Sandbox

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The data, wrangled and cleaned/tidied

```r
library(tidyverse)
df <- read.csv("data/all.csv", stringsAsFactors = FALSE)
```

Make sure it's clean

```r
# Check for missing values
na_rows <- df[!complete.cases(df), ]
na_rows
```

```
##  [1] Character  Move       onBlock    plnCmd     airmove    followUp
##  [7] projectile moveType   health     stun       vgauge1    vgauge2
## [13] fDash      bDash      fWalk      bWalk      throwHurt  throwRange
## [19] Damage     Stun
## <0 rows> (or 0-length row.names)
```

Validate before we really begin

```r
c(nrow(df), ncol(df))
```

```
## [1] 1809   20
```

```r
dim(df) # same thing
```

```
## [1] 1809   20
```

```r
summary(df)
```

```
##   Character            Move              onBlock           plnCmd
##  Length:1809        Length:1809        Min.   :-95.000   Length:1809
##  Class :character   Class :character   1st Qu.: -8.000   Class :character
##  Mode  :character   Mode  :character   Median : -3.000   Mode  :character
##                                        Mean   : -4.429
##                                        3rd Qu.:  1.000
##                                        Max.   : 48.000
##    airmove            followUp          projectile          moveType
##  Length:1809        Length:1809        Length:1809        Length:1809
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
```

```
##      health          stun          vgauge1          vgauge2
## Min.   : 900.0   Min.   : 900.0   Min.   :300.0   Min.   :600.0
## 1st Qu.: 950.0   1st Qu.: 950.0   1st Qu.:600.0   1st Qu.:600.0
## Median :1000.0   Median :1000.0   Median :600.0   Median :600.0
## Mean   : 987.8   Mean   : 997.2   Mean   :713.9   Mean   :663.5
## 3rd Qu.:1025.0   3rd Qu.:1050.0   3rd Qu.:900.0   3rd Qu.:600.0
## Max.   :1100.0   Max.   :1100.0   Max.   :900.0   Max.   :900.0
##      fDash           bDash           fWalk            bWalk
## Min.   :15.0    Min.   :21.00   Min.   :0.02200   Min.   :0.02000
## 1st Qu.:16.0    1st Qu.:21.00   1st Qu.:0.04000   1st Qu.:0.03000
## Median :17.0    Median :23.00   Median :0.04700   Median :0.03200
## Mean   :17.5    Mean   :22.99   Mean   :0.04377   Mean   :0.03214
## 3rd Qu.:18.0    3rd Qu.:24.00   3rd Qu.:0.05000   3rd Qu.:0.03500
## Max.   :25.0    Max.   :26.00   Max.   :0.05500   Max.   :0.04700
##    throwHurt        throwRange         Damage           Stun
## Min.   :0.2500   Min.   :0.8000   Min.   : 10.0   Min.   :  0.0
## 1st Qu.:0.2500   1st Qu.:0.8000   1st Qu.: 60.0   1st Qu.:100.0
## Median :0.2500   Median :0.8500   Median : 80.0   Median :120.0
## Mean   :0.2852   Mean   :0.8358   Mean   : 88.2   Mean   :122.2
## 3rd Qu.:0.3000   3rd Qu.:0.8500   3rd Qu.:100.0   3rd Qu.:150.0
## Max.   :0.4500   Max.   :1.0000   Max.   :400.0   Max.   :400.0
```

```
str(df)
```

```
## 'data.frame':    1809 obs. of  20 variables:
##  $ Character : chr  "Abigail" "Abigail" "Abigail" "Abigail" ...
##  $ Move      : chr  "Stand LP" "Stand MP" "Stand HP" "Stand LK" ...
##  $ onBlock   : int  3 5 -3 3 0 -8 3 -2 -18 2 ...
##  $ plnCmd    : chr  "LP" "MP" "HP" "LK" ...
##  $ airmove   : chr  "False" "False" "False" "False" ...
##  $ followUp  : chr  "False" "False" "False" "False" ...
##  $ projectile: chr  "False" "False" "False" "False" ...
##  $ moveType  : chr  "normal" "normal" "normal" "normal" ...
##  $ health    : int  1100 1100 1100 1100 1100 1100 1100 1100 1100 1100 ...
##  $ stun      : int  1050 1050 1050 1050 1050 1050 1050 1050 1050 1050 ...
##  $ vgauge1   : int  900 900 900 900 900 900 900 900 900 900 ...
##  $ vgauge2   : int  900 900 900 900 900 900 900 900 900 900 ...
##  $ fDash     : int  25 25 25 25 25 25 25 25 25 25 ...
##  $ bDash     : int  25 25 25 25 25 25 25 25 25 25 ...
##  $ fWalk     : num  0.032 0.032 0.032 0.032 0.032 0.032 0.032 0.032 0.032 0.032 ...
##  $ bWalk     : num  0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 ...
##  $ throwHurt : num  0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 ...
##  $ throwRange: num  0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 ...
##  $ Damage    : int  40 70 90 50 80 90 40 70 90 40 ...
##  $ Stun      : int  70 100 150 70 100 150 70 100 150 70 ...
```

Module 1: Information (description)

Descriptive stats, here mainly seeking to answer the question: how do the distributions look?

Attacks for all characters

```r
library(tidyverse)
df <- read.csv("data/all.csv", stringsAsFactors = FALSE)
```

Character numerical features summary (averages)

```r
# transpose so we print vertically
t(colMeans(df[9:18]))
```

```
##         health    stun  vgauge1  vgauge2     fDash    bDash      fWalk      bWalk
## [1,] 987.8386 997.236 713.9303 663.5158 17.50083 22.99281 0.04376739 0.03213941
##      throwHurt throwRange
## [1,] 0.2851816  0.8358322
```

Attack categorical features summary tables

```r
# define the function to create each summary table
summary_tb <- function(feature) {
  df %>%
    group_by({{ feature }}) %>%
    summarise(
      count = n(),
      average_damage = mean(Damage),
      average_stun = mean(Stun)
    ) %>%
    arrange(desc(average_damage))
}
```

```r
# call for each feature with its name as argument
summary_tb(plnCmd)
```

```
## # A tibble: 545 x 4
##    plnCmd                   count average_damage average_stun
##    <chr>                    <int>          <dbl>        <dbl>
##  1 Hold & Release PP/KK Max     1            370          400
##  2 qcf,qcf+P (can hold)         3           353.            0
##  3 qcb,qcb+K                    2            345            0
##  4 qcf,qcf+K                    8           339.         44.5
##  5 qcb,qcb+P                    1            330            0
##  6 qcf,qcf+P                   24            330            0
##  7 qcf,qcf+P or qcb,qcb+P       1            330            0
##  8 b,f,b,f+P                    1            320            0
##  9 Hold & Release PP/KK lvl9    1            290          300
## 10 Hold & Release PP/KK lvl8    1            260          300
## # i 535 more rows
```

```r
summary_tb(moveType)
```

```
## # A tibble: 11 x 4
##    moveType     count average_damage average_stun
##    <chr>        <int>          <dbl>        <dbl>
##  1 super           40            334          8.9
##  2 command-grab    18            176.        207.
##  3 throw           22            131.        168.
```

```
##  4 vtrigger              38          106.          124.
##  5 special              701          95.8          140.
##  6 movement-special       2          90            100
##  7 vskill               165          81.1          119.
##  8 taunt                  1          70            100
##  9 normal               757          68.1          119.
## 10 vbreak                41          60              0
## 11 alpha                 24          55              0
```

```r
summary_tb(airmove)
```

```
## # A tibble: 2 x 4
##   airmove count average_damage average_stun
##   <chr>   <int>          <dbl>        <dbl>
## 1 True      178           90.3         137.
## 2 False    1631           88.0         121.
```

```r
summary_tb(followUp)
```

```
## # A tibble: 2 x 4
##   followUp count average_damage average_stun
##   <chr>    <int>          <dbl>        <dbl>
## 1 True       258           96.6         135.
## 2 False     1551           86.8         120.
```

```r
summary_tb(projectile)
```

```
## # A tibble: 2 x 4
##   projectile count average_damage average_stun
##   <chr>      <int>          <dbl>        <dbl>
## 1 False       1549           88.9         125.
## 2 True         260           83.9         105.
```
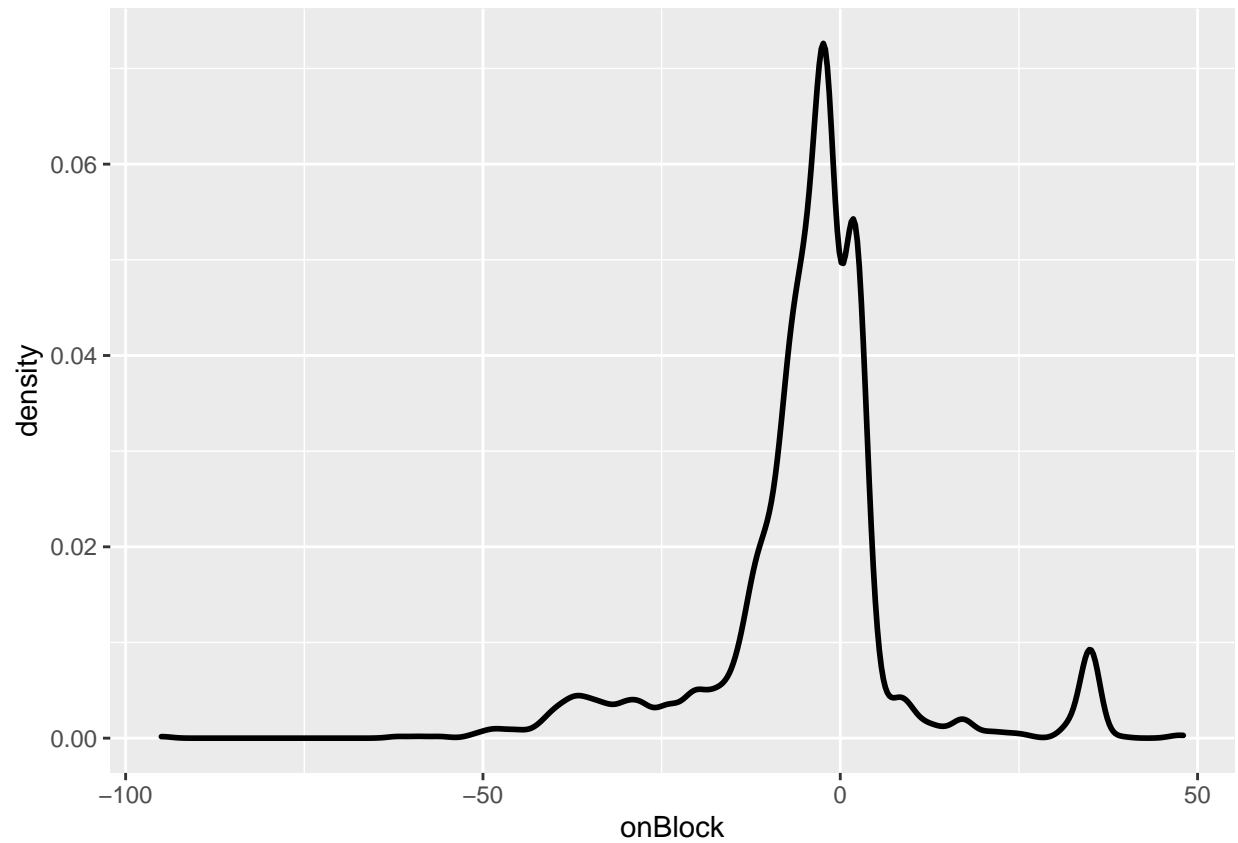
Kernel density estimates (KDEs)

```r
desc <- function(variable) {
  sprintf(
    "Median: %.2f  |  Mean: %.2f  |  Standard deviation: %.2f",
    median(variable),
    mean(variable),
    sd(variable)
  )
}

desc(df$onBlock)
```

```
## [1] "Median: -3.00  |  Mean: -4.43  |  Standard deviation: 13.31"
```

```r
# user will be able to adjust bandwidth with slider
ggplot(df, aes(onBlock)) +
  geom_density(adjust = 1, linewidth = 1, lineend = "round")
```
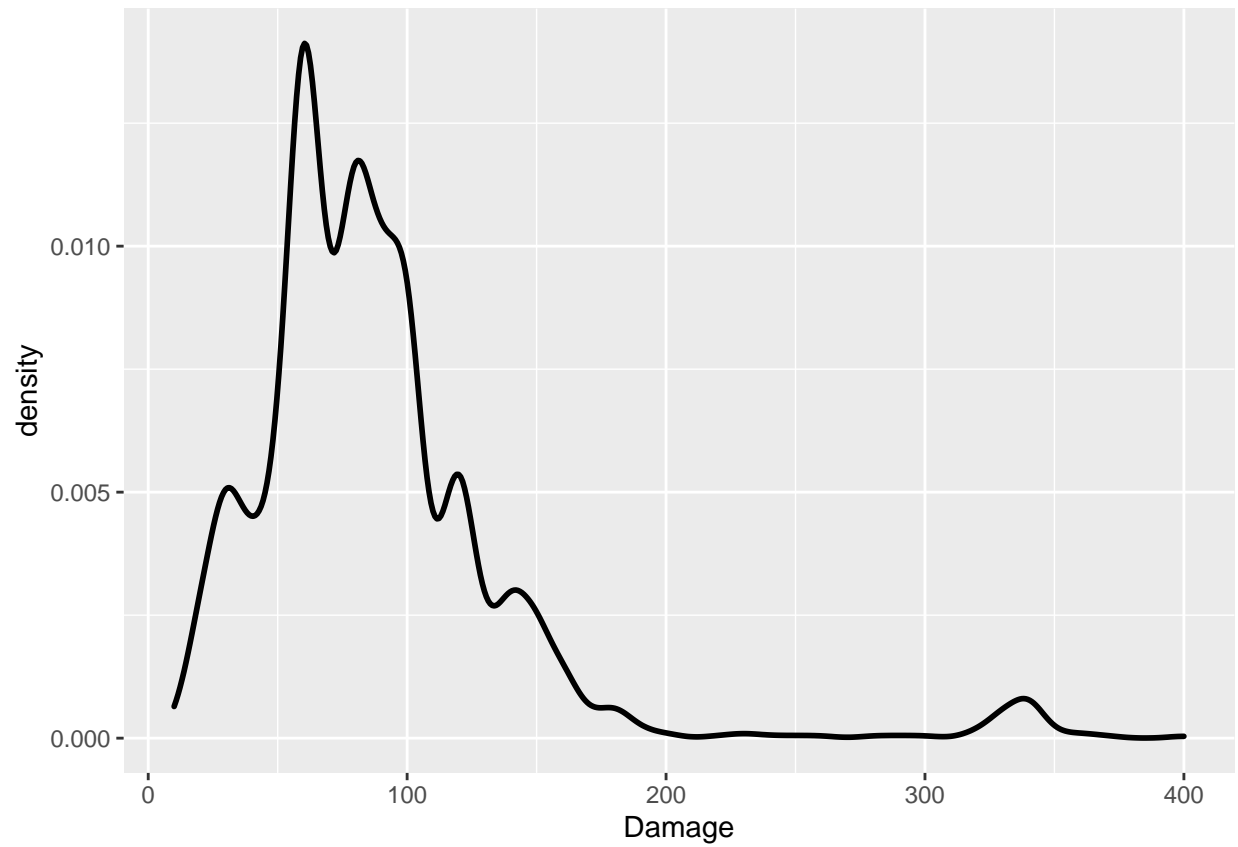
```
desc(df$Damage)
```

```
## [1] "Median: 80.00  |  Mean: 88.20  |  Standard deviation: 51.90"
```
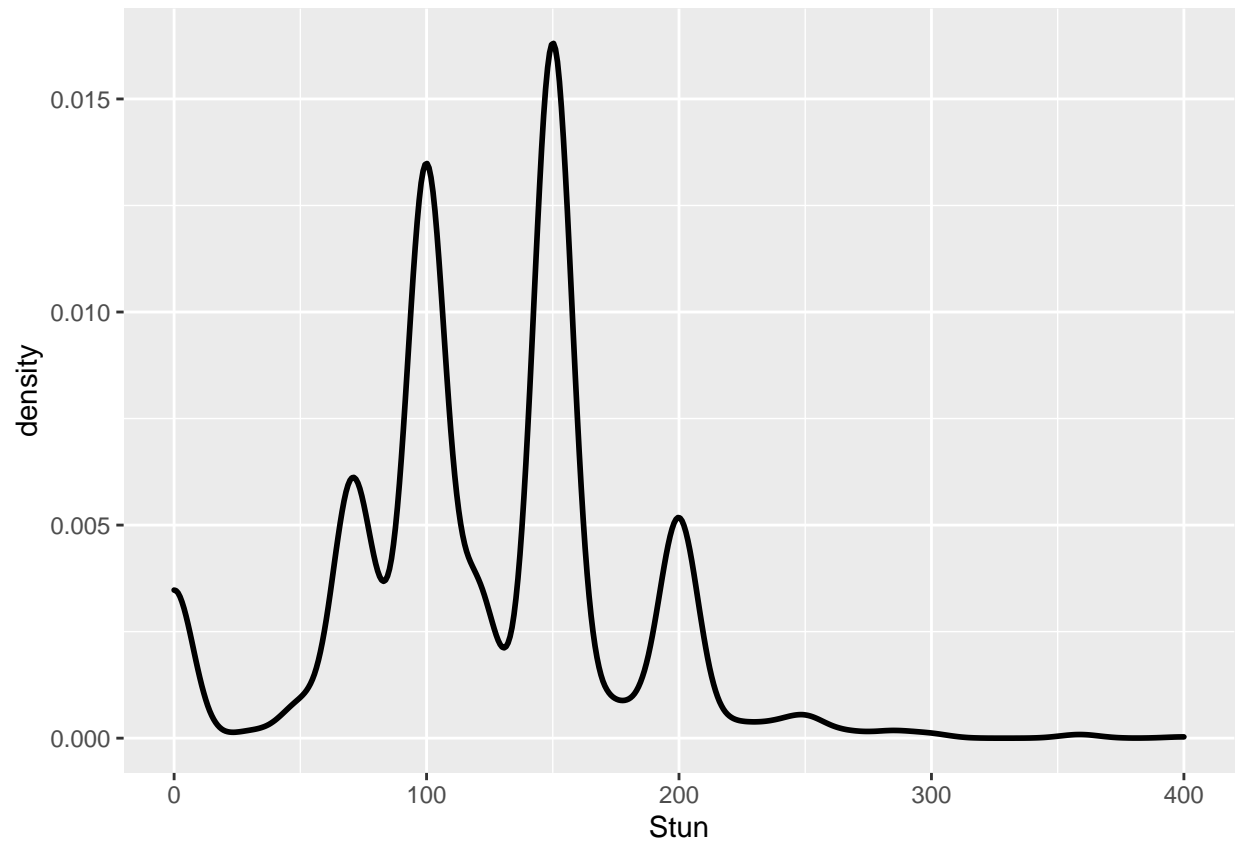
```
ggplot(df, aes(Damage)) +
  geom_density(adjust = 1, linewidth = 1, lineend = "round")
```

```
desc(df$Stun)
```

```
## [1] "Median: 120.00  |  Mean: 122.21  |  Standard deviation: 55.35"
```

```
ggplot(df, aes(Stun)) +
  geom_density(adjust = 1, linewidth = 1, lineend = "round")
```

Attacks for each character

```r
library(tidyverse)
```

Putting it all together

```r
character_info <- function(datafile, char_name, img_path, kde_color) {
  df <- read.csv(datafile, stringsAsFactors = FALSE)

  # h1(char_name)
  # Counterclockwise on grid starting here, top left: display image
  # img(src = img_path)

  # Bottom left: KDEs
  desc <- function(variable) {
    sprintf(
      "Median: %.2f  |  Mean: %.2f  |  Standard deviation: %.2f",
      median(variable),
      mean(variable),
      sd(variable)
    )
  }

  print(desc(df$onBlock))
  # user will be able to adjust bandwidth with slider
```

```r
  (ggplot(df, aes(onBlock)) +
    geom_density(
      alpha = 0.2, adjust = 1, linewidth = 1.6,
      lineend = "round", fill = kde_color, color = kde_color
    ))

  print(desc(df$Damage))
  (ggplot(df, aes(Damage)) +
    geom_density(
      alpha = 0.2, adjust = 1, linewidth = 1.6,
      lineend = "round", fill = kde_color, color = kde_color
    ))

  print(desc(df$Stun))
  (ggplot(df, aes(Stun)) +
    geom_density(
      alpha = 0.2, adjust = 1, linewidth = 1.6,
      lineend = "round", fill = kde_color, color = kde_color
    ))

  # Bottom right: all attack attributes (9 columns)
  print(head(df[c(1:7, 18:19)])) # head only temporary to see if working

  # Top right: all character facts (10 columns but printed row-wise)
  print(t(df[1, 8:17])) # same idea as earlier
}
```

