

Supplementary File (PDF)

The impact of exercise, physical activity, dietary or combined interventions on body weight in new kidney transplant recipients: a systematic review and meta-analysis

Table S1. PRISMA checklist. A completed PRISMA checklist for the systematic review

Table S2. Search strategy (Medline). An example search strategy using Medline database

Table S3. Screening form. A copy of the screening form used

Table S4. Detailed sample characteristics. Detailed information on participant samples in each key study

Table S5. Study characteristics of non-RCT's (n=6)

Table S6. Details of interventions non-RCT's (n=6)

Figure S1. Risk-of-bias plot for Non-RCT's (n=6)

Table S8. Sensitivity analysis. Additional forest plots for BW and BMI

Table S1. Completed PRISMA (2009) checklist

| Section/topic | # | Checklist item | Reported on page # |
|---------------------------|---|---|--------------------------|
| TITLE | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | Title page |
| ABSTRACT | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | Abstract Page 1 |
| INTRODUCTION | | | |
| Rationale | 3 | Describe the rationale for the review in the context of what is already known. | 1 and 2 |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS). | 2 and 3 |
| METHODS | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | Page 2 Suppl material |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | Page 2 and 3 Table 1 |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | 4 |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be | Suppl. |

| | | | |
|------------------------------------|----|--|------------------------------|
| | | repeated. | material |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | 4 and 5 |
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | Page 4, Suppl material |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | Page 4 Suppl material |
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis. | 4 |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | 4-6 |
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis. | 4-6 |

Page 1 of 2

| Section/topic | # | Checklist item | Reported on page # |
|-----------------------------|----|--|-------------------------------|
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies). | 4-5, 15, 18 |
| Additional analyses | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified. | Page 18, Suppl material |
| RESULTS | | | |

| | | | |
|-------------------------------|----|--|------------------------------|
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram. | 5-6 Figure 1 (PRISMA) |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations. | Table 2 page 7 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12). | Page 15 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot. | 17-18 |
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency. | 17-18 |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies (see Item 15). | Page 4 |
| Additional analysis | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]). | Suppl material Page 18 |
| DISCUSSION | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers). | 19-20 |
| Limitations | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias). | 21-22 |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | 22 |
| FUNDING | | | |
| Funding | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | 22 |

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: www.prisma-statement.org.

Supplementary Material Table S2. Search Strategy Medline

Platform: OvidSP

Database coverage: 1946 to present

Limits: 1985, English

Date of search: 26th June 2020. The search was re-run on the 6th of April 2021 in all data-bases and the PRISMA diagram and manuscript updated.

Search Terms: see below, Mesh terms adapted to fit database

| Search line number | Searches | Result |
|--------------------|--|--------|
| 1 | exp Kidney Transplantation/ | 92244 |
| 2 | (kidney adj3 transplan*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 102708 |
| 3 | (renal adj3 transplan*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 48156 |
| 4 | exp Diet Therapy/ | 51883 |
| 5 | diet* therap*.mp. | 60692 |
| 6 | diet* modification*.mp. | 3285 |
| 7 | diet* intervention*.mp. | 7883 |
| 8 | diet* treatment*.mp. | 9923 |
| 9 | nutrition treatment*.mp. | 191 |
| 10 | nutrition intervention*.mp. | 2346 |
| 11 | exp Exercise Therapy/ | 46650 |
| 12 | exercise* therap*.mp. | 39158 |
| 13 | exercise* rehab*.mp. | 698 |
| 14 | exercis* interventio*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, | 5364 |

| | | |
|----|---|--------|
| | keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | |
| 15 | exp Exercise/ | 180448 |
| 16 | exercis*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 358637 |
| 17 | activit* physical.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 915 |
| 18 | physical activit*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 102929 |
| 19 | training exercis*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 1606 |
| 20 | exp Behavior Therapy/ | 70594 |
| 21 | behavio?r therap*.mp. | 32036 |
| 22 | behavio?r modification*.mp. | 2896 |
| 23 | conditioning therap*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 502 |
| 24 | (behavio?r adj2 change).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 16862 |
| 25 | (behavio?r adj2 technique*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, | 1746 |

