Untitled

Load Data

```
library(readr)
library(psych)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
click_data <- read_csv("click_data.csv")
```

```
## Parsed with column specification:
## cols(
##   .default = col_character(),
##   trial_num = col_double(),
##   subj_num = col_double(),
##   rep = col_double(),
##   constrained = col_double(),
##   click_error = col_double(),
##   `27649` = col_logical(),
##   `407` = col_double()
## )
```

```
## See spec(...) for full column specifications.
```

Clean up some data

```
click_data$list <- as.factor(click_data$list)
click_data$subj_num <- as.factor(click_data$subj_num)

click_data[click_data=="#N/A"] <- NA
```

Split the data into groups

```
clicks <- split(click_data, click_data$subj_num)
```

Run calculations against each group

```
results <- data.frame(subject = integer(), listing = character(), consLegalErrors = integer(), consIlleg
clickVals <- c("!", "|")
for (cnst in clicks) {
  numConsLegal <- 0
  numConsIllegal <- 0
  numClickLegal <- 0
  numClickIllegal <- 0
  restrictedConsSlipLegal <- 0
  restrictedConsSlipIllegal <- 0
  unrestrictConsSlipLegal <- 0
  unrestrictConsSlipIllegal <- 0

  restrictedClickSlipLegal <- 0
  restrictedClickSlipIllegal <- 0
  unrestrictClickSlipLegal <- 0
  unrestrictClickSlipIllegal <- 0

  consToCons <- 0
  consToClick <- 0
  clickToCons <- 0
  clickToClick <- 0

  listing <- ""
  for(i in 1:nrow(cnst)) {
    # Get a single row of data
    row <- cnst[i, ]

    # Print out some information about what we are looking at
    if (i == 1) {
      listing <- as.character(row$list)
      print(paste("Results for ", as.integer(row$subj_num)))
      print(paste("With listing ", listing))
    }

    # There is a slip
    if (!is.na(row$slip)) {
      # It is a click
      if (row$slip %in% clickVals) {
        # There is a legal computation for it
        if (!is.na(row$legal)) {
          # It is a legal click error
          if (row$legal == 1) {
            numClickLegal <- numClickLegal + 1
          } else {
          # It is an illegal click error
            numClickIllegal <- numClickIllegal + 1
          }
        }
      # It is not a click (consonant)
      } else {
        # There is a legal computation for it
        if (!is.na(row$legal)) {
          # It is a legal consonant error
```

```
    if (row$legal == 1) {
      numConsLegal <- numConsLegal + 1
    } else {
    # It is an illegal consonant error
      numConsIllegal <- numConsIllegal + 1
    }
  }
}

#-------------------------------------------------------------------------------------------------------

# Proportion of restricted consonant slips vs proportion of unrestricted consonant slips
if (row$slip != "-") {
  if (row$slip %in% unlist(strsplit(listing, ""))) {
    # Any slip here is restricted
    if (row$slip != "!" && row$slip != "|") {
      # Consonant slip (restricted)
      if (!is.na(row$legal) && row$legal == 0) {
        # Consonant slip (restricted and illegal)
        restrictedConsSlipIllegal <- restrictedConsSlipIllegal + 1
      } else if (!is.na(row$legal) && row$legal == 1) {
        # Consonant slip (restricted and legal)
        restrictedConsSlipLegal <- restrictedConsSlipLegal + 1
      }
    } else {
      # Click Slip (restricted)
      if (!is.na(row$legal) && row$legal == 0) {
        # Click slip (restricted and illegal)
        restrictedClickSlipIllegal <- restrictedClickSlipIllegal + 1
      } else if (!is.na(row$legal) && row$legal == 1) {
        # Click slip (restricted and legal)
        restrictedClickSlipLegal <- restrictedClickSlipLegal + 1
      }
    }
  } else {
    # Any slip here is unrestricted
    if (row$slip != "!" && row$slip != "|") {
      # Consonant Slip (unrestricted)
      if (!is.na(row$legal) && row$legal == 0) {
        # Consonant slip (unrestricted and illegal)
        unrestrictConsSlipIllegal <- unrestrictConsSlipIllegal + 1
      } else if (!is.na(row$legal) && row$legal == 1) {
        # Consonant slip (unrestricted and legal)
        unrestrictConsSlipLegal <- unrestrictConsSlipLegal + 1
      }
    } else {
      # Click Slip (unrestricted)
      if (!is.na(row$legal) && row$legal == 0) {
        # Click slip (unrestricted and illegal)
        unrestrictClickSlipIllegal <- unrestrictClickSlipIllegal + 1
