ☐ Sadness
- ☐ Pain
- ☐ Anger
- ☐ Guilt
- ☐ Apathy
- ☐ Other:

23. Have you ever personally experienced a form of environmental degradation in your surroundings?

- ○ Yes
- ○ No

If yes, in what form?

	Not at all				Yes, absolutely
Do you believe technical advancements (such as new energy sources, higher energy efficiency etc.) will contribute to solving problems caused by energy consumption?	○	○	○	○	○

	Not important at all				Very important
How important is spending time outdoors/in nature to you?	○	○	○	○	○

	Not at all				Yes, absolutely
Do you feel responsible for the consequences of climate change?	○	○	○	○	○
Do you feel you have the ability to bring about change through your own actions?	○	○	○	○	○

24. Which factors are most important to you upon purchase?

Please rank from 1 (most important) to 4 (least important) by clicking and dragging the boxes into the ranking system.

Design	**Energy Efficiency**
Cost at purchase (special offers)	**Durability (lifespan, guarantee)**

1
2
3
4

	Not at all				Yes, absolutely
Do you have a gross idea, how high your average electricity consumption is per month?	○	○	○	○	○

	Strong fall				Strong rise
How do you perceive your electricity consumption has changed over the past five years?	○	○	○	○	○

	Not at all				Yes, absolutely
Are you aware how high your electricity bill is on average?	○	○	○	○	○
Would you be able to tell how the prices have changed in comparison to five years ago?	○	○	○	○	○
Would you be willing to invest more money for energy efficient technologies (all else being equal?)	○	○	○	○	○

25. Please rank the following appliances according to their electric power/wattage (work done per unit time)

Please rank from 1 (highest power/most watt) to 14 (least power/least watt) by clicking and dragging the boxes into the ranking system

Computer (on)	Computer (standby)	1
Television (color)	Television (flatscreen)	2
Dishwasher	Coffee machine	3
Hair dryer	Refrigerator	4
Laptop	Microwave	5
Radio	Vacuum cleaner	6
Toaster	Washing machine	7
		8
		9
		10
		11
		12
		13
		14

26. Do you own a dishwasher?

- Yes
- No

27. Do you own a washing machine?

- Yes
- No

28. Do you own a clothes dryer?

- Yes
- No

	never				always
Do you turn off the lights when leaving a room?					
Do you wait for the dishwasher to be full before using it?					
Would you consider washing dishes by hand if the dishwasher is less than half full?					
Do you use the drying option of your dishwasher?					
Do you wait for your washing machine to be full before using it?					
Do you wear the same clothes more than once before putting them into the laundry basket?					
Do you wash your laundry on low heat settings (under 60°C)?					
Do you clean the lint screen of your dryer?					
Do you remove clothes from the dryer while they're still damp?					
Do you use lids when you cook?					
Do you turn back the heat on your stove once the water is boiling?					
Do you turn down the thermostat when leaving for a longer period of time?					
Do you close the curtains and blinds at night?					
How often do you take baths alternatively to showers?					
Do you use the microwave/toaster oven or similar devices instead of an oven when possible?					
Do you open the oven door when in use?					
Do you leave the refrigerator door open for long periods of time?					
Do you pay attention to placing small pots on small burners?					
Do you use lighting control devices like dimmers, motion detectors etc.?					
Do you unplug electrical devices when they are not being used? (computers, televisions, VCRs etc.)					

How high do you usually turn your thermostat at home (during winter)? _____

29. Do you have furniture blocking the heaters?

- ○ Yes
- ○ No

30. What is your energy-saving behavior primarily driven by?

- ○ Saving money
- ○ Environmental concerns
- ○ Convenience
- ○ Other:

31. Have you ever had an energy audit performed for your home?

- ○ Yes
- ○ No

32. Do you consciously exercise any other kind of energy-saving behaviors?

- ○ Yes
- ○ No

(If yes) What other types of energy-saving behaviors do you perform?

33. Do you have any questions regarding the content of the survey?

Comments:

7.3. Summary (English)

The demand for energy in households is on the rise, while awareness about environmental issues is high among the general population. Despite this, studies have shown individuals to be unaware of the increase in their own energy-demand, and attitudes on environmental issues and pro-environmental behavior seem to show a strong discrepancy. In order to effectively mitigate environmental issues such as climate change, pro-environmental behavior is key. But what are the driving factors behind pro-environmental behavior? This thesis set out to explore the attitude-behavior gap of Viennese Biology students regarding energy issues, in an attempt to discover more about what motivates or deters individuals for displaying energy-saving behaviors within their home. A better understanding about energy behavior in households can be beneficial to formulating energy policies.