| | | |
|----|---|--------|
| | protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | |
| 26 | behavior?r change technique*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 791 |
| 27 | weight gain prevention.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 264 |
| 28 | weight gain treatment*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 39 |
| 29 | exp Obesity/ | 198824 |
| 30 | obesity.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 299884 |
| 31 | exp Weight Gain/ | 30126 |
| 32 | (weight adj1 gain).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 72620 |
| 33 | (weight gain or loss).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 967411 |
| 34 | weight change*.mp. | 10682 |
| 35 | (body weight adj2 (gain or loss or change)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 21027 |

| | | |
|-----------|--|---------|
| 36 | ((bmi or body mass index) adj2 (gain or loss or change)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 4261 |
| 37 | exp Body Weight/ | 441621 |
| 38 | (body adj2 weight*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 344949 |
| 39 | 1 or 2 or 3 | 110856 |
| 40 | 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 | 637509 |
| 41 | 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 | 1508242 |
| 42 | 39 and 40 and 41 | 217 |
| 43 | limit 42 to (english language and yr="1985 -Current") | 188 |

Supplementary Material Table S3. Screening form

Review Question: Weight gain prevention interventions in Kidney transplant recipients, a systematic review

- Inclusion criteria:**
- **Population-** This will be defined as new Kidney Transplant recipients within the first year following surgery
 - **Intervention-** treatments to prevent weight gain (either singular or combined of physical activity or exercise advice, nutritional/dietician advice and or behavioural change techniques)
 - **Comparator-**usual care/ standard care
 - **Outcome-** weight gained post-transplant (baseline to six months or baseline to 12 months).
 - **Study type-** randomised controlled trials, systematic reviews, non-randomised controlled trials or quasi-randomised controlled trials.

Author name and year

Title and journal

| Full text papers include or exclude paper | | Include | Exclude | Notes |
|---|-------------------------------------|---|---|-------|
| Population | New Kidney Transplant Recipient | <input type="checkbox"/> kidney transplant recipient (within first year) | <input type="checkbox"/> Kidney transplant recipient > 1 year <input type="checkbox"/> sample includes other CKD participants | |
| Outcome | Primary outcome: Weight gain | <input type="checkbox"/> baseline weight provided <input type="checkbox"/> follow up weight provided | <input type="checkbox"/> no reporting of body weight at baseline <input type="checkbox"/> no reporting of weight at follow up (either 3, 6 or 12 months) | |
| Outcome | Secondary outcomes | <input type="checkbox"/> body weight as secondary outcome <input type="checkbox"/> reports BMI <input type="checkbox"/> Bioimpedance <input type="checkbox"/> physical function <input type="checkbox"/> mood <input type="checkbox"/> self-efficacy <input type="checkbox"/> physical activity | <input type="checkbox"/> no recording of body weight <input type="checkbox"/> no recording of secondary outcomes listed | |
| Study design | Study type | <input type="checkbox"/> randomised controlled trials <input type="checkbox"/> non randomised controlled trials | <input type="checkbox"/> studies with no control group | |
| Intervention | Weight gain prevention intervention | <input type="checkbox"/> includes an intervention aimed to prevent weight gain (either singular or | <input type="checkbox"/> studies that include a drug in the intervention group | |

| | | | |
|-------------------------|--|---|---|
| | | combined of physical activity or exercise advice, nutritional/dietician advice and or behavioural change techniques) | |
| | | <input type="checkbox"/> include interventions measuring body weight and BMI (combined, physical activity or nutritional) | |
| Other factors | Publication year and language | <input type="checkbox"/> English <input type="checkbox"/> studies > 1985 | <input type="checkbox"/> exclude papers not in English <input type="checkbox"/> exclude papers published before 1985 |
| Overall decision | <input type="checkbox"/> Included | | <input type="checkbox"/> Excluded |

Supplementary Material Table S4. Table depicting detailed description of characteristics of trials

