

Numerous factors can cause imbalances between the gasotransmitters and their interactions with oxygen. Nitric oxide (NO) is known as a factor for obstructive sleep apnea. Using NO as an example, the gasotransmitters is a vasodilator while hydrogen sulfide is a vasoconstrictor. Given the fact that that the tunica intima (inner layer of cells for the vascular) is known to be the source of NO and the tunica media (the middle layer of the smooth muscle cells for the vasculature) is known to be the source for hydrogen sulfide - H₂S (a vasoconstrictor), changes in levels can result in sudden cardiac health.

Merely one example of sources of H₂S is gram-negative bacteria in gums; a fact that can be verified by bioinformatic professionals.

Any factors that can cause imbalances between gasotransmitters (secondhand smoke or other environmental factors) can cause obstructive sleep apnea or sleep disordered breathing (SDB). Reduction of levels of oxygen can exacerbate imbalances between the gasotransmitters with sudden cardiac death being an outcome.

<https://medicalxpress.com/news/2019-03-young-athletes-apnea-linked-sudden.html>

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Study of young athletes suggests snoring and sleep apnea are linked to sudden cardiac death

by European Lung Foundation

A study of university rugby players has shown that they are more likely to suffer sleep disordered breathing than an average middle-aged man.

The study also showed that the athletes who experience this problem are also more likely to have low levels of oxygen in their blood and higher pulse rates during the night, suggesting that athletes with sleep disordered [breathing](#) may be at risk of [heart](#) abnormalities.

The researchers say this study could indicate that sleep disordered breathing is a factor in the phenomenon of seemingly healthy young athletes dying from a sudden and unexplained heart attack.

Sleep disordered breathing (SDB) is characterised by abnormal respiratory patterns or pauses in breathing during sleep, ranging from snoring to sleep apnoea, where the airways close completely or partially many times during sleep. Having a high BMI, being over 40 years of age and having a large neck circumference are some of the common factors associated with SDB. If untreated, patients with SDB-related conditions face an increased risk of developing [chronic diseases](#) such as [cardiovascular disease](#), [heart failure](#) and type 2 diabetes.

The study, published in *ERJ Open Research*, was led by Yoshitaka Iso, a cardiologist and Associate Professor at Showa University Research Institute for Sport and Exercise Sciences, Yokohama, Japan. He explained: "We wanted to investigate the prevalence of sleep disordered breathing in collision sport athletes, such as rugby or American-style football players, because we know that they usually have a higher BMI and larger neck circumference than athletes from other sports.

"We tend to assume that young, competitive athletes will not experience conditions like SDB, which are more common in people with a higher BMI and inactive lifestyles, but more research is needed to determine what may be contributing to sudden cardiac death in athletes, and SDB is a good candidate for this as it can affect the heart's normal functions."

The study included 42 male rugby players aged 18-19 years. A special device was used to monitor overnight changes in the athletes' breathing rhythm, heartbeats and heart rate, blood oxygen levels, the number of times they woke up, and how long they were awake for.

The data showed that 18 (43%) of the athletes met the criteria for SDB, which means they experienced five or more pauses in breathing that lasted for at least 10 seconds, over a total sleeping time of more than three hours.

The data also showed that athletes with SDB had higher average heart-rates and lower levels of oxygen in their blood than athletes who did not have SDB. They also experienced more periods of time when their blood oxygen levels were unusually low.

Professor Iso and his team then assessed the performance of each young man's heart and lungs at rest and during exercise, to check for cardiovascular abnormalities among athletes with and without SDB. These tests showed that resting [heart-rate](#) was higher among SDB athletes, and that SDB athletes experienced more incidences of extra or disruptive heartbeats than non-SDB athletes, further suggesting that SDB may be linked to heart abnormalities.

Professor Iso said: "Sleep disordered breathing was observed in 43% of the young athletes we assessed. This is a higher rate than we expected, and is higher still than the levels of SDB reported among middle-aged men from the general population of the US and Europe. Our data also showed that several potential warning signs, such as effects on the athletes' breathing and heart rates, occurred frequently among the athletes with SDB.

"Although none of the athletes in this study were found to have serious conditions yet, likely due to their young ages, we do not know how their conditions may worsen in the future due to associated cardiovascular consequences. Based on the link between SDB and abnormal heart functions that we observed in this group, we speculate that SDB could be a possible factor in the unexplained deaths of some young collision sport athletes, as it appears to be very prevalent but currently is not regularly screened for."

Professor Anita Simonds is a Consultant in Respiratory and Sleep Medicine at Royal Brompton and Harefield NHS Foundation Trust, UK and President Elect of the European Respiratory Society, and was not involved in the research. She said: "It is too early to conclude that sleep disordered breathing is a definite factor in sudden cardiac death of athletes, but these results provide food for thought on the ways that breathing disorders may affect the health of young, fit athletes.

"In this study the overall level of sleep disordered breathing was mild, but the results highlight that a sleep study to assess for the presence of sleep disordered breathing should be considered in the care of collision sport athletes, such as rugby or American-style football players, as it could help to identify those at risk of cardiovascular complications."

The researchers say that additional large studies are necessary to confirm their results and to determine the underlying mechanisms that lead to SDB, and note that a limitation of the study is that SDB assessment was only performed on a single night.