Living to 100: Aerobic Physical Activity and Non-communicable Disease
A Systematic Review

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INTRODUCTION

- In the last 50 years, the global population of adults aged ≥65 years has tripled [1].
- Non-communicable diseases (NCDs) account for an estimated 80% of the healthcare burden among older adults [2].
- Aerobic physical activity (PA) contributes to functional mobility, increased bone and muscle strength, prevention of illness and quality of life.
- However, PA is not yet a fully realised aspect of geriatric care, and the relationship between PA and NCD outcomes among the elderly is not well characterised.

OBJECTIVE:
To review recent evidence for the impact of aerobic PA and cardiorespiratory fitness (CRF) on mortality and NCD outcomes in adults aged ≥65 years.

METHODOLOGY

- This review followed PRISMA guidelines [3]. Scopus, Cochrane Library, PubMed, and Web of Science were searched (Figs. 1 and 2).
- A narrative synthesis grouped studies by outcome, then by exposure (PA or CRF).
- A meta-analysis was not conducted due to heterogeneity in the PA exposure and outcomes.
- Cochrane Collaboration RoB tool 2.0 [4] and the Newcastle-Ottawa scale (NOS) [5] were used for risk of bias (RoB) screening for RCTs and non-randomised studies (Fig. 3), respectively.
- **Included:** Studies evaluating the association between CRF and/or aerobic PA on mortality and common NCDs in participants over 65 years old.
- **Excluded:** Studies solely exploring the impact of non-aerobic activities such as strength training, yoga, Pilates, and stretching.
- **Outcomes:**

All-cause Mortality | Cancers | Cardiovascular Disease (CVD) risk | Depression | Dysglycaemia and Glucose Metabolism (incl. T2DM) | Dyslipidaemia | Frailty and/or Falls | Hypertension/Blood Pressure (BP) | Metabolic Syndrome (MetS) | Obesity/Adiposity

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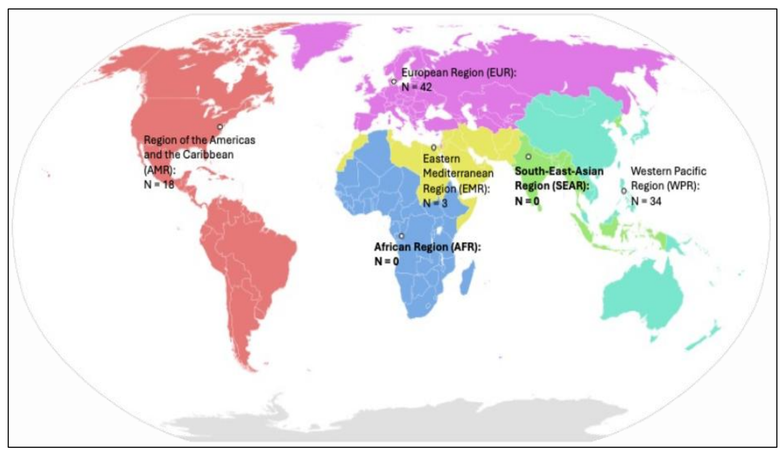
RESULTS

FIGURE 1: GEOGRAPHICAL OVERVIEW OF STUDIES (N=94)



*Map: Derfel73; Canuckguy et al., Public domain, via Wikimedia Commons.

