



## Breathe Long, Live Long

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### Abstract

Using ancient wisdom, personal experience, and modern 21<sup>st</sup> century science can help researchers understand and design scientific inquiry that will lead to useful and pragmatic research agendas. This approach is illustrated by the observations made by Taoist beliefs, the senior author's personal experience, and the scientific literature on how resting heart rates promote longevity.

### Keywords

Longevity, Soft exercises, Taoism, Resting heart rate

### Introduction

After 45 years of practicing medicine, the first author has begun to figure out how to seek truth in the practice of medicine. It is actually very simple, but most profound wisdom is usually simple. When ancient literature and practice aligns with personal experience and these two empirical sources of knowledge align with 21<sup>st</sup> century science - the chances are exceptional that one has uncovered a truth in medicine. A perfect example is the relatively recent "discovery" of Neurobehavioral Disorders associated with Prenatal Alcohol Exposure being proposed by the American Psychiatric Association [1]. This diagnosis concurs with personal observations of many low-income African-American patients on Chicago's Southside [2] and the ancient literature highlighting this problem is found in the Bible in the Book of Judges where an angel appears to Samson's mother and tells her she is going to have a son and to not drink spirits or alcohol (Judges 13:7, New International Version).

### Manuscript Body Text

More recently, we stumbled on another medical truth

that is related to health and well-being [3]. Having studied martial arts, Chinese exercises [4], and meditation for 45 years and having met and studied with various masters (Kohei Tohei, Wang Yen-Nien, Chang Tung-Sheng, Liu Da, Kuo Lien-Ying), the first author has been impressed with their health, well-being, and longevity. It was from these masters that the first author learned a pearl of ancient wisdom - "Breathe long, live long". In fact, Koichi Tohei could breathe one breath per minute for an hour [5]. Master Wang's capacity for long deep breathing was also a marvel to witness and feel. "Taoist measure life span not by counting birthdays but by counting breaths and heartbeats: Every breath and heartbeat saved now prolongs life later" [6]. Accordingly, the first author's practice has allowed him to breathe three breaths per minute while using nearly all of the lung's vital capacity of 2,000 ccs instead of the usual tidal volume of 500 ccs - resulting in a resting heart rate of 50. In medical school, the first author asked a classmate if he wanted to go jogging, the classmate jokingly said he believed that God only gave people a limited number of heartbeats to last them a lifetime, and if you used them up prematurely by exercising, a person would die young. Of course, his beliefs were not borne of either the first author's personal experience or science [7]. Interestingly, ancient Taoist folklore also suggests having a limited number of heart beats and it exposes the practice of lowering one's heart rates by deep meditative breathing [6]. Tai Chi and Chi Kung exercises both teach slow, relaxed movements coordinated with deep breathing techniques - both regular and reverse breathing [8] along with calming the mind and "sung". "Sung" is frequently translated from Chinese as relaxation, when in reality it is something very different from simple relaxation. "Sung" is more accurately thought of as a middle ground between not

trying at all, i.e. being completely relaxed and trying hard, i.e. being tense and stiff, and so it is best thought of as “trying easy” when doing traditional Chinese exercises.

Accordingly, while discussing the Taoists efforts at increasing longevity and their admiration of the tortoise, the first author was pleased that the second author was enlightened about the literature on low resting heart rate and its association with longevity. The Galapagos tortoise has a heart rate of 6 beats per minute and a life expectancy of 177 years [9]. Among mammals, there is an inverse relationship between heart rate and life expectancy, and when this is used to calculate the number of heartbeats per lifetime, the results are remarkably constant. It is plausible that this pattern is evident across the animal kingdom, as seen with the tortoise - which begs the question “Can human life be extended by cardiac slowing?” [9].

When all causes of death are evaded in the pursuit of health, longevity is a side effect. The association between resting heart rates and mortality is well established. Death by all causes, both cardiovascular and non-cardiovascular, is increased as increasing resting heart rate increases [10].; not Death by all causes, both cardiovascular and non-cardiovascular, is increased as increasing resting heart rate increases [10]. This was replicated and again proved to be true on a national scale [11]. A plethora of subsequent studies served to confirm the findings of these first two seminal studies.

The basal or resting heart rate is the number of heart beats per minute when a person is awake, in a temperate environment, under no recent subjection to any exertion or stimulation, such as stress or surprise. Faster resting heart rates are associated with shorter life expectancies [12], and increased all-cause mortality in the general population, hypertensive patients, diabetic patients [13], patients with stable coronary artery disease or a ST-elevation myocardial infarction [14], as well as the elderly [15].

There are several hypotheses regarding how low resting heart rates improves the chances of longevity. An increased resting heart rate causes increased pulsatile stress and consequent damage to elastic fibers in the arterial wall [16]. Thus, there is increased mechanical stress and decreased dynamic compliance [17]. This could explain why elevated resting heart rates are associated with markers of chronic low-grade inflammation, but it is still an independent risk factor [18].

Therefore, an elevated resting heart rate is more than a risk marker, it is a risk factor [19]. This distinction is important because control of a risk factor will reduce risk, but control of a risk marker will do nothing [14]. The significant relationship between increased resting heart rate and sudden cardiac death persists despite adjustment for left ventricular systolic dysfunction and heart rate modulating drugs [20], and the risk is independent of physical activity [21].

The association between cardiorespiratory fitness and a low resting heart rate is well known. However, an elevated resting heart rate is a risk factor for mortality independent of physical fitness, leisure-time physical activity and other major cardiovascular risks [22]. A resting heart rate above 65 beats per minute has a strong independent effect on premature mortality, so lifestyle modifications to reduce the resting heart rate to 60 beats per minute or below are beneficial [23]. Therefore, the conventional approach to exercise and fitness needs to be reevaluated in favor of methods that will most effectively reduce the resting heart rate - if longevity is the goal.

Ospina, et al. [24] meta-analysis found that Tai Chi was better than exercise at lowering heart rate, and the proposed mechanism for these cardiovascular benefits is enhancement of vagal modulation and shift the sympatho vagal balance towards a reduction in sympathetic tone [25,26]. The Polyvagal Theory [27] supports this hypothesis by noting that the Vagus nerve is ninety percent afferent, i.e. it is carrying information to the brain about the body's status. When the breath is controlled and slowed [8], the Vagus nerve is telling the body things must be peaceful and there is no reason not to be relaxed, so the heart rate can slow down. Thus, ancient wisdom and personal experience is being validated by modern science.

## Conclusions

Research in medicine has to be based on more than just 21<sup>st</sup> century western science. It also has to take into account ancient literature and personal experience to find the truth of how to understand medicine. Understanding this core precept of seeking truth by being familiar with ancient literature's empirical observations of life and having personal experience with the same, would have allowed Dyer, et al. [10] to predict that their seminal work in 1980 would be on target: increased resting heart rate will increase death by all causes. This understanding, when shared by readers and other researchers, would lead to a directionally correct research agenda to produce further studies that confirm and expand upon their findings. Essentially, what we are proposing is a method potentially to determine, whether a research finding is likely to pan out or if it is probably a blind alley. We are also proposing that scientist from various cultures do not scrap the ancient teachings in favor of modern 21<sup>st</sup> century Western science - both have tremendous value. Using the model of ancient literature, personal experience, and 21<sup>st</sup> century science is a good heuristic way to determine which initial research finding will probably yield substantial replication in future studies.

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