

Phenotype of migraine headache and migraine aura of Richard Wagner

Cephalalgia

0(0) 1–8

© International Headache Society 2014

Reprints and permissions:

sagepub.co.uk/journalsPermissions.nav

DOI: 10.1177/0333102414527645

cep.sagepub.com



Anna Göbel^{1,2}, Carl H Göbel^{1,3,4} and Hartmut Göbel¹

Abstract

Background: The headache phenotype and neurological symptoms of the German composer Richard Wagner (1813–1883), whose music dramas count towards the most frequently performed operas across the world, are previously undocumented.

Methods: Richard Wagner's own descriptions of his headache symptoms in his original writings and letters are investigated, as well as the complete diary records of his second wife, Cosima Wagner.

Results: There are manifold indications that Richard Wagner suffered from a severe headache disorder, which fulfils most likely the diagnostic criteria of migraine without aura and migraine with aura of ICHD-3 beta.

Conclusions: Richard Wagner's life and opus can help to better understand the burden and suffering caused by migraine with its severe effects on the individual, familial and social life, the culture and community.

Keywords

Headache, migraine with aura, migraine without aura, opera, Richard Wagner

Date received: 15 January 2014; revised: 9 February 2014; accepted: 16 February 2014

Introduction

The music dramas of German composer and poet Richard Wagner (22 May 1813–13 February 1883) form a milestone in music history and count towards the most frequently performed operas across the world. Arguably, no other composer has challenged musical conventions as much as Richard Wagner. His works integrate poetic, visual, musical and dramatic art to form a so-called *Gesamtkunstwerk*. Wagner's pathography has been investigated in numerous accounts. It is divided into four categories: so-called functional disorders, skin disorders, acute infections and minor ailments as well as his heart disease (1,2). A detailed analysis of the neurological disorders of Richard Wagner has so far never been carried out. Wagner is described as a particularly sensitive person, who registered external stimuli immediately and reacted quickly (1). Franken (2004) calls this a 'severe vegetative instability', as part of which numerous 'functional disorders' were manifested, mainly in bodily complaints and sleep disorders (1). His so-called 'functional headaches', mentioned in a monograph about Wagner's medical problems only as a side note (3), do not allow an exact headache phenotype classification. In an overview of Richard Wagner's ill-health, Gould

(1903) attributes these persistent symptoms to eye-strain, which could have been cured with glasses (4). Another extensive monograph about disorders of great musicians does not even mention headache as a complaint of Richard Wagner (2).

In a recent paper we showed how Richard Wagner interwove his headache suffering into his music and libretti, using the opera *Siegfried* as an example (5). However, a close diagnostic evaluation of his headache and neurological symptoms, described by him as the 'main plague of his life' (6), has never been carried out. In this study Richard Wagner's headache disorders are analysed in detail for the first time using the diagnostic criteria of the *International Classification of*

¹Kiel Migraine and Headache Centre, Kiel, Germany

²Department of Neurology, University Hospital Schleswig Holstein, Campus Lübeck, Germany

³Cognitive Neuroscience, Institute of Neuroscience and Medicine (INM-3), Research Centre Jülich, Germany

⁴Department of Neurology, University Hospital Cologne, Germany

Corresponding author:

Hartmut Göbel, Kiel Migraine and Headache Center, Heikendorfer Weg 9-27, D-24149 Kiel, Germany.

Email: hg@schmerzlinik.de

Headache Disorders (ICHD-3 beta) (7) on the basis of Richard Wagner's own descriptions of his headache symptoms in his writings and letters (6,8,9). In addition, the headache phenotype is complemented for the first time by information about Richard Wagner's headaches as specified in numerous diary records of his second wife, Cosima Wagner (10,11) from 1 January 1869 until 12 February 1883, the day before Richard Wagner died. In the following analysis we state, where possible, for each symptom described the corresponding letter-figure combination of the ICHD-3 beta criteria in square brackets.

