Cognition and Purpose

Gabrielle N. Pfund

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Contents

Preparation

make composites

```
### SENSE OF PURPOSE
# make purpose mean
let$purpose <- composite(let[,c("LE_1", "LE_2", "LE_3", "LE_4",
                                "LE_5", "LE_6")],
                         nomiss = .75)
# exclude people with missing data
let <- let %>%
  filter(!is.na(purpose))

### DEPRESSION
# make depression mean
bdi$depressionM <- composite(bdi[,c("BDI_1", "BDI_2", "BDI_3", "BDI_4", "BDI_5",
                                    "BDI_6", "BDI_7", "BDI_8", "BDI_9", "BDI_10",
                                    "BDI_11", "BDI_12", "BDI_13", "BDI_14", "BDI_15",
                                    "BDI_16", "BDI_17", "BDI_18", "BDI_19", "BDI_20",
                                    "BDI_21")],
                             nomiss = .75)
bdi$depression <- rowSums(bdi[,c("BDI_1", "BDI_2", "BDI_3", "BDI_4", "BDI_5",
                                    "BDI_6", "BDI_7", "BDI_8", "BDI_9", "BDI_10",
                                    "BDI_11", "BDI_12", "BDI_13", "BDI_14", "BDI_15",
                                    "BDI_16", "BDI_17", "BDI_18", "BDI_19", "BDI_20",
                                    "BDI_21")],
                           na.rm = FALSE) # use based on CESD
# exclude people with missing data
bdi <- bdi %>%
  filter(!is.na(depression))


### LONELINESS
# make loneliness mean
ucla$loneliness <- composite(ucla[,c("UCLA_1", "UCLA_2", "UCLA_3", "UCLA_4", "UCLA_5",
                                     "UCLA_6", "UCLA_7", "UCLA_8", "UCLA_9", "UCLA_10",
                                     "UCLA_11", "UCLA_12", "UCLA_13", "UCLA_14", "UCLA_15",
                                     "UCLA_16", "UCLA_17", "UCLA_18", "UCLA_19", "UCLA_20")],
                             nomiss = .75)
# exclude people with missing data
ucla <- ucla %>%
  filter(!is.na(loneliness))

### COGNITIVE DECLINE
# sum excludes participants with any NAs
ad8$decline <- rowSums(ad8[,c("AD8_1", "AD8_2", "AD8_3", "AD8_4",
                              "AD8_5", "AD8_6", "AD8_7", "AD8_8")],
                       na.rm = FALSE)
# dummy coded variable based on score of 2+
ad8$dementia <- ifelse(ad8$decline < 2, yes = 0, no = 1)
# exclude people with missing data
ad8 <- ad8 %>%
  filter(!is.na(decline))
```

```r
# dummy coded Black and white race variable
demo$raceDc <- ifelse(demo$PRACE == 1, yes = 0,
                      no = ifelse(demo$PRACE == 2, yes = 1,
                             no = is.na(demo$raceDc)))
```

```
## Warning: Unknown or uninitialised column: `raceDc`.
```

```r
# dummy coded gender: male = 0, female = 1
demo$genderDc <- ifelse(demo$PGENDER == 1, 0,
                      ifelse(demo$PGENDER == 2, 1,
                             is.na(demo$PGENDER)))
```

merge files

```r
dataA <- merge(demo, let, by = "PARTID", all = FALSE)
dataB <- merge(dataA, ucla, by = "PARTID", all = FALSE)
dataC <- merge(dataB, bdi, by = "PARTID", all = FALSE)
dataCf <- merge(dataC, ad8, by = "PARTID", all = FALSE)
```

standardize necessary variables

```r
# standardize
dataCf$age_z <- as.numeric(scale(dataCf$age, center = TRUE, scale = TRUE))
dataCf$purpose_z <- as.numeric(scale(dataCf$purpose, center = TRUE, scale = TRUE))
dataCf$depression_z <- as.numeric(scale(dataCf$depression, center = TRUE, scale = TRUE))
dataCf$loneliness_z <- as.numeric(scale(dataCf$loneliness, center = TRUE, scale = TRUE))
```

Descriptive Statistics

Cronbach's α

```
# sense of purpose
psych::alpha(let[,c("LE_1", "LE_2", "LE_3", "LE_4", "LE_5", "LE_6")])
```

```
##
## Reliability analysis
## Call: psych::alpha(x = let[, c("LE_1", "LE_2", "LE_3", "LE_4", "LE_5",
##     "LE_6")])
##
##   raw_alpha std.alpha G6(smc) average_r S/N    ase mean   sd median_r
##       0.86      0.87    0.85      0.52 6.5 0.0076  4.2 0.68     0.51
##
##  lower alpha upper     95% confidence boundaries
## 0.85 0.86 0.88
##
##  Reliability if an item is dropped:
##      raw_alpha std.alpha G6(smc) average_r S/N alpha se  var.r med.r
## LE_1      0.85      0.85    0.82      0.53 5.6   0.0085 0.0060  0.53
## LE_2      0.84      0.85    0.83      0.53 5.6   0.0088 0.0057  0.51
## LE_3      0.82      0.83    0.80      0.49 4.8   0.0100 0.0033  0.49
## LE_4      0.83      0.83    0.81      0.50 4.9   0.0096 0.0052  0.47
## LE_5      0.83      0.84    0.81      0.51 5.2   0.0092 0.0050  0.51
## LE_6      0.85      0.86    0.84      0.55 6.1   0.0083 0.0037  0.55
##
##  Item statistics
##        n raw.r std.r r.cor r.drop mean   sd
## LE_1 774  0.78  0.75  0.68   0.63  3.9 1.10
## LE_2 774  0.75  0.75  0.68   0.63  4.0 0.87
## LE_3 775  0.83  0.83  0.80   0.74  4.1 0.89
## LE_4 775  0.81  0.82  0.78   0.72  4.2 0.77
## LE_5 775  0.78  0.79  0.74   0.68  4.3 0.83
## LE_6 775  0.69  0.70  0.61   0.56  4.5 0.77
##
## Non missing response frequency for each item
##         1    2    3    4    5 miss
## LE_1 0.03 0.11 0.17 0.35 0.34    0
## LE_2 0.01 0.05 0.16 0.50 0.28    0
## LE_3 0.01 0.05 0.13 0.44 0.37    0
## LE_4 0.01 0.02 0.14 0.48 0.36    0
## LE_5 0.01 0.04 0.08 0.41 0.47    0
## LE_6 0.01 0.02 0.06 0.26 0.65    0
```

```
# loneliness
psych::alpha(ucla[,c("UCLA_1", "UCLA_2", "UCLA_3", "UCLA_4", "UCLA_5",
                     "UCLA_6", "UCLA_7", "UCLA_8", "UCLA_9", "UCLA_10",
                     "UCLA_11", "UCLA_12", "UCLA_13", "UCLA_14", "UCLA_15",
                     "UCLA_16", "UCLA_17", "UCLA_18", "UCLA_19", "UCLA_20")])
```

```
##
## Reliability analysis
## Call: psych::alpha(x = ucla[, c("UCLA_1", "UCLA_2", "UCLA_3", "UCLA_4",
##     "UCLA_5", "UCLA_6", "UCLA_7", "UCLA_8", "UCLA_9", "UCLA_10",
```

```
##     "UCLA_11", "UCLA_12", "UCLA_13", "UCLA_14", "UCLA_15", "UCLA_16",
##     "UCLA_17", "UCLA_18", "UCLA_19", "UCLA_20")])
##
##   raw_alpha std.alpha G6(smc) average_r S/N    ase mean   sd median_r
##       0.94      0.94    0.95      0.43  15 0.0033  1.8 0.51     0.45
##
##  lower alpha upper     95% confidence boundaries
## 0.93 0.94 0.94
##
##  Reliability if an item is dropped:
##         raw_alpha std.alpha G6(smc) average_r S/N alpha se  var.r med.r
## UCLA_1       0.93      0.94    0.95      0.44  15   0.0034 0.0126  0.45
## UCLA_2       0.93      0.94    0.95      0.44  15   0.0034 0.0119  0.46
## UCLA_3       0.93      0.93    0.94      0.43  14   0.0035 0.0117  0.44
## UCLA_4       0.93      0.94    0.94      0.43  15   0.0035 0.0119  0.45
## UCLA_5       0.93      0.93    0.94      0.43  14   0.0035 0.0123  0.45
## UCLA_6       0.93      0.93    0.94      0.43  14   0.0035 0.0123  0.44
## UCLA_7       0.93      0.93    0.94      0.43  14   0.0035 0.0120  0.44
## UCLA_8       0.93      0.94    0.95      0.44  15   0.0034 0.0123  0.45
## UCLA_9       0.93      0.94    0.95      0.44  15   0.0034 0.0120  0.46
## UCLA_10      0.93      0.93    0.94      0.43  14   0.0035 0.0122  0.44
## UCLA_11      0.93      0.93    0.94      0.43  14   0.0035 0.0128  0.45
## UCLA_12      0.93      0.94    0.95      0.43  15   0.0034 0.0126  0.45
## UCLA_13      0.93      0.93    0.94      0.43  14   0.0035 0.0124  0.44
## UCLA_14      0.93      0.93    0.94      0.43  14   0.0035 0.0124  0.44
## UCLA_15      0.93      0.94    0.95      0.44  15   0.0034 0.0122  0.45
## UCLA_16      0.93      0.93    0.94      0.43  14   0.0035 0.0121  0.45
## UCLA_17      0.94      0.94    0.95      0.46  16   0.0031 0.0069  0.46
## UCLA_18      0.93      0.94    0.95      0.43  15   0.0034 0.0128  0.45
## UCLA_19      0.93      0.93    0.94      0.43  14   0.0035 0.0116  0.45
## UCLA_20      0.93      0.93    0.94      0.43  14   0.0035 0.0113  0.45
##
##  Item statistics
##            n raw.r std.r r.cor r.drop mean   sd
## UCLA_1   774  0.63  0.65  0.62   0.60  1.6 0.58
## UCLA_2   774  0.64  0.63  0.60   0.59  2.1 0.91
## UCLA_3   774  0.76  0.75  0.74   0.72  1.6 0.82
## UCLA_4   772  0.69  0.67  0.66   0.64  1.9 0.83
## UCLA_5   774  0.72  0.72  0.71   0.68  1.7 0.78
## UCLA_6   774  0.72  0.74  0.72   0.69  1.7 0.63
## UCLA_7   774  0.76  0.75  0.74   0.72  1.6 0.82
## UCLA_8   774  0.64  0.64  0.61   0.59  2.1 0.82
## UCLA_9   774  0.57  0.59  0.56   0.53  1.6 0.62
## UCLA_10  774  0.74  0.75  0.74   0.71  1.6 0.62
## UCLA_11  774  0.73  0.73  0.71   0.69  2.0 0.78
## UCLA_12  774  0.68  0.67  0.65   0.63  1.7 0.80
## UCLA_13  774  0.72  0.72  0.70   0.68  1.9 0.84
## UCLA_14  774  0.74  0.73  0.72   0.70  1.9 0.86
## UCLA_15  774  0.64  0.64  0.61   0.59  1.6 0.78
## UCLA_16  773  0.71  0.72  0.70   0.67  1.7 0.70
## UCLA_17  774  0.38  0.37  0.32   0.30  2.2 0.84
## UCLA_18  773  0.66  0.66  0.64   0.62  2.1 0.79
## UCLA_19  774  0.71  0.72  0.72   0.68  1.4 0.65
## UCLA_20  774  0.72  0.74  0.73   0.69  1.4 0.64
```

```
##
## Non missing response frequency for each item
##            1    2    3    4 miss
## UCLA_1  0.44 0.52 0.03 0.01    0
## UCLA_2  0.33 0.32 0.31 0.05    0
## UCLA_3  0.60 0.23 0.16 0.02    0
## UCLA_4  0.36 0.39 0.22 0.03    0
## UCLA_5  0.49 0.37 0.11 0.03    0
## UCLA_6  0.38 0.55 0.06 0.01    0
## UCLA_7  0.61 0.22 0.15 0.02    0
## UCLA_8  0.28 0.39 0.32 0.02    0
## UCLA_9  0.49 0.46 0.05 0.01    0
## UCLA_10 0.43 0.51 0.05 0.01    0
## UCLA_11 0.26 0.48 0.24 0.03    0
## UCLA_12 0.46 0.36 0.16 0.02    0
## UCLA_13 0.36 0.38 0.23 0.03    0
## UCLA_14 0.39 0.34 0.24 0.03    0
## UCLA_15 0.56 0.32 0.08 0.04    0
## UCLA_16 0.44 0.46 0.07 0.02    0
## UCLA_17 0.24 0.35 0.38 0.03    0
## UCLA_18 0.24 0.43 0.31 0.02    0
## UCLA_19 0.69 0.25 0.05 0.01    0
## UCLA_20 0.71 0.23 0.05 0.01    0
```

```
# depressive symptoms
psych::alpha(dataCf[,c("BDI_1", "BDI_2", "BDI_3", "BDI_4", "BDI_5",
                       "BDI_6", "BDI_7", "BDI_8", "BDI_9", "BDI_10",
                       "BDI_11", "BDI_12", "BDI_13", "BDI_14", "BDI_15",
                       "BDI_16", "BDI_17", "BDI_18", "BDI_19", "BDI_20",
                       "BDI_21")])
```

```
##
## Reliability analysis
## Call: psych::alpha(x = dataCf[, c("BDI_1", "BDI_2", "BDI_3", "BDI_4",
##     "BDI_5", "BDI_6", "BDI_7", "BDI_8", "BDI_9", "BDI_10", "BDI_11",
##     "BDI_12", "BDI_13", "BDI_14", "BDI_15", "BDI_16", "BDI_17",
##     "BDI_18", "BDI_19", "BDI_20", "BDI_21")])
##
##   raw_alpha std.alpha G6(smc) average_r S/N    ase mean   sd median_r
##       0.89      0.91    0.92      0.33  10 0.0063 0.25 0.28     0.32
##
##  lower alpha upper     95% confidence boundaries
## 0.88 0.89 0.9
##
##  Reliability if an item is dropped:
##        raw_alpha std.alpha G6(smc) average_r  S/N alpha se var.r med.r
## BDI_1       0.89      0.90    0.92      0.32  9.4   0.0067 0.013  0.31
## BDI_2       0.89      0.90    0.92      0.32  9.4   0.0067 0.013  0.31
## BDI_3       0.89      0.91    0.92      0.32  9.5   0.0066 0.013  0.32
## BDI_4       0.88      0.90    0.92      0.32  9.3   0.0069 0.013  0.31
## BDI_5       0.89      0.91    0.92      0.33  9.7   0.0066 0.013  0.32
## BDI_6       0.89      0.91    0.92      0.33 10.1   0.0064 0.013  0.33
## BDI_7       0.88      0.90    0.91      0.32  9.2   0.0068 0.012  0.31
## BDI_8       0.89      0.91    0.92      0.32  9.5   0.0066 0.013  0.32
## BDI_9       0.89      0.91    0.92      0.33  9.9   0.0065 0.013  0.33
```

```
## BDI_10      0.89      0.91    0.92      0.32  9.6   0.0066 0.014  0.31
## BDI_11      0.89      0.91    0.92      0.33  9.8   0.0065 0.013  0.32
## BDI_12      0.88      0.90    0.91      0.32  9.3   0.0068 0.013  0.31
## BDI_13      0.89      0.91    0.92      0.33  9.6   0.0066 0.014  0.31
## BDI_14      0.88      0.90    0.91      0.32  9.2   0.0068 0.012  0.31
## BDI_15      0.89      0.91    0.92      0.33  9.7   0.0067 0.014  0.33
## BDI_16      0.89      0.91    0.92      0.33  9.9   0.0064 0.014  0.34
## BDI_17      0.89      0.90    0.92      0.32  9.4   0.0067 0.013  0.31
## BDI_18      0.89      0.91    0.92      0.33 10.0   0.0064 0.013  0.34
## BDI_19      0.89      0.91    0.92      0.33  9.7   0.0067 0.014  0.32
## BDI_20      0.88      0.90    0.92      0.32  9.5   0.0068 0.014  0.31
## BDI_21      0.90      0.91    0.92      0.34 10.4   0.0056 0.011  0.34
##
##  Item statistics
##          n raw.r std.r r.cor r.drop  mean   sd
## BDI_1  595  0.66  0.68  0.67   0.63 0.121 0.34
## BDI_2  595  0.65  0.66  0.64   0.60 0.229 0.47
## BDI_3  595  0.60  0.63  0.61   0.54 0.193 0.50
## BDI_4  595  0.70  0.70  0.69   0.66 0.281 0.52
## BDI_5  595  0.54  0.57  0.54   0.49 0.151 0.39
## BDI_6  595  0.43  0.45  0.41   0.38 0.066 0.35
## BDI_7  595  0.70  0.73  0.74   0.66 0.124 0.44
## BDI_8  595  0.61  0.63  0.61   0.56 0.136 0.43
## BDI_9  595  0.46  0.51  0.47   0.43 0.054 0.23
## BDI_10 595  0.60  0.62  0.59   0.54 0.139 0.49
## BDI_11 595  0.51  0.54  0.50   0.46 0.126 0.36
## BDI_12 595  0.71  0.70  0.70   0.66 0.198 0.47
## BDI_13 595  0.58  0.59  0.57   0.53 0.106 0.37
## BDI_14 595  0.70  0.74  0.74   0.66 0.106 0.39
## BDI_15 595  0.60  0.58  0.55   0.54 0.689 0.55
## BDI_16 595  0.54  0.49  0.45   0.44 0.565 0.74
## BDI_17 595  0.67  0.69  0.67   0.63 0.134 0.39
## BDI_18 595  0.50  0.48  0.44   0.42 0.324 0.59
## BDI_19 595  0.60  0.59  0.56   0.54 0.291 0.50
## BDI_20 595  0.67  0.64  0.62   0.61 0.466 0.60
## BDI_21 595  0.42  0.34  0.29   0.29 0.697 0.90
##
## Non missing response frequency for each item
##           0    1    2    3 miss
## BDI_1  0.88 0.11 0.01 0.00    0
## BDI_2  0.79 0.20 0.01 0.01    0
## BDI_3  0.85 0.10 0.04 0.00    0
## BDI_4  0.75 0.23 0.02 0.01    0
## BDI_5  0.86 0.13 0.00 0.00    0
## BDI_6  0.95 0.04 0.00 0.01    0
## BDI_7  0.91 0.05 0.03 0.00    0
## BDI_8  0.89 0.09 0.01 0.01    0
## BDI_9  0.95 0.05 0.00 0.00    0
## BDI_10 0.90 0.08 0.00 0.02    0
## BDI_11 0.88 0.11 0.01 0.00    0
## BDI_12 0.83 0.16 0.01 0.01    0
## BDI_13 0.91 0.07 0.02 0.00    0
## BDI_14 0.92 0.06 0.02 0.00    0
## BDI_15 0.35 0.61 0.03 0.00    0
```

```
## BDI_16 0.55 0.36 0.05 0.03    0
## BDI_17 0.88 0.11 0.01 0.00    0
## BDI_18 0.73 0.22 0.04 0.01    0
## BDI_19 0.73 0.26 0.01 0.00    0
## BDI_20 0.58 0.39 0.02 0.01    0
## BDI_21 0.54 0.30 0.10 0.07    0
```

