Middle postoperative period pain score

Boohwi Hong

Package install

Data Preparation

Model Fitting

Results of Model

```
##    Length     Class      Mode
##        34 character character
```

```
## Original data (with adjusted standard errors for multi-arm studies):
##
##                         treat1 treat2      TE   seTE seTE.adj narms multiarm
## Asar,2022             Control   ESPB  1.2000 0.2990   0.7744     2
## Zhu,2021              Control   ESPB  1.3000 0.1789   0.7364     2
## Zhang Q,2021          Control   ESPB  0.6000 0.3291   0.7865     2
## Yu,2021               Control   ESPB  1.3000 0.1265   0.7254     2
## Yesiltas,2021         Control   ESPB  0.8000 0.3218   0.7835     2
## Wang,2021             Control   ESPB  0.8000 0.1379   0.8944     3        *
## Wang,2021                ESPB   TLIP  0.4000 0.0913   0.8765     3        *
## Wang,2021             Control   TLIP  1.2000 0.1331   0.8921     3        *
## Wahdan,2021           Control   ESPB  0.5000 0.2032   0.7426     2
## Jin,2021              Control   ESPB  0.0000 0.0254   0.7148     2
## Goel,2021             Control   ESPB  0.3000 0.1592   0.7318     2
## Eltaher,2021          Control   TLIP  1.5000 0.2229   0.7483     2
## Singh, 2020           Control   ESPB  0.0000 0.5060   0.8754     2
## Kraiwattanapong,2020  Control     WI  2.0000 0.5465   0.8994     2
## Eskin,2020            Control   ESPB  1.6000 0.1628   0.7326     2
## Ekinci,2020              TLIP     WI -1.2000 0.2129   0.7454     2
## Ciftci,2020           Control   ESPB  0.4000 0.5939   1.1873     3        *
## Ciftci,2020              ESPB   TLIP  0.3000 0.5115   1.0547     3        *
## Ciftci,2020           Control   TLIP  0.7000 0.5115   1.0547     3        *
## Yayik,2020            Control   ESPB  1.0000 0.3039   0.7763     2
## Ozmen,2019            Control   TLIP  0.6000 0.0354   0.7152     2
## Mohta,2019            Control     WI  2.2000 0.1768   0.7359     2
## Ghamry,2019           Control   ESPB  0.3000 0.1549   0.7309     2
## Chen, 2019            Control   TLIP  2.8000 0.1826   0.7373     2
## Ammar,2018            Control   TLIP  0.8000 0.2624   0.7610     2
## Ozyilmaz,2012         Control     WI  0.0000 0.0500   0.7161     2
## Esmail,2008           Control     WI -0.5000 0.4203   0.8288     2
```

```
## Ersayli,2006          Control     WI -0.4000 0.2324   0.7512     2
## Yorukoglu,2005        Control     WI  0.0000 0.4785   0.8598     2
## Mirzai,2002           Control     WI  0.1000 0.5436   0.8976     2
## Milligan,1993         Control     WI  0.7000 0.6327   0.9542     2
## Yorukoglu,2021        Control   ESPB  0.0000 0.3268   0.7855     2
## Finnerty,2021         Control   ESPB  1.5000 0.5624   0.9092     2
## Ahiskalioglu,2018     Control   TLIP  2.0000 0.4743   0.8575     2
##
## Number of treatment arms (by study):
##                       narms
## Asar,2022                 2
## Zhu,2021                  2
## Zhang Q,2021              2
## Yu,2021                   2
## Yesiltas,2021             2
## Wang,2021                 3
## Wahdan,2021               2
## Jin,2021                  2
## Goel,2021                 2
## Eltaher,2021              2
## Singh, 2020               2
## Kraiwattanapong,2020      2
## Eskin,2020                2
## Ekinci,2020               2
## Ciftci,2020               3
## Yayik,2020                2
## Ozmen,2019                2
## Mohta,2019                2
## Ghamry,2019               2
## Chen, 2019                2
## Ammar,2018                2
## Ozyilmaz,2012             2
## Esmail,2008               2
## Ersayli,2006              2
## Yorukoglu,2005            2
## Mirzai,2002               2
## Milligan,1993             2
## Yorukoglu,2021            2
## Finnerty,2021             2
## Ahiskalioglu,2018         2
##
## Results (random effects model):
##
##                        treat1 treat2      MD             95%-CI
## Asar,2022             Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Zhu,2021              Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Zhang Q,2021          Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Yu,2021               Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Yesiltas,2021         Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Wang,2021             Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Wang,2021                ESPB   TLIP  0.6385 [ 0.0356;  1.2414]
## Wang,2021             Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Wahdan,2021           Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Jin,2021              Control   ESPB  0.7572 [ 0.3845;  1.1299]
```

