A Report on "A Chapter a Day: Association of Book Reading with Longevity" by Bavishi et al. (2016)

Reviewer 2

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> I am wiser than this person; for it is likely that neither of us knows anything fine and good, but he thinks he knows something when he does not know it, whereas I, just as I do not know, do not think I know, either. I seem, then, to be wiser than him in this small way, at least: that what I do not know, I do not think I know, either.
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> Plato, *The Apology of Socrates*, 21d

> To err is human. All human knowledge is fallible and therefore uncertain. It follows that we must distinguish sharply between truth and certainty. That to err is human means not only that we must constantly struggle against error, but also that, even when we have taken the greatest care, we cannot be completely certain that we have not made a mistake.
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> Karl Popper, 'Knowledge and the Shaping of Reality'

Overview

Citation: Bavishi, A., Slade, M. D., & Levy, B. R. (2016). A Chapter a Day: Association of Book Reading with Longevity. *Social Science & Medicine*, Vol. 164, pp. 44–48.

Abstract Summary: This study investigated whether book readers have a survival advantage over non-book readers and those who read other materials, and if cognition mediates this effect. The findings suggest that the benefits of reading books include a longer life in which to read them.

Key Methodology: Cox proportional hazards models were used on survival information from 3635 participants in the Health and Retirement Study over 12 years, with mediation analysis to assess cognitive engagement.

Research Question: Do books have health benefits beyond other types of reading materials, and if so, does cognition mediate this book reading effect?

Summary

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Bavishi et al. investigate whether reading books extends lifespan compared to reading periodicals or not reading at all. Drawing on data from the Health and Retirement Study, the authors conclude that reading books provides a significant survival advantage, specifically a 20% reduction in mortality risk over a 12-year follow-up period. They assert that this benefit is significantly stronger than any advantage gained from reading newspapers or magazines. Furthermore, the authors claim that this survival advantage is driven by the immersive nature of "deep reading," asserting a significant complete mediation effect of cognitive status on the relationship between book reading and survival (p. 47). While the underlying association is intriguing and the sample size is robust, the study's strong causal claims are not fully supported by its observational design and methodological choices.

The most significant limitation is the fragility of the primary predictor variable. The study relies on a single self-reported question asking participants how many hours they spent reading in the previous week (p. 45). Using a one-week snapshot as a proxy for a stable, 12-year behavioral habit introduces a high risk of measurement error and misclassification, though the authors do attempt to mitigate this with sensitivity analyses using quartiles and tertiles. Furthermore, comparing book readers to a baseline reference group of "non-book readers" introduces a risk of residual confounding. While this reference group includes periodical readers, it also likely contains individuals who do not read at all due to subclinical physical or cognitive decline. Even with statistical controls for baseline health and wealth, these individuals may be experiencing decline that both prevents reading and independently accelerates mortality. The study also lacks controls for personality traits like openness to experience, leaving open the possibility that reading is merely a marker for a

generally healthier, more engaged lifestyle. While the authors discuss reading as a sedentary behavior, they do not explicitly control for physical activity in their models, which is a notable omission given its strong link to longevity.

The article's novel claim that books provide a uniquely powerful survival advantage compared to periodicals is also questionable. The authors theorize that books are superior because they promote "deep reading," but they never measure the actual content or complexity of the material. Instead, they rely on the untested assumption that the physical format of a book guarantees deeper cognitive engagement than a magazine or newspaper. Additionally, the statistical test used to compare the hazard ratios of books versus periodicals reports astronomically high t-statistics ($t = 90.6$ and $t = 67.9$) (p. 46). While the hazard ratios themselves do suggest a stronger effect for books, these implausible t-values suggest potential reporting errors or typos, which raises questions about the precision of the direct comparison between reading formats.

