

Determining the Difference between the Chronological and Biological Age of Athletes Diagnosed with Trigeminal Neuralgia

Josip MIOČIĆ^{1*} , Milica KOMŠO², Tonći JERAK³

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ABSTRACT. Trigeminal neuralgia induces severe, often intolerable pain in patients—athletes, in this context—that is frequently resistant to currently available therapeutic options. The International Association for the Study of Pain (IASP) defines trigeminal neuralgia as a sudden, typically unilateral, intense, brief, stabbing, and recurring episode of pain in the distribution of one or more branches of the trigeminal nerve. The condition may be caused by vascular compression of the trigeminal nerve, tumor-related processes, or multiple sclerosis. Compression of the nerve itself leads to demyelination, which results in abnormal depolarization and the generation of ectopic impulses. Triggers for pain may include heat, cold, eating, breathing, tooth brushing, shaving, or incidental contact. Once diagnosed by a specialist, magnetic resonance imaging (MRI) is required to confirm or exclude multiple sclerosis. Tumorous processes may also secondarily lead to trigeminal neuralgia. The first-line pharmacological treatment remains carbamazepine. If pharmacotherapy proves ineffective, more invasive interventions such as microvascular decompression, stereotactic radiosurgery (Gamma Knife), percutaneous balloon microcompression, glycerol rhizolysis, and radiofrequency (RF) ablation may be considered. This study is unique in that its sample comprises athletes diagnosed with trigeminal neuralgia. The primary objective is to examine potential differences between their chronological and biological age by analyzing their metabolic age. The findings aim to support and potentially initiate a novel paradigm or theoretical

¹ Center for Physical Education and Student Sports, University of Zadar, Croatia.

² Md. Zadar General Hospital

³ University of Zadar: Zadar, HR

* Corresponding author: josip.miocic@szgz.hr

framework concerning the remodeling of biological aging in athletes suffering from trigeminal neuralgia, particularly in the context of optimizing training processes.

Keywords: *trigeminal neuralgia, athletes, chronological age, biological age.*

INTRODUCTION

Trigeminal neuralgia, also referred to as “tic douloureux,” is characterized by extremely sharp, episodic, intense, stabbing facial pain. The pain is localized within the innervation zone of one of the trigeminal nerve branches—most commonly the second or third—and significantly diminishes the patient’s quality of life (Dlaka & Vasung, 2007). It is a chronic pain disorder affecting the trigeminal nerve, which transmits sensory information from the face to the brain. To fully grasp the nature of trigeminal neuralgia, one must first understand neuralgia itself, which is defined as episodic irritation of a nerve that produces intense neural pain along a damaged nerve pathway. In cases of trigeminal neuralgia, even mild facial stimuli such as brushing teeth or applying makeup can provoke intense pain or distress.

The pain is typically described as stabbing, occurring in paroxysms at consistent locations and with consistent intensity (Scrivani, Mathews, & Maciewicz, 2005). The trigeminal nerve is one of the most important cranial nerves. According to Merskey and Bogduk (1994), damage to this nerve generally results in severe unilateral facial pain. In modern medicine, due to advances in diagnostic and treatment modalities, trigeminal neuralgia no longer necessarily condemns the patient to a lifetime of suffering. Although not life-threatening, it can severely impair physical functioning and quality of life.

There is currently no objective diagnostic test for trigeminal neuralgia; diagnosis relies entirely on clinical expertise and recognition of its distinct symptoms (Chudy et al., 2012). Patients experience sharp, stabbing pain on the affected side of the face, lasting from seconds to a minute. According to Apfelbaum (2000), the pain can be triggered by light touch, air drafts, or spontaneous neural activity. Attacks may recur at progressively shorter intervals until they become nearly continuous. In some instances, the pain is accompanied by muscle spasms that lead to visible facial tics.

As Chudy and colleagues (2012) explain, trigeminal neuralgia involves a disruption of trigeminal nerve function, often resulting from contact between a blood vessel (artery or vein) and the nerve within the brain. This contact exerts pressure on the nerve, disrupting and damaging its function. Additionally, trigeminal neuralgia can be associated with conditions such as multiple sclerosis,

particularly in younger individuals. In such cases, the pain may be bilateral and involve the ophthalmic branch, resulting in sensory disturbances in the forehead region (Fukuda, Ishikawa, & Okumura, 2003).