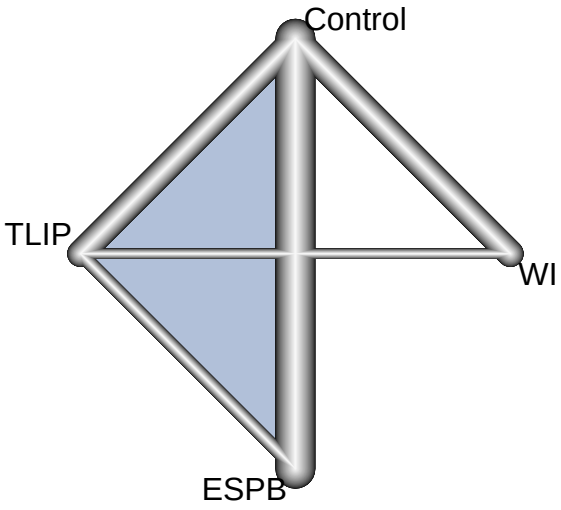
```
## Goel,2021             Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Eltaher,2021          Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Singh, 2020           Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Kraiwattanapong,2020  Control     WI  0.4612 [-0.0716;  0.9940]
## Eskin,2020            Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Ekinci,2020              TLIP     WI -0.9344 [-1.6277; -0.2412]
## Ciftci,2020           Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Ciftci,2020              ESPB   TLIP  0.6385 [ 0.0356;  1.2414]
## Ciftci,2020           Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Yayik,2020            Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Ozmen,2019            Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Mohta,2019            Control     WI  0.4612 [-0.0716;  0.9940]
## Ghamry,2019           Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Chen, 2019            Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Ammar,2018            Control   TLIP  1.3956 [ 0.8794;  1.9119]
## Ozyilmaz,2012         Control     WI  0.4612 [-0.0716;  0.9940]
## Esmail,2008           Control     WI  0.4612 [-0.0716;  0.9940]
## Ersayli,2006          Control     WI  0.4612 [-0.0716;  0.9940]
## Yorukoglu,2005        Control     WI  0.4612 [-0.0716;  0.9940]
## Mirzai,2002           Control     WI  0.4612 [-0.0716;  0.9940]
## Milligan,1993         Control     WI  0.4612 [-0.0716;  0.9940]
## Yorukoglu,2021        Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Finnerty,2021         Control   ESPB  0.7572 [ 0.3845;  1.1299]
## Ahiskalioglu,2018     Control   TLIP  1.3956 [ 0.8794;  1.9119]
##
## Number of studies: k = 30
## Number of pairwise comparisons: m = 34
## Number of treatments: n = 4
## Number of designs: d = 5
##
## Random effects model
##
## Treatment estimate (sm = 'MD', comparison: other treatments vs 'Control'):
##              MD             95%-CI     z  p-value
## Control       .                  .     .        .
## ESPB    -0.7572 [-1.1299; -0.3845] -3.98 < 0.0001
## TLIP    -1.3956 [-1.9119; -0.8794] -5.30 < 0.0001
## WI      -0.4612 [-0.9940;  0.0716] -1.70   0.0897
##
## Quantifying heterogeneity / inconsistency:
## tau^2 = 0.5102; tau = 0.7143; I^2 = 95.4% [94.3%; 96.3%]
##
## Tests of heterogeneity (within designs) and inconsistency (between designs):
##                       Q d.f.  p-value
## Total           630.43   29 < 0.0001
## Within designs  600.49   26 < 0.0001
## Between designs  29.94    3 < 0.0001

## Number of studies: k = 30
## Number of pairwise comparisons: m = 34
## Number of treatments: n = 4
## Number of designs: d = 5
##
## Random effects model
```

```
##
## Treatment estimate (sm = 'MD', comparison: other treatments vs 'Control'):
##              MD             95%-CI     z  p-value
## Control       .                  .     .        .
## ESPB    -0.7572 [-1.1299; -0.3845] -3.98 < 0.0001
## TLIP    -1.3956 [-1.9119; -0.8794] -5.30 < 0.0001
## WI      -0.4612 [-0.9940;  0.0716] -1.70   0.0897
##
## Quantifying heterogeneity / inconsistency:
## tau^2 = 0.5102; tau = 0.7143; I^2 = 95.4% [94.3%; 96.3%]
##
## Tests of heterogeneity (within designs) and inconsistency (between designs):
##                       Q d.f.  p-value
## Total           630.43   29 < 0.0001
## Within designs  600.49   26 < 0.0001
## Between designs  29.94    3 < 0.0001

## Q statistics to assess homogeneity / consistency
##
##                      Q df  p-value
## Total           630.43 29 < 0.0001
## Within designs  600.49 26 < 0.0001
## Between designs  29.94  3 < 0.0001
##
## Design-specific decomposition of within-designs Q statistic
##
##                   Design      Q df  p-value
##          Control vs ESPB 274.99 13 < 0.0001
##          Control vs TLIP 160.80  4 < 0.0001
##            Control vs WI 163.79  7 < 0.0001
##  Control vs ESPB vs TLIP   0.91  2   0.6347
##
## Between-designs Q statistic after detaching of single designs
##
##          Detached design     Q df  p-value
##          Control vs ESPB 19.62  2 < 0.0001
##          Control vs TLIP 28.80  2 < 0.0001
##            Control vs WI 21.54  2 < 0.0001
##               TLIP vs WI 21.54  2 < 0.0001
##  Control vs ESPB vs TLIP  8.41  1   0.0037
##
## Q statistic to assess consistency under the assumption of
## a full design-by-treatment interaction random effects model
##
##                    Q df p-value tau.within tau2.within
## Between designs 0.64  3  0.8879     0.8441      0.7126
```