Let's test em out

```r
# used Pika app to pick colors from images
character_info(
  "data/characters/abigail.csv",
  "Abigail",
  "img/abigail.png",
  "#af33b4"
)
```

```
## [1] "Median: -6.00  |  Mean: -7.92  |  Standard deviation: 16.17"
## [1] "Median: 85.00  |  Mean: 94.87  |  Standard deviation: 56.00"
## [1] "Median: 141.50  |  Mean: 123.32  |  Standard deviation: 59.13"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     40   70
## 2 Stand MP       5     MP   False    False      False   normal     70  100
## 3 Stand HP      -3     HP   False    False      False   normal     90  150
## 4 Stand LK       3     LK   False    False      False   normal     50   70
## 5 Stand MK       0     MK   False    False      False   normal     80  100
## 6 Stand HK      -8     HK   False    False      False   normal     90  150
##                 1
## health    1100.000
## stun      1050.000
## vgauge1    900.000
## vgauge2    900.000
## fDash       25.000
## bDash       25.000
```

```
## fWalk        0.032
## bWalk        0.025
## throwHurt    0.400
## throwRange   0.900
```

```r
character_info(
  "data/characters/akuma.csv",
  "Akuma",
  "img/akuma.png",
  "#a52e28"
)
```

```
## [1] "Median: -2.00  |  Mean: -2.03  |  Standard deviation: 15.99"
## [1] "Median: 80.00  |  Mean: 90.28  |  Standard deviation: 43.72"
## [1] "Median: 120.00  |  Mean: 127.09  |  Standard deviation: 49.38"
##         Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False    normal     30   70
## 2 Stand MP       1     MP   False    False      False    normal     60  100
## 3 Stand HP      -5     HP   False    False      False    normal     80  150
## 4 Stand LK       1     LK   False    False      False    normal     30   70
## 5 Stand MK      -4     MK   False    False      False    normal     60  100
## 6 Stand HK      -2     HK   False    False      False    normal     80  120
##                1
## health     900.000
## stun       900.000
## vgauge1    900.000
## vgauge2    600.000
## fDash       16.000
## bDash       21.000
## fWalk        0.052
## bWalk        0.036
## throwHurt    0.250
## throwRange   0.800
```

```r
character_info(
  "data/characters/alex.csv",
  "Alex",
  "img/alex.png",
  "#48683d"
)
```

```
## [1] "Median: -2.00  |  Mean: 4.83  |  Standard deviation: 20.29"
## [1] "Median: 100.00  |  Mean: 111.46  |  Standard deviation: 59.40"
## [1] "Median: 150.00  |  Mean: 153.17  |  Standard deviation: 61.74"
##         Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False    normal     30   70
## 2 Stand MP       3     MP   False    False      False    normal     60  100
## 3 Stand HP      -3     HP   False    False      False    normal     90  150
## 4 Stand LK       0     LK   False    False      False    normal     40   70
## 5 Stand MK      -2     MK   False    False      False    normal     70  100
## 6 Stand HK      -4     HK   False    False      False    normal    100  150
##                1
## health    1050.000
## stun      1075.000
## vgauge1    600.000
## vgauge2    600.000
```

```
## fDash         19.000
## bDash         24.000
## fWalk          0.040
## bWalk          0.035
## throwHurt      0.450
## throwRange     1.000
```

```r
character_info(
  "data/characters/balrog.csv",
  "Balrog",
  "img/balrog.png",
  "#235dbb"
)
```

```
## [1] "Median: -2.00   |   Mean: -4.10   |   Standard deviation: 6.92"
## [1] "Median: 100.00  |   Mean: 112.30  |   Standard deviation: 66.97"
## [1] "Median: 150.00  |   Mean: 155.40  |   Standard deviation: 74.45"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP       0     MP   False    False      False   normal     70  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK       1     LK   False    False      False   normal     30   70
## 5 Stand MK       2     MK   False    False      False   normal     60  100
## 6 Stand HK       3     HK   False    False      False   normal     80  150
##               1
## health     1025.000
## stun       1050.000
## vgauge1     900.000
## vgauge2     600.000
## fDash        17.000
## bDash        24.000
## fWalk         0.048
## bWalk         0.030
## throwHurt     0.350
## throwRange    0.850
```

```r
character_info(
  "data/characters/birdie.csv",
  "Birdie",
  "img/birdie.png",
  "#d7a23e"
)
```

```
## [1] "Median: -5.00   |   Mean: -5.91   |   Standard deviation: 10.19"
## [1] "Median: 80.00   |   Mean: 93.36   |   Standard deviation: 62.02"
## [1] "Median: 120.00  |   Mean: 121.67  |   Standard deviation: 74.59"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     40   90
## 2 Stand MP       1     MP   False    False      False   normal     60  120
## 3 Stand HP      -6     HP   False    False      False   normal     90  150
## 4 Stand LK       3     LK   False    False      False   normal     30   90
## 5 Stand MK      -2     MK   False    False      False   normal     60  120
## 6 Stand HK       0     HK   False    False      False   normal    100  150
##               1
## health     1050.000
## stun       1000.000
```

```
## vgauge1      900.000
## vgauge2      600.000
## fDash         23.000
## bDash         26.000
## fWalk          0.031
## bWalk          0.024
## throwHurt      0.300
## throwRange     0.900
```

```r
character_info(
  "data/characters/blanka.csv",
  "Blanka",
  "img/blanka.png",
  "#b36732"
)
```

```
## [1] "Median: -3.00  |  Mean: -8.08  |  Standard deviation: 13.60"
## [1] "Median: 80.00  |  Mean: 90.67  |  Standard deviation: 52.14"
## [1] "Median: 150.00  |  Mean: 125.36  |  Standard deviation: 45.45"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       0     MP   False    False      False   normal     60  100
## 3 Stand HP      -6     HP   False    False      False   normal     80  150
## 4 Stand LK       3     LK   False    False      False   normal     30   70
## 5 Stand MK       2     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##              1
## health   1025.000
## stun     1050.000
## vgauge1   600.000
## vgauge2   900.000
## fDash      16.000
## bDash      24.000
## fWalk       0.043
## bWalk       0.032
## throwHurt   0.250
## throwRange  0.800
```

```r
character_info(
  "data/characters/cammy.csv",
  "Cammy",
  "img/cammy.png",
  "#67b600"
)
```

```
## [1] "Median: -2.00  |  Mean: -3.80  |  Standard deviation: 17.44"
## [1] "Median: 80.00  |  Mean: 89.55  |  Standard deviation: 54.01"
## [1] "Median: 120.00  |  Mean: 126.25  |  Standard deviation: 62.17"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK       1     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -2     HK   False    False      False   normal     90  150
##              1
```

```
## health      925.00
## stun        925.00
## vgauge1     600.00
## vgauge2     600.00
## fDash        16.00
## bDash        21.00
## fWalk         0.05
## bWalk         0.04
## throwHurt     0.25
## throwRange    0.80
```

```r
character_info(
  "data/characters/chun-li.csv",
  "Chun-Li",
  "img/chun-li.png",
  "#37659b"
)
```

```
## [1] "Median: -3.00  |  Mean: -2.14  |  Standard deviation: 11.92"
## [1] "Median: 80.00  |  Mean: 89.65  |  Standard deviation: 51.25"
## [1] "Median: 120.00  |  Mean: 120.47  |  Standard deviation: 55.12"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -4     HP   False    False      False   normal     80  150
## 4 Stand LK      -3     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     70  100
## 6 Stand HK      -2     HK   False    False      False   normal     90  150
##                1
## health    975.0000
## stun     1000.0000
## vgauge1   600.0000
## vgauge2   900.0000
## fDash      15.0000
## bDash      21.0000
## fWalk       0.0535
## bWalk       0.0340
## throwHurt   0.3511
## throwRange  0.8461
```

```r
character_info(
  "data/characters/cody.csv",
  "Cody",
  "img/cody.png",
  "#521f15"
)
```

```
## [1] "Median: -6.00  |  Mean: -5.72  |  Standard deviation: 7.83"
## [1] "Median: 80.00  |  Mean: 90.94  |  Standard deviation: 55.26"
## [1] "Median: 150.00  |  Mean: 131.81  |  Standard deviation: 59.98"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       1     LP   False    False      False   normal     30   70
## 2 Stand MP       0     MP   False    False      False   normal     60  100
## 3 Stand HP     -10     HP   False    False      False   normal    120  170
## 4 Stand LK       3     LK   False    False      False   normal     40   70
## 5 Stand MK       3     MK   False    False      False   normal     60  100
```

```
## 6 Stand HK      -4      HK    False    False    False    normal    80   150
##                  1
## health    1025.0000
## stun      1050.0000
## vgauge1    600.0000
## vgauge2    600.0000
## fDash       17.0000
## bDash       23.0000
## fWalk        0.0470
## bWalk        0.0289
## throwHurt    0.2500
## throwRange   0.8000
```

```r
character_info(
  "data/characters/dan.csv",
  "Dan",
  "img/dan.png",
  "#bf6072"
)
```

```
## [1] "Median: -2.00  |  Mean: -4.74  |  Standard deviation: 13.89"
## [1] "Median: 80.00  |  Mean: 81.28  |  Standard deviation: 57.09"
## [1] "Median: 100.00  |  Mean: 92.56  |  Standard deviation: 39.38"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP      3      LP    False    False    False    normal    30    50
## 2 Stand MP      3      MP    False    False    False    normal    60    80
## 3 Stand HP     -2      HP    False    False    False    normal    70   120
## 4 Stand LK      0      LK    False    False    False    normal    30    50
## 5 Stand MK     -2      MK    False    False    False    normal    60    80
## 6 Stand HK     -4      HK    False    False    False    normal    90   120
##                 1
## health    1025.000
## stun       950.000
## vgauge1    300.000
## vgauge2    600.000
## fDash       16.000
## bDash       21.000
## fWalk        0.047
## bWalk        0.032
## throwHurt    0.250
## throwRange   0.800
```

```r
character_info(
  "data/characters/dhalsim.csv",
  "Dhalsim",
  "img/dhalsim.png",
  "#e0602b"
)
```

```
## [1] "Median: 0.00  |  Mean: 0.61  |  Standard deviation: 9.35"
## [1] "Median: 70.00  |  Mean: 92.93  |  Standard deviation: 79.32"
## [1] "Median: 100.00  |  Mean: 107.80  |  Standard deviation: 56.55"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP      3      LP    False    False    False    normal    30    70
## 2 Stand MP     -4      MP    False    False    False    normal    60   100
## 3 Stand HP     -6      HP    False    False    False    normal    90   150
```

```
## 4 Stand LK         2     LK   False    False     False   normal    40   70
## 5 Stand MK        -4     MK   False    False     False   normal    50  100
## 6 Stand HK        -4     HK   False    False     False   normal    90  150
##                    1
## health     950.000
## stun       950.000
## vgauge1    600.000
## vgauge2    600.000
## fDash       21.000
## bDash       25.000
## fWalk        0.022
## bWalk        0.020
## throwHurt    0.250
## throwRange   0.850
```

```r
character_info(
  "data/characters/e_honda.csv",
  "E. Honda",
  "img/e_honda.png",
  "#5197a3"
)
```

```
## [1] "Median: -2.00   |  Mean: -3.06   |  Standard deviation: 6.85"
## [1] "Median: 95.00   |  Mean: 95.25   |  Standard deviation: 53.83"
## [1] "Median: 150.00   |  Mean: 131.56  |  Standard deviation: 52.68"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP         3     LP   False    False     False   normal    40   90
## 2 Stand MP         2     MP   False    False     False   normal    70  120
## 3 Stand HP        -7     HP   False    False     False   normal    85  150
## 4 Stand LK         2     LK   False    False     False   normal    40   90
## 5 Stand MK         4     MK   False    False     False   normal    60  120
## 6 Stand HK        -1     HK   False    False     False   normal    85  150
##                     1
## health     1050.000
## stun       1075.000
## vgauge1     900.000
## vgauge2     600.000
## fDash        20.000
## bDash        24.000
## fWalk         0.044
## bWalk         0.027
## throwHurt     0.250
## throwRange    0.900
```

```r
character_info(
  "data/characters/ed.csv",
  "Ed",
  "img/ed.png",
  "#51bcd0"
)
```

```
## [1] "Median: -2.00   |  Mean: -2.43   |  Standard deviation: 13.20"
## [1] "Median: 80.00   |  Mean: 84.00   |  Standard deviation: 57.21"
## [1] "Median: 100.00  |  Mean: 109.83  |  Standard deviation: 52.83"
##              Move onBlock     plnCmd airmove followUp projectile moveType
## 1        Stand LP       3         LP   False    False      False   normal
```

```
## 2              Stand MP        3          MP   False     False      False   normal
## 3              Stand HP       -2          HP   False     False      False   normal
## 4 Stand HP (release)         -2 HP (release)  False     False      False   normal
## 5              Stand LK        1          LK   False     False      False   normal
## 6              Stand MK        2          MK   False     False      False   normal
##    Damage Stun
## 1     30    70
## 2     60   100
## 3     90   150
## 4     90   150
## 5     30    70
## 6     70   100
##                   1
## health     1025.000
## stun       1050.000
## vgauge1     600.000
## vgauge2     900.000
## fDash        16.000
## bDash        23.000
## fWalk         0.047
## bWalk         0.034
## throwHurt     0.250
## throwRange    0.800
```

```r
character_info(
  "data/characters/f_a_n_g.csv",
  "F.A.N.G",
  "img/f_a_n_g.png",
  "#3040a0"
)
```

```
## [1] "Median: -2.00  |  Mean: -3.50  |  Standard deviation: 11.15"
## [1] "Median: 60.00  |  Mean: 61.83  |  Standard deviation: 26.08"
## [1] "Median: 100.00  |  Mean: 123.63  |  Standard deviation: 48.46"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30    70
## 2 Stand MP      -3     MP   False    False      False   normal     60   100
## 3 Stand HP      -2     HP   False    False      False   normal     90   150
## 4 Stand LK       3     LK   False    False      False   normal     40    70
## 5 Stand MK       1     MK   False    False      False   normal     60   100
## 6 Stand HK       1     HK   False    False      False   normal    115   115
##                 1
## health     975.000
## stun      1000.000
## vgauge1    600.000
## vgauge2    900.000
## fDash       20.000
## bDash       24.000
## fWalk        0.032
## bWalk        0.028
## throwHurt    0.250
## throwRange   0.850
```

```r
character_info(
  "data/characters/falke.csv",
```

```
  "Falke",
  "img/falke.png",
  "#191b44"
)
```

```
## [1] "Median: -3.00   |   Mean: -6.71   |   Standard deviation: 14.28"
## [1] "Median: 70.00   |   Mean: 84.14   |   Standard deviation: 59.35"
## [1] "Median: 110.00   |   Mean: 118.93   |   Standard deviation: 51.88"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK       3     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##                  1
## health      975.00
## stun       1000.00
## vgauge1     600.00
## vgauge2     600.00
## fDash        20.00
## bDash        25.00
## fWalk         0.04
## bWalk         0.03
## throwHurt     0.25
## throwRange    0.85
```

```
character_info(
  "data/characters/g.csv",
  "G",
  "img/g.png",
  "#3d453a"
)
```

```
## [1] "Median: -4.50   |   Mean: -4.86   |   Standard deviation: 4.72"
## [1] "Median: 80.00   |   Mean: 83.80   |   Standard deviation: 43.70"
## [1] "Median: 100.00   |   Mean: 114.60   |   Standard deviation: 35.70"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK       1     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -5     HK   False    False      False   normal     80  100
##                    1
## health      1025.0000
## stun        1050.0000
## vgauge1      900.0000
## vgauge2      600.0000
## fDash         19.0000
## bDash         25.0000
## fWalk          0.0377
## bWalk          0.0300
## throwHurt      0.2500
## throwRange     0.8500
```

```r
character_info(
  "data/characters/gill.csv",
  "Gill",
  "img/gill.png",
  "#bf423b"
)
```

```
## [1] "Median: -4.00  |  Mean: -4.00  |  Standard deviation: 6.82"
## [1] "Median: 70.00  |  Mean: 78.47  |  Standard deviation: 48.58"
## [1] "Median: 120.00  |  Mean: 108.00  |  Standard deviation: 38.91"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -2     HP   False    False      False   normal     90  120
## 4 Stand LK       3     LK   False    False      False   normal     30   70
## 5 Stand MK      -4     MK   False    False      False   normal     70  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##                 1
## health     1025.0000
## stun       1050.0000
## vgauge1     600.0000
## vgauge2     600.0000
## fDash        16.0000
## bDash        25.0000
## fWalk         0.0412
## bWalk         0.0273
## throwHurt     0.2500
## throwRange    0.8500
```

```r
character_info(
  "data/characters/guile.csv",
  "Guile",
  "img/guile.png",
  "#597c00"
)
```

```
## [1] "Median: -3.00  |  Mean: -4.83  |  Standard deviation: 12.68"
## [1] "Median: 77.50  |  Mean: 80.80  |  Standard deviation: 48.49"
## [1] "Median: 100.00  |  Mean: 116.80  |  Standard deviation: 60.22"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -4     HP   False    False      False   normal     80  150
## 4 Stand LK       2     LK   False    False      False   normal     30   70
## 5 Stand MK      -1     MK   False    False      False   normal     70  100
## 6 Stand HK      -3     HK   False    False      False   normal     80  150
##              1
## health     975.000
## stun       975.000
## vgauge1    900.000
## vgauge2    600.000
## fDash       18.000
## bDash       25.000
## fWalk        0.052
## bWalk        0.033
```

```
## throwHurt    0.250
## throwRange   0.800
```

```r
character_info(
  "data/characters/ibuki.csv",
  "Ibuki",
  "img/ibuki.png",
  "#4b1d40"
)
```

```
## [1] "Median: -3.00  |  Mean: -5.80  |  Standard deviation: 8.71"
## [1] "Median: 80.00  |  Mean: 85.78  |  Standard deviation: 52.49"
## [1] "Median: 107.50  |  Mean: 117.62  |  Standard deviation: 63.97"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       1     LP   False    False      False   normal     30   70
## 2 Stand MP       2     MP   False    False      False   normal     60  100
## 3 Stand HP      -5     HP   False    False      False   normal     80  150
## 4 Stand LK      -2     LK   False    False      False   normal     30   70
## 5 Stand MK       2     MK   False    False      False   normal     60  100
## 6 Stand HK      -2     HK   False    False      False   normal     90  150
##                1
## health     925.000
## stun       950.000
## vgauge1    900.000
## vgauge2    600.000
## fDash       16.000
## bDash       21.000
## fWalk        0.052
## bWalk        0.034
## throwHurt    0.250
## throwRange   0.800
```

```r
character_info(
  "data/characters/juri.csv",
  "Juri",
  "img/juri.png",
  "#983190"
)
```

```
## [1] "Median: -5.00  |  Mean: -7.41  |  Standard deviation: 9.18"
## [1] "Median: 80.00  |  Mean: 80.16  |  Standard deviation: 52.33"
## [1] "Median: 150.00  |  Mean: 117.57  |  Standard deviation: 56.19"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP      -1     MP   False    False      False   normal     60  100
## 3 Stand HP      -6     HP   False    False      False   normal     80  150
## 4 Stand LK       1     LK   False    False      False   normal     30   70
## 5 Stand MK      -7     MK   False    False      False   normal     70  100
## 6 Stand HK      -7     HK   False    False      False   normal     80  150
##                1
## health     975.000
## stun      1000.000
## vgauge1    600.000
## vgauge2    600.000
## fDash       16.000
## bDash       24.000
```

```
## fWalk          0.050
## bWalk          0.033
## throwHurt       0.250
## throwRange      0.800
```

```r
character_info(
  "data/characters/kage.csv",
  "Kage",
  "img/kage.png",
  "#553fad"
)
```

```
## [1] "Median: -4.00  |  Mean: -5.35  |  Standard deviation: 13.89"
## [1] "Median: 70.00  |  Mean: 80.93  |  Standard deviation: 43.49"
## [1] "Median: 100.00  |  Mean: 115.43  |  Standard deviation: 47.50"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP      -1     MP   False    False      False   normal     60  100
## 3 Stand HP      -5     HP   False    False      False   normal     80  120
## 4 Stand LK       1     LK   False    False      False   normal     30   70
## 5 Stand MK      -3     MK   False    False      False   normal     70  100
## 6 Stand HK      -2     HK   False    False      False   normal     80  150
##                  1
## health     925.000
## stun       950.000
## vgauge1    600.000
## vgauge2    900.000
## fDash       16.000
## bDash       21.000
## fWalk        0.052
## bWalk        0.035
## throwHurt    0.250
## throwRange   0.800
```

```r
character_info(
  "data/characters/karin.csv",
  "Karin",
  "img/karin.png",
  "#e93824"
)
```

```
## [1] "Median: -4.00  |  Mean: -3.92  |  Standard deviation: 8.59"
## [1] "Median: 70.00  |  Mean: 81.50  |  Standard deviation: 52.65"
## [1] "Median: 100.00  |  Mean: 111.00  |  Standard deviation: 50.17"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       1     MP   False    False      False   normal     60  100
## 3 Stand HP      -5     HP   False    False      False   normal     80  150
## 4 Stand LK       2     LK   False    False      False   normal     40   70
## 5 Stand MK      -4     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##                  1
## health     925.000
## stun       950.000
## vgauge1    600.000
## vgauge2    600.000
```

```
## fDash        16.000
## bDash        21.000
## fWalk         0.049
## bWalk         0.036
## throwHurt     0.250
## throwRange    0.850
```

```r
character_info(
  "data/characters/ken.csv",
  "Ken",
  "img/ken.png",
  "#ff0000"
)
```

```
## [1] "Median: -4.00  |  Mean: -9.54   |  Standard deviation: 14.74"
## [1] "Median: 70.00  |  Mean: 82.68   |  Standard deviation: 53.02"
## [1] "Median: 100.00  |  Mean: 112.73  |  Standard deviation: 48.36"
##         Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       2     MP   False    False      False   normal     60  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK      -1     LK   False    False      False   normal     30   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##                 1
## health     1025.000
## stun       1050.000
## vgauge1     900.000
## vgauge2     600.000
## fDash        15.000
## bDash        24.000
## fWalk         0.050
## bWalk         0.035
## throwHurt     0.250
## throwRange    0.800
```

```r
character_info(
  "data/characters/kolin.csv",
  "Kolin",
  "img/kolin.png",
  "#394057"
)
```

```
## [1] "Median: -2.00  |  Mean: -0.94   |  Standard deviation: 12.04"
## [1] "Median: 70.00  |  Mean: 80.06   |  Standard deviation: 48.53"
## [1] "Median: 100.00  |  Mean: 133.94  |  Standard deviation: 69.34"
##         Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       2     MP   False    False      False   normal     60  100
## 3 Stand HP      -4     HP   False    False      False   normal     80  150
## 4 Stand LK      -2     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     50  100
## 6 Stand HK      -2     HK   False    False      False   normal     80  150
##                 1
## health     1.00e+03
## stun       1.00e+03
```

```
## vgauge1     6.00e+02
## vgauge2     6.00e+02
## fDash       1.70e+01
## bDash       2.10e+01
## fWalk       4.13e-02
## bWalk       3.25e-02
## throwHurt   3.50e-01
## throwRange  8.50e-01
```

```r
character_info(
  "data/characters/laura.csv",
  "Laura",
  "img/laura.png",
  "#80dc00"
)
```

```
## [1] "Median: 2.00   |   Mean: 5.78   |   Standard deviation: 14.67"
## [1] "Median: 80.00   |   Mean: 88.24   |   Standard deviation: 58.21"
## [1] "Median: 100.00   |   Mean: 108.29   |   Standard deviation: 55.22"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       1     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -2     HP   False    False      False   normal     80  150
## 4 Stand LK       3     LK   False    False      False   normal     30   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     90  150
##                   1
## health      1025.000
## stun        1000.000
## vgauge1      900.000
## vgauge2      600.000
## fDash         17.000
## bDash         21.000
## fWalk          0.040
## bWalk          0.032
## throwHurt      0.410
## throwRange     0.850
```

```r
character_info(
  "data/characters/lucia.csv",
  "Lucia",
  "img/lucia.png",
  "#3e77b1"
)
```

```
## [1] "Median: -4.00   |   Mean: -6.94   |   Standard deviation: 15.91"
## [1] "Median: 80.00   |   Mean: 86.31   |   Standard deviation: 53.77"
## [1] "Median: 120.00   |   Mean: 117.02   |   Standard deviation: 53.14"
##          Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     50  100
## 3 Stand HP      -2     HP   False    False      False   normal     80  150
## 4 Stand LK       1     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     90  150
##                   1
```

```
## health      975.00
## stun       1000.00
## vgauge1     900.00
## vgauge2     600.00
## fDash        16.00
## bDash        21.00
## fWalk         0.05
## bWalk         0.04
## throwHurt     0.25
## throwRange    0.80
```

```r
character_info(
  "data/characters/m_bison.csv",
  "M. Bison",
  "img/m_bison.png",
  "#480e07"
)
```

```
## [1] "Median: -1.50  |  Mean: -2.44  |  Standard deviation: 8.69"
## [1] "Median: 80.00  |  Mean: 85.15  |  Standard deviation: 53.38"
## [1] "Median: 100.00  |  Mean: 115.82  |  Standard deviation: 52.01"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP      3     LP   False    False      False    normal     30   70
## 2 Stand MP      2     MP   False    False      False    normal     60  100
## 3 Stand HP     -6     HP   False    False      False    normal     90  150
## 4 Stand LK     -2     LK   False    False      False    normal     30   70
## 5 Stand MK     -2     MK   False    False      False    normal     60  100
## 6 Stand HK      3     HK   False    False      False    normal     80  150
##                 1
## health     1.00e+03
## stun       1.00e+03
## vgauge1    9.00e+02
## vgauge2    6.00e+02
## fDash      2.20e+01
## bDash      2.20e+01
## fWalk      2.62e-02
## bWalk      2.30e-02
## throwHurt  2.50e-01
## throwRange 9.00e-01
```

```r
character_info(
  "data/characters/menat.csv",
  "Menat",
  "img/menat.png",
  "#3d224b"
)
```

```
## [1] "Median: -3.50  |  Mean: -6.05  |  Standard deviation: 9.24"
## [1] "Median: 60.00  |  Mean: 69.52  |  Standard deviation: 49.78"
## [1] "Median: 100.00  |  Mean: 104.05  |  Standard deviation: 48.19"
##            Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1     Stand LP      3     LP    False    False      False    normal     20   70
## 2 Stand LP orb      3 LP orb    False    False      False    normal     30   70
## 3     Stand MP      2     MP    False    False      False    normal     50  100
## 4 Stand MP orb     -8 MP orb    False    False      False    normal     60  100
## 5     Stand HP     -2     HP    False    False      False    normal     80  150
```

```
## 6 Stand HP orb      -10 HP orb   False     False      False    normal    80  150
##                 1
## health      950.000
## stun        950.000
## vgauge1     900.000
## vgauge2     600.000
## fDash        20.000
## bDash        24.000
## fWalk         0.040
## bWalk         0.032
## throwHurt     0.250
## throwRange    0.850
```

```r
character_info(
  "data/characters/nash.csv",
  "Nash",
  "img/nash.png",
  "#3a8455"
)
```

```
## [1] "Median: -5.00  |  Mean: -5.28  |  Standard deviation: 7.38"
## [1] "Median: 82.00  |  Mean: 92.26  |  Standard deviation: 50.95"
## [1] "Median: 100.00  |  Mean: 124.60  |  Standard deviation: 51.09"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP       0     MP   False    False      False   normal     60  100
## 3 Stand HP      -5     HP   False    False      False   normal     90  150
## 4 Stand LK       1     LK   False    False      False   normal     30   70
## 5 Stand MK       0     MK   False    False      False   normal     70  100
## 6 Stand HK      -2     HK   False    False      False   normal     80  150
##                 1
## health      975.000
## stun       1000.000
## vgauge1     600.000
## vgauge2     900.000
## fDash        18.000
## bDash        24.000
## fWalk         0.027
## bWalk         0.027
## throwHurt     0.250
## throwRange    0.850
```

```r
character_info(
  "data/characters/necalli.csv",
  "Necalli",
  "img/necalli.png",
  "#581e0d"
)
```

```
## [1] "Median: -4.00  |  Mean: -4.69  |  Standard deviation: 14.04"
## [1] "Median: 80.00  |  Mean: 91.44  |  Standard deviation: 54.99"
## [1] "Median: 120.00  |  Mean: 122.89  |  Standard deviation: 59.08"
##       Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       1     LP   False    False      False   normal     30   70
## 2 Stand MP       0     MP   False    False      False   normal     60  100
## 3 Stand HP      -2     HP   False    False      False   normal     80  150
```

```
## 4 Stand LK       2     LK    False     False       False    normal     40    70
## 5 Stand MK       2     MK    False     False       False    normal     60   100
## 6 Stand HK      -4     HK    False     False       False    normal     90   150
##                  1
## health    1025.000
## stun      1050.000
## vgauge1    900.000
## vgauge2    900.000
## fDash       17.000
## bDash       22.000
## fWalk        0.047
## bWalk        0.032
## throwHurt    0.324
## throwRange   0.814
```

```r
character_info(
  "data/characters/poison.csv",
  "Poison",
  "img/poison.png",
  "#d14461"
)
```

```
## [1] "Median: -4.00   |   Mean: -2.63   |   Standard deviation: 13.98"
## [1] "Median: 80.00   |   Mean: 87.71   |   Standard deviation: 53.09"
## [1] "Median: 150.00   |   Mean: 118.57   |   Standard deviation: 51.51"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP    False     False       False    normal     20    70
## 2 Stand MP       3     MP    False     False       False    normal     60   100
## 3 Stand HP      -6     HP    False     False       False    normal     80   150
## 4 Stand LK       1     LK    False     False       False    normal     40    70
## 5 Stand MK      -4     MK    False     False       False    normal     70   100
## 6 Stand HK      -4     HK    False     False       False    normal     80   150
##                  1
## health     975.000
## stun       975.000
## vgauge1    600.000
## vgauge2    600.000
## fDash       18.000
## bDash       23.000
## fWalk        0.041
## bWalk        0.032
## throwHurt    0.250
## throwRange   0.850
```

```r
character_info(
  "data/characters/r_mika.csv",
  "R. Mika",
  "img/r_mika.png",
  "#68e6f7"
)
```

```
## [1] "Median: 3.50   |   Mean: 9.32   |   Standard deviation: 19.70"
## [1] "Median: 90.00   |   Mean: 92.78   |   Standard deviation: 46.90"
## [1] "Median: 125.00   |   Mean: 126.60   |   Standard deviation: 50.73"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP    False     False       False    normal     30    70
```

```
## 2 Stand MP       -2     MP    False    False      False    normal    60   100
## 3 Stand HP       -6     HP    False    False      False    normal    90   150
## 4 Stand LK        1     LK    False    False      False    normal    30    70
## 5 Stand MK       -2     MK    False    False      False    normal    60   100
## 6 Stand HK       -4     HK    False    False      False    normal    90   150
##                   1
## health     9.5e+02
## stun       1.0e+03
## vgauge1    6.0e+02
## vgauge2    9.0e+02
## fDash      1.8e+01
## bDash      2.4e+01
## fWalk      4.2e-02
## bWalk      3.0e-02
## throwHurt  2.5e-01
## throwRange 8.5e-01
```

```r
character_info(
  "data/characters/rashid.csv",
  "Rashid",
  "img/rashid.png",
  "#375963"
)
```

```
## [1] "Median: -20.00  |  Mean: -18.00  |  Standard deviation: 19.56"
## [1] "Median: 100.00  |  Mean: 101.59  |  Standard deviation: 48.02"
## [1] "Median: 150.00  |  Mean: 146.15  |  Standard deviation: 55.51"
##         Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP        3     LP    False    False      False    normal    30    70
## 2 Stand MP        3     MP    False    False      False    normal    60   100
## 3 Stand HP       -3     HP    False    False      False    normal    80   150
## 4 Stand LK        1     LK    False    False      False    normal    30    70
## 5 Stand MK       -4     MK    False    False      False    normal    60   100
## 6 Stand HK       -4     HK    False    False      False    normal    90   150
##                   1
## health     950.000
## stun       950.000
## vgauge1    600.000
## vgauge2    600.000
## fDash       15.000
## bDash       24.000
## fWalk        0.040
## bWalk        0.036
## throwHurt    0.402
## throwRange   0.852
```

```r
character_info(
  "data/characters/ryu.csv",
  "Ryu",
  "img/ryu.png",
  "#457272"
)
```

```
## [1] "Median: -6.00  |  Mean: -6.56  |  Standard deviation: 13.59"
## [1] "Median: 90.00  |  Mean: 91.51  |  Standard deviation: 50.78"
## [1] "Median: 150.00  |  Mean: 133.26  |  Standard deviation: 58.79"
```

```
##           Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       2     MP   False    False      False   normal     60  100
## 3 Stand HP      -1     HP   False    False      False   normal     90  150
## 4 Stand LK      -2     LK   False    False      False   normal     30   70
## 5 Stand MK      -2     MK   False    False      False   normal     70  100
## 6 Stand HK      -1     HK   False    False      False   normal     90  150
##                 1
## health     1025.000
## stun       1050.000
## vgauge1     600.000
## vgauge2     600.000
## fDash        16.000
## bDash        21.000
## fWalk         0.047
## bWalk         0.032
## throwHurt     0.250
## throwRange    0.800
```

```r
character_info(
  "data/characters/sagat.csv",
  "Sagat",
  "img/sagat.png",
  "#a16a46"
)
```

```
## [1] "Median: -2.00  |  Mean: -9.56  |  Standard deviation: 15.42"
## [1] "Median: 80.00  |  Mean: 95.24  |  Standard deviation: 53.64"
## [1] "Median: 120.00  |  Mean: 122.46  |  Standard deviation: 45.69"
##           Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       4     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -2     HP   False    False      False   normal     90  150
## 4 Stand LK       1     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     70  100
## 6 Stand HK      -3     HK   False    False      False   normal     80  150
##                  1
## health     1025.0000
## stun       1050.0000
## vgauge1     900.0000
## vgauge2     600.0000
## fDash        20.0000
## bDash        24.0000
## fWalk         0.0365
## bWalk         0.0277
## throwHurt     0.2500
## throwRange    0.8500
```

```r
character_info(
  "data/characters/sakura.csv",
  "Sakura",
  "img/sakura.png",
  "#ff83fa"
)
```

```
## [1] "Median: -3.00  |  Mean: -6.44  |  Standard deviation: 11.18"
```

```
## [1] "Median: 80.00  |  Mean: 80.37  |  Standard deviation: 38.99"
## [1] "Median: 112.00  |  Mean: 114.20  |  Standard deviation: 46.52"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -2     HP   False    False      False   normal     80  150
## 4 Stand LK      -2     LK   False    False      False   normal     30   70
## 5 Stand MK       1     MK   False    False      False   normal     60  100
## 6 Stand HK      -4     HK   False    False      False   normal     80  150
##                 1
## health     9.75e+02
## stun       1.00e+03
## vgauge1    6.00e+02
## vgauge2    6.00e+02
## fDash      1.60e+01
## bDash      2.30e+01
## fWalk      5.27e-02
## bWalk      4.70e-02
## throwHurt  2.50e-01
## throwRange 8.00e-01
```

```
character_info(
  "data/characters/seth.csv",
  "Seth",
  "img/seth.png",
  "#6d7293"
)
```

```
## [1] "Median: -5.00  |  Mean: -7.16  |  Standard deviation: 9.76"
## [1] "Median: 80.00  |  Mean: 85.73  |  Standard deviation: 39.05"
## [1] "Median: 120.00  |  Mean: 119.17  |  Standard deviation: 45.32"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       3     LP   False    False      False   normal     30   70
## 2 Stand MP      -2     MP   False    False      False   normal     50  100
## 3 Stand HP      -4     HP   False    False      False   normal     80  150
## 4 Stand LK       3     LK   False    False      False   normal     40   70
## 5 Stand MK      -2     MK   False    False      False   normal     70  100
## 6 Stand HK     -10     HK   False    False      False   normal     80  150
##                 1
## health     900.000
## stun       900.000
## vgauge1    600.000
## vgauge2    600.000
## fDash       16.000
## bDash       23.000
## fWalk        0.047
## bWalk        0.032
## throwHurt    0.250
## throwRange   0.800
```

```
character_info(
  "data/characters/urien.csv",
  "Urien",
  "img/urien.png",
  "#714661"
```

```
)
```

```
## [1] "Median: -2.00  |  Mean: -0.69  |  Standard deviation: 10.04"
## [1] "Median: 90.00  |  Mean: 82.86  |  Standard deviation: 46.45"
## [1] "Median: 140.00  |  Mean: 115.54  |  Standard deviation: 60.16"
##                    Move onBlock      plnCmd airmove followUp projectile moveType
## 1            Stand LP       2          LP   False    False      False   normal
## 2            Stand MP       3          MP   False    False      False   normal
## 3            Stand HP      -2          HP   False    False      False   normal
## 4      Stand HP (hold)     5   HP (hold)   False    False      False   normal
## 5 Stand HP (release)    -2 HP (release)   False    False      False   normal
## 6            Stand LK       3          LK   False    False      False   normal
##    Damage Stun
## 1      30   70
## 2      60  100
## 3      90  150
## 4     100  150
## 5      90  150
## 6      40   70
##                    1
## health     1025.0000
## stun       1050.0000
## vgauge1     900.0000
## vgauge2     600.0000
## fDash        16.0000
## bDash        25.0000
## fWalk         0.0435
## bWalk         0.0300
## throwHurt     0.2500
## throwRange    0.8500
```

```
character_info(
  "data/characters/vega.csv",
  "Vega",
  "img/vega.png",
  "#ed5971"
)
```

```
## [1] "Median: -2.00  |  Mean: -3.17  |  Standard deviation: 8.98"
## [1] "Median: 85.00  |  Mean: 95.26  |  Standard deviation: 52.89"
## [1] "Median: 150.00  |  Mean: 134.57  |  Standard deviation: 57.73"
##                    Move onBlock        plnCmd airmove followUp projectile moveType
## 1 Stand LP (no claw)       3 LP (no claw)   False    False      False   normal
## 2 Stand MP (no claw)       1 MP (no claw)   False    False      False   normal
## 3 Stand HP (no claw)      -1 HP (no claw)   False    False      False   normal
## 4     Stand LP (claw)      1    LP (claw)   False    False      False   normal
## 5     Stand MP (claw)      2    MP (claw)   False    False      False   normal
## 6     Stand HP (claw)     -2    HP (claw)   False    False      False   normal
##    Damage Stun
## 1      30   70
## 2      60  100
## 3      90  150
## 4      30   70
## 5      70  100
## 6      80  150
```

```
##                       1
## health    1025.0000
## stun       975.0000
## vgauge1     600.0000
## vgauge2     600.0000
## fDash        17.0000
## bDash        21.0000
## fWalk         0.0550
## bWalk         0.0450
## throwHurt     0.4087
## throwRange    0.8557
```

```
character_info(
  "data/characters/zangief.csv",
  "Zangief",
  "img/zangief.png",
  "#e52a0e"
)
```

```
## [1] "Median: -2.00  |  Mean: -1.92  |  Standard deviation: 9.13"
## [1] "Median: 70.00  |  Mean: 74.58  |  Standard deviation: 29.04"
## [1] "Median: 100.00  |  Mean: 114.58  |  Standard deviation: 55.72"
##                  Move onBlock      plnCmd airmove followUp projectile moveType
## 1            Stand LP       3          LP   False    False      False   normal
## 2            Stand MP       2          MP   False    False      False   normal
## 3            Stand HP      -4          HP   False    False      False   normal
## 4     Stand HP (hold)       2   HP (hold)  False    False      False   normal
## 5 Stand HP (release)      -4 HP (release)  False    False      False   normal
## 6            Stand LK      -3          LK   False    False      False   normal
##   Damage Stun
## 1     40   70
## 2     70  100
## 3    100  150
## 4    130  200
## 5    100  150
## 6     30   70
##                       1
## health    1075.0000
## stun      1100.0000
## vgauge1     900.0000
## vgauge2     900.0000
## fDash        25.0000
## bDash        25.0000
## fWalk         0.0305
## bWalk         0.0235
## throwHurt     0.4000
## throwRange    0.9000
```

```
character_info(
  "data/characters/zeku_old.csv",
  "Zeku (Old)",
  "img/zeku_old.png",
  "#545345"
)
```

```
## [1] "Median: -4.00  |  Mean: -6.67  |  Standard deviation: 12.32"
```

```
## [1] "Median: 90.00  |  Mean: 92.65  |  Standard deviation: 48.17"
## [1] "Median: 100.00  |  Mean: 122.65  |  Standard deviation: 50.28"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       3     MP   False    False      False   normal     60  100
## 3 Stand HP      -5     HP   False    False      False   normal     80  150
## 4 Stand LK       2     LK   False    False      False   normal     40   70
## 5 Stand MK       2     MK   False    False      False   normal     60  100
## 6 Stand HK      -2     HK   False    False      False   normal     90  150
##                   1
## health     1.00e+03
## stun       1.00e+03
## vgauge1    6.00e+02
## vgauge2    6.00e+02
## fDash      1.70e+01
## bDash      2.20e+01
## fWalk      4.35e-02
## bWalk      2.84e-02
## throwHurt  3.00e-01
## throwRange 8.00e-01
```

```r
character_info(
  "data/characters/zeku_young.csv",
  "Zeku (Young)",
  "img/zeku_young.png",
  "#351f0a"
)
```

```
## [1] "Median: -5.00  |  Mean: -6.53  |  Standard deviation: 9.46"
## [1] "Median: 85.00  |  Mean: 94.65  |  Standard deviation: 55.96"
## [1] "Median: 150.00  |  Mean: 132.20  |  Standard deviation: 64.22"
##        Move onBlock plnCmd airmove followUp projectile moveType Damage Stun
## 1 Stand LP       2     LP   False    False      False   normal     30   70
## 2 Stand MP       2     MP   False    False      False   normal     60  100
## 3 Stand HP      -3     HP   False    False      False   normal     80  150
## 4 Stand LK      -2     LK   False    False      False   normal     40   70
## 5 Stand MK      -3     MK   False    False      False   normal     60  100
## 6 Stand HK      -2     HK   False    False      False   normal     90  150
##                  1
## health     1.0e+03
## stun       1.0e+03
## vgauge1    6.0e+02
## vgauge2    6.0e+02
## fDash      1.7e+01
## bDash      2.2e+01
## fWalk      5.4e-02
## bWalk      3.5e-02
## throwHurt  3.0e-01
## throwRange 8.0e-01
```

