Pre-Analysis Plan for the Replication of Graham et al. (2024)

Title: *Do We Become More Lonely With Age? A Coordinated Data Analysis of Nine Longitudinal Studies*
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DOI: https://doi.org/10.1177/09567976241242037
Event: Replication Games, October 28th 2024, Munich
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1. Research Question and Study Objective

The original study by Graham et al. (2024) aimed to investigate whether loneliness changes with age across the adult lifespan, utilizing data from nine longitudinal studies. The primary finding was that loneliness follows a U-shaped trajectory: decreasing from young adulthood to midlife and increasing in older adulthood (estimated Age^2 regression coefficient of 0.07 with 95% confidence interval from 0.02 to 0.13, age centered at 60 years). Our robustness reproduction effort will attempt to reproduce this main finding, with a particular focus on evaluating the robustness of the meta-analytic summary and key longitudinal regression models used to aggregate findings across datasets. If time and resources allow us, we also aim to reproduce the central insights presented in figures 2, 3, and beyond.

2. Computational Reproduction

All analyses will be conducted using the statistical programming language *R*, aligning with the preference expressed by the team and the open-access nature of the original analysis. The original study's authors used *R* and shared analytic code and model data on OSF and GitHub, and also presented their result in an online R Shiny app. These scripts and models will be utilized to ensure comparability.

A significant portion of the replication effort will focus on the robustness of the meta-analysis due to expected delays in acquiring and cleaning the nine panel datasets. Efforts will be made to access these datasets (e.g., the ELSA panel), but this may be time-consuming. Thus, the fitted models, which are available on GitHub, will serve as the basis for initial robustness checks. Data acquisition efforts may proceed during or after the event as time permits.

3. Robustness Checks

The robustness of the random effects meta-analysis related to the central finding will be examined. That is, we will assess how robust the meta-analytic Age^2 regression coefficient and 95% confidence interval (CI) are to plausible alternative analytic decisions. First, we will assess the impact of different heterogeneity variance estimators as the original paper does not specify the estimator (presumably using the default REML estimator from the metafor R package). We will give visual and numerical summaries of how the estimate and CI change, depending on the chosen estimator. We will consider an effect estimate and CI to be qualitatively different from the original analysis if the CI does include the value of zero (i.e., "no quadratic association") or if the estimate and CI go in the negative direction. Additionally, we will consider an effect estimate and CI to be quantitatively different from the original analysis if the original CI (from 0.02 to 0.13) and the CI based on the alternative analysis do not overlap. Second, we will conduct a “leave-one-out” sensitivity analysis to see how much the central result is driven by each individual data set. Depending on the time and resources during the replication games, we will conduct additional robustness checks.

References

Graham, E. K., Beck, E. D., Jackson, K., Yoneda, T., McGhee, C., Pieramici, L., Atherton, O. E., Luo, J., Willroth, E. C., Steptoe, A., Mroczek, D. K., & Ong, A. D. (2024). Do We Become More Lonely With Age? A Coordinated Data Analysis of Nine Longitudinal Studies. *Psychological Science, 35*(6), 579-596. https://doi.org/10.1177/09567976241242037