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“Singing Performance and Language Aptitude: Behavioural Study on Singing Performance and its Relation to the Pronunciation of a Second Language”

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Abstract

This thesis explores singing performance and its relation to second language pronunciation. It consists of two separate parts: a theoretical and an empirical one. As singing is defined as a subcategory of music, it starts out with evolutionary hypotheses about the origin of language and music, followed by comparisons of their most important features such as rhythm, pitch, timber and their syntactic organisation. Furthermore, it deals with acquisition processes of music and language and demonstrates that music acquisition processes are slower than first language acquisition. In addition, singing is shown from different angles such as from a singing teacher's point of view as well as from a neuroscientific analysis. The theoretical part demonstrates the findings of the tests targeted to singers. The tests defined the participants' musical talents, their singing abilities, their working memory skills as well as their speech imitation abilities. This survey also included multi-item scales which aimed at certain psychological concepts. The analysis of all data was performed by *IBM SPSS Statistics Version 20.* The results indicate that a good singing performance predicts a good foreign language pronunciation and demonstrates that speaking and singing seems to be closer than singing and musicality.

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1. Introduction

Second language acquisition plays a crucial role all around the world as globalisation aims at global communication. However, foreign language learning is often concerned with difficulties and usually less successful than first language acquisition. Thus there is further demand to isolate certain factors which facilitate second language acquisition in general. In previous investigations it has been demonstrated that musical talent predicts a good pronunciation in second languages. Therefore, this thesis focused on singing performance and its relation to the pronunciation of foreign languages as singing is defined as subcategory of music.

The opening of this diploma thesis gives a short overview about the most relevant topics which will be dealt with and it also explains some aspects crucial for the reading of the very paper. As the most essential research question of this thesis is whether good singers are also better at the pronunciation of second languages, this investigation compares singing with speaking foreign languages. However, singing and its analysis is rather complicated as it is usually associated to be closer to music and often defined as subcategory of the latter. Hence, most scientists and researchers refer to music and singing in the same way and consequently both cannot be separated in most readings. Thus, the differences between music and singing are often blurred or not recognizable. Therefore, this thesis compares language and music in the opening chapters, as comparisons of these faculties contain crucial information about singing and its relation to speech. Although the pronunciation of foreign languages and its relation to singing performances is in the foreground in this paper, it also deals with the evolutionary hypotheses about the origin of language and music as it is often argued that both faculties derive from a shared proto-faculty. Furthermore, this paper also contains comparisons of music and language on the basis of their most important features such as pitch, timbre, rhythm and it shows that music and language are rule based systems as both have a grammatical organisation. Therefore, one chapter deals with acquisition processes of music and language. Hence, it can be illustrated that both first language and music acquisition processes seem to be rather similar despite the fact that music acquisition is always slower than first language acquisition.

Throughout the reading it becomes clear that comparisons of language and music are quite helpful for understanding singing as investigations in singing are still underrepresented in the scientific field. Thus, there are many assumptions yet to be explained: e.g. in how far singing belongs to music or rather to speech? Thus, singing will be represented from different angles such as from a singing teacher's perspective and from a neuroscientific perspective. It will also be argued why this investigation proposes that singers are better at the pronunciation of second languages, namely because of their vocal flexibility.

The second part of this thesis will deal with certain tests which were targeted to singers in order to measure their musical talents, their singing abilities, their working memory skills and their speech imitation abilities. This survey also included psychological concepts which aimed at the participants' personality traits, singing behaviour during their childhood or the reasons why singers sing. The results of this survey indicate that a good singing performance and a good working memory are the most relevant predictors for good pronunciation of foreign languages. The thesis, however, starts out with evolutionary hypotheses.

2. Evolution of music and language

It is undeniable that music and language share certain features such as structural aspects and thus both faculties are often compared on a syntactic level (Honing 2011: 31; McMullen & Saffran 2004: 298; Schön, Magne & Besson 2004: 342). However, music is also referred to as a universal language – a language which seems to be less specific but operates as a medium which is still able to transfer feelings such as love and other emotions. Balkwill and Thompson (1999: 47), for instance, conducted a survey which showed that Westerners were able to understand the emotions of an unfamiliar Indian tonal system, making music comparable to a translator or a Lingua Franca. Therefore, music and language seem to have more in common than might be assumed at very first sight. Hence, scientists and researchers such as Darwin (1871, 2), Miller (2000), Livingstone (1973), Matasaka (2009) or Levman (1992) argue that it is very likely that both developed out of a certain kind of proto-faculty, but the question of whether language or music was first has remained a secret until the present moment. In the case

of music, Darwin's (1871, 2: 333) often cited statement that it "must be ranked amongst the most mysterious with which [human mankind] is endowed" explains the issue very well as scholars discuss the origin of music as well as language in a highly controversial way.

This chapter examines different hypotheses related to the origin of language and music and depending on different schools, some say that language and music developed out of alarm calls (Hockett & Ascher 1964), while others claim that music existed before language, and language developed out of music (Miller 2000; Livingstone 1973; Matasaka 2009). It is also argued that language is a product of manual gestures (Arbib 2005), or music is the result of emotional speech, whereas alternatively, others are convinced that there was a protolanguage which was neither language nor music (Nettl 1956).

Levman (1992: 147) noted scholars' different opinions concerning the origin of music and language, and in *Genesis of Music and Language* he mentions three major positions. The first states that music developed out of language. The second says that language developed out of a certain kind of musical proto-faculty. The third suggestion is that music and language developed separately. Like Levman, Honing (2011: 40) also touches upon these three different opinions but adds one further suggestion. It is based on Pinker's notion whose original hypothesis claims that music as well as religion "are better explained as by-products of adaptations" (Pinker 2005: 21). Therefore, Pinker is convinced that language existed first, as for him music has no survival functions and human beings could easily survive without it. Honing (2011: 40) however says that there is also a negative version of Pinker's hypothesis available, as there are also researchers claiming that language developed as a side-effect of music.

Another approach to the evolution of language and music is illustrated by Patel. He distinguishes between two main views concerning the evolution of language. The first one is that of the adaptationists who believe that language is the result of direct natural selection, whereas the second one is represented by those who argue that language is a social construct and therefore natural selection has only an indirect influence on language development (Patel 2008: 358-359). In the case of music, Patel (2008: 370) explains that a large number of scientists believes in natural selection but despite having the same basis their hypotheses range widely. Some argue that music is the result of

sexual selection while others claim that "music helped cement social bonds between members of ancestral human groups […]" (Patel 2008: 370).

As shown in the passages before, the opinions about the origin of music and language diverge enormously. However, this illustrates not only the complicated subject matter but also that researchers are aware of the strong relation between music and language as they would otherwise not discuss it the way they do. Both faculties are perceived acoustically and thus resemble each other in their nature. The following part demonstrates popular evolutionary hypotheses in more detail and also explains the difficulties arising when comparing different viewpoints.

2.1. Music, singing and evolution

In *The Descent of Man, and Selection in Relation to Sex* Darwin argues that music is a product of mate choice as he proposes that "musical tones and rhythm were used by the half-human progenitors of man, during the season of courtship, when animals of all kinds are excited by the strongest passion" (Darwin 1871, 2: 337). In the same text he also claims that it is very likely that in order to express love our ancestors used musical notes and rhythm before they were able to produce language (Darwin 1871, 2: 337). The crucial aspect of Darwin's hypothesis however is that he believes in a certain kind of musical proto-faculty human beings possessed before they learnt to articulate in language. Thus, Darwin claims that language developed out of music. His notion is supported by many followers. Miller, for instance, proposes a similar hypothesis (2000). He basically agrees with Darwin's idea and according to him, music has no survival benefits as predators were lured by the singing and "[t]herefore, it is most likely to have evolved due to its reproductive benefits" (Miller 2000: 7). Nevertheless, Miller also mentions a current example, which supports his hypothesis. It is the very well known musician Jimi Hendrix who had several relationships and engaged in sexual intercourse with hundreds of groupies. Miller (2000: 2) argues that although Jimi Hendrix died rather young, it was his musical genius that increased his chances for reproduction.

Another evolutionary approach is demonstrated by Livingstone (1973) who states that our ancestors could sing well before they could talk. To him language is much more complex than singing, thus he claims that language evolved out of singing because early

hominids had large territories since they were hunters and therefore "territorial songs preadapted the hominids to both speech and symboling" (Livingstone 1973: 26). Livingstone also criticises that most researchers and scientists emphasise that human beings are the only ones who are able to produce language and most of them forget that humans are also the only ones who sing. Although his argumentation seems to be straight forward, it is questionable when considering other scientific papers whether humans are the only ones that can sing or not, as this depends on the definition of song. Scientists' controversy about who or what is able to sing or what or who is capable to produce a song becomes clearer when comparing Livingstone's assumptions with those in the following paragraph by Matasaka (2009) and Patel (2008).

Matasaka (2009) argues that gibbons also have a song repertoire. According to him, primates are able to produce songs. However, his approach, as well as that of many others, demonstrates that what is considered to be song requires an accurate definition. Hence, following Matasaka's (2009: 17) argumentation, singing is not necessarily a unique human phenomenon as he claims that all sorts of gibbons use songs for different occasions and purposes. For instance, some gibbon species sing duets with their partners, while others produce songs serving communal purposes only. Masataka also sees evidence for a proto-language which was closer to music than to language. For him primates' song repertoires are comparable to that of the song repertoire human progenitors had. Patel (2008: 355) shows similar ideas concerning singing and thus seems to oppose Livingstone's assumption that singing is a unique human characteristic as well. According to Patel (2008: 355), whales or birds are also great singers with a large song-repertoire and additionally he explains that those animals do not only learn songs like infants learn language by imitating adults, but they are also able to create new ones, showing that their system seems to be productive. However, Patel (2009: 356) also clarifies that the term song is misleading in English as it is used to describe animals' acoustic displays. It is also noteworthy that animal songs always deal with the same things such as marking the territory or as warning signals and thus there is no evidence that animals "make or appreciate music in the sense human beings do" (Patel 2009: 356).

As shown before, Darwin (1871, 2), Miller (2000), Livingstone (1973) and Matasaka (2009), just to mention few who are engaged in this field, believe that music, singing or

something which could be considered music-like was used as communicative system before language developed. Leaving the efficiency of such a system aside, most of them do not make a clear distinction between music, musical notes or singing. Therefore, it is hard to compare evolutionary hypotheses at all. For example, Darwin refers to musical notes used by human progenitors during courtship. The problem however is that there is no explanation as to what exactly is meant by musical notes? Is it comparable to singing or did human progenitors use instruments or their voices only?

It can be assumed that the ancestors Darwin refers to did not use a musical instrument but their voice solely before they were capable to support their musical output with any kind of item called musical instrument. Huron (2001: 49) also discusses this problem and claims that "[i]t is not unreasonable to assume that singing preceded the making of musical instruments by some length of time" and according to Fitch (2006: 195), it is well known that since 35,000 years humans had "[…] a rich collection of musical instruments". And Huron (2001: 48) argues that the oldest flute found is between 43,000 and 82,000 years old. It is very likely that singing is significantly older than the oldest archaeological musical instrument[1] and when researchers refer to singing or musical notes in evolutionary hypotheses they most likely address sounds or vocalizations which would be perceived as being musical or songlike for us as listeners but without lyrics as we are used to hear in songs today. This shows that making music and singing are not always clearly distinguishable in these particular texts. One further problem may arise when the musical notes are mentioned because it is not automatically associated with dealing with vocalisations such as singing and therefore Westerners will more likely think about playing a musical instrument rather than singing. This demonstrates not only the strong connection between music and singing but also between music and language. Therefore, singing could be considered to be a link between language and music as it has elements of both.

2.2. Food and danger calls

In marked contrast to those who believe in a musical proto-faculty some believe that music or language developed out of certain kind of calls – such as those which primates

[1] We have only a limited perspective of ancient musical instruments and it is very likely that they are much older than is actually known.

use when they find food or recognize danger. Hockett and Ascher (1964: 142) mention "a gibbon [which] finds himself in a situation characterized by both the presence of food and the imminence of danger. The factors are closely balanced". In this situation a gibbon's call could be somehow in-between the danger and the food call and thus creates a new one, making the gibbon's call system richer. Hockett and Ascher (1964: 143) believe that the pre-language of our ancestors developed in the same way but they conclude that "it would probably not sound like human speech. It would sound more like animal calls, and only very careful analysis would reveal its language-like properties" (Hockett & Ascher 1964: 143).

According to Cross (2001b: 3), Merker has similar explanations to the two scientists discussed before. However he says that not language but music originated from certain danger and alarm calls. He believes that music developed out of unsynchronised sounds such as those chimpanzees produce when they find fruits. Consequently, they start to produce sounds indicating this specific event and thus all chimpanzees are able to interpret what this special call means. Merker states that those sounds could have become synchronical and the sounds' intensity would have shown the amount of food found. This then led to the development of music (Cross 2001b: 3). Similar results are shown by researches describing bees' "dance-language"[2]. The speed of the dance illustrates the distance to the food the bee has found (Gauld 1975: 685). Therefore, the intensity of sounds or in the case of the bees the intensity of the dance seems to have a strong impact on the information transfer. However, the explanation about the evolution of language and music of Hockett and Ascher as well as that of Merker lack clarification because it is not entirely clear what they mean when they refer to calls, or what they refer to when they differentiate between a call or a song when describing primates' vocal output.

Generally speaking, the difference between calls and songs is often said to be its complexity and thus calls are rather short compared to songs. However, both share certain structural elements and for example, alarm calls are also likely to be repeated like parts of songs are. Therefore, it is interesting to establish in what respect researchers differentiate song from call. One hint about what is considered to be a call is

[2] Bees' dance-language –for some scientists it might be questionable to define bees' dance-language as communicative system. However, it is clearly demonstrated that bees' dance helps to navigate the members of the beehive to places where they find nectar.

given by Hockett and Asher (1964: 144-145) as they suggest that humans still use particular features comparable to "the proto-hominid call system […] in human vocal auditory behavio[u]r, but as accompaniments to the use of language rather than as part of language". For example, grunts or cries should be some features which are still used today as remains of this particular proto-hominid call system. The classification of calls into grunts or cries shows that what is perceived as being a call is less aesthetic than what is considered to be music, singing or song. Therefore, it can be assumed that calls are interpreted according to the length of the sound but also seem to be less aesthetic than other forms of vocalizations. Therefore, the definitions of music, song, or singing always imply an art like aesthetic evaluation and this aesthetic is obviously not perceived by listeners when hearing calls.

2.3. Manual gestures, social cohesion and evolution

In marked contrast to those scientists who see alarm calls or musical notes as proto-faculty for language or music, some see evidence in manual gestures. One of those is Arbib (2005). He argues that language did not emerge out "of alarm calls and other species-specific vocalizations such as exhibited by nonhuman primates" (Arbib 2005: 117). Instead, he is in favour of the mirror system hypothesis (invented by Arbib and Rizzolatti 1997/98). This system is divided into seven stages whereby the first three are pre-hominid; the most important one for the development of human language is indicated by stage five. In this particular stage, our ancestors had a communicative system comparable to pantomime, and according to Arbib (2005: 107), human's protospeech "result[ed] from the ability of control mechanism evolved for protosign coming to control the vocal apparatus with increasing flexibility". Then the result was the establishment of words which followed the pantomime-like language.

Fitch (2005) opposes Arbib's mirror system and criticises it. Although he combines Arbib's mimetic stage with Darwin's view, he means that gestural hypotheses fail to explain how the protosign led to the development of protospeech. Therefore, he believes in a protolanguage which was more musical in its nature and sees dance and music as "living fossils of an earlier stage of human communicative behaviour" (Fitch 2005: 132). However, Fitch's latter argument is also used by those who believe that the original function of music was social cohesion. These studies claim that the function of

music is to strengthen the ties of a community, and additionally some argue that the function of singing is also to strengthen the bond between mothers and their infants (Patel 2008: 370).

In contrast to the mimetic approach of Arbib, the idea that music's original function was social cohesion is a very popular one, as music, similar to sports, still unites large groups. Its traceability is shown by a current example with which most will agree. Hence, during a concert the audience will most likely sympathize with the other audience members and thus music functions as social cohesion. Some researchers would additionally say that the reason for this lies in one of music's original role as "group music making could result in a shared mood state" (Patel 2008: 370). The shared mood state also results in more agreement and thus to less conflicting situations within a particular group. Thus music could also have developed in order to reduce conflicting situations or aggressive behaviour. Hence, music is often said to be highly emotional and thus the following part deals with evolutionary hypotheses demonstrating emotions and its relation to music.

2.4. Music, emotions, alternatives and evolution

Several scientists claim that music is the result of strong emotions. For example, Spencer states that music is a result of "excited speech [which] merges into recitative, and recitative in its turn merges into song; and song 'originally diverged from emotional speech in a gradual, unobtrusive manner'" (Newman 1905: 191). Spencer is convinced that music developed out of language which was opposed by Newman. The latter supported Darwin's view discussed in chapter 2.1 but additionally argued that "the savage took delight in any tones – those of the human voice, of a reed, or of a drum – purely as tone, and began to take a further simple delight in the relations between tones […]" (Newman 1905: 200). Newman seems to focus on music as being entertaining and a social activity and thus his notion is closer to social cohesion.

Another interesting remark about emotions and its relation to music is made by Hauser and McDermott (2003) as they say that it is undeniable that music influences our emotions. They also believe that the emotional state of humans, but also those of non-

humans, shows certain tendencies. For example, aggressive calls are often rather short (Hauser & McDermott 2003: 666). Therefore,

> [h]uman and nonhuman animals thus encode emotional information in their vocalization and have perceptual systems that are designed to respond appropriately to such signals. Given its evolutionary ancestry, our music faculty may well have co-opted this mechanism for use in music, even if it did not evolve for this function (Hauser & McDermott 2003: 666).

Although the approaches of Spencer (1891), Hauser and McDermott (2003) differ significantly, they mention the importance of emotions in music. It might be impossible to prove whether one of their hypotheses is true, but it must be stressed that there are many studies which demonstrate that music can positively influence people's emotions. In medical studies, for instance, Kempner and Danhauer (2005: 284) explain that "music can improve mood and reduce anxiety in surgical patients" but they also argue that "music also benefits mood in oncology patients".

Alternative approaches to the evolution of music and language propose a different development. For example, it is claimed that there was a protolanguage which was neither music nor language. One popular scientist in favour of this evolutionary theory is Bruno Nettle. He claims that in ancient times an "undifferentiated method of communication existed […], one which was neither speech nor music but which possessed the three features that they hold in common: pitch, stress and duration" (Nettl 1956: 136). According to him, this pre-form of communication can still be found in infants' noises and thus he concludes that the two differentiated faculties language and music are the result of specialisation in culture (Nettl 1956: 136).

2.5. Concluding remarks

The discussion of the different evolutionary hypotheses about the origin of music and language has shown that the various notions are not only the result of different approaches to the subject matter but also a consequence of unclear definitions of what is meant exactly by musical notes or what is considered to be a song or call. This not only leaves more room for various interpretations but also allows concluding how difficult it is to give clear definitions or explanations for those terms under consideration or how language and music emerged in the course of time. However, it is of less importance

whether one of those hypotheses explains the evolution of language and music appropriately or not, but instead one can only look at their similarities in their actual status. This is what the following chapters will deal with.

However, before turning to those, the discussion of these evolutionary hypotheses has also shown that there is a strong requirement for defining how and why music and singing is dealt with in the preceding chapters as the focus of this paper is to compare singing with the pronunciation of second languages. The first chapters however deal mostly with music and language. Therefore, it has to be clarified why it is worth to analyse music and language first before turning to the pronunciation of second languages and its relation to singing.

Although it can be assumed that there will hardly ever someone face difficulties in distinguishing between music and language, the differentiation between music and singing is more difficult as the latter is usually considered to be part of the first one. Therefore, the ending of this chapter defines how music and singing is dealt with in the very paper as both are not fully separable.

As illustrated in the beginning, many researchers or scientists, when referring to music in an evolutionary context, apply the same aspects automatically to singing and versa vice as both faculties seem to be inseparable. Hence, singing is defined to be a subcategory of music which is also demonstrated when in 1994, *The National Standards of Arts and Education* states that one of "[t]he nine content standards in music [is] singing" (Jaffurs 2004: 17).

From an evolutionary standpoint, it is questionable to define singing as a subcategory of music as it is very likely that singing, or something to be considered song-like existed before the first musical instrument was used. Considering the evolutionary approach, musical notes were produced with human organs and were thus first in hierarchy (Fitch 2006: 195; Huron 2001: 48). Furthermore, in Western music musical pieces were created which consist of an arrangement of various instruments and singing became part of the whole arrangement and thus embedded in music. Additionally, since human beings learnt to use musical instruments, the musical pieces were also no longer dependent on a singing voice. These aspects illustrate why singing became a subcategory of music and not versa vice.

What is referred to singing today is most likely a musical piece consisting of lyrics and a poetic language which should support the song's interpretation. Thereby, the lyrics do not always reflect the music's emotion as lyrics are of subordinate importance compared to other elements. Nevertheless, it is very unlikely that this was the case by our ancestors as they were surely not capable to produce language in a certain stage of human's development. It is often argued that the way animals such as birds and whales use songs during courtship is similar to what human progenitors may have done in ancient times (Darwin 1871, 2: 337). If this was the case and human's early musical attempts were not dependent on lyrics, there must have been another system for differentiation such as musical notes for courtship, songs for marking their territory, or different alarm and danger calls. Such a system could be indicated by various pitches as for instance in music tension and relaxation are achieved by different pitches which follow in culture specific sequences and vary in intensity. Furthermore, specific key changes convey specific information, or the intensity and pace of a musical piece express specific emotional states. Therefore, lyrics used in music seem to be a younger invention as they are not necessarily as important as pitch. Then this would support those evolutionary hypotheses which argue for language and music to have developed separately, or those who believe in musical notes and singing before language emerged. However, it has to be noted that all the evolutionary hypotheses are highly speculative as there are no "fossile recordings" of our ancestors or human progenitors available which would favour a particular evolutionary hypothesis over another. This indicates that all evolutionary hypotheses are based on assumptions.

However, leaving the evolutionary component aside and defining singing according to how it is understood today, it gives a different impression. It is out of question that music and singing also differ as the instrument used when singing is not a musical one but the human body, and also the sounds produced are not musical tones only but most often words, reminding us of language. The reason why singing is a subcategory of music can be illustrated by the basic element of music: pitch (Patel 2008: 9). This means that singing does not require words as they can be replaced by other sounds such as *ohh ohh ohh* which still is interpretable for listeners. This is impossible in language as the intelligibility would be reduced to zero (Patel 2008: 51). In addition, melodies without the support of a singing voice or sung lyrics are still interpretable for listeners. Specific combinations of musical notes express basic emotions such as sadness, scare

and happiness (Fritz, Jentschke, Gosselin, Sammler, Peretz, Turner, Friederici & Koelsch 2009: 573). Furthermore, it is true that in the Western world the major mode is associated with happiness whereas the minor mode is considered to express sadness (McMullen & Saffran 2004: 299) which indicates that a musical piece has a basic idea expressed through the key, pitches or chord progressions used. Therefore, singing can be considered to be one further subcategory of music in its actual status as it is of subordinate importance for the interpretation of a musical piece and thus whenever this paper talks about singing it automatically talks about music and vice versa. Then this allows applying the features of music on that of singing and consequently, music is used as a synonym for singing in this paper. Hence, this demonstrates that it is worth comparing language and music in order to gain more information about the similarity of singing and speaking. Therefore, the following chapter deals with basic elements which are shared by both music and language, namely human's sound system, the rhythm of language and music as well as music's and language's syntactic organisation.

