Cross-sectional associations between regular physical activity engagement and domains of mental health in a global sample of ~~43,227 young adults~~

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Estimating the treatment effect of regular exercise with propensity score weighting using generalized boosted models

Mental health conditions have proven to be a significant burden on the global population. Approximately 29% of individuals have experienced a common mental disorder during their lifetime, with a 9.6%, 12.9%, and 10.7% lifetime prevalence for mood, anxiety, and substance-use disorders, respectively (Steel 2014). Global burden of mental disorders in 2019 is estimated at 125.3 million disability-adjusted life-years (DALY) – an increase from 80.8 million DALYs in 1990 (Lancet 2022). Moreover, lost productivity due to poor mental health is estimated to cost the global economy $2.5T annually and is projected to more than double over the next decade, reaching $6T by 2030 (Health, 2020).

Recent epidemiological reviews of global samples indicates stagnation in the overall prevalence of mental disorders (Ritcher 2019), despite an increase in the prevalence of depression (Moreno-Agostino 2021). Together, these studies suggest that current strategies which seek to prevent and/or reduce mental problems are ineffective (Jorm 2017). The COVID-19 pandemic has also conferred a considerable toll on population mental health and wellbeing worldwide. Specifically, meta-analytic evidence from three reviews suggests there has been a small increase in mental health problems, with relatively larger effects observed for depressive and anxiety symptoms, although it should be noted that findings for general mental health and wellbeing are more mixed (Pierce 2020; Patel et al., 2022; Prati & Mancini, 2021; Robinson et al., 2022).

Emerging evidence suggests certain age cohorts across the adult lifespan may be at greater risk for poor mental health and wellbeing than others. For example, a recent report showed that younger adults living in the US consistently report the lowest scores on all six domains of well-being, including happiness, health, meaning and purpose, character, social relationships, and financial stability, with a linear pattern of improvements in wellbeing observed with increased age (Chen et al., 2022). These findings are in contrast to previous work that had demonstrated an inverted-U relationship between age and mental wellbeing in which mental wellbeing was lowest in middle adulthood (Blanchflower & Oswald 2008). Evidently, more research is needed to better understand these trends from a global perspective, including a focus on protective factors that may moderate the relationship between age and mental health and wellbeing.

An emerging body of literature continues to establish effects of physical activity on mental health as well. Observational and experimental evidence consistently shows a relationship between higher levels of physical activity and benefits across various mental health outcomes (Creese 2020, Rodriguez-Ayllon 2019, McDowell 2019, Firth 2020, Schuch 2017; Kvam et al., 2016; Schuch et al 2016a; Schuch et al., 2016b; Stathopoulou et al., 2006) For example, in a large cross-sectional dataset of 1,237,194 US respondents, Chekroud et al. (2018) demonstrated optimal amounts of exercise frequency associated with reduce mental health burden in that more is not always better. A recent meta-analysis of prospective cohort studies showed a similar pattern of results for the relationship between physical activity and depression – higher volumes of physical activity were associated with diminishing additional benefits (Pearce et al., 2022). While this evidence further supports the importance of physical activity for preventing and/or reducing a range of mental health problems and improving overall wellbeing, certain mental health disorders and symptoms have received limited attention to date. For some other mental disorders and symptoms, the evidence is less suggestive of benefits, or remains unclear (Firth 2015; Dauwan 2016; Brokmeier 2020; Brondino 2017; Ashdown-Franks 2019; Melo 2016).

Recent work has suggested that mental health is a complex and heterogenous construct in which there is considerable overlap in symptomology across the most common disorders (Newson et al., 2020). Novel measures such as the Mental Health Quotient (MHQ) have been developed to address these considerations, but due to their recency, have received limited attention. There is also a paucity of literature on the ~~specific symptoms that~~ specific aspects of mental health that physical activity may especially favor, which only one previous study to our knowledge investigating symptom-level effects (Murri 2018). Improved precision in the treatment target may have important implications for clinical outcomes (User 2012; Iniesta 2016). Varying amounts of physical activity may be associated with differential effects across the lifespan, particularly as it relates to certain aspects of mental wellbeing.

The purpose of the present study was to examine the relationship between frequency of physical activity and various aspects of mental health and wellbeing, and comparing across age groups while statistically accounting for a wide range of observed covariates in a large global sample.

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