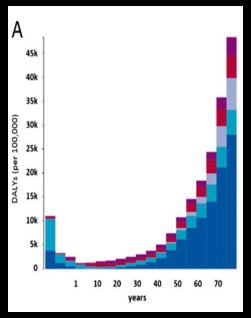
Quantification of biological aging in young adults

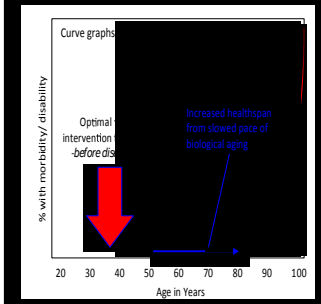
Belsky et al. 2015, *PNAS*
Moffitt, Belsky et al. 2016 *JGMS*

Premise

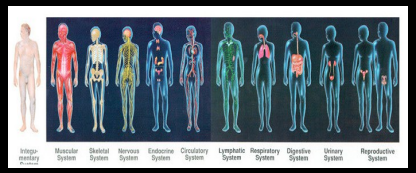


Burden of many different chronic diseases increases with advancing age (figure Belsky et al. 2015 PNAS)

New field of geroscience proposes to target the biological process of aging as a preventable cause of age-related disease (Kennedy et al. 2014 Cell)



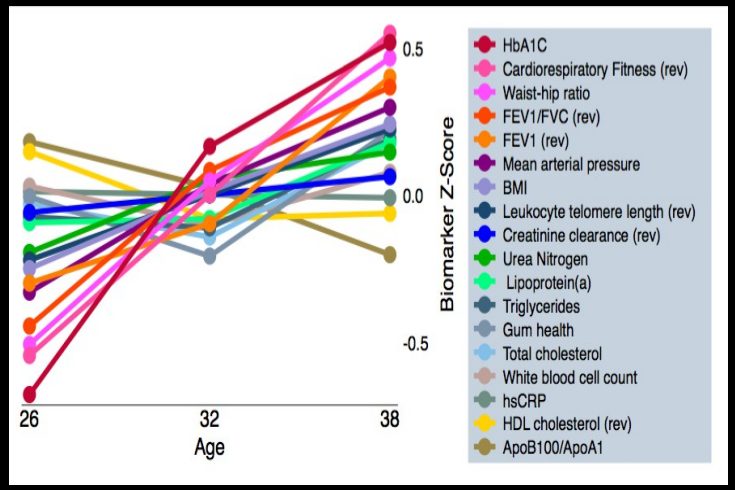
Measures needed that can track aging in people still young enough for disease prevention

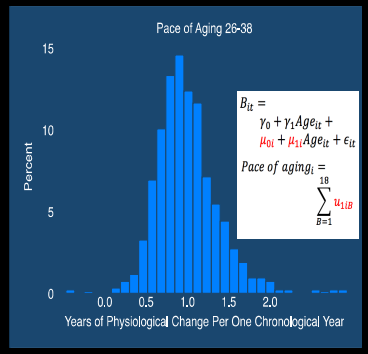


Hypothesis: Biological changes will cause gradual and progressive decline in integrity of systems throughout the body with advancing age (e.g. Kirkwood & Austad 2000 Nature)

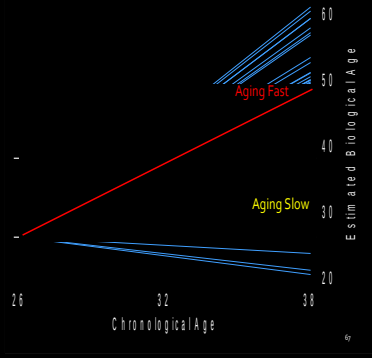
Hypothesis Test: Track changes in multiple organ systems in young, healthy adult humans.

Data from n=954 adults in the Dunedin Study who were examined at ages 26, 32, and 38 years. Analysis tested coordinated change across 18 different biomarkers of organ system integrity.





