Meta Analysis based on Standardized Mean Difference

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Data description

The analysis is done for mean of two independent groups where the effect size is **SMD(standardized mean difference)**. There are two groups: Treated and Control group. Treated group consists of sample size(n1), mean(m1) and standard deviation(sd1). Control group also consists of sample size(n2) ,mean(m2) and standard deviation(sd2).Each group involves with unique id(Author).

Results:

The result includes corrected standard mean difference(Hedge's g),summary, I^2, T^2 ,Quantify and check heterogeneity, and a forest plot.

```
#install.packages(c("meta","metafor","MAd"))
library(meta)

## Loading 'meta' package (version 6.5-0).
## Type 'help(meta)' for a brief overview.
## Readers of 'Meta-Analysis with R (Use R!)' should install
## older version of 'meta' package: https://tinyurl.com/dt4y5drs

library(metafor)

## Loading required package: Matrix

## Loading required package: metadat

## Loading required package: numDeriv

##
## Loading the 'metafor' package (version 4.2-0). For an
## introduction to the package please type: help(metafor)

library(MAd)
Author<-c("Moinr","Kabir","Pranto","Limon","Fazle","Miraz","Ahnaf","Sakib")
n1<-c(131,116,82,87,110,95,79,122)
m1<-c(83.2,75.5,108.5,76.9,83,85.7,79,85.8)
sd1<-c(15.7,14.4,26.7,16.3,12.7,19.9,27.7,24)
n2<-c(90,118,95,98,116,121,112,86)
m2<-c(82.7,89.9,76.6,102.9,69.3,93.2,101.4,100.1)
sd2<-c(23.7,28.7,27.9,18.7,19,23,16.9,31.1)
Df<-data.frame(Author,n1,m1,sd1,n2,m2,sd2)
Df
```

```
##   Author  n1    m1  sd1  n2    m2  sd2
## 1  Moinr 131  83.2 15.7  90  82.7 23.7
## 2  Kabir 116  75.5 14.4 118  89.9 28.7
## 3 Pranto  82 108.5 26.7  95  76.6 27.9
## 4  Limon  87  76.9 16.3  98 102.9 18.7
## 5  Fazle 110  83.0 12.7 116  69.3 19.0
## 6  Miraz  95  85.7 19.9 121  93.2 23.0
## 7  Ahnaf  79  79.0 27.7 112 101.4 16.9
## 8  Sakib 122  85.8 24.0  86 100.1 31.1
```

```
#Computes Vector of Standardized Mean Differences(d),Hedges g
CSMD<-compute_dgs(n.1=n1,m.1=m1,sd.1=sd1,n.2=n2,m.2=m2,sd.2=sd2,data=Df)
CSMD
```

```
##   Author  n1    m1  sd1  n2    m2  sd2 s.within           d      var.d
## 1  Moinr 131  83.2 15.7  90  82.7 23.7 19.35420  0.02583419 0.01874621
## 2  Kabir 116  75.5 14.4 118  89.9 28.7 22.76360 -0.63258880 0.01795033
## 3 Pranto  82 108.5 26.7  95  76.6 27.9 27.35112  1.16631434 0.02656406
## 4  Limon  87  76.9 16.3  98 102.9 18.7 17.61291 -1.47618993 0.02758789
## 5  Fazle 110  83.0 12.7 116  69.3 19.0 16.24253  0.84346481 0.01928557
## 6  Miraz  95  85.7 19.9 121  93.2 23.0 21.69294 -0.34573453 0.01906747
## 7  Ahnaf  79  79.0 27.7 112 101.4 16.9 22.00906 -1.01776284 0.02429843
## 8  Sakib 122  85.8 24.0  86 100.1 31.1 27.15551 -0.52659667 0.02049122
##             g      var.g      se.g
## 1  0.02574561 0.01861788 0.1364474
## 2 -0.63054159 0.01783433 0.1335452
## 3  1.16130870 0.02633653 0.1622853
## 4 -1.47013169 0.02736192 0.1654144
## 5  0.84063755 0.01915649 0.1384070
## 6 -0.34452143 0.01893390 0.1376005
## 7 -1.01371875 0.02410571 0.1552601
## 8 -0.52467712 0.02034211 0.1426258
```

```
MG<-metagen(TE=CSMD$g,
            seTE =CSMD$se.g,
            studlab =Author,
            data=Df,
            sm = "SMD",
            method.tau ="REML",
            hakn=TRUE,
            title ="Meta analysis for Standardized Mean difference ")
summary(MG)
```

```
## Review:     Meta analysis for Standardized Mean difference
##
##            SMD             95%-CI %W(common) %W(random)
## Moinr   0.0257 [-0.2417;  0.2932]       14.1       12.5
## Kabir  -0.6305 [-0.8923; -0.3688]       14.8       12.6
## Pranto  1.1613 [ 0.8432;  1.4794]       10.0       12.4
## Limon  -1.4701 [-1.7943; -1.1459]        9.6       12.4
## Fazle   0.8406 [ 0.5694;  1.1119]       13.7       12.5
```

```
## Miraz  -0.3445 [-0.6142; -0.0748]       13.9       12.5
## Ahnaf  -1.0137 [-1.3180; -0.7094]       10.9       12.5
## Sakib  -0.5247 [-0.8042; -0.2451]       12.9       12.5
##
## Number of studies: k = 8
##
##                               SMD             95%-CI   z|t  p-value
## Common effect model       -0.2257 [-0.3263; -0.1252] -4.40 < 0.0001
## Random effects model (HK) -0.2439 [-0.9875;  0.4997] -0.78   0.4634
##
## Quantifying heterogeneity:
##  tau^2 = 0.7668 [0.3227; 3.2647]; tau = 0.8757 [0.5681; 1.8069]
##  I^2 = 97.0% [95.6%; 97.9%]; H = 5.76 [4.76; 6.98]
##
## Test of heterogeneity:
##       Q d.f.  p-value
##  232.49    7 < 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 = 7)
```

Plot

```
forest.meta(MG,layout="RevMan5",fontsize = 5, spacing = .7)
```