Meta-Analysis_Kinesiophobia_Physical-Activity

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Contents

R Markdown file set-up

Data file glimpse (not included in PDF)

Meta-analysis method

In our meta-analysis, we pooled Pearson product-moment correlations from eligible studies to examine the relationship between kinesiophobia and physical activity. When a study measured physical activity with both a questionnaire and accelerometers, the correlation included in the analysis was that of the most reliable outcome, i.e., the accelerometer-based outcome. Correlations were pooled using the generic inverse pooling method via the 'metacor' function in the R 'meta' package (Schwarzer, 2023). This function automatically performs a necessary Fisher's z-transformation on the original, untransformed correlations prior to pooling. The 'metacor' function also reconverts the pooled association back to its original form for ease of interpretation.

We anticipated considerable between-study heterogeneity, and therefore used a random-effects model to pool correlations. The restricted maximum likelihood (RML) estimator (Viechtbauer, 2005) was used to calculate the heterogeneity variance Tau2. In addition to Tau2, to quantify between-study heterogeneity, we also reported the I2 statistic, which provides the percentage of variability in the correlations that is not caused by sampling error (Higgins and Thompson, 2002). The I2 statistic was interpreted as follows: 0-40%, may not be important; 30-60%, may represent moderate heterogeneity; 50-90%, may represent substantial heterogeneity; and 75-100%, may represent considerable heterogeneity. To reduce the risk of false positives, we used a Knapp-Hartung adjustment (Knapp and Hartung, 2003) to calculate the confidence interval around the pooled association. We also report the prediction interval, which provides a range within which we can expect the associations of future studies to fall based on the current evidence. The pooled correlation was interpreted using Cohen's conventions (Cohen, 1988): r -0.10, small negative correlation; r -0.30, moderate negative correlation; r -0.50, large negative correlation. Egger's regression test of funnel plot asymmetry (Egger et al., 1997) and a p-curve analysis (Simonsohn et al., 2014) were conducted to assess potential publication bias in our meta-analysis. The Rücker's limit meta-analysis method (Schwazer et al., 2023), which explicitly includes the heterogeneity variance in the model, was used to compute bias-corrected estimate of the true effect size.

We conducted subgroup analyses to examine the differences in correlations between studies including participants with different health conditions and using different types of physical activity measures (i.e., device-based versus self-reported), physical activity measurement instruments (i.e., type of questionnaires, type of devices), physical activity outcomes, and kinesiophobia measures. In addition, we used meta-regressions to examine if the average age of participants or the proportion of women in a study predicted the reported correlation between kinesiophobia and physical activity. A secondary meta-analysis was conducted using the same approach, but based on Spearman's rho values, to further test the relationship between kinesiophobia and device-based physical activity.

All analyses were performed in RStudio integrated development environment (IDE) (2023.06.1+524, "Mountain Hydrangea" release) for R software environment (R Core Team, 2023) using the 'meta' (Schwarzer, 2023), 'metasens' (Schwarzer et al., 2023), and 'metafor' (Vietchbauer, 2010, 2023) R packages.

Meta-analysis: primary analysis

```
m.cor <- metacor(cor = cor,
                 n = n,
                 studlab = author,
                 data = Kinphob_r,
                 fixed = FALSE,
                 random = TRUE,
                 method.tau = "REML",
```

```r
                 hakn = TRUE,
                 title = "Kinesiophobia and physical activity behaviour")
summary(m.cor)
```

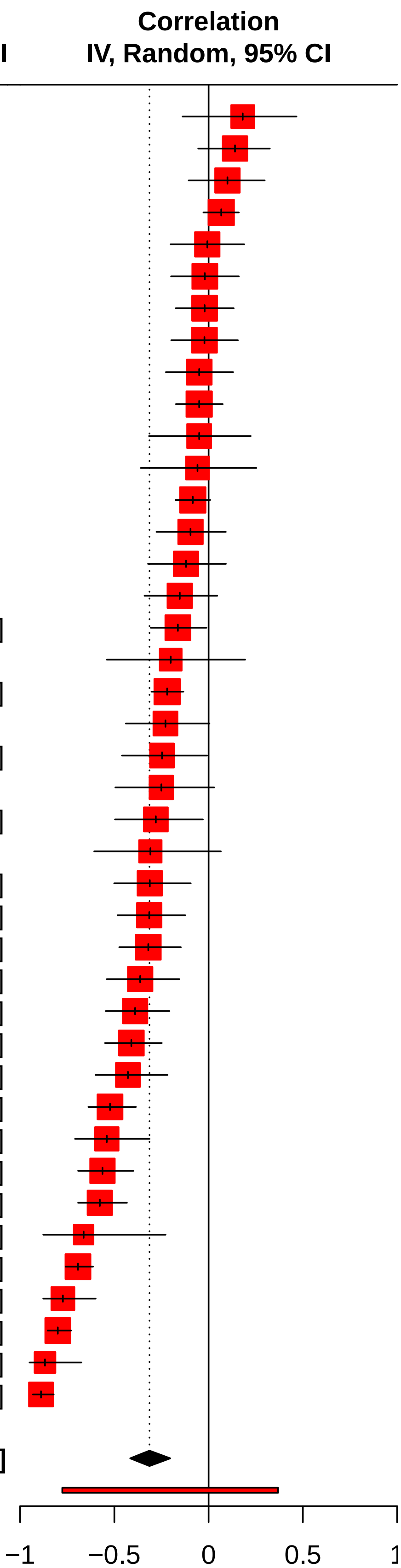
```
## Review:     Kinesiophobia and physical activity behaviour
##
##                             COR            95%-CI %W(random)
## Altug, 2016             -0.0960 [-0.2766;  0.0912]       2.5
## Assadourian, 2020       -0.0220 [-0.1983;  0.1556]       2.6
## Aydemir, 2022           -0.7730 [-0.8773; -0.5990]       2.2
## Aykut Selcuk, 2020a     -0.2470 [-0.4599; -0.0072]       2.4
## Aykut Selcuk, 2020b     -0.3090 [-0.6068;  0.0648]       2.1
## Baday-Keskin, 2022      -0.1200 [-0.3214;  0.0917]       2.5
## Baez, 2020               0.1810 [-0.1383;  0.4662]       2.2
## Bahar Ozdemir, 2021     -0.0070 [-0.2022;  0.1887]       2.5
## Baykal Sahin, 2021      -0.3150 [-0.4832; -0.1244]       2.5
## Bernard, 2015           -0.0500 [-0.2265;  0.1297]       2.6
## Carvalho, 2017          -0.0200 [-0.1993;  0.1606]       2.6
## Coronado, 2021          -0.0500 [-0.1735;  0.0750]       2.7
## Dabek, 2020a            -0.4280 [-0.6002; -0.2179]       2.4
## Dabek, 2020b            -0.8680 [-0.9499; -0.6744]       1.8
## Dabek, 2020c            -0.5230 [-0.6378; -0.3855]       2.6
## Dabek, 2020d            -0.4100 [-0.5494; -0.2483]       2.6
## Dabek, 2020e            -0.2010 [-0.5398;  0.1938]       2.0
## Dabek, 2020f            -0.5630 [-0.6923; -0.3987]       2.5
## Dabek, 2020g            -0.6630 [-0.8773; -0.2283]       1.6
## Demirbuken, 2016        -0.1530 [-0.3401;  0.0458]       2.5
## Helmus, 2012            -0.0500 [-0.3160;  0.2233]       2.4
## Kilinc, 2019            -0.6930 [-0.7588; -0.6132]       2.6
## Knapik 2019             -0.8000 [-0.8536; -0.7297]       2.6
## Koho, 2011               0.1000 [-0.1059;  0.2976]       2.5
## Luthi, 2022              0.0670 [-0.0274;  0.1602]       2.7
## Marques-Sule, 2022      -0.3200 [-0.4740; -0.1470]       2.6
## Miller, 2018            -0.5400 [-0.7085; -0.3133]       2.3
## Minetama, 2022          -0.2290 [-0.4389;  0.0045]       2.4
## Navarro-Ledesma, 2022 -0.0590 [-0.3601;  0.2532]       2.2
## Norte, 2019             -0.3120 [-0.5010; -0.0946]       2.5
## Ozer, 2022              -0.8890 [-0.9319; -0.8217]       2.4
## Pedler, 2018             0.1400 [-0.0550;  0.3247]       2.5
## Priore, 2020            -0.2510 [-0.4948;  0.0294]       2.3
## Roaldsen, 2009          -0.3900 [-0.5462; -0.2076]       2.5
## Saulicz, 2016           -0.5770 [-0.6921; -0.4332]       2.5
## Sertel, 2021            -0.0210 [-0.1742;  0.1332]       2.6
## Spaderna, 2020          -0.2800 [-0.4968; -0.0303]       2.4
## Strandberg, 2022        -0.0840 [-0.1750;  0.0084]       2.7
## Uritani, 2020           -0.1630 [-0.3073; -0.0114]       2.6
## Wasiuk-Zowada, 2022     -0.3630 [-0.5397; -0.1557]       2.5
## Zelle, 2016             -0.2200 [-0.3029; -0.1338]       2.7
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                          COR            95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
```

```
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

Our meta-analysis of 41 studies (n = 4,848) revealed a statistically significant moderate negative correlation between kinesiophobia and physical activity (r = -0.31; 95% confidence interval [95% CI]: -0.42 to -0.20; $p < 0.0001$). However, we observed considerable between-study statistical heterogeneity (Tau2 = 0.12, 95% CI: 0.08 to 0.22; I2 = 91.8%, 95% CI: 89.9 to 93.5%), and the prediction interval ranged from r = -0.78 to 0.37, indicating that a moderate positive correlation cannot be ruled out for future studies.

```r
forest.meta(m.cor,
            layout = "Revman5",
            sortvar = -TE,
            prediction = TRUE,
            print.tau2 = FALSE,
            leftlabs = c("Author", "n"),
            xlim=c(-1.0,1.0),
            fs.hetstat = 10,
            addrows.below.overall = 2)
```

Study	Total	Weight	Correlation IV, Random, 95% CI
Baez, 2020	40	2.2%	0.18 [−0.14; 0.47]
Pedler, 2018	103	2.5%	0.14 [−0.06; 0.32]
Koho, 2011	93	2.5%	0.10 [−0.11; 0.30]
Luthi, 2022	433	2.7%	0.07 [−0.03; 0.16]
Bahar Ozdemir, 2021	101	2.5%	−0.01 [−0.20; 0.19]
Carvalho, 2017	119	2.6%	−0.02 [−0.20; 0.16]
Sertel, 2021	163	2.6%	−0.02 [−0.17; 0.13]
Assadourian, 2020	123	2.6%	−0.02 [−0.20; 0.16]
Bernard, 2015	121	2.6%	−0.05 [−0.23; 0.13]
Coronado, 2021	248	2.7%	−0.05 [−0.17; 0.08]
Helmus, 2012	53	2.4%	−0.05 [−0.32; 0.22]
Navarro−Ledesma, 2022	41	2.2%	−0.06 [−0.36; 0.25]
Strandberg, 2022	451	2.7%	−0.08 [−0.17; 0.01]
Altug, 2016	112	2.5%	−0.10 [−0.28; 0.09]
Baday−Keskin, 2022	88	2.5%	−0.12 [−0.32; 0.09]
Demirbuken, 2016	99	2.5%	−0.15 [−0.34; 0.05]
Uritani, 2020	167	2.6%	−0.16 [−0.31; −0.01]
Dabek, 2020e	27	2.0%	−0.20 [−0.54; 0.19]
Zelle, 2016	487	2.7%	−0.22 [−0.30; −0.13]
Minetama, 2022	71	2.4%	−0.23 [−0.44; 0.00]
Aykut Selcuk, 2020a	67	2.4%	−0.25 [−0.46; −0.01]
Priore, 2020	50	2.3%	−0.25 [−0.49; 0.03]
Spaderna, 2020	61	2.4%	−0.28 [−0.50; −0.03]
Aykut Selcuk, 2020b	29	2.1%	−0.31 [−0.61; 0.06]
Norte, 2019	77	2.5%	−0.31 [−0.50; −0.09]
Baykal Sahin, 2021	98	2.5%	−0.32 [−0.48; −0.12]
Marques−Sule, 2022	117	2.6%	−0.32 [−0.47; −0.15]
Wasiuk−Zowada, 2022	80	2.5%	−0.36 [−0.54; −0.16]
Roaldsen, 2009	98	2.5%	−0.39 [−0.55; −0.21]
Dabek, 2020d	119	2.6%	−0.41 [−0.55; −0.25]
Dabek, 2020a	72	2.4%	−0.43 [−0.60; −0.22]
Dabek, 2020c	130	2.6%	−0.52 [−0.64; −0.39]
Miller, 2018	52	2.3%	−0.54 [−0.71; −0.31]
Dabek, 2020f	86	2.5%	−0.56 [−0.69; −0.40]
Saulicz, 2016	105	2.5%	−0.58 [−0.69; −0.43]
Dabek, 2020g	15	1.6%	−0.66 [−0.88; −0.23]
Kilinc, 2019	200	2.6%	−0.69 [−0.76; −0.61]
Aydemir, 2022	37	2.2%	−0.77 [−0.88; −0.60]
Knapik 2019	135	2.6%	−0.80 [−0.85; −0.73]
Dabek, 2020b	18	1.8%	−0.87 [−0.95; −0.67]
Ozer, 2022	62	2.4%	−0.89 [−0.93; −0.82]
Total (95% CI)	**4848**	**100.0%**	**−0.31 [−0.42; −0.20]**
Prediction interval			**[−0.78; 0.37]**



Heterogeneity: $Tau^2 = 0.1204$; $Chi^2 = 490.59$, df = 40 ($P < 0.01$); $I^2 = 92\%$