      } else if (!is.na(row$legal) && row$legal == 1) {
        # Click slip (unrestricted and legal)
        unrestrictClickSlipLegal <- unrestrictClickSlipLegal + 1
```

```
          }
        }
      }
    }

    #-------------------------------------------------------------------------------------------

    # Seeing the type of slip
    if (row$slip != "-") {
      actual <- as.character(row[substr(row$index, start = 1, stop = 3)])
      if (!(actual %in% clickVals) && !(row$slip %in% clickVals)) {
        # Consonant to consonant
        consToCons <- consToCons + 1
      } else if ((actual %in% clickVals) && !(row$slip %in% clickVals)) {
        # Click to consonant
        clickToCons <- clickToCons + 1
      } else if (!(actual %in% clickVals) && (row$slip %in% clickVals)) {
        # Consonant to click
        consToClick <- consToClick + 1
      } else {
        # click to click
        clickToClick <- clickToClick + 1
      }
    }
  }
}


print("-----------------------------------------")
print(paste("Number consonant legal errors: ", numConsLegal))
print(paste("Number consonant illegal errors: ", numConsIllegal))
print(paste("Percent consonant Legal ", (numConsLegal/(numConsLegal+numConsIllegal)) * 100 ))
print(paste("Percent consonant Illegal ", (numConsIllegal/(numConsLegal+numConsIllegal)) * 100))
print(paste("Number click legal errors: ", numClickLegal))
print(paste("Number click illegal errors: ", numClickIllegal))
print(paste("Percent click Legal ", (numClickLegal/(numClickLegal+numClickIllegal)) * 100 ))
print(paste("Percent click Illegal ", (numClickIllegal/(numClickLegal+numClickIllegal)) * 100))
print("")
print(paste("Percent restricted consonant legal", (restrictedConsSlipLegal/(restrictedConsSlipLegal +
print(paste("Percent restricted consonant illlegal", (restrictedConsSlipIllegal/(restrictedConsSlipLeg
print(paste("Percent unrestricted consonant legal", (unrestrictConsSlipLegal/(unrestrictConsSlipLegal
print(paste("Percent unrestricted consonant illegal", (unrestrictConsSlipIllegal/(unrestrictConsSlipL

print(paste("Percent restricted click legal", (restrictedClickSlipLegal/(restrictedClickSlipLegal + re
print(paste("Percent restricted click illlegal", (restrictedClickSlipIllegal/(restrictedClickSlipLegal
print(paste("Percent unrestricted click legal", (unrestrictClickSlipLegal/(unrestrictClickSlipLegal +
print(paste("Percent unrestricted click illegal", (unrestrictClickSlipIllegal/(unrestrictClickSlipLega
print("")


phiData <- matrix(c(consToCons, clickToCons, consToClick, clickToClick), ncol=2)
rownames(phiData) <- c('consonant target', 'click target')
colnames(phiData) <- c('consonant slip', 'click slip')
```

```
  phiVal <- phi(phiData, digits = 5)
  print(phiData)
  print(paste("Phi value: ", phiVal))
  results[nrow(results) + 1, ] <- list(as.integer(row$subj_num), listing, numConsLegal, numConsIllegal,

  print("=========================================")
  print("")
}
```

```
## [1] "Results for  1"
## [1] "With listing  tk"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  88"
## [1] "Number consonant illegal errors:  23"
## [1] "Percent consonant Legal  79.2792792792793"
## [1] "Percent consonant Illegal  20.7207207207207"
## [1] "Number click legal errors:  13"
## [1] "Number click illegal errors:  16"
## [1] "Percent click Legal  44.8275862068966"
## [1] "Percent click Illegal  55.1724137931034"
## [1] ""
## [1] "Percent restricted consonant legal 97.0588235294118"
## [1] "Percent restricted consonant illlegal 2.94117647058824"
## [1] "Percent unrestricted consonant legal 71.4285714285714"
## [1] "Percent unrestricted consonant illegal 28.5714285714286"
## [1] "Percent restricted click legal NaN"
## [1] "Percent restricted click illlegal NaN"
## [1] "Percent unrestricted click legal 44.8275862068966"
## [1] "Percent unrestricted click illegal 55.1724137931034"
## [1] ""
##                   consonant slip click slip
## consonant target             98          5
## click target                 21         24
## [1] "Phi value:  0.56183"
## [1] "========================================="
## [1] ""
## [1] "Results for  2"
## [1] "With listing  kt"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  118"
## [1] "Number consonant illegal errors:  19"
## [1] "Percent consonant Legal  86.1313868613139"
## [1] "Percent consonant Illegal  13.8686131386861"
## [1] "Number click legal errors:  12"
## [1] "Number click illegal errors:  24"
## [1] "Percent click Legal  33.3333333333333"
## [1] "Percent click Illegal  66.6666666666667"
## [1] ""
## [1] "Percent restricted consonant legal 84.6153846153846"
## [1] "Percent restricted consonant illlegal 15.3846153846154"
## [1] "Percent unrestricted consonant legal 86.734693877551"
## [1] "Percent unrestricted consonant illegal 13.265306122449"
## [1] "Percent restricted click legal NaN"
## [1] "Percent restricted click illlegal NaN"
```

