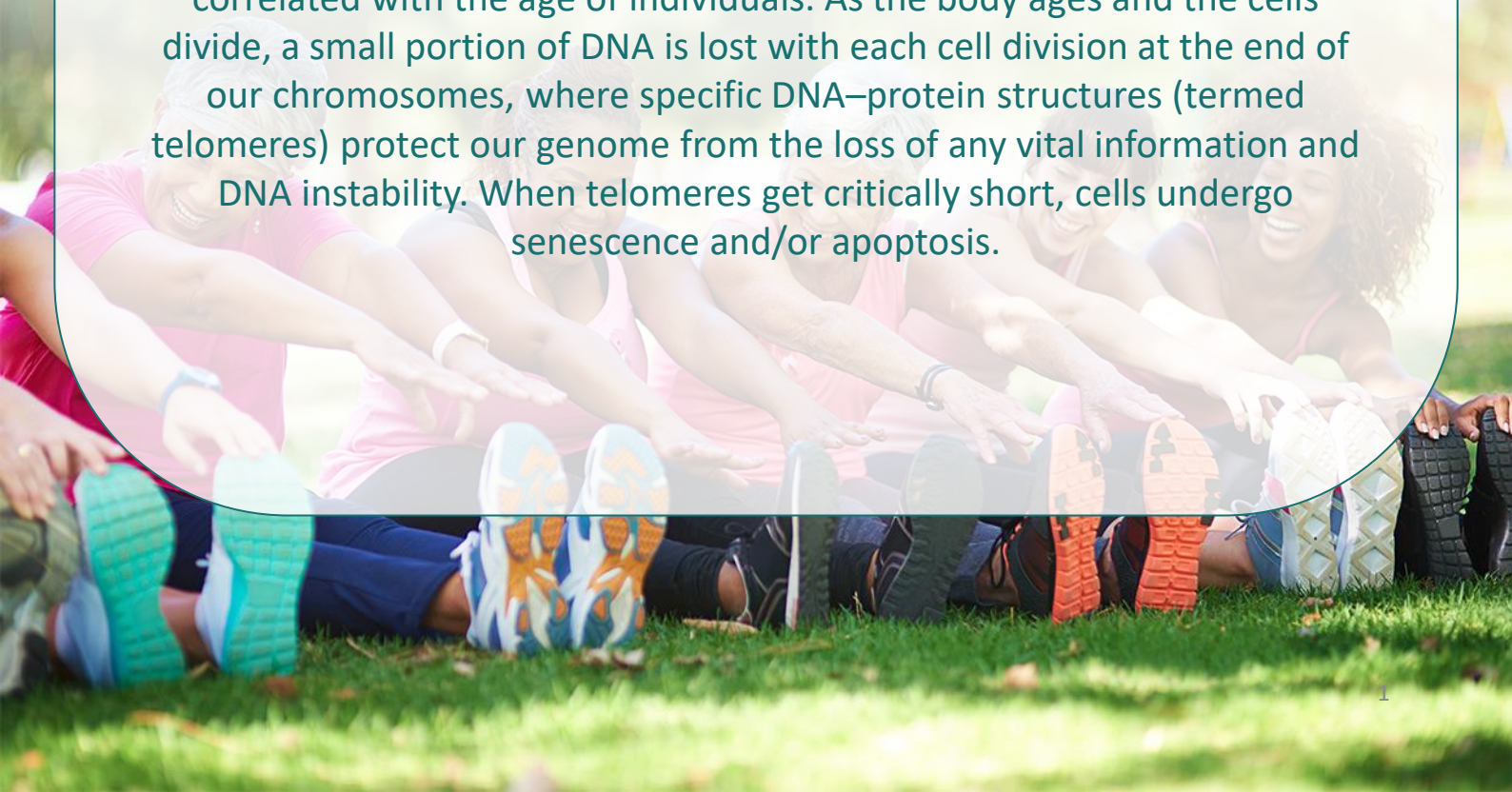# HealthBioCare GmbH

Healthy Aging

Jane Doe

Health, premature aging, healthy aging and intervention

The aging process can be described as a slow decline of multiple biological functions. Aging is a multifactorial process including molecular mechanism such as genomic instability, telomere attrition, epigenetic alterations, and mitochondrial dysfunction. While being hugely affected by external factors like environment, toxins, radicals, lifestyle, and diet, these processes result in a greater susceptibility to a wide variety of age-related diseases. An important influencing factor of aging is the epigenetic makeup of the cells. Epigenetics can be described as the software which regulates the gene sequences seen as hardware in gene expression. It is widely accepted that during the aging process the overall epigenetic methylation of the DNA decreases. Local DNA methylation of very specific DNA sites can also be correlated with the age of individuals. As the body ages and the cells divide, a small portion of DNA is lost with each cell division at the end of our chromosomes, where specific DNA–protein structures (termed telomeres) protect our genome from the loss of any vital information and DNA instability. When telomeres get critically short, cells undergo senescence and/or apoptosis.