```r
png(file = "Main analysis forestplot.png",
    width = 2800, height = 3800, res = 300)

forest.meta(m.cor,
            layout = "Revman5",
            sortvar = -TE,
            prediction = TRUE,
            print.tau2 = FALSE,
            leftlabs = c("Author", "n"),
            xlim=c(-1.0,1.0),
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Secondary analysis based on Spearman's rho values

```r
Kinphob_rho <- data.frame(author <- c("Carvalho, 2017", "Yuksel Karsli, 2019a",
                                      "Yuksel Karsli, 2019b", "Ohlman, 2018",
                                      "Verbunt, 2005"),
                          cor <- c("-0.15", "-0.158", "0.013", "-0.29", "0.06"),
                          n <- c("119", "34", "33", "52", "123"))

Kinphob_rho$cor <- as.numeric(Kinphob_rho$cor)
Kinphob_rho$n <- as.numeric(Kinphob_rho$n)
```

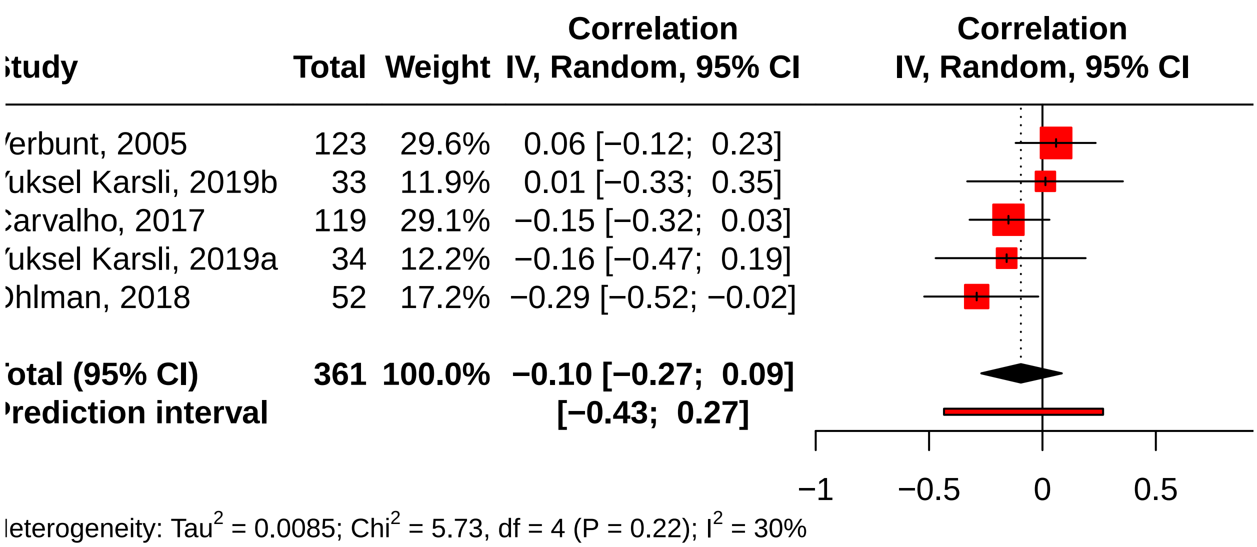
```r
m.cor.rho <- metacor(cor = cor,
                 n = n,
                 studlab = author,
                 data = Kinphob_rho,
                 fixed = FALSE,
                 random = TRUE,
                 method.tau = "REML",
                 hakn = TRUE)
summary(m.cor.rho)
```

```
##                          COR              95%-CI %W(random)
## Carvalho, 2017       -0.1500 [-0.3213;  0.0308]       29.1
## Yuksel Karsli, 2019a -0.1580 [-0.4710;  0.1903]       12.2
## Yuksel Karsli, 2019b  0.0130 [-0.3318;  0.3547]       11.9
## Ohlman, 2018         -0.2900 [-0.5216; -0.0186]       17.2
## Verbunt, 2005         0.0600 [-0.1183;  0.2345]       29.6
##
## Number of studies: k = 5
## Number of observations: o = 361
##
##                          COR             95%-CI     t p-value
## Random effects model -0.0952 [-0.2700; 0.0856] -1.46  0.2174
##
## Quantifying heterogeneity:
```

```
##  tau^2 = 0.0085 [0.0000; 0.1545]; tau = 0.0922 [0.0000; 0.3931]
##  I^2 = 30.2% [0.0%; 73.1%]; H = 1.20 [1.00; 1.93]
##
## Test of heterogeneity:
##     Q d.f. p-value
##  5.73    4  0.2205
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 4)
## - Fisher's z transformation of correlations
```

Results of the secondary meta-analysis based on Spearman rho values (k = 5, n = 361) showed no statistical evidence of an association between kinesiophobia and accelerometer-based measures of physical activity (r = -0.10; 95% CI: -0.27 to 0.09; I2 = 30.2%; p = 0.217).

```r
forest.meta(m.cor.rho,
            layout = "Revman5",
            sortvar = -TE,
            prediction = TRUE,
            print.tau2 = FALSE,
            leftlabs = c("Author", "n"),
            xlim=c(-1.0,1.0),
            fs.hetstat = 10,
            addrows.below.overall = 2)
```




```r
png(file = "Rho analysis forestplot.png",
    width = 2100, height = 1000, res = 300)

forest.meta(m.cor.rho,
            layout = "Revman5",
            sortvar = -TE,
            prediction = TRUE,
            print.tau2 = FALSE,
            leftlabs = c("Author", "n"),
            xlim=c(-1.0,1.0),
```

```r
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Meta-analysis: subgroup analyses

Subgroup analysis by health status

```r
Kinphob_r$Health_status <- as.factor(Kinphob_r$Health_status)

Health_subg <- update.meta(m.cor,
            subgroup = Health_status,
            tau.common = TRUE)
Health_subg
```

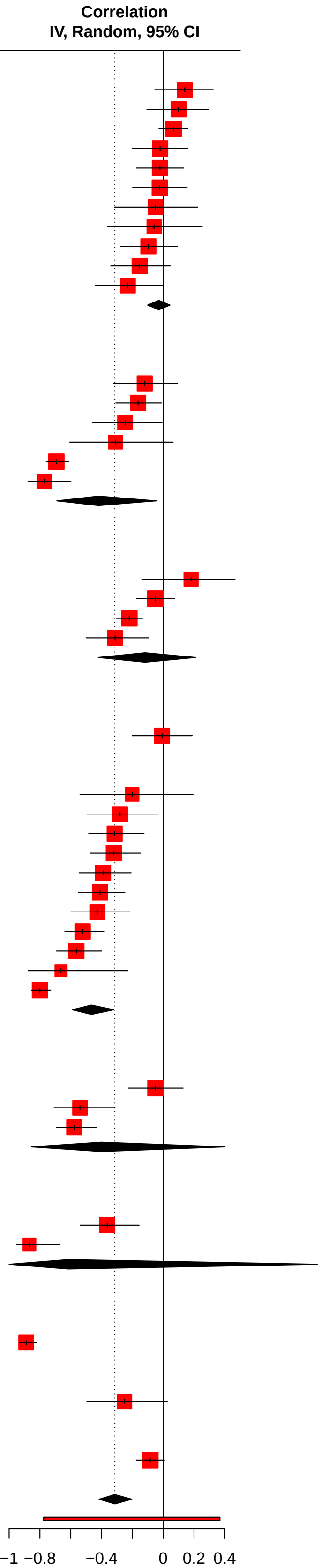
```
## Review:     Kinesiophobia and physical activity behaviour
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                           COR             95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Quantifying residual heterogeneity:
##  tau^2 = 0.0542; tau = 0.2328; I^2 = 83.6% [77.7%; 87.9%]; H = 2.47 [2.12; 2.87]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Results for subgroups (random effects model):
##                                           k     COR             95%-CI  tau^2
## Health_status = Chronic pain             11 -0.0284 [-0.1010;  0.0445] 0.0542
## Health_status = Arthritis                 6 -0.4195 [-0.6906; -0.0450] 0.0542
## Health_status = Surgery                   4 -0.1179 [-0.4215;  0.2094] 0.0542
## Health_status = Young adults              1 -0.0070 [-0.4656;  0.4545] 0.0542
## Health_status = Cardiovascular condition  11 -0.4661 [-0.5908; -0.3197] 0.0542
## Health_status = Older age                 3 -0.4022 [-0.8558;  0.4011] 0.0542
## Health_status = Neurological condition    2 -0.6156 [-1.0000;  0.9999] 0.0542
## Health_status = Pulmonary condition       1 -0.8890 [-0.9595; -0.7135] 0.0542
## Health_status = Acute_pain                1 -0.2510 [-0.6612;  0.2747] 0.0542
## Health_status = Cancer                    1 -0.0840 [-0.5004;  0.3639] 0.0542
##                                            tau     Q   I^2
## Health_status = Chronic pain            0.2328 12.25 18.3%
## Health_status = Arthritis               0.2328 68.88 92.7%
```

```
## Health_status = Surgery                  0.2328 11.22 73.3%
## Health_status = Young adults             0.2328  0.00    --
## Health_status = Cardiovascular condition 0.2328 61.93 83.9%
## Health_status = Older age                0.2328 23.19 91.4%
## Health_status = Neurological condition   0.2328 11.20 91.1%
## Health_status = Pulmonary condition      0.2328  0.00    --
## Health_status = Acute_pain               0.2328  0.00    --
## Health_status = Cancer                   0.2328  0.00    --
##
## Test for subgroup differences (random effects model):
##                     Q d.f.  p-value
## Between groups  64.55    9 < 0.0001
## Within groups  188.67   31 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
##   (assuming common tau^2 in subgroups)
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

The test of subgroup differences between health status measures was possible between studies comprising people with chronic pain (k = 11), cardiovascular disease (k = 11), arthritis (k = 6), and neurological conditions (k = 2), people who had received surgery (k = 4), and older adults (k = 3). We found statistical differences between these studies ($p < 0.0001$). The relationship between kinesiophobia and physical activity was statistically significant only in studies that included participants with cardiovascular disease (r = -0.47; 95% CI: -0.59 to -0.32) and arthritis (r = -0.42; 95% CI: -0.69 to -0.05). The effect of arthritis remained non-significant when focusing on osteoarthritis (k = 5) (r = -0.48; 95% CI: -0.76 to -0.35). Statistical heterogeneity was higher in the studies comprising people with arthritis (I2 = 92.7%) than the studies comprising people with cardiovascular disease (I2 = 83.9%).

```r
forest.meta(Health_subg,
            layout = "RevMan5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)
```

Study or Subgroup	Total	Weight	Correlation IV, Random, 95% CI
Health_status = Chronic pain			
Pedler, 2018	103	2.5%	0.14 [−0.06; 0.32]
Koho, 2011	93	2.5%	0.10 [−0.11; 0.30]
Luthi, 2022	433	2.7%	0.07 [−0.03; 0.16]
Carvalho, 2017	119	2.6%	−0.02 [−0.20; 0.16]
Sertel, 2021	163	2.6%	−0.02 [−0.17; 0.13]
Assadourian, 2020	123	2.6%	−0.02 [−0.20; 0.16]
Helmus, 2012	53	2.4%	−0.05 [−0.32; 0.22]
Navarro−Ledesma, 2022	41	2.2%	−0.06 [−0.36; 0.25]
Altug, 2016	112	2.5%	−0.10 [−0.28; 0.09]
Demirbuken, 2016	99	2.5%	−0.15 [−0.34; 0.05]
Minetama, 2022	71	2.4%	−0.23 [−0.44; 0.00]
Total (95% CI)	1410	27.6%	−0.03 [−0.10; 0.04]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 12.25, df = 10 (P = 0.27); I^2 = 18%			
Health_status = Arthritis			
Baday−Keskin, 2022	88	2.5%	−0.12 [−0.32; 0.09]
Uritani, 2020	167	2.6%	−0.16 [−0.31; −0.01]
Aykut Selcuk, 2020a	67	2.4%	−0.25 [−0.46; −0.01]
Aykut Selcuk, 2020b	29	2.1%	−0.31 [−0.61; 0.06]
Kilinc, 2019	200	2.6%	−0.69 [−0.76; −0.61]
Aydemir, 2022	37	2.2%	−0.77 [−0.88; −0.60]
Total (95% CI)	588	14.4%	−0.42 [−0.69; −0.04]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 68.88, df = 5 (P < 0.01); I^2 = 93%			
Health_status = Surgery			
Baez, 2020	40	2.2%	0.18 [−0.14; 0.47]
Coronado, 2021	248	2.7%	−0.05 [−0.17; 0.08]
Zelle, 2016	487	2.7%	−0.22 [−0.30; −0.13]
Norte, 2019	77	2.5%	−0.31 [−0.50; −0.09]
Total (95% CI)	852	10.1%	−0.12 [−0.42; 0.21]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 11.22, df = 3 (P = 0.01); I^2 = 73%			
Health_status = Young adults			
Bahar Ozdemir, 2021	101	2.5%	−0.01 [−0.20; 0.19]
Health_status = Cardiovascular condition			
Dabek, 2020e	27	2.0%	−0.20 [−0.54; 0.19]
Spaderna, 2020	61	2.4%	−0.28 [−0.50; −0.03]
Baykal Sahin, 2021	98	2.5%	−0.32 [−0.48; −0.12]
Marques−Sule, 2022	117	2.6%	−0.32 [−0.47; −0.15]
Roaldsen, 2009	98	2.5%	−0.39 [−0.55; −0.21]
Dabek, 2020d	119	2.6%	−0.41 [−0.55; −0.25]
Dabek, 2020a	72	2.4%	−0.43 [−0.60; −0.22]
Dabek, 2020c	130	2.6%	−0.52 [−0.64; −0.39]
Dabek, 2020f	86	2.5%	−0.56 [−0.69; −0.40]
Dabek, 2020g	15	1.6%	−0.66 [−0.88; −0.23]
Knapik 2019	135	2.6%	−0.80 [−0.85; −0.73]
Total (95% CI)	958	26.3%	−0.47 [−0.59; −0.32]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 61.93, df = 10 (P < 0.01); I^2 = 84%			
Health_status = Older age			
Bernard, 2015	121	2.6%	−0.05 [−0.23; 0.13]
Miller, 2018	52	2.3%	−0.54 [−0.71; −0.31]
Saulicz, 2016	105	2.5%	−0.58 [−0.69; −0.43]
Total (95% CI)	278	7.4%	−0.40 [−0.86; 0.40]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 23.19, df = 2 (P < 0.01); I^2 = 91%			
Health_status = Neurological condition			
Wasiuk−Zowada, 2022	80	2.5%	−0.36 [−0.54; −0.16]
Dabek, 2020b	18	1.8%	−0.87 [−0.95; −0.67]
Total (95% CI)	98	4.2%	−0.62 [−1.00; 1.00]
Heterogeneity: Tau^2 = 0.0542; Chi^2 = 11.2, df = 1 (P < 0.01); I^2 = 91%			
Health_status = Pulmonary condition			
Ozer, 2022	62	2.4%	−0.89 [−0.93; −0.82]
Health_status = Acute_pain			
Priore, 2020	50	2.3%	−0.25 [−0.49; 0.03]
Health_status = Cancer			
Strandberg, 2022	451	2.7%	−0.08 [−0.17; 0.01]
Total (95% CI)	**4848**	**100.0%**	**−0.31 [−0.42; −0.20]**
Prediction interval			**[−0.78; 0.37]**