```
## [1] "Percent unrestricted click legal 33.3333333333333"
## [1] "Percent unrestricted click illegal 66.6666666666667"
## [1] ""
##                  consonant slip click slip
## consonant target            133         27
## click target                  9          9
## [1] "Phi value:  0.24863"
## [1] "========================================="
## [1] ""
## [1] "Results for  3"
## [1] "With listing  |t"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  51"
## [1] "Number consonant illegal errors:  12"
## [1] "Percent consonant Legal  80.9523809523809"
## [1] "Percent consonant Illegal  19.047619047619"
## [1] "Number click legal errors:  0"
## [1] "Number click illegal errors:  0"
## [1] "Percent click Legal  NaN"
## [1] "Percent click Illegal  NaN"
## [1] ""
## [1] "Percent restricted consonant legal 80"
## [1] "Percent restricted consonant illlegal 20"
## [1] "Percent unrestricted consonant legal 81.0344827586207"
## [1] "Percent unrestricted consonant illegal 18.9655172413793"
## [1] "Percent restricted click legal NaN"
## [1] "Percent restricted click illlegal NaN"
## [1] "Percent unrestricted click legal NaN"
## [1] "Percent unrestricted click illegal NaN"
## [1] ""
##                  consonant slip click slip
## consonant target             62          0
## click target                  3          0
## [1] "Phi value:  NaN"
## [1] "========================================="
## [1] ""
## [1] "Results for  4"
## [1] "With listing  t|"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  55"
## [1] "Number consonant illegal errors:  38"
## [1] "Percent consonant Legal  59.1397849462366"
## [1] "Percent consonant Illegal  40.8602150537634"
## [1] "Number click legal errors:  11"
## [1] "Number click illegal errors:  8"
## [1] "Percent click Legal  57.8947368421053"
## [1] "Percent click Illegal  42.1052631578947"
## [1] ""
## [1] "Percent restricted consonant legal 100"
## [1] "Percent restricted consonant illlegal 0"
## [1] "Percent unrestricted consonant legal 55.8139534883721"
## [1] "Percent unrestricted consonant illegal 44.1860465116279"
## [1] "Percent restricted click legal 77.7777777777778"
## [1] "Percent restricted click illlegal 22.2222222222222"
```

```
## [1] "Percent unrestricted click legal 40"
## [1] "Percent unrestricted click illegal 60"
## [1] ""
##                  consonant slip click slip
## consonant target             88          6
## click target                  5         13
## [1] "Phi value:  0.64427"
## [1] "========================================="
## [1] ""
## [1] "Results for  5"
## [1] "With listing  !t"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  156"
## [1] "Number consonant illegal errors:  59"
## [1] "Percent consonant Legal  72.5581395348837"
## [1] "Percent consonant Illegal  27.4418604651163"
## [1] "Number click legal errors:  21"
## [1] "Number click illegal errors:  77"
## [1] "Percent click Legal  21.4285714285714"
## [1] "Percent click Illegal  78.5714285714286"
## [1] ""
## [1] "Percent restricted consonant legal 96"
## [1] "Percent restricted consonant illlegal 4"
## [1] "Percent unrestricted consonant legal 69.4736842105263"
## [1] "Percent unrestricted consonant illegal 30.5263157894737"
## [1] "Percent restricted click legal 37.5"
## [1] "Percent restricted click illlegal 62.5"
## [1] "Percent unrestricted click legal 10.3448275862069"
## [1] "Percent unrestricted click illegal 89.6551724137931"
## [1] ""
##                  consonant slip click slip
## consonant target            239         73
## click target                 36         25
## [1] "Phi value:  0.14779"
## [1] "========================================="
## [1] ""
## [1] "Results for  6"
## [1] "With listing  t!"