FIGURE 2: FLOWCHART OF STUDIES IDENTIFIED

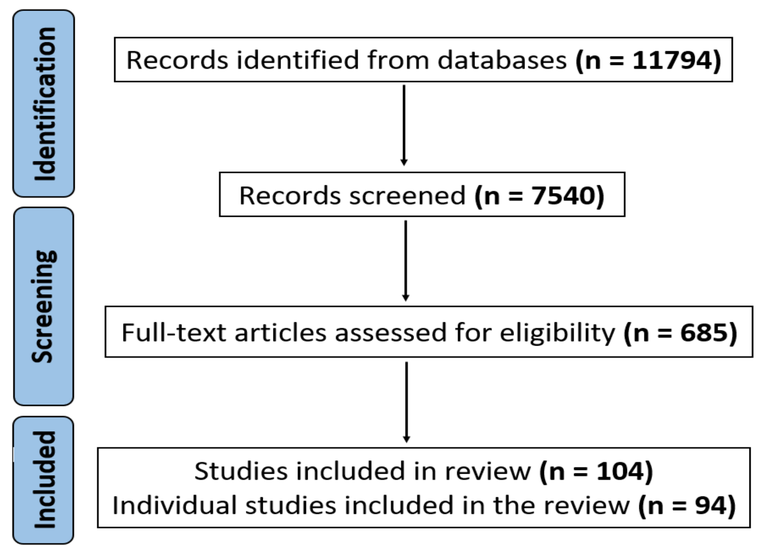


FIGURE 3: ROB SCORING FOR OBSERVATIONAL STUDIES

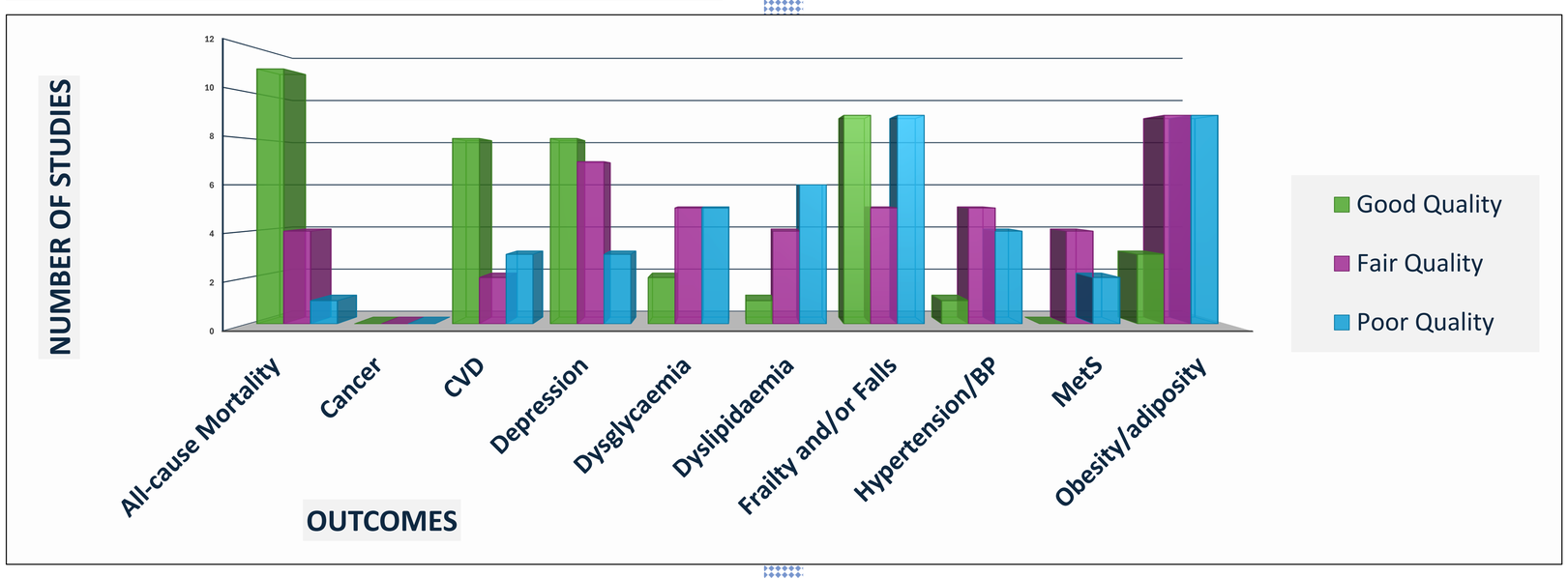


TABLE 1: NCD OUTCOMES	
All-cause Mortality	Longitudinal studies showed that both LPA and higher-intensity PA significantly reduced all-cause mortality in adults ≥65 years. Despite varied measurement methods, all observational studies found LPA, MVPA, or CRF were linked to lower mortality risk.
CVD	In the longitudinal EPIC Norfolk study (n=24502), moderately inactive participants aged >65 years had a lower risk of incident CVD events than those completely inactive [adjusted HR 0.86, 95% CI 0.78-0.96] [6].
Depression	Aerobic PA interventions were generally found to be beneficial, but one RCT showed no significant effect [7]. Observational studies showed mixed results - three studies with both cross-sectional and prospective data found significant cross-sectional but not prospective associations.
Frailty/Falls	Observational studies generally found walking, LPA, MVPA, and CRF to be inversely associated with frailty, except in a study (n=122) by Netz et al. (2021, [8]) that found no significant association in women aged 65-75. Aerobic PA's (beneficial) impact on fall risk is hard to determine, particularly in cross-sectional studies, due to the lack of a simple cause-and-effect relationship.

TABLE 1 contd: NCD OUTCOMES (METABOLIC)	
Dysglycaemia	Both RCT and observational studies found some association between PA and glucose metabolism outcomes.
Dyslipidaemia	Several studies found that higher aerobic PA, including regular walking, is associated with higher HDL-c and lower LDL-c and triglycerides [9], though the strength of these associations varies by lipid measure.
Hypertension /BP	In a study (n=779) using self-reported hypertension, MVPA was significantly lower in those with hypertension than those without (29 [IQR 26-33] vs 39 [IQR 35-44], p<0.001) [10]; though other studies showed no/only partial associations between PA + BP.