3. What do language and music have in common?

In general, music and language are both auditory phenomena and their function is to express the inner feelings of the musician or speaker to the members of the outer world and thus "[b]oth of them share a series of fundamental characteristics, such as processing of sounds, the conveyance of messages, the learning by exposure and the sharing of intrinsic features […]" (Nardo & Reiterer 2009: 229). Hence, both faculties consist of hierarchical structures, vocabulary, tonal properties, and temporal clock (Limb 2006: 437). However, this does not necessarily mean that there is always a direct equivalent in music and language available which makes both comparable. It is much more complex and very difficult to justify why one feature resembles that of the other faculty as most features vary in their importance and function. For instance, it is clear that both language and music have some rhythm[3], belonging to the metrical organisation, but despite this, their rhythm differs significantly in many respects[4].

[3] In case of language it is more complicated to argue that it has a rhythm such as music has as it lacks regular metrical organisation. A clear explanation of what is referred to rhythm in language is discussed in the following paragraphs.

[4] One has to note that poetry also has regular metrical structures such as music has. However, poetry is omitted in this paper.

Therefore, the following chapter demonstrates certain features of music and language which are shared by both on different levels and illustrates how those are compared by specialists.

According to Honing (2011: 31), the idea that music and language share a set of rules which can be analysed with linguistic methods started in the second half of the 20th century. The break through, however, in explaining music using linguistic tools failed in many instances until the present moment and even composers such as Leonard Bernstein also found no "potential relationship between the (innate) grammar of language and that of music" (Honing 2011: 31). Some progress in comparing the features of language and music features is made by Jackendoff and Lerdahl (2006), Patel (2003, 2008), Patel and Daniele (2003), Koelsch Gunter, Wittfoth and Sammler (2004), or Krumhansl and Keil (1982) who draw a comparison between language and music in terms of rhythm, pitch, or hierarchical organisation and processing. Recent research however suggests that music and language have much more in common than is actually known and new insights are especially demonstrated by the relatively young discipline: neurolinguistics (Nardo & Reiterer 2009; Patel 2003, 2008; Patel & Daniele 2003; Koelsch Gunter, Wittfoth & Sammler 2004; Limb 2006).

Comparisons between language and music address interesting questions. Four important ones are considered in this chapter. Firstly, if music is comparable to language, does it require something which could be called a musical grammar (indicated by a set of rules) similar to the grammar of language and therefore can be acquired in a similar manner? Secondly, where do we find equivalent or comparable grammatical features in language and music? Thirdly, is the sound system and rhythmic organisation of music and language comparable or entirely different? Fourthly, does music have to fulfil communicative purposes as a means to express ideas, thoughts, or convey clear messages interpretable for the listener?

The answer to the fourth question is quite obvious. As a matter of fact music expresses certain ideas such as language does (even if those are often more unspecific compared to language) (Limb 2006: 437). The first and second questions about what could be seen as musical grammar, how do human beings acquire it and where do we find equivalent features are more complicated to answer as there are many unsolved problems as will be demonstrated in the following paragraphs. The same is true for the rhythmic

organisation of music and languages and the sound system of humans which is the first aspect discussed in the following passages.

3.1. The basic sound element of music and language

Human beings' ability to express thoughts and inner feelings through language is dependent on a very crucial tool, the human's sound system. It allows combining phonemes and other small elements into words and thus into more complex units carrying specific meanings interpretable for the listener. Usually, both, the musical system of the own culture as well as the language can be acquired easily from childhood on. However, the human's sound system can be differentiated into two separate categories, namely the linguistic and the musical one (Patel 2008: 9). While the latter one basically consists of pitches and timbres, the linguistic system is divided into "vowels, consonants, and pitch contrasts of the native language" (Patel 2008: 9). Although music and language have many similarities, its basic sound category is different. In language it is timbre while it is pitch in music (Patel 2008: 9).

According to Patel (2008: 28), musical "[t]imbre, or sound quality, is usually defined as the aspect of a sound that distinguishes it from other sounds of the same pitch, duration and loudness". Reiterer, Erb, Grodd and Wildgruber (2008: 2) propose that "[t]imbre is mainly determined by the harmonic content of a sound and the dynamic characteristics of the sound such as vibrato and the attack-decay envelope of the sound". In other words, timbre can be compared to a finger print as it enables to distinguish one particular sound from another one such as in the case of music, a piano from a flute, even when they are played at the same time with the same loudness (Patel 2008: 28), or in the case of language, for example, between different speakers[5]. In contrast, pitch is a discrete element on a scale comparable to a ladder ranging from low to high rungs and thus has a fixed point, for example the tonic[6] C but "every note of the music is heard in relation to a particular fixed pitch" (Jackendoff & Lerdahl 2006: 45).

[5] Timbre allows not only distinguishing between different musical instruments and different speakers but "[…] without timbral contrasts there would be no basis for defining distinct phonemes or syllables […]" (Patel 2008: 51).

[6] By tonic is meant that "every note of the music is heard in relation to a particular fixed pitch, the tonic […] (Lehrdahl and Jackendoff 2005: 45). For example, C major and C minor have the same tonic, the note C and usually a musical piece ends at the tonic.

One significant difference of language and music, as argued in the beginning, is that their sound system is based on different properties. The reason why timbre and not pitch is the primary sound category of language is illustrated by a simple experiment. Following Patel (2008: 51), language is still highly intelligible if someone listens "to computer-synthesized monologue in which all sentences are rendered on a monotone". In marked contrast, if someone "allow[s] the pitch of the synthesized sentences to vary normally but replace all phonemes with one timbre, say the vowel /a/. Intelligibility would be replaced to zero for all languages […]" (Patel 2008: 51). Therefore, the most important feature of language's sound system is indicated by timbral contrasts while it is pitch in music (Patel 2008: 51).

One possible explanation why pitch and not timbre is the primary sound source in music is demonstrated as for instance, musical chord progressions within a culture are associated with basic emotions such as sadness, happiness or scare and according to Fritz, Jentschke, Gosselin, Sammler, Peretz, Turner, Friederici and Koelsch (2009: 573), these three basic emotions seem to be universal. Another example supporting that pitch is most relevant in music is also the Western assumption that the major modes are associated with happiness, whereas that of the minors one is sadness (McMullen & Saffran 2004: 299). Furthermore, if a musical piece is also sung, the lyrics are less important than the melody. This can be illustrated when listeners of foreign musical pieces are still able to distinguish between basic emotions of the musical piece heard, although they fail to understand the lyrics (Balkwill & Thompson 1999: 47). In music lyrics do not seek to be interpreted similarly as languages are as they have to fulfil aesthetic purposes (Limb 2006: 437) and language seems to avoid ambiguity, whereas it is purposely achieved in music (Patel 2008: 264).

Considering the basic sound element of language and music, both seem to have less in common as their central element is a rather different one. However, some comparisons on the basis of pitch structure and language are shown by Jackendoff and Lerdahl (2006: 52-53) in the following passage.

Basically, they demonstrate three examples in music and language which seem to resemble each other. According to Jackendoff and Lerdahl (2006: 52), the first analogy of language and music can be drawn as most sentences like musical phrases "move downward in pitch toward the end". The second example they mention is a comparison

between music and tone languages such as Mandarin and the third instance mentioned shows attempts to compare the intonation of music and language. The problem however is that an analogy is hard to sustain on the level of representation (Patel 2003: 676) and following Jackendoff and Lerdahl (2006: 52-53) there are surveys which

> analyze prosodic contours in terms of transitions between distinctive high and low tones, so it might be possible to treat intonation as governed by a pitch space whose layers are (a) the high and low tones[…] and (b) the pitch continuum between them.

By pitch space Jackendoff and Lerdahl (2006: 45) mean that the latter one is "associated with a tonic [which] is merely a set of pitches, each in a specified interval (a specified frequency ratio) away from the tonic". However, the problem with comparing the intonation of language and music is that language in contrast to music has no discrete pitches and the voice in language usually goes continually up and down (Jackendoff & Lerdahl 2006: 52). Additionally, there are no regular frequencies of high and low tones observable "throughout a sequence of sentences in the way the dominant and tonic are fixed in pitch space" (Jackendoff and Lerdahl 2006: 53). Similar problems arise when comparing tone languages with music as they also have no fixed pitches as well as no determined "intervals between the pitches" which is a necessary feature for musical spaces (Jackendoff & Lerdahl 2006: 53).

As illustrated, the musical and the linguistic sound system, both have an entirely different basis and although Jackendoff and Lerdahl (2006) show some analogous features between the pitch structure and language, there are some inconsistencies regarding the comparison of sound features of language with that of music's pitch structure.

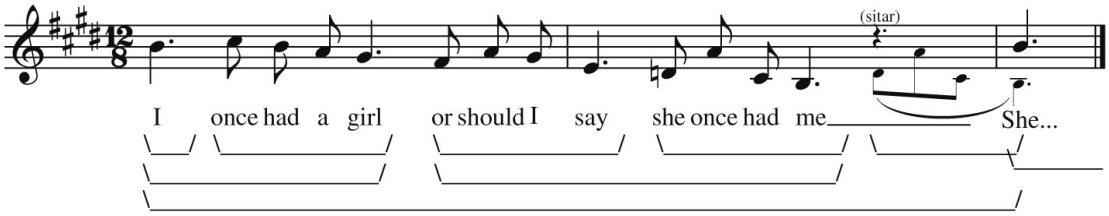
3.2. Rhythm

Another interesting comparison between language and music can be done on the basis of their rhythm. One of the most obvious features of music is rhythm and a musical piece without a metrical rhythmic organisation sounds unbalanced and lacks harmony according to Western standards. By comparing the rhythm of music and language, certain questions arise. The most important one is whether language's and music's rhythms have similar functions or not.

According to Patel (2008: 96), "[…] music […] has a regular timed beat, a perceptually isochronous pulse to which one can synchronize with periodic movements such as taps or footfalls" and thus rhythm might be based on biological rhythm (Hannon & Trainor 2007: 468). Following Patel's definition, music and language seem to have less in common in terms of rhythm as a result of the absence of a regular metrical structure in language, which, on the contrary, music or poetry surely have. However, this does not necessarily mean that language has no rhythm as every language "has [one] that is part of its sonic structure and an implicit knowledge is part of a speaker's competence in their language" (Patel 2008: 97).

This raises a serious issue as it is often demonstrated that in second language learning most foreign language learners in an early stage of their learning process lack the competence to comprehend the language's rhythm. Usually, they fail to understand the same phrase or sentence spoken by a native speaker, although they are fully able to comprehend its meaning when it is visually presented to them. One suggestion why this is the case is that they may have difficulties in mastering to differentiate between a word's ending and beginning as they lack the ability to segment speech (Patel 2008: 148). This indicates the importance of understanding language's rhythmic organization which involves the interpretation of a phrase's or sentence's phonology, syntax and semantics at the same time (Jackendoff & Lerdahl 2006: 37). This is similar to what in music is referred to as grouping in which "[t]he basic unit of grouping is a group of one or more adjacent notes in the musical surface; adjacent groups can be combined into larger groups" (Jackendoff & Lerdahl 2006: 37). Therefore, Jackendoff and Lerdahl (2006: 37) argue that the metrical structure of music is comparable to the structure of sentences as they suggest that the metrical organisation of music is a result of combining beat, notes and "patterns of tense and relaxation" into larger units (Jackendoff & Lerdahl 2006: 37). The following figure illustrates what Jackendoff and Lerdahl (2006: 38) refer to as grouping by taking the first phrase of the song *Norwegian Wood* as example.

Figure 1 First phrase of *Norwegian Wood* with its grouping structure



Source: Jackendoff, Ray; Lerdahl, Fred. 2006. "The capacity for music: What is it, and what's special about it?". *Cognition* 100(1), 38.

Another example which allows making comparisons between language and music is illustrated by the shift of stress patterns in words. Jackendoff and Lerdahl (2006: 43) argue that language has the ability to alter the stress of words in context in order to produce more regular rhythmic tendencies. As example they took the word *Kangaroo* and compared it to the word *Kangaroo court*. The latter stress shift when the final stress of *Kangaroo* shifts to the first syllable in *Kangaroo court* indicates what they refer to as "more regular metric" (Jackendoff & Lerdahl 2006: 43). The possibility to change word's stress in context into more regular patterns is especially important for poetry or nursery rhymes. However, the latter ones are omitted because a thorough analysis would be beyond the scope of this thesis.

The discussion of music's and language's rhythm shows that one crucial similarity is demonstrated by their grouping structure as words or tones "are grouped into higher level units such as phrases" (Patel 2008: 177). However, in marked contrast to music, language has no isochronous pulse and thus differs significantly in this respect. But despite this, the rhythm of language seems to have an influence on music. This is shown in the following empirical research by Patel and Daniele (2003). They compared the rhythm of language and music in French and English. Their motivation was to establish whether the native language of composers influences the rhythm of their composed musical pieces. They used "[t]he measure of durational variability used by Grabe and Low" (Patel & Daniele 2003: B37) in order to make comparisons.

The result indicates that the durational variability is different in French and English in language as well as in music and the difference observed "[…] is in [music in] the same direction as that of […] language" (Patel & Daniele 2003: B42). This suggests that the

rhythm of the native language may have an influence on the rhythm of music, or maybe shows that both are interconnected to a certain extent.

The rhythmic organisations of music and language show interesting comparisons especially on the basis of *grouping* (Jackendoff & Lerdahl 2006: 37). Furthermore, the rhythm of the music also seems to be influenced by the native language or versa vice which indicates that there might be an analogy on a certain level. And although language lacks a metrical organisation while music does not, it is important to understand language rhythmic organisation since its mastering is necessary in order to understand where one word begins and ends.

3.3. Syntactic organisation of music and language

According to Honing (2011: 31), Patel (2003: 674) and Schön, Magne and Bessons (2004: 342), music and language are comparable on a syntactic level as both faculties have hierarchical structures with which humans are familiar with since the time of acquisition of their mother tongue, or to follow the musical concept of their own culture. However, it is often said that language users are not aware of their mother tongue's grammatical system as they are so used to speaking in an appropriate manner that they hardly ever think about, unless they hear some expressions or phrases which do not follow those conventional rules. The same is true for music as every particular culture has norms and rules which follow a specific tonal system (Sloboda 2005: 179). Therefore, it is proposed that music consists of musical grammar which is specific for each culture. The musical grammar as explained by Jackendoff and Lerdahl (2006: 34) is explained as follows:

> Given that a listener familiar with a musical idiom is capable of understanding novel pieces of music within that idiom, we can characterize the ability to achieve such understanding in terms of a set of principles, or a "musical grammar" which associates strings of auditory events with musical structures.

This passage does not only give a hint about what is referred to as musical grammar but also shows that the notion of Jackendoff and Lerdahl is very close to that of language. Jackendoff and Lerdahl (2006: 34) refer to musical idiom when a listener is familiar with the tonal system of a culture and therefore able to interpret novel pieces of music. This notion makes music acquisition comparable to that of language as people

recombine phrases and sentences they have never heard or produced before and they are still able to identify it, for instance, as their own mother tongue, or understand its meaning. Therefore, music must consist of a set of rules allowing recombination within a certain paradigm. Consequently, Jackendoff and Lerdahl (2006: 34) address interesting questions such as how musical grammar is acquired, or which innate resources are involved in the acquisition of it.

As it is argued that music has a musical grammar, many researchers such as Patel (2003, 2008), Sloboda (2005), Jackendoff and Lerdahl (2006), McMullen and Saffran (2004) and Honing (2011) propose that language and music can be compared on the basis of their hierarchical structures, the musical and linguistic syntax. Following Patel's definition (2003: 674), "[s]yntax may be defined as a set of principles governing the combination of discrete structural elements".

In the case of language Sloboda (2005: 179) suggests that language's syntactic structure enables human beings to cope with language and thus he proposes that grammatical structures are helpful remembering information in a certain manner or sequence. Therefore, how words are combined or how they are related within a sentence or phrase is of great importance. This is also the case in music, except that music's syntactic rules are illustrated by the organisation of pitch, chords, the harmony of chord progressions and specific keys (Patel 2003: 674). Patel (2008: 245) explains that "in a musical context, the different scale tones take on different roles in the fabric of the music, with one tone being structurally most central and stable […]".Krumhansl and Frank (1982: 244) state that in major C the most stable tones are C E G in Western music. This illustrates the hierarchical ordering of particular tones. However, music's hierarchical structure can also be identified by chords as every chord has a tone which is considered to be the root and thus the most important one (Patel 2008: 248).

Prototypicality is another hierarchical organisation which is found in both, language and music. Every culture has certain specific chord combinations called chord progressions which are prototypical. Therefore, most people, including also non-musicians, are able to identify the prototypical chord progressions of their own culture as they are familiarised with a tonal system (Patel 2008: 249).

Although music and language seem to follow hierarchical structures, no direct equivalents are to be found. For instance, music does not have features which could be

considered to be nouns, verbs, adjectives, subjects, objects or indirect objects (Patel 2008: 263). Another difference can also be observed in how humans deal with the ambiguous structures of music and language. While in language human beings tend to reduce sentences to a single structural analysis, it is the contrary for music. The latter faculty not only shows more varieties but even uses ambiguity for aesthetic purposes (Patel 2008: 264). Patel (2003: 676) suggests that one possible solution for the problem that there are no equivalents available is "[…] that the overlap in linguistic and musical syntax is not at the level of representation". Thus he argues that one way of dealing with this problem is to differentiate between syntactic representation and processing (Patel 2003:676).

However, the discussion of the differences and similarities between the musical and the linguistic syntax demonstrates that both faculties have similar hierarchical structures in common, and despite the fact that there are no clear explanations whether both are comparable on this basis or not, it is undeniable that "one can have the same sentence structure with different words and the same harmonic structure with different chords (such as chords in different inversions or if the key is changed, an entirely different set of chords)" (Patel 2008: 265). Therefore, both examples seem to have a similar basis and thus also neurolinguists examined the relation between the processing of musical and linguistic syntax. For instance, Koelsch, Gunter, Wittfoth and Sammler (2004: 1) propose that

> processing of musical syntax […] interacts with the processing of linguistic syntax […], and that this interaction is not due to a general effect of deviance-related negativities that precede an [left anterior negativity]. Findings thus indicate a strong overlap of neural resources involved in the processing of the syntax in language and music.

Although it will require more research into this field, the relation between music and language seems to be obvious on a syntactic level as they do not only have certain comparable features, but music and linguistic syntactic processing also seem to share the same brain regions and this indicates their strong connection.

3.4. Concluding remarks

As illustrated in the previous analysis, language and music have many similar features and thus it is worth to examine their links. However, as shown, comparisons between single features of both faculties are very complicated and thus are accompanied by many unsolvable problems with the present knowledge we have. This is especially true in the case of the two different sound systems as well as in language's and music's rhythmic organisation – not to mention that someone tried to compare music and language on the basis of their semantics (Honing 2011: 32). McMullen and Saffran (2004: 298) also argue that "[a]lthough lower-level parallels between music and spoken language are relatively easy to discern, the relationship between the two at the level of semantics is less obvious and is likely where the systems diverge most strongly".

Nevertheless, when turning to the questions in the opening of this chapter, it is obvious that the musical and linguistic sound systems are not easily comparable as their basic element is an entirely different one, and although Jackendoff and Lerdahl (2006) make comparisons between the pitch structure and language, an analogy is not easy to sustain as there are many unexplained problems. This also applies to rhythm, except that what is referred to as grouping seems to be comparable as language and music combine small units into larger ones (Jackendoff & Lerdahl 2006: 37; Patel 2008: 177). However, the discussion of rhythm in language and music demonstrates that rhythm in language seems to be as important as in music and although rhythm in music is in the foreground, a listener who fails to understand language's rhythmic organisation also fails to understand its contents (Patel 2008: 148). This indicates that rhythm is important in both, music and language.

Furthermore, music consists of musical grammar and thus is comparable to the grammatical system of language as it also has hierarchical structures such as prototypical chord progressions, or particular tones which are structurally more important than others. Despite this there are no equivalent features to be found such as there are no nouns, verbs or adjectives in music as there are in languages. However, language's and music's similarity on a syntactic level is evident and Patel (2003: 676) explains it very well as he states that a comparison of language and music is not always possible on the level of representation.

However, what is out of question is that human beings are not born with the full musical and linguistic knowledge of a particular culture and thus infants have to acquire both language and music before they are able to communicate efficiently. Therefore, the question arises whether both are comparable on the basis of their acquisition processes which will be dealt with in the following chapter.

4. Acquisition of music and language

In marked contrast to language acquisition, music acquisition seems to be of subordinate importance as there are only few papers available which parallel music acquisition with that of language. One reason for this could be that "the music acquisition process is relatively under-studied compared to that of language acquisition" (Schellenberg, Bigand, Poulin-Charronnat, Garnier & Stevens 2005: 551). However, one further explanation why comparisons between those two acquisition processes are underrepresented could also be a consequence of the failure to explain particular areas of music with linguistic methods in history and thus most researchers do not dare to make an analogy between both faculties (Honing 2011: 31). Thus, music acquisition is often dealt with as separate topic, or is more readily equated with face perception in infants rather than with direct comparisons of language and music acquisition (Hannon & Trehub 2005: 12639). The interest in comparing linguistic and musical acquisition processes is a rather recent development. Thereby, it seems that in history it was often forgotten that music and language are not only faculties which underlie a process of auditory perception but both are also similarly produced[7] and thus seem to be very close in their nature.

This chapter deals with surveys addressing music acquisition and thus compares it to the acquisition of language, demonstrating what infants and children are able to detect or master to produce in particular periods of their lives. The second part illustrates findings in the field of second language acquisition and thus demonstrates common problems occurring in second language learners. Furthermore, it is illustrated that empirical

[7] Language and music are surely produced with the same bodily organs. However, it is well-known that someone who has never produced speech before can perceive language. It is also well known that young infants know more than they are able to express.

research supports the notion that musical training is able to facilitate second language acquisition in general and lists some findings of different surveys.

The reason why comparisons between music and first language acquisition is a valuable research area lies in the nature of language and music as both demonstrate rich diversities which are culture specific, and although music and language consist of the same basic elements independent of culture, they differentiate significantly in how they are arranged and organised (McMullen & Saffran 2004: 290). Consequently, the question arises how is the culture specific musical and the linguistic knowledge acquired? Hence, there is not only an analogy observable in language's and music's diversity but empirical research also supports the notion that the music and language of different cultures at least partly seem to influence each other (Patel & Daniele 2003: B42).

One aspect emerging whenever language acquisition is referred to is the age of acquisition with reference to critical and sensitive periods (Hernandez & Li 2007: 638). All these terms refer to the same concept as they describe periods or windows in which a specific skill or ability is easily taken up. This is mostly linked to a certain age, although it could be also related to a specific mental development as for example people who suffer from Williams syndrome do not have a limited time span in order to develop absolute pitch (Chin 2003: 159). Unlike people who do not suffer from that syndrome, they are able to develop this ability as adolescents as well and not in a usual way. Hence, it is supported by empirical evidence that it is more likely that children develop absolute pitch when receiving musical training between five and seven years of age than those without (Chin 2003: 158). Therefore, age may be a misleading factor as acquisition processes rely on specific mental developments. As a matter of fact, most infants develop in the same way in a similar period of time, which may lead to the assumption that age is the most important aspect in the acquisition of language or music.