Heterogeneity: Tau^2 = 0.1204; Chi^2 = 490.59, df = 40 (P < 0.01); I^2 = 92%
Residual heterogeneity: Tau^2 = 0.0542; Chi^2 = 188.67, df = 31 (P < 0.01); I^2 = 84%
Test for subgroup differences: Chi^2 = 64.55, df = 9 (P < 0.01)

```r
png(file = "Health condition forestplot.png",
    width = 2800, height = 5600, res = 300)

forest.meta(Health_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Subgroup analysis by physical activity measure: device vs self-report

```r
Kinphob_r$PA_objectivity <- as.factor(Kinphob_r$PA_objectivity)

PAobj_subg <- update.meta(m.cor,
            subgroup = PA_objectivity,
            tau.common = TRUE)
PAobj_subg
```

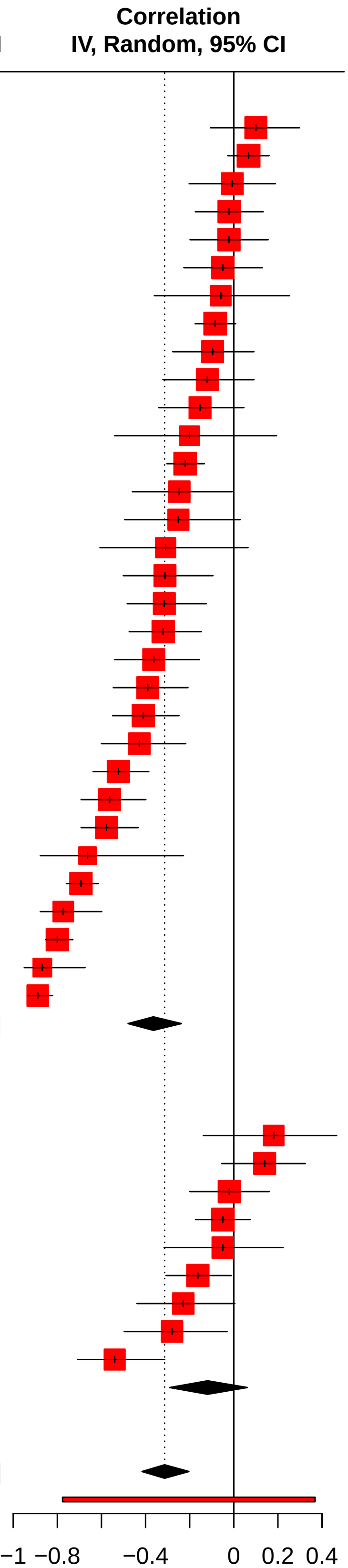
```
## Review:     Kinesiophobia and physical activity behaviour
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                             COR              95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Quantifying residual heterogeneity:
##  tau^2 = 0.1119; tau = 0.3345; I^2 = 91.6% [89.5%; 93.3%]; H = 3.45 [3.09; 3.86]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Results for subgroups (random effects model):
##                                           k     COR              95%-CI  tau^2
## PA_objectivity = Self-reported measure  32 -0.3645 [-0.4792; -0.2375] 0.1119
## PA_objectivity = Device-based measure    9 -0.1186 [-0.2906;  0.0607] 0.1119
##                                            tau      Q   I^2
## PA_objectivity = Self-reported measure 0.3345 438.00 92.9%
## PA_objectivity = Device-based measure  0.3345  26.62 69.9%
##
## Test for subgroup differences (random effects model):
```

```
##                     Q d.f.  p-value
## Between groups   6.40    1   0.0114
## Within groups  464.62   39 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
##   (assuming common tau^2 in subgroups)
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

The test of subgroup differences between self-reported (k = 32) and device-based (k = 9) measures of physical activity showed a statistical difference between these groups (p = 0.011), with only the self-reported measures showing a statistical correlation (r = -0.36; 95% CI: -0.48 to -0.24). However, we observed considerable between-study statistical heterogeneity (I2 = 92.9%).

```r
forest.meta(PAobj_subg,
            layout = "RevMan5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)
```

Study or Subgroup	Total	Weight	Correlation IV, Random, 95% CI
PA_objectivity = Self−reported measure			
Koho, 2011	93	2.5%	0.10 [−0.11; 0.30]
Luthi, 2022	433	2.7%	0.07 [−0.03; 0.16]
Bahar Ozdemir, 2021	101	2.5%	−0.01 [−0.20; 0.19]
Sertel, 2021	163	2.6%	−0.02 [−0.17; 0.13]
Assadourian, 2020	123	2.6%	−0.02 [−0.20; 0.16]
Bernard, 2015	121	2.6%	−0.05 [−0.23; 0.13]
Navarro−Ledesma, 2022	41	2.2%	−0.06 [−0.36; 0.25]
Strandberg, 2022	451	2.7%	−0.08 [−0.17; 0.01]
Altug, 2016	112	2.5%	−0.10 [−0.28; 0.09]
Baday−Keskin, 2022	88	2.5%	−0.12 [−0.32; 0.09]
Demirbuken, 2016	99	2.5%	−0.15 [−0.34; 0.05]
Dabek, 2020e	27	2.0%	−0.20 [−0.54; 0.19]
Zelle, 2016	487	2.7%	−0.22 [−0.30; −0.13]
Aykut Selcuk, 2020a	67	2.4%	−0.25 [−0.46; −0.01]
Priore, 2020	50	2.3%	−0.25 [−0.49; 0.03]
Aykut Selcuk, 2020b	29	2.1%	−0.31 [−0.61; 0.06]
Norte, 2019	77	2.5%	−0.31 [−0.50; −0.09]
Baykal Sahin, 2021	98	2.5%	−0.32 [−0.48; −0.12]
Marques−Sule, 2022	117	2.6%	−0.32 [−0.47; −0.15]
Wasiuk−Zowada, 2022	80	2.5%	−0.36 [−0.54; −0.16]
Roaldsen, 2009	98	2.5%	−0.39 [−0.55; −0.21]
Dabek, 2020d	119	2.6%	−0.41 [−0.55; −0.25]
Dabek, 2020a	72	2.4%	−0.43 [−0.60; −0.22]
Dabek, 2020c	130	2.6%	−0.52 [−0.64; −0.39]
Dabek, 2020f	86	2.5%	−0.56 [−0.69; −0.40]
Saulicz, 2016	105	2.5%	−0.58 [−0.69; −0.43]
Dabek, 2020g	15	1.6%	−0.66 [−0.88; −0.23]
Kilinc, 2019	200	2.6%	−0.69 [−0.76; −0.61]
Aydemir, 2022	37	2.2%	−0.77 [−0.88; −0.60]
Knapik 2019	135	2.6%	−0.80 [−0.85; −0.73]
Dabek, 2020b	18	1.8%	−0.87 [−0.95; −0.67]
Ozer, 2022	62	2.4%	−0.89 [−0.93; −0.82]
Total (95% CI)	**3934**	**77.9%**	**−0.36 [−0.48; −0.24]**
Heterogeneity: $Tau^2 = 0.1119$; $Chi^2 = 438$, df = 31 ($P < 0.01$); $I^2 = 93\%$			
PA_objectivity = Device−based measure			
Baez, 2020	40	2.2%	0.18 [−0.14; 0.47]
Pedler, 2018	103	2.5%	0.14 [−0.06; 0.32]
Carvalho, 2017	119	2.6%	−0.02 [−0.20; 0.16]
Coronado, 2021	248	2.7%	−0.05 [−0.17; 0.08]
Helmus, 2012	53	2.4%	−0.05 [−0.32; 0.22]
Uritani, 2020	167	2.6%	−0.16 [−0.31; −0.01]
Minetama, 2022	71	2.4%	−0.23 [−0.44; 0.00]
Spaderna, 2020	61	2.4%	−0.28 [−0.50; −0.03]
Miller, 2018	52	2.3%	−0.54 [−0.71; −0.31]
Total (95% CI)	**914**	**22.1%**	**−0.12 [−0.29; 0.06]**
Heterogeneity: $Tau^2 = 0.1119$; $Chi^2 = 26.62$, df = 8 ($P < 0.01$); $I^2 = 70\%$			
Total (95% CI)	**4848**	**100.0%**	**−0.31 [−0.42; −0.20]**
Prediction interval			**[−0.78; 0.37]**



Heterogeneity: $Tau^2 = 0.1204$; $Chi^2 = 490.59$, df = 40 ($P < 0.01$); $I^2 = 92\%$
Residual heterogeneity: $Tau^2 = 0.1119$; $Chi^2 = 464.62$, df = 39 ($P < 0.01$); $I^2 = 92\%$
Test for subgroup differences: $Chi^2 = 6.40$, df = 1 ($P = 0.01$)

```r
png(file = "PA objectivity forestplot.png",
    width = 2800, height = 4500, res = 300)

forest.meta(PAobj_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Subgroup analysis by physical activity measurement instruments

```r
Kinphob_r$PA_measure <- as.factor(Kinphob_r$PA_measure)

PAmeas_subg <- update.meta(m.cor,
            subgroup = PA_measure,
            tau.common = TRUE)
PAmeas_subg
```

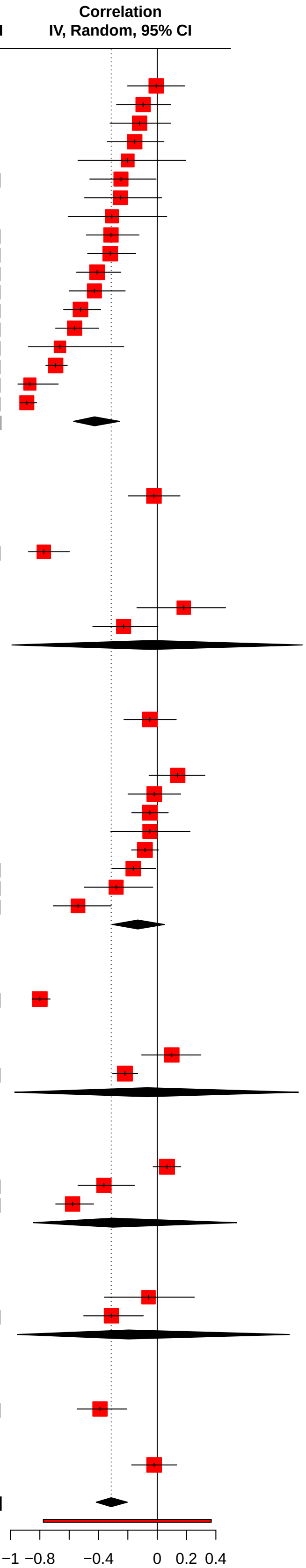
```
## Review:     Kinesiophobia and physical activity behaviour
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                          COR             95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Quantifying residual heterogeneity:
##  tau^2 = 0.0929; tau = 0.3048; I^2 = 88.4% [84.6%; 91.3%]; H = 2.94 [2.55; 3.39]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Results for subgroups (random effects model):
##                              k     COR             95%-CI  tau^2    tau      Q
## PA_measure = IPAQ           18 -0.4265 [-0.5702; -0.2575] 0.0929 0.3048 164.97
## PA_measure = Diary           1 -0.0220 [-0.5687;  0.5382] 0.0929 0.3048   0.00
## PA_measure = UCLA            1 -0.7730 [-0.9370; -0.3295] 0.0929 0.3048   0.00
## PA_measure = Pedometer       2 -0.0363 [-0.9906;  0.9891] 0.0929 0.3048   4.15
## PA_measure = Questionnaire   1 -0.0500 [-0.5876;  0.5183] 0.0929 0.3048   0.00
## PA_measure = Accelerometer   8 -0.1322 [-0.3049;  0.0488] 0.0929 0.3048  22.51
## PA_measure = PAQE            1 -0.8000 [-0.9378; -0.4441] 0.0929 0.3048   0.00
```

