

Access the code, data, and analysis at <https://github.com/C-Monaghan/crisp-clam>

## Procrastination and Dementia

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Dementia is a syndrome characterized by the progressive and typically irreversible decline of cognitive function, leading to memory loss, impaired reasoning, and difficulties with daily activities (Prince et al., 2013; Sanz-Blasco et al., 2022). It encompasses a range of conditions, including Alzheimer's disease, vascular dementia, and Lewy body dementia (Cao et al., 2020). The global burden of dementia is substantial, with projections suggesting that the number of affected individuals will rise from 57.4 million in 2019 to 152.8 million by 2050 (Nichols et al., 2022). Given this projection, identifying and addressing modifiable risk factors is crucial to mitigate the growing prevalence of dementia worldwide.

Given the progressive nature of dementia, early identification of pre-dementia conditions such as mild cognitive impairment (MCI) is essential for timely intervention. MCI is a condition characterized by cognitive changes - such as memory lapses or difficulty making decisions - that exceed typical age-related decline (Abner et al., 2012; Cooper et al., 2015; Fresnais et al., 2023; Salem et al., 2023; Yu et al., 2013). Studies indicate that approximately 46% of people with MCI transition to dementia within three years and approximately 80% within six years (Cooper et al., 2015; Shigemizu et al., 2020; Tschanz et al., 2006). As such, identifying factors that influence this progression is critically important for early intervention and personalized care.

Among the behavioural symptoms in MCI and dementia, apathy is one of the most prevalent (Dalen et al., 2018; Fresnais et al., 2023; Richard et al., 2012; Salem et al., 2023).

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Defined as a lack of motivation (Fresnais et al., 2023), apathy is also a multidimensional construct that encompasses deficits in executive and emotional functioning, initiation, and increased functional impairment (Okura et al., 2010; Radakovic & Abrahams, 2018). Individuals with apathy exhibit reduced goal-directed behavior and a diminished desire to pursue rewards or pleasure (Fahed & Steffens, 2021). Importantly, apathy has been identified as a significant risk factor for the transition from MCI to dementia (Dalen et al., 2018; Palmer et al., 2010; Ruthirakuhan et al., 2019). For instance, a meta-analysis by Dalen et al. (2018) found that apathy almost doubles the risk of transitioning to dementia. Additionally, apathy has been correlated with higher levels of neurofibrillary tangles in individuals with dementia, suggesting a potential connection to underlying neuropathology (Skogseth et al., 2008).

Procrastination, although traditionally viewed as a distinct behavioural issue, may share key characteristics with apathy, suggesting potential common underlying mechanisms. Chronic procrastination, characterized by persistent delays in decision-making and task completion (Abbasi & Alghamdi, 2015; Ferrari, 2010), has been associated with dysfunction in the brain's reward and decision-making systems, particularly the dorsolateral and ventromedial prefrontal cortices (Fridén, 2020; Zhang et al., 2019). These brain regions are critical for both initiating and sustaining goal-directed action and are areas where both apathy and procrastination show deficits (Fahed & Steffens, 2021; Zhang et al., 2019).

While apathy primarily reflects a lack of motivation, procrastination involves a delay in action despite an intention to complete such action (Steel, 2007). Both behaviours suggest impaired executive function, particularly in goal-oriented behaviour and decision-making, which are hallmark deficits in MCI and dementia (Kirova et al., 2015; Stopford et al., 2012). In this context, procrastination could reflect broader motivational and cognitive impairments akin to those seen in apathy.

Given these parallels, it is worth exploring whether chronic procrastination could serve as an early behavioural marker for cognitive impairment, or even a risk factor for dementia, especially in older adults. Procrastination may exacerbate existing cognitive decline by reinforcing patterns of inaction and passivity. Individuals who chronically delay tasks may inadvertently engage in fewer cognitively stimulating activities, such as physical activity, problem-solving, decision-making, and goal-setting—activities that are known to build cognitive resilience and reduce dementia risk (Chowdhary et al., 2022). By limiting engagement in such activities, procrastination could contribute to the acceleration of cognitive decline. Therefore, while apathy has already been established as a significant risk factor for dementia, the role of procrastination, especially when chronic, may represent an overlooked behavioural trait that warrants similar attention.