Analytical concepts

Increased experience in genetics, epigenetics, microbiota, and molecular mechanisms has resulted in the possibility of individualizing analyses to improve healthcare. Analytical concepts in premature aging can be based on a preventive, individual approach which identifies possible risks from dysfunctions in individual molecular mechanisms such as epigenetics, telomeres, inflammation or DNA instability, as well as risk factors from environment, lifestyle, and nutrition. Our analysis aims to establish a preventive concept in cooperation between the client and a healthcare professional. With our analytical concepts, we try to identify causal mechanism of health issues. This approach will strengthen intervention and monitoring. We integrate lifestyle, nutrition, and molecular analysis to give you an individualized optimal intervention plan for delaying premature aging and to promote healthy aging. Analysis in this area has to be guided by a responsible medical expert.

Intervention

Intervention in premature aging and healthy aging mostly requires integration of lifestyle, nutrition, medication or supplements and personalized nutrition.

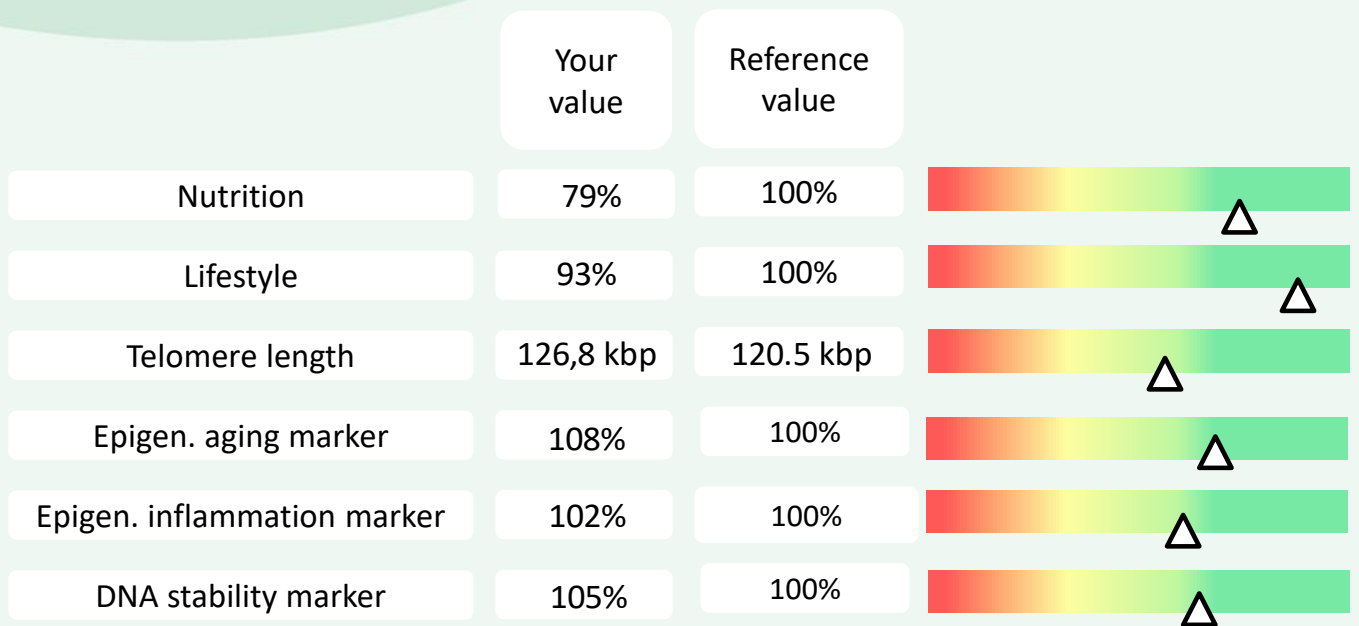| Name	Jane Doe
Birth date	21-01-69
Analysis number	1
Date	04-02-25

