



COLD PRESSOR TEST AS A PREDICTOR OF SYSTEMIC ARTERIAL HYPERTENSION

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ABSTRACT

Cardiovascular hyper-reactivity to stress has been raised as a predictor of systemic arterial hypertension, a significant risk factor for cardiovascular disease [ref]. The cold pressor test is a widely validated test that induces systemic stress by immersing an individual's hand in cold water (0 to 5 °C) over a while and has been used to identify individuals most prone to heart disease early. This review aimed to address the physiological aspects and applicability of the test in the cardiovascular context of studies focused on health.

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INTRODUCTION

The effects of high BP have affected millions of people worldwide who are still undertreated due to lack of diagnosis, access to health care, or even failure to adhere to treatment (Thompson, 2018). Systemic arterial hypertension (SAH) is characterized by increased BP (systolic ≥ 140 mmHg and diastolic ≥ 90 mmHg) and is currently a risk factor for the development of cardiovascular disease (CVD) (Pescatello, 2015). Individuals with SAH are at a higher risk of stroke, acute myocardial infarction, kidney disease, and death from other cardiovascular accidents, creating an overload on health systems (Blanchard, 2018). Evidence points out that the BP changes identified in SAH and other pathologies are linked to problems in the autonomic nervous system (ANS)⁷. The ANS influences the cardiovascular system in a tonic and reflex way in several ways, and however, when there is a failure in the action of arterial pressoreceptors, the sympathetic and parasympathetic modulation does not work correctly, generating PA variability (De Angelis, 2004). In this sense, arterial deformations caused by BP fluctuations (in the case of hypertension or even hypotension) induce the pressoreceptors

to adapt to this new level of blood pressure and start to recognize it, as usual, unprotecting the individual from this important variation control of PA (Irigoyen, 2001). Among the regulatory mechanisms, the baroreceptor reflex is one of the most important in BP control, as it balances heart rate (HR) and sympathetic tone over the cardiovascular system at all times (Martelli, 2013). Clinical studies have found low baroreflex sensitivity in infarcted individuals, increasing the chances of mortality (Campagnole-Santos, 2001). The BP response to a specific situation or event is known as cardiovascular reactivity (Lipp, 2007), which is usually assessed by comparing the baseline levels of HR, SBP, and DBP reached in the face of painful stimuli such as the cold pressor test (CPT) (Wu, 2010). The exaggerated BP response to stress tests is known as cardiovascular hyperreactivity (HC) and has been associated with the development of SAH and other coronary diseases (Lipp, 2007). These associations are based on the fact that, in the early stages, SAH presents a hyperkinetic pattern of higher cardiac output and HR, suggesting a link between CH and the high activation of the sympathetic nervous system (Vieira, 2007). The imbalance of the sympathetic and vagal components of the ANS has been

associated with sudden death and progression of CVD, exposing the individual to a situation of high cardiac risk (Dong, 2019). Initially used by Hines and Brown⁶, the cold pressor test (CPT) is a test applied to assess the branch sympathetic to stress during immersion of the hand in cold water (0 to 5 ° C) for a period of time⁴. In response to the sympathetic-excitatory stimulus, there is an increase in peripheral resistance and BP (Elias, 2019). The effects of the test on HR are variable since it can increase or even remain unchanged (Elias, 2019). Pressure hyper-reactivity to CPT was classified in 1960 by Edwards (Sant'ana, 2006) as an increase of more than 20mmHg for SBP and 15mmHg for DBP. However, in recent years the test has been adopted in some studies about hand immersion time in water and, consequently, the BP response in mmHg. Longitudinal population studies¹⁵ using CPT have shown that hyper-reactive individuals (although normotensive at the time of the test) are more likely to develop hypertension shortly and potentiated when there is a history of hypertension in close relatives. Another prospective study⁸ verified the reactivity of 824 normotensive young people of middle age and concluded that CPT might represent a higher possibility of developing SAH in this age group. Thus, the applicability of CPT aims to identify, in an early manner, factors that may predispose to CVD in different populations. New studies using the test should be developed to identify the individuals most susceptible to SAH and offer other evidence to assist in health prevention processes.

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