

## Gilles de la Tourette syndrome: a common disease among uncommonly talented individuals?

### Zespół Gillesa de la Tourette'a: częste zaburzenie u niezwykle utalentowanych jednostek?

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#### Abstract

Gilles de la Tourette syndrome is a neuropsychiatric condition of unknown cause. It consists in the occurrence of motor and vocal tics. Additionally, some psychiatric comorbidities, such as attention deficit hyperactivity disorder, obsessive-compulsive disorder, depression, anxiety disorder or autoaggression, can coexist with Gilles de la Tourette syndrome. In historical studies dedicated to Gilles de la Tourette syndrome, it was suggested that this disease occurred more frequently in talented individuals. This corresponds with speculations about other neuropsychiatric abnormalities, especially autistic spectrum disorders, epilepsy or personality disorders, being associated with outstanding performance in some areas of life. Numerous famous and talented individuals were influenced by their medical conditions, for example: Fyodor Dostoevsky is claimed to have suffered from epilepsy or psychogenic seizures, Robert Schumann is suspected to have had bipolar disorder, while Russian avant-garde composer and pianist Alexander Scriabin or pianist Clara Wieck-Schumann suffered from chronic pain which probably influenced their play. All of these diseases seem to have had a profound influence on the artistic experience of these individuals. Although the hypothesis about the influence of Gilles de la Tourette syndrome on the process of creativity and development of superb mental or performative qualities was later rejected, it seems that some famous and unique individuals could suffer from Gilles de la Tourette syndrome. Some of the well-known examples include: Wolfgang Amadeus Mozart, Samuel Johnson, Tim Howard or Peter the Great. Moreover, some celebrities, such as Kurt Cobain, were diagnosed with Gilles de la Tourette syndrome. Today, those speculations have been re-analysed, and it seems that in some cases the diagnosis of Gilles de la Tourette syndrome was not correct, and no direct influence between creativity, talent and Gilles de la Tourette syndrome could be detected. This article comprises reports on talents and creativity in Gilles de la Tourette syndrome and describes biographical facts that indicate a relationship between this syndrome and outstanding performance.

**Keywords:** Gilles de la Tourette syndrome, famous individuals, creativity, history of medicine

#### Streszczenie

Zespół Gillesa de la Tourette'a jest zaburzeniem neuropsychiatrycznym o nieznannej etiologii, do którego głównych objawów należą tiki ruchowe i wokalne. Tikom często współtowarzyszą zaburzenia psychiatryczne, takie jak zespół nadpobudliwości ruchowej z zaburzeniami uwagi, zaburzenie obsesyjno-kompulsyjne, depresja, zaburzenia lękowe czy autoagresja. Część badań dotyczących zespołu Gillesa de la Tourette'a sugerowała, że częściej występuje on u osób utalentowanych. Przypuszczenie to dotyczy także innych zaburzeń neuropsychiatrycznych, przede wszystkim ze spektrum autyzmu, padaczki czy zaburzeń osobowości, które były kojarzone z niezwykłymi zdolnościami, szczególnie w pewnych dziedzinach życia. W przypadku wielu znanych i utalentowanych osobistości sugerowano związek pomiędzy twórczością i chorobą: Fiodor Dostojewski jest podejrzewany o padaczkę lub napady psychogenne, Robert Schumann o chorobę afektywną dwubiegunową, zaś rosyjski kompozytor awangardowy i pianista Aleksander Skriabin oraz pianistka Klara Wieck-Schumann cierpieli z powodu przewlekłego zespołu bólowego, który miał wpływ na ich grę na instrumencie. Choć w późniejszym okresie negowano tezę o wpływie zespołu Gillesa de la Tourette'a na kreatywność i rozwój ponadprzeciętnych umiejętności mentalnych, nie jest wykluczone, że niektóre wybitne jednostki mogły cierpieć z powodu tego zespołu. Najbardziej znane przykłady to Wolfgang Amadeusz Mozart, Samuel Johnson, Tim Howard czy Piotr Wielki. Dodatkowo u niektórych znanych postaci ze świata show-businessu, m.in. Kurta Cobaina, zdiagnozowano to zaburzenie. Dziś spekulacje te są jeszcze raz