Headache in the writings and letters of Richard Wagner

To capture the headache phenotype of Richard Wagner, we first analysed the memoirs (6), writings and letters (8,9) of Richard Wagner.

There was a family disposition towards headaches. Richard Wagner reported this about his mother, a baker's daughter called Johanna Rosine Wagner, née Petz, (1774–1848) (6):

'Even from the time when my reminiscence of her is quite distinct, she always had to wear a cap owing to some affection of the head, so that I have no recollection of her as a young and pretty mother.'

It is not clear which 'affection of the head' she suffered from; however, in the nineteenth and also twentieth century, it was a recommendation to wear a head cap for headache and especially migraine. This was a widespread practice in European folk medicine at that time. Richard Wagner also wore a hat most times, even indoors (Fig. 1). Considering the remarks about frequent headaches of the three joint children of Richard and Cosima Wagner (see below), a familial headache predisposition over three generations appears likely.

Richard Wagner describes suffering from long-lasting, almost never-ending, 'nervous' headaches (6):

'I was not allowed to stop reading on the following days until *Der Ring des Nibelungen* was quite finished. Finally Paris claimed our attention, but while the ladies were visiting the museums I was unfortunately obliged to stay secluded in my room, tortured by never ending nervous headaches.'

This entry describes a headache attack lasting several days [1.1.B]. 'Tortured' implies a severe headache [1.1.C3], which significantly limited or indeed prohibited usual daily activities [1.1.C4]. 'Obliged to stay secluded in my room' suggests that the headaches were aggravated by physical activity and that this was

avoided, possibly with bed rest [1.1.C4], and also the presence of photo- and phonophobia with retreat to a quiet and shaded room [1.1.D2].

Richard Wagner also repeatedly describes nausea related to pain, stress and fatigue (6) [1.1.D1]:

'We had entered upon the year 1850; I had decided to go to Paris, if only for the sake of peace, but had to postpone my journey on account of ill-health. The reaction following upon the terrible excitement of recent times had not failed to have its effect on my overwrought nerves, and a state of complete exhaustion had followed.'

In his Paris reports in the *Dresden Evening News* from 5 April 1841 (9), Wagner writes [1.1.B; 1.1.C3; 1.1.C4]:

'That day I suffered from such terrible headaches and painful nerve twitches that I had to go home early and lie down in bed.'

Richard Wagner also describes the effects of headaches on his mood and social functioning in meticulous detail (6) [1.1.D2]:

'After dinner, when Liszt sat down at the piano, young Marie Wittgenstein noticed that I had withdrawn silently and rather sadly from the rest of the company; this was due partly to my headache, and partly to the feeling of isolation that came over me in these surroundings. I was touched by her sympathy and evident wish to divert me.'

Furthermore, Richard Wagner expresses a marked osmophobia in his memoirs (6). He was aware of headaches that could be triggered by olfactory stimuli [1.1.D2]:

'I went one day by appointment to see [Mr. E. Kossak], and found that his room had just been scrubbed with boiling water. The vapour from this operation was so unbearable that it had already given him a headache, and was not less disagreeable to me.'

In a letter to his sister Cäcilie Avenarius from 12 December 1844, Wagner writes (9):

'Your head is buzzing, you don't know where you are, seem as if in a dream, and all is flickering before your eyes? Quite so: we know all about that from own experience.'

Here, Wagner describes direct disturbances in terms of a visual migraine aura, headache, accompanying



Figure 1. Cosima Wagner (née Liszt), Richard Wagner, Franz Liszt and Hans von Wolzogen at Villa Wahnfried, Bayreuth, Germany. Usually Richard Wagner wore a hat inside, which was a standard remedy against headaches at the time. Painting by Wilhelm Beckmann 1881. Source: Richard Wagner Museum Lucerne, with permission.

neuropsychological disturbances and decreased level of consciousness, which he knew from his own suffering [1.2.B1; 1.2.B5].