```
## PA_measure = MLTPAQ          2 -0.0689 [-0.9719;  0.9631] 0.0929 0.3048   7.97
## PA_measure = BHPAQ           3 -0.3033 [-0.8437;  0.5425] 0.0929 0.3048  49.74
## PA_measure = GLTEQ           2 -0.1958 [-0.9537;  0.9004] 0.0929 0.3048   1.75
## PA_measure = SGPALS          1 -0.3900 [-0.7787;  0.2151] 0.0929 0.3048   0.00
## PA_measure = PASE            1 -0.0210 [-0.5636;  0.5343] 0.0929 0.3048   0.00
##                              I^2
## PA_measure = IPAQ          89.7%
## PA_measure = Diary            --
## PA_measure = UCLA             --
## PA_measure = Pedometer     75.9%
## PA_measure = Questionnaire    --
## PA_measure = Accelerometer 68.9%
## PA_measure = PAQE             --
## PA_measure = MLTPAQ        87.4%
## PA_measure = BHPAQ         96.0%
## PA_measure = GLTEQ         42.7%
## PA_measure = SGPALS           --
## PA_measure = PASE             --
##
## Test for subgroup differences (random effects model):
##                     Q d.f.  p-value
## Between groups  23.76   11   0.0138
## Within groups  251.08   29 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
##   (assuming common tau^2 in subgroups)
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

The test of subgroup differences according to the instruments used to measure physical activity was possible between studies using the IPAQ (k = 18), BHPAQ (k = 3), MLTPAQ (k = 2), GLTEQ (k = 2), as well as accelerometers (k = 8) and pedometers (k = 2). We found statistical differences between these studies (p = 0.014). The relationship between kinesiophobia and physical activity was statistically significant only in studies that used the IPAQ (r = -0.43; 95% CI: -0.57 to -0.26). However, we observed considerable between-study statistical heterogeneity (I2 = 89.7%).

```r
forest.meta(PAmeas_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)
```

Study or Subgroup	Total	Weight	Correlation IV, Random, 95% CI
PA_measure = IPAQ			
Bahar Ozdemir, 2021	101	2.5%	−0.01 [−0.20; 0.19]
Altug, 2016	112	2.5%	−0.10 [−0.28; 0.09]
Baday−Keskin, 2022	88	2.5%	−0.12 [−0.32; 0.09]
Demirbuken, 2016	99	2.5%	−0.15 [−0.34; 0.05]
Dabek, 2020e	27	2.0%	−0.20 [−0.54; 0.19]
Aykut Selcuk, 2020a	67	2.4%	−0.25 [−0.46; −0.01]
Priore, 2020	50	2.3%	−0.25 [−0.49; 0.03]
Aykut Selcuk, 2020b	29	2.1%	−0.31 [−0.61; 0.06]
Baykal Sahin, 2021	98	2.5%	−0.32 [−0.48; −0.12]
Marques−Sule, 2022	117	2.6%	−0.32 [−0.47; −0.15]
Dabek, 2020d	119	2.6%	−0.41 [−0.55; −0.25]
Dabek, 2020a	72	2.4%	−0.43 [−0.60; −0.22]
Dabek, 2020c	130	2.6%	−0.52 [−0.64; −0.39]
Dabek, 2020f	86	2.5%	−0.56 [−0.69; −0.40]
Dabek, 2020g	15	1.6%	−0.66 [−0.88; −0.23]
Kilinc, 2019	200	2.6%	−0.69 [−0.76; −0.61]
Dabek, 2020b	18	1.8%	−0.87 [−0.95; −0.67]
Ozer, 2022	62	2.4%	−0.89 [−0.93; −0.82]
Total (95% CI)	**1490**	**42.5%**	**−0.43 [−0.57; −0.26]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 164.97$, df = 17 ($P < 0.01$); $I^2 = 90\%$			
PA_measure = Diary			
Assadourian, 2020	123	2.6%	−0.02 [−0.20; 0.16]
PA_measure = UCLA			
Aydemir, 2022	37	2.2%	−0.77 [−0.88; −0.60]
PA_measure = Pedometer			
Baez, 2020	40	2.2%	0.18 [−0.14; 0.47]
Minetama, 2022	71	2.4%	−0.23 [−0.44; 0.00]
Total (95% CI)	**111**	**4.7%**	**−0.04 [−0.99; 0.99]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 4.15$, df = 1 ($P = 0.04$); $I^2 = 76\%$			
PA_measure = Questionnaire			
Bernard, 2015	121	2.6%	−0.05 [−0.23; 0.13]
PA_measure = Accelerometer			
Pedler, 2018	103	2.5%	0.14 [−0.06; 0.32]
Carvalho, 2017	119	2.6%	−0.02 [−0.20; 0.16]
Coronado, 2021	248	2.7%	−0.05 [−0.17; 0.08]
Helmus, 2012	53	2.4%	−0.05 [−0.32; 0.22]
Strandberg, 2022	451	2.7%	−0.08 [−0.17; 0.01]
Uritani, 2020	167	2.6%	−0.16 [−0.31; −0.01]
Spaderna, 2020	61	2.4%	−0.28 [−0.50; −0.03]
Miller, 2018	52	2.3%	−0.54 [−0.71; −0.31]
Total (95% CI)	**1254**	**20.1%**	**−0.13 [−0.30; 0.05]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 22.51$, df = 7 ($P < 0.01$); $I^2 = 69\%$			
PA_measure = PAQE			
Knapik 2019	135	2.6%	−0.80 [−0.85; −0.73]
PA_measure = MLTPAQ			
Koho, 2011	93	2.5%	0.10 [−0.11; 0.30]
Zelle, 2016	487	2.7%	−0.22 [−0.30; −0.13]
Total (95% CI)	**580**	**5.2%**	**−0.07 [−0.97; 0.96]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 7.97$, df = 1 ($P < 0.01$); $I^2 = 87\%$			
PA_measure = BHPAQ			
Luthi, 2022	433	2.7%	0.07 [−0.03; 0.16]
Wasiuk−Zowada, 2022	80	2.5%	−0.36 [−0.54; −0.16]
Saulicz, 2016	105	2.5%	−0.58 [−0.69; −0.43]
Total (95% CI)	**618**	**7.7%**	**−0.30 [−0.84; 0.54]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 49.74$, df = 2 ($P < 0.01$); $I^2 = 96\%$			
PA_measure = GLTEQ			
Navarro−Ledesma, 2022	41	2.2%	−0.06 [−0.36; 0.25]
Norte, 2019	77	2.5%	−0.31 [−0.50; −0.09]
Total (95% CI)	**118**	**4.7%**	**−0.20 [−0.95; 0.90]**
Heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 1.75$, df = 1 ($P = 0.19$); $I^2 = 43\%$			
PA_measure = SGPALS			
Roaldsen, 2009	98	2.5%	−0.39 [−0.55; −0.21]
PA_measure = PASE			
Sertel, 2021	163	2.6%	−0.02 [−0.17; 0.13]
Total (95% CI)	**4848**	**100.0%**	**−0.31 [−0.42; −0.20]**
Prediction interval			**[−0.78; 0.37]**



Heterogeneity: $Tau^2 = 0.1204$; $Chi^2 = 490.59$, df = 40 ($P < 0.01$); $I^2 = 92\%$
Residual heterogeneity: $Tau^2 = 0.0929$; $Chi^2 = 251.08$, df = 29 ($P < 0.01$); $I^2 = 88\%$
Test for subgroup differences: $Chi^2 = 23.76$, df = 11 ($P = 0.01$)

```r
png(file = "Physical activity measure forestplot.png",
    width = 2800, height = 5600, res = 300)

forest.meta(PAmeas_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Subgroup analysis by physical activity outcome

```r
Kinphob_r$PA_outcome <- as.factor(Kinphob_r$PA_outcome)

PAout_subg <- update.meta(m.cor,
            subgroup = PA_outcome,
            tau.common = TRUE)
PAout_subg
```

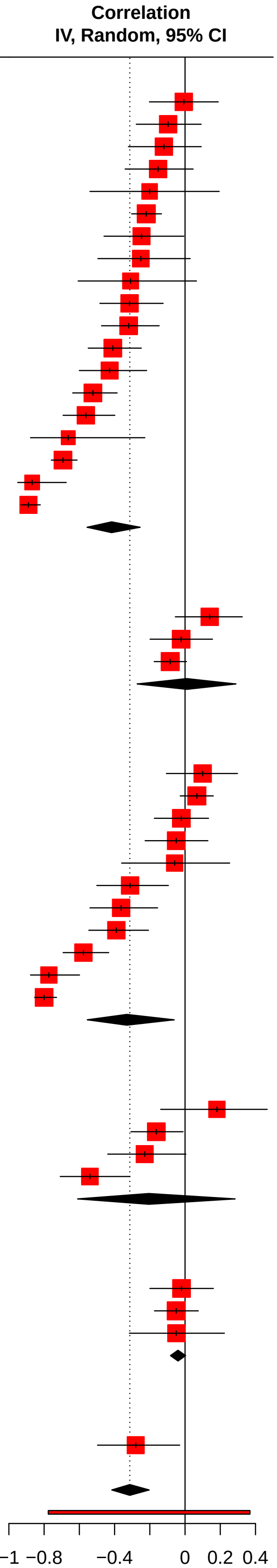
```
## Review:     Kinesiophobia and physical activity behaviour
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                             COR              95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Quantifying residual heterogeneity:
##  tau^2 = 0.1142; tau = 0.3379; I^2 = 91.4% [89.0%; 93.2%]; H = 3.40 [3.02; 3.83]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Results for subgroups (random effects model):
##                                k     COR              95%-CI  tau^2    tau      Q
## PA_outcome = MET-min/week   19 -0.4170 [-0.5562; -0.2550] 0.1142 0.3379 182.41
## PA_outcome = Active time     3  0.0094 [-0.2719;  0.2891] 0.1142 0.3379   4.19
## PA_outcome = Score          11 -0.3308 [-0.5551; -0.0616] 0.1142 0.3379 205.12
## PA_outcome = Steps/day       4 -0.2053 [-0.6099;  0.2842] 0.1142 0.3379  13.70
## PA_outcome = Counts/min      3 -0.0399 [-0.0829;  0.0034] 0.1142 0.3379   0.08
## PA_outcome = Kcal/day        1 -0.2800 [-0.7609;  0.3994] 0.1142 0.3379   0.00
##                              I^2
```

```
## PA_outcome = MET-min/week  90.1%
## PA_outcome = Active time   52.2%
## PA_outcome = Score         95.1%
## PA_outcome = Steps/day     78.1%
## PA_outcome = Counts/min     0.0%
## PA_outcome = Kcal/day         --
##
## Test for subgroup differences (random effects model):
##                      Q d.f.  p-value
## Between groups  28.90    5 < 0.0001
## Within groups  405.49   35 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
##   (assuming common tau^2 in subgroups)
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

The test of subgroup differences between physical activity outcomes was possible between studies using MET-min/week typically from the IPAQ (k = 19), a score from a questionnaire (k = 11), steps/day (k = 4), counts/min (k =3), and active time in hours per day or week (k = 3). We observed statistical differences between these studies ($p < 0.0001$), with only the studies using the MET-min/week (r = -0.42; 95% CI: -0.56 to -0.26) and score outcome (r = -0.33; 95% CI: -0.56 to -0.06) showing a statistical correlation. Heterogeneity was considerable in studies relying on these outcomes (I2 = 90.1 and 95.1%, respectively).

```r
forest.meta(PAout_subg,
            layout = "RevMan5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)
```