A survey was used to evaluate demographic, external and internal factors, as well as energy behavior, which were based on self-reported data from a total of 928 participants of the University of Vienna, the vast majority of which were students of Biology, Molecular Biology or in the Teacher Training Program of Biology and Environmental Studies.

It could be shown that this group of individuals represents a community which is defined by high energy-saving behaviors, high levels of knowledge and awareness, low income, and typically childless households. A discrepancy between attitudes and behavior could not be determined for the sample population; this lack of an attitude-behavior gap can be considered a trait of this group.

Various factors were identified as having an impact on energy-saving behavior, such as income, amount of members within the household, household structure, districts, rural or urban background, awareness of personal energy consumption, awareness of electricity prices, willingness to invest in energy-efficient technologies, willingness to change behavior, emotional involvement (particularly sadness, pain and apathy), environmental sensitivity, sense of responsibility toward the environment and locus of control.

More interesting are perhaps some of the factors which did not show differences in energy-saving behavior for this homogenous group, such as gender and age. This lets us conclude that cultural factors such as division of work and gender roles as well as the resulting differences

in status, education, knowledge, experience and awareness are in large part to blame for differences in these socio-demographic factors that can be observed in other social groups and populations.

In order to reduce energy demand in private households, the results of this thesis lead to the conclusion that alleviating differences between socio-demographic factors and making the population as homogenous as possible concerning education, environmental knowledge, experience and awareness as well as in division of work is desired. When confronted with factors such as income or household structure, the measures of homogenization will not show an effect. In these cases it is important to identify the different communities which are represented in the population, in order to recognize the different challenges and possibilities they pose for energy policies.

In addition to these efforts, it will be beneficial to raise awareness of personal energy consumption and electricity prices, for example through the implementation of smart meters. Another important measure would be raising awareness of and promoting energy-efficient technologies. Furthermore, this thesis concludes that raising people's sense of responsibility toward the environment, as well as raising their locus of control, will contribute positively to pro-environmental behavior, and can for example be achieved by promoting the involvement of the population in participatory projects.

7.4. Summary (German)

Seit Jahren ist in Österreich eine Steigerung des Energieverbrauchs festzustellen, auch in privaten Haushalten. Eine Steigerung des persönlichen Energieverbrauchs wird jedoch durch die Bevölkerung oftmals nicht wahrgenommen. Man muss immer wieder feststellen, dass trotz sehr positiven Umwelteinstellungen und starkem Umweltbewusstsein der Bevölkerung das umweltfreundliche Verhalten relativ niedrig ist. Woher entsteht diese Diskrepanz? Wenn Einstellungen und Bewusstsein nicht zu Verhaltensänderungen führen, welche Faktoren spielen dann eine Rolle? Um Umweltproblemen effektiv entgegenzuwirken hat umweltfreundliches Verhalten eine wichtige Funktion. Diese Arbeit hat zur Zielsetzung, den sogenannten „Attitude-behavior gap“ von Biologie Studenten der Universität Wien zu untersuchen, um mehr über die Einflussfaktoren von energiesparendem Verhalten im Haushalt zu erfahren. Ein besseres Verständnis dieser Umstände könnte einen Beitrag zur Formulierung von Energiemaßnahmen leisten.

Im Laufe dieser Studie wurde eine Umfrage formuliert, welche Daten über die demographischen, externen und internen Faktoren, sowie auch über das Energieverhalten der Teilnehmer im Haushalt erhoben hat. Die Daten basieren alle auf berichteten Angaben der 928 Teilnehmer, welche sich aus Studenten der Universität Wien von den Fachgebieten Biologie, Molekulare Biologie und dem Lehramt Biologie und Umweltkunde zusammensetzen.

Diese Gruppe von Individuen lässt sich als eine homogene Gruppe beschreiben, welche sehr starkes energiesparendes Verhalten, sowie ein hohes Niveau von Umweltwissen und Umweltbewusstsein, zeigen, ein geringes Einkommen haben, und typischerweise in kinderlosen Haushalten leben. Bedingt durch das starke energiesparende Verhalten konnte kein „Attitude-behavior gap“ festgestellt werden, was eine Eigenschaft dieser Gruppe darstellt.