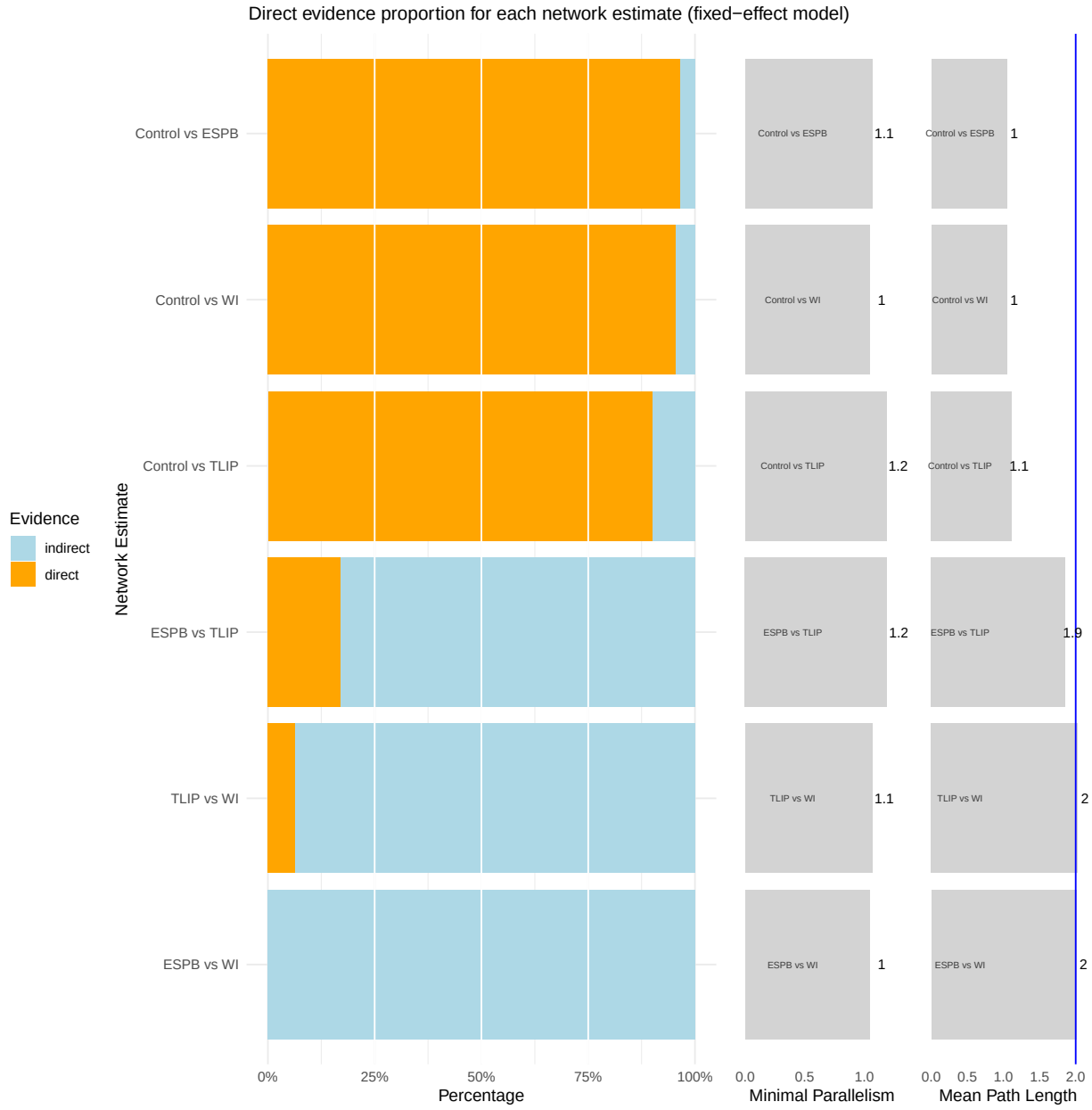
Network Graph



Visualizing Direct and Indirect Evidence

```
## Extensive documentation for the dmetar package can be found at:
##  www.bookdown.org/MathiasHarrer/Doing_Meta_Analysis_in_R/

## Direct Evidence Proportion for each Network Estimate
##  ------------------------------------------------
##                  Direct Indirect meanpath   minpar
## Control vs ESPB 0.9651   0.0349 1.048216 1.067311
## Control vs WI   0.9561   0.0439 1.048306 1.045952
## Control vs TLIP 0.9017   0.0983 1.117937 1.185862
## ESPB vs TLIP    0.1700   0.8300 1.858769 1.191270
## TLIP vs WI      0.0644   0.9356 2.028745 1.068806
## ESPB vs WI      0.0000   1.0000 2.008166 1.047173
```