analizowane i wydaje się, że w niektórych przypadkach diagnoza była postawiona niewłaściwie – nie można ustalić żadnego jednoznacznego związku pomiędzy kreatywnością lub niezwykłymi zdolnościami i zespołem Gillesa de la Tourette'a. Artykuł podsumowuje dotychczasowe doniesienia na temat niezwykłych zdolności i kreatywności w tym zaburzeniu oraz odnosi się do biografii niektórych utalentowanych osób z zespołem Gillesa de la Tourette'a.

**Słowa kluczowe:** zespół Gillesa de la Tourette'a, znane osobistości, kreatywność, historia medycyny

**G**illes de la Tourette syndrome (GTS) is a neuro-psychiatric disorder affecting children and adults. According to DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), the diagnosis of GTS is established when at least one vocal tic and various motor tics are detected in patient's clinical history. However, they do not have to occur at the same time. Moreover, the symptoms must persist for at least one year with an onset prior to the age of 18. The syndrome is also known to coexist with various psychiatric comorbidities, such as attention deficit hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD) and its variant, obsessive-compulsive symptoms (OCS), depression, anxiety disorder or learning difficulties. Historically, it was suspected that GTS and tics had only psychological background. In the original paper by Gilles de la Tourette, called *Étude sur une affection nerveuse caractérisée par de l'incoordination motrice accompagnée d'écholalie et de coprolalie (jumping, latah, myriachit)* (1885), the author discussed unusual manifestations of a disease which was an aetiological conundrum at that time (de la Tourette and Brutus, 1885). In the beginning of his study, Tourette referred to Bouteille and his work *Traité de la Chorée* (1818) that englobes the variability of symptoms which could occur in various disorders, but which perfectly reflect the general thinking about GTS in the XIX century:

*Tout est extraordinaire dans cette maladie: son nom est ridicule, ses symptômes singuliers, son caractère équivoque, sa cause inconnue, son traitement problématique. De graves auteurs ont douté de son existence, d'autres l'ont crue simulée, quelques-uns l'ont réputée surnaturelle* (de la Tourette and Brutus, 1885).

Later, an improvement after neuroleptics was suspected to confirm the hypothesis that GTS is secondary to disruptions in neurotransmission, particularly excessive activity in dopaminergic circuits in basal ganglia. A number of neuroimaging studies enabled detection of mechanisms and circuits responsible for tics (Caligiore et al., 2017). However, this did not explain the whole complexity of the disease. We know that it is hereditary, but no exact gene linked to GTS has been discovered so far. Immunological abnormalities could also influence the occurrence and course of tics in GTS (Cheng et al., 2012), but results of studies have been quite heterogenous so far (He et al., 2015; Martino et al., 2015). All in all, it can be concluded that exact causes of the disease are still unknown.

Perhaps because of its heterogeneity, GTS has also represented a starting point for a number of speculations, one of them concerning the average intelligence of patients and their inclination to creativity or outstanding performance. This was supported by the enumeration of extremely talented individuals who suffered or are suspected to have suffered from GTS. In this work, we review and reanalyse these speculations in the context of the literature published so far.