Although current research on procrastination in relation to dementia is non-existent, this possible association warrants exploration. Identifying procrastination as a potential risk factor could expand the scope of early interventions aimed at preventing or slowing the progression of dementia. As such, the purpose of this study was to test the hypothesis that higher levels of procrastination would be associated with an increased probability of transitioning from normal cognitive function or MCI to dementia.

## References

- Abbasi, I. S., & Alghamdi, N. G. (2015). The prevalence, predictors, causes, treatment, and implications of procrastination behaviors in general, academic, and work setting. *International Journal of Psychological Studies*, 7(1), 59–66.
- Abner, E. L., Kryscio, R. J., Cooper, G. E., Fardo, D. W., Jicha, G. A., Mendiondo, M. S., Van Eldik, L. J., Wan, L., & Schmitt, F. A. (2012). Mild cognitive impairment: Statistical models of transition using longitudinal clinical data. *International Journal of Alzheimer's Disease*, 2012(1), 291920.
- Cao, Q., Tan, C.-C., Xu, W., Hu, H., Cao, X.-P., Dong, Q., & Lan Tan, and J.-T. Y. (2020). The prevalence of dementia: A systematic review and meta-analysis'. *Journal of Alzheimer's Disease*, 73(3), 1157–1166. <https://doi.org/10.3233/JAD-191092>
- Chowdhary, N., Barbui, C., Anstey, K. J., Kivipelto, M., Barbera, M., Peters, R., Zheng, L., Kulmala, J., Stephen, R., Ferri, C. P., Joannette, Y., Wang, H., Comas-Herrera, A., & Alessi, C. S. (2022). (Dy), k., mwangi. K. J., Petersen, R. C., Motala, A. A., Mendis, S., ... Dua, T. *Reducing the Risk of Cognitive Decline and Dementia: WHO Recommendations. Frontiers in Neurology*, 12. <https://doi.org/10.3389/fneur.2021.765584>
- Cooper, C., Sommerlad, A., Lyketsos, C. G., & Livingston, G. (2015). Modifiable predictors of dementia in mild cognitive impairment: A systematic review and meta-analysis. *American Journal of Psychiatry*, 172(4), 323–334.
- Dalen, J. W. van, Wanrooij, L. L. van, Charante, E. P. M. van, Brayne, C., Gool, W. A. van, & Richard, E. (2018). Association of apathy with risk of incident dementia: A systematic review and meta-analysis. *JAMA Psychiatry*, 75(10), 1012–1021.
- Fahed, M., & Steffens, D. C. (2021). Apathy: Neurobiology, assessment and treatment. *Clinical Psychopharmacology and Neuroscience*, 19(2), 181.
- Ferrari, J. R. (2010). *Still procrastinating: The no regrets guide to getting it done*. Turner Publishing Company.
- Fresnais, D., Humble, M. B., Bejerot, S., Meehan, A. D., & Fure, B. (2023). Apathy as a predictor for conversion from mild cognitive impairment to dementia: A systematic review and meta-analysis of longitudinal studies. *Journal of Geriatric Psychiatry and Neurology*, 36(1), 3–17.
- Fridén, I. (2020). *Procrastination as a form of self-regulation failure: A review of the cognitive and neural underpinnings*.
- Kirova, A. M., Bays, R. B., & Lagalwar, S. (2015). Working memory and executive function decline across normal aging, mild cognitive impairment, and alzheimer's disease. *BioMed Research International*, 2015(1), 748212.
- Nichols, E., Steinmetz, J. D., Vollset, S. E., Fukutaki, K., Chalek, J., Abd-Allah, F., Abdoli, A., Abualhasan, A., Abu-Gharbieh, E., Akram, T. T., et al. (2022). Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: An analysis for the global burden of disease study 2019. *The Lancet Public Health*, 7(2), e105–e125.
- Okura, T., Plassman, B. L., Steffens, D. C., Llewellyn, D. J., Potter, G. G., & Langa, K. M. (2010). Prevalence of neuropsychiatric symptoms and their association with functional limitations in older adults in the united states: The aging, demographics, and memory study. *Journal of the American Geriatrics Society*, 58(2), 330–337.

