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QUALITY OF LIFE ASSESSMENT OF BLIND PEOPLE WITH AND WITHOUT A GUIDE DOG

Master thesis

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1 Introduction

1.1 Assistance dogs in Austria

Assistance dogs are defined by the Austrian law as dogs that increase the independency of impaired people and provide support. Apart from that, they should facilitate communication with other people and accompany persons with impairment in their daily life for a longer period.

The term "Assistance dogs" includes guide dogs, signalling dogs and service dogs. According to the Austrian law § 39a BBG a guide dog may support and assist a blind person or visually-impaired person and thereby increase his or her mobility (Republic Austria, Bundesbehindertengesetz § 39a, 2017). To award an official certificate, all assistance dogs have to be examined by the independent Coordinating Authority, located at the Messerli Research Institue, assigned by the Social Ministry. Future assistance dogs are tested in health suitability, behavioural suitability and working performance suitability with his or her trainer and later with his or her new owner. The health suitability has to be assessed by a veterinarian with an additional education by the Social Ministry. Moreover, orthopaedic, internal medicine, neurological and behavioural assessment is mandatory. Behavioural suitability requires dogs to behave neutrally in the surrounding biotic and abiotic environment. Social behaviour, obedience, hunting instinct, aggression and the self-confidence are examined as well as concentration ability and noise reactivity. The working performance suitability is also tested by the Coordinating Authority.

After the exam has been successfully passed, the assistance dog can be written into the owner's passport for a person with disability. At that time the assistance dog is officially accepted by the Austrian Republic as an assistance animal according to § 39a BBG (Republic Austria, Bundesbehindertengesetz § 39a, 2017; Bundesministerium für Arbeit, Soziales und Konsumentenschutz, 2015; Republic of Austria, Sozial Ministerium Service Assistenzhund, 2018). The assistance dog obtains a number and is listed in the assistance dog database (Bundesministerium für Arbeit, Soziales und Konsumentenschutz, 2015).

Since 1.1.2015, when the law about assistance dogs got in force, the Coordinating Authority launched the guide dog assessment service. Guide dogs statistics reveal that in the year 2015,

21 guide dogs who had been already working as a guide dog at that time were tested. In addition, 12 guide dogs passed the exam in the year 2015. In 2016, another 13 guide dogs passed the exam and in 2017 11 guide dogs successfully completed the examination and in 2018 14 guide dogs passed successfully. It is estimated that in Austria there are about 78 working guide dogs who passed the official exam and about 30 guide dogs, who did not pass the exam. In total 108 guide dogs are working in Austria, those who officially passed the exam and those, who did not (Weissenbacher, 2018).

Despite lacking agreement on a comprehensive legislation in the European Union, Austria has much elaborated on the assistance dog testing system (Bremhorst et al., 2018). But nevertheless it is not a matter of course that a person with a disability can get an assistance dog for free easily. For people in Austria with more than 50% impairment is financial support from Social Ministry service available (https://www.sozialministerium.at/site/Arbeit_Behinderung/Unterstuetzung_und_Foerderungen/#intertitle-1), under the condition, that the assistance dog helps the person to increase his or her mobility. For employed people with visual impairment the Social Ministry Service can provide financial support up to 30 000 EUR from the Compensation Taxes Found (Republic of Austria, Sozial Ministerium Service Assistenzhund, 2018). According to law, employers are obliged to employ at least one person with impairments, if their company has more than 25 employees or pay compensation taxes which support people with impairment (Republic of Austria, Behinderteneinstellungsgesetz, 2018). Compensation taxes are dedicated to persons with impairment in working age. For pensioners the Compensation Taxes Found is not responsible. For Austrian students $1/3^{rd}$ of the costs of the assistance dog may be covered through the Compensation Taxes Found (Molokandov, 2016). Individuals that are not eligible for the Compensation Taxes Found, can request up to 6000 EUR from the Support Found of Social Ministry Service. However, there is no legal claim that a person with impairment is automatically eligible for financial support (Republic of Austria, Sozial Ministerium Service Assistenzhund, 2018). Financial support may also be provided via donation. Prices for a signal dog range from 20 000 - 24 000 EUR, for a service dog 25 000 - 29 000 EUR and the most expensive dog is the guide dog, who costs between 34 000 - 40 000 EUR (Molokandov, 2016). Thus, there is a considerable financial burden associated with the adoption of a guide

dog. To date, scientific evidence on whether a guide dog may effectively support the mobility and health of a blind person is lacking.

1.2 Assistance dogs in European countries

In the Czech Republic, like in Germany, only guide dogs costs are covered by the Social Ministry. Guide dogs are incorporated among special medical adjuvants (Ministerstvo práce a sociálních věcí, 2018). A guide dog trainer usually participates in an exam with the guide dog, but it is not obligatory by the law and the standards of the exam can differ. Dog schools for guide dogs may be members of an international organization like the International Guide Dog Federation (IGDF), accepting their examination protocol (International Guide Dog Federation (a), 2018).

In Switzerland, guide dog costs are covered by the national Disability Insurance (Schweizerische Eigenossenschaft: Verordnung des EDI über die Abgabe von Hilfsmitteln durch die Invalidenversicherung, 2018). Several guide dog schools that passed the quality standards required by the Disability insurance may officially train a guide dog and receive 10 000 CHF for that. After the dog has passed the exam, the guide dog school has to sign a contract and rent the guide dog to the Disability insurance and receive 350 CHF per month. The person with visual impairments, who obtains a guide dog, receives 110 CHF for monthly expenses (Bundesamt für Sozialversicherungen, 2010). As has been written above, there is currently no comprehensive European Union (EU) legislation. This makes the orientation in the law very difficult across the countries and even within one country. This non-comprehensive legislation makes it difficult primarily for the people with impairments, who travel across the EU countries. According to the Convention on the Rights of Persons with Disabilities, permission to access public places as well travelling should be granted to people with an assistance dog (Čermák, 2012).

In addition, an official qualification exam for assistance dogs within the Europe Union is needed (Bremhorst et al., 2018). According to the European Committee for Standardisation, the lack of a comprehensive legislation among the European Union law poses a problem (European Committee for Standardisation, 2017). Even if the standardisation is not mandatory to be accepted as a law by the European Union members, it may facilitate future legislation (Bremhorst et al., 2018). The EU Standardisation or future law would affect all parties

involved, e.g. assistance dog owners, the dogs, the providers of assistance dogs, service providers, general public and financial supporters. Standardised terminology, management, training of the assistance dogs and assessment would be beneficial for all of stakeholders. For dog owners, it would simplify the transportation across the EU and facilitate access to public institutions. Finally, standardised exams shall secure animal welfare and raise transparency among assistance dog providers (European Committee for Standardisation, 2017).

Currently there are several big international organisations, which unify assistance dog providers around the world such as the Assistance Dogs International (ADI) (https://www.assistancedogsinternational.org/), International Guide Dogs Federation (IGDF), as the International Guide Dog Federation (https://www.igdf.org.uk/) or the European Guide Dog Federation (EGDF) (http://www.egdfed.org/home).

Although it is voluntary to be a member of those organisations and to follow the standards of the organisation, at least some quality assurance and security for all stakeholders is guaranteed. Assistance dogs are an essential part of the assistance dog user's life. Assistance dog should be allowed to accompany the person with impairment in public places, to work or to the doctor. So the public should be protected from poorly trained assistance dogs as well as the prospetive owner. And the dog should have the right for a welfare friendly training.

Most of the EU countries accept the final exam of international organisation as valid, but that is only on voluntary basis. As the EGDF discussed on its last conference in 2017 in Malta, it is very important that those three leading organisations, namely the EGDF, ADI and IGDF, collaborate closely (European Guide Dog Federation, 2018). This is the only feasible way how to advance legislation in the assistance dog field on a European level.

1.3 Visually impaired people in Austria

Although 79 % of the Austrian population would evaluate their health status as "good" or "very good", 21 % of the population perceive their health status as poor (Klimont and Baldasz, 2015). Most commonly mentioned problems include mobility (14.1 %), on the second place there are issues not covered by the questionnaire (7.5 %), on the third place are psychological and neurological problems (3.7 %) and on the fourth place are the visual impairments (3 %). As depicted in Tab. 1, 216 000 persons with visual diability (3 % of the

population) were registered and women were more likely to be affected (Rubisch et al., 2017). 53 000 (0.7 %) of respondents had serious visual impairments and 2200 (0.03 %) called themselves blind person. Questionnaire respondents were living in private household and were 15 - 60 years old.

Table 1. Long-term visual-impairment statistic in Austria according to the degree of impairment, sex and age (Rubisch et al., 2017).

Variables	Permanent impaired persons									
	In total		Female	Male	Female			Male		
					Age					
					15-20	20-60	60+	15-20	20-60	60+
	In 1000	Population of private households in %								
Vision problems	216.3	3	3.3	2.6	.	1.8	7.3	.	1.5	6.1
Little	75.7	1	0.9	1.2	.	0.5	1.9	.	0.8	2.5
Medium	85.4	1.2	1.6	0.7	.	0.8	3.7	.	0.3	2.1
Serious	53	0.7	0.8	0.7	.	0.8	1.7	.	0.4	1.5
Respondent is blind	2.2	0	0	0	.	0	0	.	0.1	.

If the estimated number of guide dogs in Austria (108) (Weissenbacher, 2018) are compared to the number of blind people (2200) (Rubisch et al., 2017), only 4.09 % of visually impaired people benefit from the aid of a guide dog.

1.4 Quality of life

1.4.1 Definition of Ouality of Life

Starting with the definition what exactly Quality of Life (QOL) means, it can be already stated that there is no simple and exhaustive definition.

Firstly, it has been discussed for a long time whether the terms “wellbeing” and “QOL” are synonymous, or if their meaning is different. According to Borofsky and Rowan (1998), the assessment of QOL includes measuring of happiness as well as measuring of wellbeing.

The WHO defines QOL as an individual perception of the position in life in the context of the culture and value systems in which a person lives and in relation to his or her goals, expectations, standards, and concerns. It is a broad-ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationship to prominent features of their environment (WHO, 1997, p. 1). Borofsky and Rowan (1998) understand QOL in its broadest sense as values held by an individual, a group or entire society. QOL assessment may be defined as the process of quantifying human values and incorporating them into important human decisions (Borofsky and Rowan, 1998, p.93).

Albrecht and Devlienger (1999) describe in their study the “disability paradox“, where people with serious impairment assessed their QOL to be good or excellent, although their life could appear to external observers as having a bad QOL. Therefore, a broader understanding of QOL, centred on the balance between body and mind, is feasible. Thus, it becomes apparent that QOL does not exclusively means good health.

Secondary, another complication with the described terminology is the relation between the terms “health” and “QOL” or “wellbeing”.

The WHO defines health as "A state of complete physical, mental, and social well-being not merely the absence of disease or infirmity." (WHO, 1997, p. 1). Thus, it is the quality of life factor that is an important part of health as a whole. In other words, we cannot consider an individual as healthy if he or she is lacking the feeling of wellbeing or peace of mind. The WHO’s definition of health has been mentioned already in the year 1947 on its conference in Portugal. But many participants disagreed, with the objection, whether the definition of health better describes perfect happiness or health itself (Spitzer, 1987).

If we accept the fact that wellbeing is important for a human’s health, then measuring of happiness reflects advances in the assessment of subjective phenomena (Borofsky and Rowan, 1998), which is important for the health status.

Moreover, there are other terms in use that can be confusing, like a “Health related QOL”. According to Centres for disease control and prevention (2019), “Health-related QOL” is an individual’s or a group’s perceived physical and mental health over time.

It is always the question what the investigator wants to measure, whether self-perceived health status or QOL, which includes the health problematic, but is not solely concentrated on it (Karimi and Brazier, 2016).