## GENIUS AND INSANITY

As with other neuropsychiatric, but especially psychiatric disorders, the idea that some extraordinary features could be detected in individuals suffering from GTS has fascinated scientists, philosophers and artists. Genius and insanity are often associated with an unusual pattern of thinking. That is why, up to the present, researchers have been seeking a confirmation concerning excessive creativity in neurological and mental illnesses. In a study conducted by Kyaga et al. (2011), which included a Swedish cohort of 300,000 patients with different mental illnesses, such as schizophrenia, bipolar disorder and unipolar depression, the authors found a significantly increased rate of creative professions among patients with bipolar disorder and unaffected siblings of those suffering from schizophrenia and bipolar disorder. They later performed a larger study confirming that only bipolar disorder was found more frequently among professionals with a creative job (Kyaga et al., 2013). Simeonova et al. (2005) confirmed that both children and adults with bipolar disorders are more creative. However, the vast majority of studies focused on short reports describing how outstanding qualities accompanied mental instability. Wintersgill (1994) analysed examples of psychiatric disturbances among famous musicians. He entitled his publication "Music and melancholia," giving importance to the classical definition of depression, alluding to theories of four humours. He took into account the cases of Jeremiah Clarke, Peter Warlock, Peter Tchaikovsky, Edward Elgar, Mily Balakirev, Ivor Gurney, Hugo Wolf, Anton Bruckner, Alexander Scriabin, George Frederick Handel, Robert Schumann and, finally, Wolfgang Amadeus Mozart, dividing them in different subgroups according to a suspected pathology they suffered from and its influence on creative efficacy. Most of them suffered from unipolar depression or bipolar disorder and worked excessively immediately after recovering from a depressive episode. On the other hand, Thys et al. (2012) discuss the literature dedicated to

neuro-aesthetics and the relationship between creativity and mental or neurological disorders. They discuss the fascination with mental disturbance, seen as an unusual and unique condition. This fascination goes back to Antiquity and is then continued in Romanticism, 19<sup>th</sup> century and 20<sup>th</sup> century with appraisal of Art Brut. Of course, a relationship between mental disturbance and creativity could be easily speculated in the case of visual arts and literary works. In his series of books, Swiss neurologist Julien Bogousslavsky discusses a relationship between diseases and artists (*Literary Medicine: Brain Disease and Doctors in Novels, Theater, and Film* – Bogousslavsky and Dieguez, 2013; *Neurological Disorders in Famous Artists* – Part 1, 2, 3 – Bogousslavsky and Boller, 2005; Bogousslavsky and Hennerici, 2007; Bogousslavsky et al., 2010) and comes into conclusion that disease, as any personal experience, profoundly modifies our activities, also the creative ones. These are only examples, as a list of artists and celebrities affected by various mental and neurological disturbances and scientific work dedicated to them is far more extensive, including: Vincent van Gogh, Ludwig van Beethoven, Sergei Rachmaninoff, Ernest Hemingway, Leo Tolstoy, Jonathan Swift, Oliver Cromwell, Abraham Lincoln, Theodore Roosevelt, John Nash, Nikolai Gogol, and Edgar Allan Poe (Blumer, 2002; Holm-Hadulla et al., 2010; Maude, 2016; de Souza and Mendes, 2004).

Almost every outstanding individual that had at least some traits of disturbance has been analysed by researchers to determine whether his or her artistic work was influenced by this underlying condition. Kehagia (2009) tried to trace whether personality disorder could impact creativity of Anais Nin. Some researchers use a more euphemistic version to name these possible relationships and denominate them as “creativity and unusual thinking” (Belli, 2009). Interestingly, Belli used a computer program (Opcrit 4.0) to analyse the probability of a diagnosis after inserting certain characteristics of a famous individual.

Among neurological diseases, the most popular one that is associated with superlative capacities is epilepsy. Studies about this subject were collected in Special Issue of “Epilepsy and Behavior” entitled “Epilepsy, Art and Creativity.” In this volume, Schachter (2016) draws attention to paintings produced by patients with epilepsy, Zubkov and Friedman (2016) focus on the impact of antiepileptic treatment on creativity, while Nicastrò and Picard (2016) analyse one of the most discussed cases of probable but not certain epilepsy experienced by Joan of Arc. Finally, Hesdorffer and Trimble (2016) address the relationship between music, poetry and epilepsy. Apart from Joan of Arc, the most famous epileptic patient that used his experiences in writing was Russian writer Fyodor Dostoevsky whose biography and literary work has been extensively analysed by researchers (Baumann et al., 2005; Iniesta, 2013, 2014; Morgan, 1990; Rayport et al., 2011; de Souza and Mendes, 2004). Nevertheless, it is not clear whether his seizures were provoked by epilepsy or a psychogenic disorder (Slattery, 1999).