Demographics

```
Hmisc::describe(dataCf[,c("age", "raceDc", "PRACE", "genderDc", "PGENDER",
                          "purpose", "loneliness", "depression",
                          "decline", "dementia")])
```

```
## Warning in all.is.numeric(names(weights), "vector"): NAs introduced by coercion
```

```
## dataCf[, c("age", "raceDc", "PRACE", "genderDc", "PGENDER", "purpose", "loneliness", "depression", "
##
##  10  Variables      595  Observations
## ---------------------------------------------------------------------------
## age
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##      595        0       14    0.991    71.43    3.516       67       67
##      .25      .50      .75      .90      .95
##       69       71       74       76       76
##
## lowest : 65 66 67 68 69, highest: 74 75 76 77 78
##
## Value         65    66    67    68    69    70    71    72    73    74    75
## Frequency      2    23    36    58    73    57    59    54    57    68    38
## Proportion 0.003 0.039 0.061 0.097 0.123 0.096 0.099 0.091 0.096 0.114 0.064
##
## Value         76    77    78
## Frequency     46    18     6
## Proportion 0.077 0.030 0.010
## ---------------------------------------------------------------------------
## raceDc
##        n  missing distinct     Info      Sum     Mean      Gmd
##      584       11        2    0.455      109   0.1866   0.3041
##
## ---------------------------------------------------------------------------
## PRACE
##        n  missing distinct
##      595        0        7
##
## lowest : . 1 2 3 5, highest: 2 3 5 7 8
##
## Value         NA     1     2     3     5     7     8
## Frequency      2   475   109     1     2     2     4
## Proportion 0.003 0.798 0.183 0.002 0.003 0.003 0.007
## ---------------------------------------------------------------------------
## genderDc
##        n  missing distinct     Info      Sum     Mean      Gmd
##      595        0        2    0.739      333   0.5597   0.4937
##
## ---------------------------------------------------------------------------
## PGENDER
##        n  missing distinct
##      595        0        2
##
## Value         1    2
## Frequency   262  333
## Proportion 0.44 0.56
```

```
## ------------------------------------------------------------------------------
## purpose
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##      595        0       20    0.989    4.212   0.7115    3.000    3.400
##      .25      .50      .75      .90      .95
##    3.833    4.167    4.833    5.000    5.000
##
## lowest : 1.500000 2.000000 2.166667 2.333333 2.500000
## highest: 4.333333 4.500000 4.666667 4.833333 5.000000
##
## 1.5 (1, 0.002), 2 (2, 0.003), 2.16666666666667 (3, 0.005), 2.33333333333333 (5,
## 0.008), 2.5 (6, 0.010), 2.66666666666667 (5, 0.008), 2.83333333333333 (5,
## 0.008), 3 (10, 0.017), 3.16666666666667 (9, 0.015), 3.33333333333333 (14,
## 0.024), 3.5 (26, 0.044), 3.66666666666667 (27, 0.045), 3.83333333333333 (51,
## 0.086), 4 (69, 0.116), 4.16666666666667 (68, 0.114), 4.33333333333333 (57,
## 0.096), 4.5 (41, 0.069), 4.66666666666667 (36, 0.061), 4.83333333333333 (57,
## 0.096), 5 (103, 0.173)
## ------------------------------------------------------------------------------
## loneliness
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##      595        0       48    0.999    1.705   0.5345     1.10     1.15
##      .25      .50      .75      .90      .95
##     1.35     1.65     1.95     2.40     2.65
##
## lowest : 1.00 1.05 1.10 1.15 1.20, highest: 3.20 3.40 3.60 3.65 3.75
## ------------------------------------------------------------------------------
## depression
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##      595        0       32     0.99    5.197    5.567        0        0
##      .25      .50      .75      .90      .95
##        1        4        7       12       17
##
## lowest :  0  1  2  3  4, highest: 30 33 34 44 50
## ------------------------------------------------------------------------------
## decline
##        n  missing distinct     Info     Mean      Gmd
##      595        0        9    0.709    0.684    1.066
##
## lowest : 0 1 2 3 4, highest: 4 5 6 7 8
##
## Value          0     1     2     3     4     5     6     7     8
## Frequency    391   111    45    20    10     8     5     4     1
## Proportion 0.657 0.187 0.076 0.034 0.017 0.013 0.008 0.007 0.002
## ------------------------------------------------------------------------------
## dementia
##        n  missing distinct     Info      Sum     Mean      Gmd
##      595        0        2    0.396       93   0.1563   0.2642
##
## ------------------------------------------------------------------------------
```

```
library(gmodels)
CrossTable( dataCf$raceDc, dataCf$dementia)
```

```
##
##
```

```
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  584
##
##
##                | dataCf$dementia
## dataCf$raceDc |         0 |         1 | Row Total |
## --------------|-----------|-----------|-----------|
##             0 |       401 |        74 |       475 |
##               |     0.000 |     0.000 |           |
##               |     0.844 |     0.156 |     0.813 |
##               |     0.813 |     0.813 |           |
##               |     0.687 |     0.127 |           |
## --------------|-----------|-----------|-----------|
##             1 |        92 |        17 |       109 |
##               |     0.000 |     0.000 |           |
##               |     0.844 |     0.156 |     0.187 |
##               |     0.187 |     0.187 |           |
##               |     0.158 |     0.029 |           |
## --------------|-----------|-----------|-----------|
##  Column Total |       493 |        91 |       584 |
##               |     0.844 |     0.156 |           |
## --------------|-----------|-----------|-----------|
##
##
```

Race Differences

```
# mean differences in groups
t.test(purpose ~ raceDc, data = dataCf)
```

```
##
##  Welch Two Sample t-test
##
## data:  purpose by raceDc
## t = -2.8165, df = 177.01, p-value = 0.005406
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.30633930 -0.05391823
## sample estimates:
## mean in group 0 mean in group 1
##        4.176140        4.356269
```

```
t.test(depression ~ raceDc, data = dataCf)
```

```
##
##  Welch Two Sample t-test
```

```
##
## data:  depression by raceDc
## t = -0.67189, df = 144.18, p-value = 0.5027
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.860992  0.916752
## sample estimates:
## mean in group 0 mean in group 1
##        5.124211        5.596330
```

```
t.test(loneliness ~ raceDc, data = dataCf)
```

```
##
##  Welch Two Sample t-test
##
## data:  loneliness by raceDc
## t = 0.041501, df = 148.9, p-value = 0.967
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1085737  0.1132321
## sample estimates:
## mean in group 0 mean in group 1
##        1.707834        1.705505
```

```
t.test(decline ~ raceDc, data = dataCf)
```

```
##
##  Welch Two Sample t-test
##
## data:  decline by raceDc
## t = -0.74192, df = 139.62, p-value = 0.4594
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.4352512  0.1977234
## sample estimates:
## mean in group 0 mean in group 1
##       0.6610526       0.7798165
```

```
# summary stats
dataCf %>%
  group_by(raceDc) %>%
  summarise_at(vars(purpose, depression,
                    loneliness, decline),
               list(name = mean))
```

```
## # A tibble: 3 x 5
##   raceDc purpose_name depression_name loneliness_name decline_name
##    <dbl>        <dbl>           <dbl>           <dbl>        <dbl>
## 1      0         4.18            5.12            1.71        0.661
## 2      1         4.36            5.60            1.71        0.780
## 3     NA         4.33            4.36            1.59        0.727
```

```
dataCf %>%
  group_by(raceDc) %>%
  summarise_at(vars(purpose, depression,
                    loneliness, decline),
               list(name = sd))
```

```
## # A tibble: 3 x 5
##   raceDc purpose_name depression_name loneliness_name decline_name
##    <dbl>        <dbl>           <dbl>           <dbl>        <dbl>
## 1      0        0.663            5.67           0.476         1.22
## 2      1        0.587            6.82           0.540         1.57
## 3     NA        0.483            6.23           0.459         1.42
```

```
# group differences in groups
chisq.test(dataCf$dementia, dataCf$raceDc)
```

```
##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  dataCf$dementia and dataCf$raceDc
## X-squared = 0.00000000000000000000000000033918, df = 1, p-value = 1
```

```
dataCf %>%
  group_by(raceDc) %>%
  summarise_at(vars(dementia),
               list(name = sum))
```

```
## # A tibble: 3 x 2
##   raceDc  name
##    <dbl> <dbl>
## 1      0    74
## 2      1    17
## 3     NA     2
```

Correlations

```
cor <- cor.ci(dataCf[,c("age", "purpose", "depression", "loneliness",
                "decline", "dementia")])
print(cor, short=FALSE)
```