Associated with the problem of finding the most appropriate definition of QOL, multiple research methods as well as new questionnaires may be considered (Kamelska and Mazurek, 2015). However, is any of these methods better than the other? In this respect, one of the most important methodological differences is the distinction between subjective and objective methods (Veenhoven, 2000). Objective methods focus for example on the measurement of income or the size of one's flat (Veenhoven, 2002), which are so-called social indicators used for evaluations of larger populations, by which different countries can be compared with specific regard to, e.g., employment, access to health care, education level or national security housing (Brown and Brown, 2003). In contrast, subjective methods involve terms such as satisfaction (Veenhoven, 2002) or economic, social and psychological well-being (Veenhoven, 2000). Terms like objective and subjective measurement can be misleading. For example, somebody may have a tumour that has been measured by objective methods, but as long as the person does not know about his or her disease, the subjective QOL can be high while the objective QOL is low. Moreover, the objective methods are measured by external observers, whereas the subjective assessment is based on self-report (Veenhoven, 2002), which is important because objective measurements are not always reflecting the subjective ones (Brown and Brown, 2003).

Nowadays mostly subjective methods are used, as they are more likely to capture the complexity of human life, which is missing in an objective assessment (Forward, 2003), or both methods are combined (Brown et al., 2004). From the literature, it can be concluded that most researchers would agree that QOL assessment is a multidimensional concept; and that asked questions should be relevant for the target group, sufficiently sensitive and combined into discrete domains (Forward, 2003).

1.4.2 History of Quality of Life Assessment

Assessment of QOL has a long history, as humans have always reflected on their conditions (Borofsky and Rowan, 1998). Already Aristotle and other Greek philosophers reflected on the prerequisites of a happy and good life (Fröding, 2013). But the formal assessment of QOL is a

rather recent development, because firstly political representatives had to be convinced of the benefits associated with the assessment of QOL. Secondly, physicians had to accept that humanistic questions are an important part of medicine and, last but not least, that subjective phenomena can be validly and reliably measured (Borofsky and Rowan, 1998). The term "QOL" reached a peak popularity only during the recent years, as can be seen in the scientific medical field searching for the term on databases like PubMed or other search engines (Post, 2014). Before 1970, there were very few publications on QOL available (Spitzer, 1987). The dynamic upward trend was noticeable in different fields such as sociology, psychology and medicine (Brown and Brown, 2003).

1.4.3 Quality of Life of visually impaired people

1.4.3.1 Visual impairment

Visual impairment is an impairment that affects the normal function of vision. All around the world about 1.3 billion people have some kind of visual impairment (WHO, 2018). Approximately 216.6 million people exhibit a serious visual impairment, while 188.5 million people reported mild visual impairment. Around the world 36 million people are blind, of which 31 million are older than 50 years. Most of the visual impairment problems are reported in Asia and sub-Saharan Africa. In these areas the medical care is very poor, and most probably lots of cases of blindness could be avoided if standards of public health were raised (Bourne et al., 2017). According to the WHO (2018) up to 80 % of cases of blindness are preventable, especially cataract surgery in low-income countries would prevent lots of people from blindness.

The range of impairment can be differentiated depending on how good or bad the better eye is able to see with glasses or contact lenses. Depending on how much residue of eyesight is left, we can differentiate between visually impaired persons, who have a residue of eyesight ≤ 30 %, and seriously visually impaired persons, who have a residue of eyesight ≤ 5 %, and blindness with a residue of eyesight ≤ 2 % (Öffentliches Gesundheitsportal Österreichs, 2018). The WHO defines visual impairment according to the International Classification of Diseases 11 (2018) and divides the vision impairment into two groups, distance vision

impairment and near presenting vision impairment. A more specific definition of these two groups is given in the following.

Distance vision impairment:
Normal vision is equivalent to 6/6. The first number indicates how far away is the visually impaired person from the chart, which is usually 6 meters. The second number is the distance from the chart at which healthy (normal) person would see it (Chauhan, 2019).

- Mild – presenting visual acuity worse than 6/12
- Moderate – presenting visual acuity worse than 6/18
- Severe – presenting visual acuity worse than 6/60
- Blindness – presenting visual acuity worse than 3/60

Near vision impairment:
Near vision is equivalent to N6, where "N" means near and the "6" is referring to the size of the letters, moreover smaller number after N means better vision (Chauhan, 2019).

- Presenting near visual acuity worse than N6 or N8 at 40 cm with existing correction (WHO, 2018).

There are various reasons why a person may be blind, but among the most common eye diseases are glaucoma, diabetes retinopathy, tumours and age-related macular degeneration (Blinden und Sehbehindertenverband Österreich, 2018). Further causes are injuries of the eyeballs, uveitis or detached retina (Öffentliches Gesundheitsportal Österreichs, 2018) and cataract, corneal opacity as well as uncorrected refractive errors and trachoma (WHO, 2018).
The glaucoma is a disease of the nerves, which are degenerating over time. The diabetes retinopathy is caused by the disease diabetes mellitus and related changes on the retina. The age-related macular degeneration is more frequent nowadays because of the increased expectancy of life. The most common eye tumour is the melanoma (Blinden und Sehbehindertenverband Österreich, 2018). Eye diseases like cataract are more common in low-income countries, whereas diabetic retinopathy, glaucoma or age-related macular degeneration show a higher abundance in high-income countries (WHO, 2018). Moreover, it

can be reported that the increasing number of visual impairment across the countries is caused by the overall higher mortality age (Bourne et al., 2017).

1.4.3.2 Living with impairment

As mentioned above, there are different ranges of visual impairment. Blind people have to face more obstacles than visually impaired people with residual vision. Several studies investigated the QOL of visually impaired and blind people.

Vuletić et al. (2016) reported that partially sighted people have better QOL and are significantly more satisfied with their close relationships than blind people. They are also more satisfied with achievements in life, health, standards of living as well as future security and community connectedness. On the other hand blind people reported higher safety feelings. Generally, both groups of visually impaired people were mostly satisfied with their close relationships and worried about their future security. It is important to mention that although partially sighted people reported better QOL, both groups rated their QOL over 50 % in all questions. A higher QOL was reported by blind people who were born blind or obtained blindness at a young age compared to people who acquired blindness later on. Higher QOL was also reported by people who joined a psychosocial rehabilitation group. Conversely, not visiting psychological rehabilitation was correlated with a lower feeling of security. These results are in agreement with results from Reboucas et al. (2016), who investigated the QOL of visually impaired people in Brazil using the WHO-QOL-100 questionnaire. Similarly to the study conducted by Vuletić et al. (2016), the participants assessed their QOL as good (68.75 %). The facets with the highest ratings were personal relationships, sexual activity, spirituality, religion and personal beliefs. In contrast, the financial situation, living in a polluted environment, feelings of security and protection as well as transport opportunity obtained lower ratings. As the worst factor the medical treatment dependency (8.25 %) was designated (Reboucas et al., 2016).

In a certain contrast to the above-mentioned studies, Van Nispen et al. (2016) reported that visually impaired people suffer from a higher risk of depression with increasing vision loss. An association between social network size and depression was found during this study. They pointed out that the size of social network seemed to be more important than the actual

received social support. In general, having a partner was found to be protective against depression.

Similarly, Langelaan et al. (2007) associated visual loss with depression and anxiety in patients who lost vision before the age of 12, or whose visual impairment began before this age. On the other side, people who lost their vision at a later point in time reported more problems in everyday life and, as a consequence, lower QOL. Higher educated visually impaired people reported more problems with their daily activities, but this can be because their work included computer work and had generally higher demands on visual performance. Overall, the QOL of visually impaired people was described as worse than that of people who suffer from diabetes mellitus type 2 or hearing impairment, but better than of those with strokes, multiple sclerosis, chronic fatigue syndrome, major depressive disorder or severe mental illness.

Chadha and Subramanian (2010) compared the QOL of visually impaired children to healthy children. It turned out that visually impaired children have lower QOL compared with healthy children at the same age with the reduction of 35.6 %. A tendency of decreasing QOL with higher age in children has been observed.

On the other hand, Albrecht and Devlinger (1999) presented the “disability paradox” and reported that 54.3 % of seriously disabled persons still reported excellent or good life quality. However, this study did not focus on visual disability.

Regardless of the degree of visual impairment, Kamelska and Mazurek (2015) investigated the influence of physical activity on visually impaired people and their QOL. They found that physical activity can significantly improve the QOL of visually impaired people. They consider physical activity as a possibility to explore own personality traits and develop creativity. Moreover, finding motivation and the possibility to overcome difficulties associated with visual impairment also shapes social integration if training partners are available. Visually impaired athletes reported a higher satisfaction with their health. Both groups in this study reported low levels of depression or negative feelings. Although no statistical significant differences were observed, the trend of data indicated that visually impaired athletes are more satisfied with their health, the amount of medical care they need, whereas they are less satisfied with access to the information they need in their daily life and support from friends they obtain compared to the control group.

In summary, although visual impairment does not seem to have a negative impact on QOL (Langelaan, 2007), there are several aspects like physical activity, visiting psychological rehabilitation centre, time when the visually impaired person gets blind and whether he or she is partially or full blindness or size of social network, that can influence the life of blind or visually impaired people in a positive way and improve their QOL. Furthermore, if the visual impairment remains at the same level throughout the whole life, the QOL can be significantly better (Kamelska and Mazurek, 2015).

1.5 Effect of dogs on human health

Dog-human companionship has lasted for at least 10 000 years according to Odendaal (2000). Other authors dated the beginning of domestication 14 000 years ago (Bradshaw, 2011). The most recent study suggested that domestication took place in many areas, earliest in southwest Asia about 14 500 - 11 600 years ago (Yeomans et al., 2019). As of now, it is not fully understood what is the motivation for so many people to share their homes with dogs, but it could be the possible improvement of physical and psychological health, amongst other factors. Nevertheless, a clear and strong relationship has developed between these two species which obviously is, to a certain degree, beneficial for both sides (Odendaal, 2000). Recently, human-animal interaction research has become a focus across diverse scientific disciplines, for example medical sciences or health-related professions (Spence, 2015).

Odendaal (1999) observed the impact of human-animal interaction on β-endorphin, oxytocin, prolactin, β-phenyl ethylamine, dopamine and cortisol. It turned out that β-endorphin, oxytocin, prolactin, β-phenyl ethylamine and dopamine were significantly increased in humans after the interaction with dogs, whereas cortisol was significantly decreased. The increase of prolactin and oxytocin was higher in humans interacting with their own dog, which is indicating the effect of a long-term bond benefit. Additionally, blood pressure decreased after the interaction; moreover, the optimal effect of the dog-human interaction could be achieved after 5 to 24 minutes. The control group to the interaction with the dog was reading a book. An increase of oxytocin after the interaction with an own dog was also observed by Odendaal and Meintjes (2003). Similar findings related to the oxytocin effect were reported by Handlin et al. (2011), who measured increased levels of oxytocin in women

after interacting with a dog. Further, their heart rate was significantly decreased after the interaction. On the other hand, effects of insulin and cortisol after human-dog interaction could not be determined as they were significantly decreased in owners as well as in the control group.

Allen et al. (2002) concluded that pets play an important part in human life and have a supportive function during exposure to a stressor. Dogs have positive effects on the cardiovascular system. In fact, pet owners have a significantly lower heart rate and blood pressure during a resting baseline as well as a smaller reactivity from baseline and faster recovery in response to stress. Another study reported that patients hospitalized with heart failure had significantly decreased systolic pulmonary artery pressure and capillary wedge pressure during and after animal-assisted therapy as well as significantly lower epinephrine levels (Cole et al., 2007).

Aside from cardiovascular effects, dogs can be perceived as a calming factor to women performing a stressful task. In the control group, where a human friend instead of a dog was present, women showed significantly higher physiological reactivity compared to the condition where a dog was present (Allen et al., 1991). In a closely related study Beetz et al. (2011) investigated the effect of a dog's, toy's or friend's presence on children during a stressful task. The physiological stress was measured by cortisol levels and was significantly lower when the dog was present compared to any other condition.

Furthermore, dogs may influence the immune system in positive way. Charnetski et al., (2004) found out that stroking a dog significantly increases the immunoglobulin A (IgA) levels. However, an increase of IgA was also observed in the control group, where the participants stroked a stuffed dog. Charnetski et al. (2004) concluded that this may indicate that those who have a positive attitude to dogs may benefit even if they stroke just a stuffed dog, a conclusion based on Pavlovian conditioning.