## CREATIVITY IN GILLES DE LA TOURETTE SYNDROME

The theory that GTS could be associated with some outstanding traits and performance is based on the assumption that changes in the central nervous system, but first of all changes in psychological background that can occur in GTS, may be responsible for unusual characteristics of patients. The first feature that was studied in this aspect was the level of intelligence of GTS patients. Debes et al. (2011) analysed the performance of children with GTS on Wechsler intelligence scales. Their cohort included a group of 266 children and 80 adjusted controls. The individuals affected by GTS demonstrated worse performance in Wechsler test than the general population. Significant correlations influencing poor results in Wechsler scale included the presence of comorbidities and early onset of tics. These results stood in contrast with previous speculations that GTS could be associated with even better intellectual abilities. This was suspected when making a comparison of GTS and autism or savant syndrome (Moriarty et al., 1993; Pring, 2005). Ashoori and Jankovic (2007) also speculate that GTS could be associated with a savant construct of personality. As a relationship between GTS and autism spectrum disorder was postulated in both previous and the most recent studies (Huisman-van Dijk et al., 2016; Kern et al., 2015; Rapanelli et al., 2017), savant syndrome that occurs rarely in autism can also be present in some patients with GTS. Savant syndrome is a rare condition observed in patients afflicted by different mental disabilities, mostly in patients with autism spectrum disorders and those presenting so called “island of genius.” Some savant skills could be found in 1 of 10 cases of autism (Treffert, 2009). Savant skills usually occur in five categories: music, art, calendar calculating, mathematics as well as mechanical and spatial skills. It seems that savant syndrome is linked with structural abnormalities of the left hemisphere with compensatory function of the right hemisphere (Treffert, 2009; Treffert and Christensen, 2005). Famous savants include: Erik Satie (Fung, 2009), Henry Cavendish (Lidbetter, 2009) or blind mentally impaired patients who performed astonishingly in music, such as Blind Tom and Tredgold (Treffert, 2009). Perhaps the best-known savant was Raymond Babbitt, represented in the movie *Rain Man* (1988), directed by Barry Levinson and featuring extraordinary Dustin Hoffman. In the real life and in the movie, Babbitt had a superb capacity to memorise details, which resembled encyclopaedic memory. As rare as savant syndrome is, it has gained and keeps on gaining popularity in literature, cinema and popular culture.

This tendency to overrepresent extremely talented individuals applies also to GTS patients. It is the repercussion of the metaphorisation of disease and conversion to a romantic subject fit to attract attention of readers and viewers. Extreme cases tend simply to fascinate scientists and artists, but they cannot provide a reason to generalise the disorder.

The second domain attributed to the unusual pattern of thinking can be creativity. This term could be differentially defined according to different approaches. In the context of neurocreativity, especially interesting are analyses of Mula et al. (2016) in regard to neuropsychiatry of creativity. Writer and journalist Arthur Koestler gives special attention to multidimensional thinking that surpasses common patterns of cognitive processes and is present in a creative mind (Mula et al., 2016). This has, of course, its pragmatic social implications and leads, as a result, to the progress of a group as a whole. French physician Moreau de Tours (Mula et al., 2016) sees creativity as a type of mental aberration. Mula et al. also point to neurobiological aspects of creativity where the frontal lobe and dopaminergic neurotransmission that reinforces novelty-seeking behaviours play the most relevant role. It seems that altered states of mind, for both neurological and psychiatric reasons, can enhance creativity. Mula et al. (2016) mention such disorders as non-Alzheimer's dementia, especially primary progressive aphasia, bipolarity and altered state of consciousness. Meanwhile, Glazer (2009) emphasises the heterogeneous nature of creativity, dividing it into three subtypes, representing also each mental disorder: schizophrenia, affective disorder and autism. Creative personalities are especially predisposed to cyclothymia, and each of its phases represents different mental statuses and different types of creativity:

*Mild manic periods enable high energy, rapidity, flexibility and fluidity of thought, the cognitive aspects of hypomania paralleling imaginative thinking. Depression allows the meticulous refinement, focus and organization of the wild ideas formed during the manic period* (Glazer, 2009).