Wagner had a lifelong friendship with Dr Anton Pusinelli, physician in Dresden. In a letter to Dr Pusinelli from 1 August 1843 (9), Richard Wagner describes how longer lasting headache episodes were an impediment to his work [1.1.C3]:

‘My dear friend, I have headache and I am unproductive, yet I cannot resist replying to your kind letter.’

The same is expressed in a letter from Richard Wagner to his first wife, Minna Wagner, on 12 October 1853 (9):

‘Yesterday, I had headaches so severe that I had to leave théâtre français. It is better today; I slept four hours after all.’

This passage also allows a more precise estimation of the headache episode as lasting around 1 day [1.1.B].

In another letter to Minna Wagner from 26 June 1855, Wagner writes (9) [1.1.B; 1.1.C3]:

‘I have terrible headaches today.’

Similarly on 22 June 1856 from Geneva, Switzerland (9):

‘The air is splendid; headache disappears on arriving.’

In a reply to Friedrich Schmitt from 3 June 1854, Wagner refuses to be involved in the setting-up of an opera singer school and justifies this also with his headaches (9) [1.1.A; 1.1.B; 1.1.C3]:

‘Now I just finished a new score: if you knew what work was like for me! It is a fanaticism, which

doesn't let me see anything else. I never stop, only when the most painful headaches prevent me from working further: but then I am unable to do anything for the entire day.'

On 13 September 1854, Richard Wagner writes to Minna (9) [1.1.C3]:

'I went to bed only at noon and couldn't sleep well at all. I woke up with horrible nervous headache.'

Wagner explains his headaches with ill temper in a letter to Otto Wesendonck on 22 May 1855 (9) [1.1.A]:

'It is a true misery with me: but one thing is for sure, – I wasn't born to make money, but to be creative; and the world should take care of me doing so. As we all know, one cannot force it, the world does what it wants. Just like I would like to. Thus we – the world and I – are two pig-headed fellows, banging each other's head, and the weaker one must break, – which is probably why I have my nervous headaches so often. You, my dearest friend, have stepped in between us with the best of all intentions, without doubt to soften the blows: take care not to also get injured!'

In his opera *Siegfried* (1876) act 1, scene 1 and scene 3, Richard Wagner played out migraine headache and aura phenomena vividly in music through his specific leitmotif technique (5,12). In his memoirs, Richard Wagner gives an account of the symptoms he had at the exact time of composing these bars and teases out a marked phonophobia (6) [1.1.D2]:

'I began to sketch the overture [of *Siegfried*] on September 22. That time one of the main plagues of my life arose, causing critical distress. A tinker had established himself opposite our house, and stunned my ears all day long with his incessant hammering. In my disgust at never being able to find a detached house protected from every kind of noise, I was on the point of deciding to give up composing altogether until the time when this indispensable condition should be fulfilled.'

In a letter to Franz Liszt on 27 January 1857 (8), Wagner openly voiced the suffering and disability caused by the 'tremulous headaches' [1.1.C2]:

'I have not yet got back into the mood for writing to [Carolynne and Marie von Sayn-Wittgenstein]. I am annoyed at being always in a state of lamentation, and must therefore wait for a favourable hour, for I do not like absolutely to deceive you. You yourself are used to my laments, and expect nothing else. My

health, too, is once more so bad, that for ten days, after I had finished the sketch for the first act of *Siegfried*, I was literally not able to write a single bar without being driven away from my work by a most tremulous headache. Every morning I sit down, stare at the paper, and am glad enough when at least I get as far as reading Walter Scott. The fact is, I have once more over-taxed myself, and how am I to recover my strength? With *Das Rheingold* I got on well enough, considering my circumstances, but *Die Walküre* caused me much pain. At present my nervous system resembles a pianoforte very much out of tune, and on that instrument I am expected to produce *Siegfried*. Well, I fancy the strings will break at last, and then there will be an end. We cannot alter it; this is a life fit for a dog.'