RCT's are presented first (n=10) followed by the non-RCTs (n=6)

| Study primary author, year and country or origin | Specifics of sample | Group (Usual care= RCTs, comparators= non-RCTs) | Sample at start of the study (n) | Dropouts (n and %) | % Males | Age M ± SD | KTx vintage (mean in months) |
|---|--|---|----------------------------------|--------------------|-----------|-------------------|--|
| RCT's (n=10) | | | | | | | |
| Lawrence 1995 (UK)[1] | <ul style="list-style-type: none"> Hyperlipidaemic KTRs Diabetics excluded | Total sample | 38 | NI | NI | NI | NI Mean. |
| | | Intervention | 22 | NI | 59% | 50 (range 20-70*) | Randomised after KTx |
| | | Usual care | 16 | NI | 22% | 56 (range 31-71*) | |
| Painter[†] 2002[2], 2003[3] (USA) | <ul style="list-style-type: none"> Excluded if physical limits to exercise or psych issues | Total sample | 167 | 70 (42%) ‡ | NI | NI | NI mean. Recruited one month after KTx |
| | | Intervention | 54 | 29 | 55.5% | 39.7±12.6 | |
| | | Usual care | 43 | 41 | 69.1% | 43.7±10.7 | |
| Tzvetanov 2014[4] (USA) | <ul style="list-style-type: none"> Obese KTRs with BMI > 30 Excluded if unable to participate in exercise | Total sample | 17 | 6 (35.3%) ‡ | NI | NI | NI mean. Rehab started |
| | | Intervention | 9 | 0 | 50% | 46.6±6.9 | 8.6±6.2 months after KTx |
| | | Usual care | 8 | 6 | 37.5% | 45±19 | |
| O'Connor[†] 2017[5], Greenwood 2015[6] (UK) | <ul style="list-style-type: none"> Long-term follow up ExeRT trial cohort [6] 42/60 cohort followed up at 12 months (9 months after cessation Rx. 3 groups: AT, RT and UC Pragmatic inclusion criteria | Total sample | 46 | 4 (8.7%) | 58.7% | 51.8±12.5 | 6.58±4.51 |
| | | Intervention | 13 | 1 | 77% | 53.9±10.7 | 6.09±4.86 |
| | | 1 (AT) | | | | | |
| Intervention | 13 | 3 | 54% | 54.6±10.6 | 7.39±5.13 | | |
| 2 (RT) | | | | | | | |
| Usual care | 20 | 0 | 50% | 49.5±10.6 | 6.37±4.0 | | |

| | | | | | | | |
|--|---|------------------------------|-------------------------------|------------------------|--------------------|---|--|
| Henggeler 2018[7] (NZ) | Excluded if BMI > 40 or < 18.5. | Total sample | 37 | 11 (29.7%)* | 69.4% | NI | NI mean. Recruited within the first month of KTx |
| | | Treatment | 19 | 6 | 67% | 49.2±14.6 | |
| | | Usual care | 18 | 5 | 72% | 48.3±13.9 | |
| Kuningas 2019[8] (UK) | Nondiabetic KTRs | Total sample | 130 | 27 (20.8%) | 54.6% | NI | NI mean total sample ≈ 8±6 months ≈ 8±5 months |
| | | Treatment | 66 | 10 | 43.7% | 47.7±13.1 | |
| | | Usual care | 64 | 17 | 56.5% | 47.4±13.7 | |
| Karelis 2016[9] (Canada) | <ul style="list-style-type: none"> • Nondiabetic KTRs • Non smokers • Low ETOH Sedentary (< 2hrs exercise/week) | Total sample | 24 | 4 (16.66%) | 50% | NI | NI mean. KTx 6-8 weeks earlier |
| | | Treatment | 12 | 2 | 50% | 45.3±14 | |
| | | Usual care | 12 | 2 | 50% | 39.4±8 | |
| Schmid-Mohler 2019[10] (Switzerland) | <ul style="list-style-type: none"> • combined KTR and kidney-pancreas transplants (n=123) • n=120 KTR | Total | 123 [§] (120 KTR) | 3 (2.5%) [§] | 61.8% [§] | 50.2±13.1 [§] (50.5±13.1) KTR) | NI mean. Recruited < 6 weeks post Tx |
| | | Usual care | 62 [§] (60 KTR) | 1 (1.6%) [§] | 62.9% [§] | 49.8±12.6 [§] | |
| | | Treatment | 61 [§] (60 KTR) | 2 (3.3%) [§] | 60.7% [§] | 50.5±13.8 [§] | |
| Serper 2020[11] (USA) | <ul style="list-style-type: none"> • combined sample of KTR and liver transplant recipients (n=127) • n= 65 KTRs | Total | 127 [§] (65 KTR) | 10 (7.8%) [§] | 64% [§] | 52±13 [§] | 9.5 (3-17) ^{§¶} |
| | | Usual care (Arm1) | 42 [§] (20 KTR) | 1 (2.4%) [§] | 64% [§] | 50±15 [§] | 8.4 (3.7-16) ^{§¶} |
| | | Device only (Arm 2) | 44 [§] (22 KTR) | 4 (9%) [§] | 68% [§] | 53±12 [§] | 6.5 (3-13) ^{§¶} |
| | | Treatment and device (Arm 3) | 41 [§] (23 KTR) | 5 (12.2%) [§] | 58% [§] | 54±13 [§] | 13 (4-19) ^{§¶} |
| Gibson 2020[12] (USA) | <ul style="list-style-type: none"> • KTRs recruited between 6-12 months post-transplant (n=10) • included if BMI ≥ 22kg/m², able to participate in study | Total | 10 | 1 | 5 (50%) | 44.6±10.0 | NI on mean. However recruitment of participants within 6 to 12 months post kidney transplant |
| | | Usual care | 5 | 0 | 2 (40%) | 44.0±11.0 | |
| | | Treatment | 5 | 1 | 3 (60%) | 45.2±10.2 | |