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  140"
## [1] "Number consonant illegal errors:  35"
## [1] "Percent consonant Legal  80"
## [1] "Percent consonant Illegal  20"
## [1] "Number click legal errors:  11"
## [1] "Number click illegal errors:  23"
## [1] "Percent click Legal  32.3529411764706"
## [1] "Percent click Illegal  67.6470588235294"
## [1] ""
## [1] "Percent restricted consonant legal 82.2222222222222"
## [1] "Percent restricted consonant illlegal 17.7777777777778"
## [1] "Percent unrestricted consonant legal 79.2307692307692"
## [1] "Percent unrestricted consonant illegal 20.7692307692308"
## [1] "Percent restricted click legal 36.3636363636364"
## [1] "Percent restricted click illlegal 63.6363636363636"
```

```
## [1] "Percent unrestricted click legal 30.4347826086957"
## [1] "Percent unrestricted click illegal 69.5652173913043"
## [1] ""
##                  consonant slip click slip
## consonant target            128         20
## click target                 47         14
## [1] "Phi value:  0.11625"
## [1] "========================================="
## [1] ""
## [1] "Results for  7"
## [1] "With listing  k|"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  178"
## [1] "Number consonant illegal errors:  96"
## [1] "Percent consonant Legal  64.963503649635"
## [1] "Percent consonant Illegal  35.036496350365"
## [1] "Number click legal errors:  9"
## [1] "Number click illegal errors:  20"
## [1] "Percent click Legal  31.0344827586207"
## [1] "Percent click Illegal  68.9655172413793"
## [1] ""
## [1] "Percent restricted consonant legal 87.5"
## [1] "Percent restricted consonant illlegal 12.5"
## [1] "Percent unrestricted consonant legal 60.1769911504425"
## [1] "Percent unrestricted consonant illegal 39.8230088495575"
## [1] "Percent restricted click legal 75"
## [1] "Percent restricted click illlegal 25"
## [1] "Percent unrestricted click legal 0"
## [1] "Percent unrestricted click illegal 100"
## [1] ""
##                  consonant slip click slip
## consonant target            268         24
## click target                 68          5
## [1] "Phi value:  -0.02026"
## [1] "========================================="
## [1] ""
## [1] "Results for  8"
## [1] "With listing  |k"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  140"
## [1] "Number consonant illegal errors:  25"
## [1] "Percent consonant Legal  84.8484848484848"
## [1] "Percent consonant Illegal  15.1515151515152"
## [1] "Number click legal errors:  21"
## [1] "Number click illegal errors:  22"
## [1] "Percent click Legal  48.8372093023256"
## [1] "Percent click Illegal  51.1627906976744"
## [1] ""
## [1] "Percent restricted consonant legal 96.6666666666667"
## [1] "Percent restricted consonant illlegal 3.33333333333333"
## [1] "Percent unrestricted consonant legal 82.2222222222222"
## [1] "Percent unrestricted consonant illegal 17.7777777777778"
## [1] "Percent restricted click legal 69.2307692307692"
## [1] "Percent restricted click illlegal 30.7692307692308"
```

```
## [1] "Percent unrestricted click legal 40"
## [1] "Percent unrestricted click illegal 60"
## [1] ""
##                  consonant slip click slip
## consonant target            148         18
## click target                 22         25
## [1] "Phi value:  0.4375"
## [1] "========================================="
## [1] ""
## [1] "Results for  9"
## [1] "With listing  k!"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  67"
## [1] "Number consonant illegal errors:  16"
## [1] "Percent consonant Legal  80.7228915662651"
## [1] "Percent consonant Illegal  19.2771084337349"
## [1] "Number click legal errors:  5"
## [1] "Number click illegal errors:  7"
## [1] "Percent click Legal  41.6666666666667"
## [1] "Percent click Illegal  58.3333333333333"
## [1] ""
## [1] "Percent restricted consonant legal 75"
## [1] "Percent restricted consonant illlegal 25"
## [1] "Percent unrestricted consonant legal 81.6901408450704"
## [1] "Percent unrestricted consonant illegal 18.3098591549296"
## [1] "Percent restricted click legal 100"
## [1] "Percent restricted click illlegal 0"
## [1] "Percent unrestricted click legal 30"
## [1] "Percent unrestricted click illegal 70"
## [1] ""
##                  consonant