Module 2: Visualization

Are frames on block and damage+stun correlated? Let's find out.

```
library(tidyverse)
library(RColorBrewer)
df <- read.csv("data/all.csv", stringsAsFactors = FALSE)
```

Tilemaps

```
df_tile <- df %>%
  # convert to factor and reverse level order so it looks right on plot
  mutate(character_name = factor(Character,
    levels = rev(sort(unique(Character)))
  )) %>%
  # create intervals for plotting/colormap and similar to before, reverse order
  mutate(oB_bins = cut(onBlock,
    breaks = seq(from = -100, to = max(onBlock, na.rm = TRUE) + 2, by = 25)
  )) %>%
  mutate(oB_bins = factor(as.character(oB_bins), levels = rev(levels(oB_bins))))

# make sure the set of colors matches the number of bins
cmap_bins <- length(levels(df_tile$oB_bins))

tilemap <- function(responses, custompal) {
  print(ggplot(df_tile, aes({{ responses }}, character_name, fill = oB_bins)) +
    geom_tile(width = 10, color = "white", linewidth = 0.2) +
    coord_fixed(ratio = 10) +
    guides(fill = guide_legend(title = "Frames\non block")) +
    labs(y = "") +
    # removes extra space
    scale_y_discrete(expand = c(0, 0)) +
    # define new breaks on x-axis
    scale_x_continuous(
      expand = c(0, 0),
      limits = c(-10, 410),
      breaks = seq(from = 0, to = 400, by = 50)
    ) +
    scale_fill_manual(values = rev(brewer.pal(cmap_bins, custompal))) +
    # set a base size for all fonts
    theme_grey(base_size = 9) +
    # styling to make it my own
    theme(
      legend.title = element_text(color = "#292F36"),
      legend.text = element_text(size = 7, color = "#292F36"),
      legend.key.height = grid::unit(0.8, "cm"),
      legend.key.width = grid::unit(0.3, "cm"),
      axis.title.x = element_text(margin = margin(t = 8), color = "#292F36"),
      axis.text.x = element_text(color = "#292F36"),
      axis.text.y = element_text(color = "#292F36"),
      axis.ticks = element_line(linewidth = 0.4), # thickness of axis ticks
      plot.background = element_blank(), # rm background
      panel.border = element_blank() # rm outer border
    ))
```

```
}
```

```
tilemap(Damage, "YlGnBu") # will give user option to change to YlOrRd
```
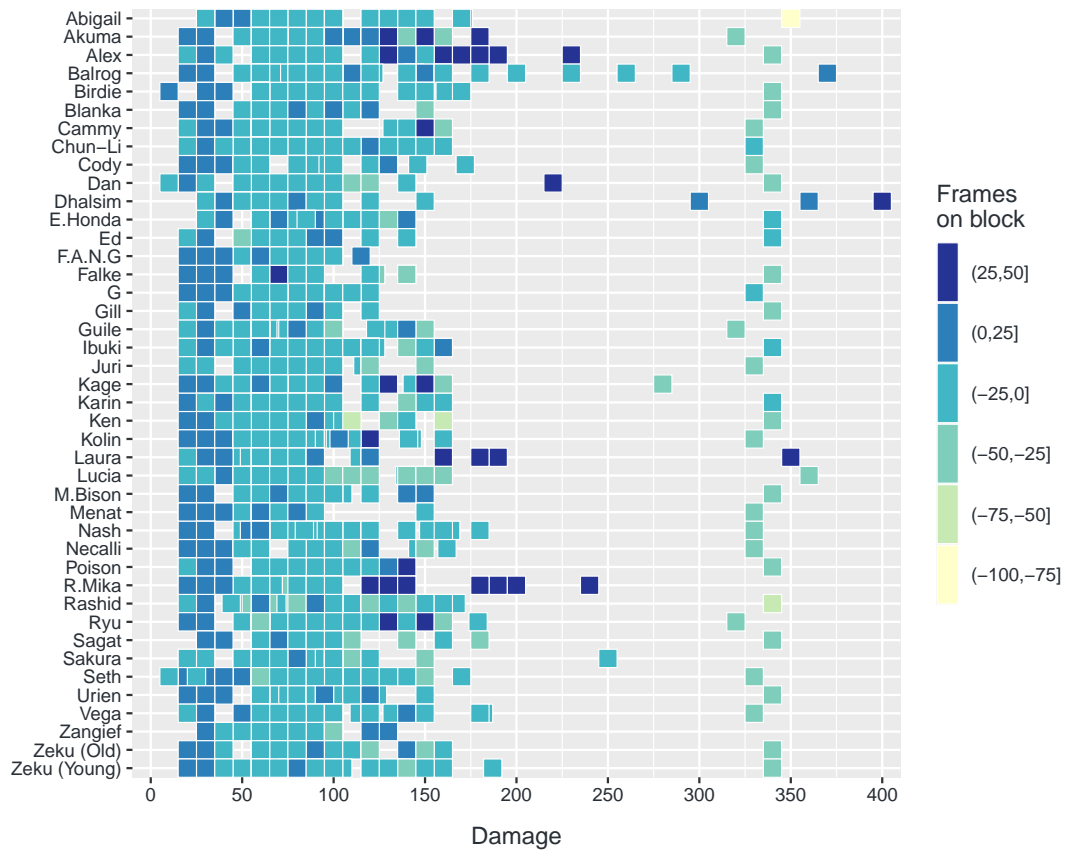


```
tilemap(Stun, "YlGnBu")
```
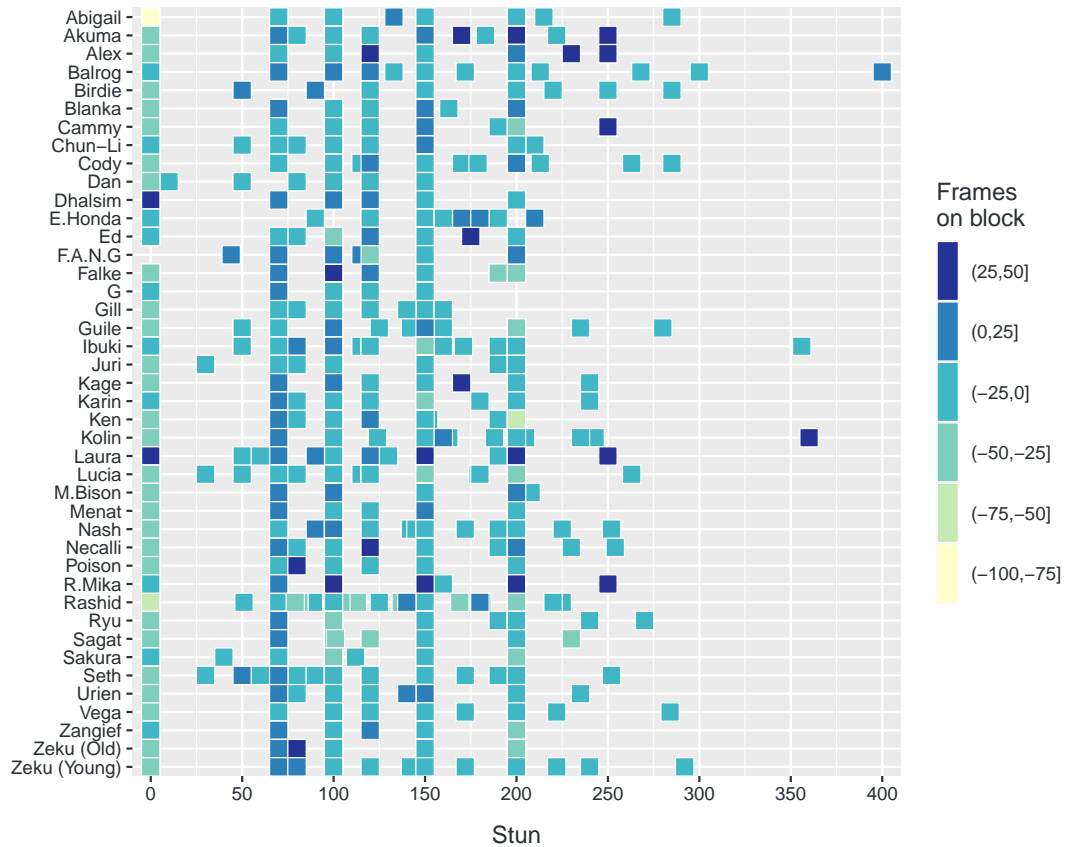
Scatter plots with linear fit

```r
library(viridisLite)

scatterplot <- function(datafile, char_name, clr) {
  df <- read.csv(datafile, stringsAsFactors = FALSE)

  print(cor.test(df$onBlock, df$Damage))
  print(lm(Damage ~ onBlock, data = df))
  print(ggplot(df, aes(onBlock, Damage)) +
    geom_point(aes(color = Damage)) +
    scale_color_gradientn(colors = viridis(max(df$Damage), option = "C")) +
    geom_smooth(
      method = "lm", formula = y ~ x,
      color = clr, fill = clr, alpha = 0.15
    ))

  print(cor.test(df$onBlock, df$Stun))
  print(lm(Stun ~ onBlock, data = df))
  print(ggplot(df, aes(onBlock, Stun)) +
    geom_point(aes(color = Stun)) +
    scale_color_gradientn(colors = viridis(max(df$Stun), option = "D")) +
    geom_smooth(
      method = "lm", formula = y ~ x,
      color = clr, fill = clr, alpha = 0.15
```

```
    ))
}
```