Mainly because of his ill health, Wagner interrupted the composition of *Siegfried* in the middle of Act 2. Only 7 years later, in 1864, he continued.

Headaches of Richard Wagner in the diaries of Cosima Wagner

Cosima Wagner (24 December 1837–1 April 1930), daughter of the composer Franz Liszt, was the second wife of Richard Wagner. Primarily intended for her two children from the first marriage, she wrote down detailed diary entries, which she carefully maintained from 1 January 1869 until 12 February 1883 (10,11). The records ended 1 day before Richard Wagner's death. She described in great detail the daily routine of family life, the family's health as well as philosophical, musical and literary opinions. As a result of testation, the *Bavarian State Bank* in Munich kept the diaries under lock and key until 1972. Only in 1975 were the records made available to the public after lengthy legal disputes. Martin Gregor-Dellin completely transcribed the records and published them in two volumes (Volume I: 1869–1872 (10); Volume II: 1878–1883 (11)) with a total of 2596 pages.

Her contemporaneous records delineate many aspects of the condition of Richard Wagner at the time. The diary entries also allow a first-time insight into the repeatedly headache-burdened life of the Wagner family. This also has never been documented and supplements the picture of the headache suffering of Richard Wagner. Cosima Wagner documented the many headache days of Richard and the family members, and thus probably kept one of the first systematic headache diaries. Descriptions crucial for the diagnostic classification of Richard Wagner's headaches are listed in Table 1. Focal neurological disturbances in terms of visual migraine auras and severely disabling headaches are confirmed. Her depictions are congruent

Table 1. Focal neurological disturbances and headaches of “R” (Richard Wagner) in the diary records of Cosima Wagner.*Visual disturbances in terms of auras*

- 13.9.1870 R. works on his Beethoven – too much, in fact, for he gets rapidly oscillating pattern of visual distortions [1.2.B1; 1.2.C1; 1.2.C3]
- 15.8.1881 Bad day, which started for R. with chest pain. He tries to deflect himself with work; but in the afternoon he gets scintillating scotoma. We go for a walk but soon return; initially the faces he sees made him uneasy, then he dislikes the air [1.2.B1]

Headaches

- 20.3.1871 R. and I both have headaches; the slightest change in our way of life upsets us. R. said yesterday: “This life is like being at a fair, strangers everywhere, one belongs nowhere. We draw nourishment from ourselves, what makes us happy is our love, our children. That is why the air outside is hostile to us, no one understands us.”
- 23.9.1871 Arrival of Fritz, R. suffering from a severe headache. [1.1.C3]
- 19.9.1872 R. had a better night, but he has a headache and is feeling despondent.
- 23.11.1872 R. has a severe headache; we go out to visit the cathedral; curious impression . . . [1.1.C3]
- 14.3.1873 R. arrived home yesterday toward midnight and laughed to find me deep in the work of Palla[dio], which was giving me great pleasure. He was not dissatisfied with the discussions, but the tobacco fumes and the beer had given him a bad headache [1.1.C3]
- 22.5.1873 R. has a headache from the previous evening, so my noble good intentions are a little spoiled.
- 14.8.1873 R. works in spite of a headache, in the afternoon in the garden
- 1.9.1873 R. has a headache and cannot work [1.1.C3]
- 8.10.1873 In spite of a violent headache, R. spoke a lot with me early this morning
- 5.12.1873 R. was dissatisfied with the Thursday gathering, which left him with a headache, but he works nonetheless.
- 15.12.1873 R. is not well, he goes for a walk in the morning to chase away a headache, but he does not succeed. [1.1.D1]
- 17.4.1874 R. plagued by a headache in consequence of the Thursday gathering, he cannot work and goes to the house; I cannot give him support, have to stay at home
- 6.2.1876 Snowfall: “Winter learns in its old age to turn white,” R. says. – He has a headache.
- 21.3.1876 R. has a severe headache, spends a quiet day in order to be able to accept the singers’ invitation to dinner in the evening. . . [1.1.C3]
- 10.5.1876 R. has a headache and holds no rehearsal today.
- 28.10.1877 R. tells me before lunch that he had a bad headache, but composed it away!
- 31.1.1878 R. had an uneasy night; he woke up with headache. . .
- 11.2.1878 He woke up with headache.
- 13.2.1878 R. has headache and cannot work
- 20.3.1878 R. has some headaches from yesterday, also some nosebleed, but still works.
- 31.5.1878 R. works. A small lunch with friend Feustel tempts R. to drink more wine than usual, and it wasn’t good for him; he has headaches
- 12.7.1878 Always cloudy weather and R. headaches, “but it will be all right”, he said “ça ira, ça ira, j’aimerai toujours ma Cosima”.
- 7.11.1878 R. rested well, but has a cold and headaches.
- 25.12.1878 R. withdraws during every interval, but I may rest assured that he is well; only with the “Egmont” overture he had some headaches; it helped to eat a little.
- 12.5.1879 R. had a good night; but complains of headache as we meet again at midday. Maybe over-worked?
- 13.5.1879 Several pretty letters wishing R. a good night; the Parsifal has chased away his headaches.
- 6.8.1879 R. wakes up with headaches, the reading has been a set-back, he looks through his essay again and corrects it, to finally part with it, happily so, as he says.
- 18.3.1880 R. gets up with headaches, already discontented, when the arrival of a letter by Dr. Jauner and the unavoidable reply saddens him completely.
- 26.12.1880 R. has some headache, calls himself the old carouser, but is cheerful.
- 26.8.1881 R. has some headache, but recovers soon.
- 9.5.1882 R. complains of headaches, and the weather is unkind.