slip click slip
## consonant target             92          8
## click target                 10          4
## [1] "Phi value:  0.22001"
## [1] "========================================="
## [1] ""
## [1] "Results for  10"
## [1] "With listing  !k"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  18"
## [1] "Number consonant illegal errors:  11"
## [1] "Percent consonant Legal  62.0689655172414"
## [1] "Percent consonant Illegal  37.9310344827586"
## [1] "Number click legal errors:  10"
## [1] "Number click illegal errors:  5"
## [1] "Percent click Legal  66.6666666666667"
## [1] "Percent click Illegal  33.3333333333333"
## [1] ""
## [1] "Percent restricted consonant legal 66.6666666666667"
## [1] "Percent restricted consonant illlegal 33.3333333333333"
## [1] "Percent unrestricted consonant legal 61.5384615384615"
## [1] "Percent unrestricted consonant illegal 38.4615384615385"
## [1] "Percent restricted click legal 83.3333333333333"
## [1] "Percent restricted click illlegal 16.6666666666667"
```

```
## [1] "Percent unrestricted click legal 55.5555555555556"
## [1] "Percent unrestricted click illegal 44.4444444444444"
## [1] ""
##                  consonant slip click slip
## consonant target             24          4
## click target                  5         11
## [1] "Phi value:  0.55272"
## [1] "========================================="
## [1] ""
## [1] "Results for  11"
## [1] "With listing  |!"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  104"
## [1] "Number consonant illegal errors:  45"
## [1] "Percent consonant Legal  69.7986577181208"
## [1] "Percent consonant Illegal  30.2013422818792"
## [1] "Number click legal errors:  5"
## [1] "Number click illegal errors:  24"
## [1] "Percent click Legal  17.2413793103448"
## [1] "Percent click Illegal  82.7586206896552"
## [1] ""
## [1] "Percent restricted consonant legal NaN"
## [1] "Percent restricted consonant illlegal NaN"
## [1] "Percent unrestricted consonant legal 69.7986577181208"
## [1] "Percent unrestricted consonant illegal 30.2013422818792"
## [1] "Percent restricted click legal 17.2413793103448"
## [1] "Percent restricted click illlegal 82.7586206896552"
## [1] "Percent unrestricted click legal NaN"
## [1] "Percent unrestricted click illegal NaN"
## [1] ""
##                  consonant slip click slip
## consonant target            128         12
## click target                 23         17
## [1] "Phi value:  0.38368"
## [1] "========================================="
## [1] ""
## [1] "Results for  12"
## [1] "With listing  !|"
## [1] "-----------------------------------------"
## [1] "Number consonant legal errors:  227"
## [1] "Number consonant illegal errors:  86"
## [1] "Percent consonant Legal  72.5239616613419"
## [1] "Percent consonant Illegal  27.4760383386581"
## [1] "Number click legal errors:  12"
## [1] "Number click illegal errors:  51"
## [1] "Percent click Legal  19.047619047619"
## [1] "Percent click Illegal  80.9523809523809"
## [1] ""
## [1] "Percent restricted consonant legal NaN"
## [1] "Percent restricted consonant illlegal NaN"
## [1] "Percent unrestricted consonant legal 72.5239616613419"
## [1] "Percent unrestricted consonant illegal 27.4760383386581"
## [1] "Percent restricted click legal 19.047619047619"
## [1] "Percent restricted click illlegal 80.9523809523809"
```

```
## [1] "Percent unrestricted click legal NaN"
## [1] "Percent unrestricted click illegal NaN"
## [1] ""
##                  consonant slip click slip
## consonant target            291         51
## click target                 52         12
## [1] "Phi value:  0.03862"
## [1] "========================================="
## [1] ""
```

```
print("")
```

```
## [1] ""
```

```
print("")
```

```
## [1] ""
```

```
print("")
```

```
## [1] ""
```

```
totalConsLegal <- sum(results$consLegalErrors)
totalConsIllegal <- sum(results$consIllegalErrors)
totalConsError <- totalConsLegal + totalConsIllegal
totalClicksLegal <- sum(results$clicksLegalErrors)
totalClicksIllegal <- sum(results$clicksIllegalErrors)
totalClicksError <- totalClicksLegal+ totalClicksIllegal
phiDataTotal <- matrix(c(sum(results$consToCons), sum(results$clickToCons), sum(results$consToClick), su
rownames(phiDataTotal) <- c('consonant target', 'click target')
