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The Impact of the Valsalva Maneuver During Resistance Exercise

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ANYONE WHO SPECIALIZES IN the field of resistance exercise prescription should be aware of the deleterious effects on blood pressure caused by the performance of resistance exercises during the execution of a Valsalva maneuver. This situation most commonly occurs in isometric or heavy resistance exercise when a client exerts a strenuous and prolonged effort. During a Valsalva maneuver, the glottis (the opening between the vocal cords) is closed and intra-abdominal pressure is increased by forcibly contracting the diaphragm and the abdominal muscles, and intrathoracic pressure is likewise increased by forcibly contracting the respiratory muscles. The result is a decrease in venous blood flow to the heart. Cardiac output correspondingly decreases, which induces a temporary drop in arterial blood pressure. Baroreceptors in the carotid sinus and aortic arch almost immediately detect this drop in cardiac output and send information to the medulla oblongata in the brain stem via the ninth and tenth cranial nerves to inhibit parasympathetic activity and promote sympathetic activity. As a survival mechanism, the brain requires increased cardiac rate and blood pressure to maintain adequate perfusion. So far, the response is physiologically normal. However, when the client exhales, there is a rapid return of venous blood flow to the heart, further increasing the blood pressure and placing a significant abnormal mechanical load on the heart (1).

To prevent clients from performing a Valsalva maneuver, the fitness professional should caution clients about holding their breath and instruct them in the appropriate breathing technique. During repetitive lifts of low intensity, the client can talk or count during the lift to minimize breath holding (1). Although beginners often stop breathing during repetitive lifts of low intensity, they should inhale and exhale during execution of the lift, especially when the weight is held on the chest. During strength exercises, the client should exhale during the forced phase of the movement, regardless of the movement's direction or anatomical position. In other words, exhale during the sticking phase, the most difficult part of the lift. The idea behind this breathing strategy is known as the principle of biomechanical matching of breathing phases (5). For experienced clients, the Valsalva maneuver is actually encouraged during short-time maximal efforts. Forced expirations, however, rather than the Valsalva maneuver, should be used whenever possible. Fitness professionals should not prescribe many exercises requiring maximal or near-maximal efforts to beginners. For maximal or near-maximal efforts, high intra-abdominal pressure is considered useful, as it decreases the compressive load on the intervertebral disks and may lessen the incidence of disk injury while simultaneously increasing lifting ability (3–5). However, the client should not inspire maximally before a lift, as it unnecessarily increases intrathoracic pressure (5).

It is especially important to caution clients with a history of cardiovascular problems (such as hypertension, myocardial infarction, or stroke) about not holding their breath (1). These clients are especially at risk for abnormally high blood pressure during a Valsalva maneuver. Exercise-induced arterial hypertension from the Valsalva maneuver during heavy resistance exercise may also be a risk factor for an acute stroke in healthy young adults (2). During resistance exercise, systolic blood pressure is often in excess of 200 mm Hg, depending on the force and length of the Valsalva maneuver. Narloch and Brandstater (2) found lower mean blood pressures during execution of the double-leg press when subjects slowly exhaled during the concentric contraction than when they had a closed glottis (198/175 mm Hg compared to 311/284 mm Hg). These readings were found at both 85 and 100% of the 1 repetition maximum (2). Geriatric clients and individuals with recent abdominal surgery or abdominal wall herniations must also be closely monitored (1).

In conclusion, the effect of the Valsalva maneuver on blood pressure is often extreme but can simply be avoided with appropriate breathing instruction and monitoring from the fitness professional. The fitness professional should especially monitor a client's breathing during heavy resistance exercise, during which there is the greatest risk for abnormally high blood pressure. ▲

References

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