- visits over the trial length, English speakers, able to report data weekly (either by phone, email or fax) and access to the internet.
- Exclusion criteria includes unwillingness to be randomized, participation in weight management or physical activity programme.

| Study primary author, year and country or origin | Specifics of sample | Group (Usual care= RCTs, comparators= non-RCTs) | Sample at start of the study (n) | Dropouts (n and %) | % Males | Age M ± SD | KTx vintage (mean in months) |
|--|--|---|----------------------------------|------------------------|--------------|------------|---|
| Non RCT's (n=6) | | | | | | | |
| Leasure 1995[13] (USA) | <ul style="list-style-type: none"> • 18-64 years • Willing to attend 3x week exercise for 12 weeks • Quasi-experimental two group repeated measure design | Total sample | 8 | 3 (37.5%) [‡] | Not reported | NI | NI mean. Started trial 8 weeks post KTx |
| | | Treatment | 2 | Not reported | Not reported | NI | |
| | | Comparator | 3 | Not reported | Not reported | NI | |
| Patel 1998[14] (UK) | <ul style="list-style-type: none"> • Stable KTR • Comparison group received no treatment | Total sample | 33 | NI | 69.7% | NI | NI mean. KTx 2months |
| | | Treatment | 11 | NI | 81.8% | 39±17 | |
| | | Comparator | 22 | NI | 63.6% | 40±11 | |
| | | Total sample | 452 | NI | NI | NI | |

| | | | | | | | |
|--|--|--------------|-----|-----------|-------|----------------------|--|
| Jeziar 2007[15] (Poland) | <ul style="list-style-type: none"> Treatment group= Obese and overweight KTR Recruited from weight reduction programme (mean BMI 33.35kg/m²) Comparator group monitored weight records for 56 months (mean BMI 25.9 kg/m²) | Treatment | 34 | NI | NI | NI | NI |
| | | Comparator | 418 | NI | NI | NI | NI |
| Sharif 2008[16] (UK) | <ul style="list-style-type: none"> KTR, grouped depending on their glucose tolerance. N=36 glucose intolerance did intensive Rx, n=79 control (leaflet) No diagnosis of Diabetes | Total sample | 115 | 4(3.5%) | 76.3% | NI | NI Mean. Recruited 6months and later after KTx |
| | | Treatment | 36 | 4 | 79% | 55 ±12** (SEM2) | |
| | | Comparator | 79 | 0 | 75% | 50±17.78** (SEM2) | |
| Teplan 2014[17] (Czech Republic) | <ul style="list-style-type: none"> 1st KTx (cadaveric) Excluded if recent cardiac event, cannot have smoked within the past 3 years | Total sample | 238 | 16 (6.7%) | 53.8% | NI | NI Mean. Recruited within first 6months KTx |
| | | Treatment | 116 | 8 | 49.2% | 58±7 | |
| | | Comparator | 122 | 8 | 53.8% | 55±8 | |
| Lorenz 2015[18] (USA) | <ul style="list-style-type: none"> Single KTR only (no combined Tx) Comparator group from 2 years earlier (post-hoc analysis) | Total sample | 307 | NI | 57% | 51±13 | NI mean. First visit within 3 weeks of KTx |
| | | Treatment | 145 | NI | 57.2% | 51±14 | |
| | | Comparator | 162 | NI | 56.8% | 52±13 | |