Further evidence for the existence of critical and sensitive periods are especially found in the field of second language acquisition. According to Yule (1996: 192), this learning process may have an optimum age between ten and sixteen years as "[…] the 'flexibility' of the language acquisition faculty has not been completely lost, and the

maturation of cognitive skills allows a more effective 'working out' of the regular features of the [second language] encountered".

In marked contrast to second language acquisition, first language acquisition and music acquisition are less well established, especially in the early periods of infants' lives. There are several reasons for this. One is that it is often not possible to arrange investigations with infants. Another difficulty emerges in how the results of empirical research should be evaluated as especially very young infants cannot express themselves with appropriate language and thus researchers rely on other parameters such as the listening time, or the looking time of their participants. Despite these limitations, there is data available demonstrating infants' reaction towards certain stimuli as well as children's judgements about musical and linguistic input which forms the basis of our present knowledge in this field. The following paragraphs demonstrate the findings of certain surveys in these two domains.

4.1. Infants' acquisition of music and language

One factor which is still unexplained is the time in which the acquisition of music and language starts. Usually, researchers concentrate on questions of the acquisition of single features such as when do children master the harmony of their music, or when are they able to detect foreign rhythm in language, or music. However, it is quite controversially discussed in how prenatal auditory experience is influencing infants' language and music acquisition. Hence, there are surveys such as those by McMullen and Saffran (2004) and by De Casper and Fifer (1980) arguing that infants have prenatal language and music experience and thus can identify certain language and musical features immediately after birth, while other scientists (e.g. Matasaka 2006) show that certain elements seem to be a postnatal development.

A survey carried out by DeCasper and Fifer (1980: 1176) demonstrates that infants prefer their mother's voice shortly after their birth. According to these researchers, this could either be a prenatal auditory experience or a postnatal one which is rather quickly acquired (DeCasper & Fifer 1980: 1176). McMullen and Saffran (2004: 294) also support that prenatal exposure enables infants to identify certain language features such as the rhythm of their native language. Likewise, they argue it is true for the rhythm of

music as "[i]t is very likely that infants acquire specific information about the musical rhythmic information in their prenatal environments […]" (McMullen & Saffran 2004: 294).

In marked contrast, an empirical survey about music acquisition carried out by Matasaka (2006: 46) proposes that humans' preference of consonance over dissonance seems to be a postnatal development. He concluded the assumption after he had investigated whether infants of deaf parents and those of their hearing counterparts reacted differently when hearing a musical stimulus. The results indicate that there is no difference observable in both groups as they all preferred consonance over dissonance. Hence, it seems that parts of language and music acquisition seem to be prenatal qualities, while others are more likely taken up postnatal. The findings of Matasaka (2006), McMullen and Saffran (2004) and De Casper and Fifer (1980) demonstrate that research in the field of music and language acquisition focus on single elements aiming at getting a whole map about infants' development in particular periods. Gaining more knowledge in language and music acquisition processes would be helpful for developing new teaching methods and thus a support for infants, children as well as their caretakers. Therefore, specific information about how, when and under which conditions abilities are acquired seem to be most essential for the scientific progress in this particular field. Thus, the following part demonstrates recent findings in music and language acquisition.

4.2. Infants in their first year

Generally speaking, the language and music acquisition during the first years of humans' lives seem to be most mysterious to scientists. Therefore, this period is of great interest because how infants crack "[…] the speech code is child's play for human infants but an unsolved problem for adult theorists and our machines" (Kuhl 2004: 831). Computers still fail to acquire languages like human beings do, and children master to express full sentences in a high quality within the first three years of their lives which is a remarkable process compared to other acquired abilities and skills.

McMullen and Saffran (2004: 292) propose that 6 month-olds are able to detect whether a vowel the infant is listening to belongs to its own language or not and three months

later they can realise deviations from standard melodies (McMullen & Saffran 2004: 293). According to Eugenia Costa (2003: 477), infants can perceive "melodic contour, rhythm, tempo, style, timbre, scale structure and intervallic dissonance" before they have completed their first year and following Kuhl (2004: 832), infants "[…] can discriminate virtually all the phonetic units used in languages […]" in their first six months. This might also be one reason for why they are open to the acquisition of all languages. This unique ability of infants however gets lost in the following months and with about one year they seem to develop an affinity for the caretaker's language (Kuhl 2004: 832). Evidence for this is found in many examples and for instance, whereas infants of English mothers were also able to discriminate Hindi sounds at the age of six months, this ability was remarkably decreasing when the infants were one year old (Kuhl 2004: 833). But at the same time they started producing spontaneous songs whereby "they use[d] discrete pitches, and they use the repetition of rhythmic and melodic contours" (Peretz, Gagnon, Hébert & Macoir 2004: 2).

Another study conducted by Hannon and Trehub (2005: 12641) demonstrates that 12 month-olds seem to have a sensitive period in which they master to distinguish foreign musical rhythm from their own language within two weeks of exposure. Hence, Hannon and Trehub (2005: 12639) conclude that "these findings may indicate a sensitivity period early in life for acquiring rhythm in particular or socially and biologically important structures more generally". This seems to be in opposition to what McMullen and Saffran (2004: 294) propose as they claim that rhythm is a prenatal development.

There are several explanations for these varying assumptions. One is that there are probably more sensitive periods for the development of single language and music features during infancy, whereas another can be found in how the data is evaluated as the variety of procedures used determines different results. Actually, it is only evident that infants seem to undergo several sensitive or critical periods in a relatively short period of their lives and thus they acquire linguistic and musical knowledge of their own culture. Consequently, they seem to be less open for new input in later periods. For example, as mentioned before, infants lose the ability to discriminate between all phonetic units after their first year (Kuhl 2004: 832). This seems to be a general trend which supports the notion that later periods make language as well as music acquisition more difficult. In music acquisition this tendency is less well observed but one example

can be found in Balkan music. This particular music does not only have isochronous but also non-isochronous meters and usually adult Americans fail to detect "disruptions to isochronous and non-isochronous meters" as this is not part of their musical knowledge (Hannon & Trainor 2007: 468).

Usually, it is not referred to as *second music acquisition* as someone hardly ever would see a point in learning foreign music as it is the case in learning second languages. Furthermore, music is culturally defined while languages are most often defined socio-politically. Therefore, languages are determined and associated with particular countries and nations. Although peoples have traditional folk songs, music is less determined as languages are. For example, Europe and North America share largely the same popular music, despite the fact that these areas consist of a large number of different languages.

However, the point is that it is more advantageous to master foreign languages than to establish the different musical concepts of different cultures. This might also be one reason why there is almost no data available which focuses on the acquisition of foreign music in later ages as it is the case for second language acquisition. Therefore, the knowledge in this area is rather limited. However, it seems to be important to look at how language and music is targeted to infants as usually people are used to direct specific linguistic and musical concepts when conversing with infants or children. The following paragraph lists some explanations why this is the case.

4.3. Language and music targeted to infants

One also has to note that the language and music targeted to infants is remarkably different than that directed to adults. Leaving the different registers, styles or inflections such as diminutives aside, language and music for children are salient for being rather simple. Hence, infants' caretakers speak differently with infants and children than they do with adults. Speech directed to infants has longer pauses, is rather slow and has more pitch variation (McMullen & Saffran 2004: 294). Obviously, mothers and caretakers are unconsciously aware of the fact that they have to use a different language variety or a simpler musical piece in order to ensure that the infant can master both acquisition processes.

Likewise, directed speech, lullabies and play songs are also remarkably simple for infants. Lullabies, for instance, seem to follow similar concepts cross-culturally as they contain onomatopoeia, reduplicated syllables and additionally they are rather slow in tempo (Trehub & Trainor 1998: 58). Adults' songs performed in the same manner would be interpreted as soothing songs or lament (Trehub & Trainor 1998: 58). Furthermore, in a cross cultural analysis it has been demonstrated that mothers "produced acoustically more extreme vowels than they did when addressing adults in order to highlight specific language features" (Kuhl, Andruski, I. Christovich, L. Christovich, Kozhevnikova, Ryskina, Stolyarova, Sundberg & Lacerda 1997: 684). The advantage of using simpler language might be that certain features can easily be distinguished and thus also more easily imitated (Kuhl, Andruski, I. Christovich, L. Christovich, Kozhevnikova, Ryskina, Stolyarova, Sundberg & Lacerda 1997: 686). Therefore, a simpler acoustic input allows the infant to easily succeed in the acquisition of its mother language. This might be the same for music acquisition as for example Gordon (2003: 16) proposes that "[…] children in the developmental music aptitude stage are not able to perceive differences reliably in dynamics, timbres, and tonal ranges unless those differences are extreme". Children "[…] are not able to attend to either the tonal dimension or the rhythm dimension of music when they hear the two at the same time" before nine years of age (Gordon 2003: 16). Hence, music and language both seem to exaggerate, simplify, highlight and thus tend to be more extreme when targeted to infants in order to make sure that infants can master to differentiate between different linguistic and musical features.

4.4. Children after three years of age

In marked contrast to music acquisition, three year-olds can exhibit remarkable high language proficiency and express themselves in a complex way. However, in the case of music it has been demonstrated that children of the same age are able to repeat contours of short phrases but they still lack the ability to produce appropriate pitches (Krumhansl & Frank 1982: 245). Infants' skills to master contour and rhythm seem to be developed at the age of five but they still have "an unstable sense of tonality" (Costa-Giomi 2003: 478; Peretz, Gagnon, Hérbert & Macoir 2004: 2). This is an indicator that infants have not fully acquired the harmony of Western music at this particular stage (Costa-Giomi

2003: 478). Hence, the acquisition of harmony seems to oppose the development of language as infants can produce full sentences within the first three years of their lives and thus they seem to be far ahead of music acquisition. As a matter of fact, children are sensitive to Western harmony when they are six or seven years of age (Schellenberg, Bigand, Poulin-Charronnat, Garnier & Stevens 2005: 561; Costa-Giomi 2003: 478-479; Hannon & Trainon 2007: 467). Krumhansl and Frank (1982: 245) also support the latter notion as they established that seven year-olds were able to detect alterations of keys "in the middle of familiar tunes".

Some surveys such as those by Schellenberg, Bigand, Poulin-Charronnat, Garnier and Stevens (2005: 561), or by Costa-Giomi (2003: 482) illustrate that infants with formal music instruction do not develop faster as those without explicit training. Thus, it has been shown that "the improvement in harmonic perception is developmental in nature and that instruction has limited effects on young children's perception" (Costa-Giomi 2003: 482). Formal musical instructions however improve the performance of "those tasks [in which] they are already successful" (Costa-Giomi 2003: 482).

Similar to the harmonic perception, the potential to high or low musical aptitude may depend on some innate factors or on "prenatal responsiveness to music" (Gordon 2003: 14) and according to Gordon (2003: 15), the music aptitude of children in their developmental stage is the result of the interplay between "[…] both innate potential and early influences […]". Hence, this would mean that a rich musical environment in the years before nine increases the chances for musical aptitude. Gordon (2003: 14) additionally suggests that infants' musical aptitude decreases from birth on unless the child is surrounded by a rich music environment. The earlier this takes place the better it is for the infants as he suggests that two infants born with the same musical potential will show different levels of musical aptitude, especially when one infant is surrounded earlier by a rich music environment than the other (Gordon 2003: 15).

Obviously there are several critical periods in which infants acquire parts of language and music. This seems to be similar in language as well as in music, except that music seems to develop slower than the linguistic knowledge (McMullen & Saffran 2004: 297). McMullen and Saffran (2004: 297) list two possible reasons why this could be the case. The first one is that infants have less experience with music than with language in their daily routine. And the second one is that acquiring language is more advantageous

as it is necessary for communication. However, these periods seem not dependent on age only but rather on a mental development (Chin 2003: 159) of the infant as for example people suffering from Williams syndrome do not have a limited time span between five and seven years in order to develop absolute pitch (Chin 2003: 159).

However, problems may occur in how the acquisition of music's and language's features are measured as it is hard to define how much weight mastering one particular language and music feature should receive. Therefore, the question arises when do children fully acquire musical and linguistic competence? In the case of music, Sloboda (2005: 179) suggests that at the age of nine gross chordal dissonances are easily detected and thus nine year-olds are capable of producing similar judgements to adults'. In the case of language, it can be assumed that children can write, read and thus have fully acquired communicative competence earlier than with nine years of age.

Furthermore, it is also not quite clear what stimulus or circumstance is needed in order to open a specific window in which one particular language or musical ability is acquired. It is only suggested that "[…] a critical period could be more loosely under genetic control, with particular experience themselves leading to the organisation of neural circuits that in turn become more stable and resistant to further changes" (Trainor 2005: 273). Patel (2008: 9) claims that the proficiency achieved in one's own culture and language implies paying a price. Hence, it becomes more difficult to acquire foreign languages as for example the "native sound system leaves an imprint on our minds" (Patel 2008: 9). This might be one reason why second language acquisition is often more difficult for learners of older ages. However, in times of globalisation it has become very crucial to master more than one language as it can open certain gates not only to higher professions but also to higher social status. This demonstrates that research in this particular field will be demanded in the future. As second language learning is often concerned with difficulties, the following paragraphs demonstrate problems occurring during the acquisition processes. In addition, it is illustrated that musical training can facilitate second language acquisition in certain areas.

4.5. Second language acquisition and musical expertise

Generally speaking, successful second language acquisition usually is more proficient in life the earlier it happens. Hence, it is said that after puberty second language learning not only becomes more difficult but also its proficiency is different compared to that of the first language. Therefore, it is generally accepted that "language learning which occurs after the age of puberty will be slower and less successful than normal first language learning" (Snow & Hoefnagel-Höhle 1978: 1114; Yule 1996: 192).

Likewise, it is proposed that high musical expertise developed later in life is rather uncommon but not necessarily impossible as the "brain retains some plasticity" (Trainor 2004: 274). Although it seems to be possible that some adults maintain the ability to develop high musical abilities in older ages, it can be suggested that there might be critical periods for high musical expertise, similar to second language acquisition in which the processes seem to be less efficient and rather slow.

Despite such general observations, there are many examples demonstrating that adolescents, or so called late learners, can acquire second language pronunciation on a native-like level (Reiterer, Hu, Erb, Rota, Nardo, Grodd, Winkler & Ackermann 2011: 1). Although the same phenomenon is not well reported for high musical expertise, Trainor (2004: 274) argues that it might also be possible to achieve excellent musical abilities when starting to play an instrument as adult, but he simultaneously emphasises that it is less likely. In contrary, large numbers of adults acquire second languages while musical expertise plays no crucial role to the masses. Thus, the following paragraphs refer mostly to second language acquisition owing to the fact that analogous research for music acquisition, especially foreign music acquisition and acquiring musical expertise in older ages is scarcely found or does not even exist.

4.6. Why do adults acquire second languages?

Depending on nation, school type and other environmental circumstances relatively high numbers of adolescents start to take up foreign languages. The reasons vary considerably and range from economic pressure to prestigious factors which will be omitted in this paper as they are beyond its scope. However, when considering the critical age hypothesis, it can be assumed that *late learners* will most likely lack

proficiency compared to those who acquired it at a young age. Furthermore, it is often said that late learners will experience more difficulties in succeeding as a consequence of the late onset. However, if this were always the case it would not explain why some adolescents still can master second languages highly proficiently, while others do not develop such exceptional abilities. Those skills are of interest for this paper as they may offer new methods and ways to support second language acquisition.

According to Reiterer, Hu, Erb, Rota, Nardo, Grodd, Winkler and Ackermann (2011: 1), talent for second language acquisition has two particular characteristics in which one either has a talent for accent-free pronunciation, or shows excellent abilities for taking up grammar. Furthermore, it is suggested that the number of adolescents who can acquire second languages and thus speak them accent-free range between 5 and 15 per cent of late language learners (Hu, Ackermann, Martin, Erb, Winkler & Reiterer 2012: 2). Therefore, it can be assumed that adults who develop excellent pronunciation in foreign languages which are comparable to a native-like level must have exceptional abilities.

One skill supporting second language acquisition in general is said to be an excellent phonological working memory as several surveys demonstrate that it is a good predictor for successful second language acquisition (Rota & Reiterer 2009: 83; Baddeley 2003: 832; Pastuszek-Lipinska 2008: 5129-5130). Furthermore, musicality has also been proposed as an indicator for being a pronunciation talent in second languages (Nardo & Reiterer 2009: 237; Milovanov 2009: 339; Wong & Perrachione 2007).

Therefore, the following parts demonstrate that musical talented people seem to have a special ability for second language pronunciation which may derive from their perceptual skills which are often developed early in their lives. Furthermore, it is also illustrated why and in which ways second language pronunciation is probably facilitated by musical training[8].

Following Wong and Perrachione (2007: 580-581), "[…] relatively little attention has been drawn to the impact of musical training on second language word learning and how specific musical abilities may contribute to phonetic perception and word

[8] It is clear that there are more factors which can be considered to be important to successful second language learning.. For example, some would be motivational factors, personality traits, economic pressures or other serious

learning". Although recent research shows that musicality and giftedness in the pronunciation of second languages seem to be highly interrelated, hardly any teaching methods have been developed and integrated into school systems which try to combine music lessons with second language acquisition. More knowledge in this field seems to be highly important in order to develop new methods which would support the acquisition process of second languages, especially in the field of pronunciation.

Again it is worth to turn to acquisition processes first, as comparisons of first and second language acquisition to music acquisition demonstrate that they have more in common as both seem to be exercised less often as is the first language due to environmental circumstances.

Generally speaking, music acquisition and second language acquisition share several important aspects. Therefore, they seem to have more in common than music acquisition with first language acquisition in terms of practice. Kraus and Chandrasekaran (2010: 603) propose that there are four parameters of musical training which support high musical expertise and thus seem to be significant. Those are "age of onset, number of years of continuous training, amount of practice and aptitude" (Kraus & Chandrasekaran 2010: 603). The same variables are also associated to be helpful for successful second language acquisition but do not necessarily play a role for first language acquisition as a consequence of the environment.

Usually, in first language acquisition every child has an early onset of its first language. Usually, this starts immediately after or even before birth (McMullen & Saffran 2004; De Casper & Fifer 1980). This is not necessarily true for music acquisition as for example, melodies are less often sung than spoken in the surroundings of infants[9]. Furthermore, it is also less likely that children grow up bilingual or multilingual, even in times of globalisation or when they live in multilingual societies.

Another difference in music and language acquisition is the amount of practice. It is normal to use the mother tongue in everyday situation which ensures constant improvement. Hence, infants are surrounded by caretakers who have the same function

[9] One might also mean that infants or children listen to the radio and thus listen to music more often than this paper describes. This might be true but listening to the radio is a rather passive approach to music acquisition and does not necessarily include being successful in its reproduction. Thus, in marked contrast to language acquisition, infants or children do not respond to the music in the way they do when they hold conversation with other people. The same is true for second language acquisition as in the classrooms pupils and students more likely consume the lessons passively and speaking is rather limited.

as teachers have. In marked contrast, growing up in a rich musical environment or in places where second languages are constantly spoken is less frequent. The latter point also has an impact on the amount of time on spends on practice. Therefore, both second language speaking and music making take more likely place in the school environment or for limited hours at home.

In the case of aptitude there are different opinions as there are those who think that aptitude is something we are born with (Gordon 2003: 15), whereas others believe that training is accessible for everyone (Kraus & Chandrasekaran 2010: 603). Leaving the aptitude factor aside, the comparisons mentioned demonstrate that one possible explanation why second language acquisition and music acquisition processes seem to be slower and less successful than first language acquisition, and this is also a consequence of receiving less input (McMullen & Saffran 2004: 297) and the reproduction of fewer utterances.

Although environmental factors may play crucial roles in acquisition processes in general, it has to be stressed that individual differences, talent and motivational factors seem to be equally important as the environment. However, one aspect which is undeniable is that second language learners face many difficulties when they start to take up new languages. And adults acquiring second languages on native-like level are still the exception rather than the norm. Hence, most learners have problems with pronunciation, perception of foreign sounds and its grammatical structure. Therefore, the following paragraphs deal with perceptual problems occurring in second languages acquisition and explain why musicians may have an advantage over non-musicians in pronouncing foreign words.

4.7. Problem areas of second language acquisition and the musical component of foreign languages

Second language learners often face several difficulties during their acquisition processes. In the beginning, they often lack the ability to segment speech and therefore, they are not able to differentiate between a word's ending and beginning as discussed in chapter three (Patel 2008: 148). Although it is said that this is a consequence of the failure to understand the language's rhythmic organisation, there are also other prime factors which lead to such difficulties. Hence, Patel (2008: 148) proposes that usually

speech "segmentation relies on units that are phonologically important in the native language". Thus, language learners apply the same segmentation strategy of their native language to that of the second language (Patel 2008: 148) which most often results in perceptual difficulties and transfer errors.

Musical training however could improve the outcome of language production in second languages, especially in the early acquisition process as trained musicians may use other strategies than non-musicians. Thus, musically gifted persons more likely remember different sounds or the "musical components of speech" (Milovanov 2009: 341). This may enable them to repeat foreign language fragments more efficiently, including that they do not always rely on segmenting single words within a phrase or a sentence. Furthermore, musicians also have a good phonological working memory allowing them to remember longer sound chunks of foreign languages (Pastuszek-Lipinska 2008: 5128). Although this has no impact on understanding what the foreign words mean, it might be a helpful tool for achieving higher pronunciation skills in foreign languages.

For example, Pastuszek-Lipinska (2008: 5126) conducted a survey in which musicians and non-musicians had to repeat phrases of six different languages. The results indicate that musicians performed better in several language repetition tasks than non-musicians (Pastuszek-Lipinska 2008: 5128). According to the author, the former were better in remembering speech passages as well as they produced more sentences than the non-musicians (Pastuszek-Lipinska 2008: 5128). This may also demonstrate that musically trained people have a better phonological working memory.

Similar results to those of Pastuszek-Lipinska (2008) are demonstrated by Milovanov (2009) who carried out a survey with children between the ages of ten and twelve. They were instructed to do the Seashore musicality test in order to determine the informants' musical aptitudes and they also had to participate in behavioural tests, whereby they had to discriminate "difficult English phonemes for Finns" (Milovanov 2009: 339). The results demonstrate that the children with higher musical aptitude were remarkably better in the pronunciation of second languages than those with less musical talent. These findings correspond with those of Nardo and Reiterer (2009: 83) who came to the same conclusion when they tested musically talented people with the *AMMA test* (Advanced Measures of Music Audiation) and compared this with their pronunciation scores in Hindi and English.