Study or Subgroup	Total	Weight	Correlation IV, Random, 95% CI
PA_outcome = MET−min/week			
Bahar Ozdemir, 2021	101	2.5%	−0.01 [−0.20; 0.19]
Altug, 2016	112	2.5%	−0.10 [−0.28; 0.09]
Baday−Keskin, 2022	88	2.5%	−0.12 [−0.32; 0.09]
Demirbuken, 2016	99	2.5%	−0.15 [−0.34; 0.05]
Dabek, 2020e	27	2.0%	−0.20 [−0.54; 0.19]
Zelle, 2016	487	2.7%	−0.22 [−0.30; −0.13]
Aykut Selcuk, 2020a	67	2.4%	−0.25 [−0.46; −0.01]
Priore, 2020	50	2.3%	−0.25 [−0.49; 0.03]
Aykut Selcuk, 2020b	29	2.1%	−0.31 [−0.61; 0.06]
Baykal Sahin, 2021	98	2.5%	−0.32 [−0.48; −0.12]
Marques−Sule, 2022	117	2.6%	−0.32 [−0.47; −0.15]
Dabek, 2020d	119	2.6%	−0.41 [−0.55; −0.25]
Dabek, 2020a	72	2.4%	−0.43 [−0.60; −0.22]
Dabek, 2020c	130	2.6%	−0.52 [−0.64; −0.39]
Dabek, 2020f	86	2.5%	−0.56 [−0.69; −0.40]
Dabek, 2020g	15	1.6%	−0.66 [−0.88; −0.23]
Kilinc, 2019	200	2.6%	−0.69 [−0.76; −0.61]
Dabek, 2020b	18	1.8%	−0.87 [−0.95; −0.67]
Ozer, 2022	62	2.4%	−0.89 [−0.93; −0.82]
Total (95% CI)	**1977**	**45.2%**	**−0.42 [−0.56; −0.25]**
Heterogeneity: Tau^2 = 0.1142; Chi^2 = 182.41, df = 18 (P < 0.01); I^2 = 90%			
PA_outcome = Active time			
Pedler, 2018	103	2.5%	0.14 [−0.06; 0.32]
Assadourian, 2020	123	2.6%	−0.02 [−0.20; 0.16]
Strandberg, 2022	451	2.7%	−0.08 [−0.17; 0.01]
Total (95% CI)	**677**	**7.8%**	**0.01 [−0.27; 0.29]**
Heterogeneity: Tau^2 = 0.1142; Chi^2 = 4.19, df = 2 (P = 0.12); I^2 = 52%			
PA_outcome = Score			
Koho, 2011	93	2.5%	0.10 [−0.11; 0.30]
Luthi, 2022	433	2.7%	0.07 [−0.03; 0.16]
Sertel, 2021	163	2.6%	−0.02 [−0.17; 0.13]
Bernard, 2015	121	2.6%	−0.05 [−0.23; 0.13]
Navarro−Ledesma, 2022	41	2.2%	−0.06 [−0.36; 0.25]
Norte, 2019	77	2.5%	−0.31 [−0.50; −0.09]
Wasiuk−Zowada, 2022	80	2.5%	−0.36 [−0.54; −0.16]
Roaldsen, 2009	98	2.5%	−0.39 [−0.55; −0.21]
Saulicz, 2016	105	2.5%	−0.58 [−0.69; −0.43]
Aydemir, 2022	37	2.2%	−0.77 [−0.88; −0.60]
Knapik 2019	135	2.6%	−0.80 [−0.85; −0.73]
Total (95% CI)	**1383**	**27.4%**	**−0.33 [−0.56; −0.06]**
Heterogeneity: Tau^2 = 0.1142; Chi^2 = 205.12, df = 10 (P < 0.01); I^2 = 95%			
PA_outcome = Steps/day			
Baez, 2020	40	2.2%	0.18 [−0.14; 0.47]
Uritani, 2020	167	2.6%	−0.16 [−0.31; −0.01]
Minetama, 2022	71	2.4%	−0.23 [−0.44; 0.00]
Miller, 2018	52	2.3%	−0.54 [−0.71; −0.31]
Total (95% CI)	**330**	**9.6%**	**−0.21 [−0.61; 0.28]**
Heterogeneity: Tau^2 = 0.1142; Chi^2 = 13.7, df = 3 (P < 0.01); I^2 = 78%			
PA_outcome = Counts/min			
Carvalho, 2017	119	2.6%	−0.02 [−0.20; 0.16]
Coronado, 2021	248	2.7%	−0.05 [−0.17; 0.08]
Helmus, 2012	53	2.4%	−0.05 [−0.32; 0.22]
Total (95% CI)	**420**	**7.6%**	**−0.04 [−0.08; 0.00]**
Heterogeneity: Tau^2 = 0.1142; Chi^2 = 0.08, df = 2 (P = 0.96); I^2 = 0%			
PA_outcome = Kcal/day			
Spaderna, 2020	61	2.4%	−0.28 [−0.50; −0.03]
Total (95% CI)	**4848**	**100.0%**	**−0.31 [−0.42; −0.20]**
Prediction interval			**[−0.78; 0.37]**



Heterogeneity: Tau^2 = 0.1204; Chi^2 = 490.59, df = 40 (P < 0.01); I^2 = 92%
Residual heterogeneity: Tau^2 = 0.1142; Chi^2 = 405.49, df = 35 (P < 0.01); I^2 = 91%
Test for subgroup differences: Chi^2 = 28.90, df = 5 (P < 0.01)

```r
png(file = "PA outcome forestplot.png",
    width = 2800, height = 5600, res = 300)

forest.meta(PAout_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Subgroup analysis by kinesiophobia measure

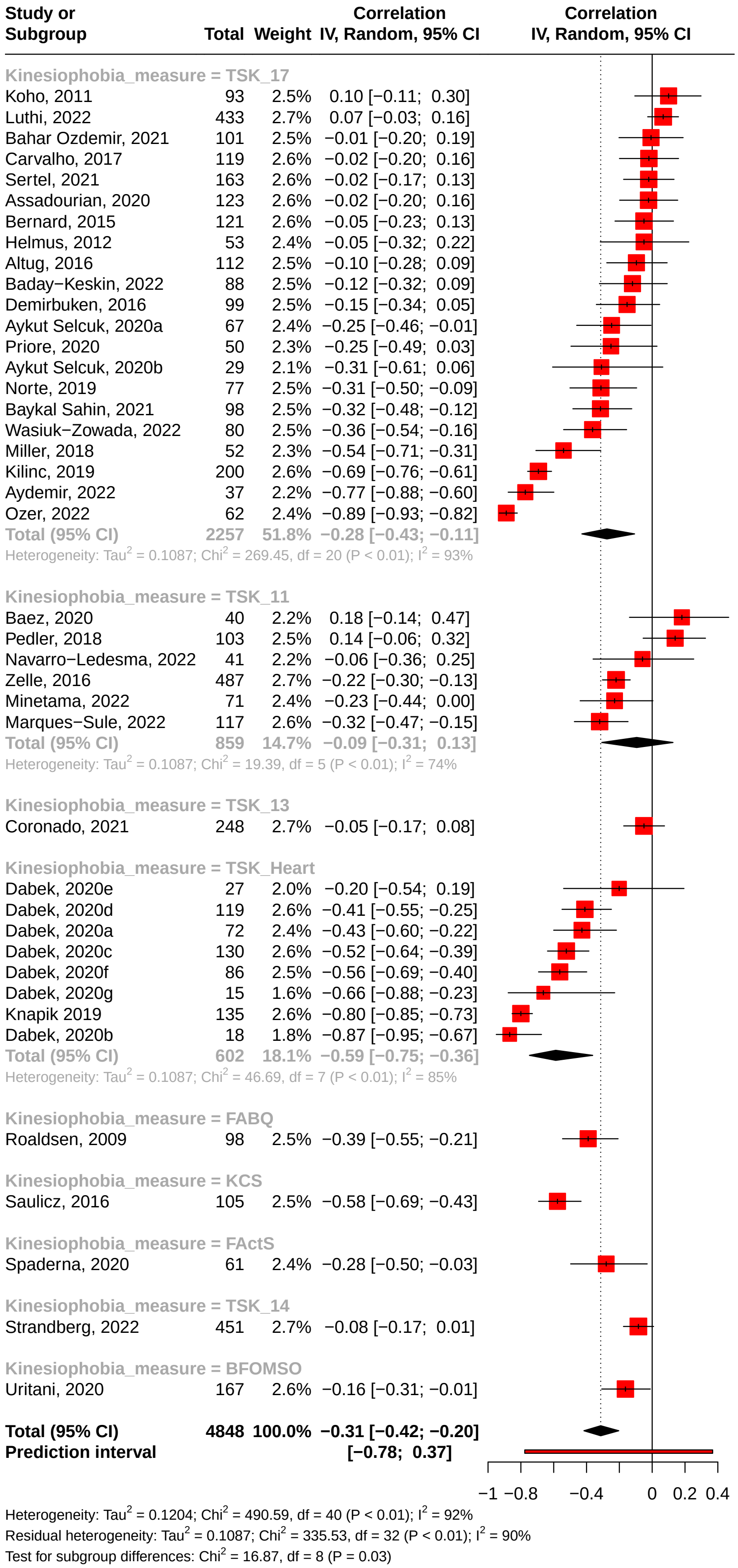
```r
Kinphob_r$Kinesiophobia_measure <- as.factor(Kinphob_r$Kinesiophobia_measure)

Kines_subg <- update.meta(m.cor,
            subgroup = Kinesiophobia_measure,
            tau.common = TRUE)
Kines_subg
```

```
## Review:     Kinesiophobia and physical activity behaviour
##
## Number of studies: k = 41
## Number of observations: o = 4848
##
##                             COR              95%-CI     t  p-value
## Random effects model -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
##  tau^2 = 0.1204 [0.0783; 0.2185]; tau = 0.3469 [0.2798; 0.4675]
##  I^2 = 91.8% [89.9%; 93.5%]; H = 3.50 [3.14; 3.91]
##
## Quantifying residual heterogeneity:
##  tau^2 = 0.1087; tau = 0.3298; I^2 = 90.5% [87.7%; 92.6%]; H = 3.24 [2.85; 3.68]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40 < 0.0001
##
## Results for subgroups (random effects model):
##                                      k     COR              95%-CI  tau^2    tau
## Kinesiophobia_measure = TSK_17      21 -0.2755 [-0.4286; -0.1070] 0.1087 0.3298
## Kinesiophobia_measure = TSK_11       6 -0.0946 [-0.3071;  0.1269] 0.1087 0.3298
## Kinesiophobia_measure = TSK_13       1 -0.0500 [-0.6097;  0.5429] 0.1087 0.3298
## Kinesiophobia_measure = TSK_Heart    8 -0.5875 [-0.7479; -0.3623] 0.1087 0.3298
## Kinesiophobia_measure = FABQ         1 -0.3900 [-0.7964;  0.2590] 0.1087 0.3298
## Kinesiophobia_measure = KCS          1 -0.5770 [-0.8699;  0.0169] 0.1087 0.3298
## Kinesiophobia_measure = FActS        1 -0.2800 [-0.7545;  0.3868] 0.1087 0.3298
```

```
## Kinesiophobia_measure = TSK_14      1 -0.0840 [-0.6274;  0.5144] 0.1087 0.3298
## Kinesiophobia_measure = BFOMSO      1 -0.1630 [-0.6798;  0.4619] 0.1087 0.3298
##                                          Q   I^2
## Kinesiophobia_measure = TSK_17    269.45 92.6%
## Kinesiophobia_measure = TSK_11     19.39 74.2%
## Kinesiophobia_measure = TSK_13      0.00    --
## Kinesiophobia_measure = TSK_Heart  46.69 85.0%
## Kinesiophobia_measure = FABQ        0.00    --
## Kinesiophobia_measure = KCS         0.00    --
## Kinesiophobia_measure = FActS       0.00    --
## Kinesiophobia_measure = TSK_14      0.00    --
## Kinesiophobia_measure = BFOMSO      0.00    --
##
## Test for subgroup differences (random effects model):
##                      Q d.f.  p-value
## Between groups   16.87    8   0.0315
## Within groups   335.53   32 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
##   (assuming common tau^2 in subgroups)
## - Q-Profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model (df = 40)
## - Fisher's z transformation of correlations
```

The test of subgroup differences between kinesiophobia measures was possible only for TSK-17 (k = 21), TSK-Heart (k = 8), and TSK-11 (k = 6), with only the former ones showing a statistical correlation. The correlation was stronger in studies using the TSK-Heart (r = -0.59; 95% CI: -0.75 to -0.36) than with the TSK-17 (r = -0.28; 95% CI: -0.43 to -0.11). Heterogeneity was lower, albeit substantial to considerable in the studies using TSK-Heart (I2 = 85.0%) than TSK-17 (I2 = 92.6%).

```r
forest.meta(Kines_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)
```



Study or Subgroup
Total
Weight
Correlation IV, Random, 95% CI
Correlation IV, Random, 95% CI
Kinesiophobia_measure = TSK_17
Koho, 2011 93 2.5% 0.10 [−0.11; 0.30]
Luthi, 2022 433 2.7% 0.07 [−0.03; 0.16]
Bahar Ozdemir, 2021 101 2.5% −0.01 [−0.20; 0.19]
Carvalho, 2017 119 2.6% −0.02 [−0.20; 0.16]
Sertel, 2021 163 2.6% −0.02 [−0.17; 0.13]
Assadourian, 2020 123 2.6% −0.02 [−0.20; 0.16]
Bernard, 2015 121 2.6% −0.05 [−0.23; 0.13]
Helmus, 2012 53 2.4% −0.05 [−0.32; 0.22]
Altug, 2016 112 2.5% −0.10 [−0.28; 0.09]
Baday−Keskin, 2022 88 2.5% −0.12 [−0.32; 0.09]
Demirbuken, 2016 99 2.5% −0.15 [−0.34; 0.05]
Aykut Selcuk, 2020a 67 2.4% −0.25 [−0.46; −0.01]
Priore, 2020 50 2.3% −0.25 [−0.49; 0.03]
Aykut Selcuk, 2020b 29 2.1% −0.31 [−0.61; 0.06]
Norte, 2019 77 2.5% −0.31 [−0.50; −0.09]
Baykal Sahin, 2021 98 2.5% −0.32 [−0.48; −0.12]
Wasiuk−Zowada, 2022 80 2.5% −0.36 [−0.54; −0.16]
Miller, 2018 52 2.3% −0.54 [−0.71; −0.31]
Kilinc, 2019 200 2.6% −0.69 [−0.76; −0.61]
Aydemir, 2022 37 2.2% −0.77 [−0.88; −0.60]
Ozer, 2022 62 2.4% −0.89 [−0.93; −0.82]
Total (95% CI) 2257 51.8% −0.28 [−0.43; −0.11]
Heterogeneity: Tau^2 = 0.1087; Chi^2 = 269.45, df = 20 (P < 0.01); I^2 = 93%
Kinesiophobia_measure = TSK_11
Baez, 2020 40 2.2% 0.18 [−0.14; 0.47]
Pedler, 2018 103 2.5% 0.14 [−0.06; 0.32]
Navarro−Ledesma, 2022 41 2.2% −0.06 [−0.36; 0.25]
Zelle, 2016 487 2.7% −0.22 [−0.30; −0.13]
Minetama, 2022 71 2.4% −0.23 [−0.44; 0.00]
Marques−Sule, 2022 117 2.6% −0.32 [−0.47; −0.15]
Total (95% CI) 859 14.7% −0.09 [−0.31; 0.13]
Heterogeneity: Tau^2 = 0.1087; Chi^2 = 19.39, df = 5 (P < 0.01); I^2 = 74%
Kinesiophobia_measure = TSK_13
Coronado, 2021 248 2.7% −0.05 [−0.17; 0.08]
Kinesiophobia_measure = TSK_Heart
Dabek, 2020e 27 2.0% −0.20 [−0.54; 0.19]
Dabek, 2020d 119 2.6% −0.41 [−0.55; −0.25]
Dabek, 2020a 72 2.4% −0.43 [−0.60; −0.22]
Dabek, 2020c 130 2.6% −0.52 [−0.64; −0.39]
Dabek, 2020f 86 2.5% −0.56 [−0.69; −0.40]
Dabek, 2020g 15 1.6% −0.66 [−0.88; −0.23]
Knapik 2019 135 2.6% −0.80 [−0.85; −0.73]
Dabek, 2020b 18 1.8% −0.87 [−0.95; −0.67]
Total (95% CI) 602 18.1% −0.59 [−0.75; −0.36]
Heterogeneity: Tau^2 = 0.1087; Chi^2 = 46.69, df = 7 (P < 0.01); I^2 = 85%
Kinesiophobia_measure = FABQ
Roaldsen, 2009 98 2.5% −0.39 [−0.55; −0.21]
Kinesiophobia_measure = KCS
Saulicz, 2016 105 2.5% −0.58 [−0.69; −0.43]
Kinesiophobia_measure = FActS
Spaderna, 2020 61 2.4% −0.28 [−0.50; −0.03]
Kinesiophobia_measure = TSK_14
Strandberg, 2022 451 2.7% −0.08 [−0.17; 0.01]
Kinesiophobia_measure = BFOMSO
Uritani, 2020 167 2.6% −0.16 [−0.31; −0.01]
Total (95% CI) 4848 100.0% −0.31 [−0.42; −0.20]
Prediction interval [−0.78; 0.37]
−1 −0.8 −0.4 0 0.2 0.4
Heterogeneity: Tau^2 = 0.1204; Chi^2 = 490.59, df = 40 (P < 0.01); I^2 = 92%
Residual heterogeneity: Tau^2 = 0.1087; Chi^2 = 335.53, df = 32 (P < 0.01); I^2 = 90%
Test for subgroup differences: Chi^2 = 16.87, df = 8 (P = 0.03)