All the studies mentioned above were only describing short-term effects of the pet on human health. Effects on the cardiovascular system were even found in longitudinal studies. Friedmann and Thomas (1995) reported that pet owners are less likely to die within the year following a heart attack compared to non-owners. This study was a replication of a previous study from the year 1890 criticized by Wright and Moore (1982). Similar positive effects on the cardiovascular system were found by Anderson and Reid (1992), who conducted an

investigation in Australia with a large sample. The results showed that pet owners had significantly lower systolic blood pressure and plasma triglycerides compered to non-owners. Some differences were found between the genders, as the cholesterol and triglyceride levels were lower in male pet owners. Although pet owners were significantly more physically active, they also ate more meat and fast food. An association between pet ownership and lower cholesterol has been also reported by Dembicki and Anderson (1996). They found out, that elderly dog owners walked significantly longer than non-dog owners. Increased physical activity can be a possible explanation for lower cholesterol levels in dog owners. However, this is controversial to findings from Parslow and Jorm (2003), who found no differences in systolic blood pressure, moreover reported higher body mass index and smoking behaviour in pet owners as well as diastolic blood pressure.

Employing a more general focus on health, Serpell (1991) compared in a 10-months prospective study the general health status of respondents before and after acquiring a dog. Results showed improvement in health and psychological well-being in respondents who acquired a dog. Those effects were long-term. Moreover, respondents owning a dog were doing more physical exercise then non-owners. Similar results reported Siegel (1990), who concluded that older pet owners, after increased stress in their daily life, needed less medical attention (i.e. less doctor visits) than non-owners, and that they were able to deal better with stress.

Results from a study on parts of the Australian population from the year 1999 suggested that dog and cat owners were significantly healthier than controls. Measurements were done by assessing the frequency of doctor visits or use of medication. After the analysis, it was concluded that pet ownership can be held accountable for Australian health expenditure savings of about 1.813 million USD (Headey, 1999). Similarly, a more recent study conducted by Headey and Grabka (2007) describes the long-term effect of pets on human health. According to their findings, pet owners exhibit better health and go to the doctor less often than the non-owners. Moreover, based on the preliminary estimates, pets could save national health expenditures. For the year 2000, possible savings were estimated for Australia 3.86 billion USD and for Germany 5.59 billion EUR respectively (Headey et al., 2002) This study was based on longitudinal data sampled in Germany and Australia as well as on large sample size. It is an interesting fact that the Australian population is visiting the doctor less

often than the German. On average, Germans visited the doctor 11.5 times per year, whereas Australians only 5.2 times. Nevertheless, the percentage difference between the groups of pet owners and non-pet owners is the same. Therefore, the effect of pets always has to be compared within one country. Besides that, people who always owned a pet had better health and fewer doctor visits per year than people who only owned a dog for the last 5 years, or never had one. Nevertheless, these results were not significantly confirmed at the 5 % level. Furthermore, people who lost their dog had slightly worse health than people who never owned one. This could indicate the stress associated with the loss of the beloved pet (Headey and Grabka, 2007; Headey et al., 2002). Ambivalent results were reported by Müllersdorf et al. (2010) from a retrospective study, that pet ownership was associated with both positive and negative aspects of health, physical/leisure activities and socio-demographics. Although pet owners had better general health, they simultaneously reported more psychological health problems, headache and upper back pain than non-owners. Pet owners were mostly female, aged between 35 - 49 and self-employed. As this study is retrospective, the results can also indicate that self-employed women in midlife are most likely to acquire a dog.

Whether dogs have a positive effect on human health or not is not unequivocally clear, nevertheless, based on the literature research more studies suggested positive effects on human health than the opposite. It is possible that different groups of people and individuals have different benefits from having a pet. Stressed people may calm down and lower their hear rate just as less active people may become to be more active. Moreover, it seems that the long-term effect can be best observed after several years and that the best results were achieved by people who always owned a dog. Amongst others, this might be attributed to the fact that the immune systems develops resistances to pathogens that are presented by the dog (Headey and Grabka, 2007).

Parslow et al. (2005) concluded that pet ownership had no health benefits for the age group of 60 - 64; moreover, it is associated with poorer health status, symptoms of depression and higher rates of use of pain relief medication. Results of this study were based on a large Australian test group. Additionally, pet ownership had no effects on the frequency with which people visited general practitioners. Similarly, Paul and Serpell (1996) reported that the presence of dogs did not necessarily implicate beneficial effects for all age groups. Obtaining a new pet dog can negatively influence a child's health in the next 6 month period.

Nevertheless, this study was based on a small sample size and over a short period of time. These findings are countered by Bufford et al. (2008) who concluded that the exposure to dogs in infancy, and especially around the time of birth, is associated with beneficial changes in immune system development and reductions in wheezing and atopy.

Females from China aged 25 - 40 seemed to profit from dog ownership. Headey et al. (2008) confirmed their hypothesis that since the ownership of dogs is not banned anymore in China, women who acquired a dog can profit from the dog's presence. Female dog owners slept better, had better self-reported health and were more physically active, while they also took less sick days at work and had less visits at the doctor's.

Furthermore, not ownership per se but the relationship quality and strength between owners and their dogs seems to play a role. Headey (1999) reported that single people with a close relationship with their dog benefitted more from the dog regarding their health, they reported less doctor visits than non-owners or owners who did not have a close relationship with their dog. In contrast to these findings are the results from Lewis et al. (2009), who noted that although pet owners reported strong attachment towards the pets, their psychological well-being was not positively affected. This study was done in New Zealand and made use of instruments identical to this study. Besides that, no higher psychological wellbeing was found in pet owners. Moreover although the physical QOL was linked to significantly higher scores on the Social domain, surprisingly this was only true for other pet owners other than cat owners or dog owners.

In addition, dogs can play a role of "social lubricant" and facilitate to find new social contacts and reduce loneliness. According to the results of the Australian study from Headey (1999), 58 % of pet owners reported that they gained new friends thanks to their dog. Moreover, 62 % of owners reported that having a pet around makes it easier to create a friendly atmosphere and facilitate conversation. Similar results were presented by McNicholas and Collis (2000). Being accompanied by a dog increased the frequency of social interactions, especially interactions with strangers. Authors compared several conditions: human and dog approaching passersby, well-dressed human approaching passersby and normal dressed human without dog approaching passersby. Although a significant effect was also found related to handlers dress, the greatest effect on the frequency of social interaction had the presence of the dog. Possibly, a social catalysis effect caused by the presence of the dog was

associated with possible better well-being and health. Controversially, findings within the above-mentioned study from Lewis et al. (2009) reported no increase in social interaction of dog owners. Wells (2004) pointed out that facilitating communication is not generic, but rather dog specific. He compared the effect of the presence of a Labrador puppy, Labrador adult, Rottweiler adult and two neutral stimuli. Passersby reacted significantly more when the Labrador puppy or adult were present. They smiled at the experimenter and even started conversations significantly more often.

A study from Guéguen and Ciccotti (2008) explored the effect of dogs on closer relations between strangers and helping behavior. According to the results, the presence of a dog was significantly associated with people's willingness to donate some money for bus tickets and the likeliness for prosocial behavior. In addition, people accompanied by the dog achieved higher attractiveness scores and, moreover, subjects were more likely to give their phone number after the confederate asked to do so and told them that they were attractive.

Oncological patients reported decreased depression symptoms after regular animal-assisted activities (AAA) compared to the control group, who had no access to AAA (Orlandi et al., 2007). These results are in agreement with the results of a study reporting lower depression rates in HIV positive men who owned a pet (Siegel et al., 1999).

According to Kurdek (2009) adult dog owners turn to their dogs rather than to close friends or relatives in times of emotional distress. 79 % of pet owners stated that their pet helps them to get through the difficult times, as the majority of owners considers their pets to be family (Headey, 1999). Pets can be accessible enhancements to a person's QOL; moreover, pets are at hand whenever they are needed (Hart, 2006).

There are several factors that can influence the results of the studies. Nevertheless, most of the studies show a positive impact of dogs on human health. For more reliable results, longitudinal studies can be recommended rather than the cross-sectional ones. The results of cross-sectional studies can be distorted. For example, if older lonely people,suffering from depression, were more likely to acquire a pet, it would mean that pet ownership was associated with poorer health and bad psychological wellbeing (Giaquinto and Valentini, 2009). Furthermore, Cutt et al. (2007) pointed out several issues which are important to have in the mind while assessing the impact of pets (dogs) on human health. Similar to the results from Giaquinto and Valentini (2009), who questioned the objection whether owning a dog

produces better health or whether healthier people acquire a dog. With this topic the importance of longitudinal studies and prospective studies is connected. Moreover, it is connected to the importance of the investigation of the influence of social, physical and related environmental factors. Also, the impact of companion animals is often assessed as a generic group rather than within one species group (Spence, 2015). The results from Parker et al. (2010) can act as an example as they reported a higher survival rate in dog owners with acute coronary syndrome compared to cat owners. Nevertheless, the study suggested that in general pet ownership was associated with lower survival rate.
Most probably, details like the length of ownership and the bond between animal and human can play a significant role (Spence, 2015).

1.5.1 Service dogs and their effect on human

Possible benefits of assistance dogs are often overlooked by medical professionals as the health management is primarily focused on pharmacological and surgical treatments. In the scientific literature, studies on assistance dogs only recently started to be published (i.e. from around 1980) (Spence, 2015). Visually impaired people have to deal with permanent stress factors like dependence, helplessness, prejudices and insufficient social acceptance or communicative problems on a daily basis (Steffens and Bergler, 1998). Beyond the support from friends and family, guide dogs may be a considerable help to deal with such problems. The most common mobile aid associated with blind people is the white cane and although the cane is a very practical mobile aid, an overwhelming majority of guide dog owners preferred guide dogs over the cane (Steffens and Bergler, 1998; Whitmarsh, 2005; Wong, 2006). In addition, although nowadays many technology devices for mobility like GPS or talking sight exist, guide dog owners prefer guide dogs even over those modern mobility aids (Wong, 2006). They perceive guide dogs as a safer and faster mobility aid, especially in unknown environments (Wiggett-Barnard and Steel, 2008).
There is some evidence that assistance dogs can improve the QOL and health of the owners (Whitmarsh, 2005; Steffens and Bergler, 1998; Refson et al., 1999; Hall et al., 2017). Moreover, guide dog owners tended to believe that their guide dog changed their life positively (Wong, 2006). Controversially, Milan (2007) in his master's thesis reported no significantly increased QOL in the assistance dog group and reported only positive findings

regarding to mobility aid. The possible improvement in QOL of service (guide) dog owners will be discussed below.

The presence of an assistance dog can increase social contact (Hart et al., 1987). A closely related study from UK mentioned that 92 % of respondents reported that they made new friends since their dog's presence (Lane et al., 1998). Similar results are confirmed by Wong (2006), who investigated social factors involved with the ownership of a guide dog. 98.9 % of the respondents reported acquiring new friends through their guide dog. Furthermore, service dogs can create a more 'normal' social environment and heighten approachability for people with impairment (Hart et al., 1987). Those early findings were in agreement with findings from a follow-up study (Eddy et al., 1988). In contrast, Milan (2007) found no significant difference regarding social interaction, occupation or economic self-sufficiency in the assistance dog group compared to non-owners. Nevertheless, a general tendency to better QOL in the service dog group was noticed.

It is important to note that increased social attention is not always perceived as positive. Although a majority of the assistance dog owners enjoyed the increased social contact, some of the recipients reported that the dog sort of pushed the owner into the background, because the greetings were mostly delivered to the dog rather than to the owner. In addition, some people disrupt the dog from it´s work by inappropriate touching (Hart et al., 1987). However, a US study doubted that it is necessary to be accompanied by a service dog for the effect of increased social contact, and their data showed that there was no significant difference whether the impaired person was accompanied by a service dog or a pet dog (Shyne et al., 2012). Interesting results were presented in a study from South Africa, where dogs are perceived in a very ambivalent way. Either as an absolute social magnet or repellent, which is related to the different cultural history compared to Western Europe (Wiggett-Barnard and Steel, 2008).