One possible explanation why musicians and musically gifted persons seem to perform better in the pronunciation of foreign languages could be that they are better in detecting the musical aspects of language (Milovanov 2009: 341). This implies that they do not rely on the segmentation of speech as they treat foreign languages similarly to melodies. Thus, they do not concentrate on the meaning of the foreign words, or phrases they are listening to, but on repeating the sound patterns heard. However, one reason why musicians outperformed non-musicians in these surveys mentioned above might be a result of the participants' specific musical training or the impact of a rich music environment. Hence, it is said that this improves the auditory skills in general. This is also supported by a survey carried out by Schön, Magne and Besson (2004: 347) which demonstrates that musical training seems to influence humans' perception of sounds. According to Schön, Magne and Besson (2004: 347), musical training facilitates pitch processing in both music and language. Therefore, it can be assumed that musical training seems to influence other cognitive skills as well (Kraus & Chandrasekaran 2010: 600). The following paragraphs deal with the auditory skills of musicians and demonstrate possible markers for musicality.

4.8. Auditory skills

Infants can only succeed in the acquisition of language and music as they have an auditory system which receives the acoustic input to which they start to respond to in an appropriate manner. Although it requires years of training, almost every child succeeds in the acquisition of language and the music of its own culture. The perceptual skills of individuals however vary considerably and thus it is said that musical training has an influence on the development of the brain structure.

Generally speaking, musicians' brains seem to be more efficiently designed for receiving acoustic input than those of non-musicians. And according to Nardo and Reiterer (2009: 245) and Limb (2006: 437), it could be possible that the size of the Heschl's gyrus might be a marker for musicality. However, "[p]rofessional musicians showed [also] a significantly greater increase in [magnetoencephalographic] activity within primary auditory cortex […]" (Nardo & Reiterer 2009: 245). Thus Limb (2006: 437) believes that "[o]ne of the most striking findings in recent years is that of the major

differences in both physiology and morphology of the auditory system even at the primary level, between musicians and non-musicians".

Although research in this particular field is still at an early stage, the structural differences of the brain and the activation of specific brain regions indicate that trained musicians have a developmental advantage over non-musicians, especially in detecting, discriminating and perceiving sounds. For instance, Kraus and Chandrasekaran (2010: 600) suggest that although

> [m]usic and speech are perceptually distinct [, they] share many commonalities at both an acoustic and cognitive level. At the acoustic level, music and speech use pitch, timing and timbre cues to convey information. At a cognitive level, music and speech processing require similar memory and attention skills, as well as an ability to integrate discrete acoustic events into a coherent perceptual stream according to specific syntactic rules.

Hence, the perceptual skills of musicians have a positive transfer effect on language perception (Kraus & Chandrasekaran 2010: 599-600; Schön, Magne & Besson 2004: 347; Thompson, Schellenberg & Husain 2004: 47). This is especially supported by neuroscientific evidence, and musical expertise seems to have an impact on language processing, "especially in the phonetic/phonological domain" (Nardo & Reiterer 2009: 238). Furthermore, it is argued that "[m]usicians are more successful than non-musicians in learning to incorporate sound patterns of new language into words" (Kraus & Chandrasekaran 2010: 602-603). Therefore, it might be reasonable to assume that music education early in life could be a gate opener for successful second language acquisition later in life.

However, as demonstrated before, being equipped with musical talent seems to facilitate second language acquisition due to various reasons mentioned. Hence, it could be assumed that this might be the same for singers with which is dealt with in the following chapter.

5. Singing and speaking

Before singing is analysed in the following parts, this chapter starts out with a short review of crucial findings from previous sections. Hence, it has been demonstrated that music and language are very close in their nature as both are auditory phenomena

(Nardo & Reiterer 2009: 229) and both share similar features which are easily comparable on a syntactic level, resulting from their hierarchical organisation (Honing 2011: 31; McMullen & Saffran 2004: 298; Schön, Magne & Besson 2004: 342; Kraus & Chandrasekaran 2010: 600). However, language and music are also acquired faculties varying from culture to culture or from nation to nation and seem to resemble each other in this respect as well. In addition, as discussed in chapter four, empirical evidence supports that musical talent facilitates second language acquisition, especially in the field of pronunciation (Nardo & Reiterer 2009; Milovanov 2009; Pastuszek-Lipinska 2008) and musical expertise is also said to have a positive transfer effect on language perception (Kraus & Chandrasekaran 2010: 599-600; Schön, Magne & Besson 2004: 347; Thompson, Schellenberg & Husain 2004: 47). Therefore, it could be assumed that singing exercises may also facilitate second language acquisition.

Although it is well known what singing is, it is rather complicated to define as it has parts of both music and language. Steinke, Cuddy and Jakobson (2001: 412) claim that singing is a combination of two distinct processes in which melody derives from music and text or lyrics from language. When considering the various findings of the surveys discussed in previous chapters about musicality and how it facilitates the pronunciation of second languages, it might be reasonable to assume that singers may also have a special ability for the pronunciation of second languages. Hence, singing exercises include both music instructions and vocal exercises. Thus, it could even be argued that trained or talented singers may be able to perform better in the pronunciation of second languages than musicians who play an instrument, because singers are trained to be rather flexible in the alteration of their voice.

However, as a matter of fact, investigations in singing and its relation to second language acquisition have almost been ignored and there are only few surveys available which address singing in particular (Schunk 1999; Mora 2000; Salcedo 2010; Murphey 1990). According to Peretz, Gagnon, Hébert and Macoir (2004: 374), "[t]he major reason for this limited attention is that singing abilities are considered to be unequally distributed in the general population". However, the few investigations in singing have demonstrated the opposite. "Non-musicians are highly consistent in their ability to sing familiar songs" (Peretz, Gagnon, Hébert and Macoir 2004: 374). Nevertheless, the ignorance of singing for scientific work might also be a result of how singing is dealt

with in the Western sphere. Hence, singing became something outstanding and extraordinary and its practice seems to be no longer available to the masses. This depends also on the representation of singing in the media and on the fact that singing usually is not part of the daily routine in the Western sphere.

This chapter demonstrates why singing facilitates second language acquisition either directly or indirectly. Therefore, singing is shown from different angles such as from a neuroscientific, from a cognitive, from a cultural, from a singing and language teacher's point of view.

5.1. Singing from a neuroscientific point of view

Singing from a neuroscientific point of view raises interesting questions about its language and music components. Is singing music or language or something entirely different? Hence, a song consists of two elements, a melody and a text (Crowder, Serafine & Repp 1990: 469). Therefore, it could be argued that singing is the result of two processes, namely that of language and music processing. According to Peretz, Gagnon, Hébert and Macoir (2004: 375), it is not. According to them, "classical teaching in neurology as well as in behavioural studies with normal listeners suggest that, in songs, music and speech are integrated rather than simply aligned with each other" (Peretz, Gagnon, Hébert & Macoir 2004: 375). The cognitive neuropsychological standpoint shows similar notions and Steinke, Cuddy and Jakobson (2001: 412) propose that, "[a] song, by definition, consists of integrated melody and speech, or text".

As a matter of fact, the processing of singing has reached little attention (Steinke, Cuddy & Jakobson 2001: 412) and how the combination of melody and text is achieved remains largely unknown or highly speculative. The same is true for how songs are memorised. Recent research shows mixed results but seems to favour a dual system for song memory in which lyrics and melodies are independently stored (Peretz, Gagnon, Hébert & Macoir 2004: 378; Stahl, Kotz, Henseler, Turner & Geyer 2011: 3084-3085). However, alternatives argue that there might be a special store for songs as well (Peretz Gagnon, Hébert & Macoir 2004: 378). And Gordon, Schön Magne, Astésano and Besson (2010: e9889) propose that "[m]elody in song may also serve as a mnemonic of storage of words in long-term memory".

Most of these findings are based on investigations in aphasics. It deals with those people who suffer from severe language disorders caused by a stroke or other brain damages. However, most aphasics retain the ability to generate melodies or sing words. Therefore, investigations in aphasics seem to hold key information about how singing is memorised or achieved. Thus, the following parts demonstrate what aphasia is and why singing might be important for speech recovery.

5.2. Aphasia and its relation to singing

The phenomenon called aphasia has been known since the second half of the 19th century and was first established by Paul Broca (Schlaug, Norton, Marchina, Zipse & Wan 2010: 1; Stahl, Kotz, Henseler, Turner & Geyer 2011: 3083). From a medical perspective, aphasia, "[i]n right-handed individuals, nonfluent aphasia, generally results from lesions in the left frontal lobe, including the portion of the left frontal lobe known as Broca's region" (Schlaug, Norton, Marchina, Zipse & Wan 2010: 1). This leads to language disorders "that restrain or disrupt the spontaneous expression of speech" (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3083). However, most aphasics can sing melodies or even generate sung words (Peretz, Gagnon, Hébert & Macior 2004: 376-377; Stahl, Kotz, Henseler, Turner & Geyer 2011: 3083; Schlaug, Norton, Marchina, Zipse & Wan 2010: 2; Özdemir, Norton & Schlaug 2006: 628). This is interesting for this paper as it contains information of language related and music related processes in singing. However, research in this particular field is rather problematic since each aphasic is a single case with specific problems which not always allows for generalisations (Peretz, Gagnon, Hébert & Macior 2004: 376).

In general, there are two different types of aphasia, these are aphasia without amusia and amusia without aphasia (Peretz, Gagnon, Hébert & Macior 2004: 376-377). The first one shows language disorders, whereas the latter, the less frequent one, results in music processing damages. Usually, natural recovery from non-fluent aphasia is scarcely observed as well as "[…] the neural mechanisms underlying post-stroke recovery continue to remain unclear" (Schlaug, Norton, Marchina, Zipse & Wan 2010: 2). However, spontaneous improvement or recovery of aphasics is often said to be a right hemisphere compensation (Schlaug, Norton, Marchina, Zipse & Wan 2010: 2), whereas others believe that there exists a "[…] singing-based or melodically-intoned

route that is either bihemispheric or via the right hemisphere" (Özdemir, Norton & Schlaug 2006: 629). This might also be one reason why many aphasics can sing words but cannot speak. However, it is still unclear how, why and under which circumstances aphasics recover from severe language disorders.

Owing to the fact that many aphasics can still generate melodies, or even sing some words, it illustrates the importance to explore singing in more detail. Hence, "singing is not the simple output[s] of language and music processing systems" (Peretz, Gagnon, Hébert & Macior 2004: 376) and according to Peretz, Gagnon, Hébert and Macior (2004: 377), the argument that in most non-fluent aphasics' "music processing is spared because it is computationally less complex and primitive, than language" does not explain why there are cases of amusia without aphasia. Hence, Peretz, Gagnon, Hébert and Macoir (2004: 377) propose that in the case that music were more primitive than language, cases in which people retain the ability to speak, but cannot produce melodies could not exist. However, such cases are reported (Hence, Peretz, Gagnon, Hébert & Macoir 2004: 377). This makes it even more complicated but simultaneously indicates that singing seems to hold key elements for understanding human beings' language and music processing systems.

Although there are some surveys which do not support that singing, as it is used in speech therapies, directly improves speech production of aphasics (Peretz, Gagnon, Hébert & Macior 2004: 386; Stahl, Kotz, Henseler, Turner & Geyer 2011: 3083), it is not quite clear why many patients can sing words they are otherwise not able to produce while speaking . Gordon, Schön, Magne, Astésano and Besson (2010: e9889) explain it very well when they argue that "study[ing] the perception of song" is one way to find out the differences and similarities between language and music processing. This would also help to understand which language processing systems might be damaged when people suffer from severe language disorders. Consequently, more effective therapies for speech recovery could be developed. Furthermore, this would also help healthy people as they could train language, music or singing skills more precisely.

One speech therapy targeted at aphasics is the melodic intonation therapy. It is based on the assumption that intoned words (singing) improve the spontaneous speech production. However, experts have contradictory explanations for the therapy's success and some raise doubts that singing directly improves speech recovery while others give

possible explanations why it does. The following paragraphs demonstrate what the melodic intonation therapy is and why it may help people to regain the ability to speak simple words and phrases.

5.3. Melodic intonation therapy

The melodic intonation therapy is targeted at people suffering from language disorders, and it aims at improving the spontaneous speech production of non-fluent aphasics (Schlaug, Norton, Marchina, Zipse & Wan 2010: 3). Originally, it has been invented as it was believed that singing stimulates the right hemisphere of the brain which is associated to have "compensatory functions in speech recovery" (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3084). And according to Schlaug, Norton, Marchina, Zipse and Wan (2010: 3), the

> [melodic intonation therapy] contains two unique components: the melodic intonation (singing), with its inherent continuous voicing, and the rhythmic tapping of each syllable (using the patient's left hand) while phrases are intoned and repeated.

Although the treatment with the melodic intonation therapy has shown improvements of patients' speech production, it is unclear why some recover and some do not. Therefore, researchers are most interested in the single components of the melodic intonation therapy and its effects to aphasics.

For instance, Stahl, Kotz, Henseler, Turner and Geyer (2011: 3083) propose that the reason why the melodic intonation therapy helps improving speech recovery is not singing but its rhythmic component, the left-hand tapping[10]. Furthermore, they suggest that "the lyric production in non-fluent aphasics may be strongly mediated by long term memory and motor automaticity, irrespective of whether lyrics are sung or spoken" (Stahl, Kotz, Henseler, Turner & Geyer 2001: 3083). They concluded this assumption after introducing three different types of tests in which "original, formulaic and non-formulaic lyrics" were sung, spoken in rhythmic or in arrhythmic condition by aphasics with the same language disorders (Stahl, Kotz, Henseler, Turner & Geyer 2001: 3087). The data of this survey suggest that rhythmic tapping seems to be the most promising

[10] The left-hand tapping is one component of this speech therapy. While the patients have to produce intoned words they have to tap with their hands to each syllable.

factor for speech recovery as it is shown to have a positive effect on the basal ganglia (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3090-3091). This brain region is said to be responsible for the rhythmic segmentation in speech and thus is stimulated by the left-hand-tapping (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3084).

However, they also conclude that "lyric memory and motor automaticity may affect speech production in different ways" (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3091). For example, original and formulaic lyrics in songs were more easily produced by the participants demonstrating that preserved motor automaticity and long term memory seem to be further key factors why aphasics can still produce sung words of familiar songs (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3093).

Norton, Zipse, Marchina and Schlaug (2009) also deal with the impact of the melodic intonation therapy in speech recovery. They describe four essential parts of this therapy, the left-hand tapping, the inner rehearsal, the auditory-motor feedback training and the intonation (Norton, Zipse, Marchina & Schlaug 2009: 3).

In marked contrast, the survey by Stahl, Kotz, Henseler, Turner and Geyer (2011), claims that intoned words (singing) play a crucial role. For instance, it is proposed that in singing "the slower rate of articulation and continuous voicing […] increases connectedness between syllables and words in singing [and] may reduce dependence on the left hemisphere" (Norton, Zipse, Marchina & Schlaug 2009: 3). Therefore, aphasics with left hemisphere damage may be able to produce simple words or short phrases again. Another reason why singing is said to be helpful is that the patients can easier differentiate the sung words as the "phonemes are isolated" (Norton, Zipse, Marchina & Schlaug 2009: 3). This additionally includes that the phonemes are longer and easier to discriminate. Furthermore, it is also suggested that the inner rehearsal of a phrase seems to support speech production which affects the motor commands (Norton, Zipse, Marchina & Schlaug 2009: 3). Although the suggestions and the results of these surveys raise interesting notions, further research will be required in order to explain which components can most stimulate brain regions involved in speech recovery. Hence, scientists just begin to understand how the human brain works.

One similarity between singing and speaking is how both are produced. Hence, the following paragraphs demonstrate observations of a singing teacher's point of view.

5.4. Sound production and the achievements of singers

In general, singing and speaking are produced with the same organs. The place of sound production is basically the larynx. Originally, it had protective functions such as "shield[ing] the lungs from food aspirated during swallowing" (Berke, Long 2010: 420). However, with increasing flexibility of the larynx it became human beings' most essential way to communicate.

The sound production of speech and singing depends on a process whereby

> [a]ir from the lungs [is] forced through the vocal folds [which] can set the loose connective tissue layer into self oscillations. Sound is then produced due to the compression and rarefaction of the air molecules above and below the vocal cords (Berke & Long 2010: 423-424).

In other words sounds are generated by the airstreams of the lungs which bring the vocal folds into oscillation. This process is almost identical for speaking or singing, except that the trained singer (or probably the talented singer unconsciously) has more control over this process and thus allows him/her to alter the voice more easily or to produce tones in a highly qualitative manner.

Hence, several singing teachers argue that singing and speaking are based on the same principles as for example, García-López and Gavilán Bouzas (2010: 443) argue that body posture, breathing, emission, resonance and articulation are some of the basic elements which are shared by both, singing and speaking. However, some slight differences can be found in how singers breathe because the effective singing process involves that "the [e]xhalation becomes much more active than inhalation when speaking […]" (García-López & Gavilán Bouzas 2010: 443). This is especially important for singers as in singing tunes are longer than in speech. Furthermore, effective "vocal technique pursues correct glottic closure with a stable larynx position, which is achieved by the coordination of not only the extrinsic but also the intrinsic muscles" (García-López & Gavilán Bouzas 2010: 443). These are some basic principles allowing the singer to use the voice without damaging it even if the performance lasts several hours.

Therefore, the professional singer could be compared to an athlete as she or he is trained in using the body for singing purposes and thus his or her organs for sound production are often more flexible than those of common people. For instance, singers are able to

alter and modify sounds with the palate, the tongue or the lips (Colton, Kasper & Leonard 2006: 2) more easily than common people but they are also able to use the oral cavity as well as the pharynx in order to reach a maximum of their voice. The level of training also allows concluding that professional singers may be better in pronouncing foreign languages or may be able to adapt foreign language pronunciation in a short period of time as they are rather flexible in producing various sounds.

Although it could be assumed that singing facilitates second language pronunciation, there are only few surveys which deal with this topic (Schunk 1999; Mora 2000; Salcedo 2010; Murphey 1990). This depends on several factors. One is that Westerners tend to believe that singing is distributed unequally in the general population (Peretz, Gagnon, Hébert & Macoir 2004: 374) and research would have no benefit to the masses. Furthermore, singing is often ignored in the scientific environment as it is associated with art and thus judgments depend on aesthetic evaluation and not on objective measurements. Consequently, singing in the Western sphere is accessible for a limited group of people only, the specialists – people who are known from media. The following paragraphs deal with singing in the Western world and demonstrate that singing and foreign language classes have many similarities. Furthermore, it is demonstrated that singing facilitates second language acquisition in general.

5.5. Singing and its relation to second language pronunciation in the classroom environment

In foreign language teaching, sound production is one of the most essential elements. However, the pronunciation of foreign languages is often rather difficult as the new sounds are complicated to produce or are unusually combined compared to the mother tongue. Second language classes are entirely different from other subjects taught as they do not include the evaluation of the acoustic output of learners. In foreign language classes sound production is as important as grammar. Thus pronunciation is part of the evaluation of language learners.

The following paragraphs illustrate that anxieties of singers on stage are similar to those of second language learners in second language classrooms. Therefore, this chapter explains how singing is represented in the Western society and compares this to the classroom environment in which foreign languages are taught. Hence, analysing singing

and singing anxieties helps to understand second language teaching and its requirements. Furthermore, this chapter illustrates that second languages and songs can activate an inner rehearsal which is one of the most natural *Language Activation Devices*.

Leaving maternal singing aside, singing in the Western sphere became a profession and requires specialists' knowledge. Hence, there are music teachers, singing teachers, conservatories and academies of music. A singer without a professional singing education is considered to be a lay singer, and many people will agree that singing is an exceptional ability. This is also represented in the media and since the introduction of TV shows, which search for singing talents, singing has become more and more of a profession. However, singing should be considered as one of the most essential means of communication after language as every infant starts to generate melodies in the same way it acquires the language of its own culture.

However, all the singing professions, the singing education facilities and singing's representation in the media create the impression that good singers received a singing education. The only problem is that singing education is not part of the school system and private lessons are rather expensive. Although it can be argued that music lessons are part of Austrian schools, they hardly ever deal with singing but more likely focus on the history of musicians.

Turning back to talent shows, it could also be argued that these shows search for singing talents in the general population. This might be true but the selection of a few singers demonstrates that most people are not able to perform singing as well as the selected ones do. This seems even more manifested if the environment in which the performance takes place is analysed. Usually, a singer is placed on stage which makes him superior to the ordinary masses and the stereotypical appearance of a Western singer is that of someone who has sex appeal, is young, handsome or beautiful. In addition, singers who are considered to be talented seem to possess special skills. The result is that the good singer receives genius – qualities which the common people lack. It is therefore reasonable to assume that most people develop anxieties to sing in the public sphere.

Understanding singing and the reasons why most people do not sing publicly in the Western sphere helps us to understand why second language learners are anxious to pronounce foreign languages. The environment of popular singers on stage is similar to

language classrooms. For instance, class members have to hold presentations in front of the audience. Thus, they are on stage and both language learners and singers are evaluated on the basis of their sound production. Surely, singing could be considered to be an extremer example than second language pronunciation because singing on stage is associated with a larger audience than second language classes. Nonetheless, overall the problems remain the same. Both singing on stage and pronouncing foreign words share a common set of similar anxieties and singers as well as second language learners fear to be evaluated negatively. This has an enormous impact on the learning progress. Hence, a low anxiety condition is essential for people in order to be receptive to language input (Horwitz E., Horwitz M. & Cope 1986: 127). The same is also true for singing lessons. If singing students are anxious, they most often hesitate to produce sounds. The result is that the voice lacks clarity, intensity and expressivity. Therefore, anxieties in singing lessons and second language classes are counter-productive for the progress. Language learners who are anxious have difficulties in "[…] concentrating, [they] become forgetful, sweat, and have palpitations" (Horwitz E., Horwitz M. & Cope 1986: 126). And the "foreign language anxiety concerns performance evaluation within academic and social context" (Horwitz E., Horwitz M. & Cope 1986: 127).The same is true for singing "as performance anxiety is heightened when it occurs within a social context" (Abril 2007: 3).

Thus, every class member is evaluated by the teacher and his or her classmates. The evaluation of the content is as important as its pronunciation. Incorrect pronunciation can be compared to singing out of tune and the anxiety to fail could be compared to stage fright. In extreme cases, language learners stop speaking and the result is that they are destined to fail. This does not necessarily depend on their lower language skills but on a lack of self-confidence.

However, one significant difference between talent shows and foreign language teaching classes is that the latter should ensure that most participants can acquire second languages and its pronunciation successfully. How this can be achieved remains problematic. Although individual differences will always influence language progress, singing in the classroom seems to offer a solution to anxiety.

Singing reduces fear in second language classrooms (Salcedo 2010: 21) and group or choir singing reduces the distance to class members, helps cement social bonds and has

a positive influence on the members' emotions (Kreutz, Bongard, Rohrmann, Hodapp & Grebe 2004: 623; Kreutz, Bongard, Rohrmann, Grebe, Bastian & Hodapp 2003: 216). One further advantage of choir singing in second language classes is that the single voice of the members is not in the foreground which reduces stress for the individual.

However, there are only a few foreign language teaching methods which include singing. One is the *Audio-Singual Method* invented by Kind (1980). It is said to be rather effective because it employs familiar songs for English teaching purposes because "the tunes employed are familiar, which offer a satisfying feeling of recognition to the learner who can overcome fear of the unknown often associated with learning a second language" (Salcedo 2010: 21). Although singing in classrooms will not reduce anxieties to almost zero, it is one way to warm up second language communication in the beginning of lessons.