Analyzed Elements

Nutrition
Lifestyle
Telomere length
Epigen. aging marker
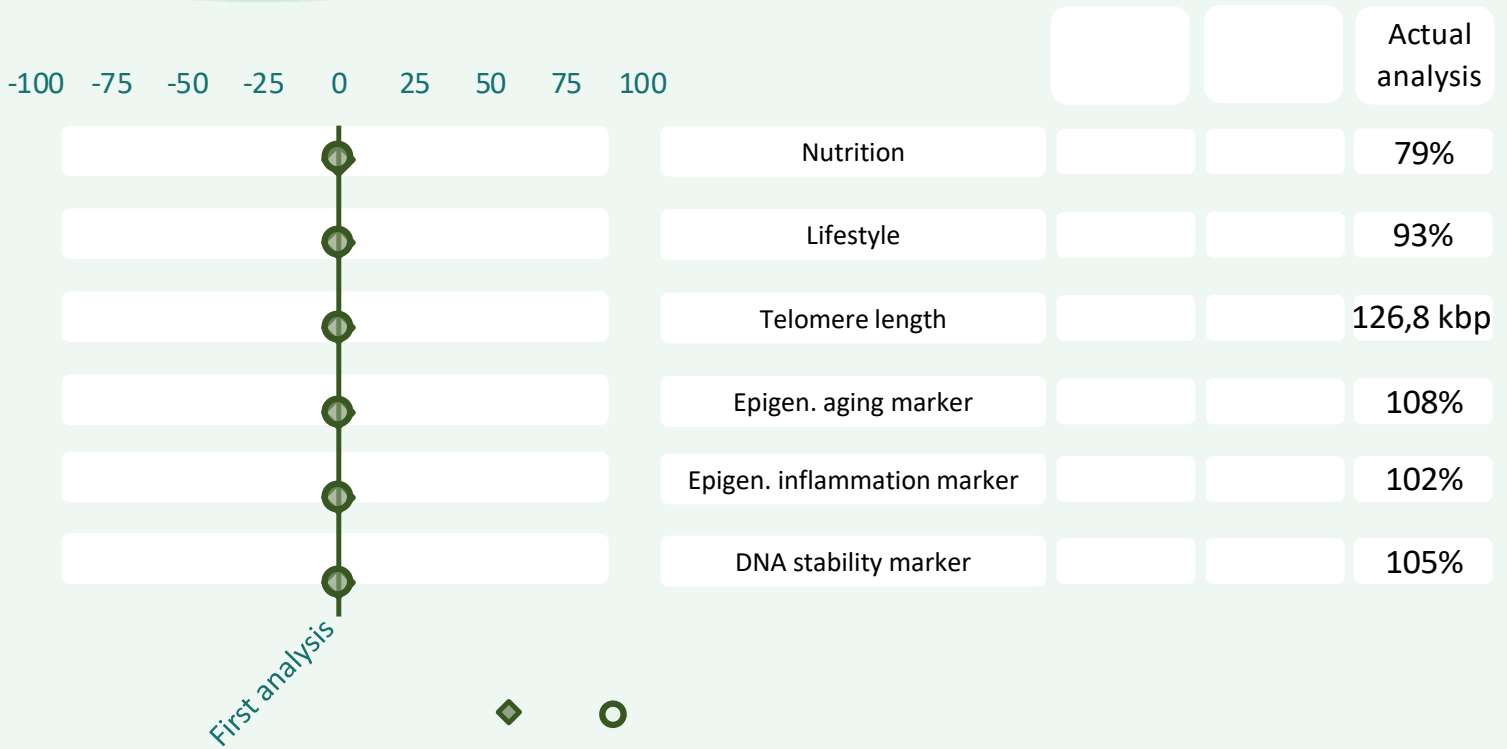Epigen. inflammation marker
DNA stability marker

Summary of the analysis at a glance

Analysis overview

	Your value	Reference value	
Nutrition	79%	100%	
Lifestyle	93%	100%	
Telomere length	126,8 kbp	120.5 kbp	
Epigen. aging marker	108%	100%	
Epigen. inflammation marker	102%	100%	
DNA stability marker	105%	100%	