Nevertheless, the value of service dogs goes beyond the increase of social interaction with passersby. As Spence (2015) suggests, mobility dogs offer more advantages than pet dogs. It is necessary to highlight the fact that pet dogs do not have public access rights. Moreover, mobility dog owners reported a higher QOL compared to pet dogs owners with mobility impairment. However, no statistical analysis was carried out because of the small sample size of this investigation.

Sanders (2000) investigated the impact of guide dogs on the identity of people with visual impairments. Western culture attributes a central importance to sight; therefore, to go blind can be perceived as losing an element of oneself. Acquiring a guide dog can be a transformative experience, i.e. guide dog owners can change the definition of themselves because of the presence of the dog. The relationship with the dog can provide an alternation of the social identity. The ownership of a service dog was associated with better understanding of oneself (Hall et al., 2017). According to Spence (2015), who studied the impact of assistance dogs on people with moving disorders, dogs play different roles in people's life like, e.g., companion, protector, caregiver, icebreaker, empowerer, motivator, entertainer or tool. All these roles together collectively influence an individual's self-perception of QOL.

According to the results of a study from Scotland (Refson et al., 1999), guide dog owners were found to be healthier and more mobile, showed greater independence, confidence and acceptance of their visual impairment than visually impaired persons without a guide dog. Moreover, dog owners reported increased social contacts and enhanced psychological and physical wellbeing. Similar results were presented by Whitmarsh (2005). Physical and hearing service dog owners reported better QOL regarding health, independency, working and learning compared to persons with impairment on a waiting list for an assistance dog (Hall, 2017). Steffens and Bergler (1998) addressed that guide dogs provide the feeling and returning of affection, love and tenderness. Besides the increased independence, mobility and flexibility, they reduce loneliness by means of increased contact with other people. Guide dog owners also enjoyed playing with the dog and having a friend by their side. The reports of having a friend and the companionship with the dog are also confirmed by Wiggett-Barnard and Steel (2008) and Refson et al. (1999). 59 % of assistance dog owners shared their negative feelings and problems with the dog (Lane et al., 1998). The feeling of having a friend by the side all the time can be a good reason for reduced loneliness. Nevertheless, Collins et al. (2006) reported that self-esteem, depressive symptoms and feelings of loneliness did not differ between service dog owners and non-dog owners. No differences regarding the level of loneliness and depression were also found by Milan (2007).

The measurements of health improvement due to the presence of the assistance dog are rather based on self-assessment than on objective measurements. Refson et al. (1999) compared the health status of guide dog owners and non-dog owners in Scotland. The study results

suggested that guide dog owners had a significantly better health in comparison to non-dog owners. However, in general 66 % of guide dog owners reported health problems apart from their visual impairment. Lane et al. (1998) suggested enhanced self-perceived health in the service dog group, while a majority of the participants of the study reported to be more relaxed since the dog was present and they also worried less about their health. They explained the health improvement as follows: “Reports from many of our subjects suggest that an enhanced sense of physical and psychological health may be associated with the role of their dog as a means of social integration, a close affectionate companion and a source of support and comfort” (Lane et al., 1998, p. 56).

The presence of guide dogs initiates increased physical activity. Visually impaired people walk longer distances with a dog than they would if only using a cane (Wong, 2006). In contrast to this finding, in another study only seven people out of 80 respondents reported that the guide dog promoted better health and increased fitness (Steffens and Bergler, 1998).

In previous studies the most frequently discussed topics are increased independence and the possibility to find new social contacts due to the presence of a guide dog rather than a direct impact on improved health or economic cost issues. This is except for one publication, which dealt directly with the economic costs and financial benefits of guide dogs. The study was done in the US and reported that the approximate total net costs per one guide dog over one working year was about 2379 USD (considering 8 years working period of the guide dog). These results were calculated after the summation of all costs for a guide dog like costs associated with the acquisition and training of the dog, which were set at 35 536 USD, and annual maintenance costs over the dog’s life, which were calculated at 5061 USD, leading to a total of 40 598 USD. Additionally, people who owned a guide dog needed less formal and informal care. Therefore the total discount of formal (16 324 USD) and informal (5244 USD) care was 21 568 USD. Meaning (40 598-21 568)/8= 2379 USD (Wirth and Rein, 2008). Although there are limitations in this study that should be considered like the real acquisition price of the guide dog or the training timeframe of the dog, it is a unique study which dealt with the raw costs of the guide dogs and later savings due to the visually impaired people needing less assistance. Economic benefits of the ownership of a service dog were also presented in an earlier study by Fairman and Huebner (2000), who reported an average reduction of two hours of human paid assistance per week and six hours of unpaid assistance

per week, which is equivalent to 600 USD per year. Moreover, Allen and Blascovich (1996) presented a dramatic decrease in paid and unpaid assistance hours of service dog owners. For the period of eight years the saved costs were calculated up to 60 000 USD. In contrast to this finding, Milan (2007) found no significant differences in medical service economics between groups with and without a service dog. However, the service dog group tended to use more paid assistance hours, whereas non-owners tended to use more unpaid assistance hours.

Although the studies presented above reported many positive facts about guide dog ownership, not all visually impaired people have or want a guide dog. One study from UK pointed out the discrepancy between how many visually impaired people there are on earth and how many of them actually have a guide dog. Several reasons may account for the fact that not all visually impaired or blind people have a guide dog. The most common are informational, psychological, social and environmental barriers (Whitmarsh, 2005). Lane et al. (1998) investigated the most motivational factors in applying for a dog and 70 % of participants of the study responded that they hoped to be more independent, 35 % responded that they wanted companionship, and 23 % hoped to be able to socialise more.

Similar findings on the benefits of pet dog ownership are presented by Heady and Grabka, (2006). It seems that different groups of guide dog owners appreciate different positive aspects of the guide dog ownership. Generally, guide dog owners are a subgroup of the visually impaired community. They are younger, healthier, and more independent and have suffered from pathologies since earlier age (Jackson et al., 1994). Moreover, guide dog owners are more likely to be higher educated and have a paid job. Results suggested that women perceive the security that the dog provides as the biggest benefit of the ownership, whereas men appreciate the independence. Older people preferred the opportunity for walking a guide dog, especially in comparison to younger owners who appreciate increased social contact and confidence (Whitmarsh, 2005).

In spite of the fact that guide dogs are an aid that is preferred over a cane (Steffens and Bergler, 1998), a dog still is a living being. Therewith several issues can be associated, for instance desirable and undesirable behaviour of the dog. One respondent from a South African study said in an interview: “My cane doesn’t get distracted by squirrels“ (Wiggett-Barnard and Steel, 2008, p. 1022). Craigon et al. (2017) explored which aspects of guide dog behaviour are important to the owner. Results indicate that the safety owners experience

because of the presence of the dog is the most important positive aspect. Contrariwise, the unwanted pulling on the lead was suggested as the most negative conduct. Moreover, dog owners reported attentiveness and obedience as key traits of a high quality guide dog. Additionally, the consistency of the dog's behaviour was considered another important behavioural trait, especially in relation to the owner's confidence while being guided. Furthermore, the social behaviour of the dog, i.e. besides its working time, seemed to play an important role for the owners. Less experienced guide dog owners reported some problems with their ability of behavioural assessment of the guide dog, which indicates the high importance of pre-education of the future guide dog owners. Problems with working behaviour and social (home) behaviour are the most common reasons for returning a guide dog (Lloyd, 2004). Owning a guide dog implicates several limitations, for example responsibility, caring for the dog and keeping it clean (Whitmarsh, 2005). As a result, owners have to deal with some significant lifestyle changes (Wiggett-Barnard and Steel, 2008). Besides that, there are several public places or situations where the guide dogs are not welcomed and the access rights of guide dogs sometimes get violated as well (Whitmarsh, 2005; Wiggett-Barnard and Steel, 2008). Recent guide dog owners also reported that they had to educate their surroundings as to how to behave towards the guide dog, which can be experienced as a tiring task (Wiggett-Barnard and Steel, 2008). However, not withstanding the negative aspects the dog ownership implicates, guide dog owners reported that benefits prevailed the disadvantages (Wong, 2006).

Visually impaired people who do not own a guide dog often neither can imagine how much of a friend the guide dog may be nor his or her ability to facilitate contact with other people (Steffens and Bergler, 1998). Consequently, the most common incentive for applying for a guide dog is increased independence and improved mobility, not the companionship (Refson et al., 1999). As a result, the guide dog usually holds a positive surprise for the future guide dog owner (Steffens and Bergler, 1998). The relationship between the guide dog and the owner seems to play a role in the perception of the positive effects of the dog. Owners who possessed similar personality traits as their guide dogs reported more satisfaction with their dogs (Craigon et al., 2017; Lloyd, 2004). Moreover, guide dog owners acquired a guide dog of their own free will reported greater satisfaction with the dog's work as well as with the mutual relationship. In addition, 93 % of respondents had a good relationship with the dog,

they even valued the dog's importance to be similar to that of family members (Lane et al., 1998). Similarly, Wong (2006) reported that all respondents except one considered their guide dog as a companion and friend.

An important topic that should not be overlooked is the stress associated with the termination of the partnership of the guide dog and the owner. Nicholson et al. (1995) suggested that distress increases particularly if (a) the partnership ends abruptly, (b) it is the owner's first guide dog or (c) when the owner had a poor relationship with the association who provided their guide dog. However, only 5 % of the guide dog owners thought regularly about that the guide dog would eventually die or may get seriously ill (Whitmarsh, 2005).

Overall, guide dogs seem to implicate positive effects, especially for younger visually impaired people (Sachs-Ericsson et al., 2002). Major outcome measures report on the social effect of service dogs, the psychological effect and, last but not least, the functional effect (Winkle et al., 2012). 95 % of the current dog owners reported that life was not conceivable without their guide dog (Steffens and Bergler, 1998). On the other hand 23 % of non-dog owners in the UK reported that they simply felt like they did not have a need for a guide dog. 40 % of these non-dog owners were still considering an application for a guide dog (Whitmarsh, 2005).

In order to explore in more detail the effects of guide dog ownership on health and QOL, longitudinal studies that compare measures before and after obtaining the guide dog as well as changes related to aging and medical conditions are needed (Sachs-Ericsson et al., 2002; Winkle et al., 2012). According to Winkle et al. (2012), studies on service dogs are commonly rated as methodologically weak because of small sample sizes, poor descriptions of the methodological design, outcome measures or the lack of a power calculation.

1.5.2 History of guide dogs

There is no clear evidence for when the first guide dog was used as there are no texts from Ancient or Middle age time that could clearly prove their usage in earlier times. There are several paintings that could be considered as an evidence for guide dogs in Ancient and Middle age time, but their interpretation is speculative (Calabrò, 1998). For example, a painting in the buried ruins of the Roman town of Herculaneum could be seen as the first evidence of the existence of guide dogs. This painting is dated back to the 1st century AD

(International Guide Dog Federation (b), 2018). As the painting is not accompanied by an explanative text, it is speculative as to whether the dog on the painting is really a guide dog as we understand it nowadays. Keller (1909) describes the painting from Herculaneum as picture of a blind beggar who held a line with a dog, but there is no real reference to a guide dog. Another scroll painting has been found in China in the 13th century. On this painting there is a blind man with a dog on a leash (Fishman, 2003). Furthermore, a wood carving from 1465 of a blind beggar with a dog exists. But again it is not clear whether the dog is a guide dog or not (Calabrò, 1998). Generally, all the dogs pictured on the earlier paintings are rather small, and therefore their guidance function remains questionable (Fishman, 2003).

