*C-K. PENG.* ***Interdisciplinary technologies used to evaluate frailty and promote healthy aging (Keynote).*** *Gerontechnology 2014;13(2):71;* doi:10.4017/gt.2014.13.02.412.00 **Purpose** Frailty is a common geriatric syndrome, characterized by a combination of systemic symptoms that may be the result of any number of underlying pathophysiologic processes. These symptoms are likely to be markers of underlying regulatory abnormalities that impair the integrated function of multiple physiological systems. The dynamic behavior of these various markers, over time, can provide complementary information related to the integrity of their underlying control mechanisms. Under basal resting conditions, most healthy physiologic systems demonstrate highly complex, often irregular, dynamics that represent the interaction of regulatory processes operating over multiple time and spatial scales. These processes enable the organism to react to sudden physiological stressors. Our research team has shown that aging and disease are associated with a loss of complexity in the dynamics of a variety of physiologic systems. This loss of complexity is associated with reduced adaptive capacity, functional decline, and frailty. Mathematical analyses that can quantify the dynamics of physiologic systems and their interactions may, therefore, help characterize the syndrome of frailty, and multisystem interventions aimed toward restoring healthy dynamics, and in this way may prevent functional decline. **Method** In recent years, we have developed a framework used to study fluctuating signals generated by these complex biological systems[1-3]. We have demonstrated that it is possible to gain significant understanding of a complex biological system via studying its spontaneous fluctuations in time. In particular, we have linked the ***dynamic complexity*** of a system's spontaneous fluctuations to its ability to adapt to environmental challenges[3], and developed a computational algorithm, called Multi-scale Entropy (MSE) analysis, to evaluate this complexity. **Results & Discussion** The complexity measure can serve as a biomarker for a system's status[3,4]; specifically, it can be used as a systemic measurement of frailty in elderly subjects. The most powerful aspect of the complexity theory is that it can be calculated from any signals generated by the systems of interest, for example, heart rate time series, EEG, postural sway (balance) time series, to name just a few. The complexity measure thus can also be used to evaluate the efficacy of intervention aimed at restoring healthy dynamics in elders.

**References**

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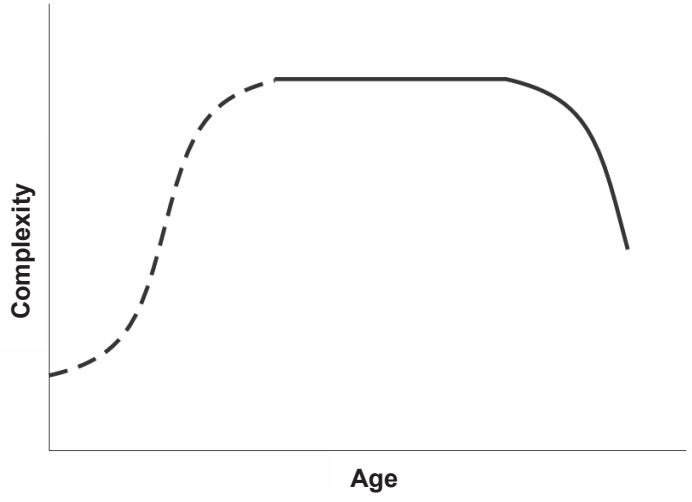


*Figure 1. Schematic plot of the complexity development in humans, The solid black curve, supported by research data, indicates that complexity peaks as people become healthy young adults, and maintains that level, until it degrades with old age*