The chart above displays an overview of your values in percent compared to the average values corresponding to your age and gender. An assessment of these values is shown in a traffic light system.
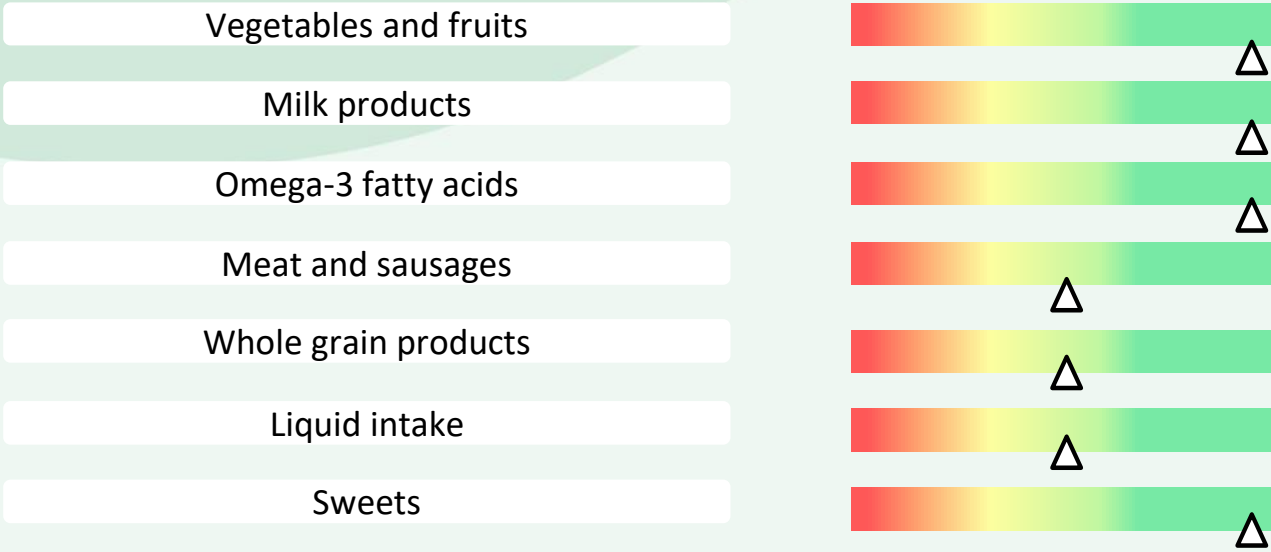
Variations of the analyzed parameter over time

	-100	-75	-50	-25	0	25	50	75	100				Actual analysis
Nutrition													79%
Lifestyle													93%
Telomere length													126,8 kbp
Epigen. aging marker													108%
Epigen. inflammation marker													102%
DNA stability marker													105%

First analysis

This is your first analysis.

Evaluation of your nutrition and lifestyle questionnaire

Overview of your eating habits

| Nutrition group	Rating
Vegetables and fruits	
Milk products	
Omega-3 fatty acids	
Meat and sausages	
Whole grain products	
Liquid intake	
Sweets	

Your diet was analyzed and compared to the WHO-based recommendations such as the Food Pyramid. Results of the nutrition groups are expressed in the traffic light system.

Your diet contains a variety of healthy foods, but further improvements are needed to ensure optimal nutrient absorption. Reduce your meat consumption, especially red and processed meats, as they have an inflammatory effect. Fiber is essential for keeping you full for longer and reducing the risk of various diseases. Try to further increase your fiber intake. This helps prolong the feeling of fullness and reduces the risk of various diseases. To do this, integrate more whole grain products, legumes and seeds (shells) into your diet every day. To stay optimally hydrated, you should drink at least 2 liters of water daily, as 1-2 liters are often not enough.

Lifestyle overview

|	
BMI	
Nutritional balance	
Physical activity	
Susceptibility to infection/inflammation	
Smoking	
Stress	
Alcohol consumption	
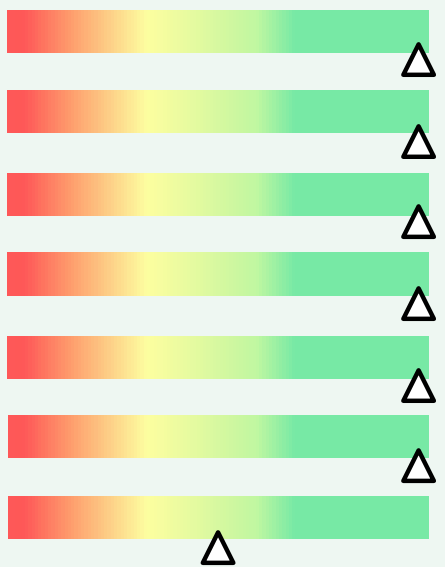
You have a solid foundation for a balanced lifestyle. Continue your current habits while incorporating the suggested nutritional changes. Consider enhancing your physical activity by adding endurance exercises. Additionally, reducing your alcohol consumption can further improve your overall well-being.