with those of Richard Wagner. The headaches were an impediment to his work and had negative mood-related effects. Excessive labour, exertion, stress, odours, tobacco smoke and alcohol are mentioned as trigger factors. The quotations in Table 1 supplement Richard Wagner's direct description of his headache phenotype. The selection emphasises the high headache frequency and periodicity, continuously documented by Cosima in her diary.

Notably in many parts of her diary, Cosima Wagner also complained of headaches making her bed-ridden for several days. Her elaborations support the assumption that she suffered from a migraine without aura and a migraine with aura with severe attacks. In a diary entry from 1 April 1869, Cosima Wagner even describes a marital conflict related to her headaches in great detail (10):

'In the evening R. [Richard] speaks to me about the *Odyssey* and the *Iliad*, smoking and drinking beer. Since the joiners had been varnishing in the next room, all these various smells combine, and I gradually begin to feel dizzy and get headaches, which rob me entirely of my vision and finally of my hearing, too. When I told R. of my condition he became very angry, seeing a reproach in what was only an explanation. He then said many things it would have been better for him not to have said. I up to my room where, feeling upset, it made me cry. Now I am wondering what would be the best thing to do – whether I should leave his temper to cool down or go to him, quietly explain again what had happened, and soothe him. Hardly had I written this when R. came in to wish me good night. I then went downstairs to him and calmed his fantasies.'

On 7 September 1879, Cosima describes the caring understanding from Richard because of her headaches (11):

'Fever, I must rest in bed until the doctor comes, having severe headaches. Without seeing the children and under the heavenly care of R. I spend the day in great pain. R. finishes his Beethoven.'

Cosima Wagner is also repeatedly concerned about the headaches of the joint children Isolde, Eva and Siegfried. She treated them with cold compressions (entry from 15 September 1882) (11).

Cosima Wagner even documents undesired neurological side effects of Richard Wagner's music on 23 May 1874 (10):

'Frau v. M. leaves; all day with Marie Dönhoff, listening to her outpourings, my pain stays unexpressed. The painter Hoffmann arrives with his sketches, but unfortunately he has altered nothing. In the evening Marie Dönhoff plays very beautifully, she tells us the Crown Princess said R.'s music gave her a headache.'