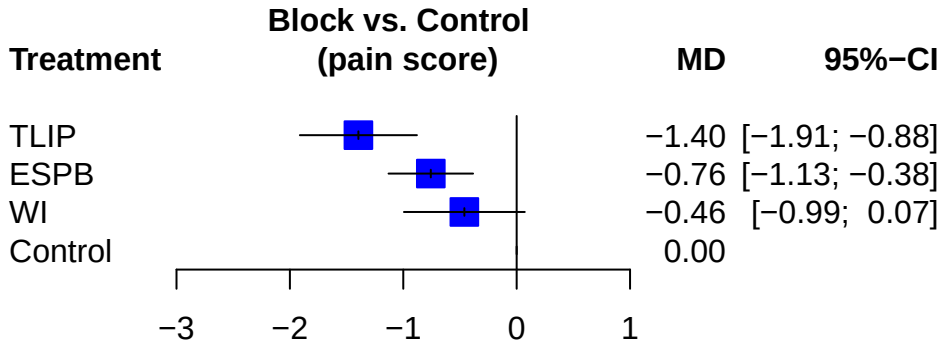
Effect Estimate Table

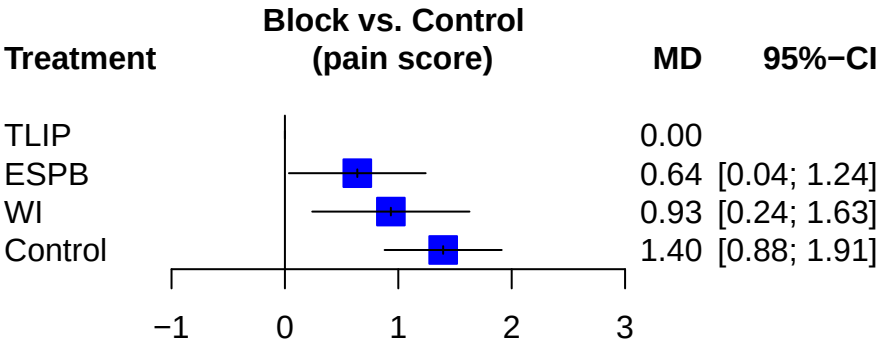
```
##         Control  ESPB  TLIP     WI
## Control      NA 0.757 1.396  0.461
## ESPB         NA    NA 0.638 -0.296
## TLIP         NA    NA    NA -0.934
## WI           NA    NA    NA     NA
```

```
## League table (random effects model):
##
##              Control  0.73 ( 0.35;  1.11)  1.37 ( 0.80;  1.94)
##  0.76 ( 0.38;  1.13)                 ESPB  0.36 (-0.73;  1.45)
##  1.40 ( 0.88;  1.91)  0.64 ( 0.04;  1.24)                 TLIP
##  0.46 (-0.07;  0.99) -0.30 (-0.94;  0.35) -0.93 (-1.63; -0.24)
##
##   0.50 (-0.07;  1.07)
##                     .
##  -1.20 (-2.66;  0.26)
##                    WI
```

Ranking and Forest plot

```
##          P-score
## TLIP      0.9923
## ESPB      0.6114
## WI        0.3813
## Control   0.0150
```