The first written notes about guide dogs are known from 18th century from France. They describe the training of guide dogs in Paris at the "Les Quinze Vingts" hospital (International Guide Dog Federation (b), 2018). In 1788, Josef Riesinger of Vienna, Austria, got a dog, a Spitz, as a present. Although he trained his guide dog himself, it was very well-trained, so that people sometimes did not believe that Riesinger was actually blind. After the Spitz got old and could not serve anymore, he trained another guide dog, a Poodle (Beer, 1813). Several years after, in 1819, Johann Wilhelm Klein founded the Institute for the Education of the Blind in Vienna and wrote descriptions on how to train guide dogs (International Guide Dog Federation (b), 2018). This concept was new insofar as the person who trained the dog was not blind. Shortly after, trained guide dogs were introduced in Switzerland by Jakob Birrer, a blind man who started to train guide dogs similarly to Josef Riesinger. His training of the guide dogs was based more on punishment, but it also involved reward (Calabrò, 1998) from Klein (1819). At the end of the 19th century, the number of the guide dogs was in remission because it was no longer that expensive to pay an assistance accompaniment (Calabrò, 1998).

With the start of World War I, the demand of the guide dogs increased, especially because soldiers were blinded during gas attacks. In 1916, the first guide dog school in the world opened in Oldenburg, Germany. When the quality of the guide dogs decreased, the guide dog school in Oldenburg closed and a new one was opened in Potsdam with a new training technique, which was capable to train up to 12 guide dogs per month (International Guide Dog Federation (b), 2018). A few years after, the US citizen Dorothy Harrison Eustis, who had already been training dogs for the army and police in Switzerland, developed an interest in guide dog training (Seeing Eye, 2018). She wrote an article for the Saturday Evening Post

about the training of German shepherds as guide dogs in Germany (Eustis, 1927). After the article had been printed, an American blind man, Morris Frank, read the article and asked Dorothy Harrison Eustis for help and more information about the guide dogs. She agreed to help him, and so Morris Frank came to Switzerland in 1928 and completed the training with his new guide dog Buddy (The Seeing Eye, 2018). In 1929, Dorothy Eustis founded a school for the training of guide dog instructors. This school was first located in Lausanne and later on in Vevey (Fishman, 2003). After Morris Frank returned to the USA with his guide dog, he also founded a guide dog school in cooperation with Eustis. That was the beginning of guide dog schools in the US. The dog school was named "The Seeing Eye"; it was first located in Nashville and relocated to Whippany later on (The Seeing Eye, 2018). Shortly after this dog school was established, Italian volunteers contacted Eustis for help to found a guide dog school in Italy. As a result, the first Italian guide dog school was established in Florence in 1928 (Scuola Nazionale Cani Guida per Ciechi, 2018). Finally, the first guide dog school in Switzerland was established in 1970 by Walter Rupp (Calabrò, 1998). Two years later, two British women, Muriel Crooke and Rosamund Bond, who were also fascinated by Dorothy Harrison Eustis, contacted her and asked her for help and information on how to train a guide dog. Eustis sent one of her colleagues to England. In 1934, The Guide Dogs for the Blind Association (GDBA) was founded. Since then, many other guide dog schools have opened all around the world (International Guide Dog Federation (b), 2018).

1.6 Aim of the study

The primary aim of this study was to investigate whether blind people having a guide dog have a better QOL compared to blind people not having a guide dog. To answer this question a standardized questionnaire, the WHOQOL-BREF was used (WHO, 1997). The secondary aim of this study was to investigate whether blind people, who have a guide dog are healthier and therefore have lower medical costs. To answer this question, the medical costs by means of the medical insurance report from 2016 were compared between the groups.

The tertiary aim of this study was to investigate the attitude towards the human-guide dog relationship, i.e. how respondents of both groups rate the relationship quality and believe in its positive effects. To this end, additional items were added to the questionnaire for the

purpose of this study. Blind people without a guide dog answered the question on a hypothetical way, based on the assumption they had a guide dog while blind people with a guide dog answered the question on their own experience.

1.7 Hypothesis

Primary Hypothesis:

H0: Blind people who have a guide dog have similar QOL than blind people without a guide dog.

H1: Blind people who have a guide dog have a better QOL compared to blind people without a guide dog.

Secondary Hypothesis

H0: Blind people who have a guide dog have the same medical yearly costs as blind people without a guide dog.

H2: Blind people who have a guide dog have lower medical yearly costs compared to blind people without a guide dog.

Tertiary Hypothesis

H0: Blind people with a guide dog do not differ in their attitude regarding the relationship towards the guide dog and similarly believe in the positive effects of this relationship as blind people without a guide dog.

H3: Compared to blind people without a guide dog, blind people with a guide dog differ in their attitude regarding the relationship towards the guide dog and are more likely to believe in the positive effects of this relationship.

2 Material and Methods

2.1 Participants

Two groups of blind participants were recruited to complete an online accessible questionnaire. The first group consisted of blind people with a guide dog (n=18) and the second group of blind people without a guide dog (n=18).

For the purpose of this study, an accessible online questionnaire was used, advised by a blind volunteer who was involved in the planning and data collection phase. Contacts to the blind people with and without a guide dog were possible only via oficial organizations and to protect their privacy especially as the General Data Protection Regulation (GDPR) law came into force, organizations are no longer allowed to share any of their contacts. Online questionnaires are fully anonym and barrier-free for everybody, who has access to the Screen Reader software, an assistive technology essential to people with visual impairment. Furthermore while the voice of the researcher may influence the respondent, the Screen Reader voice is artificial and emotionless. This is another huge advantage of the method, as blind people could be more sensitive on auditive cues. Nowadays diverse companies such as Apple, Google or Microsoft have included the Screen Reader in their system. Some Screen Reader software programs are open source and freely available to download (Apple, 2019; Usability Geek, 2019). Moreover in Austria, it is possible to apply for financial support to buy a Screen Reader. Another possibility for blind people to read a questionnaire online is to use the Braille keyboard (Reference, 2019).

During the recruitment phase (2.9.2018 - 30.11.2018), potential participants of the first group were contacted via the Coordination center for assistance dogs Austria (https://www.vetmeduni.ac.at/de/assistenzhunde/), because due to the mandatory exam of all Austrian assistance dogs, all dog owners are registered in their database. The second group was contacted via the Association for blind and visually impaired people in Austria (http://www.blindenverband.at/). All potential participants obtained an invitation email via the above-mentioned organizations. The invitation email contained a link that lead the participants to a website with the questionnaire (see appendix).

The inclusion criteria was that the participants were between 18 and 65 years old. The rationale for a minimum age of 18 was because in Austria it is the beginning of the full age. An age limit of 65 was set due to higher risk of co-morbidities and overall mortality. According to Austrian Statistics, 16 percent of the population over the age of 65 are likely to have problems with at least one basic activity like eating ortaking a shower (Klimont and Baldasz, 2014). All participants had to live in Austria because it would not be feasible to compare the QOL across different countries. The inclusion criteria for the group with a guide dog was having a guide dog and for the group without a guide dog was the inclusion criteria not having a guide dog at the moment or within the past three years.

2.2 Instruments

For the purpose of this study two versions of the questionnaire have been used.
The first part contained identical questionnaires for both groups, based on the German version of the WHOQOL-BREF (World Health Organization, Quality of life questionnaire a shorter version of the original instrument WHOQOL-100 questionnaire). The second part was a questionnaire designed for the specific purpose of this study and for each group slightly different (see appendix).
Questionnaires were accessible via an online link. For this purpose we used (https://www.soscisurvey.de/), which is available freely to students to publish their questionnaires. Soscisurvey is also compatible with Screen reader modus, which enables visually impaired people to use a computer.

2.2.1 WHOQOL-BREF

WHOQOL-BREF is a brief version of the WHOQOL-100 (World Health Organization, Quality of life questionnaire). It was developed for use in larger studies and for cases where the use of a longer version is not practicable (WHO, 1997). In average, the WHOQOL-BREF should be completed in 5-10 minutes (Angermeyer et al., 2002). As this study is focused on blind people, the longer version WHOQOL-100 could be to exhaustive, therefore it was decided to use the shorter WHOQOL-BREF.

The WHOQOL-BREF has been translated to over 30 languages to allow for comparative and cross-cultural studies (WHO, 1998). It is a useful instrument to assess individual perception of QOL. The questionnaire contains 24 items which are assessed within four domains: Physical (seven items), Psychological (six items), Social Relationships (three items) and Environment (eight items) plus two items scored separately. The Physical domain includes questions about pain, energy, sleep, mobility, activities, medication, and work. The Psychological domain contains questions about positive and negative feelings, thinking/ thoughts, self-esteem, body and spirituality. The Social relationships domain includes questions about relationships, support and sexuality. The Environment domain includes questions about safety, home, finance, services, information, leisure, environment and transport satisfaction. And finally, the two items, which are scored separately, asking about the individual overall perception of QOL and about the individual overall perception of his or her health. All items are rated on a five-point scale (WHO, 1997; WHO, 1998).
The WHOQOL-BREF German version was requested for the purpose of this study from the WHO organization and its content was changed to a barrier-free version made suitable for blind people with the help of a blind volunteer (see appendix).

2.2.2 Questionnaire for blind people with and without a guide dog

The second part of the questionnaire was specifically designed for the purpose of this study. Both groups obtained a tailored version of the questionnaire. The group with a guide dog was asked how the presence of the dog influenced their daily life, meaning their sufficiency, access to new social contacts, their perceived health. The next questions were associated with the dog, whether participants consider it demanding to own a guide dog, whether they think that it is a demanding job for the dog and about their general relationship with the dog.
Participants of the second group without a guide dog were asked basically the same questions like the first group just in a hypothetical way if they imagined they would have a guide dog.
All those questions have been rated on a 10 points scale, 1 for “no agreement” and 10 for “full agreement”.
In addition, participants were asked if they suffer from any chronic diseases, if they consume any addictive substances and about their medical cost in the year 2016 according to medical insurance. A chronic disease was defined as a continuing condition over six months period.

Among the most common chronic diseases in Austria are back pain, allergies, high blood pressure, chronic cervical spine pain, arthrosis, depression, headache, diabetes, asthma and chronic bronchitis and heart attack (Klimont and Baldasz, 2014). For the purpose of this study, all types of pain were scored in one item except for headache which was asessed separetely and question about cancer and anxiety were added.

Both questionnaires, the WHOQOL-BREF and self-designed questionnaire were attached to each other and were easily accessible via the online link. Prior to access to the study questions, which was different for each group as described above, a filter system sceened for guide dog ownership was used. If the participant answered yes (having a guide dog) it was automatically directed to the questions for the group with a guide dog. If the answer was no (not having a guide dog), the participant was automatically directed to the questions for the group without a guide dog.

2.3 Ethical consideration

The study protocol was approved by the Medical University of Vienna Human Participants Ethics Committee (see Appendix), reference number 1247/2018 (submitted by thesis supervisor Dr. Lisa Maria Glenk). For the purpose of this study, we created an anonymous barrier-free online survey in which no individual-related questions (e.g. birth date or name of the participant) were asked. At the end of the questionnaire, participants had to confirm that they understood that their data will be anonymously analysed solely for purpose of this study.

2.4 Statistical Analysis

2.4.1 Power-Analysis

Based on expected responses it was predicted to have at least 16 participants in each group.

Standard deviation: 2

Group 1 Mean : 7

Group 2 Mean: 5

power (1- β) : 0.8

Type error rate α: 0.05

2.4.2 WHOQOL-BREF Analysis

The WHOQOL-BREF produces four domain scores, the Physical domain, the Psychological, the Social relationships domain and the Environment domain. For each domain the domain score is analysed according to the WHO instructions (see appendix).

2.4.3 Statistical analysis

All analyses were performed using IBM SPSS (version 24.0; IBM Corp., Armonk, NY, U.S.A.). Differences between the two groups in frequency distribution were analyzed using chi-square tests. For metric scaled variables such as the domain scores of the WHOQOL-BREF the two groups were compared using t-tests for independent samples or the nonparametric Mann-Whitney-test (U-test), if the assumption of normal distribution, which was tested using Kolmogorov-Smirnov-test, was not met, or in case of ranked data. For all analyses a p-value of 5 % ($p > 0.05$) was considered significant.

3 Results

3.1.1 Socio-demographic data

In total 36 participants finished the questionnaire. According to intern SoSci statistics, which keep in record how many times the online questionnaire has been accessed as well as successful and unsuccessful attempts of completion, 51 questionnaires were not successfully finished. In total, the online questionnaire was opened 475 times.