Results: Young adults who were all the same chronological age experienced different rates of biological aging



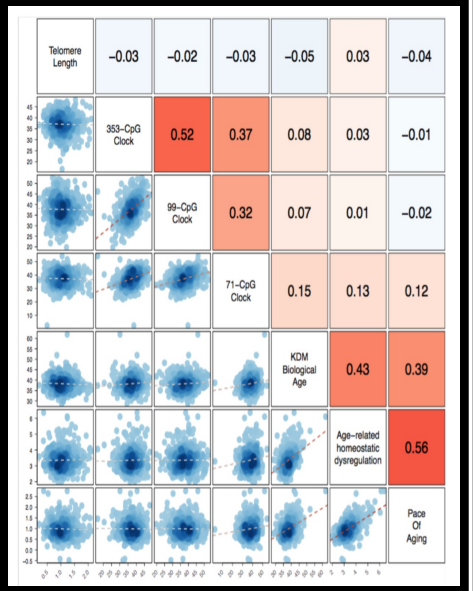
Faster agers showed deficits on tests of physical function, cognitive decline, and facial aging

D. Belsky

Three projects to advance translation

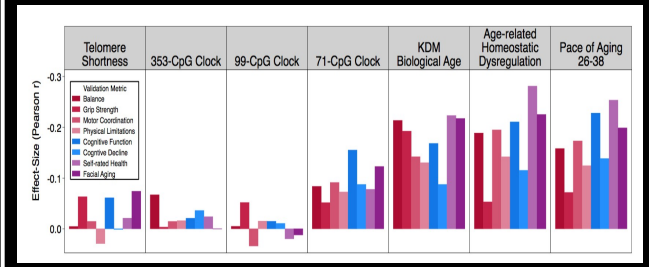
1. Comparison of genomic and clinical-biomarker algorithm methods to quantify biological aging (Belsky et al. R&R *JGBS*)

Many proposed measures. We conducted the first test of 7 different genomic and clinical biomarker methods in the same humans.



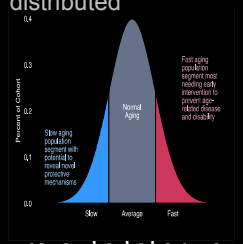
Validation Metric
- Balance
- Grip Strength
- Motor Coordination
- Physical Limitations
- Cognitive Function
- Cogntive Decline
- Self-rated Health
- Facial Aging

Overall, genomic measures were only weakly correlated with clinical biomarker measures. Clinical biomarker measures were more closely tied to healthspan.



2. Developing a test battery to screen patients for geroprotector trials (Belsky et al. R&R *Aging Cell*)

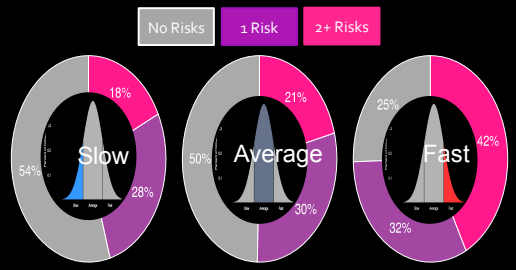
Rate of aging is normally distributed



Brief interview needed to identify fast-aging patients to ensure representation in clinical trials

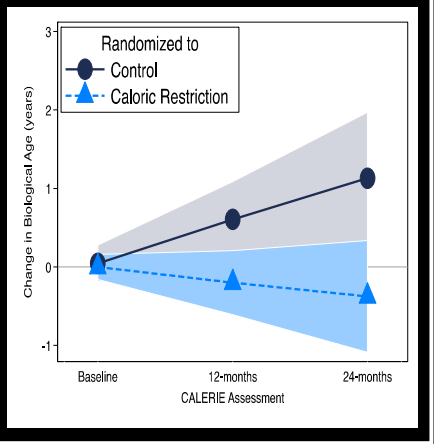
15-minute Interview to assess 5 risks:
- Short-lived family (no grandparents 80+)
- Grew up poor
- Adverse childhood experiences
- Low educational attainment (<high school)
- Nurse-rated personality

Cumulative risk burden identifies fast aging group



3. Does caloric restriction slow the rate of biological aging (in review, Belsky et al. *JGBS*)

calerie



In-progress: Can measures of biological aging predict *modifiable* risk for AD/dementia?

New molecular assays of Duke EPESE, CALERIE, and Dunedin data

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