Richard Wagner's headache phenotype

The analysis of writings of Richard Wagner and the diary entries of Cosima Wagner give numerous clues about the presence of diagnostic criteria of migraine without aura and migraine with aura (Tables 2 and 3). The historical analysis of the writings can only refer to available sources. A medical history definitive in all details, especially including temporal characteristics of aura symptoms according to criteria 1.2.C, is

Table 2. Indications of diagnostic subcriteria of migraine without aura (code 1.1. ICHD-3 beta).

Diagnostic criteria Migraine without aura (1.1. ICHD-3 beta)	Indications
A. At least five attacks fulfilling criteria B–D	Yes
B. Headache attacks lasting 4–72 hours (untreated or unsuccessfully treated)	Yes
C. Headache has at least two of the following four characteristics:	
1. unilateral location	–
2. pulsating quality	Yes
3. moderate or severe pain intensity	Yes
4. aggravation by or causing avoidance of routine physical activity	Yes
D. During headache at least one of the following:	
1. nausea and/or vomiting	Yes
2. photophobia and phonophobia	Yes
E. Not better accounted for by another ICHD-3 diagnosis	Yes

not possible. Another limitation is the fact that information about individual headache characteristics is not entirely clear and this has to be aggregated over multiple attacks. This is true, for example, regarding the headache character. Richard Wagner used terms such as ‘nervous’ or ‘tremulous’ headaches. Whether he meant a pulsatile headache character or focal sensory symptoms related to headaches cannot be determined for sure. The word ‘migraine’ itself is neither used in his writing nor in Cosima’s diary entries. However this word was also not prevalent in German language in the nineteenth century. Even today, only 3 out of 10 migraine sufferers are aware of the diagnosis or indeed the word ‘migraine’ in Germany (13). The frequency of information about the headaches is surprising. Overall, the impression results that headaches and associated symptoms were a significant burden to Richard Wagner for decades and had central health implications. The first hint of his headache suffering can be found at age 28, the last one at age 67. A particularly high level of suffering with many indications of a severe headache burden can be found between the ages of 30 and 51. Effective treatment methods were not available to him. Frequently Wagner went in for water cures and diets, but these measures do not appear to have led to pain relief. Against the background of the aforementioned limitations, in summary there is a clinically high probability that Richard Wagner suffered from severe migraine without and migraine with aura. A similar situation results as seen today during the initial presentation of a new patient with headache: retrospective information is sketchy in their details and quantitatively

imprecise. Only a prospective analysis, using a headache diary, ensures a certain diagnosis. With a historical analysis, this is not possible. Despite these limitations, the information available supports the assumption that the diagnostic criteria of migraine without and migraine with aura are adequately fulfilled. Other ICHD-3 beta diagnoses cannot better explain the described headache symptoms [1.1.E; 1.2.D].

Life-long migraine and especially migraine with aura carries an increased risk of the development of ischemic vascular disorders including angina, myocardial infarction, coronary revascularization, claudication and cardiovascular mortality (14,15). Until today, migraine has been associated with 12 known risk genes (16). Two of these are also known to be involved in the development of cardiovascular disorders: mutations in TGFBR2 can be implicated in the pathogenesis of abdominal aortic aneurysms, PHACTR1 increases the risk for a myocardial infarction at young age (16). Richard Wagner suffered from cardiovascular symptoms in the last years of his life and probably died from a myocardial infarction (1,2). Effective migraine therapy of present day standards (13,17) could have given him more creative ability and life span. The family and social life of the Wagner family would have also been less burdened. The question arises as to what effects an adequate diagnosis and sustainable migraine therapy might have had on his music. Richard Wagner’s life and opus can help us to better understand the burden and suffering caused by headache with its severe effects on the individual, familial and social life, the culture and community.

Table 3. Indications of diagnostic subcriteria of migraine with aura (code 1.1. ICHD-3 beta).