The socio-demographic data of the participants are presented in Tab. 2. The data are sorted by the tested group: Group without a guide dog (NGD) and Group with a guide dog (GD). The size of the groups was equal, with 18 participants in each group. In total, more females attended the study, as 12 females and only 6 men were included in the GD group. In the NGD group, gender was equally balanced. The mean age in GD group was 42.1 years and 48.9 years in the NGD. The majority of the respondents was either single, divorced or widowed. In both groups, 15 respondents stated that they were currently not ill and three respondents stated that were currently ill.

Table 2. Socio-demographic data of the participants of this study with and without a guide dog in Austria. Note: The education system is different among the countries. In the current study the questionnaire was presented in German, therefore the answers in terms of the highest education level were also presented in German. *Hauptschule* is equivalent to the term *secondary school*. *Mittlere Reife* is equivalent to the term *general secondary school* leaving with certificate. *Fachhochschulreife* is equivalent to the term *advanced technical college entrance qualification*. *Abitur* is equivalent to the term *maturity* (collage entrance qualification). *Fachhochschule* is equivalent to the term *collage of higher education*. *Universität* is equivalent to the term *university*. *Postgraduiert* is equivalent to the *doctorate*.

	Participants (n=36)	
	Guide dog	**No guide dog**
Gender		
Male	6	9
Female	12	9
Age		
18-30	1	4
30-40	4	4
40-50	2	5
50+	10	4
Mean age	42.1	48.9
Marital status		
Single	6	8
Married	3	5
Living with partner	2	4
Divorced	4	1
Widowed	3	0
Highest received education		
Hauptschule	4	2
Mittlere Reife	5	2
Fachhoschulreife	1	0
Abitur	2	8
Fachhoschule	2	2
Universität	4	3
Postgraduiert	0	1
Currently ill status		
Yes	3	3
No	15	15

Quality of life (QOL) of blind people with and without a guide dog

The results regarding QOL obtained from the WHOQOL-BREF, which refers to a self-assessment of QOL are shown in Tab. 3 and in Fig. 1.

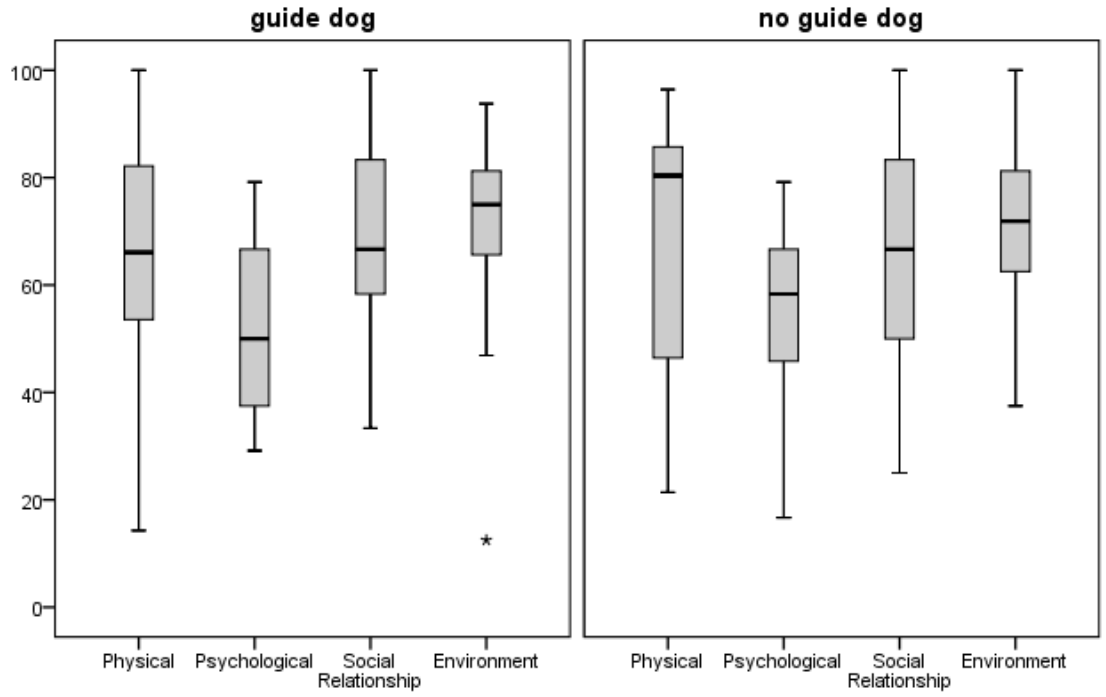
No significant differences between groups were observed in any of the domains (Physical, Psychological, Social relationships, Environment).

Respondents self-assessed their QOL in general as good. In all domains they assessed their QOL over 50 %. According to the ordinary scala defined by WHO, 50 % can be defined as neutral (neither good nor not good). According to the results of this study, the Environmental domain reached the highest score of all domains in both groups: 70.7 % within GD the group and 70.8 % within the NGD group. High scores were also found in the Physical domain with (65.7 % within the GD group and 71 % within the NGD group). The Social relationships domain reached 68.1 % in the GD 68.1 % and 66.7 % in the NGD group. The Psychological domain was the only one, which did not reach more than 60 %. NGD group assessed the psychological QOL with 55.5 % and the GD group an even lower with 52.3 %.

Table 3. Results of WHOQOL-BREF. Comparison of four domains between the GD group and NGD group.

		Mean	Std.Deviation	p
Physical	GD	65.7	21.0	0.461
	NGD	71.0	22.0	
Psychological	GD	52.3	16.2	0.600
	NGD	55.3	17.9	
Social relationships	GD	68.1	19.0	0.835
	NGD	66.7	20.6	
Environmental	GD	70.7	19.9	0.977
	NGD	70.8	16.3	

Figure 1. Results of the WHOQOL-BREF. Domain comparisons between the GD group and the NGD group.



3.1.2 Health status and consumption of addictive substances in blind people with and without a guide dog

Respondents were asked whether they suffered from chronic illness like chronic pain, asthma, allergy, diabetes, depression, high blood pressure, chronic headache, arthrosis, chronic bronchitis, cancer, stroke, anxiety or any other chronic diseases.

There was no significant difference between both groups regarding suffering from chronic illnesses. Nevertheless, it could be observed that GD group suffered non significantly more under depression, high blood pressure and anxiety. 38.9 % of respondents of the GD group reported, that they suffer under depression, whereas only 16.7 % of the respondents of the NGD group. 27.8 % of the GD group reported, that they had increased blood pressure, while in the NGD group 16.7 % of subjects reported increased blood pressure. Increased anxiety was reported by 38.9 % of respondents of the GD group in contrast to the NGD group, where

22.2 % respondents reported increased anxiety. All other responses regarding to chronic pain, asthma, allergy, diabetes, chronic headache, arthrosis, chronic bronchitis, cancer, stroke and other chronic disease were not significantly different between the groups.

Regular usage of medication was reported by 72.2 % of respondents in the GD group and by 68.8 % in the NGD group.

This study showed no significant difference regarding the consumption of addictive substances between both groups. Respondents were asked if they consume any of the following addictives: alcohol, nicotine, caffeine, cannabis, stimulants drugs and sedative drugs or any other drugs.

Nevertheless respondents of the GD group reported non significantly higher consumtion of nicotine, cannabis, stimulants drugs and sedative drugs. According to the results 38.9 % of the respondents from the GD group consumed nicotine in comparison to 16.7 % in the NGD group. 22.2 % of the GD group consumed cannabis, whereas 11.1 % of the NGD group respondents did. Usage of stimulants and sedatives drugs was in general very low. 5.6 % of the GD group respondents consumed stimulant drugs, whereas no respondent of the NGD group reported usage of stimulants. Consume of sedative drugs was reported by 11.1 % of the GD group respondents and by 5.6 % of the NGD respondents.

3.1.3 Medical insurance costs

Respondents were asked about their medical costs from the year 2016. This question was not obligatory in terms of inclusion criteria to take the questionnaire as valid. Only 10 participants provided information about their medical insurance costs, three participants from the GD group and seven from the NGD group. With that limited information it was observed that higher numbers of costs were given in the NGD group. The mean medical costs in the GD group was 492.67 (±467.249 SD) EUR per month, whereas in the NGD group it was 2445.98 (±3146.154 SD) EUR.

3.1.4 Owner-guide dog relationship

Respondents self-reported their relationship with their guide dog or in case of the NGD group on a hypothetical basis. Statistically significant differences were observed between both groups in question (Q) 1, 3 and 6. The results regarding the relationship between the guide

dog and owner are presented in Tab. 4 and Fig. 2.The most striking difference in the responses between the groups was seen in Q 1 (To which extend did the presence of the dog increase your independence?), where the mean score in the GD group was 8.67, whereas in the NGD group it was highly significantly lower with 3.83 ($p< 0.001$). In the questions 3 (To which extend did the presence of the dog improve your health?) and 6 (To which extend do you consider the guide dog as a family member?) there were also significant differences between both groups. The majority of the GD group respondents reported that their health was improved since they have a guide dog, whereas the majority of NGD group respondents did not believe, that the presence of a guide dog could improve their health. According to question 6, all respondents of the GD group considered their guide dog as a family member and scored lowest with number 7 on the ordinary scale, NGD group respondents scored also with number 1, although the general mean of the NGD group was also relatively high (8.33 in contrast to the mean of 9.83 of the GD group). Except Q 5 (To which extend do you think, that the service of the guide dog negatively influence its QOL?), all questions were higher scored by the GD group than by the NGD group.

Although there was no significant difference between both groups with regard to question 2, a tendency has been found that respondents of the GD group responded more often that a guide dog facilitates finding new social contacts in comparison to the NGD group.

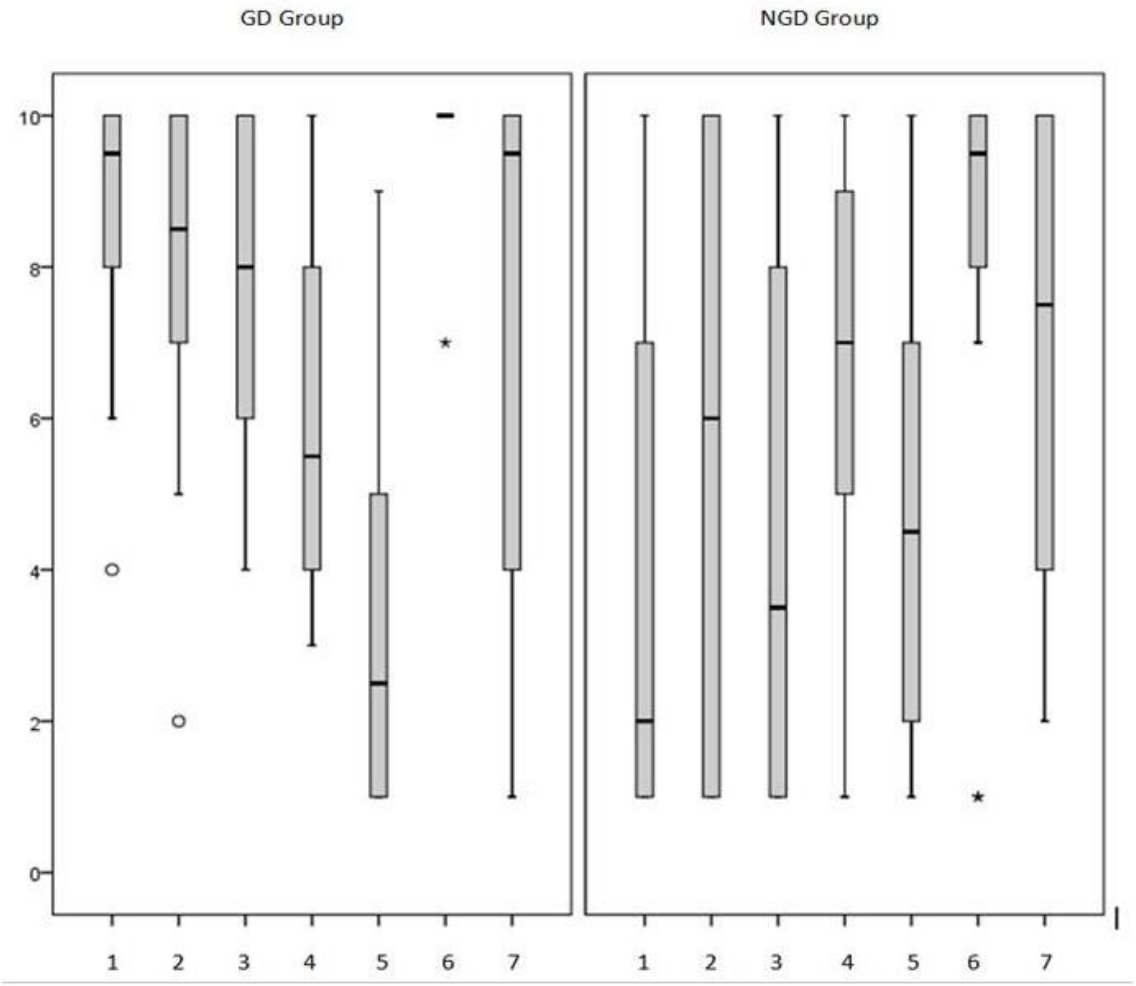
Table 4. The results of owner–guide dog relationship or hypothetical relationship

p - values in bold type face represent the statistically significant results.