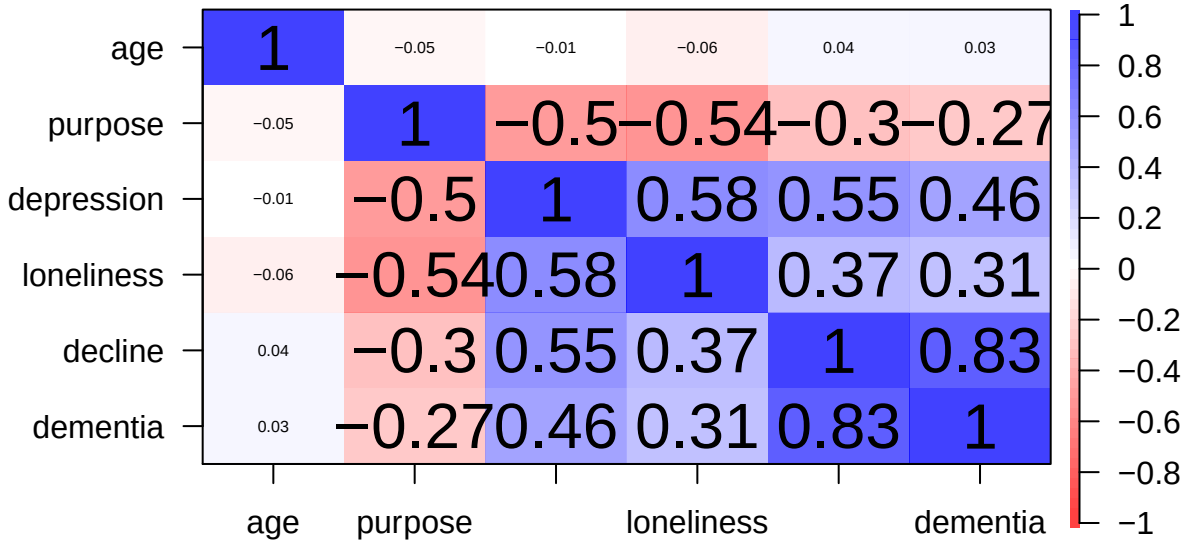
```
## Call:corCi(x = x, keys = keys, n.iter = n.iter, p = p, overlap = overlap,
##     poly = poly, method = method, plot = plot, minlength = minlength,
##     n = n)
##
##  Coefficients and bootstrapped confidence intervals
##             age   purps dprss lnlns decln demnt
## age         1.00
## purpose    -0.05  1.00
## depression -0.01 -0.50  1.00
## loneliness -0.06 -0.54  0.58  1.00
## decline     0.04 -0.30  0.55  0.37  1.00
## dementia    0.03 -0.27  0.46  0.31  0.83  1.00
##
##  scale correlations and bootstrapped confidence intervals
##             lower.emp lower.norm estimate upper.norm upper.emp    p
## age-purps       -0.12      -0.12    -0.05       0.03      0.04 0.25
## age-dprss       -0.08      -0.09    -0.01       0.06      0.07 0.69
## age-lnlns       -0.14      -0.14    -0.06       0.02      0.02 0.14
## age-decln       -0.03      -0.03     0.04       0.10      0.10 0.34
## age-demnt       -0.06      -0.06     0.03       0.10      0.09 0.58
## purps-dprss     -0.56      -0.56    -0.50      -0.43     -0.43 0.00
```

```
## purps-lnlns     -0.61      -0.61    -0.54      -0.46     -0.48 0.00
## purps-decln     -0.38      -0.39    -0.30      -0.21     -0.20 0.00
## purps-demnt     -0.37      -0.36    -0.27      -0.18     -0.18 0.00
## dprss-lnlns      0.51       0.50     0.58       0.65      0.65 0.00
## dprss-decln      0.46       0.45     0.55       0.64      0.63 0.00
## dprss-demnt      0.38       0.39     0.46       0.54      0.53 0.00
## lnlns-decln      0.26       0.26     0.37       0.46      0.45 0.00
## lnlns-demnt      0.20       0.21     0.31       0.41      0.42 0.00
## decln-demnt      0.81       0.81     0.83       0.85      0.85 0.00
```

```
cor$ci$p
```

```
##  [1] 0.2477374626545241209641 0.6864974683795088683524 0.1441234648695293163456
##  [4] 0.3422836957427735082859 0.5764681402453248892925 0.0000000000000000000000
##  [7] 0.0000000000000000000000 0.0000000008978784382663 0.0000000925825858200113
## [10] 0.0000000000000000000000 0.0000000000000002220446 0.0000000000000000000000
## [13] 0.0000000003915472390759 0.0000000168997051908093 0.0000000000000000000000
```

```
round(cor.ci(dataCf[,c("age", "purpose", "depression", "loneliness",
                "decline", "dementia")])$ci, digits = 4)
```



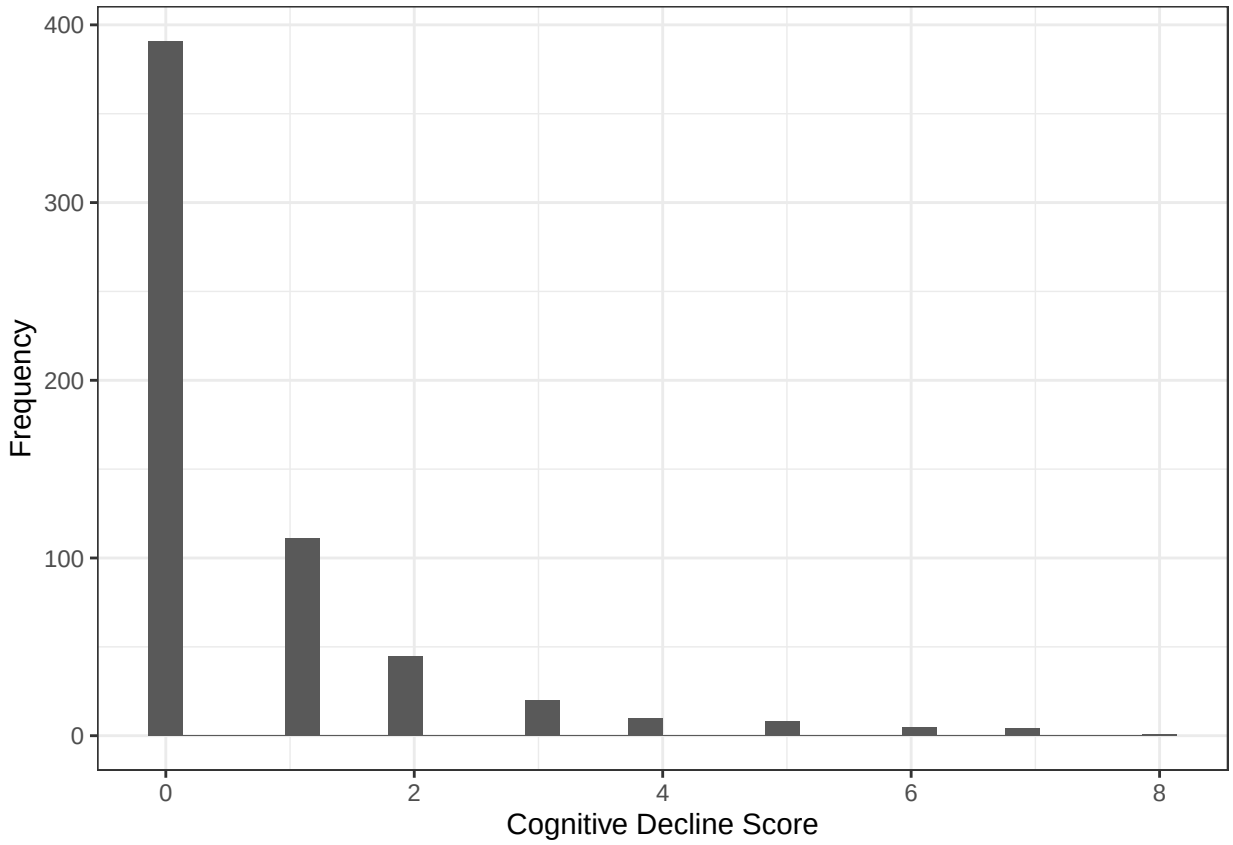

```
##               lower   low.e   upper    up.e      p
## age-purps   -0.1216 -0.1189  0.0310  0.0201 0.2437
## age-dprss   -0.1005 -0.1079  0.0666  0.0657 0.6894
## age-lnlns   -0.1361 -0.1356  0.0154  0.0079 0.1184
## age-decln   -0.0394 -0.0436  0.1146  0.1067 0.3369
## age-demnt   -0.0602 -0.0569  0.1168  0.1144 0.5288
## purps-dprss -0.5674 -0.5638 -0.4396 -0.4415 0.0000
## purps-lnlns -0.6132 -0.6050 -0.4717 -0.4805 0.0000
## purps-decln -0.3871 -0.3854 -0.2031 -0.1997 0.0000
## purps-demnt -0.3546 -0.3508 -0.1795 -0.1728 0.0000
## dprss-lnlns  0.5005  0.5025  0.6504  0.6577 0.0000
## dprss-decln  0.4442  0.4427  0.6251  0.6211 0.0000
## dprss-demnt  0.3919  0.3825  0.5218  0.5123 0.0000
## lnlns-decln  0.2767  0.2910  0.4468  0.4353 0.0000
## lnlns-demnt  0.2313  0.2262  0.3872  0.3946 0.0000
## decln-demnt  0.8081  0.8060  0.8530  0.8516 0.0000
```

Distributions

cognitive decline

```
ggplot(dataCf, aes(x = decline)) +
  geom_histogram() +
  theme_bw() +
  labs(x = "Cognitive Decline Score",
       y = "Frequency")
```

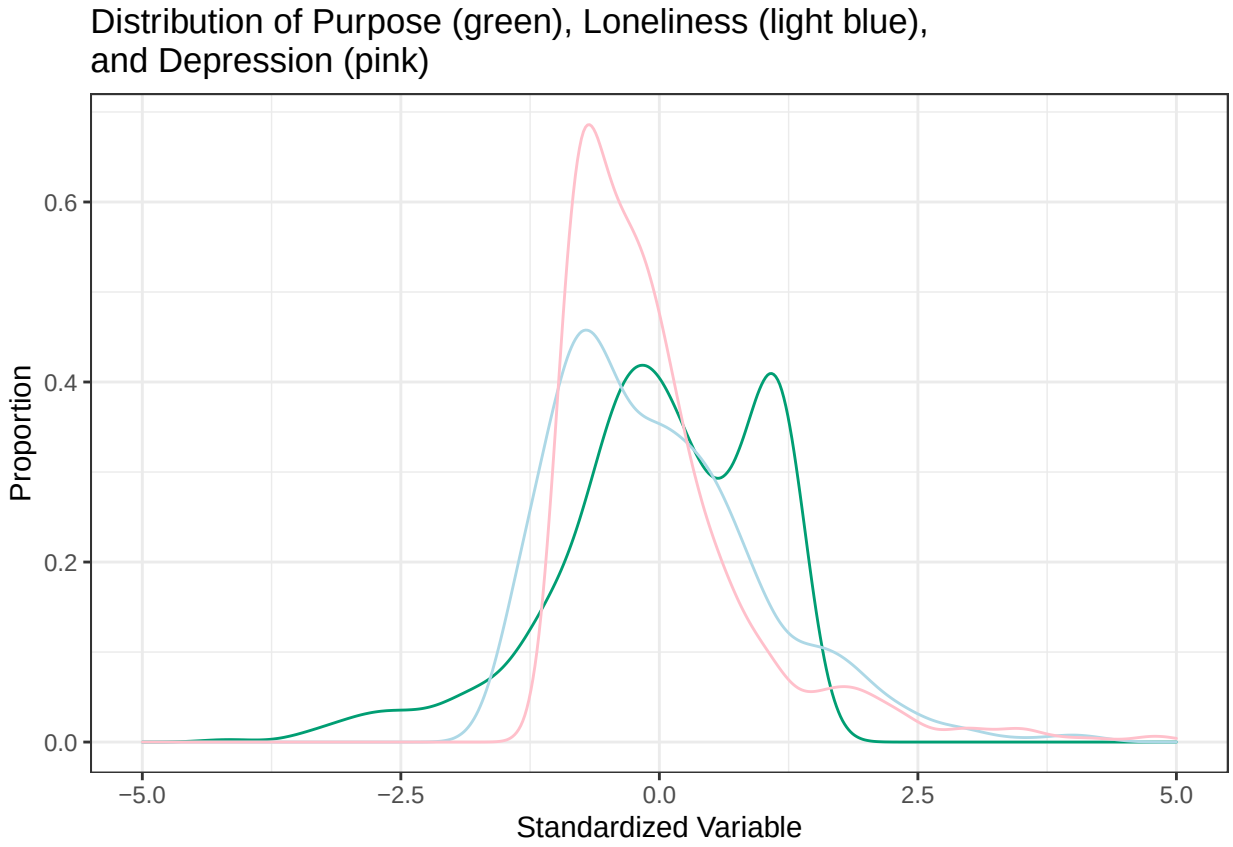
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



standardized psychological variables

```
ggplot(dataCf) +
  geom_density(mapping = aes(x = purpose_z), color = "#009E73") +
  geom_density(mapping = aes(x = loneliness_z), color = "lightblue") +
  geom_density(mapping = aes(x = depression_z), color = "pink") +
  theme_bw() +
  xlim(-5,5) +
  labs(x = "Standardized Variable",
       y = "Proportion",
       title = "Distribution of Purpose (green), Loneliness (light blue),\nand Depression (pink)")
```

```
## Warning: Removed 2 rows containing non-finite values (stat_density).
```



Hypothesis Testing

Only depression is a unique predictor of cognitive decline both continuously and dichotomously when standardized purpose, loneliness, and depression are entered simultaneously alongside age.

```
mod1cdA <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z + depression_z,
              data = dataCf)
summary(mod1cdA)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z +
##     depression_z, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6247 -0.5368 -0.1843  0.2063  7.1727
##
## Coefficients:
##               Estimate Std. Error t value            Pr(>|t|)
## (Intercept)   0.775262   0.066941  11.581 <0.0000000000000002 ***
## age_z         0.061144   0.044630   1.370              0.1712
## genderDc     -0.163005   0.089673  -1.818              0.0696 .
## purpose_z    -0.005646   0.055163  -0.102              0.9185
## loneliness_z  0.087766   0.058826   1.492              0.1362
## depression_z  0.655391   0.056942  11.510 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.081 on 589 degrees of freedom
## Multiple R-squared:  0.3072, Adjusted R-squared:  0.3013
## F-statistic: 52.23 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
mod1cd <- lm(decline ~ age + genderDc + purpose_z + loneliness_z + depression_z,
             data = dataCf)
summary(mod1cd)
```

```
##
## Call:
## lm(formula = decline ~ age + genderDc + purpose_z + loneliness_z +
##     depression_z, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6247 -0.5368 -0.1843  0.2063  7.1727
##
## Coefficients:
##               Estimate Std. Error t value            Pr(>|t|)
## (Intercept)  -0.650004   1.042881  -0.623              0.5333
## age           0.019953   0.014564   1.370              0.1712
## genderDc     -0.163005   0.089673  -1.818              0.0696 .
## purpose_z    -0.005646   0.055163  -0.102              0.9185
## loneliness_z  0.087766   0.058826   1.492              0.1362
## depression_z  0.655391   0.056942  11.510 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 1.081 on 589 degrees of freedom
## Multiple R-squared:  0.3072, Adjusted R-squared:  0.3013
## F-statistic: 52.23 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
mod1dem <- glm(dementia ~ age + genderDc + purpose_z + loneliness_z + depression_z,
               data = dataCf)
summary(mod1dem)
```

```
##
## Call:
## glm(formula = dementia ~ age + genderDc + purpose_z + loneliness_z +
##     depression_z, data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.71718  -0.15404  -0.07727  -0.00423   0.94536
##
## Coefficients:
##               Estimate Std. Error t value            Pr(>|t|)
## (Intercept)  -0.147089   0.311268  -0.473               0.637
## age           0.004282   0.004347   0.985               0.325
## genderDc     -0.004409   0.026765  -0.165               0.869
## purpose_z    -0.010867   0.016464  -0.660               0.509
## loneliness_z  0.019542   0.017558   1.113               0.266
## depression_z  0.151745   0.016996   8.929 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.104013)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 61.264  on 589  degrees of freedom
## AIC: 349.88
##
## Number of Fisher Scoring iterations: 2
```

```
mod1demA <- glm(dementia ~ age_z + genderDc + purpose_z + loneliness_z + depression_z,
                data = dataCf)
summary(mod1demA)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + loneliness_z +
##     depression_z, data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.71718  -0.15404  -0.07727  -0.00423   0.94536
##
## Coefficients:
##               Estimate Std. Error t value             Pr(>|t|)
## (Intercept)   0.158770   0.019980   7.947   0.0000000000000098 ***
## age_z         0.013121   0.013321   0.985                0.325
## genderDc     -0.004409   0.026765  -0.165                0.869
```

```
## purpose_z    -0.010867   0.016464  -0.660               0.509
## loneliness_z  0.019542   0.017558   1.113               0.266
## depression_z  0.151745   0.016996   8.929 < 0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.104013)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 61.264  on 589  degrees of freedom
## AIC: 349.88
##
## Number of Fisher Scoring iterations: 2
```