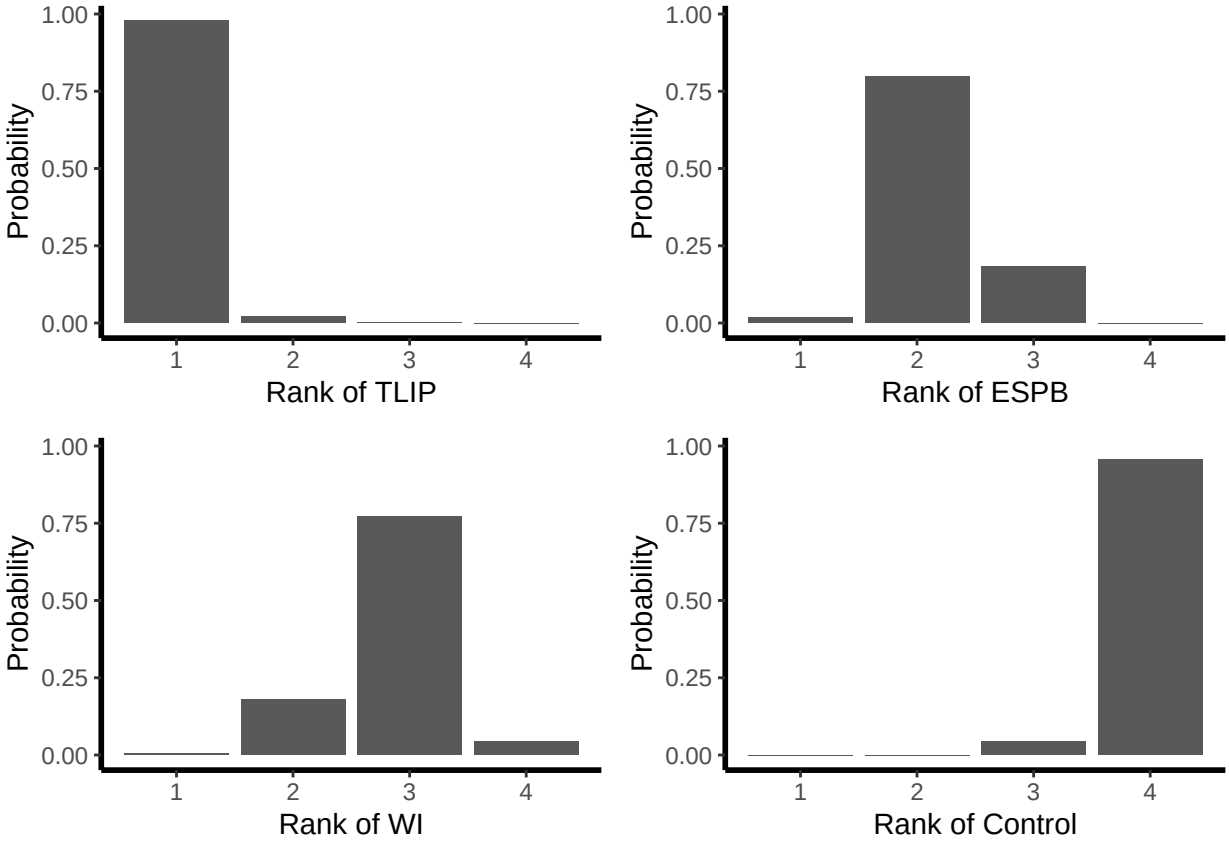


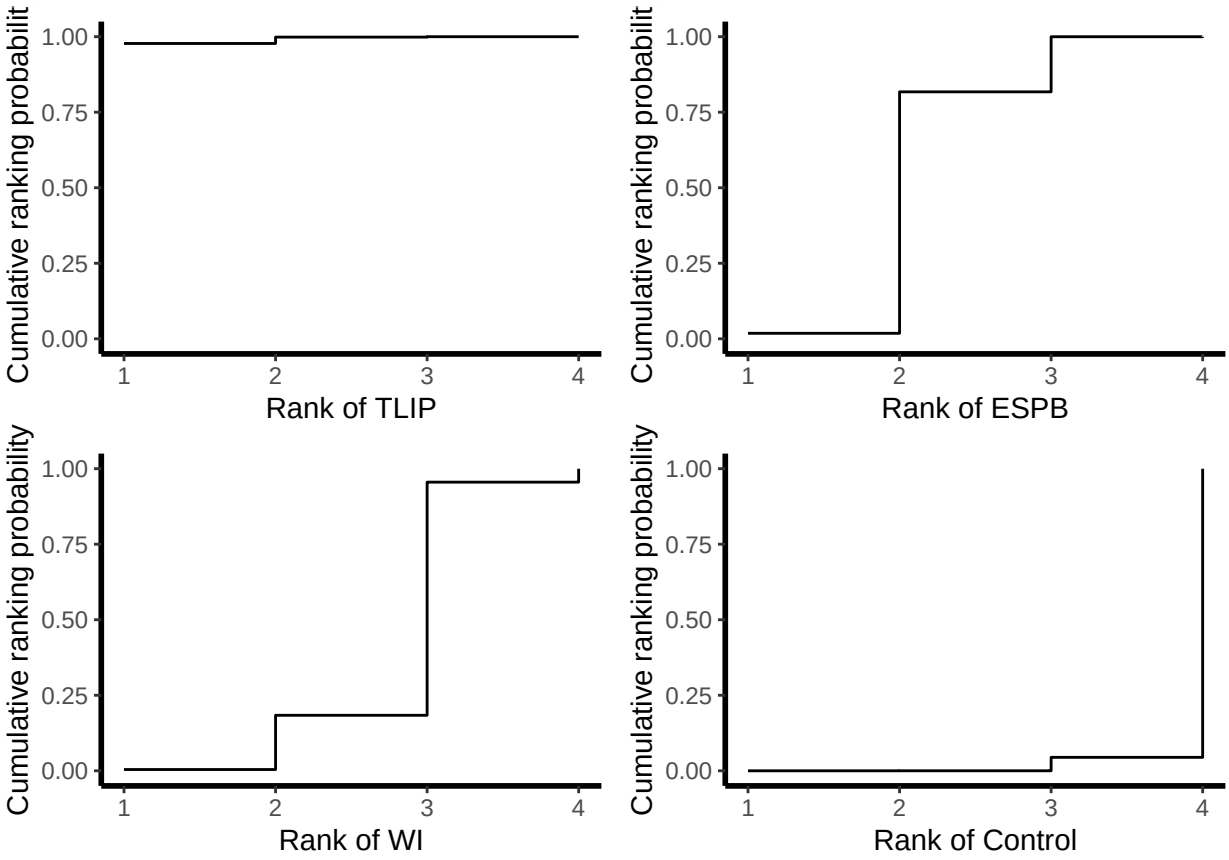

Block vs. Control
(pain score)
Treatment
MD
95%−CI
TLIP
ESPB
WI
Control
0.00
0.64 [0.04; 1.24]
0.93 [0.24; 1.63]
1.40 [0.88; 1.91]
−1
0
1
2
3