Analysis Results

Epigenetic mechanisms are molecular-biological processes which regulate the activity of genes without affecting the DNA sequence itself. DNA methylation is one of these mechanisms, and it indicates the addition of the small methyl-group to distinct positions of the DNA. The methylation level of distinct genes is correlated to the aging process, to conditions like obesity, and to disease. Changes of the epigenetic methylation pattern are associated with the development of complex diseases or premature aging. Epigenetic DNA methylation can be modified through environmental influences like diet and lifestyle.

Telomere length
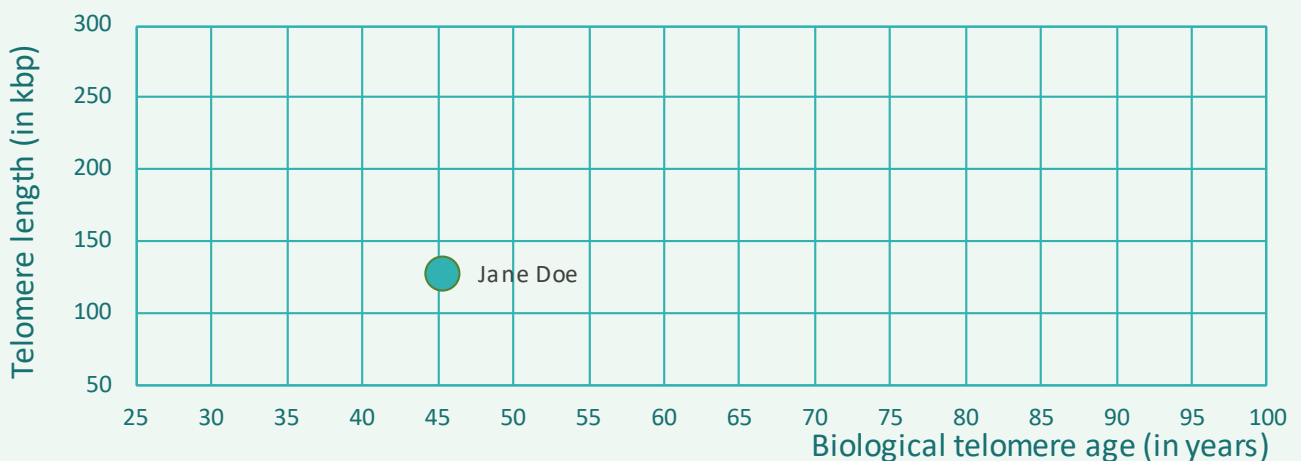
Your telomere length of 126.8 kbp is 5% longer compared to the age- and gender-matched control group. The calculated biological telomere age is 19% younger as your chronological age.

The ends of human chromosomes are protected and stabilized by distinct DNA sequences called telomeres. With each cell division, some base pairs of the telomere structure get lost, and thus the length of the telomere is correlated to an individual´s age. Furthermore, lifestyle factors such as obesity, an unhealthy diet, smoking, and psychological stress have negative effects on telomere health. Telomeres which are shorter than age-appropriate are associated with a wide range of complex diseases. The length of the telomeres can be stabilized or even elongated through dietary- and lifestyle-interventions including specific supplements or through therapy of the underlying disease.

Epigenetic aging markers

Methylation (%)

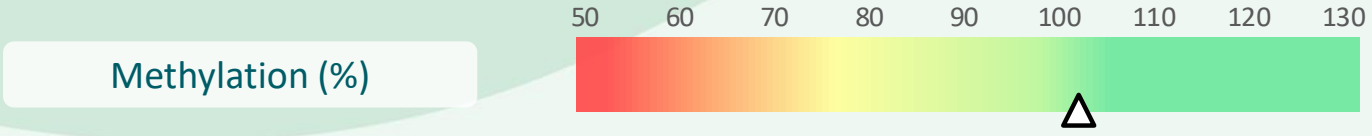| 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |

Compared to the age- and gender-matched control group, the epigenetic aging marker genes are 108% methylated. This is a positive result.

The analysis of the methylation of strictly age-related genes is an established marker for the assessment of the biological gene age. The chart above shows the combined methylation level of these genes compared to an age- and gender matched control group (100%). A value of under 90% is associated with an older biological age, a value of more than 100% is desireable.