- Palmer, K., Di Iulio, F., Varsi, A. E., Gianni, W., Sancesario, G., Caltagirone, C., & Spalletta, G. (2010). Neuropsychiatric predictors of progression from amnesic-mild cognitive impairment to alzheimer's disease: The role of depression and apathy. *Journal of Alzheimer's Disease*, 20(1), 175–183.
- Prince, M., Bryce, R., Albanese, E., Wimo, A., Ribeiro, W., & Ferri, C. P. (2013). The global prevalence of dementia: A systematic review and meta analysis. *Alzheimer's & Dementia*, 9(1), 63–75. <https://doi.org/10.1016/j.jalz.2012.11.007>
- Radakovic, R., & Abrahams, S. (2018). Multidimensional apathy: Evidence from neurodegenerative disease. *Current Opinion in Behavioral Sciences*, 22, 42–49.
- Richard, E., Schmand, B., Eikelenboom, P., Yang, S. C., Ligthart, S. A., Moll van Charante, E. P., Gool, W. A. van, & Initiative, A. D. N. (2012). Symptoms of apathy are associated with progression from mild cognitive impairment to alzheimer's disease in non-depressed subjects. *Dementia and Geriatric Cognitive Disorders*, 33(2-3), 204–209.
- Ruthirakuhan, M., Herrmann, N., Vieira, D., Gallagher, D., & Lanctôt, K. L. (2019). The roles of apathy and depression in predicting alzheimer disease: A longitudinal analysis in older adults with mild cognitive impairment. *The American Journal of Geriatric Psychiatry*, 27(8), 873–882.
- Salem, H., Suchting, R., Gonzales, M. M., Seshadri, S., & Teixeira, A. L. (2023). Apathy as a predictor of conversion from mild cognitive impairment to alzheimer's disease: A texas alzheimer's research and care consortium (TARCC) cohort-based analysis. *Journal of Alzheimer's Disease*, 92(1), 129–139.
- Sanz-Blasco, R., Ruiz-Sánchez de León, J. M., Ávila-Villanueva, M., Valentí-Soler, M., Gómez-Ramírez, J., & Fernández-Blázquez, M. A. (2022). Transition from mild cognitive impairment to normal cognition: Determining the predictors of reversion with multi-state Markov models. *Alzheimer's & Dementia*, 18(6), 1177–1185. <https://doi.org/10.1002/alz.12448>
- Shigemizu, D., Akiyama, S., Higaki, S., Sugimoto, T., Sakurai, T., Boroevich, K. A., Sharma, A., Tsunoda, T., Ochiya, T., Niida, S., & Ozaki, K. (2020). Prognosis prediction model for conversion from mild cognitive impairment to alzheimer's disease created by integrative analysis of multi-omics data. *Alzheimer's Research & Therapy*, 12\*, 1–12.
- Skogseth, R., Mulugeta, E., Ballard, C., Rongve, A., Nore, S., Alves, G., & Aarsland, D. (2008). Neuropsychiatric correlates of cerebrospinal fluid biomarkers in alzheimer's disease. *Dementia and Geriatric Cognitive Disorders*, 25(6), 559–563.
- Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, 3(1).
- Stopford, C. L., Thompson, J. C., Neary, D., Richardson, A. M., & Snowden, J. S. (2012). Working memory, attention, and executive function in alzheimer's disease and frontotemporal dementia. *Cortex*, 48(4), 429–446.
- Tschanz, J. T., Welsh-Bohmer, K. A., Lyketsos, C. G., Corcoran, C., Green, R. C., Hayden, K., Norton, M. C., Zandi, P. P., Toone, L., West, N. A., & Breitner, J. C. S. (2006). And the cache county investigators. *Conversion to Dementia from Mild Cognitive Disorder: The Cache County Study*. *Neurology*, 67(2), 229–234.

- Yu, H. M., Yang, S. S., Gao, J. W., Zhou, L. Y., Liang, R. F., & Qu, C. Y. (2013). Multi-state Markov model in outcome of mild cognitive impairments among community elderly residents in mainland China. *International Psychogeriatrics*, 25(5), 797–804.
- Zhang, S., Liu, P., & Feng, T. (2019). To do it now or later: The cognitive mechanisms and neural substrates underlying procrastination. *Wiley Interdisciplinary Reviews: Cognitive Science*, 10(4), e1492.