Es wurden diverse Faktoren identifiziert, die einen Einfluss auf energiesparendes Verhalten haben. Zu diesen Faktoren zählen: Einkommen, Anzahl der Haushaltsmitglieder, Haushaltsstruktur, Bezirk, ländlicher oder städtischer Hintergrund, Bewusstsein des persönlichen Energieverbrauchs, Bewusstsein der Strompreise, Bereitschaft in

energieeffiziente Technologien zu investieren, Bereitschaft das Verhalten zu ändern, emotionale Beteiligung (insb. Traurigkeit, Schmerz und keine Gefühlsregung), Umwelt-empfindlichkeit, Verantwortungsbewusstsein und Kontrollüberzeugung.

Relevant sind auch ein paar Faktoren welche keine Unterschiede in Energieverhalten im Rahmen dieser homogenen Gruppe aufgewiesen haben, sowie Geschlecht und Alter. Es kann daraus geschlossen werden, dass Unterschiede dieser sozio-demographischen Faktoren, welche in anderen sozialen Gruppen und Populationen auftauchen, ihre Wurzeln in kulturellen Faktoren haben, sowie in der Arbeitseinteilung oder in den Geschlechterrollen. Solche Gegebenheiten verursachen Unterschiede in sozialen Status, Bildung, Wissen, Erfahrung und Bewusstsein, Unterschiede welche durch gezielte Maßnahmen verringert werden können.

Um das energiesparende Verhalten der Bevölkerung zu steigern ist es von Bedeutung, die eben erwähnten sozio-demographischen Faktoren zu Homogenisieren, um die gesamte Population auf denselben Stand bezüglich Bildung, Wissen, Erfahrung und Bewusstsein zu bringen. Unterschiede in sozio-demographischen Faktoren wie Einkommen und Haushaltsstrukturen kann man durch diese Bemühungen jedoch nicht ausgleichen. Hier müssen die verschiedenen Gruppen, die hinter diesen Unterschieden stehen, identifiziert werden. Durch die Ermittlung der Eigenschaften der verschiedenen Gruppen, können Energiestrategien angepasst werden.

Da ein gesteigertes Bewusstsein des persönlichen Energieverbrauchs sowie der Strompreise mehr energiesparendes Verhalten zur Folge hat, ist die Einführung des Smart Meters in Österreichischen Haushalten zu begrüßen. Zusätzlich wären Bemühungen die Investition in energieeffiziente Technologien zu fördern erwünscht. Weiters gibt es auch Potenzial in der Erhöhung des Verantwortungsbewusstseins und der Kontrollüberzeugung der Bevölkerung, welches zum Beispiel durch die Einbindung einer breiten Bevölkerungsgruppe in partizipativen Projekten erfolgen kann.

7.5. Curriculum vitae

Name:	Gloria Elisabeth Rose
Date and Place of Birth:	08.06.1989 in Assen, the Netherlands
Nationality:	Austria

Education:

Since October 2008:	Study of Biology at the University of Vienna
	Specialization: Human Ecology
	Bachelor of Science in 2012
Oct. 2007 – Jan. 2011:	Study of Archaeology at the University of Vienna
	Bachelor of Arts in 2011
1999 – 2007:	German International School of The Hague
	Degree: Abitur
1997 – 1999:	The Village School in Houston, Texas, USA
1994 – 1997:	German School of The Hague, the Netherlands
1991 – 1994:	English private school in Muscat, Sultanate of Oman

Linguistic Proficiency:	German: Native speaker
	English: Almost native speaker
	Dutch: Good qualification
	French: Basic skills
	Intermediate Latinum

7.6. Eidesstattliche Erklärung

Ich erkläre hiermit an Eides Statt durch meine eigenhändige Unterschrift, dass ich die vorliegende Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel verwendet habe.

Alle Stellen, die wörtlich oder inhaltlich den angegebenen Quellen entnommen wurden, sind als solche kenntlich gemacht.

Die vorliegende Arbeit wurde bisher in gleicher oder ähnlicher Form noch nicht als Magister-/Master-/Diplomarbeit/Dissertation eingereicht

Wien, am 01.07.2014

Unterschrift
(Gloria Rose)