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Peer Review

Review of: "Gompertz Law-Based Biological Age (GOLD BioAge): A Simple and Practical Measurement of Biological Aging to Capture Morbidity and Mortality Risks"

Feng Zhu¹

1. department of critical care medicine, Shanghai East Hospital, Shanghai, China

The study proposed a biological age model (GOLD BioAge) based on the Gompertz law, combining biomarkers and age, developed a biological age algorithm for predicting mortality and chronic disease risk, and verified it in NHANES, UKB, CHARLS, CLHLS, and RuLAS. The results showed that it performed better than the traditional age model in predicting mortality and chronic disease risk. It also proposed a simplified version, Light BioAge, that uses fewer biomarkers (serum creatinine, blood glucose, C-reactive protein) to accommodate clinical practice. There are few articles in the field of geriatrics, which has certain novelty and practicability. The idea and structure of the full text are clear, with a standard format, exquisite illustrations, and detailed references. Please clarify several questions:

1. GOLD BioAge used LASSO Cox regression for biomarker screening; it may ignore some nonlinear associations. Whether it can be compared with other feature selection methods (such as random forest or SHAP value analysis) is unclear.

2. The performance of GOLD BioAge and Light BioAge in the long-term dynamic aging process still needs more data to support it. Only the CHARLS cohort provided results over a time span, but longterm follow-up data for other cohorts is lacking. It is recommended to supplement the discussion of the importance of dynamic validation.

3. In the GOLD BioAge model, the US NHANES data and UK UKB data were used for the population, and in the Light BioAge external verification, three Chinese databases: CHARLS, CLHLS, and RuLAS were used. Are there limitations and impacts due to population geographical differences?

4. The article shows the association of BioAgeDiff with mortality and disease, but does not explicitly discuss whether these associations reflect causality.

5. The paper emphasizes that the GOLD BioAge model is better than other aging clock models, but the limitations are not discussed enough.

6. Spelling and language issues exist, such as "and and" (2 duplicates in the full text), "longtidinal" (spelling error, should be longitudinal), etc.

Declarations

Potential competing interests: No potential competing interests to declare.