Some would also argue that singing in second language classes might be useful for beginners only. However, Mora (2000: 151) argues that intermediate and advanced language learners also benefit from singing. She calls this a melodic approach to language teaching (Mora 2000: 151) and argues that advanced learners can improve their pronunciation skills as well as beginners take advantage from such an approach as a "[…] melodic presentation of a [language] structure has a slower tempo than speech, the syllables are lengthened, and pauses between different thought groups become notable" (Mora 2000: 151). This is not only helpful for establishing the rhythmic component, but also gives the learners more time to memorise the language input (Mora 2000: 151).

In the chapter about aphasia it has been demonstrated that one probable reason why aphasics can sing words they are not able to speak might depend on the long term memory. Furthermore, the survey by Stahl, Kotz, Henseler, Turner and Geyer (2011) proposes that original texts such as that of the German song "Hänschen Klein" were reproduced more easily by those who have severe language damages than non-formulaic texts (Stahl, Kotz, Henseler, Turner & Geyer 2011: 3093). Therefore, songs help to memorise text (Gordon, Schön Magne, Astésano & Besson 2010: e9889) and "simple musical song can transform ordinary text into information that is effectively retained and recalled when needed" (Salcedo 2010: 22).

One probable reason why singing seems to help memorisation might also depend on a cognitive process which is stimulated by the input of songs. It can activate an inner rehearsal and the repetition of the inner voice acts as if singing it aloud. The consequence is that the information is stored better in the long-term memory as it is repeated several times. This is also called the song-stuck-in-my-head phenomenon[11].and was first described by Murphey (1990), who argues that songs are dining through the head several times after having heard them shortly before (Murphey 1990: 58).

A similar phenomenon is also described in second language acquisition. It is called the din and this "term […], as used in psychology, refers to a phenomenon occurring after a period of contact with a foreign language in which the new information repeats without the speaker's intentional effort" (Salcedo 2010: 22). Krashen (1983) describes that the din "[…] is a result of the stimulation of the [l]anguage [a]cquisition [d]evice" (Murphey 1990: 55) and its activation depends on several stimuli. Most important is that it is best started with aural input (Krashen 1983: 44), but it also seems to be rather important that the language input includes new information to language learners as the frequency in which the din occurs is higher in beginners than in advanced language learners (Salcedo 2010: 22).

This, however, could also be interpreted differently. Hence, beginners may perceive foreign languages like melodies because they cannot understand all the words they are listening to as well as segment every single word of a phrase or a sentence as discussed in chapter four. It is very likely that language learners rely on the musical components of language when they start learning foreign languages. This would also explain why children with higher musical aptitude were better in the pronunciation of foreign languages than those with less musical talent (Milanova 2009: 339). Hence, the higher the musical aptitude the easier it might be for language learners to remember and reproduce new sounds.

Furthermore, this notion is also supported by the most obvious difference between the musical din and the din in second language learning: the time that is required for its activation. In language learning it takes around one to two hours (Krashen 1983: 44), whereas the musical din is activated immediately. If language learners at beginner level perceive the target language more music-like, it is more likely that the din occurs more

[11] Is also called the musical din.

frequently by beginners than by advanced learners. This means that they are more often reminded of melodies when they listen to foreign languages. Although there is no factual evidence which supports the latter ideas so far, Murphey (1990) gives one possible explanation for this. He argues that "[o]ntogenetically, infant vocalizations, language in the crib, resemble singing more than speech" (Murphey 1990: 59) and the input infants receive by their caretakers is usually exaggerated. This means that speech targeted at infants has longer tunes and a more song-like intonation. Thus it could be assumed that songs activate the din as it is one of the most important language activation devices of infancy and, therefore, rather strong and natural.

Another interesting aspect which is also noteworthy is what is called egocentric language. This is referred to as babbling of infants who repeat language purely out of pleasure "[…] without any concern for an addressee nor for words with meaning […]" (Murphey 1990: 54). This is also called thinking aloud (Murphey 1990: 54) and is said to become an inner voice in school age when "[t]he child learns to think words "secretly", not out loud" (Murphey 1990: 55). If Murphey (1990) is right when he argues that speech targeted to infants is song-like and more musical in its nature, infants and very young children may also perceive language like music. When the egocentric language becomes an inner voice children do no longer rely on the musical components of their first language as they understand its meaning. What may remain is that songs naturally activate this language acquisition device as the stimulus of song reminds us of the input received as infants and the inner rehearsal, what Murphey describes as the song-stuck-in-my-head phenomenon, might be a remainder of the *thinking aloud* of infants which goes under the surface with around 6 years of age. The result might be the musical din.

5.6. Concluding remarks

As explained in the previous chapter, singing can facilitate second language learning directly or indirectly. In an indirect way singing reduces anxieties in the classroom environment as group or choir singing reduces the distance to class members, helps cement social bonds and has a positive influence on the members' emotions (Kreutz, Bongard, Rohrmann, Hodapp & Grebe 2004: 623; Kreutz, Bongard, Rohrmann, Grebe, Bastian & Hodapp 2003: 216). However, singing can also directly facilitate second

language acquisition as for instance, singing helps to memorise texts (Salcedo 2010: 22; Gordon, Schön Magne, Astésano & Besson 2010: e9889) or improves the pronunciation of foreign languages (Mora 2000: 151). Furthermore, it can activate an inner rehearsal "[…] without an intentional effort" (Salcedo 2010: 22) which makes the learning process more effective.

Singing seems to be a rich source for teaching foreign languages but also for research purposes and Krashen (1983: 44) explains it best when he states that "language acquisition is a natural and enjoyable process for everyone, as long as the right kind of input is provided!" Singing in second language classes might be one of those.

6. Empirical research

The second part of this paper explores singing and its relation to second language pronunciation in more detail. Therefore, this survey employs certain tests targeted to singers who participated in several tasks related to their memory, their musical talent, their personality traits, their pronunciation skills and their singing abilities. The research was inspired by previous investigations about musicality and its relation to the pronunciation of second languages as discussed in detail in chapter 4 (Nardo & Reiterer 2009: 237). (Pastuszek-Lipinska 2008; Milovanov 2009: 339; Wong & Perrachione 2007). However, the main focus of this paper is to explore whether good singers are also better in the pronunciation of second languages as singing exercises include both music instructions as well as vocal exercises. Hence, the opening of this paper gives an overview about the tests targeted to singers, the test procedure and the singers who participated in this survey. First of all, it starts out with the test procedure.

6.1. Procedure

In general, this survey consists of certain sections where the participants had to fill in personal data, answer multi-item scales, read the text *North Wind and the Sun*, repeat English and Hindi sentences, sing the song *Happy Birthday* and parts of a song they did not know before. Furthermore, they had to make the *AMMA test* (Advanced Measures

of Music Audiation) by Gordon (1989) in order to measure their musical talent, and they were also instructed to complete certain working memory tests.

The whole procedure lasted around two hours which was a rather longish test. In order to avoid that the participants got tired, or lacked concentration during the test procedure, it was divided into two separate parts. The first one was completed at home as it was possible to do this on the internet while the second part, which included the recordings, was finished in a studio.

The first part included personal data of the participants but also multi-item scales. According to the participants, the average time spent for answering the first part was around forty minutes, whereas the second part lasted one hour and twenty minutes and involved the speaking, reading and singing tasks as well as the working memory and the *AMMA test*. In the second part of the investigation the singers were allowed to make short breaks inbetween the various tasks for recovery.

Theoretically, the second part could have been done at home as well. However, the participants received important instructions which also ensured that the rules of this survey were obeyed and thus all the participants had equal chances to make a good performance at the studio. The test procedure was always done in the same order and the participants started with the working memory tests, followed by the speaking, reading, and the singing tasks. Lastly, they had to do the *AMMA test*.

There were more reasons for suggesting that this test procedure would demonstrate the best results. One was to reduce anxiety during the test conditions. Hence, before the participants of this survey were tested, the whole procedure was practiced with five volunteers. After the test procedure they argued that they were most nervous during the singing tasks or when they were recorded. Consequently, the working memory tests and speaking as well as reading tasks functioned as warm-up exercises. Then the singing tasks were recorded. As the whole procedure was rather exhausting for the informants, the same order equalled the chances for all informants.

6.2. Participants

All participants received singing lessons[12] and their level of training ranged between 3 months and 14 years. Some of them sing in a choir as well as some in a band. However, most of them attend singing lessons on a regular basis for their own pleasure. This survey consists of 46 informants who demonstrate their singing and language skills and thus should represent an average distribution within people who received singing lessons as Field (2009: 42) suggests that a normal distribution can be achieved if the sample consists of at least 30 participants. Five of the 46 test persons are excluded in the final analysis because two of them did not finish the recording tasks in time. Another test person was unable to fulfil the working memory task as she was of Turkish origin and had difficulties with responding numbers in German while one did not receive singing lessons and another could not repeat the Hindi and English files at all.

The remaining test group consists of seven male and thirty-four female persons. The participants were between 17 and 67 years of age. The mother tongue of all participants is German, except two who are bilinguals of German and English as well as of German and Filipino. The whole test group speaks English as second language, and for most participants English is also the foreign language in which they are most proficient. Furthermore, around half of the informants practice singing for some hours within one week. Most of the participants also play one or more musical instruments and received formal instructions.

In this survey, the analysis was done two times. The first one consists of all participants, whereas the second one demonstrates the results of those between the ages of 18 and 45 years only. The latter age group, however, still consists of 30 participants and thus is within the normal distribution of the participants as considered to be appropriate for this research. The reason for comparing the data between the large and the small age group was to prove whether age has an influence on the results or not. A comparison of both groups indicates that there were minor important differences only. Those factors which correlated and were found to be significant in the whole test group were also correlating as well as significant in the second age group. Therefore, the final analysis contains all 41 participants as age has a minor effect on the results only and thus can be ignored.

[12] Some participants were not instructed in notation during singing lessons as this is less important for singing exercises in general. They were taught how to use their body, muscles, vocal flexibility or how to apply breathing techniques.

6.3. About the questionnaires

The questionnaire of this survey consists of two different parts. The first one is a simple form to fill in personal data illustrating important background knowledge concerning the participants including age, singing and language education as well as other crucial aspects for this survey which will be dealt with in later sections.

The second part is comprised of multi-item scales which try to sum up following concepts: *music's function for sexual courtship or reproduction*, *extroversion, income*, *singing improves the mood*, *singing during childhood, singing for becoming famous* and *openness to experience*. The latter concept, *openness to experience*, is taken form the *NEO-FFI-test* by Borkenau and Ostendorf (1993). Each of these concepts consists of three to six statements. The statements were randomly ordered in order to make sure that the participants did not realise that there were concepts behind the individual statements.

These concepts are not only important in order to find out whether singers have specific personality traits but they also relate to previous chapters. For instance, the concept about *music's function for sexual courtship* relates to evolutionary matters as Darwin (1871, 2: 337) states that "musical tones and rhythm were used by the half-human progenitors of man, during the season of courtship, when animals of all kinds are excited by the strongest passion". Although multi-item scales will not explain evolutionary matters at all, they demonstrate if singers believe whether famous singers are advantaged in finding partners or not. Therefore, the multi-item scales in this survey represent more general beliefs, character traits or possible reasons why the singers of this sample sing. It could be argued that this is too vague to explain what motivates the participants to attend singing lessons. However, this investigation should be a starting point for further research owing to the fact that the exploration of singing has almost been ignored throughout history. As far as known, there is no similar past research available which could be used as guideline. Thus this survey includes certain parameters and tries to create a mind map about different factors relevant to singing or not. This also implies finding out which aspects are not significant and therefore can be ignored in future.

6.4. Concept and design of the multi-item scales

The design and guideline of the multi-item scales in this survey are based on the recommendations of Dörnyei (2010: 23), who states that factual questions are usually answered correctly as someone will hardly ever give incorrect answers when he or she is asked to fill in the gender. However, with non-factual questions such as asking about opinions, interests, or beliefs it is entirely different. In this case the wording plays a significant role. Hence, "it is not unusual to find that responses given by the same people to two virtually identical items differ […]" (Dörnyei 2010: 23). As the statements targeted to the participants are non-factual statements, this survey uses multi-item scales.

Thus multi-item scales give reliable data as this research strategy allows using differently worded statements referring to the same target concept such as in this survey to *music's function for sexual courtship*. The advantage of this method is that more questions focus on the same target and one inconsistent answered statement has not too much weight and thus less influential to the result of the total score (Dörnyei 2010: 24).

Another benefit of multi-item scales is that they are usually correctly answered even when the questionnaire contains sensitive questions which are often felt to be rather offensive. Sensitive questions are those which are very personal, such as, for instance, asking for the income of the participants. The problem with these statements is that they are often answered incorrectly or felt to be annoying (Dörnyei 2010: 15). Thus multi-item scales can refer indirectly to a sensitive topic.

In this sample the participants could choose between six possible answers for all statements. For instance, one of those in this survey is: "I often try new and foreign food". Then the participants could choose between six possible answers such as 'I strongly disagree' (1), 'I disagree' (2), 'slightly disagree' (3), 'I slightly agree' (4), 'I agree' (5), and 'I strongly agree' (6). All statements were programmed on a computer. Screenshots of the website as well as all statements and concepts are included in the appendix A.2. and A.3.

The reliability of this sample is proved by a Cronbach's Alfa coefficient recommending a minimum score of .7 in general (Field 2009: 675). The concepts *singing improves the mood*, *singing for becoming famous*, *music's function for sexual courtship* and *openness*

to experience have a coefficient above .7. The concepts *singing during childhood*, *music's function for sexual courtship*, *income* and *extroversion* are slightly below the minimum score but still can be considered to be reliable because concepts which deal "[…] with psychological constructs values below even .7 can, realistically, be expected because of the diversity of the constructs being measured" (Field 2009: 675). Furthermore, some concepts consist of three questions only and usually the Cronbach's Alfa increases with the number of items (Field 2009: 675). One reason why this questionnaire contains only a limited number of statements for each concept was to keep the task as short as possible as the whole investigation would have become beyond the scope of this research. The reliability analysis is contained in the appendix A.1.

6.5. Reading task and repeating phrases

The pronunciation skills of the participants were measured in different ways. First of all, the participants had to repeat two English sentences after they had listened to them. The original ones were all spoken by native speakers of English or Hindi. The first English sentence in the repeating task functioned as a warm up exercise and was not part of the rating. The test conditions were always the same and the participants had to repeat the sentence immediately after they had heard the original English or Hindi file the third time. They were also instructed that the recording was automatically done and thus they should concentrate on their task only.

The second way to measure the pronunciation skills was that the informants had to repeat a sentence in Hindi as it could be suggested that the participants had no contact or knowledge in this language. The reason why they had to repeat a sentence in a language they did not master is based on different assumptions. One is that it can be suggested that people with higher education have no advantage over those with lower ones. Another is that the participants relied on remembering the sounds only and as stated by Rota and Reiterer (2009: 83) a good phonological working memory seems to be a good predictor for high pronunciation skills in foreign languages. Thus it could be suggested that those who perform well in the Hindi repeating task might also have a good working memory. Therefore, all participants were asked whether they speak Hindi or not as Hindi speaking participants would have been excluded from the final analysis.

The third way to measure the pronunciation skills was to analyse the reading skills of the participants. Therefore, they had to read the fable *The North Wind and the Sun.* The following paragraph demonstrates the version used for this survey.

> The North Wind and the Sun were disputing which was the stronger, when a travel[l]er came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the travel[l]er take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the travel[l]er fold his cloak around him; and at last the North Wind gave up the attempt. Then the Sun shined out warmly, and immediately the travel[l]er took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two (International Phonetic Association 1999, 44).

Before the informants were recorded they were allowed to practice the text for some minutes. The recordings were done with music software *Steinberg Cubase 4* and with a microphone *Shure SM58*.

All spoken files were rated by seven native speakers of English for the English recordings, and by seven native speakers of Hindi for the Hindi recordings. The English native speakers who rated the sound files were either from Australia or the United States and the Hindi speakers from India. All native speakers could rate the sound files online as the rating system was programmed on a computer and thus people from Australia, America and India could participate in this survey.

Generally speaking, the Hindi and the English raters received almost the same instructions. In general, the voters had to indicate the sound file they were listening to by a number. The lowest one for a bad performance was indicated by zero and the highest number for a very good performance by ten. Both the English and Hindi native speakers had to evaluate how well the spoken recordings were pronounced, whereby the focus should not lie on single features only but on the overall impressions of the participants. However, they received some guidelines in the opening of their tasks in order to ensure that they were able to understand what should be measured in their analysis. Thus the instructions were that they should evaluate how well the intonation, word stress, rhythm of the language, intelligibility and linking sounded to them. These instructions were the same for the Hindi and the English raters except for one. The

Hindi raters were informed that the participants never received lessons in the Hindi language before they had to repeat one sentence in this language. This should ensure that intelligibility was treated with more tolerance and also an attempt to avoid that the Hindi raters were always scoring the participants with zero. The English raters, however, were told that the participants did not have to speak a certain accent and thus they should treat a British accent in the same way as an American or an Australian one. The English sound file taken for the final analysis was spoken by an American native speaker. The raters could also listen to the original sound file whenever they liked as this particular file was always available to them.

6.6. Sing *Happy Birthday* and repeat parts of a song

Another important way to find out whether singing facilitates second language acquisition was to measure how well the participants performed in different singing tasks. The aim of this survey was to find out whether the singing performances of the participants had an impact on their pronunciation skills in foreign languages or not. In this survey this was the most essential research question as it is based on the assumption that good singers may also be better in the pronunciation of foreign languages. Thus the first step towards a detailed analysis was to test the participants' singing abilities. Therefore, they were instructed to two different singing tasks. The first one was to prove their spontaneous singing skills as they were repeating an unknown song while the second task of the participants was to sing the well-known song *Happy Birthday*.

The reason for taking an unknown song as first measurement for the singing abilities was that this ensured that none of the informants knew the song better than the other. This created a solid basis for a further analysis. The same was true for the second singing task, in which they had to sing the well known *Happy Birthday* song. While the first singing test aimed at the spontaneous singing skills of the participants, the second task focussed on their practiced abilities as it could be assumed that everybody knew *Happy Birthday* since they were a child. This makes the singing tasks comparable with the speaking and reading tasks as they also measure the spontaneous and the practiced aspects as discussed in chapter 6.5.

The aim of the first singing task, however, was to measure the participants' memories and abilities to repeat a song they had to learn spontaneously in a very short period of time. The singing voice of the original musical piece the participants were instructed to repeat was a male voice. Despite this female singers were not disadvantaged. One further instruction which should ensure that gender or anatomical differences of the voice did not affect the participants' performances was that all of them were instructed to sing in a key of their own choice. This was the second way to ensure that the participants felt comfortable as the keys in which the participants sang were excluded from the final evaluation.

The first singing task was divided into three parts and every step became more difficult for the singers as every further task included one or two additional phrases the participants had to repeat after they were listening to the original sound file for three times. During the first singing task they had to repeat the singing voice of three musical phrases only. The original version was supported by music instruments but had also an intro without a voice. The latter had two functions. One was that the participants developed an idea of the song's harmonies while the second was that they had some time for preparation. The participants, however, had to repeat the melody and remember the text of the song by heart. Furthermore, they had no background music or intro when they repeated the part of the song. The reason why the participants also had no intro before they started to repeat the part of the song was that before this empirical research started to collected data the tests were practiced with five volunteers who felt irritated by the intro. Therefore, it was left out as all of them argued that it was easier for them to start immediately after they listened the third time to the part of the song.

The first musical phrases (referred to as *song 1*) they had to sing was *whenever I miss, whenever I miss, I miss your smiling* (each musical phrase is separated by a comma). The second musical statement (referred to as *song 2*) the participants repeated included the same musical piece as in the first test before but received two further phrases to sing which made the task more difficult. Thus they had to repeat the lyrics: *whenever I miss, whenever I miss, I miss your smiling*, *whenever I try, I try to fake a little smile*. The last musical statement (referred to as *song 3*) they had to repeat was comprised of eight phrases resulting in a very long part of a song they had to remember. The text is as

follows: *whenever I miss, whenever I miss, I miss your smiling*, *whenever I try, I try to fake a little smile, I keep the voice, have no other choice*.

The recordings of these singing tasks were rated by 10 raters who were comprised of unprofessional and professional ones. They had to indicate how well the participants sang with a number. The lowest grade someone could receive was zero and the highest ten. The raters had to do this for four different parameters. Those were melody, rhythm, the quality of the voice such as resonance, warmth and colour as well as how well they were able to repeat the text of the song. The maximum score someone could reach was 40. For this survey the second and the third spontaneous singing tasks were rated, the first one was excluded as it was produced by all participants too easily.

The second singing task the participants had to fulfil was to sing a very creative version of the *Happy Birthday* tune / song. The reason for choosing this song was that it could be proposed that the participants had equal chances to perform this particular song as it is known throughout the Western world. The participants learned that they had to sing this song seven days before the recording. Thus they had some time to practice their version of Happy Birthday they liked most as the participants were not forced to follow a specific version of it. This would have restricted their creativity was one crucial measurement in the singing score. Again, key was not part of the evaluation as it has been avoided that the participants sang in a key they found not pleasurable or suitable for their singing voice. The participants were allowed to sing *Happy Birthday* three times in order to get familiarized with the situation and the technical support. All three attempts were recorded and the singers were asked to decide which version he or she liked most. Then this one was taken for the evaluation by singing teachers and unprofessional raters.

The recordings of the participants' *Happy Birthday*s were rated by 12 raters. Again they were comprised of unprofessional and professional raters. Half of them were singing teachers and experts in singing, whereas the remaining raters were people without any music or singing education. All were instructed to evaluate the participants' *Happy Birthday*s according to their own evaluation criteria but received further instructions. Hence, they were told that key should not be part of their evaluation. In order to make sure that all raters knew their task they could rely on some further guidelines. In this survey the evaluation criteria were intonation, rhythm, creativity and the quality of the

voice such as vibrato, colour/warmth and resonance. For all of the four categories the singers were given a number. The scores ranged between 0 and 10, whereby zero was the lowest and ten the highest score someone could receive for one of the evaluation criteria. The maximum score, as in the first singing task, was 40.

All recordings of the singers were rated online as everything was programmed on a computer and the participants received a login and a password. Furthermore, they were instructed to rate spontaneously as well as they were asked to do it without making a pause. This should ensure that the ratings were consistent because it could be suggested that pauses would have skewed the results. In addition, there were more than the 41 participants rated in the final analysis. The additional ones were excluded as discussed in chapter 6.2. The excluded ones were placed at the opening of every singing rating task because this helped the raters to familiarize themselves with their task without influencing the results as the first five ratings were not part of the final analysis. The recordings of the singing voices were done with the music software *Steinberg Cubase 4* and a microphone called *Shure SM58*. All the sound files were mastered and thus the loudness of the recordings did not vary very much and it could be assumed that this had no influence on the ratings.

6.7. *Advanced Measures of Music Audiation* (Gordon 1989)

In order to find out the participants' musical talent they were invited to do the *AMMA test*. Usually it is targeted to "high school students and college/university music and non-music majors" (Nardo & Reiterer 2009: 228). For this survey, the test was provided by Nardo and Reiterer (2009). As all the participants received singing lessons and most of them played one or more musical instruments it could be concluded that they could be seen as advanced musicians according to the Western standards.