One of the examples of the affective type of creativity could be represented by German poet Wolfgang Goethe (Holm-Hadulla, 2013). As Glazer (2009) mentions, psychotic symptoms cause another pattern of thinking:

*Individuals experience a sense of alienation, hyper self-consciousness, detachment, and affinity for non-conformist thought. These are at odds with the philosophy bred during the Romantics, accounting for the paucity in findings of schizophrenic tendencies in geniuses of that time* (Claman, 2001).

The inclination to creativity in a group characterised by schizotypy was also objectively confirmed by Claridge and Blakey (2009) as well as Stoneham and Coughtrey (2009). Finally, Glazer (2009) also distinguishes the autistic type of creativity that could be detected in high functioning autism and approximates savant syndrome, where an individual has very good memory and original pattern of thinking. Creativity, in these cases is a type of adaptation of a transformed individual to the solid, unadaptable world.

This is the cause of not only mental suffering, but also physical debilitation (Maude, 2016). The disease itself produces unusual emotions and behaviours that would otherwise be absent. It is an extreme experience that modifies rapidly or gradually our body and, subsequently, our state of mind and soul. It can lead to alienation and degradation or approximation to art and perfectionism, such as in the example of Romantic English poet John Keats who suffered from lethal tuberculosis and died at age of 25. Before his death, he wrote one of his best and well-known poems entitled *Bright star, would I were steadfast as thou art*, which was partially inspired by the suffering caused by the disease and also served as the background for a number of artistic interpretations, such as a beautifully filmed movie by Jane Campion:

*Bright star, would I were steadfast as thou art—  
Not in lone splendour hung aloft the night  
And watching, with eternal lids apart,  
Like nature's patient, sleepless Eremite,  
The moving waters at their priestlike task  
Of pure ablution round earth's human shores,  
Or gazing on the new soft-fallen mask  
Of snow upon the mountains and the moors—  
No—yet still steadfast, still unchangeable,  
Pillow'd upon my fair love's ripening breast,  
To feel for ever its soft fall and swell,  
Awake for ever in a sweet unrest,  
Still, still to hear her tender-taken breath,  
And so live ever—or else swoon to death.*

As for creativity in GTS, Espert et al. (2017) have recently revised the existing literature and studies, giving special attention to the fact that creativity in GTS is related to the excess of dopamine that contributes to the development of a creative trait of thinking. The significant changes in the pattern of thinking of GTS patients are secondary to alterations in neurocircuits. They demonstrate mostly the disinhibition and deficits in control and executive functioning (Morand-Beaulieu et al., 2017). However, we always have to bear in mind the presence of comorbidities that can significantly contribute to the worsening of performance in these patients. Espert et al. (2017) confirm, after taking the existing literature into consideration, that speculations on whether GTS is associated with a predisposition to creativity were only based on a series of case reports, but in any case it seems that among outstanding individuals with GTS, the most common ones are musicians. However, it is far too dangerous to overinterpret these few examples as they may be just casual. One cannot say exactly whether GTS predisposes to better musical performance, but we can definitely draw the conclusion that engagement in musical tasks can improve patient's condition (Bodeck et al., 2015). The well-known example of creativity associated with GTS was described by Oliver Sacks in his famous book *The Man Who Mistook His Wife for a Hat* (1985) and in his article about "ticcy witticisms" and "witty ticcicisms," called *Tourette's*

*syndrome and creativity* (Sacks, 1992). The case of a drummer who used his motor tics during performance elucidates the importance of tics for some patients:

*But phantasmagoric Tourette's syndrome is another matter entirely, and while it can also cause much distress and disability it can hardly fail to touch, to interact with, a person's character and creativity and even to lend that person some of its own striking "character." This was clear with my patient "Witty Ticky Ray," who believed that there was a close analogy between his wit and his tics and spoke of his "ticky witticisms" and his "witty ticcicisms," feeling both as expressions of the sudden, unexpected swerves and twists, the irruptions and interruptions, in his mental and motor stream (Sacks, 1992).*

Tics, in contrast to obsessions that can also occur in GTS, are egosyntonic and barely noticed by some patients. They could be even interpreted as a harmonic part of everyday life and personality, and while treatment of tics can lead to amelioration of symptoms, it could worsen the general quality of life. Sacks wrote about GTS also in his other writings such as *An Anthropologist on Mars. Seven Paradoxical Tales* (1995). He focused there mostly on cases of autism, but also mentioned his friend afflicted by GTS, depicting mainly his unusual ability to understand and penetrate feelings of other people:

*I had spent an extraordinary week at a camp for autistic children, Camp Winston, in Ontario – the more so as one of the counselors there this summer was a friend of mine, Shane, with Tourette's syndrome, who, with his lungings and touchings, reachings and buttings, his enormous vitality and impulsiveness, seemed able to get through to the most deeply autistic children, in a way the rest of us were unable to do (Sacks, 1995).*

His poetic description of autistic behaviour and pattern of thinking approximates more a description of savant syndrome. It is, therefore, a subjective vision of people with distinct pathological traits who are original and, in a way, gifted, but this cannot lead to a generalisation and conclusion that autism or GTS equal the excess of talents, mental predispositions or mindfulness.

When analysing GTS and creativity, we have to bear in mind, once again, comorbidities, such as ADHD. Aliabadi et al. (2016) analysed creativity among children with ADHD and did not find any difference between healthy controls. It could only be speculated that coexisting traits of depression, OCD or anxiety in GTS can provoke an effect on creativity, but this assumption has never been widely studied before.

## OUTSTANDING TOURETTES

However casual, the examples of outstanding individuals suffering from GTS are certainly worth mentioning. Obviously, when describing some of these cases we cannot

be absolutely sure of their certainty due to historical and biographical bias. Nevertheless, they give the basis for broader thinking when analysing the complexity of this disease. As it has been mentioned before, the most famous and discussed case of genius affected by GTS was Wolfgang Amadeus Mozart (1756–1791). It is well known that from early childhood Mozart demonstrated talent in music, but also complexity of behaviour. He was suspected of being afflicted with different conditions, but the hypothesis that one of these conditions could be GTS was first mentioned during the World Congress of Psychiatry in Vienna in 1983. Simkin (1992) confirmed that Mozart could fulfil the criteria for GTS and therefore be diagnosed with such a disturbance. Some suggested that he even could present vocal and motor tics (Bhattacharyya and Rai, 2015). Nevertheless, these abnormal movements could be also stereotypies or mannerisms or even just mere expressions of extravagance. It is certain that Mozart was affected by obsessive thoughts that could change even more the pattern of his movement disorder. To give an example, he was especially obsessed with his wife and was afraid that she would not return home and therefore controlled her everyday living (Monaco et al., 2009). The use of coprographia was confirmed, and he even composed a canon entitled *Lick my ass*, but there is no clear evidence that Mozart was also affected by coprolalia. Isolated coprographia is rarely present in GTS patients, which could be one of the arguments against a GTS diagnosis. It has also been indicated (Ashoori and Jankovic, 2007; Monaco et al., 2009) that Mozart's vocabulary was not vulgar in the context of the widely used lexicon at that time and in this region of Germany. Ashoori and Jankovic (2007) but also Simkin (1992) analysed writings of Mozart's family members, and it seems that all of them demonstrated some level of coprography. Scatology, defined as interest for faeces and anal region, could be simply the indicator of Mozart's grotesque style. The case of Mozart is far more complicated. Wintersgill (1994) suspects that Mozart's character was mostly cyclothymic with strong inclination to depression secondary to external factors, such as death of his relatives. His unusual behaviour could also indicate ADHD, autistic traits, bipolar disorder or the presence of obsessions and even paediatric autoimmune neuropsychiatric disorders (PANDAS) (Fog and Regeur, 1985; Kern et al., 2015; Möller, 2014). However, it seems that Mozart was quite extravagant in his behaviour and therefore all the assumptions mentioned could be mere misinterpretations. Monaco et al. (2009) as well as Powell and Kushner (2015) also criticise direct conclusions about Mozart's GTS based only on scatology and his unusual behaviours. They allude also to Cavanna's et al. (2011) paper on paligrographia and written jocularity in GTS, which seem very rare.

