R code for power for subgroup analysis of two groups with standardized mean difference, Fixed Effects

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# Power analysis for fixed effects subgroup analysis of two groups - SMD

library(ggplot2)

# Create a dataframe with N = 15 values for power analysis
# subdiff is a range of subgroup mean differences
# m is the common number of studies in both groups
# ssize is the within-study sample size
# vi is the common within-study variance for the effect size

N <-15
powerparms1 <- data.frame(subdiff = numeric(N), ssize = (N), vi = numeric (N))

# add values for the power parameters
# seq is a function that creates a sequence of numbers for the subgroup differences
# rep is a function that repeats a value for the common within-study sample size

powerparms1$subdiff <- c(seq(from = 0.05, to = 0.75, by = 0.05))
powerparms1$ssize <- c(rep(20, times=15))

# use effsize and ssize to create vi for standardized mean difference
# 1/2 of the subgroup difference of interest is the overall mean effect size with equal
#    numbers of studies per group
# Change the code for vi below for other effect sizes like Fisher's Z or log-odds ratio

powerparms1$vi <- ((powerparms1$ssize)/((0.5*powerparms1$ssize) ^ 2)) +
  (((0.5*powerparms1$subdiff) ^ 2)/ (2*powerparms1$ssize))

# copy the dataframe 3 times to create parameters for 3 different
# scenarios for number of studies within groups m = 5, 10, 15

powerp1 <- rbind(powerparms1, powerparms1, powerparms1)

# create values for equal m within groups of 5, 10, 15

powerp1$m <- c(rep(5, times=15), rep(10, times=15), rep(15, times=15))
powerp1$mlab <- c(rep("3:m=5", times=15), rep("2:m=10", times = 15),
         rep("1:m=15", times=15))

# get the sums of the weights for values of the vi and m
powerp1$w1sum <- powerp1$m*(1/powerp1$vi)
powerp1$w2sum <- powerp1$m*(1/powerp1$vi)

# get lambda the non-centrality parameter
powerp1$lambda <- (powerp1$w1sum*((0.5*powerp1$subdiff) ^ 2))+
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  (powerp1$w2sum*((0.5*powerp1$subdiff) ^ 2))

#get power
powerp1$power <- 1 - pchisq(3.84, 1, ncp = powerp1$lambda, lower.tail = T,
                log.p = F)

# plot the power curves
ggplot(powerp1, aes(x=powerp1$subdiff, y=powerp1$power, group=powerp1$mlab)) +
  geom_point() +
  geom_line(aes(color  = powerp1$mlab)) +
  ggtitle("Power for subgroup differences with SMD") +
  labs(y = "Power", x = "Subgroup difference") +
  labs(shape = "Subgroup size")
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