Rankogram by 100,000 simulation

This rankogram function calculates the probabilities of each treatment being at each possible rank and the SUCRAs (Surface Under the Cumulative RAnking curve) in frequentist network meta-analysis.

```
## Rankogram (based on 1e+05 simulations)
##
## Common effects model:
##
##              1      2      3      4
## Control 0.0000 0.0000 0.0043 0.9957
## ESPB    0.0000 0.7925 0.2075 0.0000
## TLIP    1.0000 0.0000 0.0000 0.0000
## WI      0.0000 0.2075 0.7882 0.0043
##
## Random effects model:
##
##              1      2      3      4
## Control 0.0000 0.0000 0.0445 0.9555
## ESPB    0.0182 0.7993 0.1824 0.0001
## TLIP    0.9776 0.0211 0.0013 0.0000
## WI      0.0042 0.1796 0.7718 0.0444
```



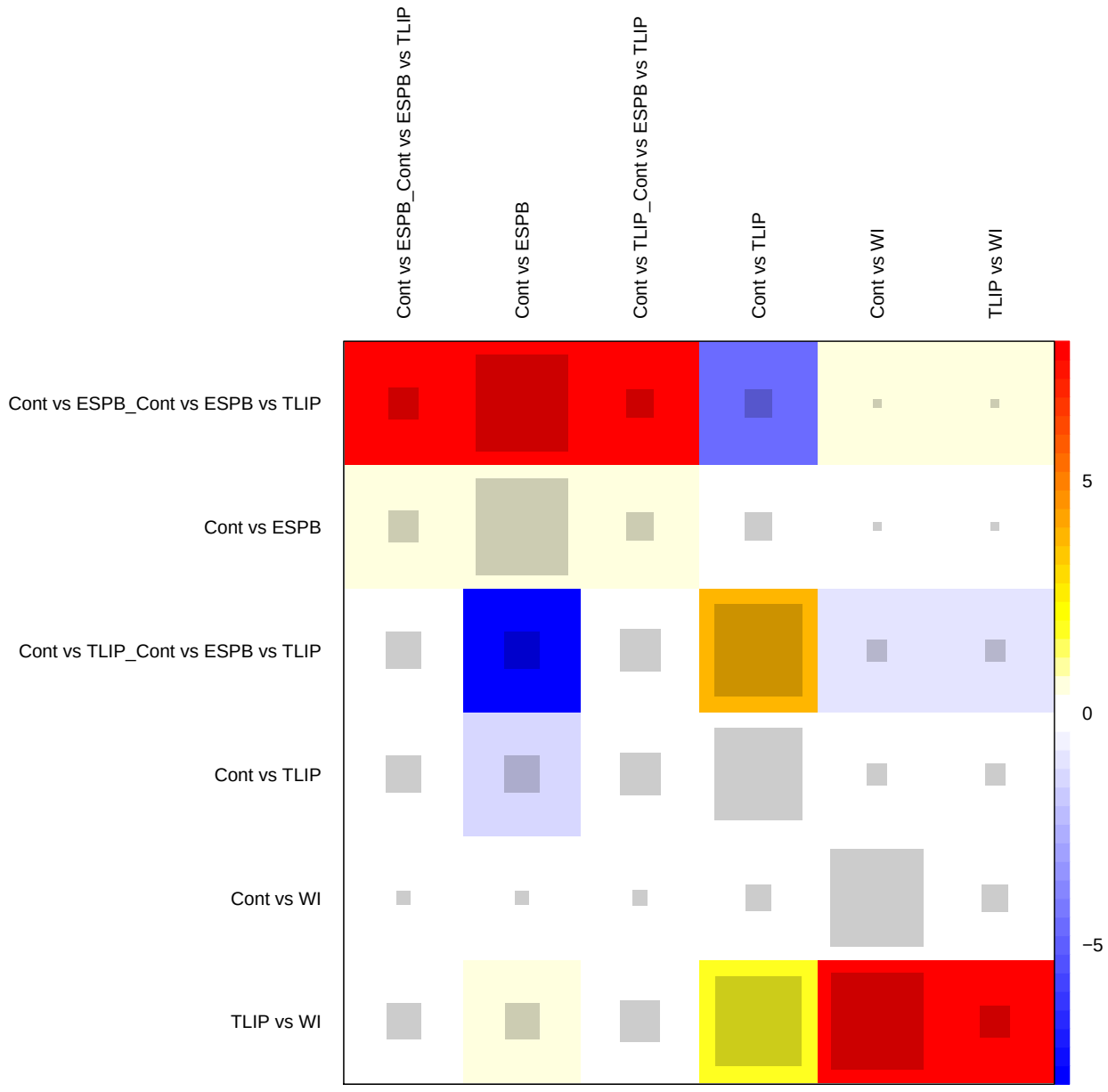

Cumulative ranking probabilit
1.00
0.75
0.50
0.25
0.00
1
2
3
4
Rank of TLIP
Cumulative ranking probabilit
Rank of ESPB
Cumulative ranking probability
Rank of WI
Cumulative ranking probability
Rank of Control