Purpose X Loneliness

Results

Higher sense of purpose and lower loneliness are associated with less cognitive decline when treating cognitive decline both continuously and dichotomously when accounting for age. Furthermore, there is an interaction between loneliness and purpose, wherein the association between loneliness and cognitive decline gets weaker as purpose levels get higher. In other words, sense of purpose could be a buffer against the effects of loneliness on cognitive decline.

```
# for graphing
mod2cd <- lm(decline ~ age + genderDc + purpose + loneliness + purpose * loneliness,
             data = dataCf)
summary(mod2cd)
```

```
##
## Call:
## lm(formula = decline ~ age + genderDc + purpose + loneliness +
##     purpose * loneliness, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.2032 -0.5674 -0.3246  0.3702  7.0913
##
## Coefficients:
##                     Estimate Std. Error t value   Pr(>|t|)
## (Intercept)        -4.29753    1.66112  -2.587   0.009917 **
## age                 0.02077    0.01597   1.300   0.193971
## genderDc           -0.05990    0.09802  -0.611   0.541407
## purpose             0.54196    0.26257   2.064   0.039447 *
## loneliness          2.48823    0.53128   4.683 0.00000351 ***
## purpose:loneliness -0.42711    0.12905  -3.310   0.000991 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.185 on 589 degrees of freedom
## Multiple R-squared:  0.1668, Adjusted R-squared:  0.1598
## F-statistic: 23.59 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
mod2dem <- glm(dementia ~ age + genderDc + purpose_z + loneliness_z + purpose_z * loneliness_z,
             data = dataCf)
summary(mod2dem)
```

```
##
## Call:
## glm(formula = dementia ~ age + genderDc + purpose_z + loneliness_z +
##     purpose_z * loneliness_z, data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.78984  -0.15335  -0.09322  -0.05363   0.95329
##
## Coefficients:
##                          Estimate Std. Error t value  Pr(>|t|)
## (Intercept)            -0.195174   0.328991  -0.593   0.55324
## age                     0.004482   0.004593   0.976   0.32960
```

```
## genderDc                0.019990   0.028190   0.709   0.47855
## purpose_z              -0.035139   0.017470  -2.011   0.04474 *
## loneliness_z            0.075203   0.017153   4.384 0.0000138 ***
## purpose_z:loneliness_z -0.037151   0.011760  -3.159   0.00166 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1161233)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 68.397  on 589  degrees of freedom
## AIC: 415.41
##
## Number of Fisher Scoring iterations: 2
```

```
# standardized age for tables
mod2cdA <- lm(decline ~ age_z + genderDc + purpose + loneliness + purpose * loneliness,
              data = dataCf)
summary(mod2cdA)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose + loneliness +
##     purpose * loneliness, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.2032 -0.5674 -0.3246  0.3702  7.0913
##
## Coefficients:
##                    Estimate Std. Error t value   Pr(>|t|)
## (Intercept)        -2.81398    1.14645  -2.455   0.014396 *
## age_z               0.06364    0.04894   1.300   0.193971
## genderDc           -0.05990    0.09802  -0.611   0.541407
## purpose             0.54196    0.26257   2.064   0.039447 *
## loneliness          2.48823    0.53128   4.683 0.00000351 ***
## purpose:loneliness -0.42711    0.12905  -3.310   0.000991 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.185 on 589 degrees of freedom
## Multiple R-squared:  0.1668, Adjusted R-squared:  0.1598
## F-statistic: 23.59 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
confint(mod2cdA)
```

```
##                          2.5 %     97.5 %
## (Intercept)        -5.06561660 -0.5623434
## age_z              -0.03247768  0.1597662
## genderDc           -0.25241705  0.1326229
## purpose             0.02627964  1.0576360
## loneliness          1.44479530  3.5316600
## purpose:loneliness -0.68055115 -0.1736608
```

```
mod2demA <- glm(dementia ~ age_z + genderDc + purpose_z + loneliness_z + purpose_z * loneliness_z,
              data = dataCf)
```

```r
summary(mod2demA)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + loneliness_z +
##     purpose_z * loneliness_z, data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.78984  -0.15335  -0.09322  -0.05363   0.95329
##
## Coefficients:
##                         Estimate Std. Error t value     Pr(>|t|)
## (Intercept)              0.12495    0.02219   5.631 0.0000000278 ***
## age_z                    0.01373    0.01407   0.976      0.32960
## genderDc                 0.01999    0.02819   0.709      0.47855
## purpose_z               -0.03514    0.01747  -2.011      0.04474 *
## loneliness_z             0.07520    0.01715   4.384 0.0000137914 ***
## purpose_z:loneliness_z -0.03715    0.01176  -3.159      0.00166 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1161233)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 68.397  on 589  degrees of freedom
## AIC: 415.41
##
## Number of Fisher Scoring iterations: 2
```

```r
confint(mod2demA)
```

```
## Waiting for profiling to be done...
```

```
##                              2.5 %       97.5 %
## (Intercept)             0.08145663  0.1684424319
## age_z                  -0.01385300  0.0413196580
## genderDc               -0.03526234  0.0752414567
## purpose_z              -0.06937979 -0.0008978967
## loneliness_z            0.04158280  0.1088226524
## purpose_z:loneliness_z -0.06020002 -0.0141014549
```

```r
# odds ratio effects
exp(coef(mod2demA))
```

```
##            (Intercept)                    age_z                 genderDc
##              1.1330913              1.0138281              1.0201907
##              purpose_z          loneliness_z purpose_z:loneliness_z
##              0.9654714              1.0781027              0.9635309
```

```r
exp(confint(mod2demA))
```

```
## Waiting for profiling to be done...
```

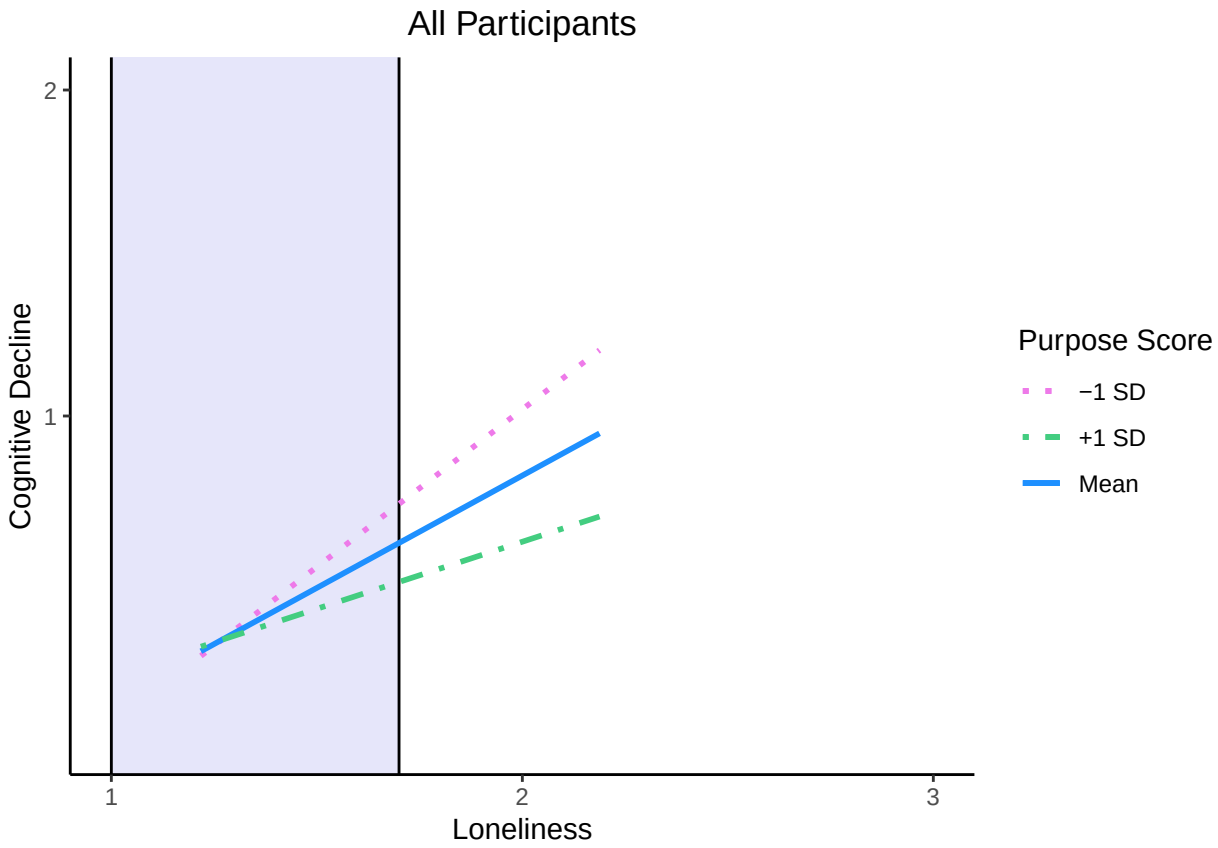
```
##                             2.5 %    97.5 %
## (Intercept)             1.0848662 1.1834601
## age_z                   0.9862425 1.0421852
```

```
## genderDc                0.9653521 1.0781444
## purpose_z               0.9329723 0.9991025
## loneliness_z            1.0424595 1.1149646
## purpose_z:loneliness_z 0.9415762 0.9859975
```

Simple Slopes Visualization

```
# creating data with low purpose and mean age
predictDataLow1 <- with(dataCf,
                        data.frame(age = mean(dataCf$age),
                                   genderDc = .5,
                                   purpose = mean(dataCf$purpose, na.rm=T)-
                                     sd(dataCf$purpose, na.rm=T),
                                   loneliness = seq(from = mean(dataCf$loneliness, na.rm=T)-
                                                      (sd(dataCf$loneliness, na.rm=T)),
                                                    to = mean(dataCf$loneliness, na.rm=T)+
                                                      (sd(dataCf$loneliness, na.rm=T)),
                                                    0.01)))
# creating data with mean purpose and mean age
predictDataMean1 <- with(dataCf,
                         data.frame(age = mean(dataCf$age),
                                    genderDc = .5,
                                    purpose = mean(dataCf$purpose, na.rm=T),
                                    loneliness = seq(mean(dataCf$loneliness, na.rm=T)-
                                                       (sd(dataCf$loneliness, na.rm=T)),
                                                     mean(dataCf$loneliness, na.rm=T)+
                                                       (sd(dataCf$loneliness, na.rm=T)),
                                                     0.01)))
# creating data with high purpose and mean age
predictDataHigh1 <- with(dataCf,
                         data.frame(age = mean(dataCf$age),
                                    genderDc = .5,
                                    purpose = mean(dataCf$purpose, na.rm=T)+
                                      sd(dataCf$purpose, na.rm=T),
                                    loneliness = seq(mean(dataCf$loneliness, na.rm=T)-
                                                       (sd(dataCf$loneliness, na.rm=T)),
                                                     mean(dataCf$loneliness, na.rm=T)+
                                                       (sd(dataCf$loneliness, na.rm=T)),
                                                     0.01)))
# get predicted values for pa based on three conditions
predictedLow1 <- predict(mod2cd,
                         newdata = predictDataLow1,
                         n.sims = 1000, level = 0.95,
                         type = "response",
                         include.resid.var = FALSE, which = "fixed")
predictedMean1 <- predict(mod2cd, newdata = predictDataMean1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
predictedHigh1 <- predict(mod2cd, newdata = predictDataHigh1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
# combine data frames
predictDataAll1 <- as.data.frame(rbind(predictDataLow1,
                                       predictDataMean1,
                                       predictDataHigh1))
predictions1 <- rbind(as.matrix(predictedLow1),
                      as.matrix(predictedMean1),
```

```
                      as.matrix(predictedHigh1))
predictions1 <- cbind(predictDataAll1, predictions1)

predictionsWide1 <- cbind(predictDataLow1, predictDataMean1, predictDataHigh1,
                          as.matrix(predictedLow1),
                          as.matrix(predictedMean1),
                          as.matrix(predictedHigh1))

names(predictionsWide1) <- c("ageL", "genderDcL", "purpL", "lonelyL",
                         "ageM", "genderDcM", "purpM", "lonelyM",
                         "ageH", "genderDcH", "purpH", "lonelyH",
                         "predictedCdL", "predictedCdM", "predictedCdH")

# getting groupings
colors <- c("-1 SD" = "orchid2", "+1 SD" = "seagreen3", "Mean" = "dodgerblue")
linetype <- c("-1 SD" = "dotted", "+1 SD" = "dotdash", "Mean" = "solid")

# graphing
library(ggplot2)
ggplot(predictionsWide1) +
  geom_rect(aes(xmin = 1, xmax = 1.70, ymin = -Inf, ymax = Inf),
            fill = "lavender") +
  geom_vline(xintercept = 1) +
  geom_vline(xintercept = 1.70) +
  geom_line(aes(x = lonelyL, y = predictedCdL, color = "-1 SD", linetype = "-1 SD"), size = 1) +
  geom_line(aes(x = lonelyM, y = predictedCdM, color = "Mean", linetype = "Mean"), size = 1) +
  geom_line(aes(x = lonelyH, y = predictedCdH, color = "+1 SD", linetype = "+1 SD"), size = 1) +
  expand_limits(x=c(1,3), y=c(0,2)) +
  scale_x_continuous(breaks = c(1,2,3,4,5)) +
  scale_y_continuous(breaks = c(1,2,3)) +
  theme_classic() +
  theme(plot.title = element_text(hjust = .5)) +
  labs(x = "Loneliness",
       y = "Cognitive Decline",
       color = "Purpose Score",
       linetype = "Purpose Score",
       title = "All Participants") +
  scale_color_manual(values = colors) +
  scale_linetype_manual(values = linetype)
```




```
# filtering based on values of loneliness
lowPurp <- dataCf %>% filter(purpose_z < -1)
meanPurp <- dataCf %>% filter(purpose_z < 1 & purpose_z > -1)
highPurp <- dataCf %>% filter(purpose_z > 1)

# models based on simple slope levels
modL <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z,
              data = lowPurp)
summary(modL)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z,
##     data = lowPurp)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.9931 -1.2572 -0.3184  0.7977  5.1261
##
## Coefficients:
##              Estimate Std. Error t value  Pr(>|t|)
## (Intercept)    1.2306     0.5626   2.187    0.0316 *
## age_z         -0.2029     0.2021  -1.004    0.3183
## genderDc      -0.4138     0.3804  -1.088    0.2799
## purpose_z      0.1631     0.2890   0.564    0.5740
## loneliness_z   0.7816     0.1905   4.103 0.0000966 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.721 on 81 degrees of freedom
## Multiple R-squared:  0.2299, Adjusted R-squared:  0.1918
## F-statistic: 6.044 on 4 and 81 DF,  p-value: 0.0002624
```

```
modM <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z,
           data = meanPurp)
summary(modM)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z,
##     data = meanPurp)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.7512 -0.6440 -0.3764  0.3038  7.0910
##
## Coefficients:
##              Estimate Std. Error t value          Pr(>|t|)
## (Intercept)   0.66518    0.08678   7.665 0.000000000000136 ***
## age_z         0.12742    0.05753   2.215            0.0273 *
## genderDc     -0.04360    0.11471  -0.380            0.7041
## purpose_z    -0.12766    0.10919  -1.169            0.2430
## loneliness_z  0.29856    0.07045   4.238 0.000028032256489 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.144 on 401 degrees of freedom
## Multiple R-squared:  0.06433,    Adjusted R-squared:  0.055
## F-statistic: 6.893 on 4 and 401 DF,  p-value: 0.00002253
```

```
modH <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z,
           data = highPurp)
summary(modH)
```