		Mean	Std.Deviation	Median	Min.	Max.	p
1.To which extend did the presence of the dog increase your independence?	GD	8.67	1.715	9.5	4	10	**< 0.001**
	NGD	3.83	3.468	2	1	10	
2.To which extend did the dog facilitate to find new social contacts?	GD	08.6	2.209	8.5	2	10	0.081
	NGD	5.67	3.819	6	1	10	
3.To which extend did the presence of the dog improve your health?	GD	7.72	2.081	8	4	10	**0.021**
	NDG	4.78	3.719	3.5	1	10	
4.To which extend do you think that the service of the guide dog is demanding?	GD	6.22	2.463	5.5	3	10	0.513
	NGD	6.56	2.684	7	1	10	
5.To which extend do you think, that the service of the guide dog negatively influence its QOL?	GD	3.28	2.469	2.5	1	9	0.203
	NGD	4.44	2.895	4.5	1	10	
6.To which extend do you consider the guide dog as a family member?	GD	9.83	0.707	10	7	10	**0.005**
	NGD	8.33	2.828	9.5	1	10	
7.To which extend do you consider the guide dog as a medical adjuvant/mobile aid?	GD	7.17	3.569	9.5	1	10	0.715
	NGD	6.89	3.142	7.5	2	10	

Figure 2. Owner-guide dog relationship

On the X-axis the selfdesigned questions (1-7) are given and on the Y-axis, the ordinary scale score (1-10), where 1 means “no agreement” and 10 “full agreement”, is provided.



4 Discussion

Accounting for the global prevalence of visual impairment, research into the feasibility of guide dog provision and funding is needed. To this end, this study aimed to investigate whether blind people having a guide dog have a better QOL compared to blind people not having a guide dog. The secondary purpose of this study was to investigate whether blind people, who have a guide dog, are healthier and therefore have lower medical costs by means of medical insurance expenses. There is accumulating evidence that the quality of the human-dog relationship modulates human health outcomes (Hall e al., 2017; Heady, 1999; Craigon et al., 2017; Lloyd, 2004). Thus, the tertiary aim of this study was to investigate the attitude towards the human-guide dog relationship; how respondents rate the relationship quality and believe in its positive effects.

The primary hypothesis of this study, that guide dog owners have a better QOL than non-guide dog owners was not confirmed. The results of this study suggest that blind people with a guide dog do not have a better overall QOL than those without a guide dog. The total QOL score in the NGD group was 65.95 % and 64.20 % in the GD group. No significant differences were observed in any of the isolated domains (Physical, Psychological, Social Relationship and Environment). Moreover respondents of the NGD group scored non-significantly higher in all domains except for the Social relationships domain, where respondents of the GD group exhibited higher scores. Nevertheless, both groups rated their QOL homogenously general with a good QOL.

As a reasearch method, an online questionnaire was used. Another possibility would be a telephon interview or a personal interview. The advantage of using telephon or personal interview is that participants who do not use a computer can be easily reached. However, nowadays computer usage among the blind community is very common. According to the Screen Reader Survey, the majority of people with impairment who use the Screen Reader are in fact people with visual impairment (WebAim, 2015). Moreover in Austria children and teenagers are encouraged to participate in the Austria computer camp or International computer camp, which has long history in Austria. Modern technologies are therefore extremely helpful for blind people to be independent and use the Screen Reader rather than to depend on help of other people. Therefore, the questionnaire of this study was designed

according to the Web Content Accessibility Guidelines (WCAG) guidelines for barrier-free access (Shawn, 2018). Moreover, the disadvantage of a telephone interview is that they are more time demandingand in interaction with the interviewer, respondents may be more shy with regard to their privacy. Accounting for the latest GDPR legislative, there was no access to contacts of blind people.

Results of this study are in agreement with the study from Reboucas et al. (2016), who investigated QOL of visually impaired people in Brazil using the WHOQOL-100 questionnaire. The results of their study reported a similarly high scored QOL in visually impaired people like in this study. Brazilian visually impaired respondents rated their QOL with 68.75 %. It is interesting to note, that respondents of the Brazilian study scored higher in the Psychological and Social relationships domain, but lower in the Physical and Environmental domain compared to this study on Austrians. A big difference was observed in the Environmental domain, in which Brazilian respondents scored with 48.48 %, whereas Austrians with 70.7 % (GD group) and 70.8 % (NGD group). This difference may be attributed to the different public infrastructure in these countries. In Brazil the public infrastructure is relatively poor (Silveira and Dischingen, 2019), it can be difficult for blind people to orientate themselves in the traffic whereas in Austria, a wide range of accessibility by road, air and rail is available (Austria arrive and revive, 2019). In addition, Vuletić et al. (2016) suggested that the QOL score of visually impaired people in Croatia was rated as good (68.75 %), this result is within the normative range for the global population of 60 to 80 %. The high rated QOL in visually impaired people could be explained also by the disability paradox. Despite severe impairment, people with disability can achieve a high QOL, when they are able to centre the balance between their body and mind (Albrecht and Devlienger, 1999). However, it is suggested that visually impaired people may benefit from a wide array of support, for instance disabled individuals who visited psychological rehabilitation, reported a higher QOL (Reboucas et al., 2016). On the contrary, results of this study regarding the general QOL, which was rated as good in both groups, are in contrast to several previous publications. For instance Langelaan et al. (2007) reported a lower QOL in visually impaired people compared to the rest of the population. The comparison of the QOL between the groups in this study is in disagreement with Hall et al. (2017), who found that people owning hearing or physical service dog rated their QOL significantly higher. Enhanced psychological

and physical wellbeing in guide dog owners which was also reported by Refson et al. (1999) and Whitmarsh (2005) could not be confirmed in the present analysis. A plausible reason for not having achieved any statistical differences in QOL between the GD and the NGD group in this study is the small sample size. Another possibility is that only active individuals with a fulfilled life are willing to participate in such a study. With the presumption that active visually impaired people have eventful lives and have more social contacts, a better QOL is likely and therefore no difference between the groups was found in this study. Another explanation may be associated with the initial QOL scores in that values above a certain threshold are unlikely to rise even in response to a positive stimulus such as the presence of a dog. Still, there seems to be a discrepancy between objective QOL score and the subjective interpretation as guide dog owners, if they are asked whether their QOL was improved since dog's presence, answer yes. Similarly, Wong (2006) reported that guide dog owners believe that their guide dog changed their life positively. Maybe when the respondents with guide dogs assessed their QOL with a less direct question about QOL using the WHOQOL-BREF questionnaire they scored their QOL similar as non-guide dog owners although believing that the dog raised their QOL. Similarly results of this study show, that guide dog owners believe, that their health was improved since presence of the dog (Q 3, will be discussed more in detail later on), but when assessing the chronic illnesses no difference was observed.

The findings of this study also did not confirm the secondary hypothesis that blind people who have a guide dog have lower yearly medical costs compared to blind people without a guide dog on a statistically significant level due to the limited compliance of respondents to provide their medical insurance fees. Thus, GD group respondents only had lower medical costs only by means of descriptive data analysis. Information about medical costs was not obligatory in terms of an inclusion criteria to take the questionnaire as valid, only 10 participants in total provided this information. Insurance companies send each of their clients the yearly medical costs statement per post and it is possible to obtain this information online, so it was assumed that study respondents can easily access their respective costs and include this information. However, it turned out that the majority of participants failed to provide this information. In future studies it should be taken into consideration access to the medical yearly costs statement can be facilitated that the participants are not burdened with obtaining this information. From another perspective, asking for personal medical costs may be

regarded as a too sensitive information and as a result, participants possibly were not willing to provide this information. If this was the case, then in future studies it would be necessary to explain more concisely, that this information is handled as anonymously as the entire questionnaire to enhance the trust of study volunteers. In the absence of statistical significance due to few respondents, a higher number of yearly medical costs was given in the NGD group. This would support the investigation of Jackson et al. (1994), who suggested that guide dog owners are healthier. Serpell (1991) compared in a 10-months prospective study the general health and psychological wellbeing before and after acquiring a dog and suggested improved health and wellbeing in dog owners. Moreover, Refson et al. (1999) noted better health in guide dog owners. Whitmarsh (2005) claimed better health in hearing dog owners. Siegel (1990) reported less doctor visits in dog owners during stressful periods. Closely related studies reported also less doctor visits and use of medication in pet owners, especially those, who owned a dog for longer period of time (Heady, 1999; Headey and Grabka, 2007). As the pet owners visit the doctor less often, savings regarding to the national health expenditures are possible. For the year 2000, possible savings were estimated for Australia 3.86 billion USD and for Germany 5.59 billion EUR, respectively (Headey and Grabka, 2007). Controversially to these findings, Steffens and Bergler (1998) suggested no health promotion in guide dog owners.

There are no studies to the best of our knowledge which calculated general economic benefits of guide dogs regarding health savings, savings in formal and informal assistance care. One study calculated the economic benefit of guide dogs regarding formal and informal care and reported that those savings about 2379 USD per working year of a guide dog (Wirth and Rein, 2008). Results of a close related study suggested an average reduction of two hours of human paid assistance per week and six hours of unpaid assistance per week, which is equivalent to 600 USD per year.

Nevertheless such calculations are conflicting as actual health expenditures were not considered. Although at the first look the guide dog costs are high, possible savings in national health expenditures could be interesting for the insurance companies and their willingness to financially support guide dogs or other assistance dogs as valid medical adjuvant. To acquire more data, future investigations are necessary.

In this study, no significant differences between the groups were observed regarding the suffering from chronic illnesses as well as regarding to injecting of addictive substances. Nevertheless, descriptive data analysis revealed higher depression, high blood pressure and anxiety scores in the GD group. These results are in agreement with the results of Parslow et al. (2005), who concluded that pet ownership had no health benefits and was associated with symptoms of depression. In addition, Parslow and Jorm (2003) found no differences in systolic blood pressure between the groups of pet owners and non-pet owners. Moreover, pet owners were associated with higher diastolic blood pressure. Milan (2007) found no association between depression and ownership of mobility dogs. Van Nispen et al. (2016) reported a higher risk of depression in visually impaired people in general.

However most of the previous studies reported decreased blood pressure and depression associated with pet ownership. Oncological patients reported decreased depression after regular animal-assisted activities (Orlandi et al., 2007). HIV positive men who owned a pet reported lower depression (Siegel et al., 1999). A decrease in blood pressure after the interaction with a dog was observed by Odendaal (1999) and Cole et al. (2007). Moreover Anderson and Reid (1992) found that pet owners had significantly lower systolic blood pressure compered to non-owners. Descriptive data analysis revealed higher injecting of addictive substances like smoking behaviour, consume of cannabis, stimulants and sedative drugs in the GD group. Increased smoking behaviour was also observed in a previous done study. According to Parslow and Jorm (2003) pet owners reported increased smoking behaviour. Nevertheless, usage of addictive substances is not well investigated in this scientific field.