Initial treatment typically involves pharmacological intervention. For many patients, this is sufficient (Scrivani, Mathews, & Maciewicz, 2005). However, due to variations in individual physiology and disease progression, medications can lose efficacy over time or produce adverse effects. For such cases, modern medicine offers injections or surgical procedures, including microvascular decompression and other techniques, which can effectively manage the disorder (Chudy et al., 2012).

According to Perrudin (2005), sport as a structured physical activity engages both physical and psychological dimensions, with an inherent social component. These characteristics make sport highly relevant to overall health and well-being, encompassing physical, mental, and social domains (Mijolović, 2014). At its core, sport consists of rule-governed physical activity aimed at progress in physical, psychological, and social development (Wikipedia, 2024). Just like the general population, athletes diagnosed with trigeminal neuralgia endure intense pain that interferes with their daily lives and primary sporting activities.

Pathopsychology

According to Tolle, Dukes, and Sadosky (2006), trigeminal neuralgia most commonly occurs in middle-aged and elderly individuals, including athletes. In the literature, it is described as paroxysmal pain of extreme intensity, with burning, stabbing, and tearing characteristics. Merskey and Bogduk (1994) report that it is most often localized within the maxillary and mandibular branches of the trigeminal nerve and, less frequently, the ophthalmic branch. Patients frequently describe it as the most excruciating pain imaginable—akin to electric shocks, lightning strikes, stabbing, tearing, or burning sensations across the face.

To emphasize the severity of this condition, Tomasović (2019) notes that there have unfortunately been documented cases of suicide among patients who could no longer endure the pain. Typically, the pain episodes are brief, lasting only a few seconds to one minute, but their intensity can provoke involuntary facial muscle contractions, including tonic-clonic spasms of the eye and cheek. Following an attack, patients may experience autonomic symptoms such as facial flushing, lacrimation, nasal discharge, or salivation (Dionne, Newton-John, & Zakrzewska, 2009). Despite the frequency of these attacks, patients experience pain-free intervals between episodes.

As previously mentioned, pain can be triggered by minimal facial stimulation, speech, chewing, or exposure to cold air. In severe cases, patients may avoid all movement and contact, including speaking or eating, to prevent triggering pain—resulting in what is sometimes described as the "mummy face." Due to reduced food intake, patients—particularly athletes—often experience significant weight loss over short periods.

The condition typically begins with alternating periods of pain and remission, complicating the structuring of a consistent training regimen. According to Androja et al. (2021), pain episodes may persist for several months before spontaneously resolving. However, Radoš (2004) observes that over time, painful periods lengthen and pain-free intervals shorten, ultimately leading to a state of continuous pain in all patients. After prolonged disease progression, approximately one-quarter of patients develop sensory deficits in the area innervated by the trigeminal nerve (Radoš, 2004).

Symptomatic trigeminal neuralgia occurs when the nerve is irritated by an underlying pathological condition such as multiple sclerosis, vascular compression, a basilar artery aneurysm, or a pontocerebellar tumor. Numerous studies and authors report that sensory loss on the face and diminished corneal reflexes are characteristic findings. Miočić and Komšo (2020) emphasize that diagnosis is primarily clinical, although magnetic resonance imaging (MRI) in idiopathic cases may reveal dilation of the superior cerebellar artery loop, exerting pressure on the nerve and leading to demyelination. According to Tomasović (2019), in younger patients, trigeminal neuralgia most frequently arises as a consequence of demyelinating lesions or neoplasms.

Sport and Trigeminal Neuralgia

For athletes, physical movement, active engagement, communication, and dynamic social interaction are essential to participating in sports. The coexistence of such a physically demanding lifestyle with a condition as debilitating as trigeminal neuralgia appears paradoxical—yet it occurs. Athletes diagnosed with this disorder face daily battles to maintain functionality and continue their professional activities.

Imagine an individual for whom deep breathing, swallowing, chewing, or even speaking triggers excruciating pain—described as akin to a needle prick or an electric shock. Now, imagine that this individual is a professional athlete. According to Chong et al. (2023), trigeminal neuralgia is widely recognized in both medical and public discourse due to the extreme facial pain it causes. Affecting approximately 12 out of every 100,000 individuals worldwide (Machado, Ogrin, Rosenow, & Henderson, 2021), the condition's rarity makes its presence among elite athletes particularly noteworthy.