Another famous musician who was suspected to suffer from GTS was Kurt Cobain (1967–1994), a famous composer and lead singer of Nirvana, who committed suicide in 1994. As he experienced severe struggles in concentration during his primary education, he was finally diagnosed

with ADHD and treated with methylphenidate. Afterwards, he continued to worsen in his education and started to misuse alcohol and illicit drugs. Cobain demonstrated also obsessive thoughts, mostly related to physiological functions, death, autodestruction and suicide (Cross, 2001). Cobain himself confirmed that his songs are inspired by his personal experiences, among them also the disease that drove him to write songs such as *Tourette* (text of the song is below) and *Lithium*. Camargo and Bronzini (2015) mention that Cobain supposedly experienced simple motor tics in his childhood, and some simple motor and vocal tics could be detected during one of his interviews in 1993. They also draw attention to the fact that these movements could be secondary to a number of other causes than GTS, as we do not have any reliable medical documentation.

*Tourette's* by Kurt Cobain

*Mayday everyday, my day  
 Could've had a heart attack, oh my heart  
 We don't know anything of my heart  
 We all want something fair of my heart*

*Hey!  
 Hey!  
 Heeeeeeeeeey!*

*Out of town, out of fire, is my heart  
 Queen of lies, how's today on my heart?  
 One more on the phone of my heart  
 One more at the door of my heart*

*Hey!  
 Hey!  
 Heeeeeeeeeey!*

*Mean heart  
 Cold heart*

A group of contemporary musicians suffering from GTS also include: Michael Wolff, Nick van Bloss and James Durbin (Camargo and Bronzini, 2015). Michael Wolff is an American jazz pianist and composer who has been presenting the symptoms of GTS from childhood, but the final diagnosis was made in late adulthood. He is actively engaged in GTS initiatives and has even co-produced the film on GTS *The Tic Code*.

Meanwhile, Nick van Bloss is an English concert pianist who, having struggled with tics since he was seven, was finally diagnosed in his twenties. Camargo and Bronzini

(2015) mention also the example of James Durbin, who won the fourth prize in 2011 Idol Contest (Camargo and Bronzini, 2015). Blunt (2010) even suggested that Michael Jackson could be the victim of tics and OCD, and that his movement disorder was used in his choreography.

In their book *Tourette Syndrome: The Facts* (2008), Robertson and Cavanna extensively analyse examples of famous individuals affected or suspected to have been affected by GTS. It seems that the list is far longer than it was suspected before. They centre firstly on historically important individuals such as King of England William III, emperor of Russia Peter the Great and Napoleon Bonaparte. In the case of Peter the Great, his behaviour, described by vice-admiral Just Juel, indicates that the tsar could suffer from tics:

*We got out of the carriage and saw how the tsar approached a simple soldier carrying a Swedish flag and began hacking him mercilessly with his bare sword and shower him with blows, perhaps because he did not march as the tsar had wished. Then the tsar stopped the horse but kept doing the same, horrible grimaces, he moved his head, twisted his lips, turned his eyes, flailed his hands and arms, and waved his legs to and fro. [...] These convulsions [...] raid him at the table when he eats, and if he holds a fork and knife in his hands, he moves them towards his face, evoking fear in others that he might hurt himself or prick his face (Juel, 2001).*