The tertiary hypothesis of this study compared blind people with and without a guide dog with regard to differences in their attitude regarding the relationship towards the guide dog. It emerged that actual guide dog owners are more likely to believe in the positive effects of this relationship.

Results of this study suggest statistically significant differences between both groups in some of the questions in the self-designed instrument, (Q1 - To which extend did the presence of the dog increase your independence?; Q3 - To which extend did the presence of the dog improve your health?; Q6 - To which extend do you consider the guide dog as a family member?). The biggest difference in the responses between the GD and NGD group was

found in Q 1, with a $p < 0.001$, where the GD group scored significant higher compared to the NGD group. Although it was expected that guide dog owners will score higher in this question, it is surprising that the difference was so big, as increased independence due to presence of guide dog is highly discussed in previous studies as well as among the non-scientific population. Refson et al. (1999) reported higher independence in guide dog owners compered to visually impaired non-guide owners. Similar results were presented by Hall (2017), with the difference that the study assessed assistance dogs in general, not only guide dogs. An increased level of independence was also reported by Steffens and Bergler (1998). Moreover, Lane et al. (1998) reported that 70 % of people, who applied for a guide dog, did so because they hoped for greater independence. Similarly Refson et al. (1999) suggested that the hope for independence is the most common motivation for applying for a guide dog and not the companionship or other possible benefits. The benefit of independence was reported especially in male guide dog users (Whitmarsh, 2005).

There was also a significant difference regarding to the results of owner-guide dog relationship and the extent that respondents believed that the presence of the dog improved their health. The GD group scored significantly higher compared to the NDG group. Again, these results confirm those of a previous study. According to Lane et al. (1998) enhanced self-perceived health and less worries about health were found in service dog owners. Accordingly, in future studies it would be interesting to compare the self-perceived health with objective assessed health more in detail.

The third significant finding referred to the pet attitude, whether respondents considered a guide dog as a family member. Again, the GD group scored significantly higher compared to the NGD group. These findings are in agreement with results of previous studies. Similarly to this study, Lane et al. (1998) reported that 93 % of the participants rated the dog's importance similar to that of family members. Future guide dog owners (those who apply for a guide dog), usually do not expect that a guide dog will become a family member (Refson et al., 1999; Steffens and Bergler, 1998). Moreover the association between health benefits and the relationship between the owner and dog does play a role (Headey, 1999; Craigon et al., 2017; Lloyd, 2004), meaning those with a better relationship with their dog benefit more from it. In addition, the beneficial effect was intensified, when it was the owner's own idea to acquire a guide dog (Lane et al., 1998).

In Q 2 (To which extend did the dog facilitate to find new social contacts?) a tendency with p < 0. 081 was observed. GD group respondents responded more often that a guide dog facilitates finding new social contacts compared to the NGD group.This finding maybe due to the lack of real experience with a guide dog ownership in the NGD group.

In questions 4 (To which extend do you think, that the service of the guide dog is demanding?), 5 (To which extend do you think, that the service of the guide dog negatively influence its QOL?) and 7 (To which extend do you consider the guide dog as a medical adjuvant/mobile aid?) no significant differences were found. Regarding to the Q 4, the GD group had lower ratings than the NGD group. Although this result was not significant it is interesting, that guide dog owners are unlikely to regard the guide dog service as demanding. According to Craigon et al. (2017) guide dog owners reported that their dogs enjoyed their work. Guide dog owners may be more likely to think that if their guide dogs want to work, their service is not demanding. Although Q 5 was rated higher on as descriptive level in the NGD group, in which participants believed more often that the service of the guide dog can negatively influence its QOL, this question was in general low-rated.

In contrast, Q 7 was rated very high in both groups, which could be indicative for an attitude towards an instrumentalisation of the dog. Nevertheless, a guide dog can be seen as both, a family member and mobile aid. In general, the topic of guide dogs QOL was not in focus of this study, but nevertheless should be discussed in future studies. According to Bremhorst et al. (2018), after searching the term “assistance dogs welfare” only five peer-reviewed scientific journal publications were found.

4.1 Limitations of the study

A major limitation of the study is the small sample size. Participants from the GD group were recruited via an invitation email via the Coordination centre for assistance dogs Austria, whereas participants from the NGD group were contacted via the Association for blind and visually impaired people in Austria. The Coordination centre for assistance dogs Austria sent reminder emails to all (78) potential participants. Nevertheless, only 18 guide dog owners completed the questionnaire. The Association for blind and visually impaired people in Austria sent invitation emails only. As the GDPR came into force before the invitation emails

were sent, some of the coordinators of the federal states of Association for blind and visually impaired people in Austria were not willing anymore to forward an invitation email. This may have resulted in a low participation rate. Finally, the head of the Association for blind and visually impaired people in Austria shared the invitation email with all members of the Association for blind and visually impaired people in Austria. Nevertheless, there were also only 18 participants in the NGD group. In the case of the GD group however, 18 subjects represent a sizeable sample of the blind population with a guide dog. As previously mentioned, there are around 78 officially tested guide dogs in Austria (Weissenbacher, 2018), but in the NGD group it is questionable whether the results can be generalized to the blind population at large. In addition, 51 participans did not finish the questionnaire. This may be because of the length of the questionnaire and participants may have considered the questionnaire as too time demanding. Another reason can bethat questionnare contained sensitive questions and participants were not willing to respond to them.

Moreover an invitation via an official association could have influenced the selection of participants. It can be possible, that only active visually impaird people who are social and like to communicate were willing to participate in the study as has been discussed above. That could be the possible reason for no differences in QOL between the GD group and the NGD group. Furthermore, this could also explain the high rated QOL in general.

The self-administered questionnaire on the human-guide dog relationship was an innovative approach, in which actual guide dog owners, attitudes and experiences were compared to hypothetical answers of non-dog owners. While the significant findings are interesting and certainly provide a starting for continuative research, there is no evidence whether hypothetical pet ownership can be regarded as a valid construct to allow for comparison.

Limitations of this study include also the fact, that this study was not longitudinal. It would be more effective to assess the QOL of future dog owners and compare these results later on, when they live with the dog for a longer period of time.

In the future longitudinal studies with larger sample sizes should be conducted. Financial benefits or other benefits could be used to motivate more people to participate in such studies. It would also be beneficial if insurance companies would be involved to provide the medical information to the participants more easily.

5 Conclusion

Using the standardised questionnaire for the assessment of QOL (WHOQOL-BREF) and a self-designed questionnaire for assessing the attitude and relationship towards the guide dog, this study documented QOL of blind people with and without a guide dog, their health status as well as the attitude and relationship towards guide dogs. Owning a guide dog was not significantly associated with better QOL. Moreover, although not all participants provided the information about yearly medical costs, guide dog owners reported lower medical costs. When assessing the participant's attitude regarding the relationship towards the guide dog and his or her belief in the positive effects of this relationship, some statistical differences were observed.

Future studies with larger sample sizes would be beneficial for visually impaired people and their families, insurance companies or governments, to achieve a better understanding of ownership benefits, savings and expenditures regarding guide dogs.

6 Abstract

In recent years the number of visually impaired people has significantly increased. Vision loss or blindness can be associated with a lower quality of life (QOL). Beside the help of the family and friends, guide dogs may be a valid support for blind people in increasing their level of independence, mobility and social relationships.

First purpose of this study was to investigate whether blind people having a guide dog have a better QOL compared to blind people without a guide dog. Second purpose of this study was to investigate whether blind people who have a guide dog are healthier and therefore have lower medical costs. Third aim of this study was to investigate the attitude towards the human-guide dog relationship and beliefs in its positive effects.

Two groups of blind participants with (n=18) and without (n=18) a guide dog were recruited for an online accessible questionnaire

that consisted of the WHOQOL-BREF (Questionnaire form World Health Organization for measurment of QOL) and self-designed questions on subjective health status as well as an assessment of attitude towards and relationship with a guide dog. Non-guide dog owners answered the dog-specific questions hypothetically. Owning a guide dog was not significantly associated with a better QOL by means of the WHOQOL-BREF scores. Still, non-significantly lower yearly medical cost expenditures in guide dog owners were notable. Actual guide dog owners were significantly more likely to believe that the dog increased their independency and exerted positive effects on their health. Moreover, guide dog owners were also more likely to consider a guide dog as a family member than non-guide dog owners.

Although within the framework of this study owning a guide dog was not significantly associated with increased QOL, some differences between the groups regarding health beliefs, attitude towards the dog and relationship with the dog were identified. Accounting for the emerging prevalence of visual impairment, further research into this topic is warranted.

7 Zusammenfassung

In den letzten Jahren hat sich die Anzahl sehbehinderter Menschen bedeutend erhöht. Allgemein wird der Verlust der Sehkraft wird mit niedriger Lebensqualität assoziiert. Blindenführhunde können hierbei abgesehen von der Unterstützung von Familie und Freunden eine wertvolle Hilfe für Unabhängigkeit, Mobilität und soziale Beziehungen sein.

Der primäre Zweck dieser Studie war zu erforschen, ob blinde Menschen mit Blindenführhund eine höhere Lebensqualität haben als blinde Menschen ohne Blindenführhund. Des Weiteren wurde erforscht, ob blinde Menschen mit Blindenführhund gesünder sind und folglich niedrigere jährliche Krankenkosten haben. Außerdem wurden Fragen zur Mensch-Blindenführhund-Beziehung und zur subjektive Einstellung zu deren Effekt gestellt.

Zwei Gruppen von blinden Teilnehmer/innen mit (n=18) und ohne (n=18) Blindenführhund wurden für die Teilnahme an dem Online-Fragebogen rekrutiert, der sich aus Fragen des „Quality of Life“ Fragebogens der World Health Organization (WHOQOL-BREF) und eigenen Fragen zusammensetzte, die den subjektiven Gesundheitsstatus und die Mensch-Hund-Beziehung abfragte. Blinde Menschen ohne Blindenführhund wurden gebeten, spezifische Fragen zum Hund hypothetisch zu beantworten.

Der Besitz eines Blindenführhundes führte zu keiner signifikant höheren Lebensqualität nach Beurteilung des WHOQOL-BREF. Da nicht alle Studienteilnehmer/innen Auskunft über ihre Krankenkassakosten gewährten, fand sich nur ein deskriptiver Unterschied zwischen den Gruppen. Blindenführhund-halter/innen verfügten dabei über geringere jährliche Ausgaben für Sozialversicherungsleistungen als blinde Personen ohne Hund. Im Gegensatz zur Gruppe ohne Hund kamen Halter/innen von Blindenführhunden zur Einschätzung, dass die Präsenz ihres Hundes ihre Gesundheit verbesserte, ihre Unabhängigkeit erhöhte und waren eher dazu geneigt, ihren Hund als Familienmitglied zu bezeichnen.

Obwohl der Besitz eines Blindenführhundes in dieser Studie nicht mit höherer Lebensqualität in Verbindung gebracht werden konnte, konnten Unterschiede bezüglich der Selbstwahrnehmung von gesundheitlichen Vorteilen aufgrund der Präsenz eines Hundes nachgewiesen werden. Ebenso differenzierte die Einstellung zur Beziehung des Hundes. In

Bezug auf die Zunahme von Sehbehinderungen ist zukünftige Forschung auf diesem Gebiet erwünscht.

8 Abbreviations

QOL - Quality of life

WHO - World Health Organisation

WHOQOL - BREF World Health Organization Quality of Life Assessment, short version of the questionnaire

WHOQOL - 100- World Health Organization Quality of Life Assessment questionnaire

EU – European Union

CEN - European Committee for Standardisation

ADI - Assistance Dogs International

IGDF - International Guide Dogs Federation

EGDF - European Guide Dog Federation

GDBA - Guide Dogs for the Blind Association

AAA - Animal-assisted activities

Q – question

GD – Group with a guide dog

NGD –Group without a guide dog

GDPR - The General Data Protection Regulation

Tab. - Table

Fig. - Figure

9 References

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