Put it to the test

```
scatterplot(
  "data/all.csv",
  "All characters",
  "#0000ff"
)
```
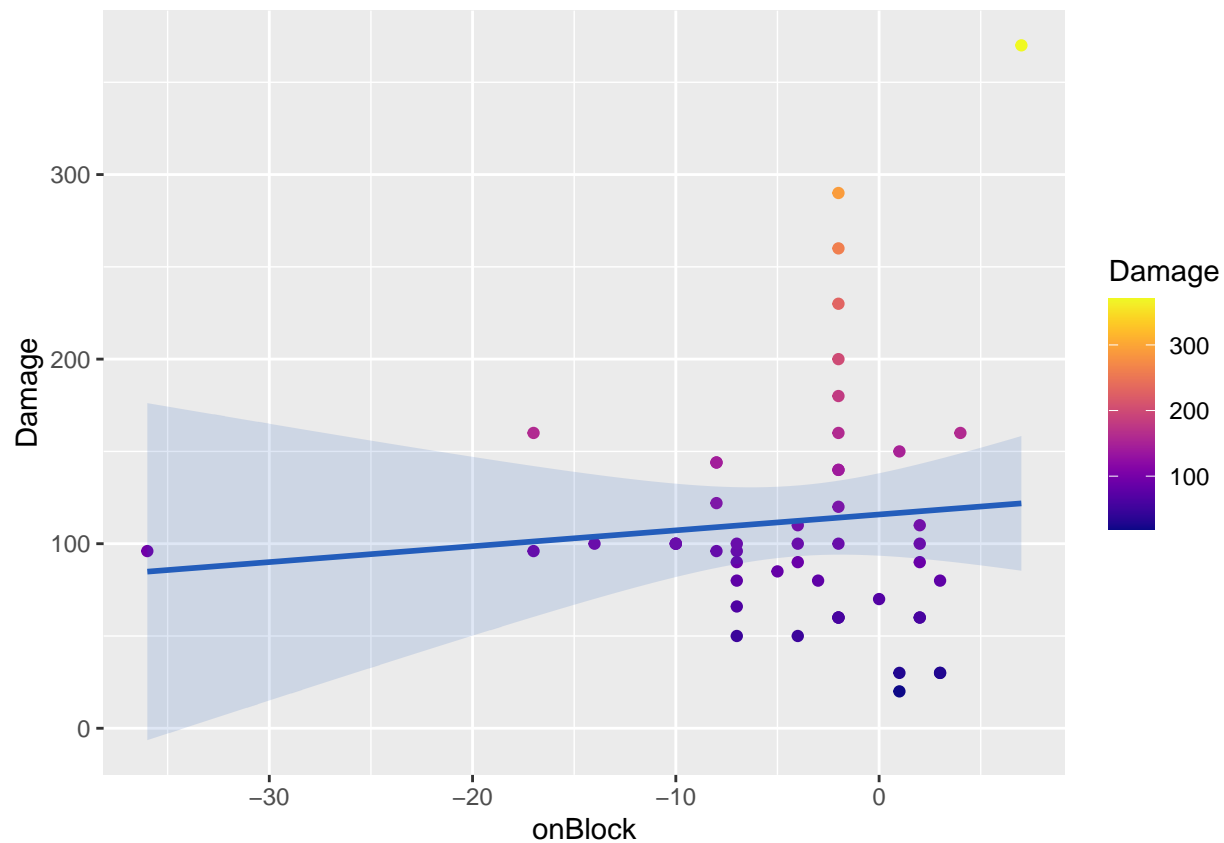
```
##
##   Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -11.126, df = 1807, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2958481 -0.2095717
## sample estimates:
##        cor
## -0.2532133
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      83.833       -0.987
```
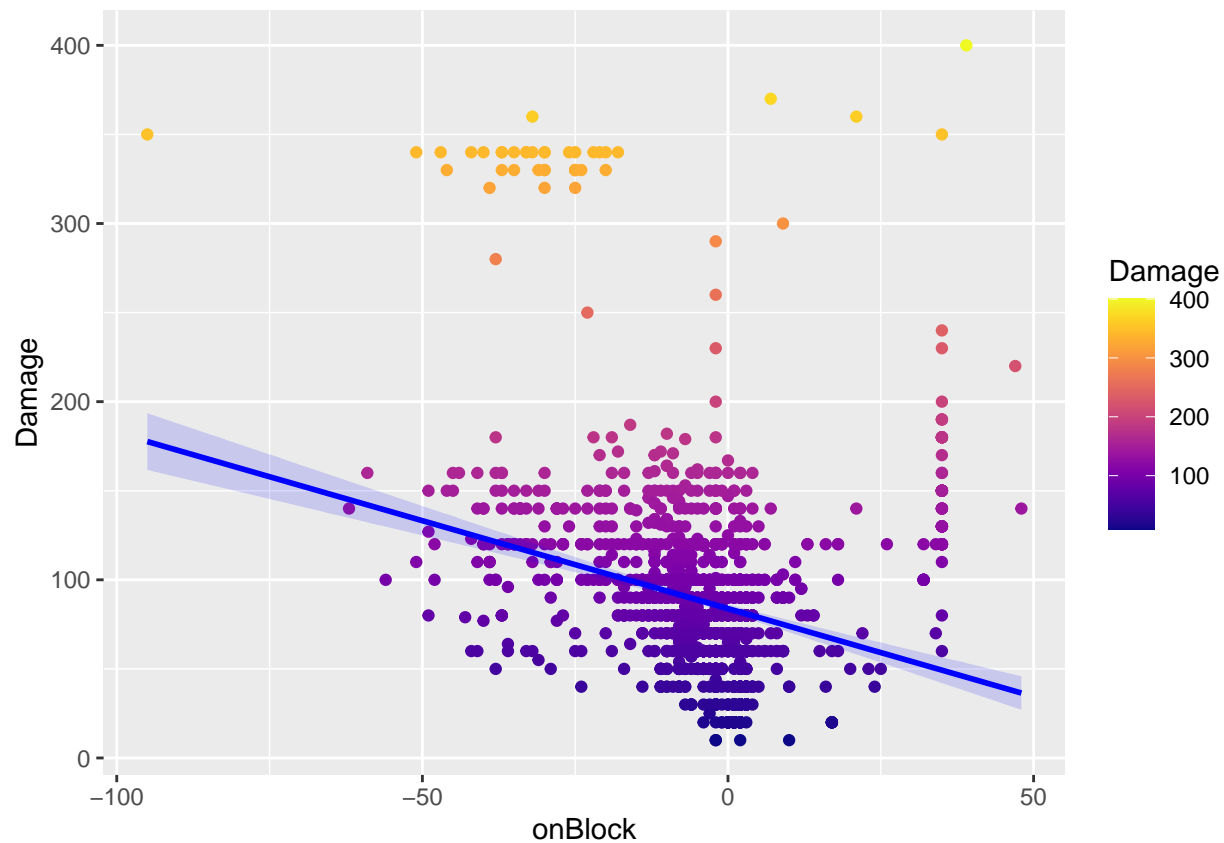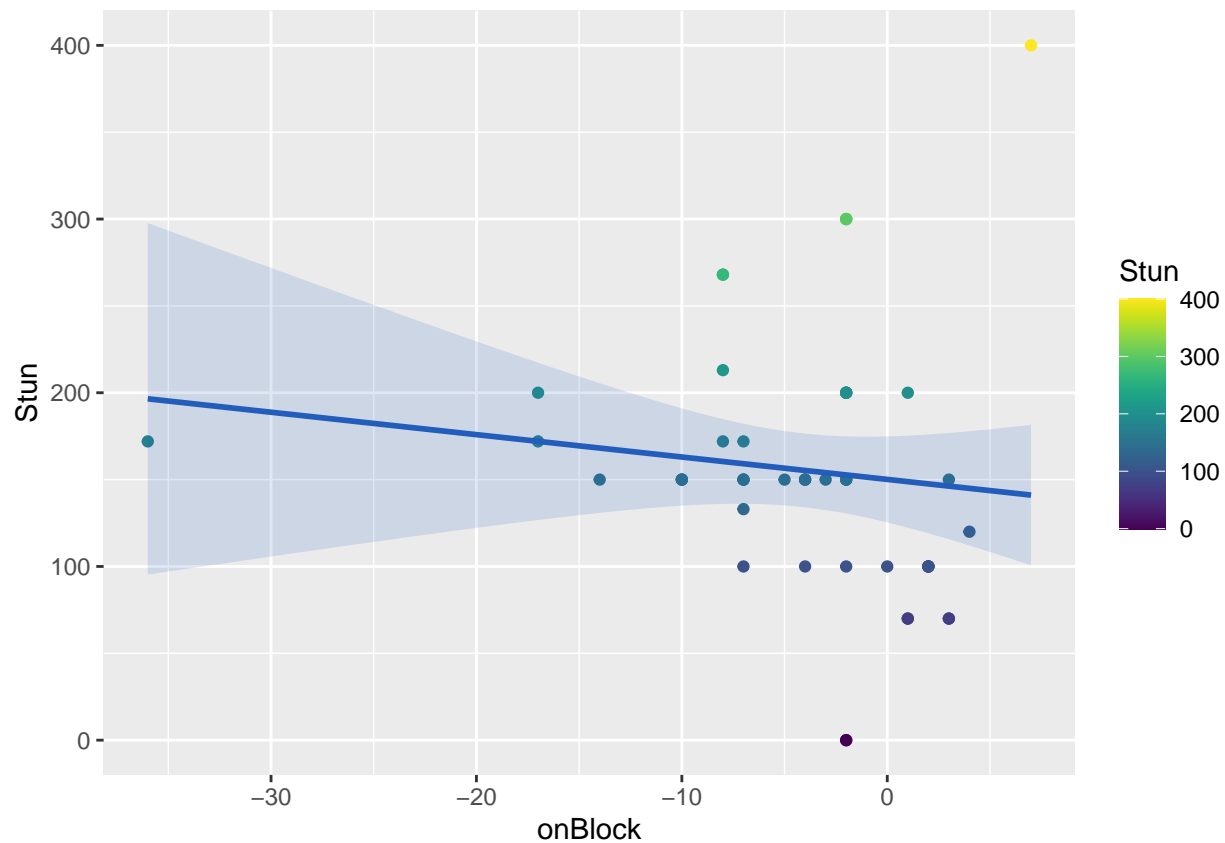
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.5214, df = 1807, p-value = 0.1283
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.08172056  0.01033640
## sample estimates:
##         cor
## -0.03576795
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    121.5538      -0.1487
```
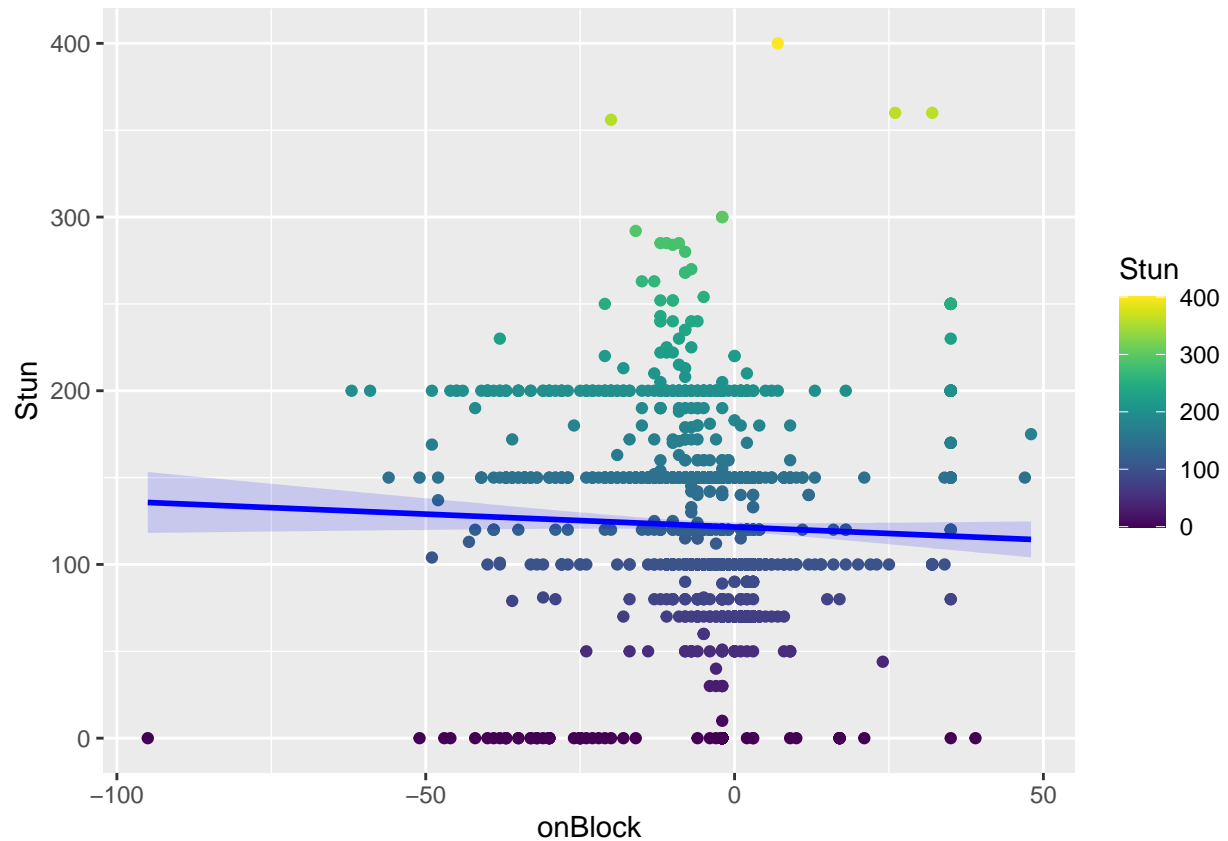
```
scatterplot(
  "data/characters/abigail.csv",
  "Abigail",
  "#af33b4"
)
```
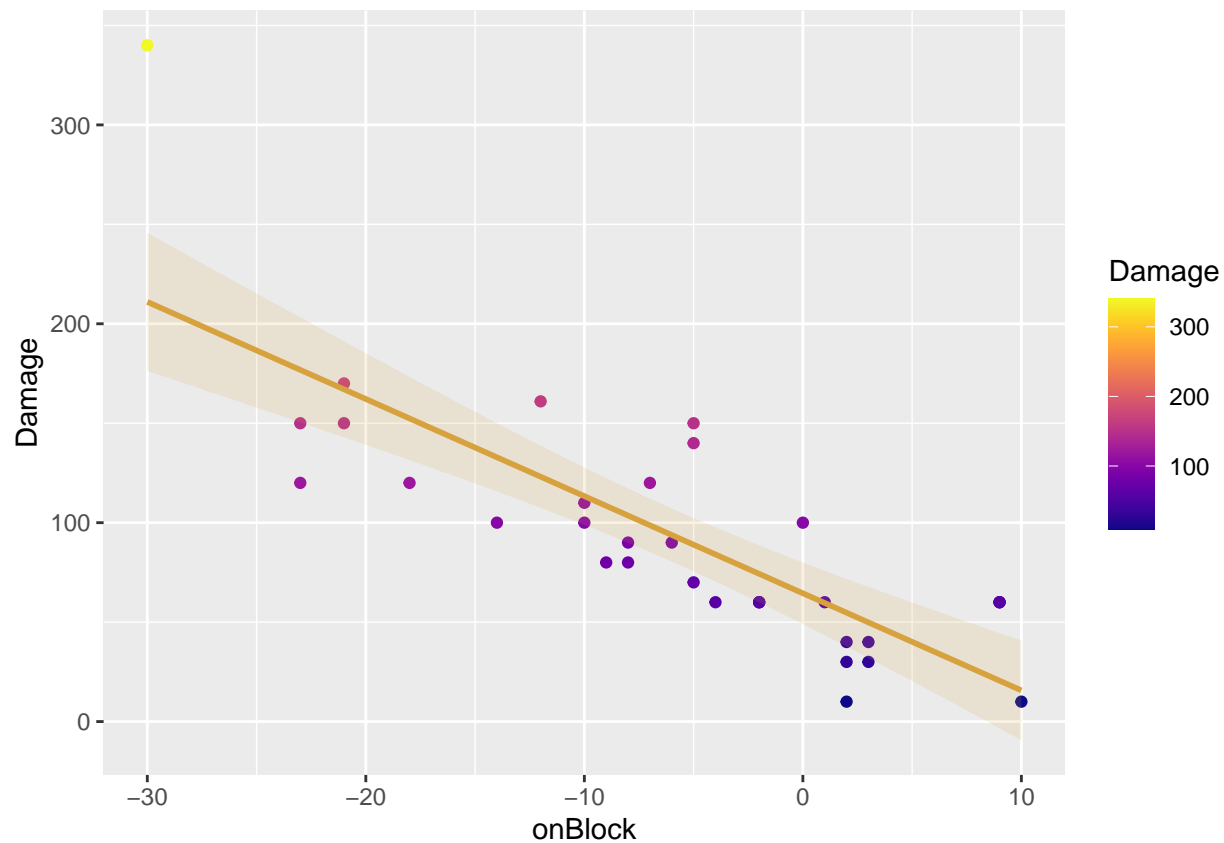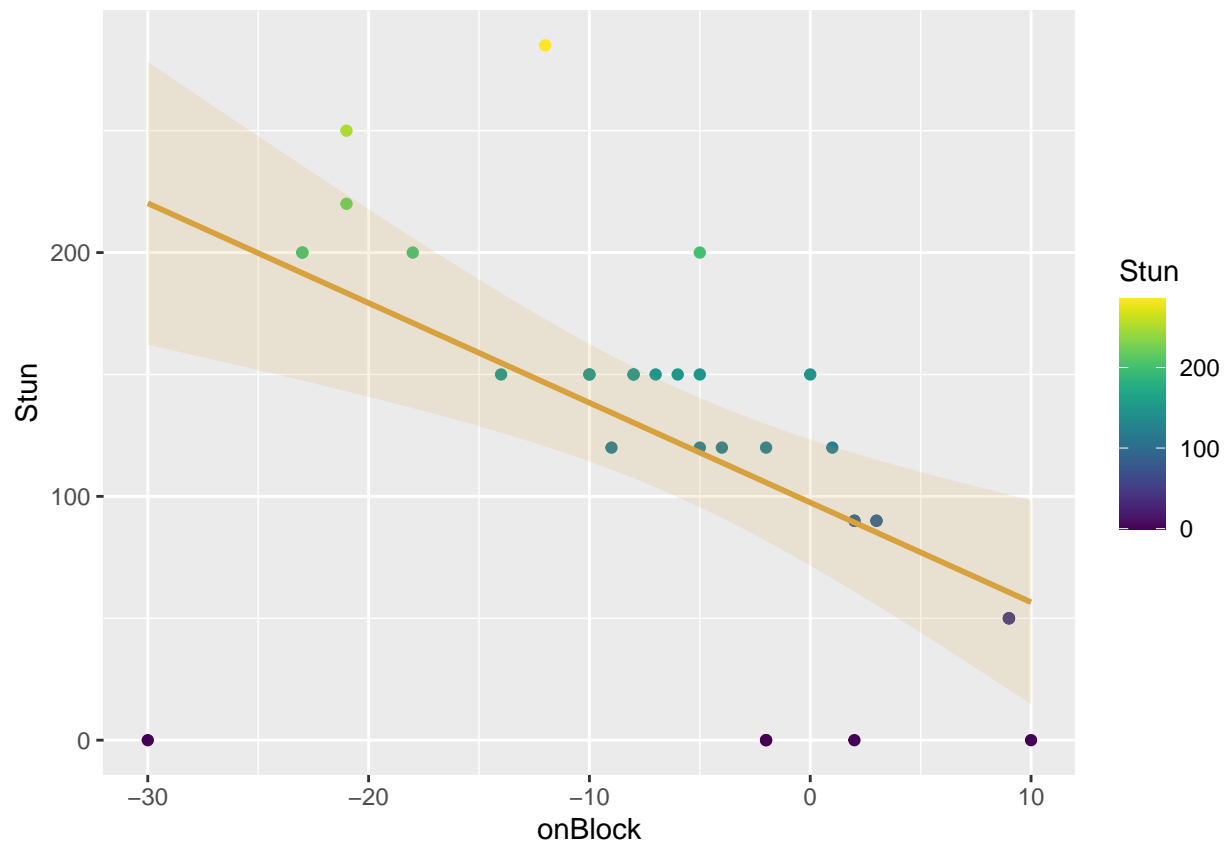
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -10.75, df = 36, p-value = 8.692e-13
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.9325583 -0.7678548
## sample estimates:
##        cor
## -0.8731947
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      70.914       -3.024
```
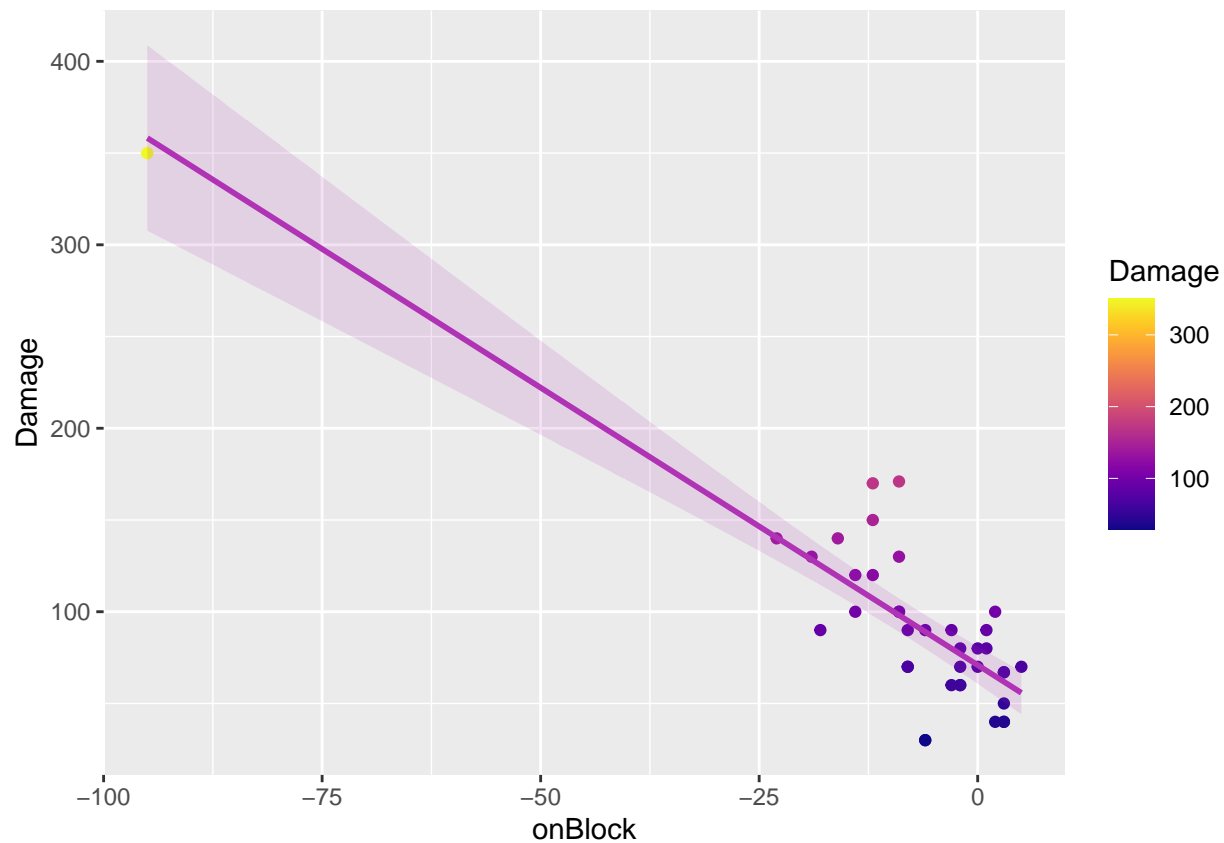
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.69945, df = 36, p-value = 0.4888
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2117303  0.4199297
## sample estimates:
##       cor
## 0.1157905
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    126.6701       0.4235