Epigenetic inflammation markers

Methylation (%)

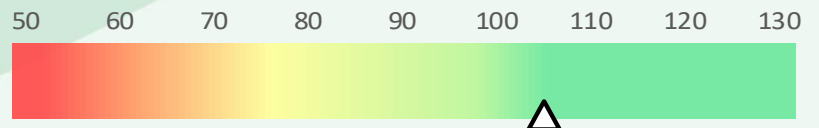| 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |

Compared to the age- and gender-matched control group, the inflammation marker genes are 102% methylated. This is a positive result.

The measured inflammatory markers mainly concern metabolically related inflammations, i.e. non-acute inflammatory processes. Reduced methylation in comparison to the reference group means a higher activity of metabolic inflammatory factors. Low grade metabolic related inflammation is a key mechanism of aging. Increased metabolic related inflammation levels lead to symptoms of old age. The genes TNF-α and IL-6 regulate inflammatory responses. The degree of epigenetic regulation (methylation) of the two genes influences the production of these mediators and thereby the formation or decay of inflammatory reactions. Healthy people have high methylation, and individuals with metabolic disorders show low methylation of these genes. The chart above shows the combined methylation level of these two genes compared to an age- and gender matched control group (100%). A value of under 90% is associated with an older biological age, and a value of more than 100% is desirable.

DNA stability marker

Methylation (%)

| 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |

Compared to the age- and gender-matched control group, the DNA stability marker gene is 105% methylated. This is a positive result.

The DNA methylation of LINE-1 represents the methylation level of the whole DNA of this tissue. A high DNA methylation corresponds with a high stability of the DNA. A low DNA methylation level is associated with premature aging and to the development of diseases. The chart above shows the methylation level of this gene compared to an age- and gender matched control group (100%). A value of under 90% is associated with an older biological age, and a value of more than 100% is desirable.

Conclusion - Individual recommendation

General Results

| Age in years | 40 | 45 | 50 | 55 | 60 |

Age:
O biological
| chronological
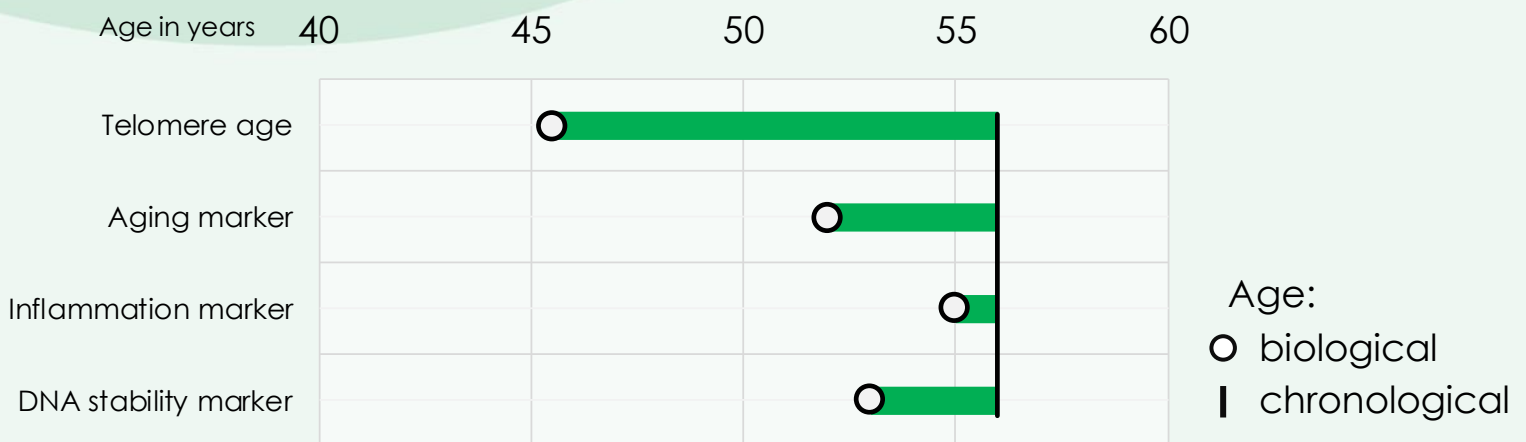
Aging is a natural and complex process that involves various physiological mechanisms. The overview above illustrates how your biomarker levels reflect your biological age compared to your chronological age. Your telomere length is above the average for your age, gender, and ethnicity-matched comparison group. To maintain this positive effect and keep the values stable, continue your current strength training routine. If desired, consider incorporating endurance exercises to further support your overall health and fitness. All your epigenetic markers are within a good range. Keep up your balanced lifestyle and consider implementing our suggestions to optimize your health further.