Although the identities of affected athletes are generally kept private, an exception can be made in the case of Álvaro Morata, a prominent football player and member of the Spanish national team. Public reports have confirmed that Morata suffers from trigeminal neuralgia (Sport, 2024). His club, Atlético Madrid, has openly expressed concern, highlighting that although the condition is rare, it poses a significant challenge to maintaining a normal lifestyle and consistent football training.

The lead author of this paper, himself a former athlete and now an official in the sports sector, also lives with what he refers to as a “condition” rather than a disease—trigeminal neuralgia. Like others—both athletes and non-athletes—he contends with pain episodes that arise suddenly, last for varying durations over days or weeks, and then subside. This erratic pattern inevitably impacts quality of life, professional obligations, and the ability to participate in either competitive or recreational physical activity. Nevertheless, his experience serves as evidence that coexisting with such a condition, while difficult, is possible.

As previously noted, diagnosing this disorder is far from straightforward, especially in athletes, for whom time-sensitive performance requirements demand rapid medical clarity. There is no definitive diagnostic test; diagnosis depends heavily on patient interviews and thorough clinical and neurological examinations. According to Professor Klepac, diagnostic procedures are primarily aimed at ruling out other conditions that may mimic trigeminal neuralgia. These include vascular compression, tumors, or demyelinating diseases such as multiple sclerosis (Xu & Jackson, 2021).

Timely medical consultation is essential, as chronic pain severely compromises quality of life. In conclusion, trigeminal neuralgia is a neurological condition that causes chronic facial pain due to damage or dysfunction of the trigeminal nerve. It presents significant obstacles for athletes, hindering both their routine training activities and their ability to maintain a full quality of life.

Chronological and Biological Age

According to Vásquez-Alvarez et al. (2021), chronological age is measured in years from an individual's date of birth. A crucial distinction exists between how many years a person has lived—referred to as chronological age—and the overall condition of their body, known as biological age. This difference can help demystify the aging process and support a more holistic and robust approach to health assessment.

As noted by Mišigoj-Duraković et al. (2018), biological or physiological age can be defined as an individual's capacity to adapt to environmental conditions, most commonly expressed through endurance, strength, flexibility, coordination,

and work capacity. Both chronological and biological age serve as metrics for understanding aging and the impact of time on the human body. Chronological age quantifies the number of years a person has lived. According to Pisaruk et al. (2021), individuals born in the same year share the same chronological age regardless of how old or young they may appear or feel.

In contrast, biological age varies between individuals and more accurately reflects the diversity in aging processes. Donma and Donma (2020) argue that biological age reveals how a person is aging based on numerous factors and biomarkers. However, no single biomarker or diagnostic test can definitively determine a person's age. Various studies have advanced the theoretical framework in this domain. For instance, Paolisso, Barbieri, Bonafè, and Franceschi (2001) proposed a new paradigm—the theory of aging remodeling. This has been further developed by researchers such as Kusnopranto et al. (2020) and Pisaruk et al. (2021).

MATERIALS AND METHODS

The study was conducted in Croatia, where, based on the authors' knowledge and the available literature, a total of 46 athletes from various sports disciplines and competitive levels diagnosed with trigeminal neuralgia (G50.0) were included. Statistical analysis was performed using the Statistica 14.0 software package, with the level of significance set at $p < 0.05$.

Descriptive statistical parameters were calculated, including arithmetic mean (AM), standard deviation (SD), minimum (MIN), and maximum (MAX) values. To determine differences between chronological age and metabolic age among participants, a paired-samples t-test was applied. Furthermore, to examine the relationship between the variables representing the difference between chronological and metabolic age, a correlation analysis using Pearson's correlation coefficient was conducted.

Prior to the measurement of morphological variables, participants completed a questionnaire containing personal data, including their chronological age (CA). The morphological status variables used in the research included body mass, hydration status, fat mass, lean mass, and muscle mass, all measured using the Tanita BC-418 body composition analyzer, which employs bioelectrical impedance analysis. Body height was assessed using an anthropometer.