```
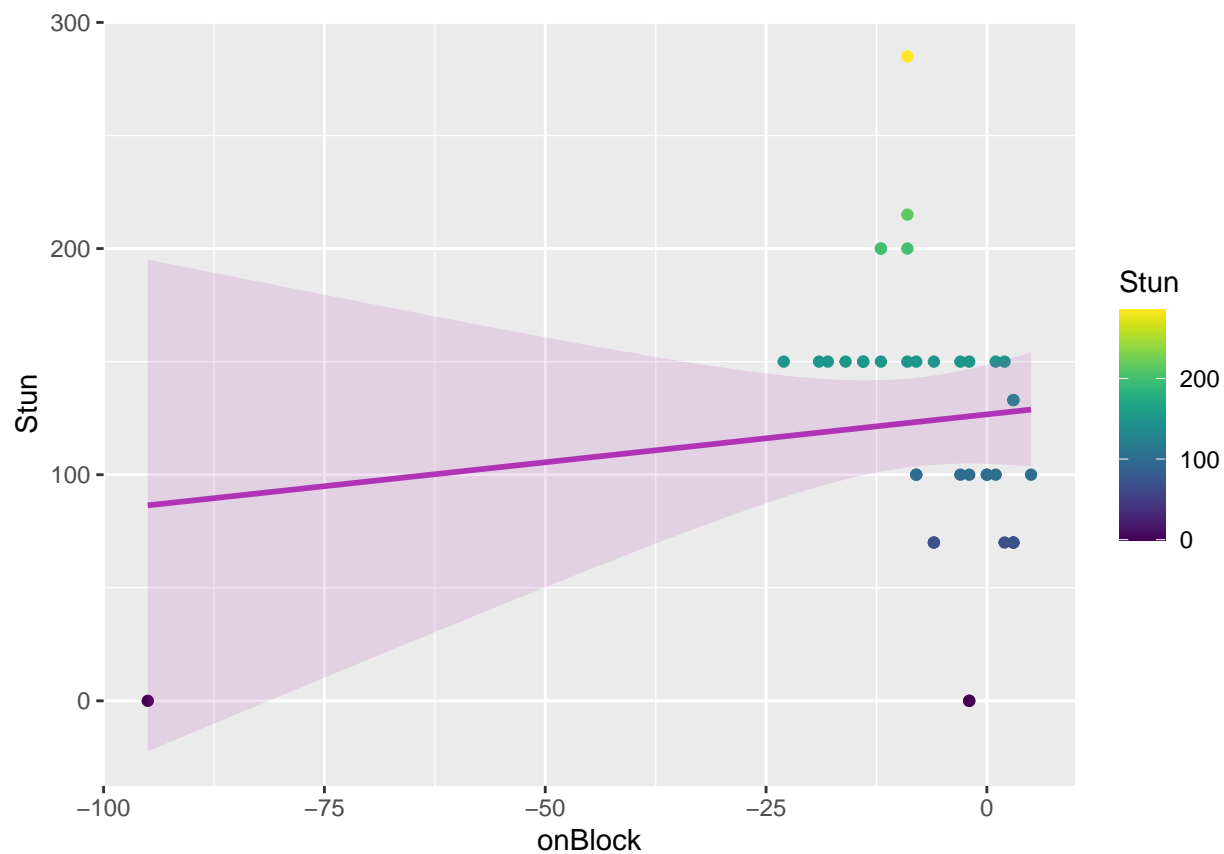
```
scatterplot(
  "data/characters/akuma.csv",
  "Akuma",
  "#a52e28"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = 0.066519, df = 65, p-value = 0.9472
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2324189  0.2479676
## sample estimates:
##         cor
## 0.008250357
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    90.32938      0.02256
```
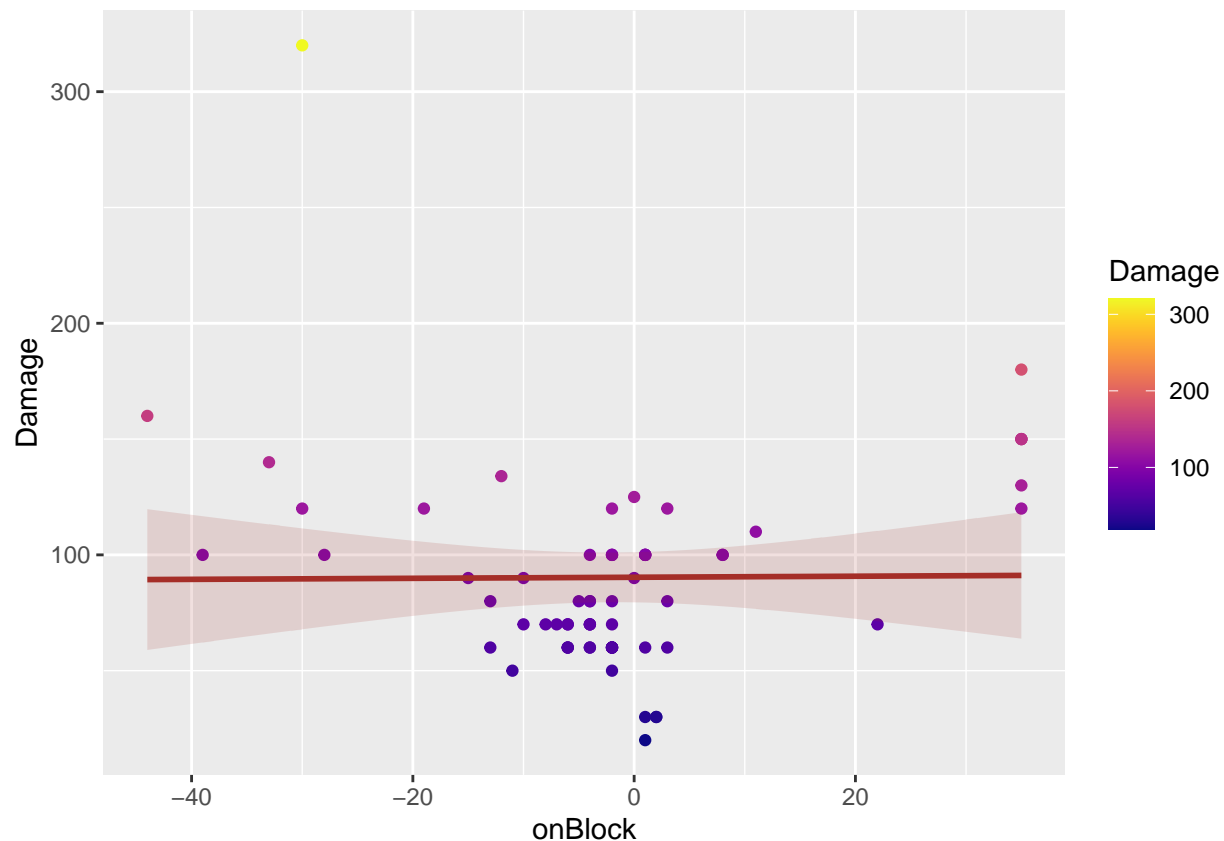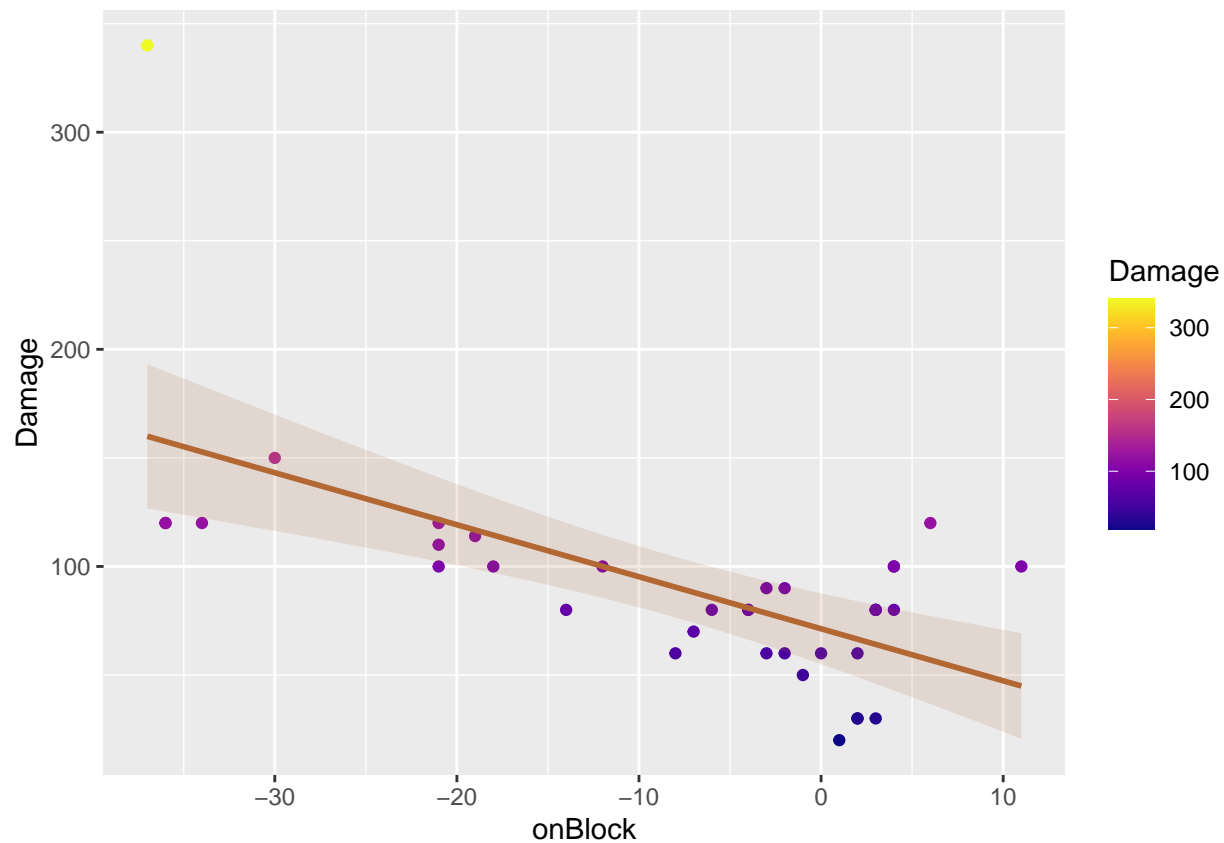
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 1.8699, df = 65, p-value = 0.066
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.01508786  0.44215151
## sample estimates:
##       cor
## 0.2259396
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    128.5061       0.6979
```
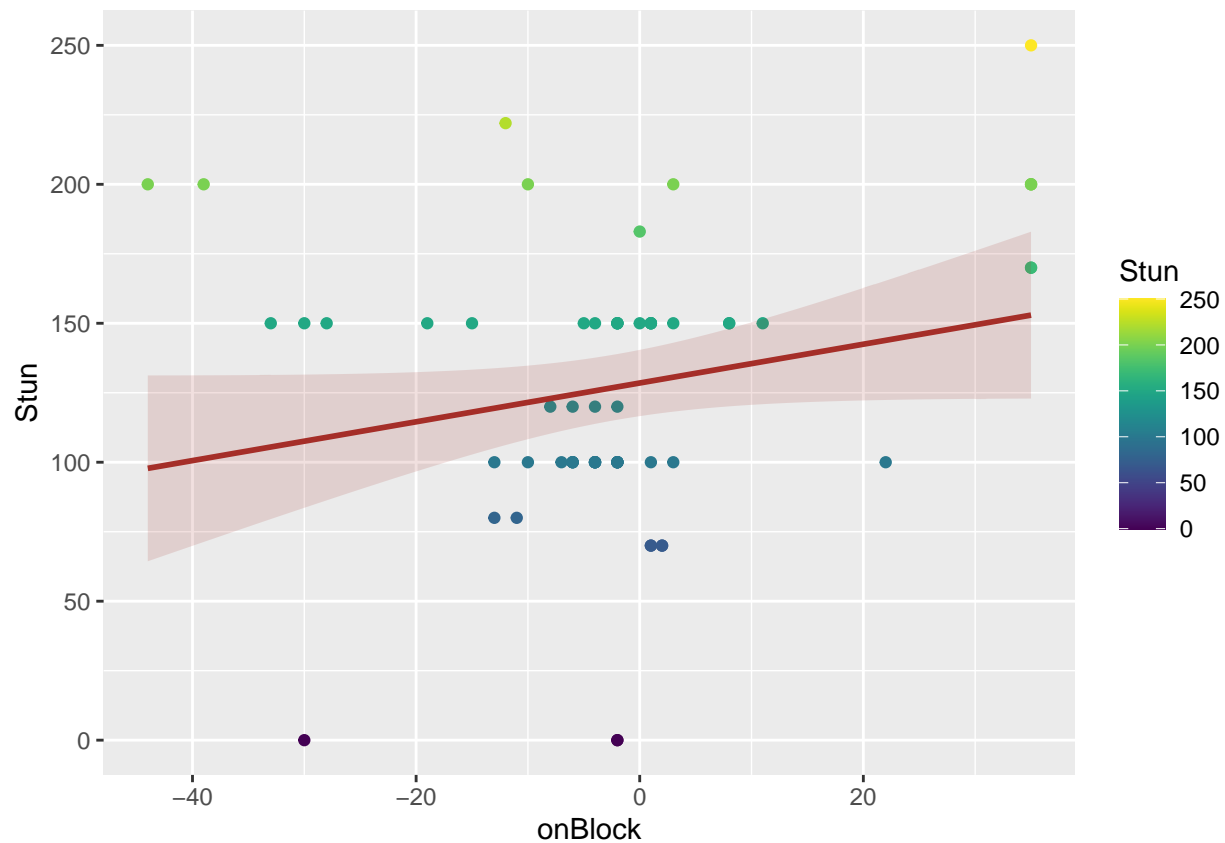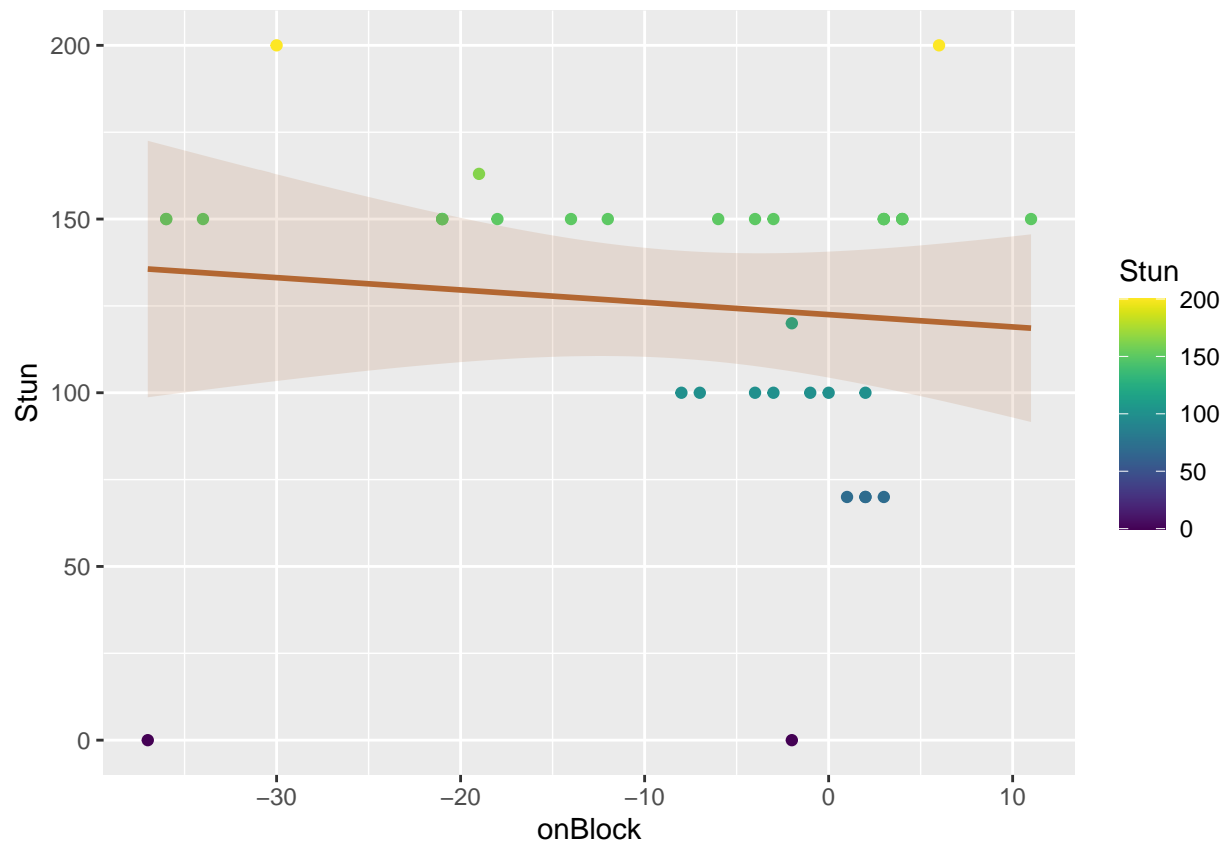
```
scatterplot(
  "data/characters/alex.csv",
  "Alex",
  "#48683d"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = 1.6441, df = 39, p-value = 0.1082
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.05757528  0.52139762
## sample estimates:
##       cor
## 0.2545846
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    107.8638       0.7454
```
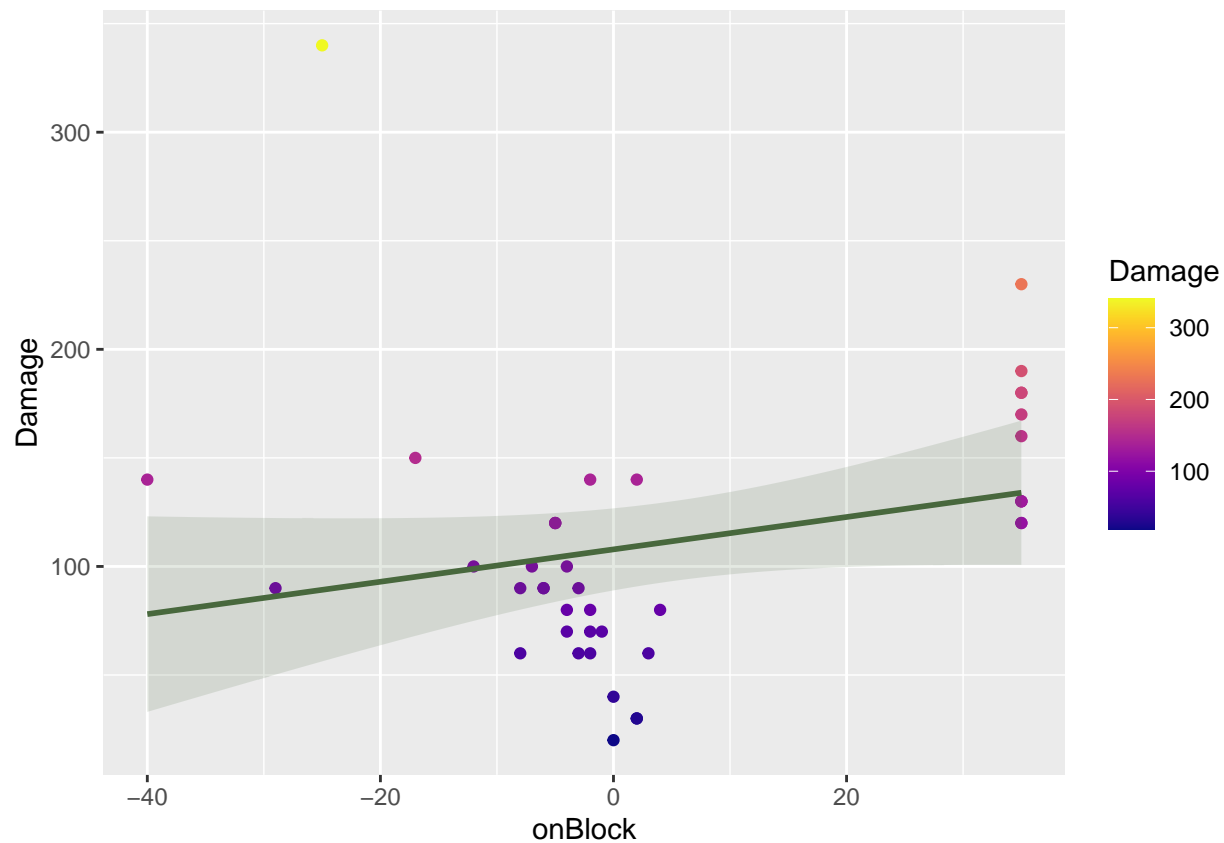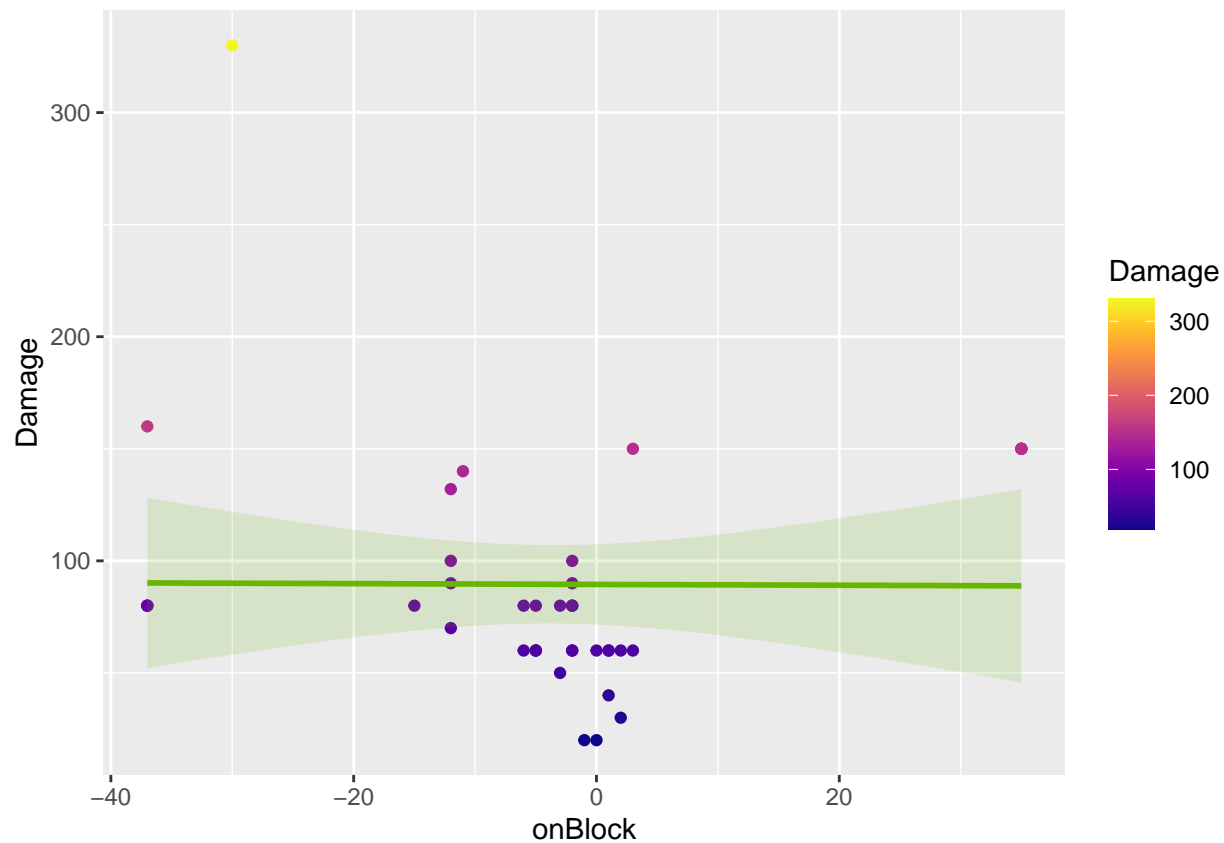
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = 3.1919, df = 39, p-value = 0.002792
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1714727 0.6690823
## sample estimates:
##       cor
## 0.4551142
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##     146.481        1.385