They also mentioned a well-known and studied case of Samuel Johnson, the author of the first dictionary of English, and some members of Tolstoy's family as well as Algernon Charles Swinburne and André Malraux. On the list of contemporary celebrities with GTS, there are people representing completely different backgrounds, such as music, sport, visual arts, medicine and science or popular culture. However, once more the diagnosis is not certain in many cases, and it could be therefore profoundly discussed whether they are the victims of GTS. Obviously, this is the case of historically important individuals who died many centuries ago and in the case of whom we do not possess any objective documentation. That is why any statement in relation to these findings can remain only a speculation. Peter the Great, for example, according to existing documentation, was quite violent and aggressive and was also an alcohol misuser (Lagerkvist, 2005), and sometimes was experiencing some involuntary movements, mostly, face grimaces (Lagerkvist, 2005; Robertson and Cavanna, 2008). However, this cannot be misinterpreted as an exact indicator of GTS. Perhaps the case of Dr Samuel Johnson is more complex (Bhattacharyya and Rai, 2015; Claman, 2001; Maude, 2016). In their book, Robertson and Cavanna (2008) confirm that he was a victim of GTS and very pronounced OCD. It seems that he had especially severe vocal tics, such as vocalisations resembling mastication or animalistic sounds and even complex vocal tics, reflecting his devotion to God (repetition of prayer "Our Lord") and

echolalia. He is claimed to have suffered from motor tics and self-injurious behaviours. These statements were also confirmed by Rousseau (2009), Monaco et al. (2009) and Murray (1979) who took into account the entire psychopathological and neurological complexity of abnormalities experienced by Johnson and concluded that it was a case of comorbid GTS and OCD. Especially interesting were not only his tics, but also compulsions, very complex ritualistic behaviours gaining momentum prior to leaving the room (measuring the steps, touching posts and other bizarre gestures). He was also a victim of depression, described at times as melancholy, and he also suffered stroke. The exact origin of abnormal movements was not totally confirmed. Interesting and inspiring are also the cases of sportsmen and successful scientists with GTS. Mort Doran is a Canadian surgeon and Peter Hollenbeck has graduated from the University of Harvard and is a professor of neurobiology in Purdue University. Also, some of GTS patients have achieved very high results in sport. For example, Jim Eisenreich is a successful American baseball player with GTS. However, the most famous sportsman, but also the most socially involved in GTS, is Tim Howard. He was born in 1979 and is a soccer player, now a goalkeeper of Colorado Rapids, and he represents the American national team. Apart from being a very effective football player, he suffers both from GTS and OCD and described his struggles in book *The Keeper. The Unguarded Story of Tim Howard*, published in 2014. Howard was diagnosed with GTS and OCD in the secondary school. The disease has had a significant impact on his personal life, which is why he decided to support the Tourette Syndrome Association and all initiatives related with it. As a consequence, he received a number of different awards such as: MLS Humanitarian of the Year in 2001 and Champion of Hope in 2014.

## BEYOND HISTORY AND SPECULATIONS

It can therefore be concluded that we cannot speak about a special type of gifted individuals with GTS, such as “musical tourettism.” As in the whole population, people affected by GTS could present the entire spectrum of talents, but separate examples cannot serve as scientific background to draw any conclusions about the group as a whole. Moreover, as we do not possess reliable historiographic sources, we cannot draw objective conclusions in cases that go back to remote centuries. As much as the topic of neuropsychiatry and genius fascinates both artists and scientists, it appears that disease of any kind modulates our perception of the word and ourselves, but predisposition to exceptional performance cannot be reduced just to be a mere consequence of psychopathology or physical debilitation.

### Conflict of interest

*The authors do not report any financial or personal connections with other persons or organisations which might negatively affect the content of this publication and/or claim authorship rights to this publication.*

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