colnames(phiDataTotal) <- c('consonant slip', 'click slip')
totalPhi <- phi(phiDataTotal, digits = 5)

print(paste("Total percent of consonant legal errors: ", (totalConsLegal/totalConsError)*100))
```

```
## [1] "Total percent of consonant legal errors:  74.2667404537908"
```

```
print(paste("Total percent of consonant illegal errors: ", (totalConsIllegal/totalConsError)*100))
```

```
## [1] "Total percent of consonant illegal errors:  25.7332595462092"
```

```
print(paste("Total percent of clicks legal errors: ", (totalClicksLegal/totalClicksError)*100))
```

```
## [1] "Total percent of clicks legal errors:  31.9410319410319"
```

```
print(paste("Total percent of clicks illegal errors: ", (totalClicksIllegal/totalClicksError)*100))
```

```
## [1] "Total percent of clicks illegal errors:  68.0589680589681"
```

```
print(phiDataTotal)
```

```
##                  consonant slip click slip
## consonant target           1699         301
## click target                248         159
```

```
print(paste("Phi values for all subjects: ", totalPhi))
```

```
## [1] "Phi values for all subjects:  0.22896"
```

```
percentsLegality <- data.frame(subject = integer(),
```

```
                      percentRestrictConsonantLegal = numeric(),
                      percentRestrictConsonantIllegal = numeric(),
                      percentUnrestrictConsonantLegal = numeric(),
                      percentUnrestrictConsonantIllegal = numeric(),

                      percentRestrictClickLegal = numeric(),
                      percentRestrictClickIllegal = numeric(),
                      percentUnrestrictClickLegal = numeric(),
                      percentUnrestrictClickIllegal = numeric())
for(i in 1:nrow(results)) {
  row <- results[i, ]
  percentsLegality[i, ] <- c(row$subject,
                     (row$restrictedConsonantSlipsLegal/(row$restrictedConsonantSlipsLegal+row$restricte
                     (row$restrictedConsonantSlipsIllegal/(row$restrictedConsonantSlipsLegal+row$restri
                     (row$unrestrictedConsonantSlipsLegal/(row$unrestrictedConsonantSlipsIllegal+row$un
                     (row$unrestrictedConsonantSlipsIllegal/(row$unrestrictedConsonantSlipsIllegal+row$

                     (row$restrictedClickSlipsLegal/(row$restrictedClickSlipsLegal+row$restrictedClickS
                     (row$restrictedClickSlipsIllegal/(row$restrictedClickSlipsLegal+row$restrictedClic
                     (row$unrestrictedClickSlipsLegal/(row$unrestrictedClickSlipsLegal + row$unrestricte
                     (row$unrestrictedClickSlipsIllegal/(row$unrestrictedClickSlipsLegal + row$unrestri
}

percentsLegality
```

```
##    subject percentRestrictConsonantLegal percentRestrictConsonantIllegal
## 1        1                     0.9705882                      0.02941176
## 2        2                     0.8461538                      0.15384615
## 3        3                     0.8000000                      0.20000000
## 4        4                     1.0000000                      0.00000000
## 5        5                     0.9600000                      0.04000000
## 6        6                     0.8222222                      0.17777778
## 7        7                     0.8750000                      0.12500000
## 8        8                     0.9666667                      0.03333333
## 9        9                     0.7500000                      0.25000000
## 10      10                     0.6666667                      0.33333333
## 11      11                           NaN                             NaN
## 12      12                           NaN                             NaN
##    percentUnrestrictConsonantLegal percentUnrestrictConsonantIllegal
## 1                        0.7142857                         0.2857143
## 2                        0.8673469                         0.1326531
## 3                        0.8103448                         0.1896552
## 4                        0.5581395                         0.4418605
## 5                        0.6947368                         0.3052632
## 6                        0.7923077                         0.2076923
## 7                        0.6017699                         0.3982301
## 8                        0.8222222                         0.1777778
## 9                        0.8169014                         0.1830986
## 10                       0.6153846                         0.3846154
## 11                       0.6979866                         0.3020134
## 12                       0.7252396                         0.2747604
##    percentRestrictClickLegal percentRestrictClickIllegal
## 1                        NaN                         NaN
## 2                        NaN                         NaN
```