Finally, the claim that cognitive status "completely" mediates the survival advantage is technically accurate by standard conventions but substantively overstated. The theoretical mechanism relies on complex cognitive processes like empathy, social perception, and critical thinking, but the actual mediator measured is a cognitive screening score based on tasks like counting backwards, naming objects, and naming the President (p. 46). There is a conceptual gap between the hypothesized "deep reading" mechanism and this broad screening measure. Moreover, the indirect effect of this cognitive score accounts for only a small fraction of the total effect of reading on survival. Declaring a complete mediation effect because the direct effect becomes non-significant ($p = 0.10$), when the indirect pathway explains so little of the overall association, paints a potentially misleading picture of the mechanism's strength (p. 47).

Ultimately, the article successfully identifies a positive correlation between self-reported book reading and longevity across various demographic groups. However,

the deterministic language suggesting that reading books directly extends life by preserving cognitive function outpaces the evidence. The fragility of the behavioral measure, the potential for unmeasured confounding, and the questions surrounding the statistical comparisons between reading formats mean the headline claims should be interpreted with caution.

The Bottom Line

Bavishi et al. present an appealing narrative that reading a chapter a day can significantly extend one's lifespan by preserving cognitive function. However, the study's reliance on a single, one-week snapshot of self-reported reading habits and its vulnerability to unmeasured confounding limit its ability to prove a causal relationship. Furthermore, unusual statistical reporting and a strong interpretation of the mediation effects weaken the article's novel claims regarding the superiority of books over periodicals. While the correlation between reading and longevity is robustly documented across demographics, the assertion that books uniquely and directly cause a survival advantage remains unproven.

Potential Issues

Unjustified causal language: Despite its observational design, which can only establish association, the article frequently uses deterministic language that implies causality. For example, the discussion states that "the survival advantage was due to the effect that book reading had on cognition" and that "reading books provide a survival advantage due to the immersive nature that helps maintain cognitive status" (p. 47). This framing overstates the evidence and suggests a causal relationship has been proven, which the study's correlational design cannot support. While the authors do attempt to test for reverse causality in their mediation model, this statistical check is insufficient to warrant such strong causal conclusions (p. 47).

Risk of unmeasured confounding: The study's observational design cannot definitively establish a causal link between book reading and longevity. While the analysis adjusts for a range of important covariates, including wealth, education, and health status, the association may be driven by unmeasured characteristics of people who read books (p. 46). Potential confounders not included in the model include personality traits like openness to experience, lifelong patterns of cognitive engagement, health literacy, and other cognitively stimulating leisure activities. Furthermore, while the authors discuss reading as a sedentary behavior, the analysis does not explicitly control for physical activity levels. It is plausible that the observed survival advantage is attributable to this constellation of unmeasured factors rather than the act of reading itself.

Inadequate measurement of the primary predictor: The study's main predictor variable—time spent reading—is based on a single self-reported question about behavior in the preceding week ("How many hours did you actually spend last week reading books?", p. 45). Using this one-week snapshot as a proxy for a stable habit over a 12-year follow-up period is a significant limitation. This measure is susceptible to temporal instability, as reading habits can fluctuate, and to measurement error

from recall and social desirability biases. While the authors use data from multiple time points for specific checks (like the reverse causality analysis), the primary survival model relies on this baseline snapshot, which may lead to unreliable estimates of the association with longevity.

Apparent statistical anomalies in a key comparison: A central claim of the article is that the survival advantage from reading books is "significantly greater" than that from reading periodicals. While the hazard ratios support this (HRs for periodicals are closer to 1.0), the statistical test used to compare them reports astronomically high t-statistics ($t = 90.6$ and $t = 67.9$) (p. 46). These values are highly implausible for this type of analysis and sample size, suggesting a potential reporting error or typo. This lack of precision casts some doubt on the rigor of the direct comparison between reading types, a novel finding the article emphasizes.

Mismatch between theoretical mechanism and empirical measure: The study's theoretical framework is built on the concept of "deep reading," described as a "slow, immersive process" that improves complex skills like critical thinking, empathy, and emotional intelligence (p. 44). However, the variable used to test this mechanism is a "total cognitive score" based on items measuring memory, attention, and mental orientation, such as immediate recall, serial 7s, backward counting, and naming the President (p. 46). While these are valid cognitive measures, there is a conceptual gap between the sophisticated processes hypothesized to be at work and the screening tool used to measure them. Therefore, the study provides only indirect evidence that the "immersive nature" of deep reading is the operative mechanism.