```r
png(file = "Kinesiophobia measure forestplot.png",
    width = 2800, height = 4700, res = 300)

forest.meta(Kines_subg,
            layout = "Revman5",
            sortvar = -TE,
            common = FALSE,
            xlim = c(-1.0, 0.5),
            prediction = TRUE,
            fs.hetstat = 10,
            addrows.below.overall = 2)

dev.off()
```

```
## pdf
##   2
```

Meta-analysis: meta-regression

Meta-regression by age

```r
m.cor.reg.age <- metareg(m.cor, ~Age)
```

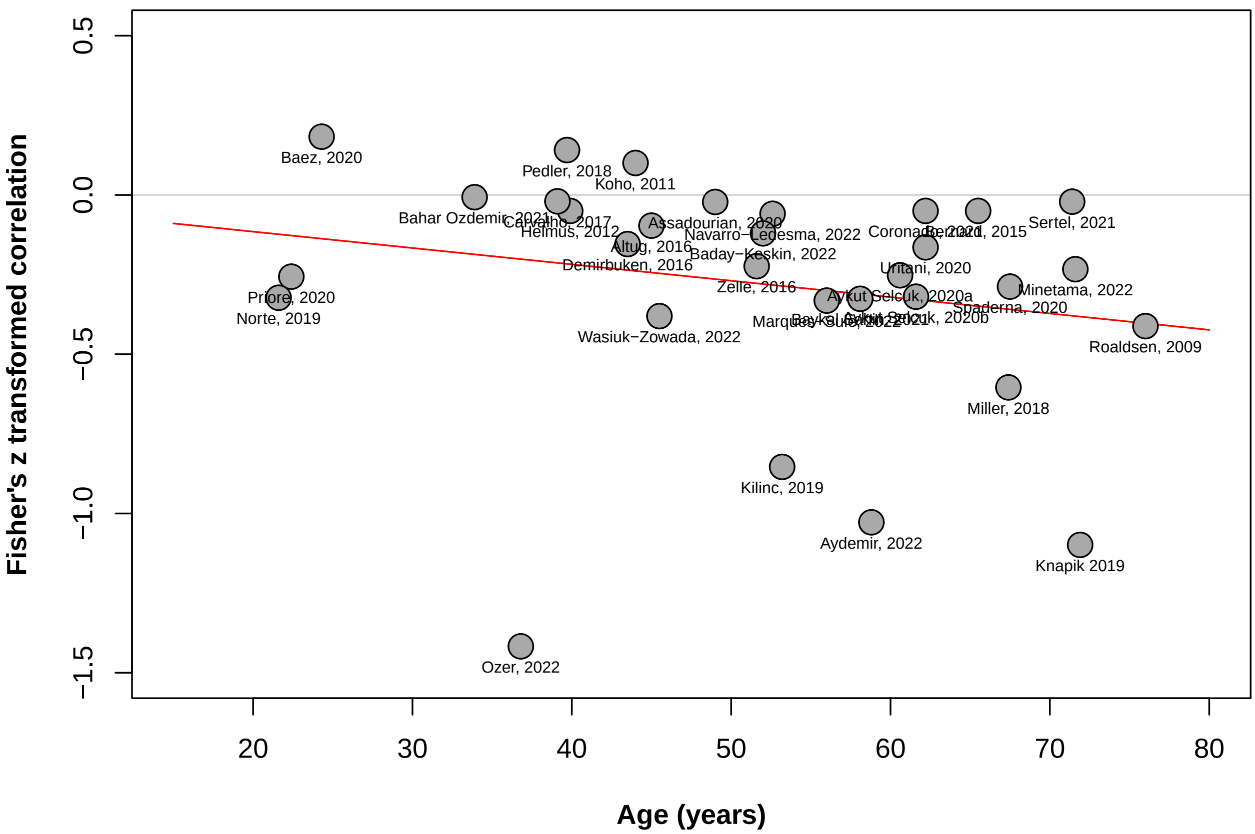
```
## Warning: 10 studies with NAs omitted from model fitting.
```

```r
m.cor.reg.age
```

```
##
## Mixed-Effects Model (k = 31; tau^2 estimator: REML)
##
## tau^2 (estimated amount of residual heterogeneity):     0.1195 (SE = 0.0348)
## tau (square root of estimated tau^2 value):             0.3456
## I^2 (residual heterogeneity / unaccounted variability): 92.58%
## H^2 (unaccounted variability / sampling variability):   13.47
## R^2 (amount of heterogeneity accounted for):            1.03%
##
## Test for Residual Heterogeneity:
## QE(df = 29) = 350.4233, p-val < .0001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 29) = 1.3045, p-val = 0.2627
##
## Model Results:
##
##          estimate      se     tval  df    pval    ci.lb   ci.ub
## intrcpt   -0.0123  0.2427  -0.0508  29  0.9598  -0.5087  0.4840
## Age       -0.0051  0.0045  -1.1421  29  0.2627  -0.0143  0.0041
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Age did not statistically influence the correlation values of the meta-analysis studies (k = 31; p = 0.263). Due to the similar I2 between this meta-regression and the main meta-analysis (92.6% vs. 91.8%, respectively), the addition of age as a predictor did not explain the considerable heterogeneity observed between study correlations. The R2 revealed that only 1.0% of the differences between study correlations could be explained by age.

```
bubble(m.cor.reg.age,
       xlim = c(15, 80),
       ylim = c(-1.5, 0.5),
       xlab = 'Age (years)',
       font.lab = 2,
       studlab = TRUE,
       cex = 2,
       cex.studlab = 0.6,
       pos.studlab = 1,
       offset = 0.5,
       col.line = 'red')
```



Meta-regression by proportion of women

```
m.cor.reg.women <- metareg(m.cor, ~Prop_women)
```

```
## Warning: 8 studies with NAs omitted from model fitting.
```

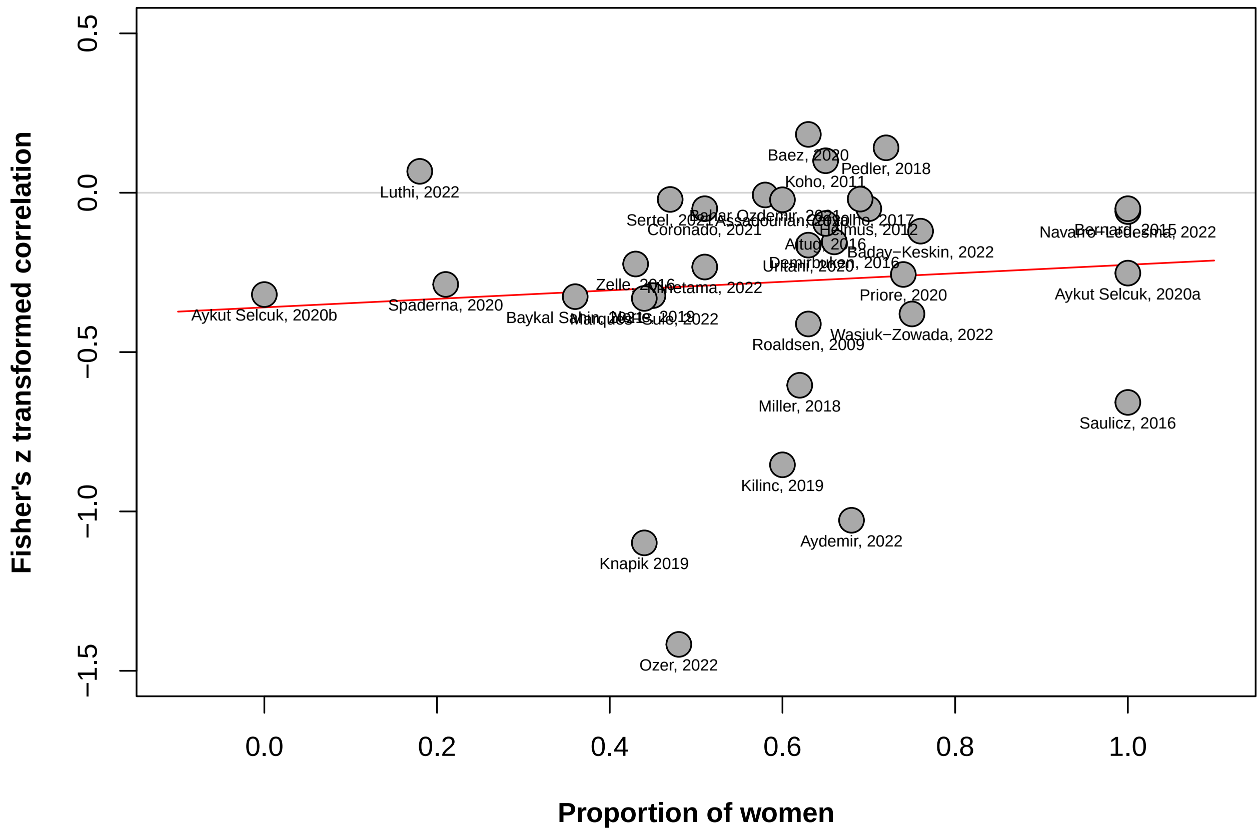
```
m.cor.reg.women
```

```
##
## Mixed-Effects Model (k = 33; tau^2 estimator: REML)
##
## tau^2 (estimated amount of residual heterogeneity):     0.1245 (SE = 0.0348)
## tau (square root of estimated tau^2 value):             0.3529
## I^2 (residual heterogeneity / unaccounted variability): 93.21%
```

```
## H^2 (unaccounted variability / sampling variability):   14.73
## R^2 (amount of heterogeneity accounted for):            0.00%
##
## Test for Residual Heterogeneity:
## QE(df = 31) = 418.4237, p-val < .0001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 31) = 0.2070, p-val = 0.6523
##
## Model Results:
##
##             estimate      se     tval  df    pval    ci.lb   ci.ub
## intrcpt      -0.3597  0.1876  -1.9178  31  0.0644  -0.7422  0.0228  .
## Prop_women    0.1337  0.2938   0.4549  31  0.6523  -0.4656  0.7329
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Similarly, the proportion of women (k = 33) and the mean level of pain in the studies (k = 23) did not influence correlation values. The R2 revealed that these variables explained less than 0.01% of the differences between study correlations.