```
## 3                       NaN                       NaN
## 4                 0.7777778                 0.2222222
## 5                 0.3750000                 0.6250000
## 6                 0.3636364                 0.6363636
## 7                 0.7500000                 0.2500000
## 8                 0.6923077                 0.3076923
## 9                 1.0000000                 0.0000000
## 10                0.8333333                 0.1666667
## 11                0.1724138                 0.8275862
## 12                0.1904762                 0.8095238
##    percentUnrestrictClickLegal percentUnrestrictClickIllegal
## 1                    0.4482759                    0.5517241
## 2                    0.3333333                    0.6666667
## 3                          NaN                          NaN
## 4                    0.4000000                    0.6000000
## 5                    0.1034483                    0.8965517
## 6                    0.3043478                    0.6956522
## 7                    0.0000000                    1.0000000
## 8                    0.4000000                    0.6000000
## 9                    0.3000000                    0.7000000
## 10                   0.5555556                    0.4444444
## 11                         NaN                          NaN
## 12                         NaN                          NaN
```

```
percentsNoLegality <- data.frame(subject = integer(),
                                 percentRestrictedConsonant = numeric(),
                                 percentUnrestrictedConsonant = numeric(),

                                 percentRestrictedClick = numeric(),
                                 percentUnrestrictedClick = numeric())
for (i in 1:nrow(results)) {
  row <- results[i, ]
  percentsNoLegality[i, ] <- c(row$subject,
                               (row$restrictedConsonantSlipsLegal + row$restrictedConsonantSlipsIllegal
                               (row$unrestrictedConsonantSlipsLegal + row$unrestrictedConsonantSlipsIll

                               (row$restrictedClickSlipsLegal + row$restrictedClickSlipsIllegal)/(row$r
                               (row$unrestrictedClickSlipsLegal + row$unrestrictedClickSlipsIllegal)/(r
                               )
}

percentsNoLegality
```

```
##    subject percentRestrictedConsonant percentUnrestrictedConsonant
## 1        1                  0.30630631                    0.6936937
## 2        2                  0.28467153                    0.7153285
## 3        3                  0.07936508                    0.9206349
## 4        4                  0.07526882                    0.9247312
## 5        5                  0.11627907                    0.8837209
## 6        6                  0.25714286                    0.7428571
## 7        7                  0.17518248                    0.8248175
## 8        8                  0.18181818                    0.8181818
## 9        9                  0.14457831                    0.8554217
## 10      10                  0.10344828                    0.8965517
## 11      11                  0.00000000                    1.0000000
```

```
## 12      12                 0.00000000                   1.0000000
##    percentRestrictedClick percentUnrestrictedClick
## 1               0.0000000               1.0000000
## 2               0.0000000               1.0000000
## 3                     NaN                     NaN
## 4               0.4736842               0.5263158
## 5               0.4081633               0.5918367
## 6               0.3235294               0.6764706
## 7               0.4137931               0.5862069
## 8               0.3023256               0.6976744
## 9               0.1666667               0.8333333
## 10              0.4000000               0.6000000
## 11              1.0000000               0.0000000
## 12              1.0000000               0.0000000
```