Strong interpretation of mediation results: The article concludes there was a "significant complete mediation effect of cognitive score" on the relationship between reading and survival (p. 47). While technically correct because the direct effect becomes non-significant ($p = 0.10$), this interpretation is substantively aggressive. The magnitude of the indirect effect ($ab = 0.03$) is very small relative to the total effect ($c = 0.25$), explaining only about 12% of the association. Describing a pathway that

accounts for such a small portion of the total effect as "complete mediation" obscures the fact that the vast majority of the relationship remains unexplained by the measured cognitive variable.

Potential for bias from the reference group: The primary analysis compares book readers to a reference group of individuals who reported reading zero books. This group, which comprises 41% of the sample, includes those who read periodicals but also those who read nothing at all (p. 45). This latter subgroup may be systematically different in ways not fully captured by the covariates. For instance, it could include a disproportionate number of individuals with subclinical health decline, undiagnosed cognitive impairment, or frailty that makes reading difficult and also increases mortality risk. While the authors attempt to mitigate this by controlling for self-rated health, comorbidities, and vision, residual confounding from this group remains a plausible concern that could inflate the apparent benefit of reading (p. 46).

Untested assumption about reading material: The study's comparison between books and periodicals rests on the unsubstantiated assumption that the physical format of a "book" is a valid proxy for more cognitively engaging content. The authors speculate that "books engage readers' minds more than newspapers and magazines" but provide no data on the content or complexity of the materials being read (p. 44). The analysis treats "books" and "periodicals" as monolithic categories, ignoring the vast heterogeneity within each. The observed difference could be an artifact of the average complexity of materials read by this specific sample rather than an inherent property of the format.

Lack of transparency in reporting: The study's claims of robustness are not fully verifiable due to incomplete reporting. For several sensitivity analyses—including using quartiles instead of tertiles and shortening the follow-up period—the authors only provide qualitative summaries like "the same pattern of effects was found" without reporting the actual hazard ratios or confidence intervals (p. 47). Additionally, the article does not specify how missing data were handled for the numerous

covariates used in the models, apart from a note on imputation for the cognitive score (p. 46). This lack of detail on missing data protocols is a critical omission for assessing the study's reproducibility and potential for bias.

Presentation and reporting inconsistencies: The article contains several clerical errors and inconsistencies that reduce confidence in its precision. A reported hazard ratio for the second tertile of periodical reading (HR = 1.01) is paired with a highly implausible p-value of < 0.001 (p. 46). Key findings are reported with slight variations across different sections; for example, the main adjusted hazard ratio for book reading is reported with $p < 0.01$ in the abstract but $p < 0.001$ in the results (pp. 44, 46). Finally, the coefficients presented in the mediation analysis diagram do not sum perfectly (total effect $c = 0.25$; direct effect $c' = 0.21$; indirect effect $ab = 0.03$), though this is likely attributable to rounding or the nature of non-linear models (p. 47).

Future Research

Longitudinal measurement of reading habits: Future research should utilize repeated, validated assessments of reading behavior over time rather than relying on a single retrospective question about the previous week. Ecological momentary assessment or digital tracking of reading habits via e-readers and audiobooks could provide much more reliable, granular data on long-term exposure to reading materials and account for fluctuations in habits over a decade.

Direct assessment of reading content and complexity: To genuinely test the "deep reading" hypothesis, subsequent studies must move beyond the crude categorization of physical formats. Researchers should measure the actual complexity, genre, and cognitive demands of the texts being consumed, perhaps by integrating natural language processing tools to analyze the linguistic complexity of participants' self-reported reading logs or digital reading histories.

Rigorous causal inference designs: Future observational studies must better address the risk of reverse causality and unmeasured confounding, particularly the healthy-user bias inherent in comparing readers to non-readers. Employing quasi-experimental designs, such as propensity score matching that includes physical activity, personality traits, and detailed baseline cognitive trajectories, would help isolate the specific effect of reading on mortality from the broader constellation of healthy lifestyle factors.

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