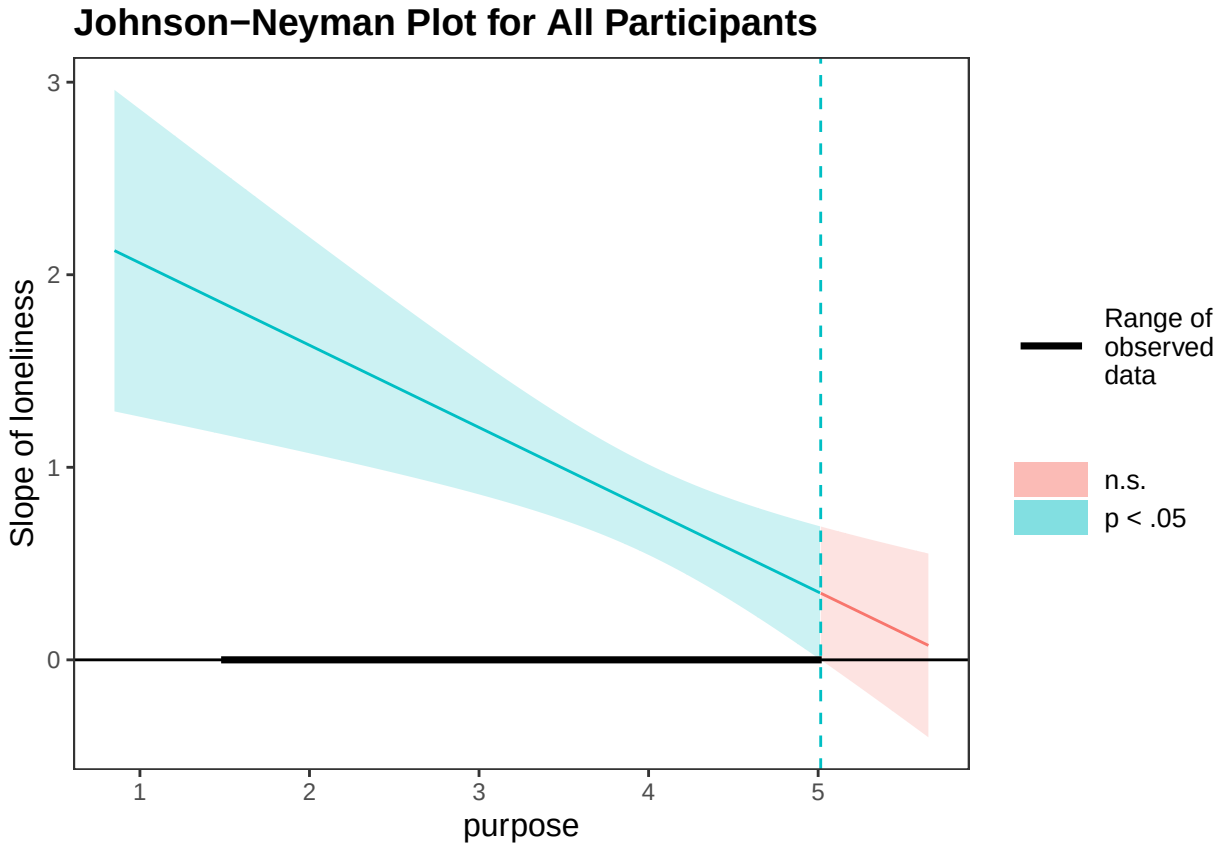
```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z,
##     data = highPurp)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5711 -0.3510 -0.2303 -0.0577  3.4740
##
## Coefficients: (1 not defined because of singularities)
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.272819   0.102148   2.671  0.00885 **
## age_z        -0.009002   0.059788  -0.151  0.88063
## genderDc      0.211720   0.131093   1.615  0.10948
## purpose_z           NA         NA      NA       NA
## loneliness_z  0.176594   0.083626   2.112  0.03723 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.6423 on 99 degrees of freedom
## Multiple R-squared:  0.05605,    Adjusted R-squared:  0.02745
## F-statistic:  1.96 on 3 and 99 DF,  p-value: 0.125
```

Johnson-Neyman Technique

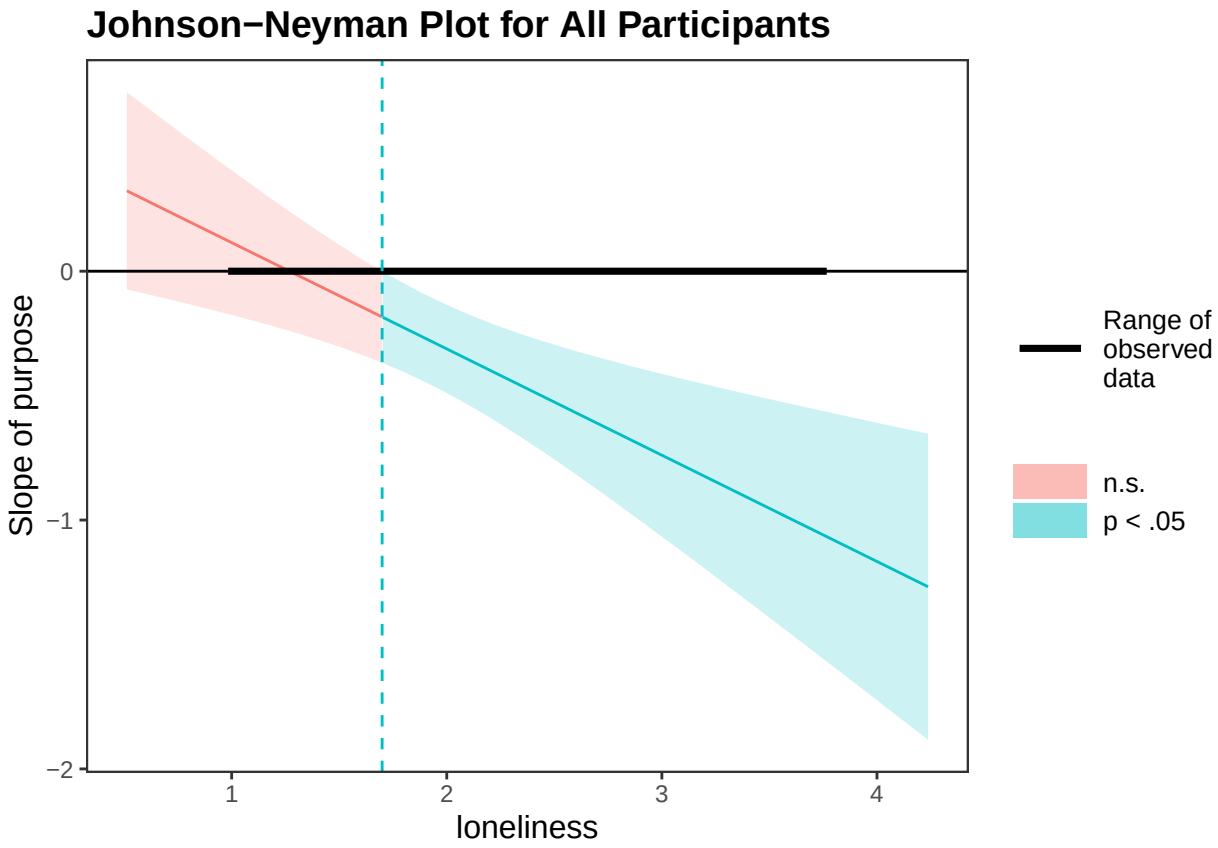
```
johnson_neyman(model = mod2cd, pred = loneliness, modx = purpose,
               title = "Johnson-Neyman Plot for All Participants")
```

```
## JOHNSON-NEYMAN INTERVAL
##
## When purpose is OUTSIDE the interval [5.02, 8.61], the slope of loneliness
## is p < .05.
##
## Note: The range of observed values of purpose is [1.50, 5.00]
```




```
johnson_neyman(model = mod2cd, pred = purpose, modx = loneliness,
               title = "Johnson-Neyman Plot for All Participants")
```

```
## JOHNSON-NEYMAN INTERVAL
##
## When loneliness is OUTSIDE the interval [0.14, 1.70], the slope of purpose
## is p < .05.
##
## Note: The range of observed values of loneliness is [1.00, 3.75]
```


Johnson−Neyman Plot for All Participants
Slope of purpose
0
−1
−2
1
2
3
4
loneliness
Range of observed data
n.s.
p < .05

Purpose X Depression

```
# for graphing
mod3cd <- lm(decline ~ age + genderDc + purpose_z + depression_z + purpose_z * depression_z,
             data = dataCf)
summary(mod3cd)
```

```
##
## Call:
## lm(formula = decline ~ age + genderDc + purpose_z + depression_z +
##     purpose_z * depression_z, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6073 -0.5435 -0.1778  0.1910  7.2184
##
## Coefficients:
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            -0.43678    1.04666  -0.417              0.6766
## age                     0.01721    0.01458   1.180              0.2384
## genderDc               -0.17867    0.09043  -1.976              0.0487 *
## purpose_z              -0.03825    0.05195  -0.736              0.4618
## depression_z            0.70959    0.06369  11.141 <0.0000000000000002 ***
## purpose_z:depression_z  0.01741    0.03657   0.476              0.6341
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.082 on 589 degrees of freedom
## Multiple R-squared:  0.3048, Adjusted R-squared:  0.2989
## F-statistic: 51.65 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
mod3dem <- glm(dementia ~ age + genderDc + purpose_z + depression_z + purpose_z * depression_z,
             data = dataCf)
summary(mod3dem)
```

```
##
## Call:
## glm(formula = dementia ~ age + genderDc + purpose_z + depression_z +
##     purpose_z * depression_z, data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.72295  -0.15684  -0.07288   0.00289   0.95844
##
## Coefficients:
##                          Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            -0.081633   0.312006  -0.262               0.794
## age                     0.003472   0.004348   0.799               0.425
## genderDc               -0.009707   0.026957  -0.360               0.719
## purpose_z              -0.019055   0.015485  -1.231               0.219
## depression_z            0.169301   0.018986   8.917 <0.0000000000000002 ***
## purpose_z:depression_z  0.009242   0.010902   0.848               0.397
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## (Dispersion parameter for gaussian family taken to be 0.1041048)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 61.318  on 589  degrees of freedom
## AIC: 350.4
##
## Number of Fisher Scoring iterations: 2
```

```
# standardized age for tables
mod3cdA <- lm(decline ~ age_z + genderDc + purpose_z + depression_z + purpose_z * depression_z,
              data = dataCf)
summary(mod3cdA)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + depression_z +
##     purpose_z * depression_z, data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6073 -0.5435 -0.1778  0.1910  7.2184
##
## Coefficients:
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)              0.79278    0.07157  11.077 <0.0000000000000002 ***
## age_z                    0.05275    0.04469   1.180              0.2384
## genderDc                -0.17867    0.09043  -1.976              0.0487 *
## purpose_z               -0.03825    0.05195  -0.736              0.4618
## depression_z             0.70959    0.06369  11.141 <0.0000000000000002 ***
## purpose_z:depression_z   0.01741    0.03657   0.476              0.6341
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.082 on 589 degrees of freedom
## Multiple R-squared:  0.3048, Adjusted R-squared:  0.2989
## F-statistic: 51.65 on 5 and 589 DF,  p-value: < 0.00000000000000022
```

```
confint(mod3cdA)
```

```
##                              2.5 %       97.5 %
## (Intercept)             0.65221631  0.933339024
## age_z                  -0.03502957  0.140526260
## genderDc               -0.35627347 -0.001058991
## purpose_z              -0.14027551  0.063765851
## depression_z            0.58449690  0.834679364
## purpose_z:depression_z -0.05441096  0.089240667
```

```
mod3demA <- glm(dementia ~ age_z + genderDc + purpose_z + depression_z + purpose_z * depression_z,
              data = dataCf)
summary(mod3demA)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + depression_z +
##     purpose_z * depression_z, data = dataCf)
##
```

```
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.72295  -0.15684  -0.07288   0.00289   0.95844
##
## Coefficients:
##                          Estimate Std. Error t value             Pr(>|t|)
## (Intercept)              0.166380   0.021334   7.799   0.0000000000000286 ***
## age_z                    0.010640   0.013323   0.799                0.425
## genderDc                -0.009707   0.026957  -0.360                0.719
## purpose_z               -0.019055   0.015485  -1.231                0.219
## depression_z             0.169301   0.018986   8.917 < 0.0000000000000002 ***
## purpose_z:depression_z   0.009242   0.010902   0.848                0.397
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1041048)
##
##     Null deviance: 78.464  on 594  degrees of freedom
## Residual deviance: 61.318  on 589  degrees of freedom
## AIC: 350.4
##
## Number of Fisher Scoring iterations: 2
```

```
confint(mod3demA)
```

```
## Waiting for profiling to be done...
```

```
##                              2.5 %     97.5 %
## (Intercept)             0.12456489 0.20819429
## age_z                  -0.01547275 0.03675224
## genderDc               -0.06254230 0.04312819
## purpose_z              -0.04940452 0.01129445
## depression_z            0.13208886 0.20651405
## purpose_z:depression_z -0.01212452 0.03060949
```

```
# odds ratio effects
exp(coef(mod3demA))
```

```
##            (Intercept)                    age_z                 genderDc
##              1.1810213              1.0106965              0.9903399
##              purpose_z           depression_z purpose_z:depression_z
##              0.9811254              1.1844771              1.0092853
```

```
exp(confint(mod3demA))
```

```
## Waiting for profiling to be done...
```

```
##                             2.5 %   97.5 %
## (Intercept)             1.1326555 1.231452
## age_z                   0.9846463 1.037436
## genderDc                0.9393733 1.044072
## purpose_z               0.9517960 1.011358
## depression_z            1.1412097 1.229385
## purpose_z:depression_z 0.9879487 1.031083
```