```
idx <- intersect(which(!is.na(percentsLegality$percentRestrictConsonantLegal)), which(!is.na(percentsLeg
t.test(results$restrictedConsonantSlipsLegal[idx], results$unrestrictedConsonantSlipsLegal[idx], paired
```

```
##
##  Paired t-test
##
## data:  results$restrictedConsonantSlipsLegal[idx] and results$unrestrictedConsonantSlipsLegal[idx]
## t = -5.9492, df = 9, p-value = 0.0002156
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -78.81213 -35.38787
## sample estimates:
## mean of the differences
##                   -57.1
```

```
wilcox.test(results$restrictedConsonantSlipsLegal[idx], results$unrestrictedConsonantSlipsLegal[idx], pa
```

```
##
##  Wilcoxon signed rank test
##
## data:  results$restrictedConsonantSlipsLegal[idx] and results$unrestrictedConsonantSlipsLegal[idx]
## V = 0, p-value = 0.001953
## alternative hypothesis: true location shift is not equal to 0
```

```
idx <- intersect(which(!is.na(percentsLegality$percentRestrictConsonantIllegal)), which(!is.na(percentsl
t.test(results$restrictedConsonantSlipsIllegal[idx], results$unrestrictedConsonantSlipsIllegal[idx], pa
```

```
##
##  Paired t-test
##
## data:  results$restrictedConsonantSlipsIllegal[idx] and results$unrestrictedConsonantSlipsIllegal[idx
## t = -3.4989, df = 9, p-value = 0.006735
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -45.773673  -9.826327
## sample estimates:
## mean of the differences
##                   -27.8
```

```
wilcox.test(results$restrictedConsonantSlipsIllegal[idx], results$unrestrictedConsonantSlipsIllegal[idx
```

```
## Warning in
```

```
## wilcox.test.default(results$restrictedConsonantSlipsIllegal[idx], : cannot
## compute exact p-value with ties
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  results$restrictedConsonantSlipsIllegal[idx] and results$unrestrictedConsonantSlipsIllegal[idx
## V = 0, p-value = 0.005889
## alternative hypothesis: true location shift is not equal to 0
```

```
idx <- intersect(which(!is.na(percentsLegality$percentRestrictClickLegal)), which(!is.na(percentsLegali
t.test(results$restrictedClickSlipsLegal[idx], results$unrestrictedClickSlipsLegal[idx], paired = TRUE)
```

```
##
##  Paired t-test
##
## data:  results$restrictedClickSlipsLegal[idx] and results$unrestrictedClickSlipsLegal[idx]
## t = 1.0184, df = 6, p-value = 0.3478
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.805639  6.805639
## sample estimates:
## mean of the differences
##                       2
```

```
wilcox.test(results$restrictedClickSlipsLegal[idx], results$unrestrictedClickSlipsLegal[idx], paired =
```

```
## Warning in wilcox.test.default(results$restrictedClickSlipsLegal[idx],
## results$unrestrictedClickSlipsLegal[idx], : cannot compute exact p-value
## with ties
```

```
## Warning in wilcox.test.default(results$restrictedClickSlipsLegal[idx],
## results$unrestrictedClickSlipsLegal[idx], : cannot compute exact p-value
## with zeroes
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  results$restrictedClickSlipsLegal[idx] and results$unrestrictedClickSlipsLegal[idx]
## V = 14, p-value = 0.5236
## alternative hypothesis: true location shift is not equal to 0
```

```
idx <- intersect(which(!is.na(percentsLegality$percentRestrictClickIllegal)), which(!is.na(percentsLega
t.test(results$restrictedClickSlipsIllegal[idx], results$unrestrictedClickSlipsIllegal[idx], paired = T
```

```
##
##  Paired t-test
##
## data:  results$restrictedClickSlipsIllegal[idx] and results$unrestrictedClickSlipsIllegal[idx]
## t = -3.5801, df = 6, p-value = 0.01164
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -18.758642  -3.527073
## sample estimates:
## mean of the differences
##               -11.14286
```

```r
wilcox.test(results$restrictedClickSlipsIllegal[idx], results$unrestrictedClickSlipsIllegal[idx], paire
```

```
## Warning in wilcox.test.default(results$restrictedClickSlipsIllegal[idx], :
## cannot compute exact p-value with ties
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  results$restrictedClickSlipsIllegal[idx] and results$unrestrictedClickSlipsIllegal[idx]
## V = 0, p-value = 0.02225
## alternative hypothesis: true location shift is not equal to 0
```