In general, the *AMMA test* aims at identifying the participant's ability to discriminate whether a musical statement and the following answer statement are either the same or not. The test consists of 30 items comprised of two pairs, whereby the participants had to decide whether the two musical statements in each pair were the same, or showed a rhythmic, or a tonal change. In case the answer musical statement was different from the first example it was either a rhythmic or a tonal change but never both (Nardo &

Reiterer: 2009: 228). Although the informants were instructed by a computer they also got the same instructions in an oral form a second time in order to make sure that all participants understood their task. As there was always an overseer present while the participants did the musicality test (*AMMA test*) which ensured that the participants were not listening to each pair a second time. Before the test started the participants were allowed to practice three samples as often as they liked. Then they listened to each pair one time and thus had to fill in the answer immediately afterwards.

6.8. Working memory test

Another test of this survey should measure the working memory skills of the participants because the working memory is said to be one crucial aspect for good second language pronunciation "even when it starts after puberty" (Rota & Reiterer 2009: 83). This has been supported by certain empirical surveys such as one conducted by Rota and Reiterer (2009: 83) who demonstrated that a good phonological working memory was also a good predictor for having the ability to acquire foreign languages. Hence, it seems that the humans' working memory is dependent on a phonological loop (Rota & Reiterer 2009: 80) comparable to a "phonological store, which can hold memory traces for a few seconds before they fade […]" (Baddeley 2003: 830). Furthermore, it has been demonstrated that a good phonological working memory seems to be especially important in second language acquisition as in an early learning stage the input a learner of a second language receives is relatively meaningless and thus remembering the new language relies more likely on sound perception than on other parameters. Therefore, being equipped with a good working memory, which enables to store more phonological characteristics, facilitates the process of second language acquisition in general (Rota & Reiterer 2009: 81). This is one reason why the participants in this survey had to repeat a sentence in Hindi as it is a language the informants were never taught, or exposed to for a longer period. Furthermore, they had not made any attempt to acquire Hindi before. Therefore, it can be concluded that those who are equipped with a good phonological working memory will receive better scores in Hindi than those without. Thus Baddeley (2003: 829) argues that the short term memory is important for storing sounds, whereas in the long term memory meaning seems to be more relevant.

In this survey the working memory tests used are based on the research conducted by Rota and Reiterer (2009). The whole working memory test is comprised of two different types. Whereas the first one is a modified version of the Wechsler Digit Span (Wechsler 1939: 229) in which the participants had to repeat strings of numbers either forwards or backwards, the second one consists of "monosyllabic non-words with a German-like phonetic quality" (Rota & Reiterer 2009: 83).

7. The results of this survey

7.1. The multi-item scales

Although there are only few correlations of the multi-item scales with the performances of the singers in this survey, they show possible reasons why the participants sing. Furthermore, the concept demonstrates the participants' singing behaviour during childhood as well as they help to produce a profile of the participants' character traits. In addition, some concepts of this questionnaire also relate to previous chapters such as to evolutionary matters. The analysis of all data was performed by *IBM SPSS Statistics Version 20*. In the following paragraphs the findings are discussed in detail.

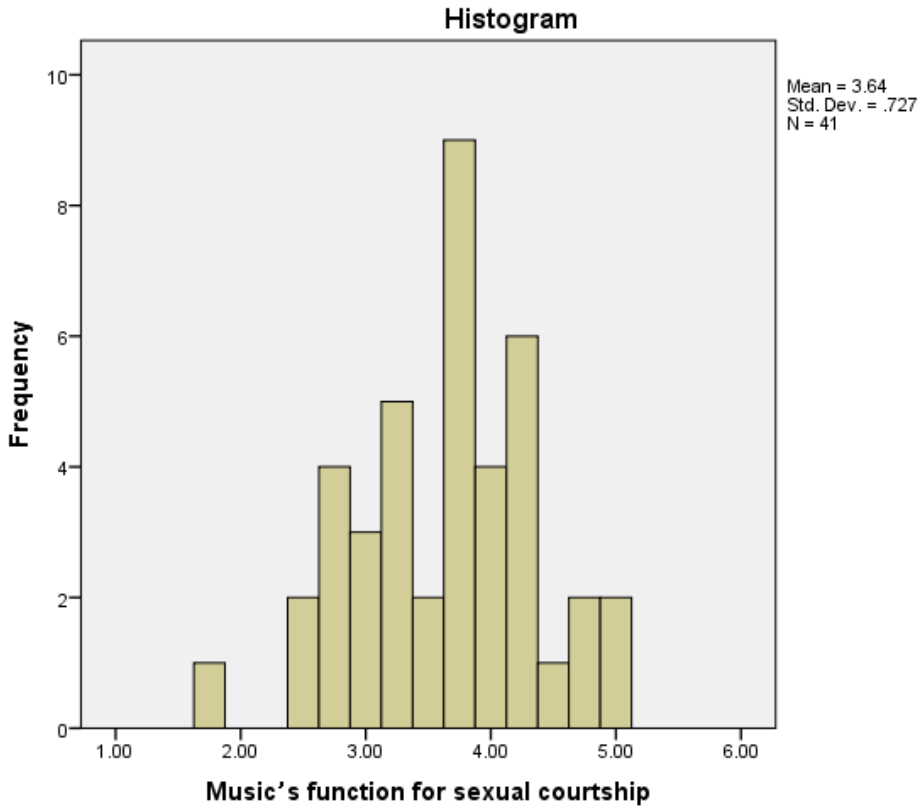
7.1.1. *Music's function for sexual courtship*

As stated in the opening of this paper, certain evolutionary theories claim that music was a result of mate choice and sexual courtship (Darwin 1871, 2: 337). Miller (2000: 7) also agrees with Darwin's notion and states that today the musical genius of famous singers still improves the chances for reproduction by explaining that Jimi Hendrix's musical talent helped him to find more partners than ordinary people. Thus the multi-item scales *music's function for sexual courtship* try to find out whether the participants also believe that famous singers find partners more easily or not. The results indicate, other than suggested, that most of them slightly agree or agree only. Although more participants of this survey believe that famous singers are advantaged in finding a partner, the participants' answers indicate that they only partly support Miller's notion. Probably the participants were thinking about finding "true love" and not about increasing the chances for producing more offspring when they answered the statements

for the concept reproduction. The statements of this concept are contained in the appendix A.2. Hence, it could be improved in future research by including further statements such as “Male famous singers have more illegitimate children”. This would aim more directly to reproductive benefits of famous singers.

In the following graph the x-axis shows the mean of the answers of the participants and 1 stands for ‘I strongly disagree’, 6 for ‘I strongly agree’. The y-axis illustrates the frequency of each answer. As demonstrated the mean of the answers is in the middle of slightly agree and agree.

Figure 2 Histogram – *music’s function for sexual courtship*

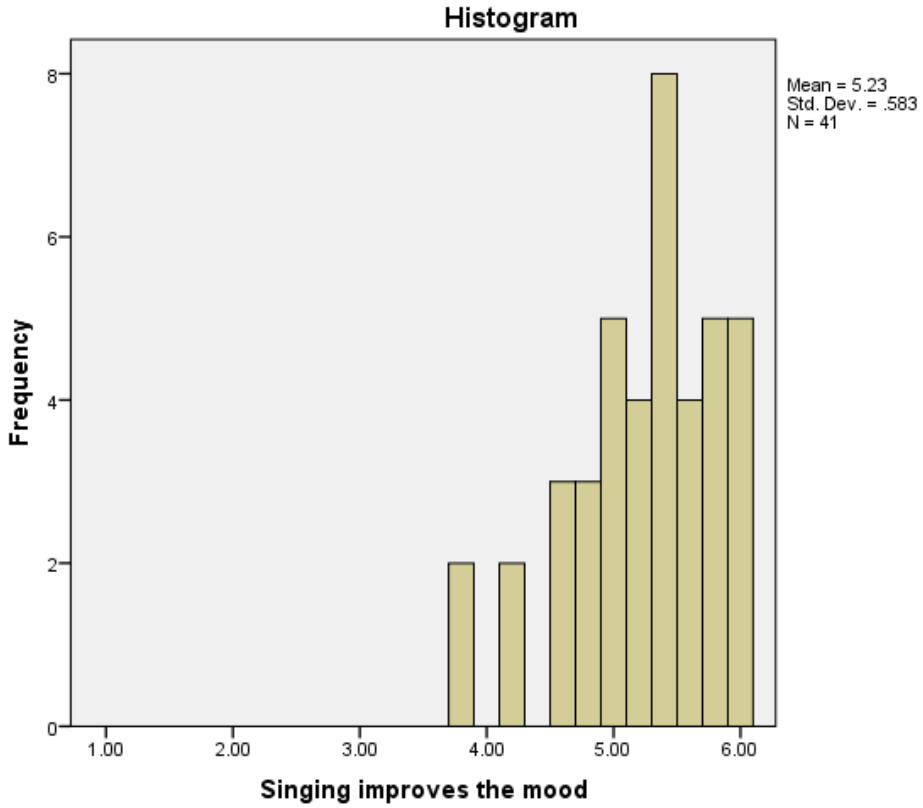


7.1.2. *Singing improves the mood*

Another concept of this survey explains whether the participants believe that singing improves the mood, helps to achieve social cohesion or in difficult situations. The idea again is based on evolutionary matters but also on current observations. As explained in chapter 2.3, some scientists believe that “music helped cement social bonds between

members of ancestral human groups […]" as well as " […] group music making could result in a shared mood, state" (Patel 2008: 370). Furthermore, recently published medical studies as for instance by Kempner and Danhauer (2005: 284) also state that "[…] music can improve mood […]". The results of this survey basically support the findings of Kempner and Danhauser (2005: 284) as well as the evolutionary hypothesis of Patel (2008: 370) when considering the participants' answers. Although it has to be clarified that the results of this survey cannot explain whether music's original function was to cement social bonds, it demonstrates that people are convinced that singing can positively influence the mood of the individual as well as singing as group activity is also able to improve the mood of a whole group. Thus the results are very close to the idea that singing or music making help cement social bonds or strengthen social cohesion. The following graph represents the results and illustrates that most of the participants 'agreed' (5) or 'strongly agreed' (6) with the statements of the concept *singing improves the mood*.

Figure 3 Histogram – *singing improves the mood*



7.1.3. *Singing for becoming famous* and *openness to experience*

One crucial aspect of this survey is to find out if singers have special aims or specific personality traits. As stated in chapter 5 singing is considered to be an exceptional ability and singing is not part of the daily routine of most Westerners. One logical assumption might be that those who attend singing lessons or sing in the public sphere might have special personality traits or different aims compared to the masses[13]. Although this survey does not contain a second test group of people who do not sing, the results of the following concepts demonstrates that the majority of the participants of this survey would like to be famous and they are more likely open to new experience than people who do not sing.

7.1.4. *Singing for becoming famous*

The graph below illustrates that the majority of the participants 'slightly agree' (4) or 'agree' (5)" with the statements of the *concept of fame*. The results show that the participants more likely would favour being well-known or would take the chance to be if they were given the opportunity. However, the most interesting finding of the concept fame is its negative correlation to the participants' singing performances. According to this survey, it demonstrates that the more the participants like to become famous, the worse their singing performance was. The singing performances as explained in chapter 6.6. were rated by professional and non-professional raters. Hence, there was a significant relationship between participants' singing performance and their desires to become famous as indicated below in table 1, $r = -.34$, p (one-tailed) $< .05$. Table 1 represents the negative correlation between the concept *singing for becoming famous* and *singing total mean*[14].

[13] Furthermore, it could be also argued that singers simply have exceptional abilities. This, however, will be dealt with in another analysis in a later section.
[14] *Singing total mean* is the mean of all singing tasks.

Figure 4 Histogram – *singing for becoming famous*

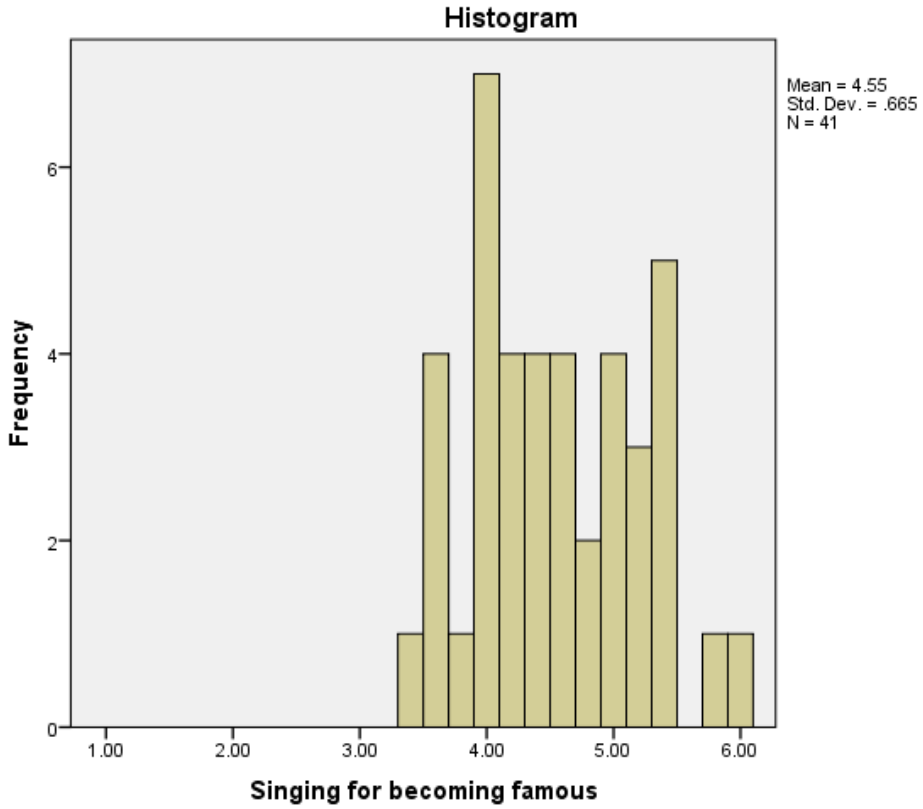


Table 1 Negative correlation between the performances of all songs and the participants' desire to become famous

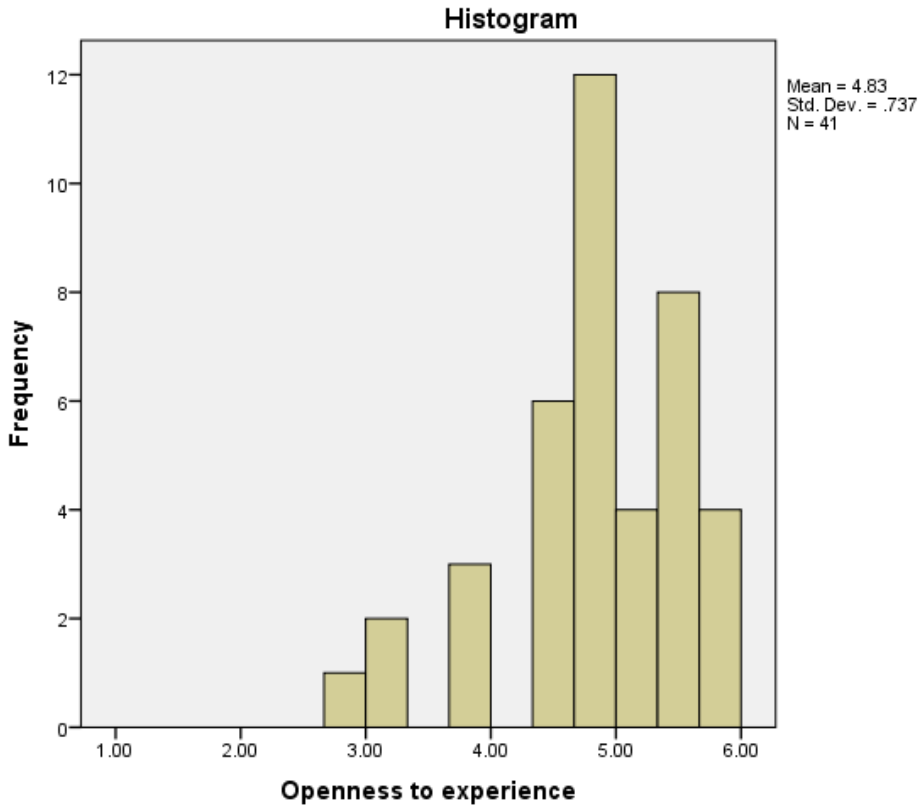
		Total Mean of all 3 Songs	Singing for becoming famous
Total Mean of all 3 Songs	Pearson Correlation	1	-.339*
	Sig. (1-tailed)		.015
	N	41	41
Singing for becoming famous	Pearson Correlation	-.339*	1
	Sig. (1-tailed)	.015	
	N	41	41

*. Correlation is significant at the 0.05 level (1-tailed).

7.1.5. *Openness to experience*

The following graph illustrates the results of the multi-item scales *concept openness to experience* (Borkenau & Ostendorf 1993). As stated before, singers may have special character traits as singing is not practiced in everyday situation in the Western sphere. *Openness to experience* might be one of these as the results indicate that the informants are rather open to new experience. Hence, most participants 'agree' (5) or 'strongly agree' (6) with the statements of this concept as indicated in figure 5 below. However, this concept has no influence on how well the informants sing as there is no correlation between singing and openness to experience found.

Figure 5 Histogram – ***openness to experience***



7.1.6. *Singing during childhood*

The last concept discussed in this survey explores if the participants were singing during their childhood. This concept is related to the fourth chapter which deals with acquisition processes in general and is based on the assumption that an early onset of both second language acquisition and musical expertise has a significant effect on the proficiencies someone can reach. For instance, Gordon (2003: 15) states that the musical aptitude of children in their developmental stage is the result of the interplay between "[…] both innate potential and early influences […]". The same is true for second language acquisition which thumb rule seems to be the earlier the better. Therefore, an early onset of singing might have the same effect as early second language acquisition and musical expertise. In this survey the statements for the concept *singing during childhood* illustrates the singing behaviours of the participants during their childhood. Hence, it shows that overall more participants were singing during their childhood or were dreaming of becoming a famous singer than those informants who were not. The most interesting aspect, however, is that the findings illustrate that there was a significant relationship between those participants who sang more often during childhood and a good singing performance (*singing total mean*), $r = .32$, p (one-tailed) $< .05$. This illustrates that children who started to sing during their childhood seem to be more proficient than those who did not actively sing very often when they were a child. Furthermore, there is also a significant relationship between the quality of the voice[15] and singing during childhood, $r = .34$ p (one-tailed) $< .05$. In this survey, quality of voice refers to resonance warmth and colour of the voice. This allows the suggestion that singing during childhood seems to have an effect on the quality of the voice someone can reach. Although there is a demand for further research as this short questionnaire has a limited number of statements only, the findings demonstrate that singing during childhood seems to predict a good singing performance like an early onset in both, second language acquisition as well as musical expertise predicts a high proficiency. The graph below illustrates that most participants sang during their childhood, whereas table 2 demonstrates the correlation of the singing tasks, the quality of the voice and the singing behaviour during childhood.

[15] The quality of the voice was one aspect which was rated in the singing tasks. The quality of voice in this example is the mean of all quality measurements of the singing performances.

Figure 6 Histogram – *singing during childhood*

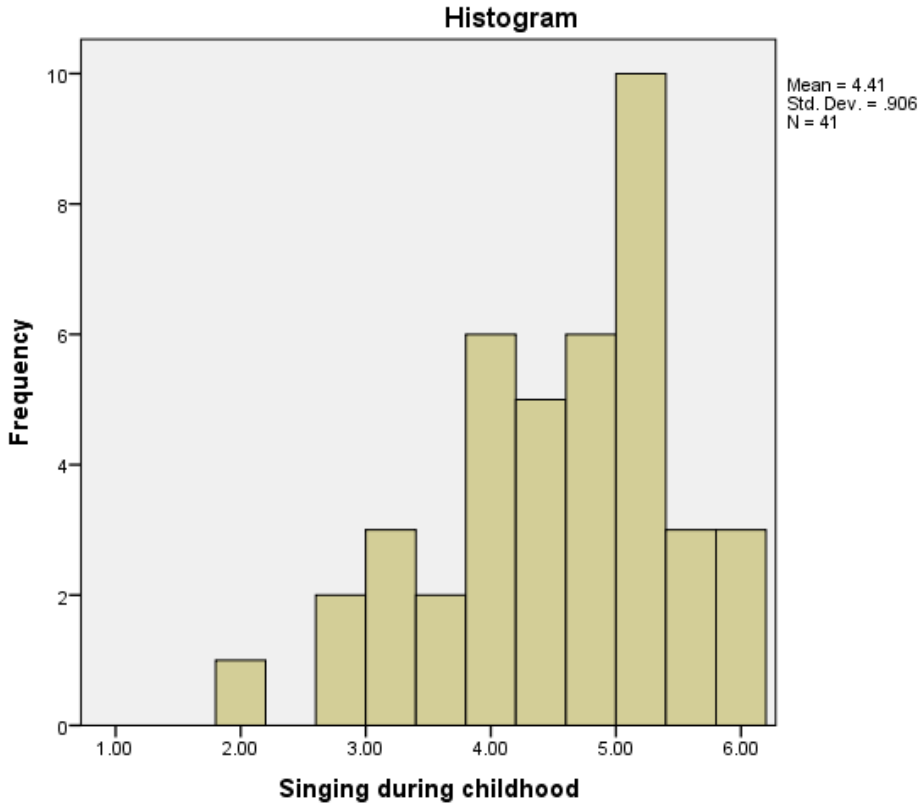


Table 2 Correlations between the performances of all songs, the quality of the voice and the participants' *singing during childhood*

		Total Mean of all 3 Songs	Quality Mean of all 3 Songs	Singing during childhood
Total Mean of all 3 Songs	Pearson Correlation	1	.889**	.322*
	Sig. (1-tailed)		.000	.020
	N	41	41	41
Quality Mean of all 3 Songs	Pearson Correlation	.889**	1	.341*
	Sig. (1-tailed)	.000		.015
	N	41	41	41
Singing during childhood	Pearson Correlation	.322*	.341*	1
	Sig. (1-tailed)	.020	.015	
	N	41	41	41

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

7.2. Concluding remarks

As demonstrated above, the multi-item scales illustrate some interesting findings of the character traits, beliefs or assumptions of the participants. However, there are four crucial aspects which might be worth mentioning in the final analysis. One is the multi-item *concept mood* as most participants are convinced that singing improves the mood not only in the individual but also within a group. This demonstrates two interesting ideas related to previous chapters. One is about the origin of music as there are hypotheses which claim that singing in ancient tribes was important for cementing social bonds but it also leads to a shared mood state (Patel 2008: 370). Thus the findings indicate that the participants believe that singing can positively influence the environment and that it ensures a good mood within a group. Although this does not fully explain whether music originated as it helped cement social bonds, it might be important to a second aspect discussed in chapter 5.5. which refers to teaching foreign language classes. Salcedo (2010: 21), for instance, argues that singing reduces anxiety in second language classes and Kreutz, Bongard, Rohrmann, Hodapp and Grebe (2004: 623) state that singing in a group has a positive influence on the members' emotions. The latter notion is also supported by the participants in this survey. Therefore, it could be argued that singing can facilitate second language acquisition also in an indirect way as it may help to achieve a low anxiety condition in the foreign language classes. This is not only important to the language learners as this condition allows them to be receptive to the new language input but also for their speaking abilities as singing seems to reduce shyness within a group.