Exploratory Race Analyses

loneliness

The association between sense of purpose and loneliness is moderated by race (i.e., three-way interaction), wherein the influence of sense of purpose one the connection between loneliness on cognitive decline in stronger for Black participants than white participants. In other words, sense of purpose appears to provide an even more powerful buffering effect for Black participants than white participants when it comes to the negative influence of loneliness on cognitive decline.

```
### STANDARDIZING AGE FOR TABLES
modExCdLa <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z + raceDc +
                purpose_z * loneliness_z +
                raceDc * purpose_z +
                raceDc * loneliness_z +
                purpose_z * loneliness_z * raceDc,
              data = dataCf)
summary(modExCdLa)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z +
##     raceDc + purpose_z * loneliness_z + raceDc * purpose_z +
##     raceDc * loneliness_z + purpose_z * loneliness_z * raceDc,
##     data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8693 -0.5712 -0.3189  0.3807  7.0188
##
## Coefficients:
##                                Estimate Std. Error t value           Pr(>|t|)
## (Intercept)                     0.64333    0.08180   7.865 0.0000000000000184
## age_z                           0.07121    0.04920   1.447             0.1483
## genderDc                       -0.09052    0.09841  -0.920             0.3581
## purpose_z                      -0.09604    0.06786  -1.415             0.1575
## loneliness_z                    0.33022    0.06852   4.819 0.0000018461304584
## raceDc                          0.10830    0.14088   0.769             0.4423
## purpose_z:loneliness_z         -0.10625    0.04519  -2.351             0.0191
## purpose_z:raceDc               -0.29883    0.15975  -1.871             0.0619
## loneliness_z:raceDc            -0.08840    0.13957  -0.633             0.5267
## purpose_z:loneliness_z:raceDc -0.25157    0.10872  -2.314             0.0210
##
## (Intercept)                    ***
## age_z
## genderDc
## purpose_z
## loneliness_z                   ***
## raceDc
## purpose_z:loneliness_z         *
## purpose_z:raceDc               .
## loneliness_z:raceDc
## purpose_z:loneliness_z:raceDc *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 1.174 on 574 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.1868, Adjusted R-squared:  0.174
## F-statistic: 14.65 on 9 and 574 DF,  p-value: < 0.00000000000000022
```

```
confint(modExCdLa)
```

```
##                                    2.5 %      97.5 %
## (Intercept)                     0.48267049  0.80399519
## age_z                          -0.02542291  0.16783326
## genderDc                       -0.28380283  0.10276857
## purpose_z                      -0.22932203  0.03724403
## loneliness_z                    0.19564253  0.46480419
## raceDc                         -0.16839573  0.38499865
## purpose_z:loneliness_z         -0.19501977 -0.01748824
## purpose_z:raceDc               -0.61259709  0.01494205
## loneliness_z:raceDc            -0.36253072  0.18573281
## purpose_z:loneliness_z:raceDc -0.46510428 -0.03804421
```

```
# dichotomous with all participants
modExDemLa <- glm(dementia ~ age_z + genderDc + purpose_z + loneliness_z + raceDc +
                  purpose_z * loneliness_z +
                  raceDc * purpose_z +
                  raceDc * loneliness_z +
                  purpose_z * loneliness_z * raceDc,
                data = dataCf)
summary(modExDemLa)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + loneliness_z +
##     raceDc + purpose_z * loneliness_z + raceDc * purpose_z +
##     raceDc * loneliness_z + purpose_z * loneliness_z * raceDc,
##     data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.75694  -0.15340  -0.09564  -0.04178   0.95643
##
## Coefficients:
##                                Estimate Std. Error t value     Pr(>|t|)
## (Intercept)                    0.129858   0.023743   5.469 0.0000000675 ***
## age_z                          0.013847   0.014280   0.970       0.3326
## genderDc                       0.010502   0.028564   0.368       0.7132
## purpose_z                     -0.033867   0.019697  -1.719       0.0861 .
## loneliness_z                   0.084062   0.019889   4.227 0.0000275920 ***
## raceDc                        -0.001718   0.040891  -0.042       0.9665
## purpose_z:loneliness_z        -0.030990   0.013118  -2.362       0.0185 *
## purpose_z:raceDc              -0.022288   0.046369  -0.481       0.6309
## loneliness_z:raceDc           -0.056815   0.040512  -1.402       0.1613
## purpose_z:loneliness_z:raceDc -0.042275   0.031556  -1.340       0.1809
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1160656)
##
```

```
##     Null deviance: 76.820  on 583  degrees of freedom
## Residual deviance: 66.622  on 574  degrees of freedom
##   (11 observations deleted due to missingness)
## AIC: 411.53
##
## Number of Fisher Scoring iterations: 2
```

```
confint(modExDemLa)
```

```
## Waiting for profiling to be done...
```

```
##                                     2.5 %       97.5 %
## (Intercept)                     0.08332226  0.176392820
## age_z                          -0.01414060  0.041835371
## genderDc                       -0.04548212  0.066486914
## purpose_z                      -0.07247189  0.004738023
## loneliness_z                    0.04508105  0.123042770
## raceDc                         -0.08186204  0.078426677
## purpose_z:loneliness_z         -0.05670051 -0.005279129
## purpose_z:raceDc               -0.11317070  0.068593787
## loneliness_z:raceDc            -0.13621620  0.022586387
## purpose_z:loneliness_z:raceDc -0.10412292  0.019573513
```

```
# odds ratios
exp(coef(modExDemLa))
```

```
##                   (Intercept)                         age_z
##                     1.1386662                     1.0139437
##                      genderDc                     purpose_z
##                     1.0105577                     0.9667001
##                   loneliness_z                        raceDc
##                     1.0876962                     0.9982838
##         purpose_z:loneliness_z               purpose_z:raceDc
##                     0.9694854                     0.9779581
##            loneliness_z:raceDc purpose_z:loneliness_z:raceDc
##                     0.9447689                     0.9586064
```

```
exp(confint(modExDemLa))
```

```
## Waiting for profiling to be done...
```

```
##                                      2.5 %    97.5 %
## (Intercept)                     1.0868920 1.1929066
## age_z                           0.9859589 1.0427228
## genderDc                        0.9555367 1.0687470
## purpose_z                       0.9300919 1.0047493
## loneliness_z                    1.0461126 1.1309328
## raceDc                          0.9213991 1.0815840
## purpose_z:loneliness_z          0.9448770 0.9947348
## purpose_z:raceDc                0.8929982 1.0710011
## loneliness_z:raceDc             0.8726539 1.0228434
## purpose_z:loneliness_z:raceDc 0.9011145 1.0197663
```

```
### FOR GRAPHING
# continuous with all participants
modExCdL <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z + raceDc +
                purpose_z * loneliness_z +
                raceDc * purpose_z +
```

```
                raceDc * loneliness_z +
                purpose_z * loneliness_z * raceDc,
              data = dataCf)
summary(modExCdL)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z +
##     raceDc + purpose_z * loneliness_z + raceDc * purpose_z +
##     raceDc * loneliness_z + purpose_z * loneliness_z * raceDc,
##     data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8693 -0.5712 -0.3189  0.3807  7.0188
##
## Coefficients:
##                                Estimate Std. Error t value           Pr(>|t|)
## (Intercept)                     0.64333    0.08180   7.865 0.0000000000000184
## age_z                           0.07121    0.04920   1.447             0.1483
## genderDc                       -0.09052    0.09841  -0.920             0.3581
## purpose_z                      -0.09604    0.06786  -1.415             0.1575
## loneliness_z                    0.33022    0.06852   4.819 0.0000018461304584
## raceDc                          0.10830    0.14088   0.769             0.4423
## purpose_z:loneliness_z         -0.10625    0.04519  -2.351             0.0191
## purpose_z:raceDc               -0.29883    0.15975  -1.871             0.0619
## loneliness_z:raceDc            -0.08840    0.13957  -0.633             0.5267
## purpose_z:loneliness_z:raceDc -0.25157    0.10872  -2.314             0.0210
##
## (Intercept)                    ***
## age_z
## genderDc
## purpose_z
## loneliness_z                   ***
## raceDc
## purpose_z:loneliness_z         *
## purpose_z:raceDc               .
## loneliness_z:raceDc
## purpose_z:loneliness_z:raceDc *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.174 on 574 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.1868, Adjusted R-squared:  0.174
## F-statistic: 14.65 on 9 and 574 DF,  p-value: < 0.00000000000000022
```

```
# dichotomous with all participants
modExDemL <- glm(dementia ~ age_z + genderDc + purpose_z + loneliness_z + raceDc +
                purpose_z * loneliness_z +
                raceDc * purpose_z +
                raceDc * loneliness_z +
                purpose_z * loneliness_z * raceDc,
              data = dataCf)
```

```r
summary(modExDemL)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + loneliness_z +
##     raceDc + purpose_z * loneliness_z + raceDc * purpose_z +
##     raceDc * loneliness_z + purpose_z * loneliness_z * raceDc,
##     data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.75694  -0.15340  -0.09564  -0.04178   0.95643
##
## Coefficients:
##                                 Estimate Std. Error t value     Pr(>|t|)
## (Intercept)                     0.129858   0.023743   5.469 0.0000000675 ***
## age_z                           0.013847   0.014280   0.970       0.3326
## genderDc                        0.010502   0.028564   0.368       0.7132
## purpose_z                      -0.033867   0.019697  -1.719       0.0861 .
## loneliness_z                    0.084062   0.019889   4.227 0.0000275920 ***
## raceDc                         -0.001718   0.040891  -0.042       0.9665
## purpose_z:loneliness_z         -0.030990   0.013118  -2.362       0.0185 *
## purpose_z:raceDc               -0.022288   0.046369  -0.481       0.6309
## loneliness_z:raceDc            -0.056815   0.040512  -1.402       0.1613
## purpose_z:loneliness_z:raceDc -0.042275   0.031556  -1.340       0.1809
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1160656)
##
##     Null deviance: 76.820  on 583  degrees of freedom
## Residual deviance: 66.622  on 574  degrees of freedom
##   (11 observations deleted due to missingness)
## AIC: 411.53
##
## Number of Fisher Scoring iterations: 2
```

```r
### STRATIFICATION
# making dataframes separated by race
white <- dataCf %>%
  filter(raceDc == 0)
black <- dataCf %>%
  filter(raceDc == 1)

# continuous with white people only (standardized)
modExCdLz <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z +
                purpose_z * loneliness_z,
              data = white)
summary(modExCdLz)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z +
##     purpose_z * loneliness_z, data = white)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.7986 -0.5489 -0.3174  0.4157  6.7306
##
## Coefficients:
##                         Estimate Std. Error t value         Pr(>|t|)
## (Intercept)              0.57769    0.08269   6.986 0.00000000000974 ***
## age_z                    0.05163    0.05212   0.990           0.3225
## genderDc                 0.02478    0.10457   0.237           0.8128
## purpose_z               -0.09590    0.06525  -1.470           0.1423
## loneliness_z             0.33073    0.06586   5.022 0.00000072891379 ***
## purpose_z:loneliness_z -0.10898    0.04345  -2.508           0.0125 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.128 on 469 degrees of freedom
## Multiple R-squared:  0.1553, Adjusted R-squared:  0.1463
## F-statistic: 17.24 on 5 and 469 DF,  p-value: 0.000000000000001127
```

```
confint(modExCdLz)
```

```
##                             2.5 %      97.5 %
## (Intercept)              0.4151982  0.74018437
## age_z                   -0.0507985  0.15405384
## genderDc                -0.1807110  0.23026668
## purpose_z               -0.2241276  0.03231945
## loneliness_z             0.2013154  0.46015146
## purpose_z:loneliness_z -0.1943711 -0.02359474
```

```
# continuous with black people only (standardized)
modExCdBz <- lm(decline ~ age_z + genderDc + purpose_z + loneliness_z +
                purpose_z * loneliness_z,
              data = black)
summary(modExCdBz)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + loneliness_z +
##     purpose_z * loneliness_z, data = black)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6277 -0.7133 -0.3139  0.1616  6.7154
##
## Coefficients:
##                         Estimate Std. Error t value   Pr(>|t|)
## (Intercept)              1.0332     0.2018   5.119 0.00000143 ***
## age_z                    0.1627     0.1333   1.221    0.22494
## genderDc                -0.6088     0.2630  -2.315    0.02258 *
## purpose_z               -0.3497     0.1674  -2.089    0.03916 *
## loneliness_z             0.2514     0.1459   1.723    0.08787 .
## purpose_z:loneliness_z  -0.3831     0.1134  -3.377    0.00104 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 1.338 on 103 degrees of freedom
## Multiple R-squared:  0.303,  Adjusted R-squared:  0.2692
## F-statistic: 8.957 on 5 and 103 DF,  p-value: 0.0000004316
```

```
confint(modExCdBz)
```

```
##                               2.5 %      97.5 %
## (Intercept)             0.63289163  1.43345027
## age_z                  -0.10159588  0.42694552
## genderDc               -1.13039358 -0.08729402
## purpose_z              -0.68167662 -0.01772676
## loneliness_z           -0.03795525  0.54074116
## purpose_z:loneliness_z -0.60803260 -0.15807620
```

```
# continuous with white people only (plotting)
modExCdL <- lm(decline ~ age + genderDc + purpose + loneliness +
                purpose * loneliness,
              data = white)
summary(modExCdL)
```

```
##
## Call:
## lm(formula = decline ~ age + genderDc + purpose + loneliness +
##     purpose * loneliness, data = white)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.7986 -0.5489 -0.3174  0.4157  6.7306
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        -3.63186    1.78197  -2.038 0.042099 *
## age                 0.01685    0.01701   0.990 0.322455
## genderDc            0.02478    0.10457   0.237 0.812804
## purpose             0.43896    0.28284   1.552 0.121346
## loneliness          2.12720    0.56495   3.765 0.000187 ***
## purpose:loneliness -0.34392    0.13713  -2.508 0.012478 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.128 on 469 degrees of freedom
## Multiple R-squared:  0.1553, Adjusted R-squared:  0.1463
## F-statistic: 17.24 on 5 and 469 DF,  p-value: 0.000000000000001127
```

```
confint(modExCdL)
```

```
##                          2.5 %      97.5 %
## (Intercept)        -7.13349841 -0.13022613
## age                -0.01657717  0.05027269
## genderDc           -0.18071102  0.23026668
## purpose            -0.11683519  0.99476311
## loneliness          1.01705642  3.23734801
## purpose:loneliness -0.61338009 -0.07445831
```

```
# continuous with black people only (plotting)
modExCdB <- lm(decline ~ age + genderDc + purpose + loneliness +
```

```
               purpose * loneliness,
             data = black)
summary(modExCdB)
```

```
##
## Call:
## lm(formula = decline ~ age + genderDc + purpose + loneliness +
##     purpose * loneliness, data = black)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6277 -0.7133 -0.3139  0.1616  6.7154
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)        -10.05528    4.44406  -2.263 0.025757 *
## age                  0.05309    0.04348   1.221 0.224941
## genderDc            -0.60884    0.26298  -2.315 0.022584 *
## purpose              1.52347    0.68862   2.212 0.029150 *
## loneliness           5.60738    1.46165   3.836 0.000216 ***
## purpose:loneliness  -1.20881    0.35798  -3.377 0.001036 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.338 on 103 degrees of freedom
## Multiple R-squared:  0.303,  Adjusted R-squared:  0.2692
## F-statistic: 8.957 on 5 and 103 DF,  p-value: 0.0000004316
```

```
confint(modExCdB)
```

```
##                          2.5 %      97.5 %
## (Intercept)        -18.86901679 -1.24154567
## age                 -0.03315398  0.13932597
## genderDc            -1.13039358 -0.08729402
## purpose              0.15775541  2.88918589
## loneliness           2.70853157  8.50621929
## purpose:loneliness  -1.91877876 -0.49884375
```