Note. RCT indicates randomised controlled trial, M= mean, SD=standard deviation, KTR= kidney transplant recipient, numbers indicate references (see list below), KTx= kidney transplantation, NI- no information, BMI=body mass index, Rx= treatment, AT= aerobic training, RT= resistance training, UC= usual care

*= standard deviation not provided and unable to be calculated

†= study with two publications from the same research study

‡ = significant dropouts, data only given for those who completed follow up

§= data from transplant combined sample

¶= median and IQR provided by authors, only in publication

**= standard deviations manually calculated

Supplementary Material. Table S5 study characteristics non-RCT's (n=6)

Table summarising the characteristics of the included non-RCT studies (n=6)

| First author, year (country of origin) | Study duration (months) | Sample | Groups | Outcomes (primary and secondary) | Results (for primary and secondary outcomes) | Comments |
|--|-------------------------|-------------|---|--|--|--|
| Leasure et al [13] (USA) | 6 | n=8 KTRs | IG: Exercise only for 12 weeks IG2: Initial 12 weeks no exercise, then exercise 12 weeks | Primary: Not stated Secondary: BC (hydrostatic weight and bioimpedance), strength (Cybex dynamometer), mean arm muscle area (skinfolds), endurance exercise tolerance test, nutritional assessment (4-day food diary), BW, BMI, and symptoms frequency distress scale for medication side effects | Primary/secondary: <ul style="list-style-type: none"> Increased fat weight (4%) initial post-transplant phase No between-group difference BW or BC Both groups gained fat weight and reduced lean weight. No consistent between-group difference in strength at 20 weeks No participants reached VO₂max No between-group difference in distress scale for medication All participants reported elevated appetite and difficulty following a low calorie/fat/salt diet | <ul style="list-style-type: none"> Small sample size with dropouts (3 dropouts) Convenience sampling AEs not reported Limited reporting No longer-term follow-up Descriptive statistics due to limited sample size |
| Patel et al [14] (UK) | 12 | n=33 | IG: Dietitian-led intensive dietary education for 4 months CG: | Primary: weight gain and BMI at 4 months and 1-year post KTx Secondary: | Primary: <ul style="list-style-type: none"> Significant between-group difference in BW and BMI at 4- and 12-months favouring IG | <ul style="list-style-type: none"> AEs not reported Confounding variables not controlled for Limited reporting |

| | | | | | | |
|--------------------------------------|---|-----------------|---|--|--|--|
| | | | Post-hoc controls receiving no dietary advice. From 4 years earlier | BW, height, BMI, diet histories (subjective assessment by dietitian), PA | <ul style="list-style-type: none"> • 5.5kg weight gain in IG vs 11.8kg in CG Secondary: <ul style="list-style-type: none"> • Increased self-reported PA IG • IG decreased high fat and sugar food and increased fruit and veg (diet histories) | <ul style="list-style-type: none"> • Control group was from KTRs 4 years earlier who had not received dietary intervention • Limited trial reporting contributing to 'no-information' score for risk-of-bias |
| Jeziorski et al [15] (Poland) | 6 | n= 452, n=34 IG | IG: Ax with education on the harms of weight gain, and then dietary advice 2 nd visit CG: Retrospective controls 4.5 years after KTx . no specific information given. | Primary: Not stated Secondary: BW, waist/hip/thigh circumference, bioimpedance skinfold tests and 3-day dietary history | Primary/secondary: <ul style="list-style-type: none"> • 27% IG increased BW during 6-months vs 80% CG during 4.5years • IG demonstrated a mean weight loss of 2kg in 6-months with an associated reduction in BMI • CG demonstrated a weight gain of approx. 0.62kg per six months | <ul style="list-style-type: none"> • AEs not reported • Preliminary results of a weight reduction programme • IG were included OW and OB KTR enrolled from a weight loss programme • No further publications • Limited reporting • No between-group testing of BW • Difficult to compare groups as significant difference in time |