```
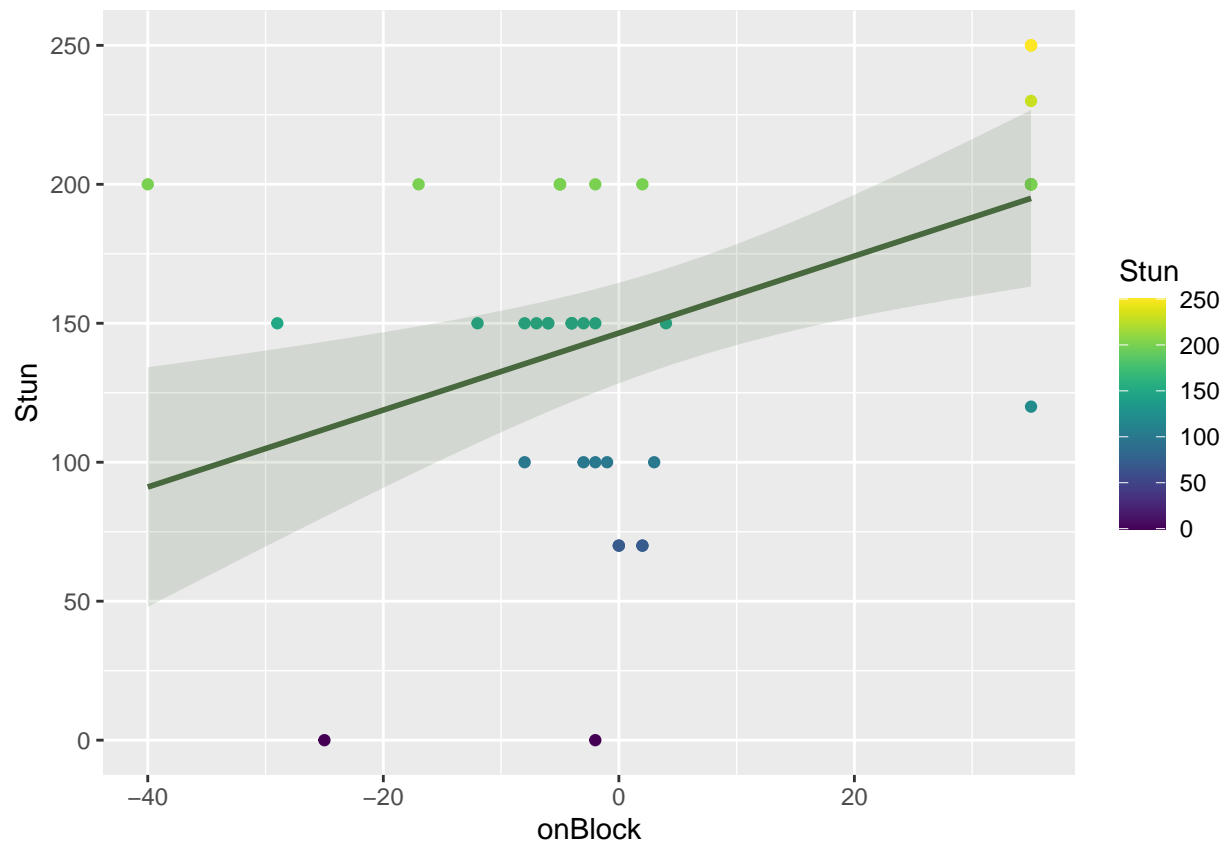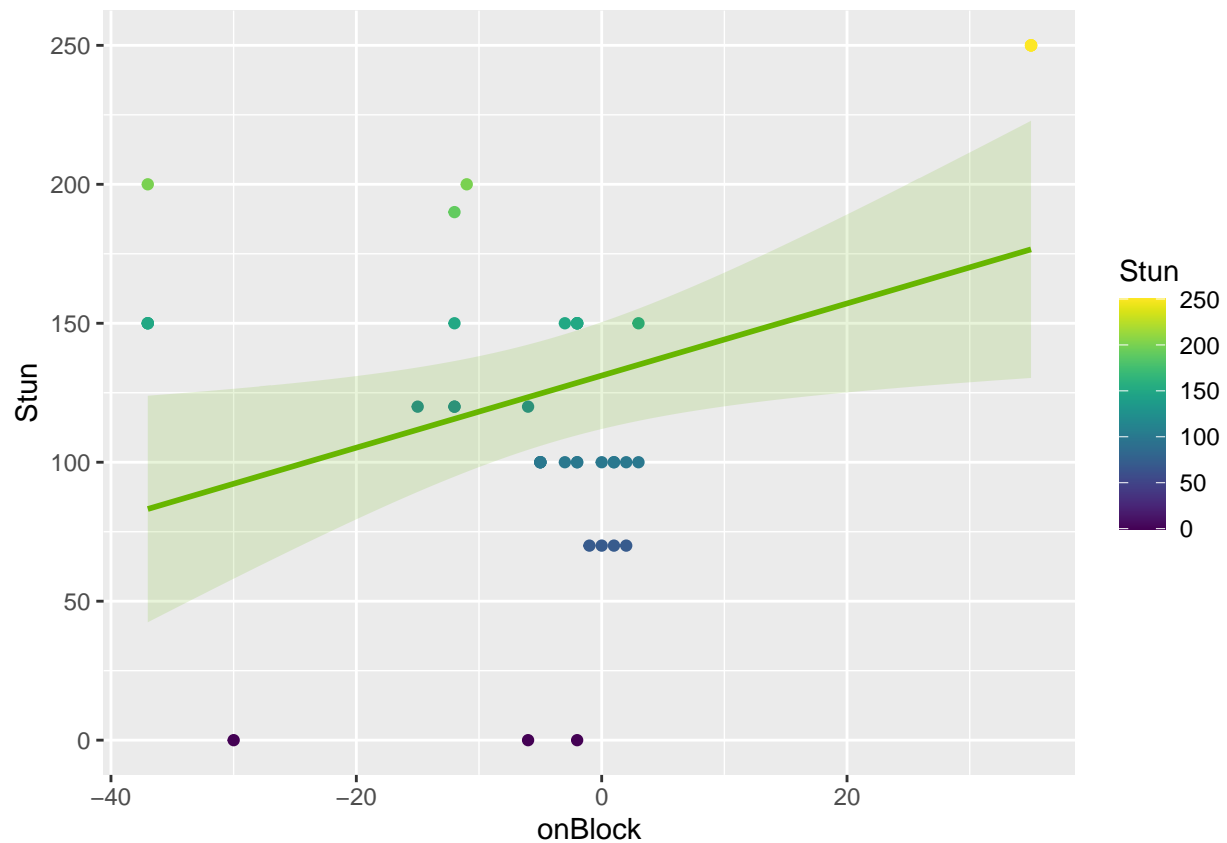
```
scatterplot(
  "data/characters/balrog.csv",
  "Balrog",
  "#235dbb"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = 0.61796, df = 48, p-value = 0.5395
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.1943101  0.3583293
## sample estimates:
##        cor
## 0.08884275
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    115.8264       0.8601
```
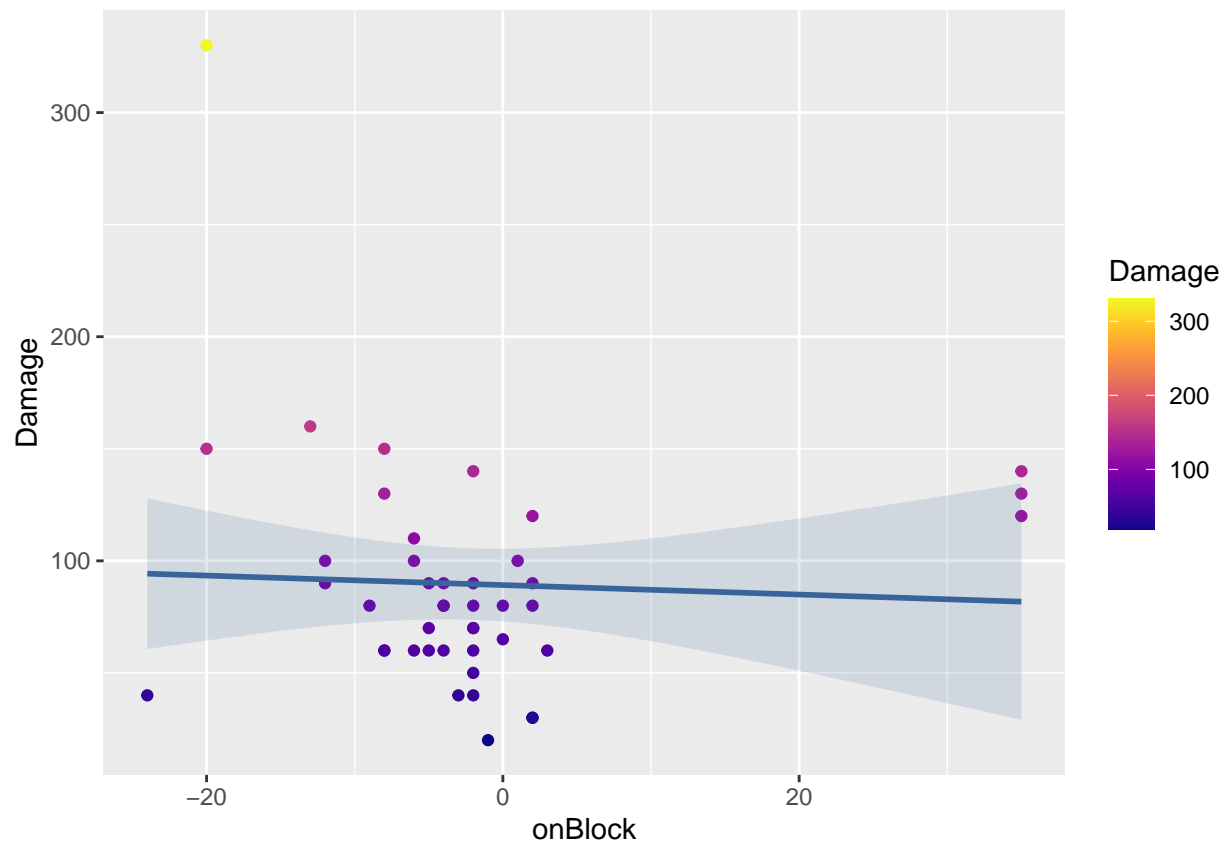
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -0.83575, df = 48, p-value = 0.4074
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3852662  0.1640550
## sample estimates:
##        cor
## -0.1197615
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     150.115       -1.289
```
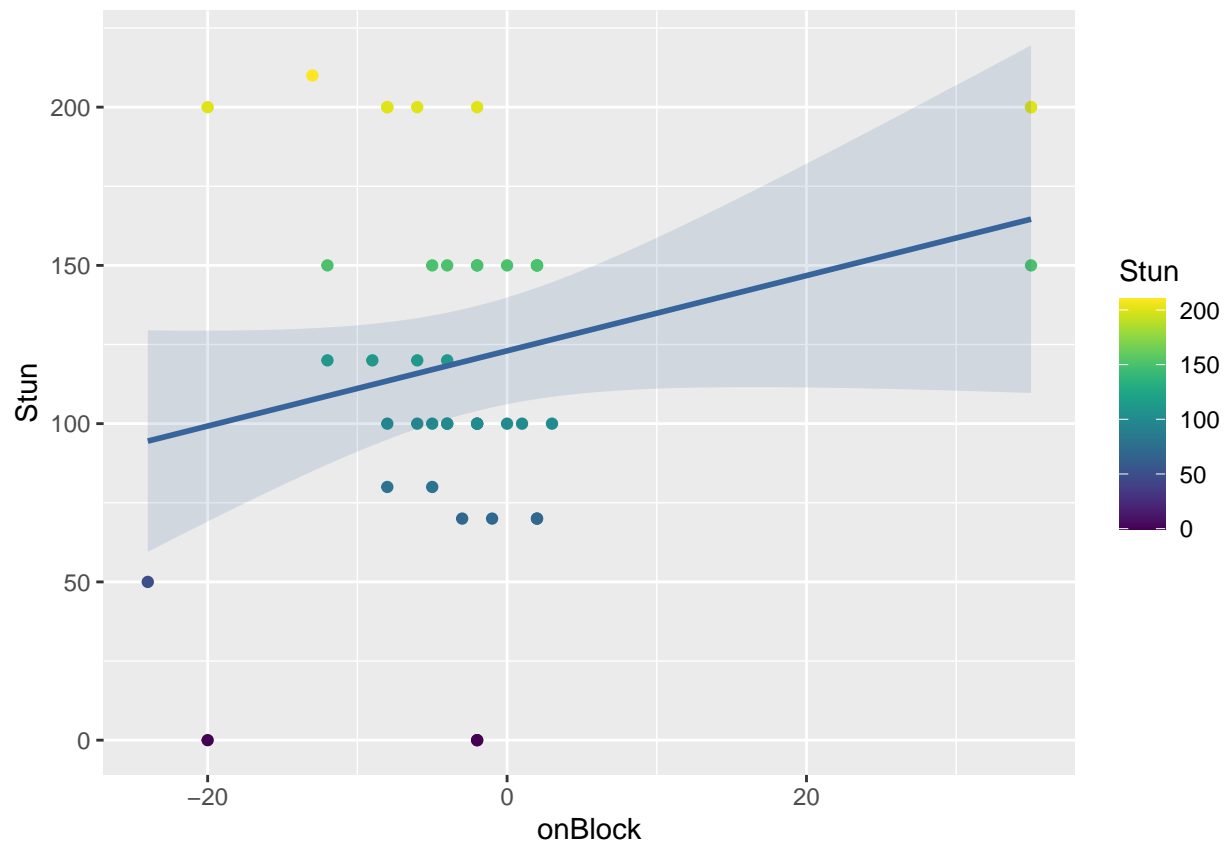
```
scatterplot(
  "data/characters/birdie.csv",
  "Birdie",
  "#d7a23e"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -7.4862, df = 31, p-value = 1.957e-08
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8982671 -0.6336522
## sample estimates:
##        cor
## -0.8024068
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      64.507       -4.883
```
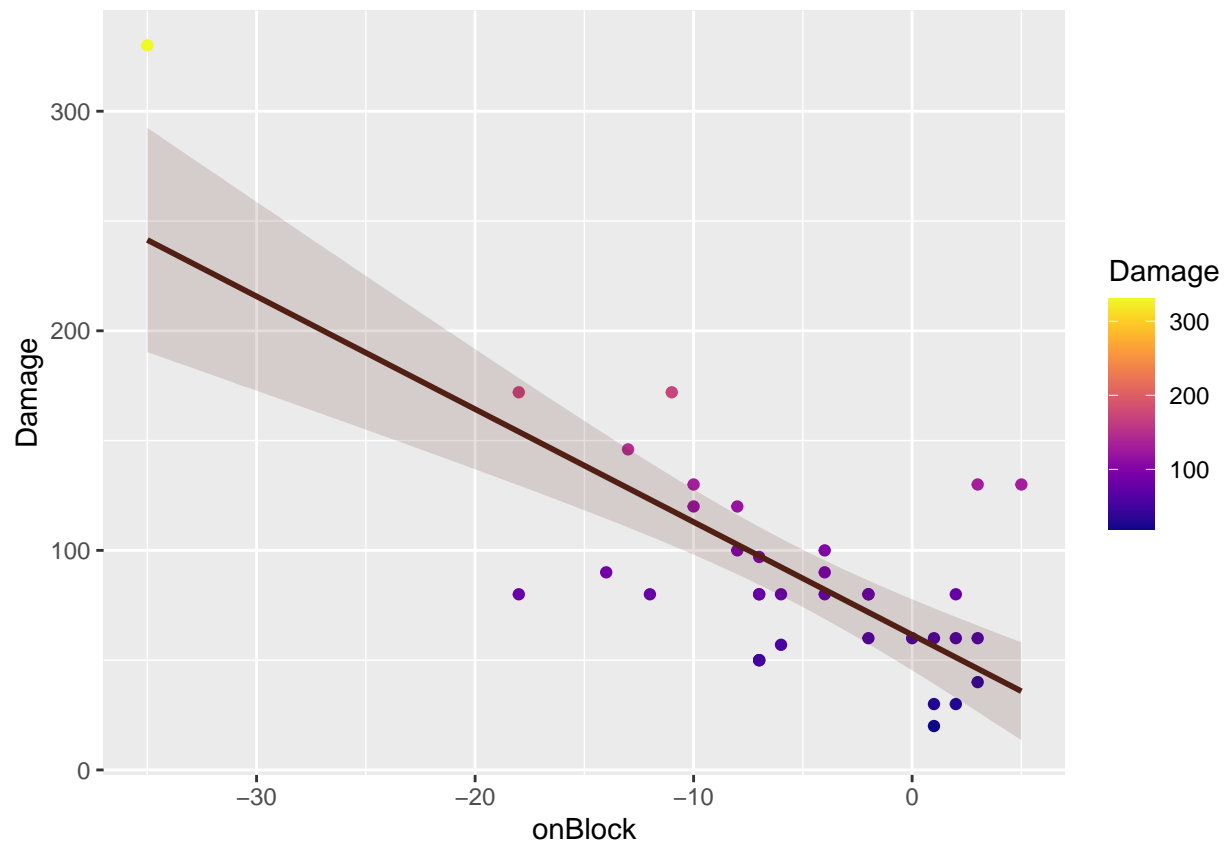
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -3.7532, df = 31, p-value = 0.0007216
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7570035 -0.2668613
## sample estimates:
##        cor
## -0.5589606
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      97.490       -4.092
```