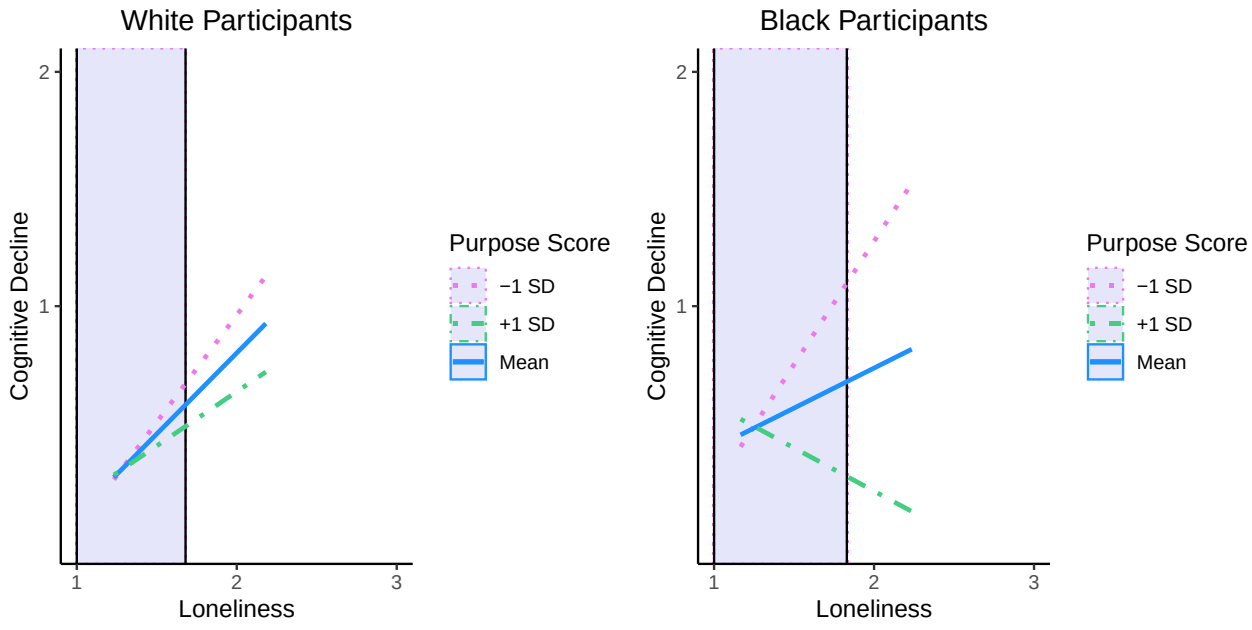
Simple Slopes Visualization

```
### Graphing for white participants

# creating data with low purpose and mean age
predictDataLow1 <- with(white,
                        data.frame(age = mean(white$age),
                                   genderDc = .5,
                                   purpose = mean(white$purpose, na.rm=T)-
                                     sd(dataCf$purpose, na.rm=T),
                                   loneliness = seq(from = mean(white$loneliness, na.rm=T)-
                                                      (sd(white$loneliness, na.rm=T)),
                                                    to = mean(white$loneliness, na.rm=T)+
                                                      (sd(white$loneliness, na.rm=T)),
                                                    0.01)))
# creating data with mean purpose and mean age
predictDataMean1 <- with(white,
                         data.frame(age = mean(white$age),
                                    genderDc = .5,
                                    purpose = mean(white$purpose, na.rm=T),
                                    loneliness = seq(mean(white$loneliness, na.rm=T)-
                                                       (sd(white$loneliness, na.rm=T)),
                                                     mean(white$loneliness, na.rm=T)+
                                                       (sd(white$loneliness, na.rm=T)),
                                                     0.01)))
# creating data with high purpose and mean age
predictDataHigh1 <- with(white,
                         data.frame(age = mean(white$age),
                                    genderDc = .5,
                                    purpose = mean(white$purpose, na.rm=T)+
                                      sd(white$purpose, na.rm=T),
                                    loneliness = seq(mean(white$loneliness, na.rm=T)-
                                                       (sd(white$loneliness, na.rm=T)),
                                                     mean(white$loneliness, na.rm=T)+
                                                       (sd(white$loneliness, na.rm=T)),
                                                     0.01)))

# get predicted values for pa based on three conditions
predictedLow1 <- predict(modExCdL,
                         newdata = predictDataLow1,
                         n.sims = 1000, level = 0.95,
                         type = "response",
                         include.resid.var = FALSE, which = "fixed")
predictedMean1 <- predict(modExCdL, newdata = predictDataMean1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
predictedHigh1 <- predict(modExCdL, newdata = predictDataHigh1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
# combine data frames
predictDataAll1 <- as.data.frame(rbind(predictDataLow1,
                                       predictDataMean1,
```

```
                                        predictDataHigh1))
predictions1 <- rbind(as.matrix(predictedLow1),
                      as.matrix(predictedMean1),
                      as.matrix(predictedHigh1))
predictions1 <- cbind(predictDataAll1, predictions1)

predictionsWide1 <- cbind(predictDataLow1, predictDataMean1, predictDataHigh1,
                          as.matrix(predictedLow1),
                          as.matrix(predictedMean1),
                          as.matrix(predictedHigh1))

names(predictionsWide1) <- c("ageL", "genderL", "purpL", "lonelyL",
                         "ageM", "genderM", "purpM", "lonelyM",
                         "ageH", "genderH", "purpH", "lonelyH",
                         "predictedCdL", "predictedCdM", "predictedCdH")

# getting groupings
colors <- c("-1 SD" = "orchid2", "+1 SD" = "seagreen3", "Mean" = "dodgerblue")
linetype <- c("-1 SD" = "dotted", "+1 SD" = "dotdash", "Mean" = "solid")

# graphing
whiteGraph <- ggplot(predictionsWide1, aes(x = lonelyL, y = predictedCdL, color = "-1 SD", linetype = "
  geom_rect(aes(xmin = 1, xmax = 1.68, ymin = -Inf, ymax = Inf),
            fill = "lavender") +
  geom_vline(xintercept = 1) +
  geom_vline(xintercept = 1.68) +
  geom_line(size = 1) +
  geom_line(aes(x = lonelyM, y = predictedCdM, color = "Mean", linetype = "Mean"), size = 1) +
  geom_line(aes(x = lonelyH, y = predictedCdH, color = "+1 SD", linetype = "+1 SD"), size = 1) +
  expand_limits(x=c(1,3), y=c(0,2)) +
  scale_x_continuous(breaks = c(1,2,3,4,5)) +
  scale_y_continuous(breaks = c(1,2,3)) +
  theme_classic() +
  theme(plot.title = element_text(hjust = .5)) +
  labs(x = "Loneliness",
       y = "Cognitive Decline",
       color = "Purpose Score",
       linetype = "Purpose Score",
       title = "White Participants") +
  scale_color_manual(values = colors) +
  scale_linetype_manual(values = linetype)

### Graphing for Black participants

# creating data with low purpose and mean age
predictDataLow1 <- with(black,
                        data.frame(age = mean(dataCf$age),
                                   genderDc = .5,
                                   purpose = mean(black$purpose, na.rm=T)-
                                     sd(black$purpose, na.rm=T),
                                   loneliness = seq(from = mean(black$loneliness, na.rm=T)-
                                                      (sd(black$loneliness, na.rm=T)),
                                                    to = mean(black$loneliness, na.rm=T)+
```

```
                                                  (sd(black$loneliness, na.rm=T)),
                                                0.01)))
# creating data with mean purpose and mean age
predictDataMean1 <- with(black,
                         data.frame(age = mean(black$age),
                                    genderDc = .5,
                                    purpose = mean(black$purpose, na.rm=T),
                                    loneliness = seq(mean(black$loneliness, na.rm=T)-
                                                       (sd(black$loneliness, na.rm=T)),
                                                     mean(black$loneliness, na.rm=T)+
                                                       (sd(black$loneliness, na.rm=T)),
                                                     0.01)))
# creating data with high purpose and mean age
predictDataHigh1 <- with(black,
                         data.frame(age = mean(black$age),
                                    genderDc = .5,
                                    purpose = mean(black$purpose, na.rm=T)+
                                      sd(black$purpose, na.rm=T),
                                    loneliness = seq(mean(black$loneliness, na.rm=T)-
                                                       (sd(black$loneliness, na.rm=T)),
                                                     mean(black$loneliness, na.rm=T)+
                                                       (sd(black$loneliness, na.rm=T)),
                                                     0.01)))
# get predicted values for pa based on three conditions
predictedLow1 <- predict(modExCdB,
                         newdata = predictDataLow1,
                         n.sims = 1000, level = 0.95,
                         type = "response",
                         include.resid.var = FALSE, which = "fixed")
predictedMean1 <- predict(modExCdB, newdata = predictDataMean1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
predictedHigh1 <- predict(modExCdB, newdata = predictDataHigh1,
                          n.sims = 1000, level = 0.95,
                          type = "response",
                          include.resid.var = FALSE, which = "fixed")
# combine data frames
predictDataAll1 <- as.data.frame(rbind(predictDataLow1,
                                       predictDataMean1,
                                       predictDataHigh1))
predictions1 <- rbind(as.matrix(predictedLow1),
                      as.matrix(predictedMean1),
                      as.matrix(predictedHigh1))
predictions1 <- cbind(predictDataAll1, predictions1)
names(predictions1) <-  c("purpose", "loneliness", "age", "predictedCog")

predictionsWide1 <- cbind(predictDataLow1, predictDataMean1, predictDataHigh1,
                          as.matrix(predictedLow1),
                          as.matrix(predictedMean1),
                          as.matrix(predictedHigh1))

names(predictionsWide1) <- c("ageL", "genderL", "purpL", "lonelyL",
```

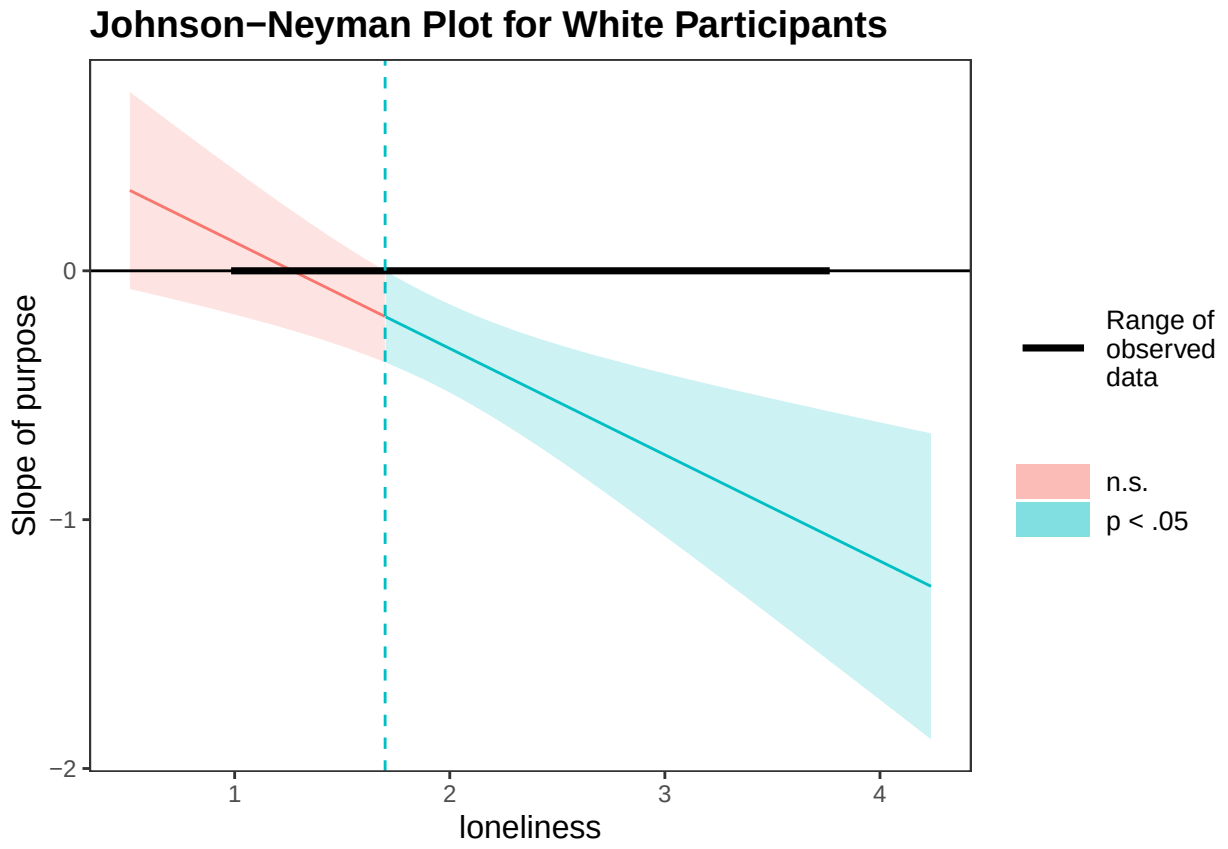
```
                        "ageM", "genderM", "purpM", "lonelyM",
                        "ageH", "genderH", "purpH", "lonelyH",
                        "predictedCdL", "predictedCdM", "predictedCdH")

# getting groupings
colors <- c("-1 SD" = "orchid2", "+1 SD" = "seagreen3", "Mean" = "dodgerblue")
linetype <- c("-1 SD" = "dotted", "+1 SD" = "dotdash", "Mean" = "solid")

# graphing
blackGraph <- ggplot(predictionsWide1, aes(x = lonelyL, y = predictedCdL, color = "-1 SD", linetype = "-
  geom_rect(aes(xmin = 1, xmax = 1.83, ymin = -Inf, ymax = Inf),
            fill = "lavender") +
  geom_vline(xintercept = 1) +
  geom_vline(xintercept = 1.83) +
  geom_line(size = 1) +
  geom_line(aes(x = lonelyM, y = predictedCdM, color = "Mean", linetype = "Mean"), size = 1) +
  geom_line(aes(x = lonelyH, y = predictedCdH, color = "+1 SD", linetype = "+1 SD"), size = 1) +
  expand_limits(x=c(1,3), y=c(0,2)) +
  scale_x_continuous(breaks = c(1,2,3,4,5)) +
  scale_y_continuous(breaks = c(1,2,3)) +
  theme_classic() +
  theme(plot.title = element_text(hjust = .5)) +
  labs(x = "Loneliness",
       y = "Cognitive Decline",
       color = "Purpose Score",
       linetype = "Purpose Score",
       title = "Black Participants") +
  scale_color_manual(values = colors) +
  scale_linetype_manual(values = linetype)

# make combined graph
ggarrange(whiteGraph, blackGraph)
```



