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Parasympathetic Activity and Bronchial Hyperresponsiveness in Athletes

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Parasympathetic Activity and Bronchial Hyperresponsiveness in Athletes

Bronchial hyperresponsiveness (BHR) is known as an enhanced sensitivity to stimulants present in the environment that trigger constriction of the bronchi (Stang et al., 2016). It is found in endurance athletes due to increased parasympathetic activity and can occur with asthma. A research study was conducted to measure parasympathetic activity in the heart and pupils of athletes as well as non-athletes to determine the relationship between parasympathetic activity, methacholine, and BHR (Stang et al., 2016). The primary article, “Parasympathetic Activity and Bronchial Hyperresponsiveness in Athletes” written by Stang et al. (2016) will be evaluated based on the significance of the results of the conducted study.

BHR occurs specifically in athletes such as swimmers and skiers. Bronchial constriction occurs in BHR when the bronchi, which provide air to the lungs, are sensitive to stimuli that elicit a parasympathetic response. An inhaled drug called methacholine can be used to assess BHR and asthma (Stang et al., 2016). Stang et al.’s study aimed to determine the relationship between methacholine, parasympathetic activity, and BHR in healthy non-athletic and athletic individuals with and without asthma who are involved in swimming and skiing. They determined that is important to identify the relationship between these factors to better understand how they influence each other and how parasympathetic activity is involved in BHR in athletes (Stang et al., 2016).

This study focused on a population of 28 cross-country skiers, 29 swimmers, and a control group of 30 healthy non-athletic individuals (Stang et al., 2016). The study was conducted over a period of two days, where heart rate and pupil size were measured prior to and during exercise, and the cardiac vagal index was used to calculate the results for all participants. The cardiac vagal index measures the stress on the vagus nerve in the parasympathetic nervous system. These vagal nerves are also involved in the constriction of the bronchi. In addition, all participants had to undergo a methacholine bronchial challenge and a skin allergy test (Stang et al., 2016). A methacholine bronchial challenge measures a participant’s lungs based on their response and sensitivity to different stimuli and can be used to diagnose asthma (Stang et al., 2016). Methacholine is inhaled at different doses, and the constriction of the lungs is measured at each dosage. Ultimately, Stang et al. determined that individuals with a positive methacholine bronchial challenge will experience a decrease in twenty percent of their lung function. This can be indicative of BHR.

The results concluded that BHR is related to the parasympathetic activity of the heart rather than the pupils (Stang et al., 2016). The intensity of BHR and its association with parasympathetic activity will depend on the sport (Stang et al., 2016). BHR was not significantly different between the groups. Severe BHR occurred in swimmers with a higher cardiac vagal index (Stang et al., 2016). This finding supports the idea that severe BHR in athletes is due to increased parasympathetic activity. In addition, methacholine was found to be associated with BHR and cardiac vagal activity (Stang et al., 2016).

When evaluating this study, it was limited by its small size and ability to prove causality between variables. The control group contained more individuals with BHR, which could be due to bias when choosing the control group (Stang et al., 2016). The data collected on the association of BHR and parasympathetic activity could be influenced by the use of anti-asthmatic drugs in the study. This is because anti-asthmatic drugs counteract BHR. In addition, other factors, including the timing of testing and the type of exercise used for testing, could have affected the data collected. This impact is due to the fact that participants were instructed to cycle on a bike or cycle ergometer rather than swim or ski to trigger the onset of their BHR. Therefore, the type of activity might alter the onset of BHR. BHR can also change throughout the day and can increase at night. Therefore, this study conducted during the same time each day would not represent BHR during all times when these sports are performed. The training environment and type of training can also affect results since the results depend on the type of sport and its environment.

The relationship between parasympathetic activity, BHR, and methacholine was studied in athletes and non-athletes. Data was collected to measure the parasympathetic activity of the heart and pupils during exercise. The results showed that BHR had a stronger relation to the parasympathetic activity of the heart rather than the pupils (Stang et al., 2016). Methacholine was shown to have a relationship with cardiac vagal activity and BHR (Stang et al., 2016). The study also indicated that the relationship between BHR and parasympathetic activity varies based on the sport (Stang et al., 2016). While the study lacked a larger sample size, and the data could have been subject to bias and outside factors, it did yield significant results. Overall, the study concluded that there is a significant association between BHR and parasympathetic activity of the heart. The study also concluded that methacholine is associated with BHR and cardiac vagal activity and that these measures vary based on the sport studied. The results impact athletes by determining that BHR appears more in swimmers and that its occurrence depends on the sport. Therefore, there needs to be more awareness of the increase of BHR in swimmers. These results helped determine better methods of measurement of parasympathetic activity for future studies by ruling out the use of a pupillometer to measure the parasympathetic activity of the pupils. Future studies must focus on measuring parasympathetic activity between the heart and lungs in different sports to understand how BHR affects other athletes.

References

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