Net Heat Plot for evaluating the validity of the results

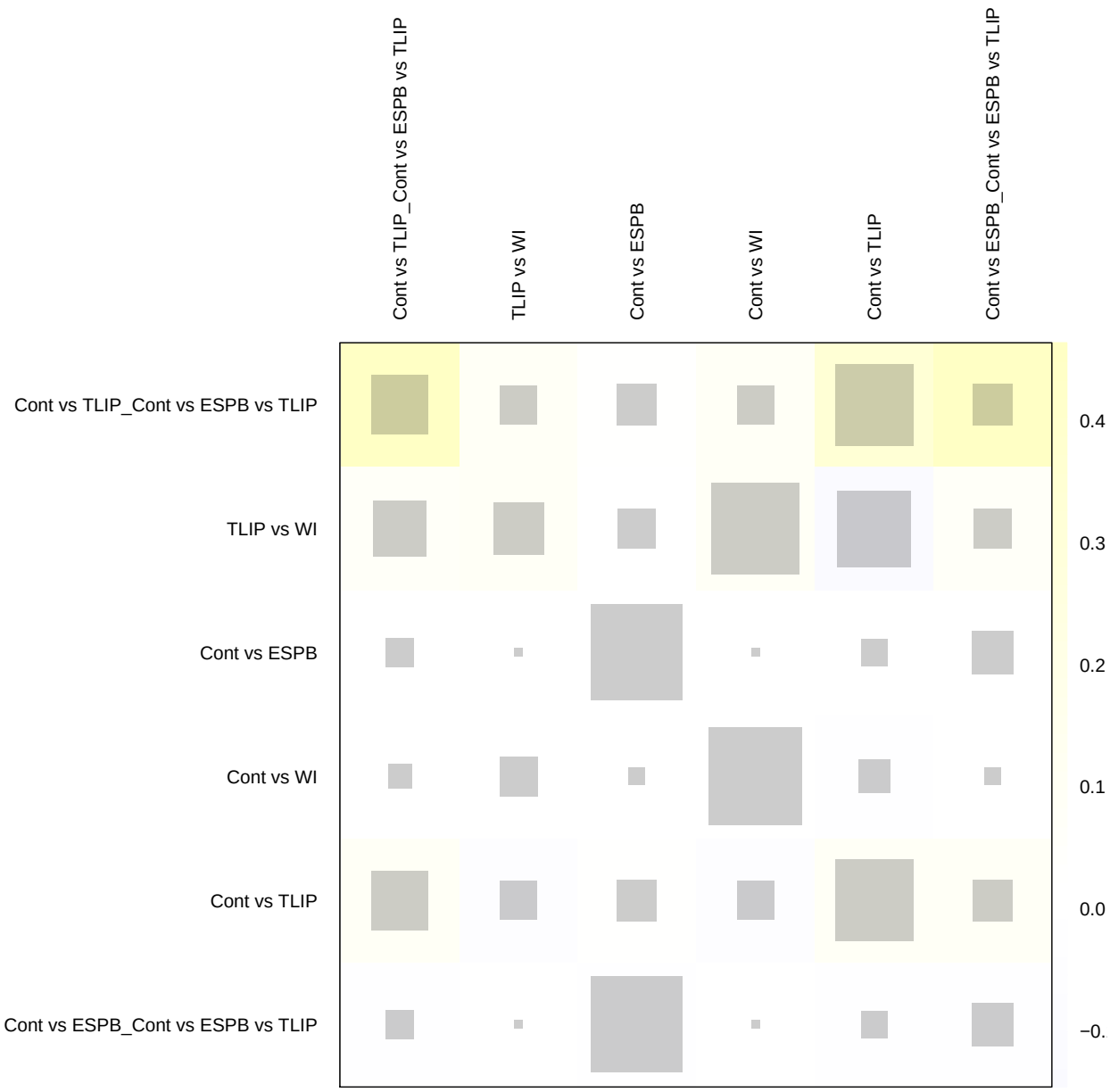
The gray boxes signify how important a treatment comparison is for the estimation of another treatment comparison. The bigger the box, the more important the comparison.

The colored backgrounds signify the amount of inconsistency of the design in a row that can be attributed to the design in a column. Field colors can range from a deep red (which indicates strong inconsistency) to blue (which indicates that evidence from this design supports evidence in the row).