```
scatterplot(
  "data/characters/blanka.csv",
  "Blanka",
  "#b36732"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -4.6676, df = 34, p-value = 4.614e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7910511 -0.3729646
## sample estimates:
##        cor
## -0.6249267
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)       onBlock
##      71.301        -2.396
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -0.62247, df = 34, p-value = 0.5378
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4200377  0.2304211
## sample estimates:
##        cor 
## -0.1061504 
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock  
##    122.4935      -0.3547  
```
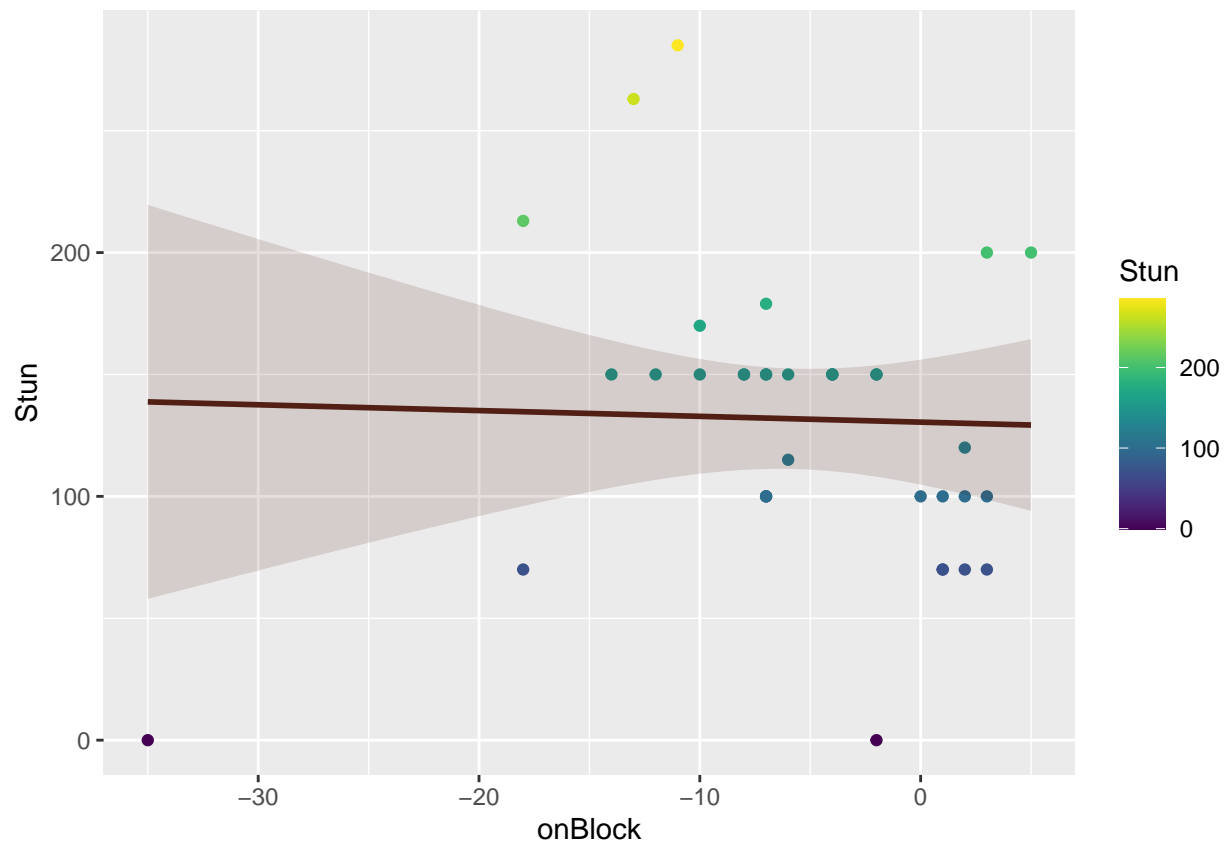
```
scatterplot(
  "data/characters/cammy.csv",
  "Cammy",
  "#67b600"
)
```
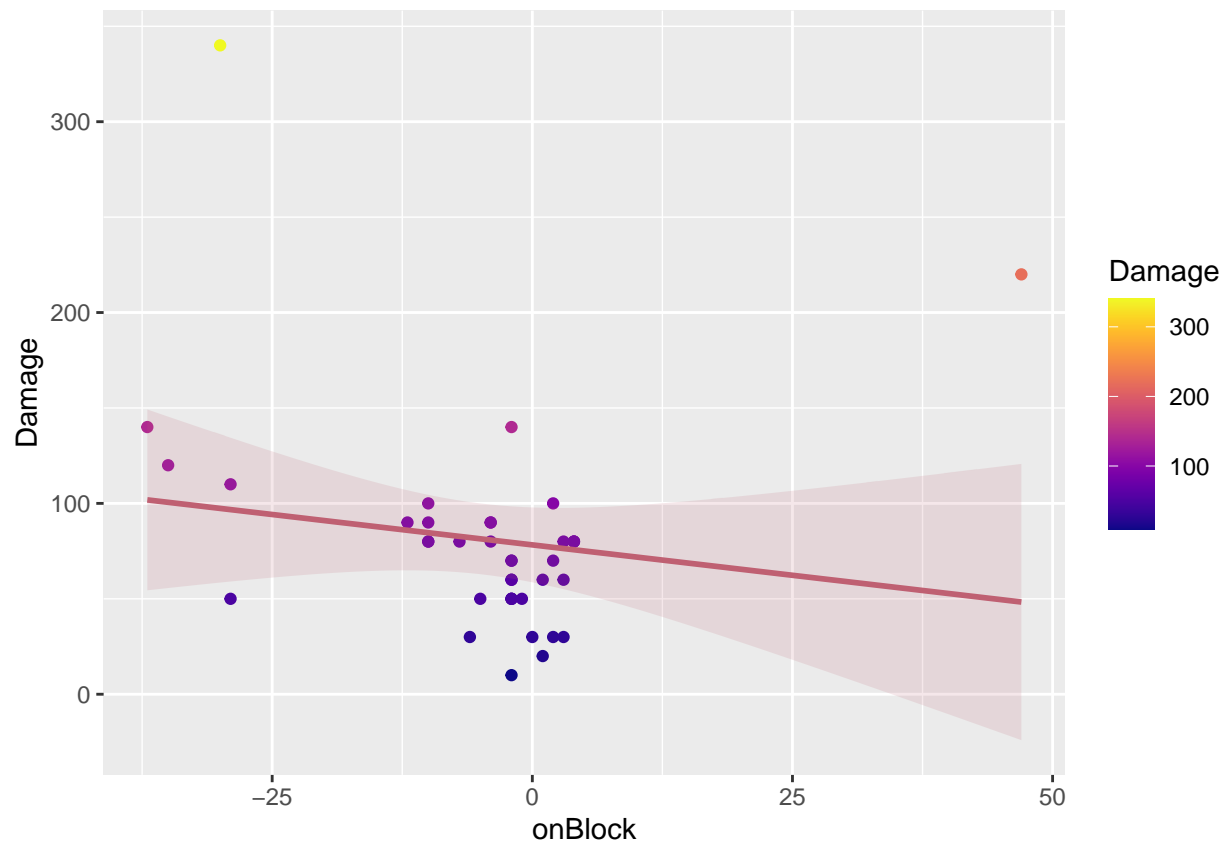
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -0.035634, df = 38, p-value = 0.9718
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3167196  0.3062803
## sample estimates:
##          cor
## -0.005780581
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     89.4820      -0.0179
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 2.4098, df = 38, p-value = 0.02091
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.05931215 0.60678312
## sample estimates:
##       cor
## 0.3640944
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     131.181        1.298
```
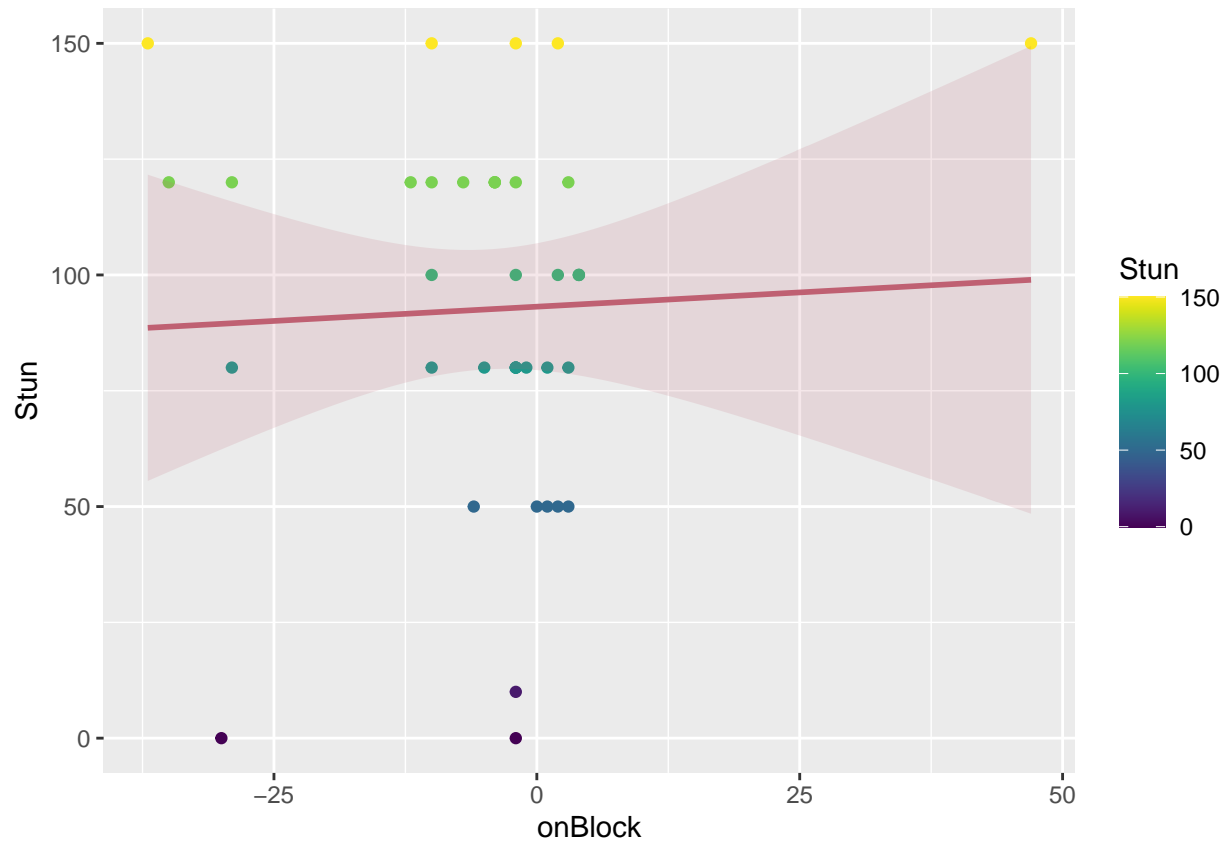
```
scatterplot(
  "data/characters/chun-li.csv",
  "Chun-Li",
  "#37659b"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -0.31535, df = 41, p-value = 0.7541
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3444455  0.2549196
## sample estimates:
##         cor
## -0.04919045
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     89.1986      -0.2115
```
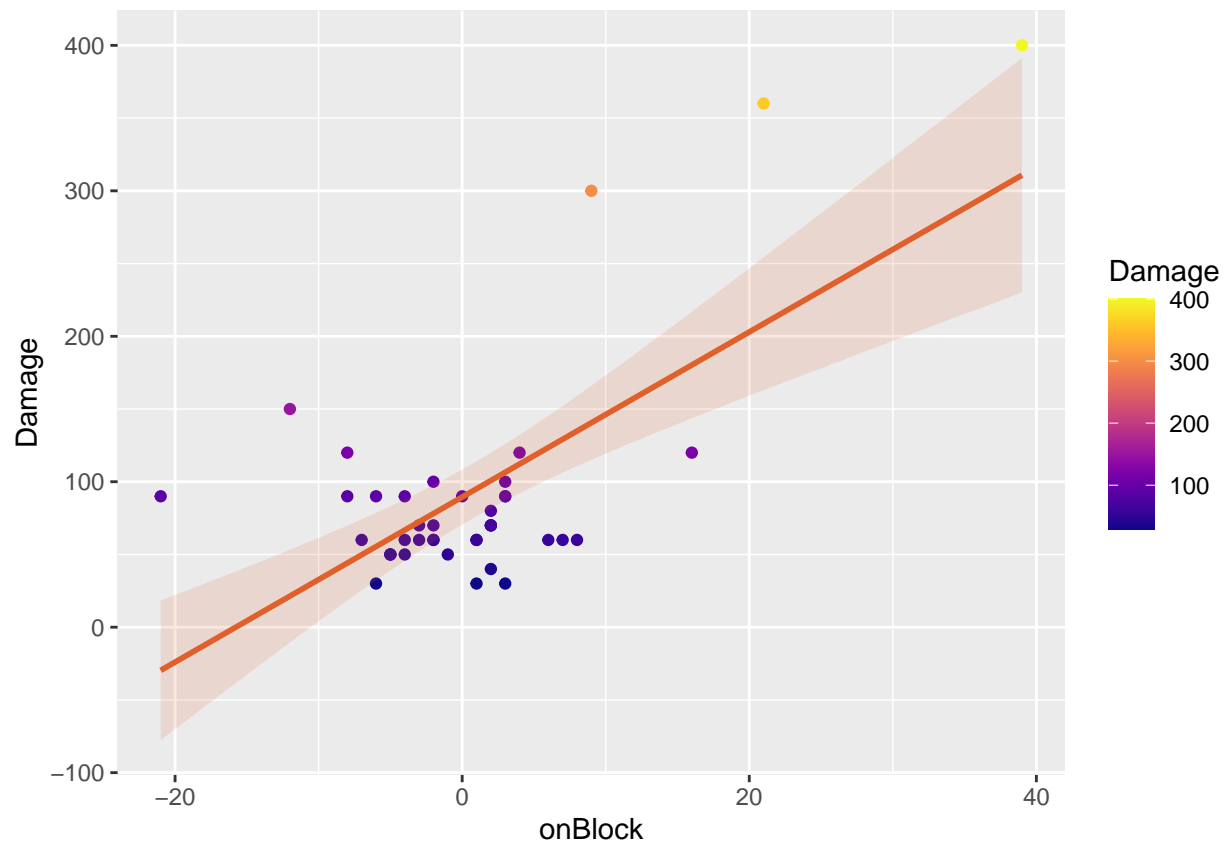
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = 1.7032, df = 41, p-value = 0.09611
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.04691208  0.51744815
## sample estimates:
##       cor 
## 0.2570536 
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock  
##     123.008        1.189  
```
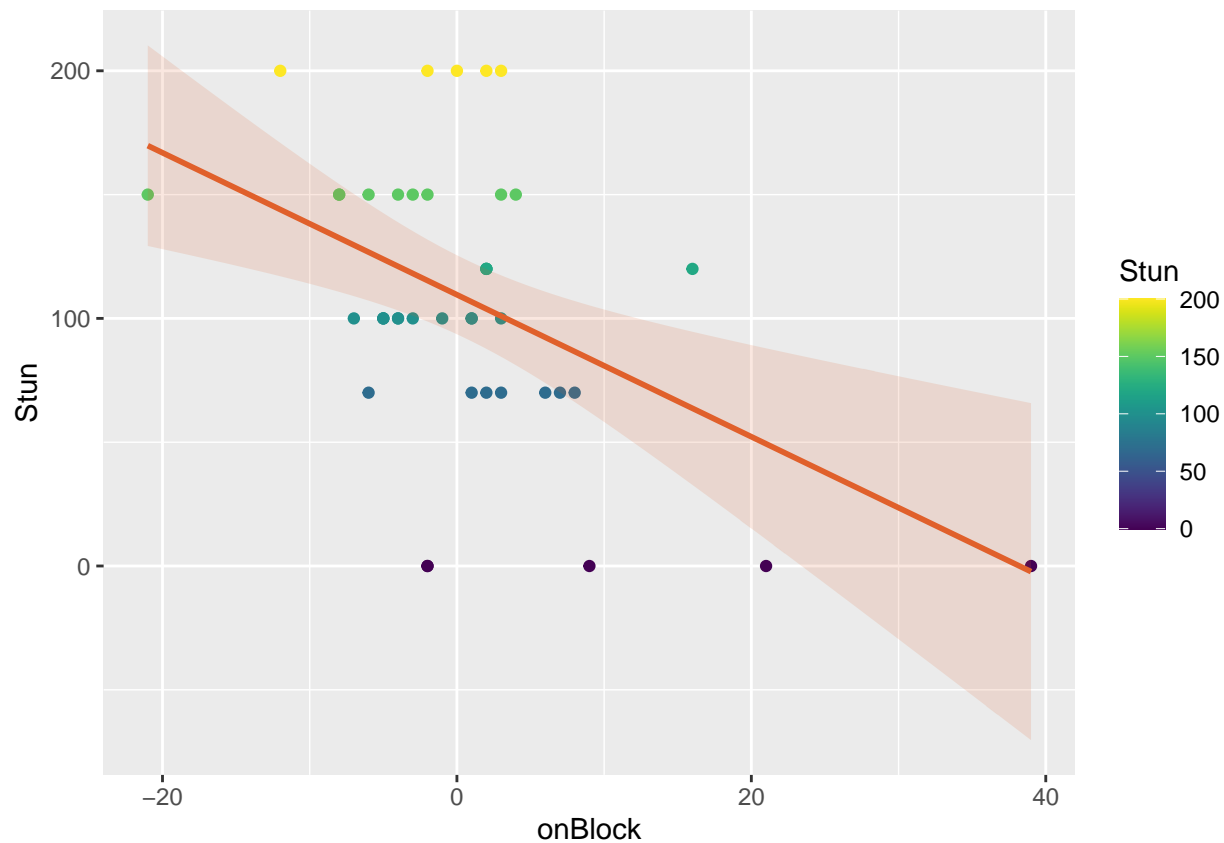
```
scatterplot(
  "data/characters/cody.csv",
  "Cody",
  "#521f15"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -6.19, df = 34, p-value = 4.886e-07
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8525565 -0.5248906
## sample estimates:
##        cor
## -0.7279029
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      61.543       -5.138
```
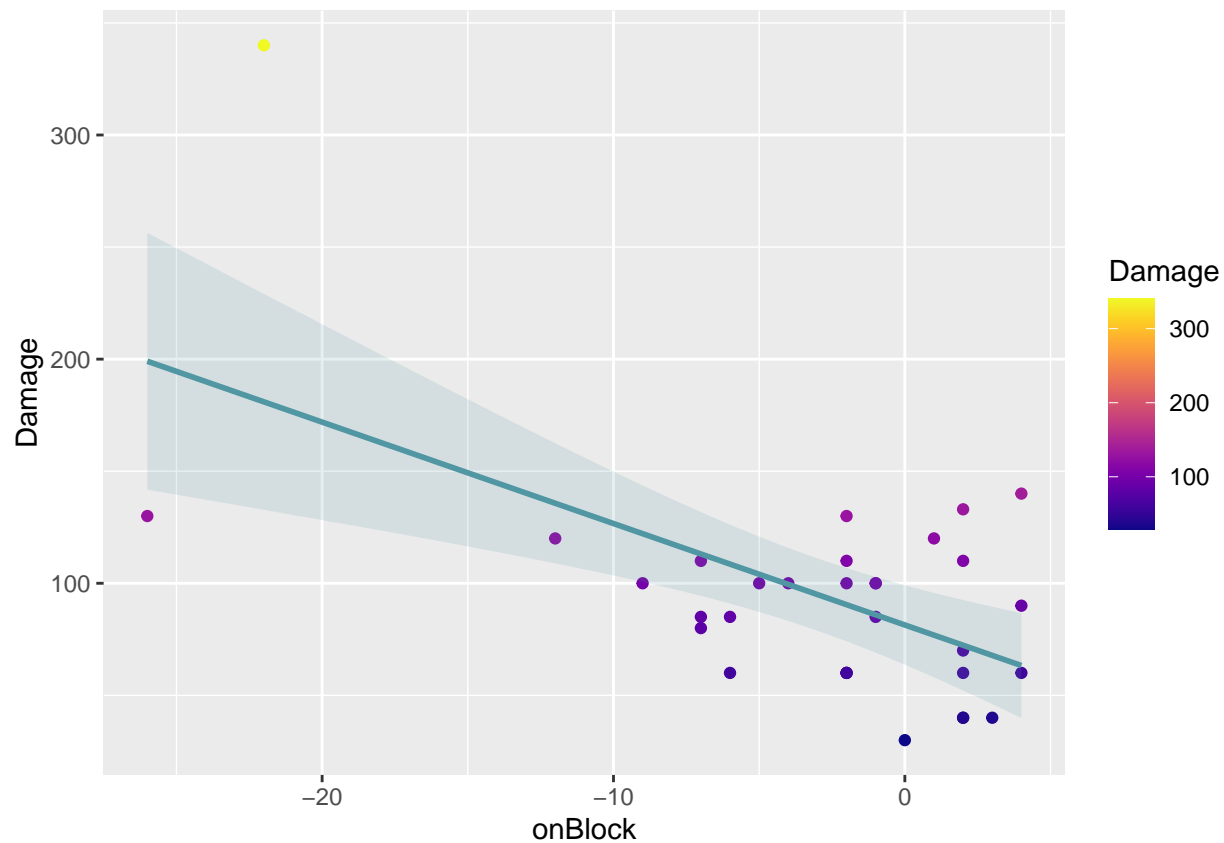
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -0.18069, df = 34, p-value = 0.8577
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3558881  0.3006210
## sample estimates:
##         cor
## -0.03097391
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    130.4477      -0.2373
```
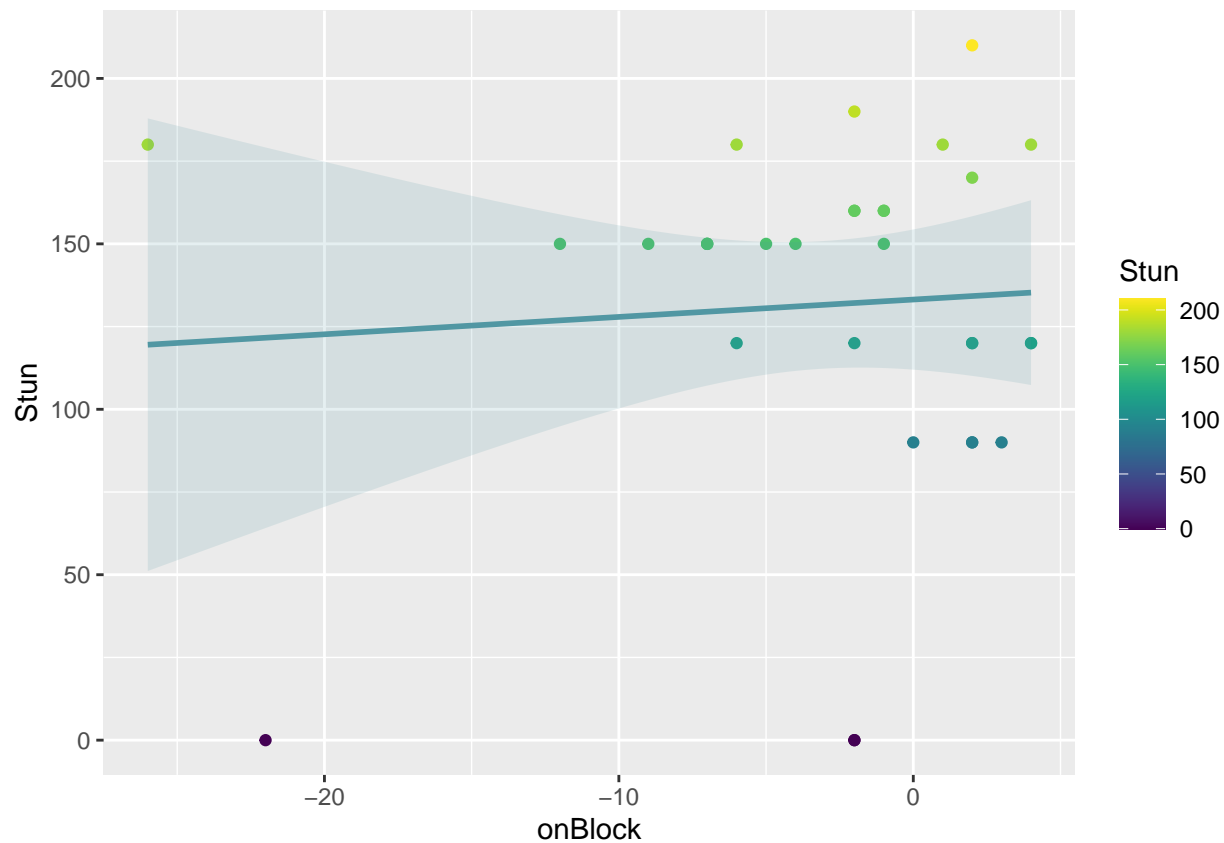
```
scatterplot(
  "data/characters/dan.csv",
  "Dan",
  "#bf6072"
)
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Damage
## t = -0.95461, df = 37, p-value = 0.346
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4486117  0.1687313
## sample estimates:
##        cor 
## -0.1550397 
## 
## 
## Call:
## lm(formula = Damage ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock  
##      78.260       -0.637  
```
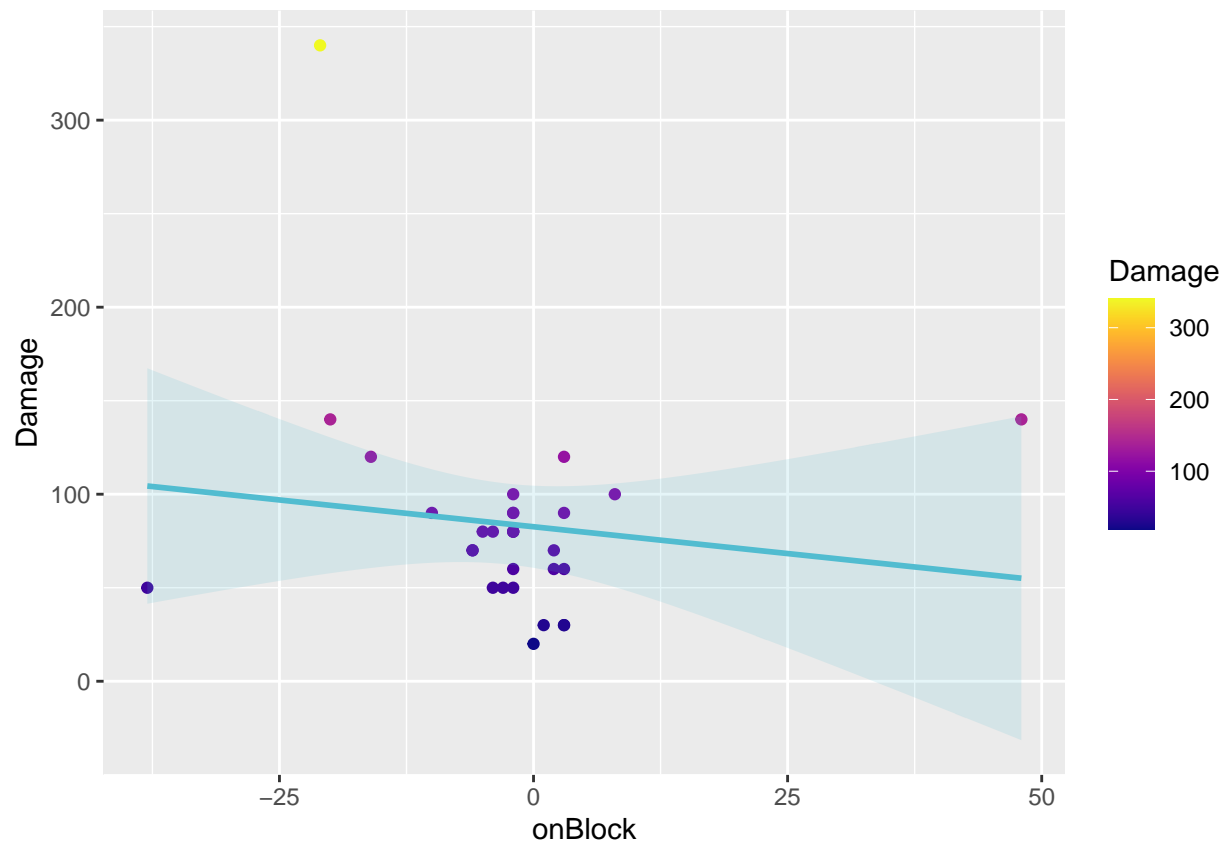
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.2648, df = 37, p-value = 0.7926
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2758098  0.3541493
## sample estimates:
##        cor
## 0.04349202
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     93.1489       0.1233
```

