Pre-Load and After-Load: Rhythm of Life, More so in Stiff Hearts

**Corresponding Author:**  
Dr. Deepak Gupta,  
Former Senior Research Associate, Self, 110032 - India

**Submitting Author:**  
Dr. Deepak Gupta,  
Former Senior Research Associate, Self, 110032 - India

---

**Article ID:** WMC002507  
**Article Type:** My opinion  
**Submitted on:** 24-Nov-2011, 03:10:02 PM GMT  
**Published on:** 25-Nov-2011, 06:00:44 PM GMT  
**Article URL:** http://www.webmedcentral.com/article_view/2507  
**Subject Categories:** CARDIOLOGY  
**Keywords:** Pre-Load, After-Load, Climbing Up Stairs, Climbing Down Stairs, Shavasana  
**How to cite the article:** Gupta D. Pre-Load and After-Load: Rhythm of Life, More so in Stiff Hearts. WebmedCentral CARDIOLOGY 2011;2(11):WMC002507  
**Source(s) of Funding:**  
None  
**Competing Interests:**  
None
Pre-Load and After-Load: Rhythm of Life, More so in Stiff Hearts

Author(s): Gupta D

My opinion

The functioning of cardiovascular system is grossly dependent on three variables, namely Pre-Load, Contractility and After-Load. Pre-Load is majorly dependent on the venous return to heart; Contractility is the intrinsic contractile activity of the heart to deliver the returned venous blood; and After-Load is the resistance of the cardiovascular arterial system that accepts the re-circulated blood. All three determinants work in synchronized rhythmic fashion to maintain the essence of life. However, as the symptoms of heart failure especially diastolic heart dysfunction surface leading to poorly contracting and/or relaxing myocardium, this rhythm of life maintained by the Pre-Load and After-Load takes the lead to ensure the survival of patient with good quality of life. The focus of my opinion is to present that the drugs are not the only ways to maintain an adequately compensated rhythm; instead the day to day observations of the patients' activities do provide us with the information for the non-pharmacological measures that have been ignored secondary to blinding light of the booming pharmaceuticals. The point is not to get away with the medications, but to incorporate the day to day adjustments in our activities that were so obvious in our immediate fore-sight that we have long ignored to pay attention to them.

Let me start with the first obviate: why climbing up flight of stairs is more stressful than climbing down flight of stairs and this difference is not in synchrony to the documented half to one-third of the energy spent in climbing down the stairs as compared to the climbing up. People usually can climb down any number of stairs; however climbing up may be restricted to two to three flight of stairs in most of the population. This disproportionate effect can not be adequately explained just by the difference in the metabolism. However, when the rhythm of life is taken in consideration, we see the matter in a different light. Climbing up the stairs involve constant or worsening increase in the After-Load by the contracting lower extremity muscles to counter gravitational energy even though the Pre-Load is constantly trying to match and fill the contracting/relaxing heart that eventually signals to the body to give it a rest; however while climbing down the stairs no stiff leg muscles are required for favorable gravitational energy and hence the Pre-Load is not stressed out as the After-Load is in relaxed mood, and the contracting/relaxing heart can have a longer run while climbing down the stairs before it raises hands for a break.

Let us move on to the second obviate: is stress an exclusive cerebral phenomenon or are we ignoring the major contributions of the cardiovascular dysregulation. We all have observed that same amount of stress (physiological or psychological) behaves differently across the population and we as physicians primarily focus on subliming the inciting agent (stressful stimulus) without focusing on the conditioning of the whole body especially cardiovascular system that is the primary exacerbator of the body’s differential response to the stressful stimulus. The focus again turns to the rhythm of Pre-Load and After-Load wherein the fluctuating Pulmonary Vasculature and Cerebral Arterial After-Loading secondary to the Stiff Arterial Systems and Poorly Relaxing Heart overshoots the psychologically anxious scenario to a vicious physiological stress cycle. And thereafter, people with poor hearts and erratic lungs explode the minimal cerebral stress or psychological event into the catastrophic torpedo of panic attacks.

And finally, moving on to the final obviate for this discussion: how shavasana (a yoga position also called corpse pose wherein all body muscle tension is released to lie down flat on a surface) works (1-2) or is it myth/placebo. However, if we apply our non-biased minds to the reasoning, we will realize that the rhythm of Pre-Load and After-Load comes to our rescue once again. When the whole body muscle tension is released then the After-Load on beating heart becomes minimal and the heart that is full of passively returning blood from relaxed supine positioned patient beats with great zeal. This good functioning of the cardiovascular system promotes the healing of the stress within the body because stress is not an exclusive cerebral phenomenon. In the same context, even when the person is not in the position of shavasana, the person can focus on keeping his/her muscles relaxed so that unwanted exacerbation of After-Load can be constantly avoided. It is easier said than done but one can start with keeping his/her fists open rather closed as closed fists are only contributing to disproportionately higher increase in the
Upper-Extremity’s contribution to After-Load as compared to Upper-Extremity’s contribution to Pre-Load. Additionally, the disproportionate muscle mass and hence muscular pumps of the upper extremities versus lower extremities may explain that people with eventually deteriorating stiffer hearts are able to walk on flat surfaces that increase Pre-Load from calf muscles without worsening After-Load as compared to their accentuating capacity to perform day to day hand-performed activities that primarily elevate the After-Load without improvement in the limited Pre-Load contribution from the arm muscles.

In summary, the point is that anxiety is only an inciting stimulus; it is the elasticity/plasticity of the responding cardiovascular system that defines the final patho-physiological picture. And it will not be harmful to understand and realize the maintenance of a good rhythm between our Pre-Load and After-Load by maintaining good flat-surface walks even if instrumental activities of daily living or activities of daily living have suffered a blow; or by climbing down the stairs even when our cardiovascular system (CVS) wants us to climb up elevators; or by taking it easy rather than completing it fast when our room for error between the Rock of Psychological Incite and the Hard Place of Stiff CVS has been squeezed to miniscule. Because Pre-Load and After-Load is Rhythm of Life, More So in Stiff Hearts but Not Only for Them.

Reference(s)

Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.