Diagnostic criteria Migraine with aura (1.2. ICHD-3 beta)	Indications
A. At least two attacks fulfilling criteria B and C	Yes
B. One or more of the following fully reversible aura symptoms:	
1. visual	Yes
2. sensory	–
3. speech and/or language	–
4. motor	–
5. brainstem	Yes
6. retinal	–
C. At least two of the following four characteristics:	
1. at least one aura symptom spreads gradually over 5 minutes, and/or two or more symptoms occur in succession	Yes
2. each individual aura symptom lasts 5-60 minutes	–
3. at least one aura symptom is unilateral	–
4. the aura is accompanied, or followed within 60 minutes, by headache	Yes
D. Not better accounted for by another ICHD-3 diagnosis, and transient ischaemic attack has been excluded.	Yes

Clinical implications

- Headaches and associated symptoms were a significant burden to Richard Wagner for decades and had central health implications.
- There is a clinically high probability that Richard Wagner suffered from a severe headache disorder fulfilling the phenotype of migraine without and migraine with aura of ICHD-3 beta.
- Effective migraine therapy of present day standards could have given Richard Wagner, whose music dramas count towards the most frequently performed operas across the world, more creative ability and life span.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

None declared.

References

1. Franken FH. *Die Krankheiten großer Komponisten. Band 3: R. Wagner, G. Mahler, G. Bizet, M. Reger, N. Paganini*. Taschenbücher zur Musikwissenschaft Band 114. 2nd edn. Wilhelmshaven: Noetzel, 2004.
2. Otte A and Wink K. *Kerners Krankheiten großer Musiker*, 6 edn. Stuttgart: Schattauer, 2008.
3. Eggebrecht HH. *Terminologie der musikalischen Komposition*. Stuttgart: F. Steiner, 1996.
4. Gould GM. The ill-health of Richard Wagner. *Lancet* 1903; 162(1903): 306–313.
5. Göbel CH, Göbel A and Göbel H. ‘Compulsive plague! Pain without end!’ How Richard Wagner played out his Migraine in the Opera Siegfried. *BMJ* 2013; 347: f6952.
6. Wagner R. *Mein Leben*. München: Bruckmann, 1911.
7. Headache Classification Committee. The International Classification of Headache Disorders, 3rd edition beta. *Cephalalgia* 2013; 33(2013): 629–808.
8. Liszt F and Wagner R. *Briefwechsel zwischen Wagner und Liszt. Erster-Zweiter Band (1841–1853, 1854–1861)*. Leipzig: Breitkopf & Härtel, 1887.
9. Wagner R. *Werke, Schriften und Briefe*. Berlin: Directmedia Publishing, 2004.
10. Wagner C. *Die Tagebücher, Band 1. 1869–1877*. München: Piper, 1976.
11. Wagner C. *Die Tagebücher, Band 2. 1878–1883*. München: Piper, 1977.
12. Göbel H. Schwan-Lenz-Abendstern: Wagners schönste Stellen. *Frankfurter Allgemeine Zeitung* 7 2013; 181: 27.
13. Göbel H. *Die Kopfschmerzen*, 3 edn. Berlin, Heidelberg: Springer, 2012.
14. Sacco S, Ricci S and Carolei A. Migraine and vascular diseases: a review of the evidence and potential implications for management. *Cephalalgia* 2012; 32(2012): 785–795.
15. Scher AI, Terwindt GM, Picavet HS, et al. Cardiovascular risk factors and migraine: the GEM population-based study. *Neurology* 2005; 64(2005): 614–620.
16. Anttila V, Winsvold BS, Gormley P, et al. Genome-wide meta-analysis identifies new susceptibility loci for migraine. *Nat Genet* 2013; 45(8): 912–917.
17. Göbel H, Heinze-Kuhn K, Petersen I, et al. Integrated headache care network. Kiel Migraine and Headache Center and German National Headache Treatment Network. *Schmerz* 2013; 27(2013): 149–165.