MetS	One study (n=3554) found no significant difference in MetS prevalence between regular and non-regular walkers (30.7% vs 35.8%, p=0.468), possibly due to the low intensity of walking (min 30 mins per day) [9]. Overall, evidence for aerobic PA's impact on metabolic outcomes, particularly lipid profiles and the composite MetS classification, was inconsistent, reflecting previous review findings [11].
Obesity/ Adiposity	Walking, swimming, and aerobic interval training interventions were found to positively impact at least one adiposity measure compared to a control group; however, the impact of LPA vs MVPA remains unclear.
In older age, PA benefits may be reduced due to complex interactions with lifelong environmental, behavioural, and metabolic risk factors [11].	

FIGURE 4: ASSOCIATION BETWEEN PA AND CRF AND NCDS

ASSOCIATION BETWEEN PA AND CRF AND NCDS

	PAI / PAO / CRFO*								
	Yes			Some			No		
All-cause Mortality	0	10	4	1	2	0	0	0	0
CVD	1	4	0	0	8	1	2	0	0
Depression	3	5	1	1	8	0	1	1	0
Dysglycaemia	1	5	0	2	4	0	1	3	0
Dyslipidaemia	0	2	0	1	7	0	2	2	0
Frailty/Falls	1	10	2	2	7	1**	0	3**	0
Hypertension/BP	3	2	0	5	4	0	0	4	0
MetS	0	2	1	1	3	0	0	0	0
Obesity/Adiposity	2	7	0	3	8	0	2	6	0

*PA Intervention Studies (PAI); PA Observational Studies (PAO); CRF Observational Studies (CRFO)
**Netz et al. (2021) assessing PA and CRF for frailty and/or falls – cross-sectional and prospective analysis [8].

CONCLUSION

- We found significant heterogeneity between studies.
- Aerobic PA/CRF may be beneficial for reducing mortality, CVD, frailty, and dysglycaemia.
- Less conclusive evidence is available for metabolic outcomes (obesity, dyslipidemia, hypertension, MetS) and depression.
- Public health initiatives should continue to promote aerobic PA into daily routines [12].
- Further high-quality longitudinal studies focusing on aerobic PA and its ideal frequency, duration, and intensity are needed.

KEY INFORMATION

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KEY INFORMATION

COMPETING INTERESTS AND ACKNOWLEDGEMENTS

None to declare