```r
bubble(m.cor.reg.women,
       xlim = c(-0.1, 1.1),
       ylim = c(-1.5, 0.5),
       xlab = 'Proportion of women',
       font.lab = 2,
       studlab = TRUE,
       cex = 2,
       cex.studlab = 0.6,
       pos.studlab = 1,
       offset = 0.5,
       col.line = 'red')
```



Meta-regression by pain

```r
m.cor.reg.pain <- metareg(m.cor, ~Pain)
```

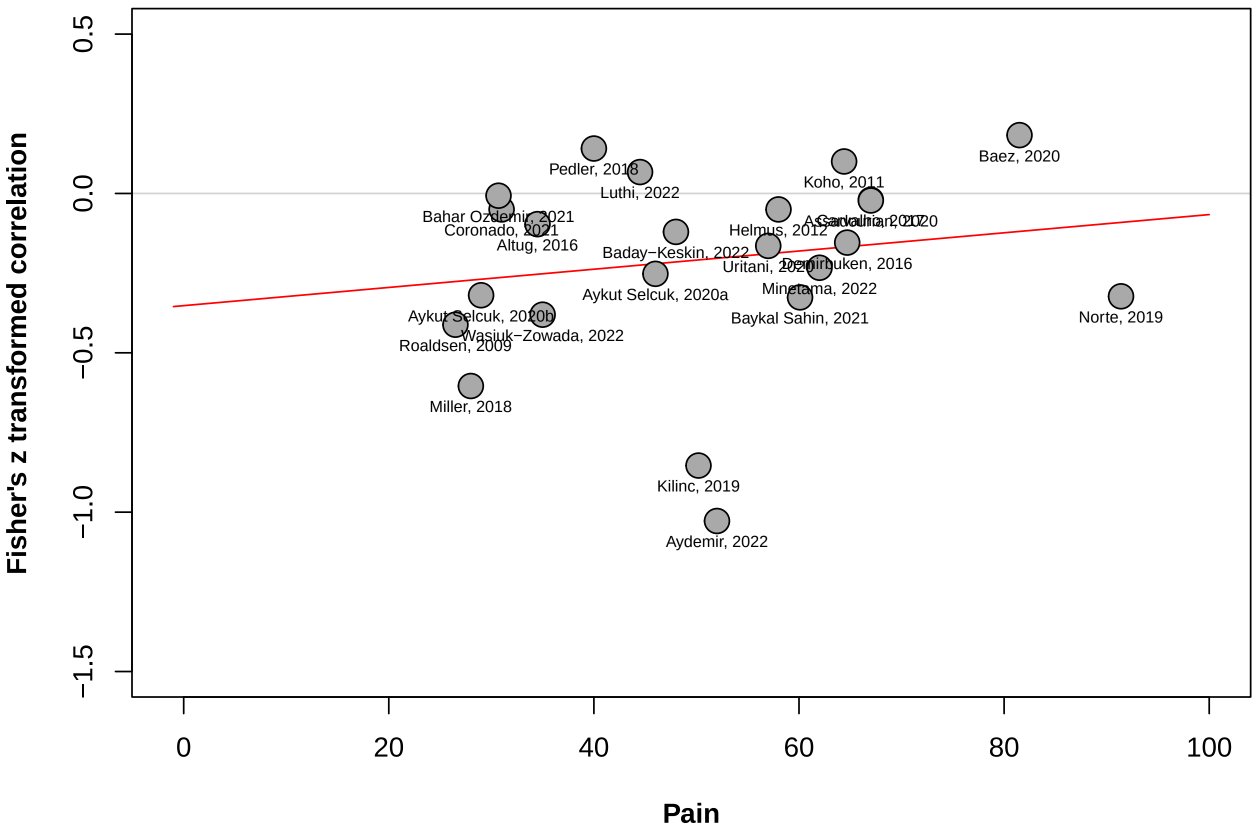
```
## Warning: 18 studies with NAs omitted from model fitting.
```

```r
m.cor.reg.pain
```

```
##
## Mixed-Effects Model (k = 23; tau^2 estimator: REML)
##
## tau^2 (estimated amount of residual heterogeneity):     0.0737 (SE = 0.0266)
## tau (square root of estimated tau^2 value):             0.2715
## I^2 (residual heterogeneity / unaccounted variability): 88.68%
## H^2 (unaccounted variability / sampling variability):   8.83
## R^2 (amount of heterogeneity accounted for):            0.00%
##
## Test for Residual Heterogeneity:
## QE(df = 21) = 198.4949, p-val < .0001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 21) = 0.6204, p-val = 0.4397
##
## Model Results:
##
##          estimate      se     tval  df    pval    ci.lb   ci.ub
## intrcpt   -0.3520  0.1943  -1.8120  21  0.0843  -0.7560  0.0520  .
## Pain       0.0029  0.0036   0.7877  21  0.4397  -0.0047  0.0104
```

```
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
bubble(m.cor.reg.pain,
       xlim = c(-1, 100),
       ylim = c(-1.5, 0.5),
       xlab = 'Pain',
       studlab = TRUE,
       font.lab = 2,
       cex = 2,
       cex.studlab = 0.6,
       pos.studlab = 1,
       offset = 0.5,
       col.line = 'red')
```



Sensitivity analysis: meta-regression by axis score

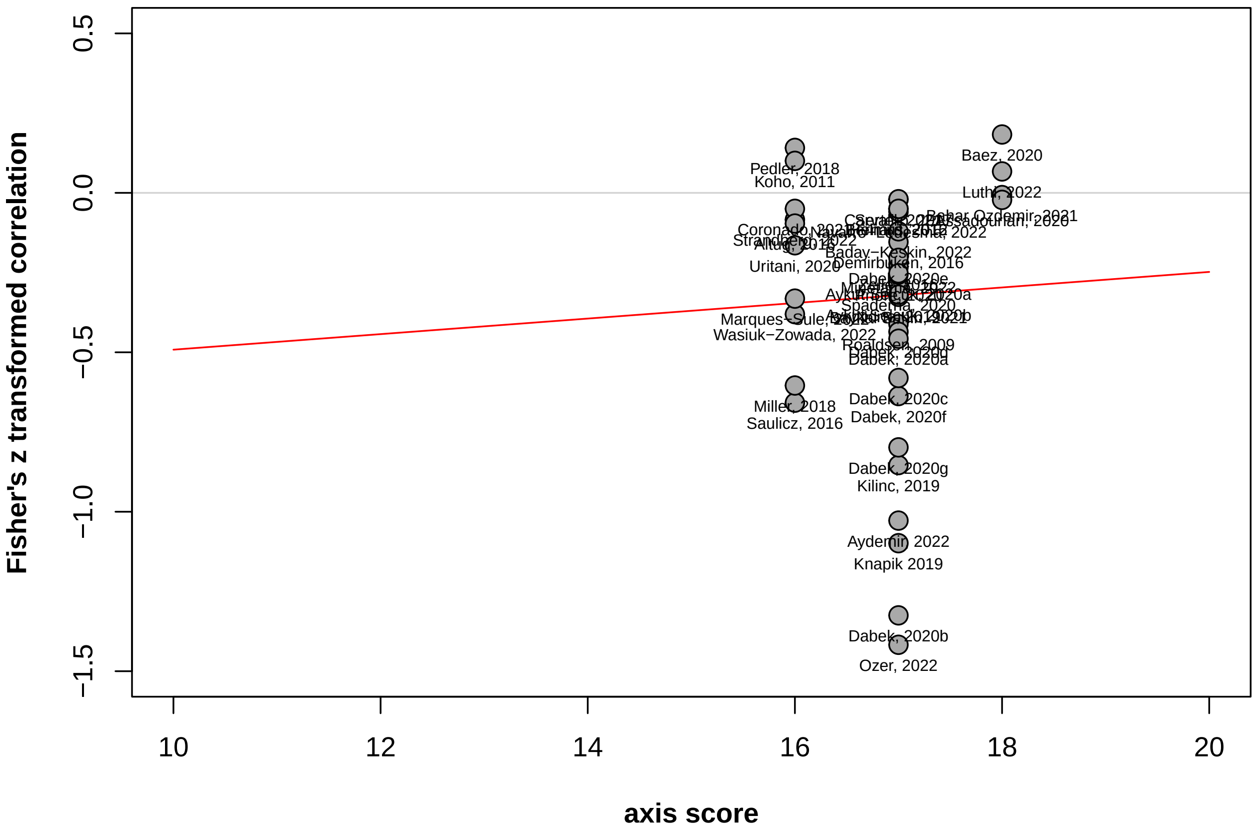
```r
m.cor.reg.axis <- metareg(m.cor, ~Axis_score)
m.cor.reg.axis
```

```
##
## Mixed-Effects Model (k = 41; tau^2 estimator: REML)
##
## tau^2 (estimated amount of residual heterogeneity):     0.1239 (SE = 0.0314)
## tau (square root of estimated tau^2 value):             0.3521
## I^2 (residual heterogeneity / unaccounted variability): 93.10%
```

```
## H^2 (unaccounted variability / sampling variability):   14.49
## R^2 (amount of heterogeneity accounted for):            0.00%
##
## Test for Residual Heterogeneity:
## QE(df = 39) = 489.0111, p-val < .0001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 39) = 0.0561, p-val = 0.8140
##
## Model Results:
##
##             estimate      se     tval  df    pval    ci.lb   ci.ub
## intrcpt      -0.7356  1.7353  -0.4239  39  0.6740  -4.2454  2.7743
## Axis_score    0.0244  0.1029   0.2368  39  0.8140  -0.1839  0.2326
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

A study's axis score (k = 41) did not influence correlation values. The R2 revealed that these variables explained less than 0.00% of the differences between study correlations. However, it should be noted that there was very littel variation in axis scores with all scores ranging between 16 and 18.

```r
bubble(m.cor.reg.axis,
       xlim = c(10, 20),
       ylim = c(-1.5, 0.5),
       xlab = 'axis score',
       studlab = TRUE,
       font.lab = 2,
       cex = 1.5,
       cex.studlab = 0.6,
       pos.studlab = 1,
       offset = 0.5,
       col.line = 'red')
```

