

Supplementary Material

Search strategy

The meta-analyses reviewed in this paper, and other referenced studies, were identified using a comprehensive search for peer-reviewed manuscripts in MEDLINE (up to December 2021). Search terms included Medical Subject Headings (MeSH) terms and key words related to CKD and exercise and physical training terms:

Chronic kidney disease terms (population) (chronic kidney disease[Title/Abstract] OR “Kidney Failure, Chronic”[Mesh] OR “Renal Insufficiency, Chronic”[Mesh] OR “Kidney Diseases”[Mesh])

Exercise terms (intervention) (“Exercise”[Mesh] OR “Rehabilitation”[Mesh] OR “exercise therapy”[MeSH] OR “Exercise Movement Techniques”[Mesh] OR “Exercise Therapy”[Mesh] OR “Warm-Up Exercise”[Mesh] OR “Plyometric Exercise”[Mesh] OR “Circuit-Based Exercise”[Mesh] OR “Resistance Training”[Mesh] OR “High-Intensity Interval Training”[Mesh] OR physical training[Title/Abstract] OR physical activity[Title/Abstract] OR physical fitness[Title/Abstract] OR resistance training[Title/Abstract] OR resistance exercise[Title/Abstract] OR resistance program[Title/Abstract] OR strength program[Title/Abstract] OR strength exercise[Title/Abstract] OR strength training[Title/Abstract] OR aerobic training[Title/Abstract] OR aerobic program[Title/Abstract] OR aerobic exercise[Title/Abstract] OR exercise training OR tai chi[Title/Abstract] OR swimming[Title/Abstract] OR running[Title/Abstract] OR cycling[Title/Abstract] OR Walking[Title/Abstract])

Table S1. Studies included in published systematic reviews of effects of exercise on kidney function in ND-CKD.

Yamamoto 2021	Nakamura 2020	Wu 2020	Villanego 2020	Zhang 2019	Vanden Wyngaert 2018
Aoike 2015	Aoike 2018	Barcellos 2018	Aoike 2015	Aoike 2015	Aoike 2015
Baria 2014	Barcellos 2018	Greenwood 2015	Aoike 2018	Baria 2014	Baria 2014
Gomes 2017	Beetham 2018	Hiraki 2017	Baria 2014	Greenwood 2015	Greenwood 2015
Greenwood 2015	Greenwood 2015	Leehey 2016	Gomes 2017	Headley 2012	Headley 2012
Headley 2012	Headley 2012	Liang 2016	Greenwood 2015	Hiraki 2017	Howden 2013
Howden 2015	Hiraki 2017	Liang 2018	Headley 2012	Howden 2015	Leehey 2009
Ikizler 2018	Leehey 2016	Zhang 2019	Leehey 2016	Kiuchi 2017	Leehey 2016
Leehey 2009	Van Craenbroeck 2015	Hamada 2016	Hiraki 2017	Leehey 2009	Miele 2017
Leehey 2016	Kirkman 2019	Nylen 2015	Howden 2013	Leehey 2016	Van Craenbroeck 2015
Miele 2017			Howden 2015	Miele 2017	
Van Craenbroeck 2015			Leehey 2009	Van Craenbroeck 2015	
			Van Craenbroeck 2015	Toyama 2010	

Note: Studies which have been included in systematic reviews and meta-analyses investigating the effects of exercise training on kidney function in non-dialysis CKD patients. Studies included in multiple systematic reviews are given colours. Publications which represent sub-samples or interim analysis of a larger study are all highlighted with the same colour. Studies which appear in only one review are not highlighted with colour

Table S2. Effect of Exercise Training on Kidney Function in NDD-CKD: summary of study results.

Study Reference	Kidney function measure	Exercise Treatment Result, baseline to follow-up (ml/min/1.73 ²)	Comparator Result, baseline to follow-up (ml/min/1.73 ²)	Interpretation/Notes
Castaneda 2001, 2004	measured GFR (I ¹²⁵ -iothalamate clearance)	1.18*	-1.62	Significantly improved eGFR with exercise training vs small decrease in low-protein diet alone.
Greenwood 2015	eGFR (CKD-EPI Cr)	3.7*	-4.8	Significant within-group improvement in eGFR in ET, vs decline in UC. Also improvement in annual rate of eGFR decline vs UC.
Kiuchi 2017	eGFR (CKD-EPI Cr)	<i>ModET</i> : 12.1*	<i>HIIT</i> : 1.4	Moderate exercise improves eGFR in training 18-26 months (between and within-group comparisons)
Shi 2014	eGFR (Chinese MDRD)	6.0*	-2.0	Improved eGFR in Tai Chi group (BGD and WGD)
Beetham 2018	eGFR (CKD-EPI Cys)	-0.7	-2.4*	Significant within-group decline in eGFR _{cys} in UC; no between group differences
Aoike 2018 (2015)	eGFR (CKD-EPI Cr)	<i>Centre-based</i> 0.9 <i>Home-based</i> 2.4	-1.2	No effect on eGFR (Improved eGFR at 12 weeks in Aoike 2015 substudy)
Barcellos 2018	eGFR (CKD-EPI Cr)	-1.9	-2.6	No effect on eGFR
Eidemak 1997	mGFR (⁵¹ Cr-EDTA)	-0.27	-0.28	No effect on change in mGFR
Headley 2012	eGFR (MDRD)	1.0	5.0	No effect on eGFR & no difference in rate of change eGFR per month
Hiraki 2017	eGFR (Japanese Cr equation)	-1.9	-1.6	No effect on eGFR
Ikizler 2018	eGFR (CKD-EPI Cys)	<i>ET</i> : 1.44 <i>ET&diet</i> 0.15	-0.02	No effect on eGFR
Kirkman 2019	eGFR (MDRD)	0	0	No effect on eGFR
Leehey 2009	GFR (urine Cr and urea clearance)	-5	-6	No effect on eGFR
Leehey 2016	eGFR (MDRD)	-1.9	-3.1	No effect on eGFR at 12 or 52 weeks
Miele 2017	eGFR (MDRD)	5.4	1.8	No effect on eGFR
Mustata 2011	eGFR (MDRD)			No effect (no numbers reported)
Van Craenenbroeck 2015	eGFR (MDRD)	0.74	-0.33	No effect on eGFR
Hellberg 2019	mGFR (iohexol clearance)	-1.8	-1.8	No non-exercise control. Both groups decreased (statistically significant)

Note: Summary of individual exercise training studies which report kidney function findings. Studies with statistically significant results suggesting a benefit of exercise training (ET) vs usual care (UC) are listed first, with significant results marked with an asterisk(*). "No effect" implies no statistically significant changes in either within-group or between group comparisons. The results shown are the absolute difference between baseline and final follow up, or mean estimated effect size if reported; negative numbers indicate a decline in kidney function.