| | | | | | | |
|---|--------------------|---------------------------------------|---|--|--|--|
| | | | | | | since transplant (6 months IG vs 4.5 years CG) |
| Sharif et al [16] (UK) | Mean follow-up 8.2 | n=115 KTR, grouped depending on GT | IG: IGT patients. Given Diet and exercise for 6 months CG: Normal GT. Given education about the risks of IGT and received leaflets on healthy lifestyle and exercise | Primary: change in GT Secondary: BW, height, self-reported PA | Primary: <ul style="list-style-type: none"> Significant within group difference in the IG with a significant reduction in 2-hr postprandial glucose levels ($P=0.012$) Significant within group increase in glucose levels ($P=0.001$) in CG Secondary: <ul style="list-style-type: none"> Good adherence IG throughout the study with 100% adherence to the dietitian visits, 94% completed food diary, and 88% maintained exercise diary No significant changes in BW in either group Significant within-group difference in self-reported PA in both groups, IG appeared to have a higher gain in PA | <ul style="list-style-type: none"> Only KTRs with no diagnosis of PTDM were eligible Participants allocated to groups based on GT AEs not reported Unclear number of Rx visits Preliminary work for the CAVIAR trial by Kuningas 2019 [8] |
| Teplan et al [17] (Czech Republic) | 6 | n=238 | IG: 6-months ET (AT) CG: Matched controls, no ET | Primary: ADMA (blood marker for risk of cardiovascular disease) Secondary: | Primary: <ul style="list-style-type: none"> Significant between-group difference favouring IG vs UC for reduced ADMA levels Secondary: | <ul style="list-style-type: none"> AE not reported BW not reported Reasons for dropouts (n=12) at |

| | | | | | | |
|--|----|-------|---|--|---|---|
| | | | blood lipids, HbA1C. Insulin, BP, Height, BW | | <ul style="list-style-type: none"> No significant difference in HbA1c, insulin, BP or blood lipids between groups Significant between-group difference in BMI and waist circumference with an increase in the CG compared with IG ($P<0.02$) | 6-months not reported |
| Lorenz et al [18] (USA) | 12 | n=307 | IG: 90 days pedometer and PA CG: Post-hoc controls, no PA Rx | Primary: Adherence to Rx Secondary: Metabolic parameters (HTN, hyperlipidaemia, PTDM), renal bloods | Primary: <ul style="list-style-type: none"> IG adherence to PA prescription was 36.5% 44.8% of IG returned PA diaries Secondary: <ul style="list-style-type: none"> No significant between-group difference between groups for 4-month weight gain, PTDM, lipids, or kidney function Lower BP at four-months post KTx IG vs CG Less impaired fasting glucose vs CG (between-group analysis, $P=0.04$) Adherent IG participants were less likely to gain weight ($P=0.01$) | <ul style="list-style-type: none"> AEs not reported Low adherence to Rx prescription 36.5% Additional data (SD) provided by authors on request BMI not reported |

Note. KTRs= kidney transplant recipient, IG= intervention Group, CG= control group, BW= body weight (kg), BMI= body mass index (kg/m²), AE=adverse event, Ax= assessment, GT= glucose tolerance, IGT= impaired glucose tolerance, PA= physical activity, AT= aerobic training, ADMA=asymmetric dimethylarginine, HbA1c=haemoglobin A1c, BP= blood pressure, HTN= hypertension, PTDM= post-transplant diabetes mellitus and SD=- standard deviation, vs=versus