The second important finding of the multi-item scales concepts is the correlation between how well the singers of this survey sing and their singing behaviour during their childhood, $r = .32$, p (one-tailed) $< .05$. This makes singing comparable to second language acquisition and musical expertise as the age of onset in all three faculties seem to have an effect on the proficiency someone can reach. Although it is rather difficult to find out when exactly the participants started to sing, it can be concluded that the statements for the participants' singing behaviour during childhood, as contained in the appendix A.2., demonstrate that those who sang more often during childhood seem to be more professional singing performers as adults.

A similar effect has been found between the quality of the voice and singing during childhood as they show a significant correlation, $r = .34$, p (one-tailed) $< .05$. Hence, it seems that the more the participants sang during their childhood the better their resonance and quality of their voice is.

The fourth interesting result of this investigation is the negative correlation between the singing performances and the participants' desires to become famous. Hence, the more the singers in this survey desired to become famous the worse they performed, $r = -.34$, p (two-tailed) $< .05$. Furthermore, the negative correlation between the songs which had to be repeated and their desires to become famous was even stronger, $r = -.40$, p (one-tailed) $<.01$. Although there is no clear explanation for this finding at the present moment, future investigations might reveal interesting reasons why the desire to become famous has a negative effect on the singing performances.

Although not all multi-item scales concepts show correlations with the participants' singing performances, they illustrate some interesting findings. In future research the whole questionnaire could be improved by being targeted to another test group who do generally not sing. There might be differences between the participants of this survey and another test group. However, the aim of this questionnaire was to find out whether there are some specific characteristics which might correlate with the participants' singing performances. Furthermore, as investigations in singing are rather rare, the questionnaire might help future research to select which factors might be valuable for a more detailed analysis such as singing during childhood and the role of becoming famous. The following pages will demonstrate the findings of the second part of the test.

8. Results of the second part of the test

8.1. *AMMA test* and the pronunciation of second languages

As demonstrated in chapter 4.6., several empirical surveys show that there is a strong relationship between musical talent and the pronunciation of second languages (Nardo & Reiterer 2009; Milovanov 2009; Pastuszek-Lipinska 2008). In this survey the results are in concordance with previous research and indicate that those who were musically

gifted, according to the *AMMA test*, were also remarkably better in the pronunciation of second languages in Hindi and English. The overall mean of all the pronunciation tasks (*pronunciation mean*) which included the imitation of a Hindi and an English sentence as well as the reading of the fable *The North Wind and the Sun* shows a significant correlation with the total score of the *AMMA test*, $r = .43$, p (one-tailed) $< .01$. The total *AMMA test* is comprised of all discrimination tasks as explained in chapter 8.1.

The individual sub scores of the musicality test (*AMMA test*) and the different pronunciation tasks demonstrate further interesting findings. Although both, a high ability to discriminate tonal differences as well as a high proficiency in detecting rhythmic changes in paired musical statements show a high correlation with the pronunciation of second languages, the rhythmic component correlates more strongly, $r = .46$, p (one-tailed) $< .01$ while the tonal discrimination ability is slightly lower, $r = .38$, p (one-tailed) $< .01$.

The individual tasks which measured the pronunciation skills of the participants were to repeat sentences in Hindi and English as well as read the fable *The North Wind and the Sun* aloud as stated before. These speech imitation tasks reveal further interesting aspects supporting the thesis that detecting rhythmic changes in paired musical statements seems to be a better predictor for a good pronunciation in foreign languages than the ability to discriminate tonal changes. Hence, the singers' rhythmic discrimination performances of the musicality test (*AMMA test*) show a significant correlation between their pronunciation skills in Hindi $r = .38$, p (one-tailed) $< .01$, the English sentence $r = .37$, p (one-tailed) $< .01$ and the English fable $r = .36$, p (one-tailed) $< .05$. This, however, was different for the tonal discrimination task of the *AMMA test*. The correlation between the participants' ability to detect tonal changes and their pronunciation skills were slightly lower or not given. While there is no correlation to the reading task, *The North Wind and the Sun*, there is one to the Hindi imitation, $r = .32$, p (one-tailed) $< .05$ and to the repetition of the English sentence, $r = .35$, p (one-tailed) $< .05$.

Based on this investigation, it can be concluded that those who have a high ability to detect rhythmic changes in music are also better in the pronunciation of second languages. Furthermore, the findings also supports that the perceptual skills of musicians seem to have a positive transfer effect on language perception as proposed by

Kraus and Chandrasekaran (2010: 599-600), Schön, Magne and Besson (2004: 347), and Thompson, Schellenberg and Husain (2004: 47). However, it could also be argued that it does not only have a positive effect on the perception but also on their performance as the musically gifted participants in this survey showed a very good performance in repeating the Hindi sentence, a language they were never exposed to. Thus there seems to be a strong connection between the motor ability to produce new utterances and their perception.

As mentioned in chapter 3.2., the ability to segment speech is highly important as especially beginners of language learners fail to understand where one word begins or ends (Patel 2008: 148). However, as the musically gifted people in this survey show a better performance in adopting foreign language pronunciation, they may not rely on the segmentation of words when they repeat short sentences of a new language but more on the musical aspects of language as stated by Milovanov (2009: 341). Musically gifted people may be advantaged when they have to repeat phrases in foreign languages not only as they have a good sense for rhythm but they are also trained in remembering sounds and thus seem to possess a good working memory as well as a good phonological store. The following paragraphs demonstrate that there was a significant correlation between the working memory of the participants and all tasks in which they had to repeat sentences or parts of a song.

8.2. Working memory explains innate talent of musicality, foreign language pronunciation and singing?

Baddeley (2003: 829) argues that the short term memory is important for storing sounds while he states that meaning is more relevant in the long term memory. In this survey, the participants with a good short term memory were also very good at imitating Hindi with a significant correlation, $r = .73$, p (one-tailed) $< .01$. The *working memory test* is comprised of two different tasks in which the participants had to repeat strings of numbers either forwards or backwards. However, the *working memory test* also shows a high correlation to the musicality test (*AMMA total*), $r = .49$, p (one-tailed) $< .01$. The same is true for the singing task *song 2* in which the participants had to repeat a song they had never heard before, as there is also a significant correlation with the working memory, $r = .45$, (one-tailed) $< .01$. This leads to the conclusion that these tests are

highly dependent on good memory skills and they support the notion that the short term memory is more important for storing sounds or remembering acoustic displays as proposed by Baddeley (2003: 829). Kraus and Chandrasekaran (2010: 600) also state that "music and speech processing require similar memory and attention skills" which explains the strong correlation between the working memory skills of the participants and their musicality test (*AMMA test*). According to this study, it is also true for singing *song 2* which included the spontaneous repetition of a part of an unknown song.

However, the strong correlation between musicality (*AMMA test*), the *working memory test* and *song 2* might also be a result of the nature of the tests as they all share that the participants had to respond to something after hearing it the third time. Therefore, the whole investigation included also other tasks which were not aiming at spontaneous repetition tasks but on something which was practiced by everybody such as the song *Happy Birthday*. Thus it is worth to look at the correlations of the individual singing tasks first. Table 3 below illustrates that *song 2* and *song 3*, the spontaneous singing tasks, show lower correlation to the song *Happy Birthday*.

Table 3 Correlations between the individual singing tasks

		Total Mean Song 2 (repeating)	Total Mean Song 3 (repeating)	Total Mean Song "Happy" (performing)
Total Mean Song 2 (repeating)	Pearson Correlation	1	.718**	.620**
	Sig. (1-tailed)		.000	.000
	N	41	41	41
Total Mean Song 3 (repeating)	Pearson Correlation	.718**	1	.438**
	Sig. (1-tailed)	.000		.002
	N	41	41	41
Total Mean Song "Happy" (performing)	Pearson Correlation	.620**	.438**	1
	Sig. (1-tailed)	.000	.002	
	N	41	41	41

**. Correlation is significant at the 0.01 level (1-tailed).

Furthermore, table 4 below demonstrates that there is a medium correlation between the performances of *Happy Birthday* and the musicality test (*AMMA test*), $r = .35$, p (one-tailed) $< .05$, as well as a lower correlation with the *working memory test* of the

participants although this correlation is not significant when a threshold of $p < .017$ ($p < .05/3$) is applied after Bonferroni correction[16]. The performances of *Happy Birthday* still highly correlate to the *song 2*, one of the spontaneous singing tasks. Another interesting finding is that the Hindi imitation task shows no correlation with the singing performance of *Happy Birthday* which indicates that *Happy Birthday* is entirely different compared with spontaneous singing and speech imitation tasks and it seems to be lower related to the musicality test (*AMMA test*).

Table 4 Correlations between the performances of the song *Happy Birthday*, the working memory skills, the musicality test *(AMMA Total*) and the Hindi speech imitation task

		Total Mean Song "Happy" (performing)	AMMA Total	Working memory Total (F+B)	Total Mean Song 2 (repeating)	Hindi Sentence imitation
Total Mean Song "Happy" (performing)	Pearson Correlation	1	.349*	.288*	.620**	.158
	Sig. (1-tailed)		.013	.034	.000	.161
	N	41	41	41	41	41
AMMA Total	Pearson Correlation	.349*	1	.489**	.433**	.357*
	Sig. (1-tailed)	.013		.001	.002	.011
	N	41	41	41	41	41
Working memory Total (F+B)	Pearson Correlation	.288*	.489**	1	.453**	.730**
	Sig. (1-tailed)	.034	.001		.001	.000
	N	41	41	41	41	41
Total Mean Song 2 (repeating)	Pearson Correlation	.620**	.433**	.453**	1	.482**
	Sig. (1-tailed)	.000	.002	.001		.001
	N	41	41	41	41	41
Hindi Sentence imitation	Pearson Correlation	.158	.357*	.730**	.482**	1
	Sig. (1-tailed)	.161	.011	.000	.001	
	N	41	41	41	41	41

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

[16] A Bonferroni correction is applied when multiple comparisons are made in order to control the error rate.

It seems to be undoubtedly true that a good working memory is essential for speech imitation and it predicts that someone can remember and learn songs rather fast. However, the *Happy Birthday* performances of this survey show that singers with lower working memory skills as well as lower speech imitation abilities can also be good singers of a familiar song. Thus it can be assumed that the performance of *Happy Birthday* might rely on different memory skills. Again it is worth to turn to a previous chapter which deals with aphasia. Stahl, Kotz, Henseler, Turner and Geyer (2001: 3083) state "the lyric production in non-fluent aphasics may be strongly mediated by long term memory and motor automaticity, irrespective of whether lyrics are sung or spoken" (Stahl, Kotz, Henseler, Turner & Geyer 2001: 3083). They concluded this assumption as they established that aphasics could more easily produce the original words of familiar songs than new ones. This indicates that familiar songs seem to leave a deep imprint in our minds and thus can be more easily produced as well as performed than something which is new. This might also be one reason why the performances of the *Happy Birthday*s in this survey seem to be different than the other singing tasks. Although it could be argued that it is not an outstanding finding that *Happy Birthday* seems to be stored in the long term memory or in any other kind of store[17], it contains one key element, namely how talents are defined.

Hence, talent is referred to as the ability to acquire something spontaneously and rapidly and thus much faster than expected such as in this survey repeating an unknown language very well for language talent, or being able to discriminate sounds as well as rhythm in paired musical statements for musical talent, or to imitate and remember songs in a very short period of time for singing talent. What they all have in common is that they refer to the performance of something which is done without very much practice. Thus, this is what is usually referred to as innate talents – talents which people are born with and therefore they are often genetically explained. These talents might be innate or acquired early during childhood.

The performances of *Happy Birthday* in this sample, however, demonstrate that singers can make good performances without possessing an outstanding short term memory or musical ability and thus illustrates that singing familiar songs is also possible for less

[17] It is still unclear whether there exists a separate store for memorising songs as this is discussed in a highly controversial way.

talented[18] singers as well. Hence, the *Happy Birthday* performances can be seen as a product of nurture. However, as stated in chapter 4.4., some findings suggest that abilities such as "harmonic perception is developmental in nature" and children who receive formal instructions do not develop faster (Costa-Giomi 2003: 482). Thus, infants who received formal instructions demonstrated that their performances became better (Costa-Giomi 2003: 482). This indicates that there might be innate and developmental factors which cannot be influenced by nurture but training helps improve the performances of something in which someone has been already successful at before. As in this survey, the participants were all successful at learning *Happy Birthday*. This demonstrates two crucial aspects. First of all, it shows that everybody has the potential to sing songs and not only the talented ones, while the second aspect relates to how human beings are tested. For instance, a test in school lasts one hour and within this hour the pupils have to fulfil certain tasks in order to receive a pass grade. Thus tests are comprised of how well and quickly someone can show his or her skills. Therefore, people have to demonstrate their talent and their acquired skills during a test condition. When considering that *Happy Birthday* was performed by the "less talented" ones also very well it is quite obvious that time pressure, as during a test condition, has a negative impact on the results as it was the case for the spontaneous singing and speech imitation tasks in this survey. Hence this implies that the way things are tested needs to be rethought.

8.3. *Working memory* or *sound memory*?

The working memory tests of this survey show that there are strong correlations with all the tasks the participants had to repeat after they had heard them for the third time. This was true for the speaking and singing tasks as well as for the *AMMA test*. As discussed in the paragraphs before, someone is considered to be a language talent if he or she can imitate a language rather quickly. Thus those who performed very well in the imitation of the Hindi sentence in this survey would be classified as pronunciation talents or speech imitation talents. On the one hand this seems to depend on their extraordinary

[18] The talent of this survey refers to the measurements of this investigation. There might be different ones which would use other measurements. Furthermore, it has to be clarified that "talent" is a social construct and thus a rather subjective measurement.

memory skills but on the other hand also on their flexibility to adapt and produce sounds. The latter will be discussed in the last chapter.

To turn to the working memory first, the table below illustrates that the working memory correlates with the Hindi performance of the participants most strongly, r = .73, p (one-tailed) < .01. However, the working memory of the participants also shows a high correlation with *song 2*, the part of the song which had to be repeated, r = .45, p (one-tailed) < .01. In addition, there is also a strong correlation between the working memory total and the *non-words working memory test*, r = .52, p (one-tailed) < .01.[19] The correlations are all represented in table 5 below.

Table 5 Correlations between *working memory total*, *Hindi imitation*, *song2*, *non words repetition*.

		Working memory Total (F+B)	Hindi imitation	Total Mean Song 2 (repeating)	Working memory non words
Working memory Total (F+B)	Pearson Correlation	1	.730**	.453**	.523**
	Sig. (1-tailed)		.000	.001	.000
	N	41	41	41	41
Hindi imitation	Pearson Correlation	.730**	1	.482**	.437**
	Sig. (1-tailed)	.000		.001	.002
	N	41	41	41	41
Total Mean Song 2 (repeating)	Pearson Correlation	.453**	.482**	1	.201
	Sig. (1-tailed)	.001	.001		.104
	N	41	41	41	41
Working memory non words	Pearson Correlation	.523**	.437**	.201	1
	Sig. (1-tailed)	.000	.002	.104	
	N	41	41	41	41

**. Correlation is significant at the 0.01 level (1-tailed).

Further information about the strong relationship between the working memory of the participants and their speech imitation performance as well as their spontaneous singing abilities are demonstrated with a t-test, as shown in the tables 6 and 7 below. In the t-test the best and the worst performances of the working memory test are divided into two groups as indicated in the table 6 by *best* and *worst*. The aim of this test is to find

[19]The *non-words working memory test* consists of words with a German-like phonetic quality. However, they have no meaning. The participants had to repeat those words. For further information consult chapter 6.8.

out whether a good working memory also predicts a good language and singing imitation performance as well as a high musicality (*AMMA test*).

On average, the participants with the best working memory performances received also higher scores in their *Hindi imitation performances* (M = 5.46, SE = .34) than those participants with the worst working memory performances (M = 3.21, SE = .25). This difference is significant $t(21) = 5.37$, $p < 0.01$; it shows a high effect $r = .76$. The same is also true for the other imitation tasks, *the English repeating,* the singing performance *of song 2, the non words working memory* and the musicality test (*AMMA test*) as indicated below. Although this is also true for the singing task *Happy Birthday* and the reading of the fable *The North Wind and the Sun,* table 7 shows that they are less significant than the spontaneous imitation tasks.

Table 6 t-test – Group Statistics

Working memory total (F+B) Groupcode		N	Mean	Std. Deviation	Std. Error Mean
Hindi imitation	best	11	5.455	1.126	.340
	worst	12	3.214	.867	.250
English Sentence repeating	best	11	7.338	1.088	.328
	worst	12	5.131	1.825	.527
Total Mean Song 2 (repeating)	best	11	7.070	.887	.267
	worst	12	5.595	.740	.213
AMMA Total	best	11	64.000	8.355	2.519
	worst	12	53.750	7.875	2.273
Working memory non words	best	11	5.636	.674	.203
	worst	12	4.083	.793	.229
Total Mean Song "Happy" (performing)	best	11	6.464	.841	.254
	worst	12	5.832	.797	.230
English Text reading	best	11	7.442	.358	.108
	worst	12	6.274	1.608	.464

Table 7 t-test – Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	r	Sig. (1-tailed)	Mean Diff.	Std. Error Diff.
Hindi imitation	Equal variances assumed	.658	.426	5.373	21.00	.761	.000	2.240	.417
	Equal variances not assumed			5.311	18.77	.775	.000	2.240	.422
English Sentence repeating	Equal variances assumed	3.024	.097	3.479	21.00	.605	.001	2.207	.634
	Equal variances not assumed			3.555	18.18	.640	.001	2.207	.621
Total Mean Song 2 (repeating)	Equal variances assumed	1.258	.275	4.349	21.00	.688	.000	1.476	.339
	Equal variances not assumed			4.313	19.58	.698	.000	1.476	.342
AMMA Total	Equal variances assumed	.039	.846	3.029	21.00	.551	.003	10.250	3.384
	Equal variances not assumed			3.021	20.54	.555	.003	10.250	3.393
Working memory non words	Equal variances assumed	.267	.611	5.036	21.00	.740	.000	1.553	.308
	Equal variances not assumed			5.073	20.90	.743	.000	1.553	.306
Total Mean Song "Happy" (performing)	Equal variances assumed	.002	.968	1.851	21.00	.374	.039	0.632	.342
	Equal variances not assumed			1.846	20.57	.377	.040	0.632	.343
English Text reading	Equal variances assumed	8.829	.007	2.352	21.00	.457	.014	1.168	.497
	Equal variances not assumed			2.451	12.19	.575	.015	1.168	.476

As demonstrated, speech and singing imitation seem to rely on good working memory skills as well as on a good phonological store. The argument that in the short term memory sounds are more important than other elements seems to be supported by the findings of this survey. However, there are also further interesting aspects which relate to anxieties in language classes. For instance, Horwitz (1986: 126) argues that "[a]nxious language learners also complain of difficulties discriminating the sound and structure of a target language message". Thus it could be assumed that the failure to acquire foreign languages depends either on a psychological problem such as classroom anxiety or on an underdeveloped working memory. However, as all healthy human

beings master to acquire their mother tongue, they should also be able to hold sounds in their phonological store in order to learn new words. Thus, the explanation that someone's phonological working memory is underdeveloped is less likely to be true than the anxiety factor. The latter, however, seems to block that new words are remembered and it is also said that " [a]nxiety contributes to an affective filter […] which makes the individual unreceptive to language input; thus the learner fails to 'take in' the available target language messages and language acquisition does not progress" (Horwitz 1986: 127). There is also empirical evidence that in stressful situations people show deficits of their verbal short term memory (Bremner, Randall, Scott, Capelli, Delaney, McCarthy & Charney 1995: 98). This, however, demonstrates that the short term memory seems to be a *sound memory*. This would also explain why in this survey, the participants with a good working memory also performed very well in the language imitation tasks in Hindi as well as in English, in repeating new songs, in repeating words which made no sense *(non-words working memory test* as explained in chapter 6.8.), as well as in discriminating rhythmic or tonal changes in paired musical statements (*AMMA test*). Hence good musicians and singers seem to possess a better *sound memory*.

8.4. Singing, the musicality test, the short term memory and the pronunciation of foreign languages

The most important research question of this survey was to establish whether singing also has a positive correlation with the pronunciation of second languages. As shown in the analysis before, singing has a strong correlation with the pronunciation of foreign languages. In the table below it is indicated that singing correlates highly with the *pronunciation mean*, $r = .58$, p (one-tailed) $< .01$. The *singing total mean* is comprised of all singing tasks and the *pronunciation mean* includes all pronunciation tasks in English and Hindi. Furthermore, it is also demonstrated that the musicality test (*AMMA test*) correlates highly with the *pronunciation mean* as well, $r = .43$, p (one-tailed) $< .01$.

Table 8 Correlations between pronunciation of second languages, singing and the musicality test

		Pronunciation Mean	Total Mean of all 3 Songs	AMMA Total
Pronunciation Mean	Pearson Correlation	1	.581**	.426**
	Sig. (1-tailed)		.000	.003
	N	41	41	41
Total Mean of all 3 Songs	Pearson Correlation	.581**	1	.379**
	Sig. (1-tailed)	.000		.007
	N	41	41	41
AMMA Total	Pearson Correlation	.426**	.379**	1
	Sig. (1-tailed)	.003	.007	
	N	41	41	41

**. Correlation is significant at the 0.01 level (1-tailed).

Although both musical talent as well as singing correlate highly with the pronunciation of foreign languages, singing seems to be a better predictor for good foreign language pronunciation. This is an important finding as it indicates that singing seems to be closer to speaking as it is to musicality. This shows singing from a different light as it is usually associated to be related to music as for instance, *The National Standards of Arts and Education* states that one of "[t]he nine content standards in music [is] singing" (Jaffurs 2004: 17). Thus the latter classification should be revised according to this survey as it is more likely that singing is a subcategory of speech or from an evolutionary standpoint speech is a subcategory of singing.

The reason why singing seems to be a better predictor for good second language pronunciation may depend on the nature of singing as well as on singing instructions. Hence, singing exercises include both music instructions and vocal exercises. Thus singers can be compared to artists and sound imitation professionals in general. For instance, singing lessons include exercises for the jaw, the larynx, the tongue and all other related areas which are responsible for producing sounds. The aim is to be as flexible as possible which is essential for immediate sound alterations. This might also be one reason why singers are very good in adapting to foreign language pronunciation as they know how to use their vocal apparatus in order to produce specific sounds. This seems to be quite similar to what Nasir and Ostry (2008) argue with regards to speech production as they claim that the latter "[…] must be understood as both as an auditory and a somatosensory task". Hence Nasir and Ostry (2008: 1) established that in the

absence of an auditory feedback people still corrected their speech movement after a robotic device displaced their jaw. Thus the motor commands seem to be closely connected to the perceptive systems. In another investigation Nasir and Ostry (2009: 20470) demonstrated that the perception of words changed after the participants were trained in a "[…] force-field learning task […] in which a robotic device applied a mechanical load to the jaw as subjects repeated aloud test utterances […]". The result indicates that those participants who adapted the new motor commands in speech also showed a perceptual shift while those, who did not adapt, did not (Nasir & Ostry 2009: 20473). This also seems to be a plausible explanation why singing facilitates second language pronunciation as these processes might be the same for speech and singing. Thus it is also very likely that singing exercises improve speech production especially in the field of foreign pronunciation as singers are rather flexible to produce new utterances. As singing exercises include the training of the vocal apparatus this may have also an effect on singers' perception and this could possibly increase the ability to produce unexpected and new sound categories.