Fixed effect model

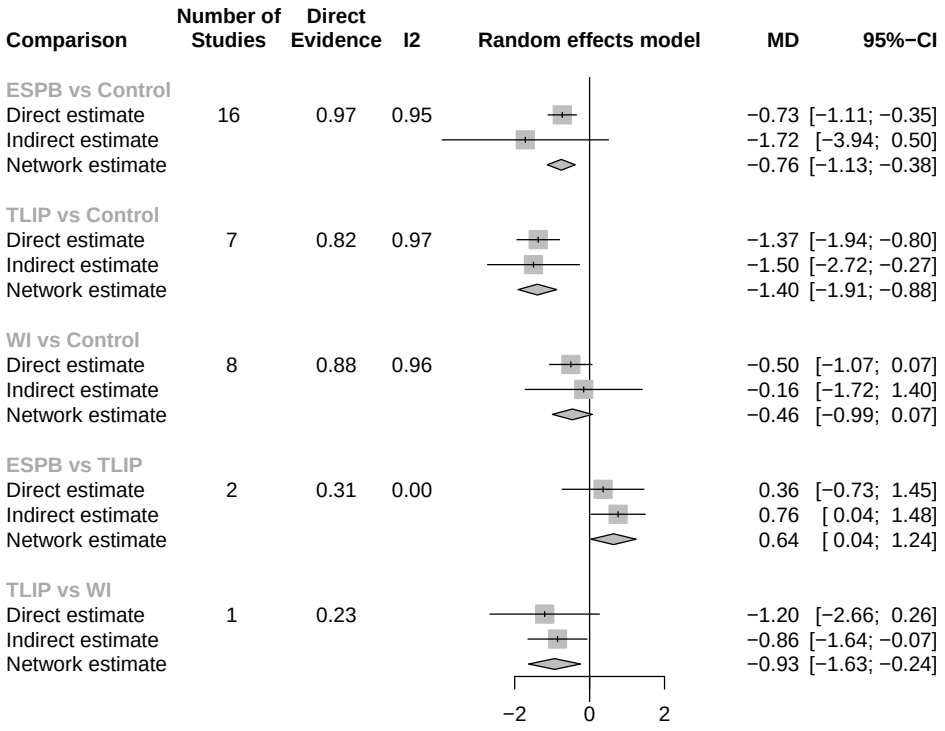


Random effect model



Net Splitting to check for consistency

```
## Separate indirect from direct evidence (SIDE) using back-calculation method
##
## Random effects model:
##
##       comparison  k prop     nma  direct  indir.    Diff     z p-value
##  ESPB vs Control 16 0.97 -0.7572 -0.7294 -1.7161  0.9867  0.86  0.3903
##  TLIP vs Control  7 0.82 -1.3956 -1.3734 -1.4988  0.1255  0.18  0.8556
##    WI vs Control  8 0.88 -0.4612 -0.5012 -0.1584 -0.3428 -0.40  0.6856
##     ESPB vs TLIP  2 0.31  0.6385  0.3598  0.7608 -0.4009 -0.60  0.5484
##       ESPB vs WI  0    0 -0.2960       . -0.2960       .     .       .
##       TLIP vs WI  1 0.23 -0.9344 -1.2000 -0.8572 -0.3428 -0.40  0.6856
##
## Legend:
##  comparison - Treatment comparison
##  k          - Number of studies providing direct evidence
##  prop       - Direct evidence proportion
##  nma        - Estimated treatment effect (MD) in network meta-analysis
##  direct     - Estimated treatment effect (MD) derived from direct evidence
##  indir.     - Estimated treatment effect (MD) derived from indirect evidence
##  Diff       - Difference between direct and indirect treatment estimates
##  z          - z-value of test for disagreement (direct versus indirect)
##  p-value    - p-value of test for disagreement (direct versus indirect)
```


Comparison
Number of Studies
Direct Evidence
I2
Random effects model
MD
95%−CI
ESPB vs Control
Direct estimate 16 0.97 0.95 −0.73 [−1.11; −0.35]
Indirect estimate −1.72 [−3.94; 0.50]
Network estimate −0.76 [−1.13; −0.38]
TLIP vs Control
Direct estimate 7 0.82 0.97 −1.37 [−1.94; −0.80]
Indirect estimate −1.50 [−2.72; −0.27]
Network estimate −1.40 [−1.91; −0.88]
WI vs Control
Direct estimate 8 0.88 0.96 −0.50 [−1.07; 0.07]
Indirect estimate −0.16 [−1.72; 1.40]
Network estimate −0.46 [−0.99; 0.07]
ESPB vs TLIP
Direct estimate 2 0.31 0.00 0.36 [−0.73; 1.45]
Indirect estimate 0.76 [0.04; 1.48]
Network estimate 0.64 [0.04; 1.24]
TLIP vs WI
Direct estimate 1 0.23 −1.20 [−2.66; 0.26]
Indirect estimate −0.86 [−1.64; −0.07]
Network estimate −0.93 [−1.63; −0.24]
−2
0
2

Comparison-Adjusted Funnel Plots

```
## Warning: Use argument 'method.bias' instead of 'linreg' (deprecated).
```