Supplementary Material Table S6. Table depicting detailed description of characteristics of trials

| Study | Rx type | Rx Description | Rx Behaviour components | Provider | Duration | Frequency | Intensity | Type of ET | Time (in mins) |
|--------------------------|--------------------------|---|--|----------|----------|--|--------------------------------|-------------------------------|------------------|
| Leasure 1995 [13] | Exercise | <ul style="list-style-type: none"> ET started 8 weeks after KTx Progressed from 30 to 60 minutes Mode: F2F | <ul style="list-style-type: none"> NI | PT | 12 weeks | 36 sessions/ 12 weeks, 3x week, 1x week supervised | AT based on HR; RT based on Ax | AT + RT | 30-60 |
| Patel 1998 [14] | Diet | <ul style="list-style-type: none"> Verbal and written edu on exercise and healthy lifestyle edu on snacks, shopping, convenience foods, stress, weight management, alcohol and smoking Mode: NI, assume F2F | <ul style="list-style-type: none"> Goal setting (BCT) for diet or weight loss | RD | 4 months | NI | NA | NI | NI |
| Jezior 2007 [15] | Other (measures and edu) | <ul style="list-style-type: none"> 2 x F2F visits: <ul style="list-style-type: none"> Visit 1=measures taken (weight, height, waist, bioimpedance, skinfolds, dietary questionnaires) and edu on negative effects of obesity Visit 2= dietary guidance (limited information reported) | <ul style="list-style-type: none"> Information about health consequences of obesity on mortality after transplant | Phys | NI | 2x visits over 6 months | NA | NA | NA |
| Sharif 2008 [16] | Combine d | <ul style="list-style-type: none"> Lifestyle edu Multiple components | <ul style="list-style-type: none"> Self-monitoring (diaries) | RD | 6 months | RD= NI sessions | NI | AT=walking, jogging, swimming | AT 120 minutes / |

| | | | | | | | | | |
|-------------------------|----------|--|--|---------------|----------------------------------|----------------------------------|--|-------------|------|
| | | <ul style="list-style-type: none"> • Healthy eating edu based on Diabetes UK guidelines • Graded ET • Food and exercise diaries • Mode: NI, assume F2F | | | | ET=2hrs per week | | | week |
| Teplan 2014 [17] | Exercise | <ul style="list-style-type: none"> • Cycling on stationary bikes • Mode: F2F | <ul style="list-style-type: none"> • NI | Phys | 6 months | 2-3x week (1x week unsupervised) | 60-70% difference in HR | AT | 60 |
| Lorenz 2015 [18] | PA | <ul style="list-style-type: none"> • Prior to discharge participants in Rx group given a pedometer and recording sheet for 90 days • Mode: F2F to give pedometer, steps taken unsupervised | <ul style="list-style-type: none"> • Self-monitoring behaviour (PA) | Self-directed | 90 days (≈ 2.96 months) | Daily | Advised to walk as many steps as possible in 20 mins | AT= walking | 20 |

Note. Rx indicates treatment, ET= exercise training, edu=education, F2F=face-to-face, NI= no information, RD= renal dietitian, NA= not applicable, KTx= Kidney transplant, PT= Physiotherapist, Ax=assessment, AT= aerobic training, HR= hear rate, RT= resistance training, BCT= behaviour-change techniques, HRM= heart rate max, Phys.= Physician, 1:1= one on one (individual treatment), CBT= cognitive behavioural therapy, P.Tr= Personal trainer, PA= physical activity, 1RM= one repetition maximum, UC= usual care, HRR- heart rate reserve, reps= repetitions, SMART goals= specific measurable achievable realistic and timed goals, Ex. Phys= Exercise Physiologist, PTDM= post-transplant diabetes mellitus, and APN= advanced practice nurse

Supplementary Material Figure S1. Risk-of-bias plot non-RCT's (n=6)

| Study | Risk of bias domains | | | | | | | Overall |
|--------------|----------------------|----|----|----|----|----|----|---------|
| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | |
| Leasure 1995 | | | | | | | | |
| Patel 1998 | | | | | | | | |
| Jezior 2007 | | | | | | | | |
| Sharif 2008 | | | | | | | | |
| Teplan 2014 | | | | | | | | |
| Lorenz 2015 | | | | | | | | |