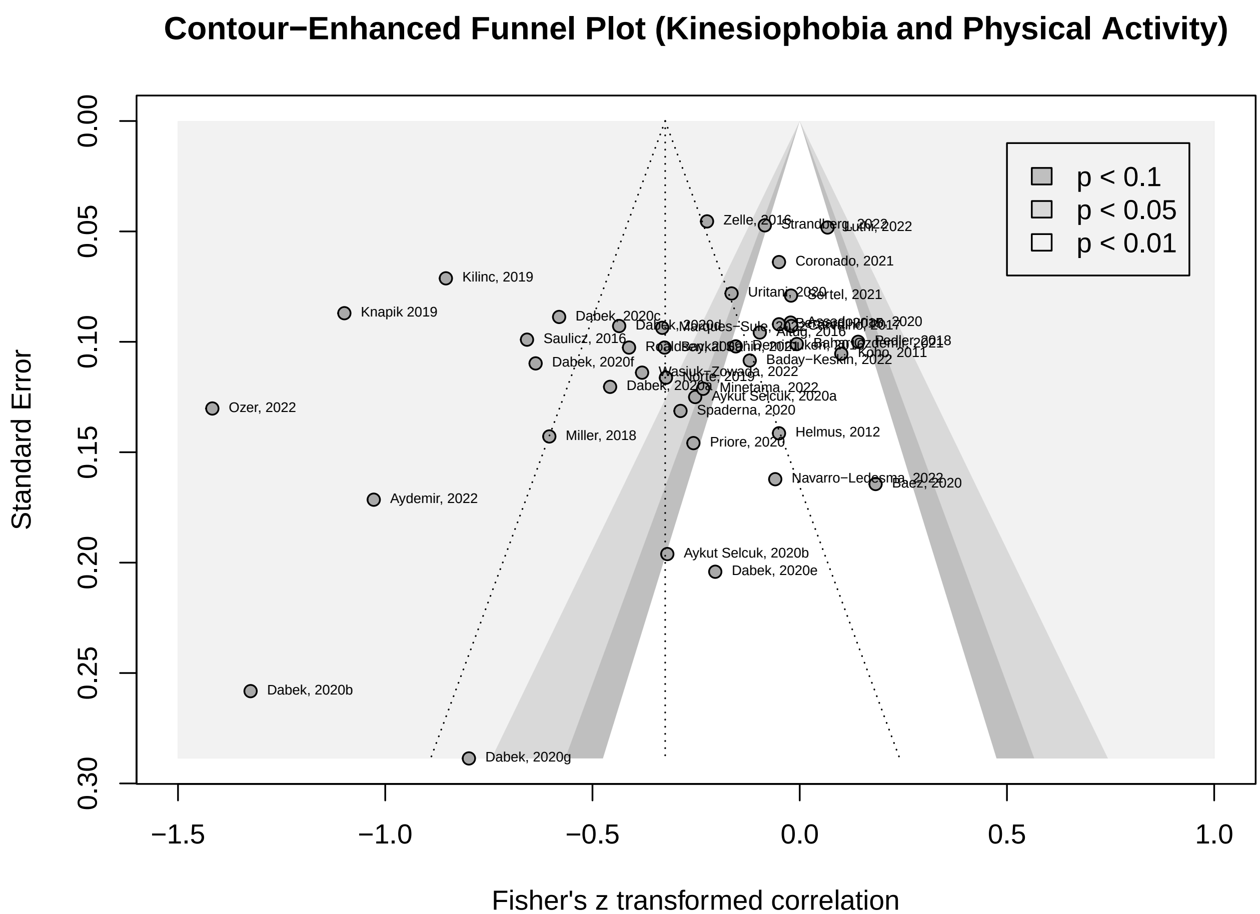


Publication bias analysis

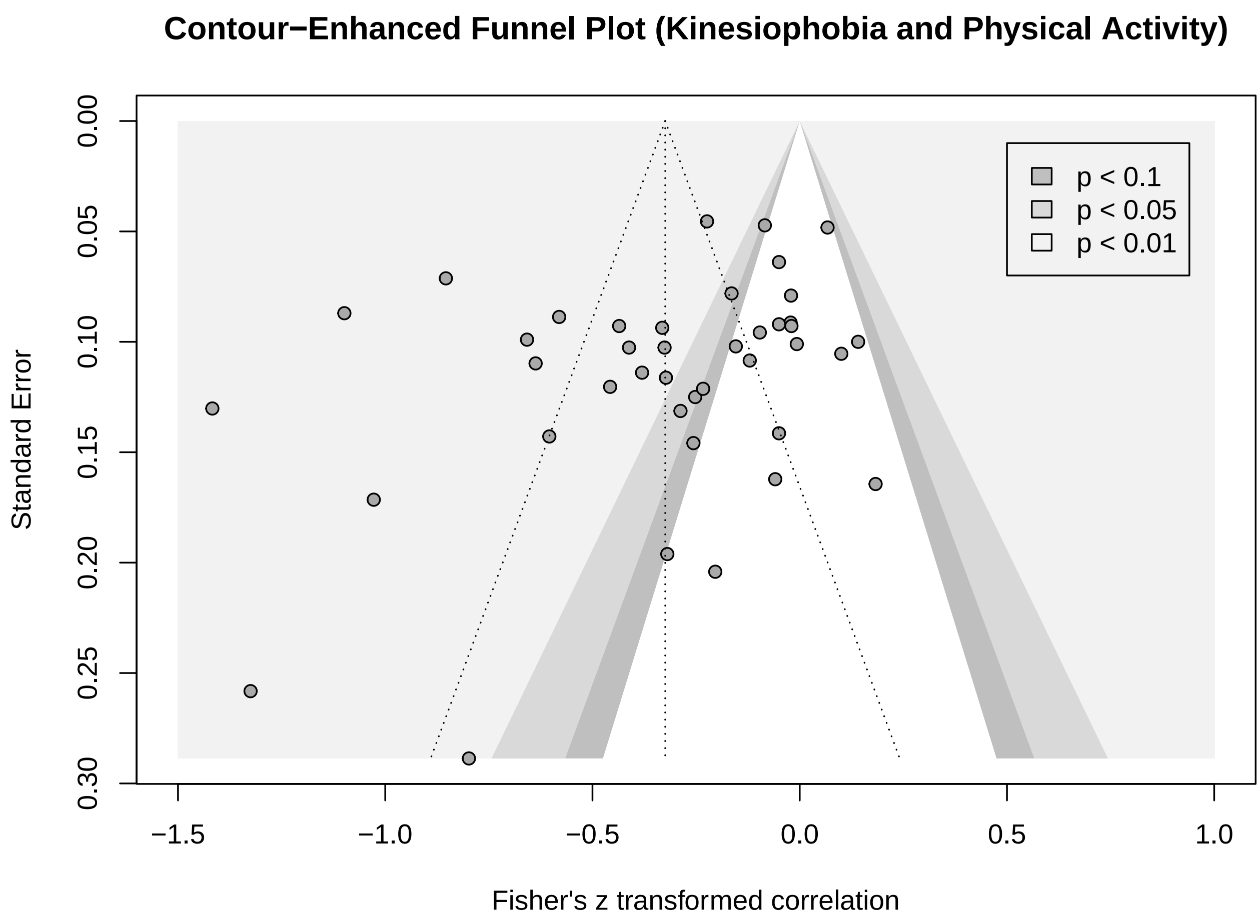
Small-study effects

Funnel plot

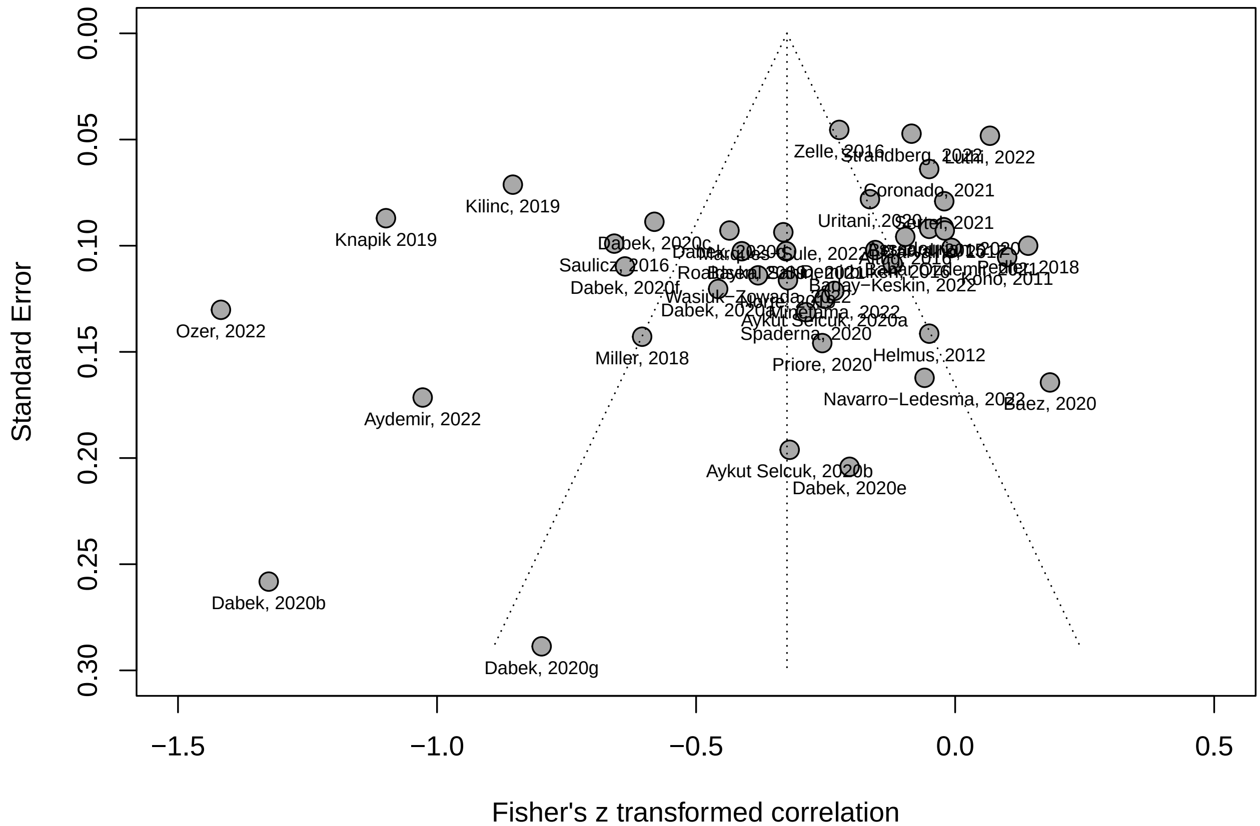
```
# Define fill colors for contour
col.contour = c("gray75", "gray85", "gray95")

# Funnel plot
funnel.meta(m.cor, xlim = c(-1.5, 1),
            contour = c(0.9, 0.95, 0.99),
            col.contour = col.contour,
            studlab = TRUE,
            cex = 1,
            cex.studlab = 0.5,
            pos.studlab = 4,
            offset = 0.5)

# legend
legend(x =0.5, y = 0.01,
       legend = c("p < 0.1", "p < 0.05", "p < 0.01"),
       fill = col.contour)

# title
title("Contour-Enhanced Funnel Plot (Kinesiophobia and Physical Activity)")
```




```r
# Define fill colors for contour
col.contour = c("gray75", "gray85", "gray95")

# Funnel plot
funnel.meta(m.cor, xlim = c(-1.5, 1),
            contour = c(0.9, 0.95, 0.99),
            col.contour = col.contour)

# legend
legend(x =0.5, y = 0.01,
       legend = c("p < 0.1", "p < 0.05", "p < 0.01"),
       fill = col.contour)

# title
title("Contour-Enhanced Funnel Plot (Kinesiophobia and Physical Activity)")
```




```r
# Produce funnel plot
funnel.meta(m.cor,
            xlim = c(-1.5, 0.5),
            ylim = c(0.3, 0.0),
            studlab = TRUE,
            cex = 1.5,
            cex.studlab = 0.7,
            pos.studlab = 1,
            offset = 0.5)
```




```r
png(file = "Funnel Plot.png", width = 2100, height = 1500, res = 300)

funnel.meta(m.cor,
            xlim = c(-1.5, 0.5),
            ylim = c(0.31, 0.0),
            studlab = TRUE,
            cex = 1,
            cex.studlab = 0.6,
            pos.studlab = 1,
            offset = 0.5)

dev.off()
```

```
## pdf
##   2
```

Egger's test

```r
metabias(m.cor, method.bias = "linreg")
```

```
## Review:     Kinesiophobia and physical activity behaviour
##
## Linear regression test of funnel plot asymmetry
##
## Test result: t = -2.06, df = 39, p-value = 0.0458
##
## Sample estimates:
##     bias se.bias intercept se.intercept
```

```
##  -2.8483  1.3806   -0.0051       0.1286
##
## Details:
## - multiplicative residual heterogeneity variance (tau^2 = 11.3415)
## - predictor: standard error
## - weight:    inverse variance
## - reference: Egger et al. (1997), BMJ
```

```r
eggers.test(m.cor)
```

```
## Eggers' test of the intercept
## =============================
##
##  intercept        95% CI      t          p
##     -2.848 -5.55 - -0.14 -2.063 0.04580985
##
## Eggers' test indicates the presence of funnel plot asymmetry.
```

Egger's regression test showed that the data in the funnel plot was asymmetric (b = -2.85, 95% CI: -5.55 to -0.14, p = 0.046), which may be explained by publication bias, but also by other potential causes, such as different study procedures and between-study heterogeneity, which was considerable here.

Limit meta-analysis

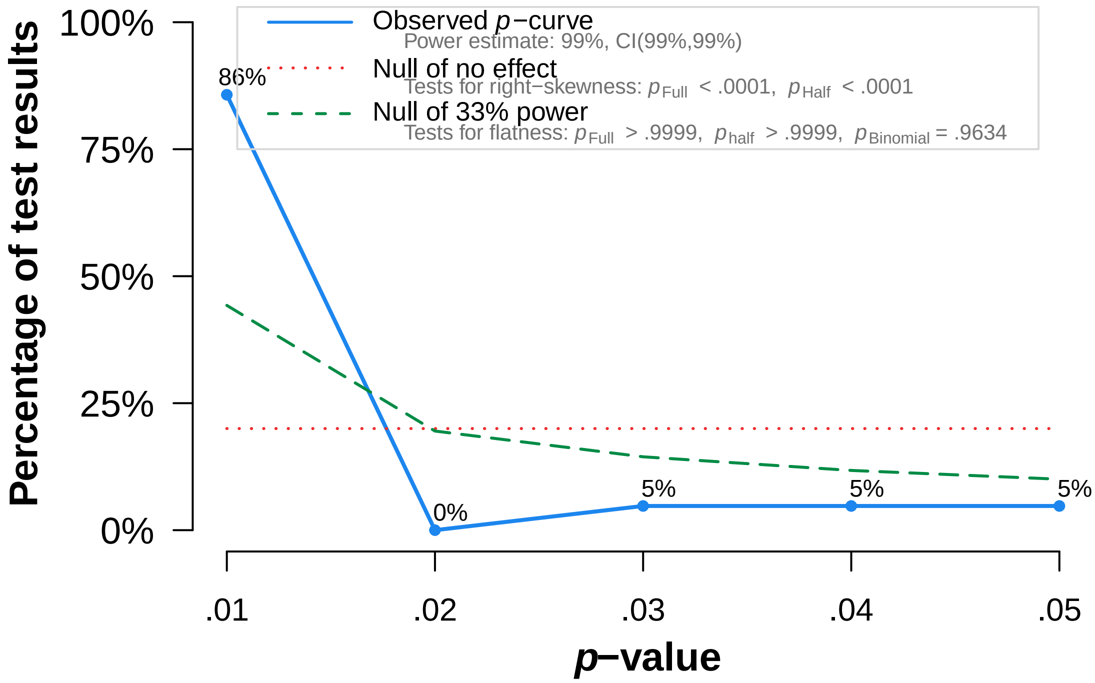
```r
limitmeta(m.cor)
```

```
## Review:     Kinesiophobia and physical activity behaviour
##
## Result of limit meta-analysis:
##
##  Random effects model     COR             95%-CI     z     pval
##     Adjusted estimate -0.1788 [-0.3376; -0.0102] -2.08   0.0378
##   Unadjusted estimate -0.3136 [-0.4159; -0.2035] -5.55 < 0.0001
##
## Quantifying heterogeneity:
## tau^2 = 0.1204; I^2 = 91.8% [89.9%; 93.5%]; G^2 = 98.4%
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  490.59   40        0
##
## Test of small-study effects:
##    Q-Q' d.f.  p-value
##   48.27    1 < 0.0001
##
## Test of residual heterogeneity beyond small-study effects:
##      Q' d.f.  p-value
##  442.32   39        0
##
## Details on adjustment method:
## - expectation (beta0)
```

The bias-corrected estimate of the true effect size, calculated using Rücker's limit meta-analysis method, showed that the correlation would remain significant if there was publication bias (r = -0.18; 95% CI: -0.34 to -0.01; p = 0.0378).

Pcurve analysis

```r
pcurve(m.cor, effect.estimation = FALSE, N, dmin = 0, dmax = 1)
```



Note: The observed p−curve includes 21 statistically significant ($p < .05$) results, of which 18 are $p < .025$.
There were 20 additional results entered but excluded from p−curve because they were $p > .05$.

```
## P-curve analysis
##  -----------------------
## - Total number of provided studies: k = 41
## - Total number of p<0.05 studies included into the analysis: k = 21 (51.22%)
## - Total number of studies with p<0.025: k = 18 (43.9%)
##
## Results
##  -----------------------
##                      pBinomial   zFull pFull   zHalf pHalf
## Right-skewness test      0.001 -16.221     0 -17.087     0
## Flatness test            0.963  12.917     1  15.794     1
## Note: p-values of 0 or 1 correspond to p<0.001 and p>0.999, respectively.
## Power Estimate: 99% (99%-99%)
##
## Evidential value
##  -----------------------
## - Evidential value present: yes
## - Evidential value absent/inadequate: no
```

A total of 41 studies were provided to the p-curve analysis, including 21 (51.2%) studies with $p < 0.05$ and 18 studies (43.9%) with $p < 0.025$. The p-value of the right-skewness test was < 0.001 for both the half and full curve, suggesting that evidential value was present.

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