One further aspect which may show that singing seems to be a better predictor for second language pronunciation than musicality might rely on the proprioception. Hence, singing and speaking share one crucial aspect which playing a musical instrument does not. The latter is played with the fingers or with other parts of the body depending on its kind and the outcome, the music is produced outside of the body while singing and speaking are generated inside the body. Thus the proprioception of singing and speaking is quite different to playing an instrument. This again supports the finding that singing is a subcategory of speech or speech a subcategory of singing.

Finally, in a multiple regression it can be demonstrated that there are three crucial aspects which explain the variability in foreign language pronunciation in this survey. In table 10 is shown that this model can explain 65 per cent[20] of the pronunciation performances *(pronunciation mean*) with the working memory skills of the participants (*working memory test*) their singing abilities (*singing total mean*) as well as with their educational backgrounds[21]. The multiple regression indicates that a higher performance

[20] The number of the R Square has been multiplied with 100. The column *R Square* in table 10 shows "how much of the variability is accounted for by the predictors" (Field 2009: 235).
[21] The *education score* was based on the participants' professions and educational background. For instance, someone who was a florist received the score 1, whereas a 2 was given for the 'Matura' and a 3 for a university degree.

in the latter mentioned predictors will very likely result in a higher performance in foreign language pronunciation. The tables below demonstrate the findings. Table 9 shows the high correlations between the predictors under consideration while table 10 demonstrates the predictors in a multiple regression. In table 11 it is demonstrated that all *b*-values have a positive relationship between the predictor and the outcome.

Table 9 Correlations between the pronunciation of second languages, the working memory and the educational background

		Pronunciation Mean	Working memory Total (F+B)	Total Mean of all 3 Songs	Education Score
Pronunciation Mean	Pearson Correlation	1	.685**	.581**	.454**
	Sig. (1-tailed)		.000	.000	.001
	N	41	41	41	41

**. Correlation is significant at the 0.01 level (1-tailed).

Table 10 Multiple regression demonstrates the three predictors which can explain 65 per cent the pronunciation in foreign languages

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.685[a]	.469	.455	.85251	
2	.768[b]	.590	.568	.75937	
3	.806[c]	.650	.622	.71040	

	Change Statistics					
Model	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.469	34.449	1	39	.000	
2	.120	11.153	1	38	.002	
3	.061	6.419	1	37	.016	1.830

a. Predictors: (Constant), Working memory Total (F+B)
b. Predictors: (Constant), Working memory Total (F+B), Total Mean of all 3 Songs
c. Predictors: (Constant), Working memory Total (F+B), Total Mean of all 3 Songs, Education Score
d. Dependent Variable: Pronunciation Mean

Table 11 Multiple regression: coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.342	.700		1.918	.063
	Working memory Total (F+B)	.284	.048	.685	5.869	.000
2	(Constant)	-.671	.867		-.774	.444
	Working memory Total (F+B)	.225	.047	.543	4.832	.000
	Total Mean of all 3 Songs	.464	.139	.375	3.340	.002
3	(Constant)	-1.021	.823		-1.241	.222
	Working memory Total (F+B)	.221	.044	.532	5.062	.000
	Total Mean of all 3 Songs	.353	.137	.286	2.578	.014
	Education Score	.481	.190	.264	2.534	.016

a. Dependent Variable: Pronunciation Mean

9. Conclusion

This diploma thesis has demonstrated that investigations in singing seem to be quite relevant to second language acquisition, especially in the field of pronunciation. This has been demonstrated throughout this investigation, but especially with the multiple regression in the last chapter where all predictors which showed a high correlation to the *pronunciation mean,* were entered in a stepwise multiple regression. The predictors were the *AMMA test*, the *educations score, singing total mean* and the *non words working memory*. Thus, despite their high correlations with the pronunciation score, musicality (*AMMA test*) and the *non words working memory test* were not found to be relevant for explaining the pronunciation abilities in multiple regression. Thus, the working memory skills (short term memory), the singing abilities and the educational background are those factors which can explain 65 percent of the variance of the pronunciation performances in this survey. Hence, singing seems to contain some key elements which facilitate foreign language pronunciation. One of this might be vocal flexibility which is one of the most important skills singers aim at. Hence, this allows

them to adapt, produce and alter sounds more effectively, but also to vary in intonation. This might be one reason why singing seems to be a better predictor than musicality as good singers might have a larger vocal motor repertoire. Thus, this could also have an effect on their sound perception, resulting in more plasticity for being open to new and unexpected sound combinations. This seems to be plausible as Nasir and Ostry (2009) detected that a change in the motor commands of speech production also leads to perceptual changes of utterances. Thus, singers may be able to adapt to using new sound combinations more quickly as their perceptive system is trained to be open to new and unusual sounds as a side effect of their vocal flexibility. Although further research is necessary, these findings indicate that singing seems to be closer to speech than it is to music. Thus, singing as a subcategory of music needs to be revised according to this survey.

However, this thesis has also shown that scientific research in singing is rather rare and that there is a serious demand for further investigation as singing for scientific purposes has been largely ignored. However, singing seems to hold many undiscovered secrets which might reveal the relationship between music and language. As this survey also demonstrated that short term memory has an influence on the pronunciation of second languages, it has also been mentioned that singing might be a very useful tool for storing information in long term memory. This has been known since ancient times in which songs were used to pass on information from generation to generation. However, today it is still unclear where and how song texts are stored as explained in chapter 5.2., which deals with aphasia. Hence, for most researchers in this field it is quite interesting that people suffering from brain lesions can still generate words of familiar songs while they cannot produce those in a spoken condition. Thus, it is believed that singing is one aspect which facilitates speech recovery. Future research might explain several aspects discussed in this thesis for which no explanations are currently available. However, this investigation has been one of the first attempts to explore singing and its relation to the pronunciation of second languages in more detail.

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A. Appendix

A.1. Reliability analysis

A.1.1. Concept *music's function for sexual courtship*

Table 12 Reliability statistics – *music's function for sexual courtship*

Cronbach's Alpha	N of Items
.607	4

Table 13 Item-total statistics – *music's function for sexual courtship*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 2	11.63	5.338	.338	.577
Multi Item Statement 3	9.54	6.105	.509	.497
Multi Item Statement 4	10.68	5.222	.293	.625
Multi Item Statement 5	11.83	4.845	.499	.446

A.1.2. Concept *extroversion*

Table 14 Reliability statistics – *extroversion*

Cronbach's Alpha	N of Items
.685	3

Table 15 Item-total statistics – *extroversion*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 6	7.10	4.290	.538	.538
Multi Item Statement 7	8.05	4.998	.410	.697
Multi Item Statement 8	7.39	4.144	.552	.518

A.1.3. Concept *income*

Table 16 Reliability Statistics – *income*

Cronbach's Alpha	N of Items
.630	4

Table 17 Item-total statistics – *income*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 11	8.05	7.698	.499	.490
Multi Item Statement 12	9.49	10.056	.366	.590
Multi Item Statement 14	9.95	11.248	.324	.616
Multi Item Statement 15	8.44	9.102	.464	.519

A.1.4. Concept *singing improves the mood*

Table 18 Reliability statistics – *singing improves the mood*

Cronbach's Alpha	N of Items
.771	5

Table 19 Item-total statistics – *singing improves the mood*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 16	21.17	5.345	.568	.720
Multi Item Statement 17	21.22	5.276	.622	.699
Multi Item Statement 18	20.88	5.210	.668	.682
Multi Item Statement 19	20.63	6.738	.409	.769
Multi Item Statement 20	20.78	6.176	.451	.758

A.1.5. Concept *singing for becoming famous*

Table 20 Reliability statistics – *singing for becoming famous*

Cronbach's Alpha	N of Items
.709	5

Table 21 Item-total statistics – *singing for becoming famous*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 21	18.59	6.499	.610	.594
Multi Item Statement 22	18.93	7.870	.404	.686
Multi Item Statement 23	18.54	6.155	.611	.593
Multi Item Statement 24	17.29	9.112	.366	.700
Multi Item Statement 25	17.59	8.299	.367	.698

A.1.6. Concept *singing during childhood*

Table 22 Reliability statistics – *singing during childhood*

Cronbach's Alpha	N of Items
.614	5

Table 23 Item-total statistics – *singing during childhood*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 26	17.22	14.226	.485	.508
Multi Item Statement 27	18.39	13.244	.336	.587
Multi Item Statement 28	17.10	14.740	.536	.500
Multi Item Statement 29	17.80	15.511	.240	.625
Multi Item Statement 30	17.78	14.276	.334	.579

A.1.7. Concept *openness to experience*

Table 24 Reliability statistics – *openness to experience*

Cronbach's Alpha	N of Items
.790	6

Table 25 Item-total statistics – *openness to experience*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Multi Item Statement 31	23.95	14.498	.600	.747
Multi Item Statement 32	24.46	12.905	.633	.734
Multi Item Statement 33	24.83	14.045	.425	.793
Multi Item Statement 34	23.73	14.101	.691	.728
Multi Item Statement 35	23.80	14.461	.625	.742
Multi Item Statement 36	24.22	14.876	.377	.800

A.2. Concepts and statements

Table 26 Concept and statements – *music's function for sexual courtship*

Music's function for sexual courtship	
Multi Item Statement 1	Viele Menschen sagen, dass gute Sänger und Sängerinnen eine erotische Ausstrahlung haben.
Multi Item Statement 2	Es ist allgemein bekannt, dass berühmte Sänger häufiger ihre Partner wechseln als der Durchschnittsmensch.
Multi Item Statement 3	Bekannte Sänger und Sängerinnen haben viele Verehrerinnen bzw. Verehrer.
Multi Item Statement 4	Viele bekannte ältere Sänger und ältere Sängerinnen finden leichter jüngere Partner als der Durchschnittsmensch.
Multi Item Statement 5	Als Sänger findet man leichter einen Partner als normale Menschen

Table 27 Concept and statements – *extroversion*

Extroversion	
Multi Item Statement 6	Vor Menschen vorzutragen, fällt mir nicht schwer.
Multi Item Statement 7	Beim Präsentieren oder Vorsprechen werde ich sehr oft nervös.
Multi Item Statement 8	Vor Leuten zu singen, ist für mich kein Problem.
Multi Item Statement 9	Wenn mich jemand auffordern würde, eine Rede zu halten, würde ich nicht zögern.
Multi Item Statement 10	Wenn ich beim Tanzen auffalle, stört mich das nicht.

Table 28 Concept and statements – *income*

Income	
Multi Item Statement 11	Es ist mir nicht fremd, mehrmals im Jahr auf Urlaub zu fahren.
Multi Item Statement 12	Wenn ich mir Kleidung kaufe, bevorzuge ich Markenkleidung.
Multi Item Statement 13	In bin es von Kindheit an gewohnt, in einer großen Wohnung/Haus zu wohnen.
Multi Item Statement 14	Mir ist ein großes Auto lieber, obwohl es teurer ist.
Multi Item Statement 15	Ich gehe häufig ins Restaurant essen.

Table 29 Concept and statements – *singing improves the mood*

Singing improves the mood	
Multi Item Statement 16	Wenn ich singe, vergesse ich meine schlechte Laune.
Multi Item Statement 17	Wenn ich singe, vergesse ich viele Dinge die mir unangenehm sind.
Multi Item Statement 18	Gemeinschaftliches Singen hebt die Stimmung in der Gruppe.
Multi Item Statement 19	Singen wirkt entspannend auf viele Menschen.
Multi Item Statement 20	Mit Gesang kann man die Umwelt positiv beeinflussen.

Table 30 Concept and statements – *singing for becoming famous*

Singing for becoming famous	
Multi Item Statement 21	Wenn mir die Möglichkeit geboten würde, berühmt zu werden, würde ich nicht zögern.
Multi Item Statement 22	Es muss ein gutes Gefühl sein, wenn man von vielen Menschen persönlich gekannt wird.
Multi Item Statement 23	Von vielen Menschen begehrt zu werden, ist sicherlich ein tolles Gefühl.
Multi Item Statement 24	Auf einer Bühne singen zu können, ist eine sehr schöne Erfahrung.
Multi Item Statement 25	Wenn ich die Möglichkeit hätte, in einer Oper/Musical/Band mitzusingen würde ich es freudig annehmen.

Table 31 Concept and statements – *singing during childhood*

Singing during childhood	
Multi Item Statement 26	Als ich ein Kind war, habe ich mir keine Gedanken gemacht, wenn ich gesungen habe. Ich sang einfach drauf los.
Multi Item Statement 27	Mein Kindheitstraum war es, ein berühmter Sänger zu werden.
Multi Item Statement 28	Als Kind habe ich gerne in einem Chor, mit Freunden oder zu festlichen Anlässen wie Weihnachten gesungen.
Multi Item Statement 29	Als Kind habe ich mir nie Gedanken gemach, ob das was ich singe, richtig oder falsch klingt.
Multi Item Statement 30	Wenn ich als Kind die Möglichkeit hatte, habe ich in der Kirche laut mitgesungen?

Table 32 Concept and statements – *openness to experience*

Openness to experience	
Multi Item Statement 31	Mich begeistern die Motive, die ich in der Natur und in der Kunst finde.
Multi Item Statement 32	Poesie beeindruckt mich wenig.
Multi Item Statement 33	Ich probiere oft neue und fremde Speisen aus.
Multi Item Statement 34	Wenn ich Bücher lese oder ein Kunstwerk betrachte, empfinde ich manchmal eine Welle der Begeisterung.
Multi Item Statement 35	Ich bin sehr wissbegierig.
Multi Item Statement 36	Ich habe oft Spaß daran, mit Theorien oder abstrakten Ideen zu spielen.

Statements are taken from the *NEO-FFI-test* by Borkenau and Ostendorf (1993).

A.3. Screenshots

Figure 7 Front page

Figure 8 Overview – multi-item scales

Figure 9 Multi-item scales – statement

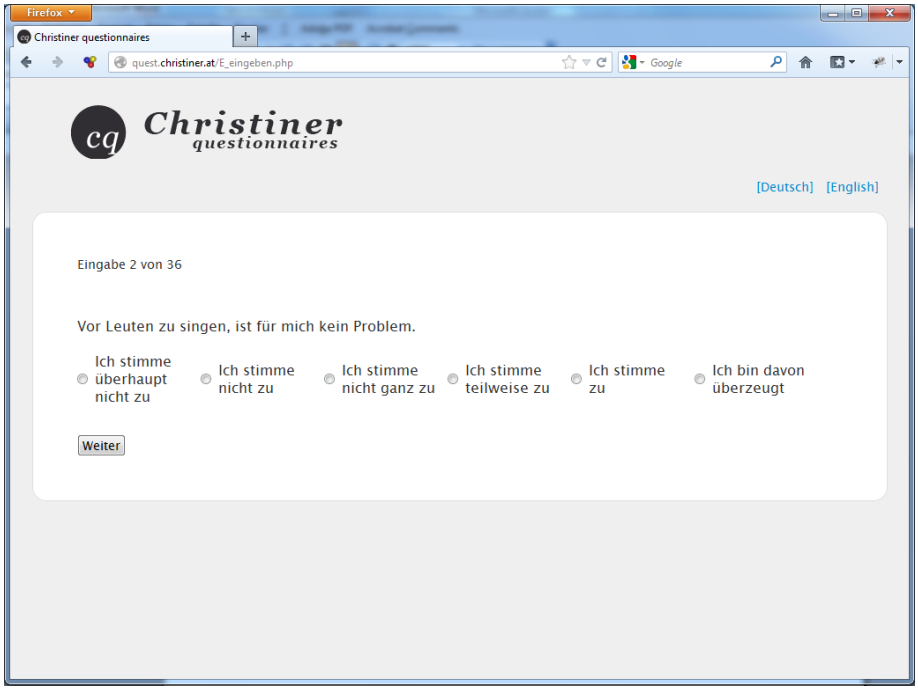


Figure 10 Overview for raters – instructions

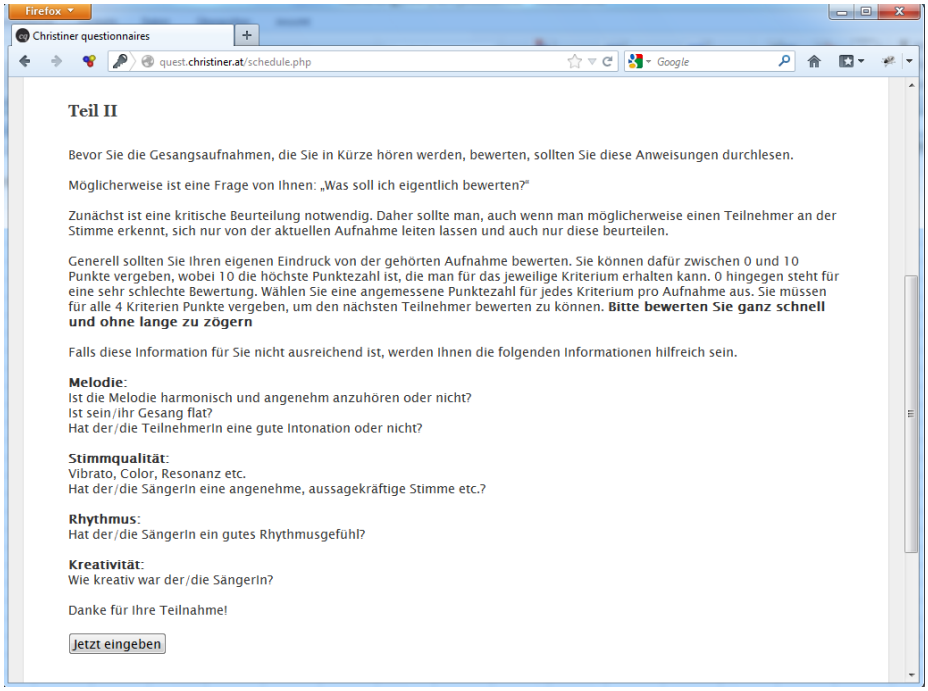
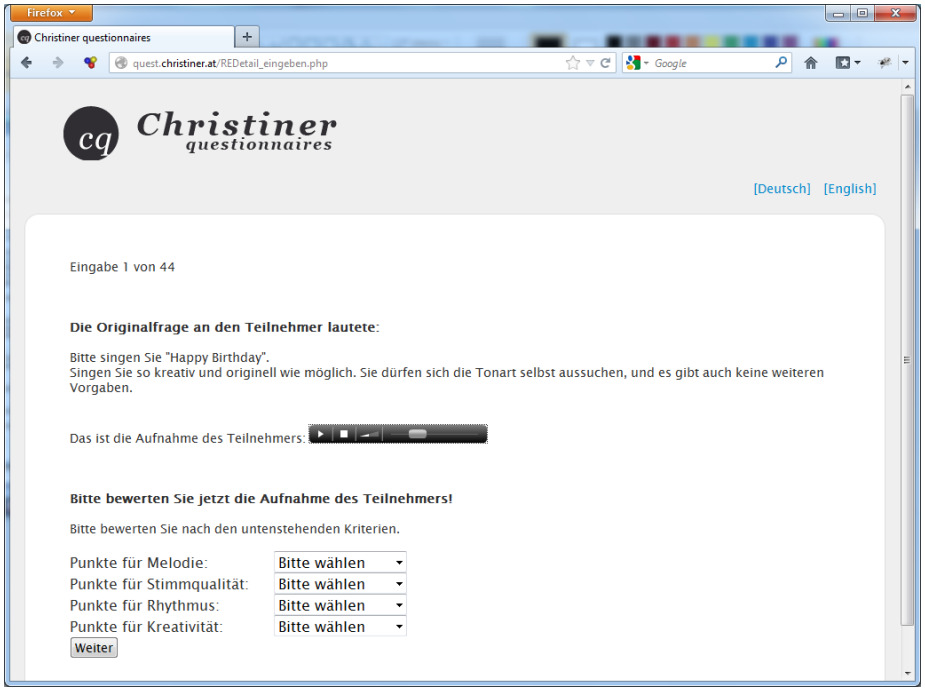


Figure 11 Rating system – song *Happy Birthday*



A.4. Zusammenfassung

In dieser empirischen Studie werden die Zusammenhänge zwischen der Aussprache in Fremdsprachen und Singen erforscht. Diese wissenschaftliche Arbeit ist unterteilt in zwei Hauptteile, einen theoretischen und einen empirischen. Da Singen als Unterkategorie von Musik bezeichnet wird, werden zunächst Evolutionstheorien über die Entstehung und die Zusammenhänge von Musik und Sprache behandelt. In weiterer Folge werden auch die wichtigsten Bestandteile wie Rhythmus, Intonation, Klangfarbe und die syntaktischen Aspekte von Musik und Sprache verglichen. Da Musik und Sprache grammatikalische Regeln aufweisen, werden auch der Spracherwerb und Musiklernprozesse von Kindern und Kleinkindern behandelt sowie deren Zusammenhänge erforscht. Ein weiterer Abschnitt behandelt Singen aus verschiedenen Blickwinkeln wie etwa aus der Sicht von Gesangslehrern oder aus einer neurolinguistischen Perspektive. Im zweiten Hauptteil werden die Ergebnisse einer empirischen Studie präsentiert, bei welcher 41 Personen, die Gesangsunterricht hatten, teilgenommen haben. Die Tests umfassten einen Musikalitätstest, einen Gesangstest, einen Test über die Merkfähigkeit des Kurzzeitgedächtnisses und über das Aussprachetalent in Fremdsprachen. Weiters beinhaltet die empirische Untersuchung die Ergebnisse von psychologischen Konzepten über die Charaktereigenschaften und Gründe, warum die Teilnehmer dieser Studie singen. Die Daten wurden mit *IBM SPSS Statistics Version 20* analysiert. Die Ergebnisse zeigen, dass gute Sänger auch besser in der Aussprache von Fremdsprachen sind und Singen und Sprachimitation in starkem Zusammenhang stehen. Deshalb ist Singen als Unterkategorie von Musik auch zweifelhaft, da Singen und Sprache anscheinend näher aneinanderliegen als Singen und Musikalität.

A.5. Lebenslauf

Persönliche Daten

Name:	Markus Christiner
Geburtsdatum:	10. 12. 1976
Geburtsort:	Fürstenfeld
Staatsbürgerschaft:	Österreich

Aus- und Weiterbildung

seit 2004	Diplomstudium für Anglistik und Amerikanistik an der Universität Wien
2004	Berufsreifeprüfung
2002 – 2012	Gesangsausbildung
1995	Lehrabschlussprüfung als Florist
1992 – 1995	Lehre als Florist
1991 – 1992	Bundesoberstufenrealgymnasium
1987 – 1991	Hauptschule
1983 – 1987	Volksschule

Besondere Kenntnisse

Sprachen

Deutsch
Englisch
Latein

Gesangsausbildung

EDV-Kenntnisse

Microsoft Windows
Microsoft Office (Word, Excel, Powerpoint, Outlook, Access)
Steinberg Cubase
IBM SPSS