Johnson-Neyman Technique

```
# participant groups
jnAll <- lm(decline ~ age + genderDc + purpose + loneliness +
              purpose * loneliness,
            data = dataCf)
jnWhite <- lm(decline ~ age + genderDc + purpose + loneliness +
              purpose * loneliness,
            data = white)
jnBlack <- lm(decline ~ age + genderDc + purpose + loneliness +
              purpose * loneliness,
            data = black)

# johnson_neyman analyses
johnson_neyman(model = jnAll, pred = purpose, modx = loneliness,
            title = "Johnson-Neyman Plot for White Participants")
```

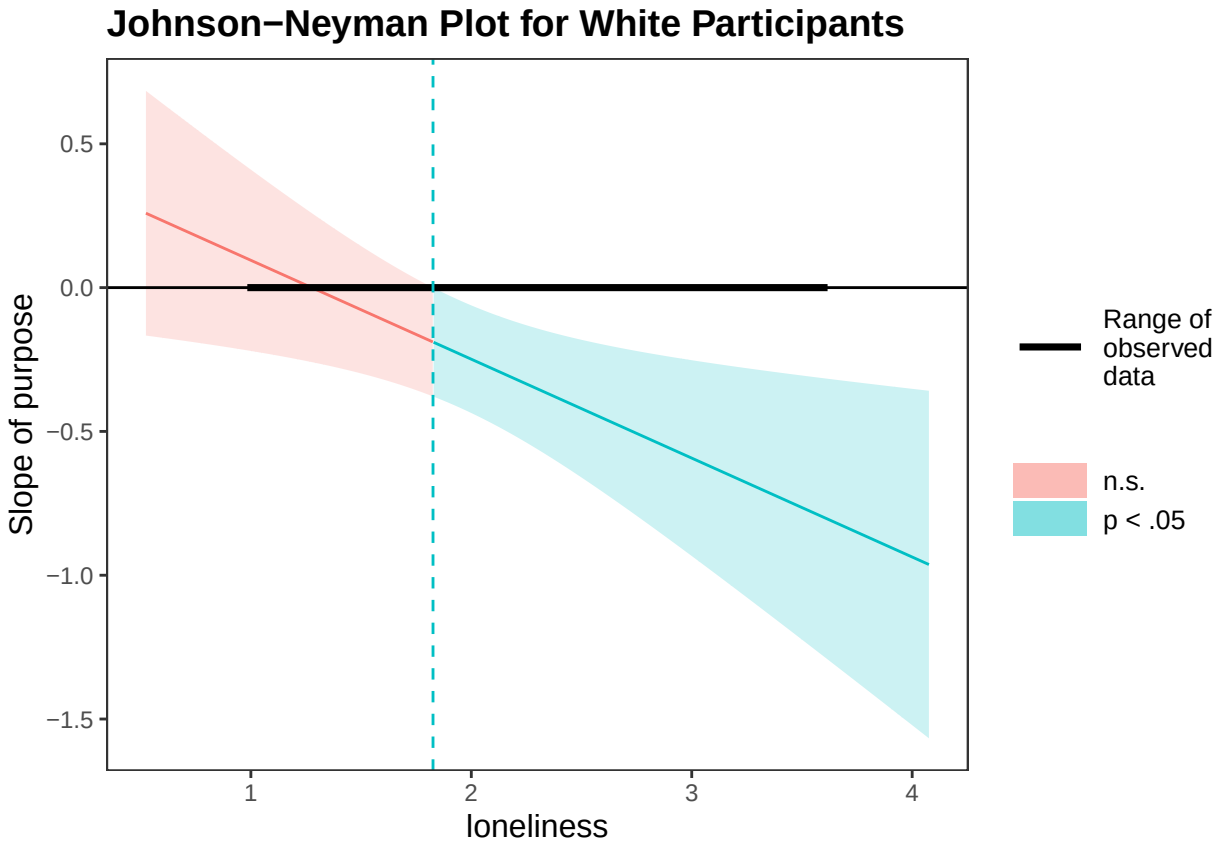
```
## JOHNSON-NEYMAN INTERVAL
##
## When loneliness is OUTSIDE the interval [0.14, 1.70], the slope of purpose
## is p < .05.
##
## Note: The range of observed values of loneliness is [1.00, 3.75]
```




```
johnson_neyman(model = jnWhite, pred = purpose, modx = loneliness,
            title = "Johnson-Neyman Plot for White Participants")
```

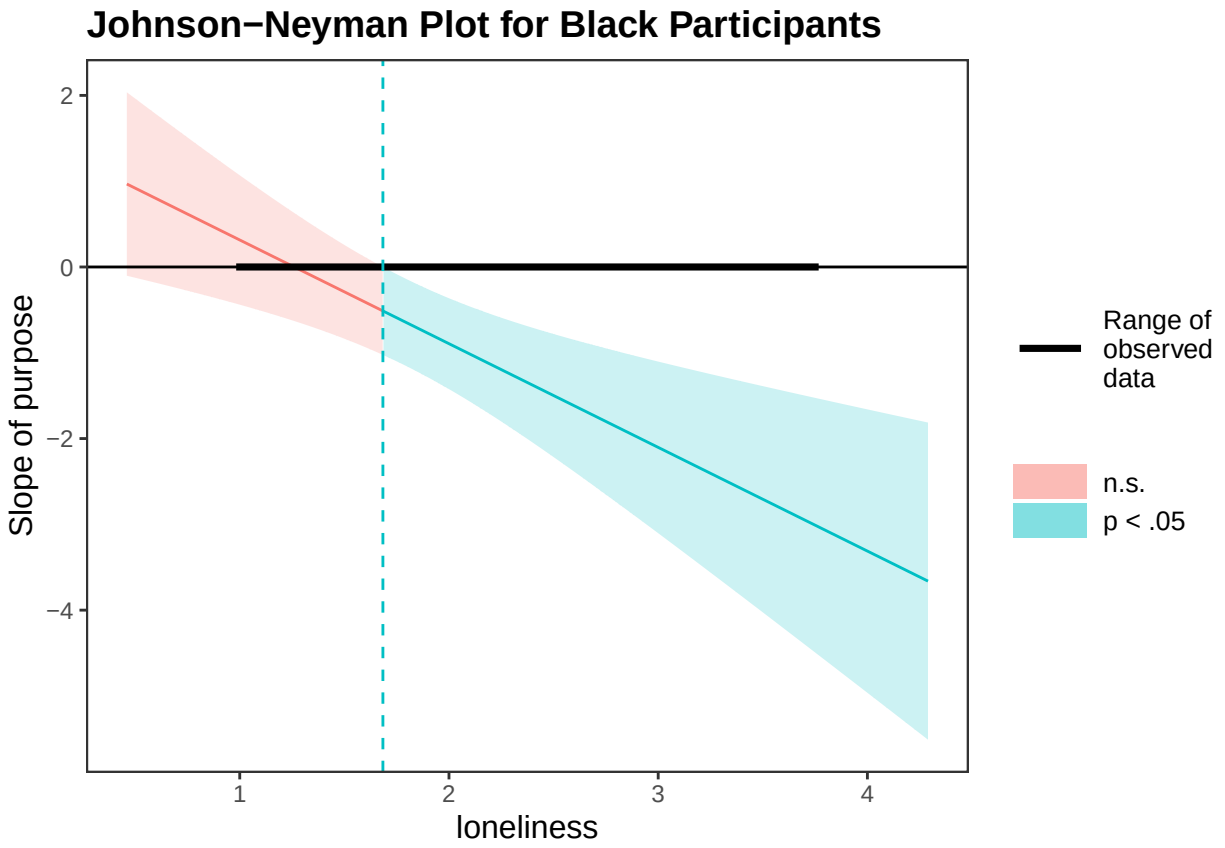
```
## JOHNSON-NEYMAN INTERVAL
```

```
##
## When loneliness is OUTSIDE the interval [-1.39, 1.83], the slope of purpose
## is p < .05.
##
## Note: The range of observed values of loneliness is [1.00, 3.60]
```




```
johnson_neyman(model = jnBlack, pred = purpose, modx = loneliness,
               title = "Johnson-Neyman Plot for Black Participants")
```

```
## JOHNSON-NEYMAN INTERVAL
##
## When loneliness is OUTSIDE the interval [0.28, 1.68], the slope of purpose
## is p < .05.
##
## Note: The range of observed values of loneliness is [1.00, 3.75]
```




```
# proportion above value
table(dataCf$loneliness >= 1.70)
```

```
##
## FALSE  TRUE
##   322   273
```

```
273/(322+273)
```

```
## [1] 0.4588235
```

```
table(white$loneliness >= 1.68)
```

```
##
## FALSE  TRUE
##   255   220
```

```
220/(220+255)
```

```
## [1] 0.4631579
```

```
table(black$loneliness >= 1.83)
```

```
##
## FALSE  TRUE
##    69    40
```

```
40/(69+40)
```

```
## [1] 0.3669725
```

depression

There is no interaction between the association for depression and loneliness with race when predicting cognitive decline.

```
modExCdD <- lm(decline ~ age_z + genderDc + purpose_z + depression_z + raceDc +
                 purpose_z * depression_z +
                 raceDc * purpose_z +
                 raceDc * depression_z +
                 purpose_z * depression_z * raceDc,
               data = dataCf)
summary(modExCdD)
```

```
##
## Call:
## lm(formula = decline ~ age_z + genderDc + purpose_z + depression_z +
##     raceDc + purpose_z * depression_z + raceDc * purpose_z +
##     raceDc * depression_z + purpose_z * depression_z * raceDc,
##     data = dataCf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8424 -0.5355 -0.1833  0.2166  7.1292
##
## Coefficients:
##                                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)                     0.78384    0.07638  10.262 <0.0000000000000002
## age_z                           0.05934    0.04535   1.308              0.1913
## genderDc                       -0.18930    0.09184  -2.061              0.0397
## purpose_z                      -0.02821    0.05725  -0.493              0.6225
## depression_z                    0.70742    0.07202   9.822 <0.0000000000000002
## raceDc                          0.08126    0.13100   0.620              0.5353
## purpose_z:depression_z          0.02270    0.04136   0.549              0.5833
## purpose_z:raceDc               -0.15638    0.15609  -1.002              0.3168
## depression_z:raceDc            -0.16426    0.17455  -0.941              0.3471
## purpose_z:depression_z:raceDc -0.07603    0.09463  -0.804              0.4220
##
## (Intercept)                    ***
## age_z
## genderDc                       *
## purpose_z
## depression_z                   ***
## raceDc
## purpose_z:depression_z
## purpose_z:raceDc
## depression_z:raceDc
## purpose_z:depression_z:raceDc
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.088 on 574 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.301,  Adjusted R-squared:   0.29
## F-statistic: 27.46 on 9 and 574 DF,  p-value: < 0.00000000000000022
```

```
confint(modExCdD)
```

```
##                                     2.5 %       97.5 %
## (Intercept)                     0.63382026  0.933858014
## age_z                          -0.02973739  0.148420788
## genderDc                       -0.36967425 -0.008916318
## purpose_z                      -0.14065700  0.084246298
## depression_z                    0.56596207  0.848873738
## raceDc                         -0.17603496  0.338546285
## purpose_z:depression_z         -0.05852740  0.103929804
## purpose_z:raceDc               -0.46296913  0.150199936
## depression_z:raceDc            -0.50709611  0.178580193
## purpose_z:depression_z:raceDc -0.26188769  0.109820661
```

```
modExDemD <- glm(dementia ~ age_z + genderDc + purpose_z + depression_z + raceDc +
                   purpose_z * depression_z +
                   raceDc * purpose_z +
                   raceDc * depression_z +
                   purpose_z * depression_z * raceDc,
                 data = dataCf)
summary(modExDemD)
```

```
##
## Call:
## glm(formula = dementia ~ age_z + genderDc + purpose_z + depression_z +
##     raceDc + purpose_z * depression_z + raceDc * purpose_z +
##     raceDc * depression_z + purpose_z * depression_z * raceDc,
##     data = dataCf)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.63455  -0.15757  -0.07457  -0.00010   0.96477
##
## Coefficients:
##                                    Estimate   Std. Error t value
## (Intercept)                     0.165257117  0.022757358   7.262
## age_z                           0.012227510  0.013512997   0.905
## genderDc                       -0.014417954  0.027362881  -0.527
## purpose_z                      -0.023821607  0.017058536  -1.396
## depression_z                    0.164740904  0.021458373   7.677
## raceDc                          0.000006052  0.039030120   0.000
## purpose_z:depression_z          0.001994520  0.012322105   0.162
## purpose_z:raceDc                0.036758475  0.046507840   0.790
## depression_z:raceDc             0.008773503  0.052007392   0.169
## purpose_z:depression_z:raceDc   0.021931976  0.028193452   0.778
##                                          Pr(>|t|)
## (Intercept)                   0.0000000000012506 ***
## age_z                                      0.366
## genderDc                                   0.598
## purpose_z                                  0.163
## depression_z                  0.0000000000000704 ***
## raceDc                                     1.000
## purpose_z:depression_z                     0.871
## purpose_z:raceDc                           0.430
```

```
## depression_z:raceDc                         0.866
## purpose_z:depression_z:raceDc               0.437
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.1051231)
##
##     Null deviance: 76.820  on 583  degrees of freedom
## Residual deviance: 60.341  on 574  degrees of freedom
##   (11 observations deleted due to missingness)
## AIC: 353.7
##
## Number of Fisher Scoring iterations: 2
```

```
confint(modExDemD)
```

```
## Waiting for profiling to be done...
```

```
##                                     2.5 %     97.5 %
## (Intercept)                     0.12065352 0.20986072
## age_z                          -0.01425748 0.03871250
## genderDc                       -0.06804822 0.03921231
## purpose_z                      -0.05725572 0.00961251
## depression_z                    0.12268327 0.20679854
## raceDc                         -0.07649158 0.07650368
## purpose_z:depression_z         -0.02215636 0.02614540
## purpose_z:raceDc               -0.05439522 0.12791217
## depression_z:raceDc            -0.09315911 0.11070612
## purpose_z:depression_z:raceDc -0.03332617 0.07719013
```

```
# odds ratios
exp(coef(modExDemD))
```

```
##                   (Intercept)                         age_z
##                     1.1796964                     1.0123026
##                      genderDc                     purpose_z
##                     0.9856855                     0.9764599
##                   depression_z                        raceDc
##                     1.1790876                     1.0000061
##         purpose_z:depression_z               purpose_z:raceDc
##                     1.0019965                     1.0374424
##            depression_z:raceDc purpose_z:depression_z:raceDc
##                     1.0088121                     1.0221742
```

```
exp(confint(modExDemD))
```

```
## Waiting for profiling to be done...
```

```
##                                    2.5 %   97.5 %
## (Intercept)                    1.1282339 1.233506
## age_z                          0.9858437 1.039472
## genderDc                       0.9342154 1.039991
## purpose_z                      0.9443525 1.009659
## depression_z                   1.1305263 1.229735
## raceDc                         0.9263607 1.079506
## purpose_z:depression_z         0.9780873 1.026490
## purpose_z:raceDc               0.9470577 1.136453
```

```
## depression_z:raceDc           0.9110485 1.117067
## purpose_z:depression_z:raceDc 0.9672230 1.080247
```