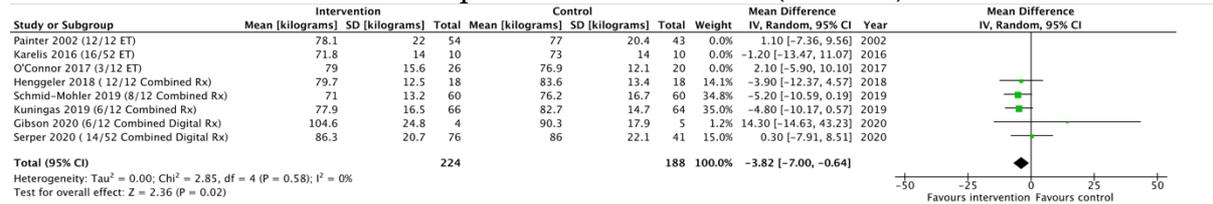
Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

Judgement
 Critical
 Serious
 Moderate
 Low
 No information

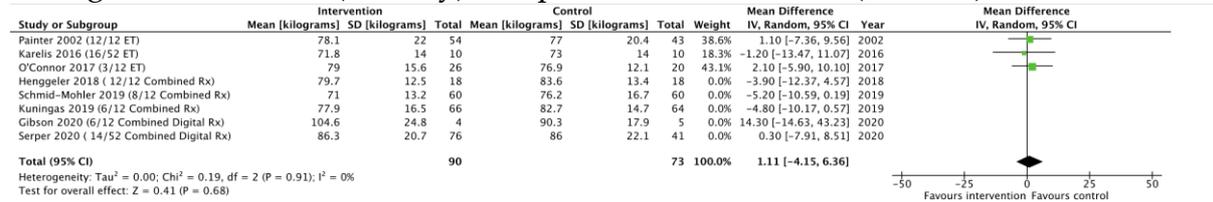
Supplementary Material Table S7. Sensitivity Analysis

To explore the relationship between the type of intervention (exercise, diet or combined) and BW and BMI, the following sensitivity analyses were performed.

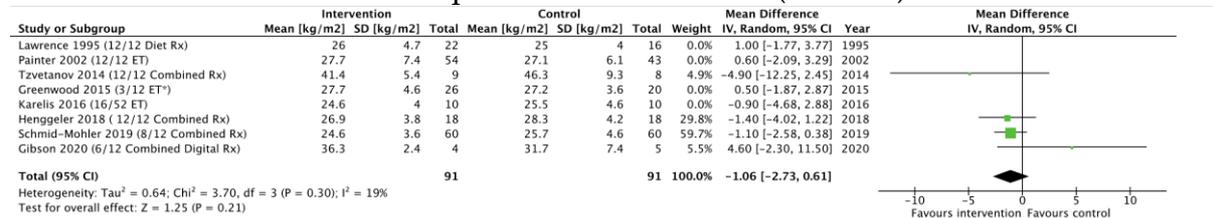
1. Combined interventions and post-intervention BW (5 RCT's)



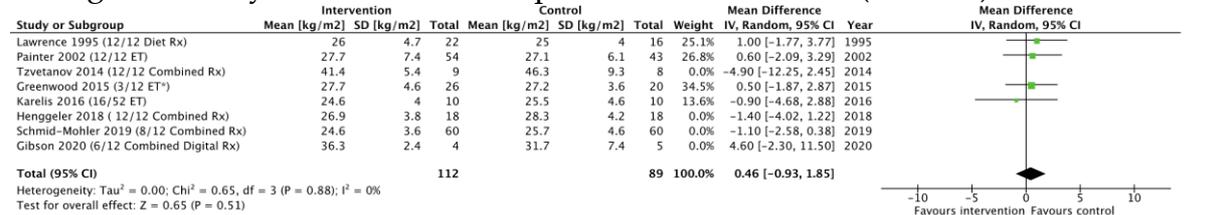
2. Single interventions (ET only) and post-intervention BW (3 RCT's)



3. Combined interventions and post-intervention BMI (4 RCT's)



4. Single modality interventions and post-intervention BMI (4 RCT's)



Supplementary Material References

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