Based on the results obtained from the morphological measurements, the Tanita device calculated each participant's metabolic age (MA). For the purpose of this study, the difference between chronological age and metabolic age (CA-MA) was subsequently calculated and analyzed.

RESULTS

An athlete's chronological age may serve as one indicator of their physical conditioning relative to other athletes. In contrast, metabolic age reflects the athlete's basal metabolic rate in comparison with peers. In other words, if an athlete's chronological age aligns with their metabolic age, this suggests that the athlete's physiological status is consistent with that of the broader athletic population within the same age range.

Table 1. Descriptive Statistical Indicators of the Applied Variables
(*N* – number of participants, *AM* – arithmetic mean, *SD* – standard deviation, *MIN* – minimum value, *MAX* – maximum value)

	N	AS	SD	MIN	MAX
KD	46	66.08	5.56	51.00	78.00
MD	46	52.45	8.41	38.00	72.00
KD-MD	46	12.89	8.69	-14.00	17.00
ST	46	132.10	23.04	90	166.00
DT	46	76.62	10.04	51.00	95.00
FS	46	72.40	10.01	51.00	94.00

Legend: **KD** – chronological age, **MD** – metabolic age, **KD-MD** – difference between chronological and metabolic age, **ST** – systolic pressure, **DT** – diastolic pressure, **FS** – heart rate

The research findings emphasize the fact that elevated heart rate is a strong predictor of cardiovascular mortality—more commonly observed in men (Palatini et al., 1999)—and that it is essential to monitor heart rate regularly, both at rest and during physical activity in athletes.

Table 2. Results of the Paired-Samples t-Test
(Differences Between Chronological and Metabolic Age)

	AS	SD	N	t	df	p
KD	64.07	5.65	46	9.44	41.00	0.00
MD	51.40	8.79				

Legend: **KD** – chronological age, **MD** – metabolic age

The results of the paired-samples t-test (Table 2) confirmed the hypothesis regarding the statistical significance of differences between the chronological and metabolic age of participants engaged in recreational exercise programs ($p = 0.00$). Additionally, the t-test results confirmed the significance of differences between chronological and metabolic age among participants involved in professional sports programs ($p = 0.00$). These significant differences highlight the fact that metabolic age is a much stronger predictor of cardiovascular risk than chronological age (Elguezabal-Rodelo et al., 2021).

Table 3. Results of the Correlation Analysis Between Cardiac Functions (Systolic and Diastolic Blood Pressure and Heart Rate) and the Difference Between Chronological and Metabolic Age

	KD-MD	FS	DT	ST
KD-MD	1.00	-	-	-
FS	-0.14	1.00	-	-
DT	-0.51	0.16	1.00	-
ST	-0.19	0.006	0.65	1.00

Legend: **KD-MD** – difference between chronological and metabolic age, **ST** – systolic pressure, **DT** – diastolic pressure, **FS** – heart rate

Within this study, the only statistically significant correlation was observed between the difference in chronological and metabolic age and diastolic blood pressure ($r = -0.51$). A higher basal metabolic rate was associated with lower diastolic pressure. Although this outcome is logically coherent, it contrasts with several previous findings (Seghieri et al., 2008). It is important to emphasize that the study sample predominantly consisted of male participants, most of whom were classified as non-obese.

CONCLUSION

The conducted research established a significant difference between the chronological and metabolic age of athletes diagnosed with trigeminal neuralgia. Furthermore, the findings confirmed the paradigm that there is a meaningful correlation between heart rate and the difference between chronological and

metabolic age among the examined athletes. In addition, a significant association was observed between diastolic blood pressure and the difference between chronological and metabolic age in the same population.

These results support the premise that professional athletes affected by trigeminal neuralgia—a condition that causes intense and often debilitating facial pain—may still exhibit a lower metabolic age despite the limitations imposed by their condition. Moreover, participants with a greater discrepancy between chronological and metabolic age also showed lower diastolic blood pressure values, regardless of the influence of trigeminal neuralgia.

The findings contribute valuable insight into the role of biological and chronological age in the context of athletic training among individuals with trigeminal neuralgia. Importantly, the study underscores the need for continued research to further explore this topic and potentially influence how differences between chronological and biological age are assessed in athletes suffering from this neurological condition.

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