```
scatterplot(
  "data/characters/dhalsim.csv",
  "Dhalsim",
  "#e0602b"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = 5.6226, df = 39, p-value = 1.731e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.4551452 0.8100131
## sample estimates:
##      cor
## 0.669104
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      89.467        5.674
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -3.3646, df = 39, p-value = 0.00173
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6823872 -0.1951366
## sample estimates:
##        cor
## -0.4743123
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##     109.553       -2.867
```
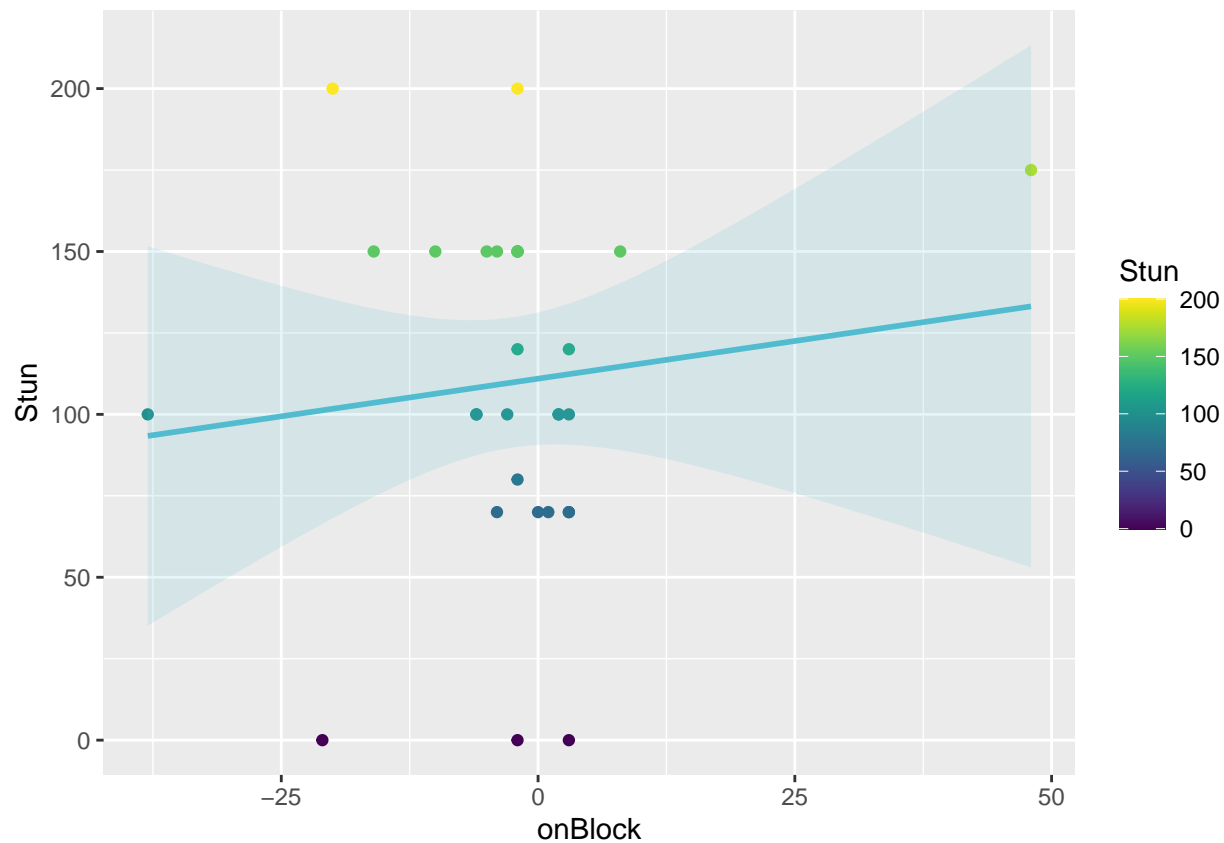
```
scatterplot(
  "data/characters/e_honda.csv",
  "E. Honda",
  "#5197a3"
)
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Damage
## t = -3.8563, df = 30, p-value = 0.0005658
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7698463 -0.2840094
## sample estimates:
##        cor
## -0.5756913
## 
## 
## Call:
## lm(formula = Damage ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##      81.391       -4.525
```
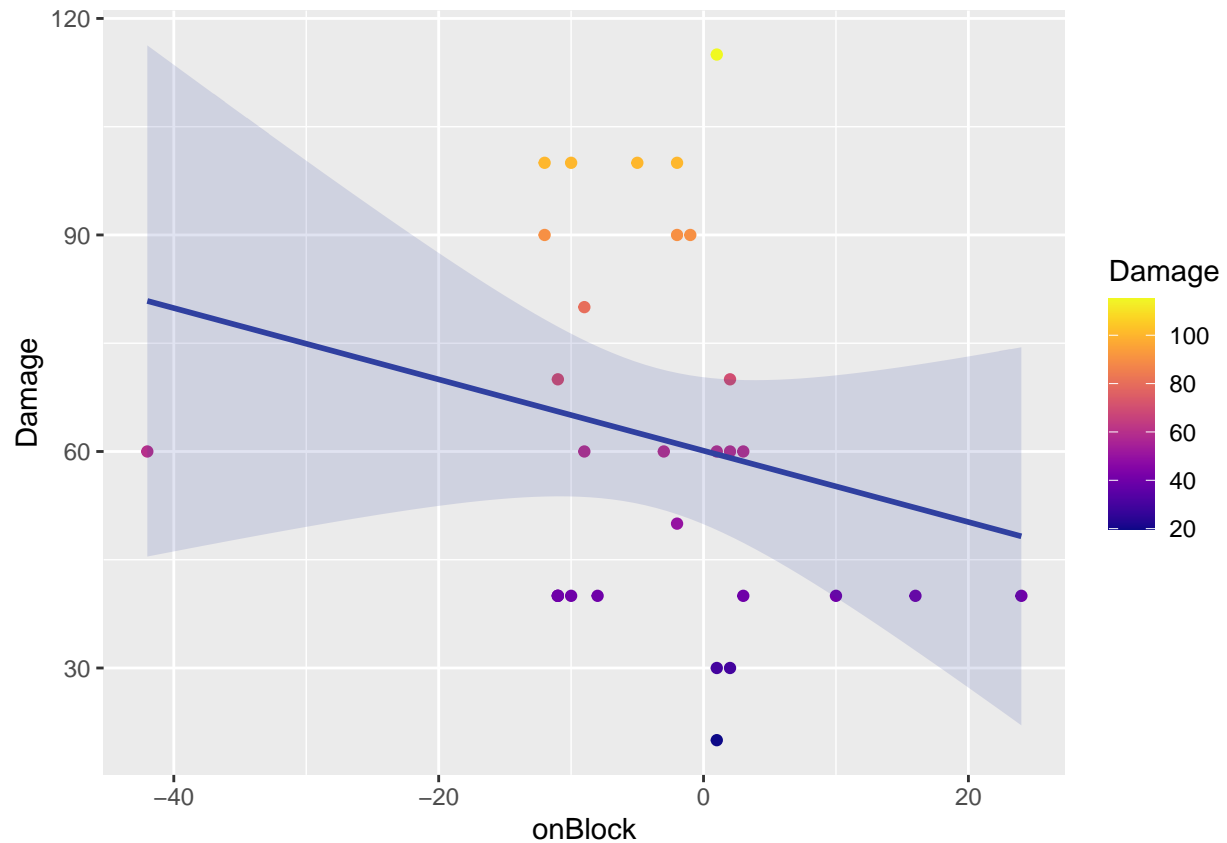
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.37463, df = 30, p-value = 0.7106
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2872916  0.4072422
## sample estimates:
##        cor
## 0.06823822
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     133.1700       0.5249
```
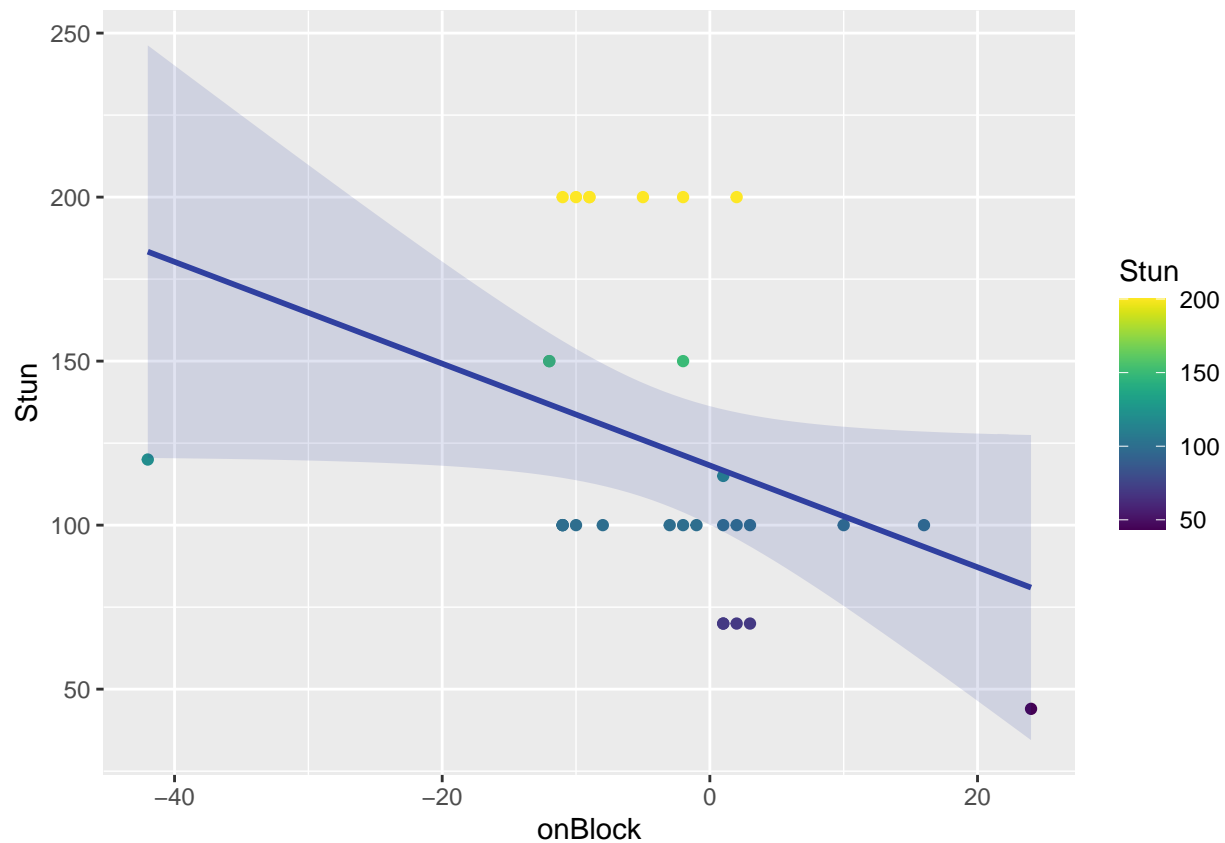
```
scatterplot(
  "data/characters/ed.csv",
  "Ed",
  "#51bcd0"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -0.70625, df = 28, p-value = 0.4859
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4701557  0.2393838
## sample estimates:
##        cor
## -0.1322949
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     82.6051      -0.5733
```
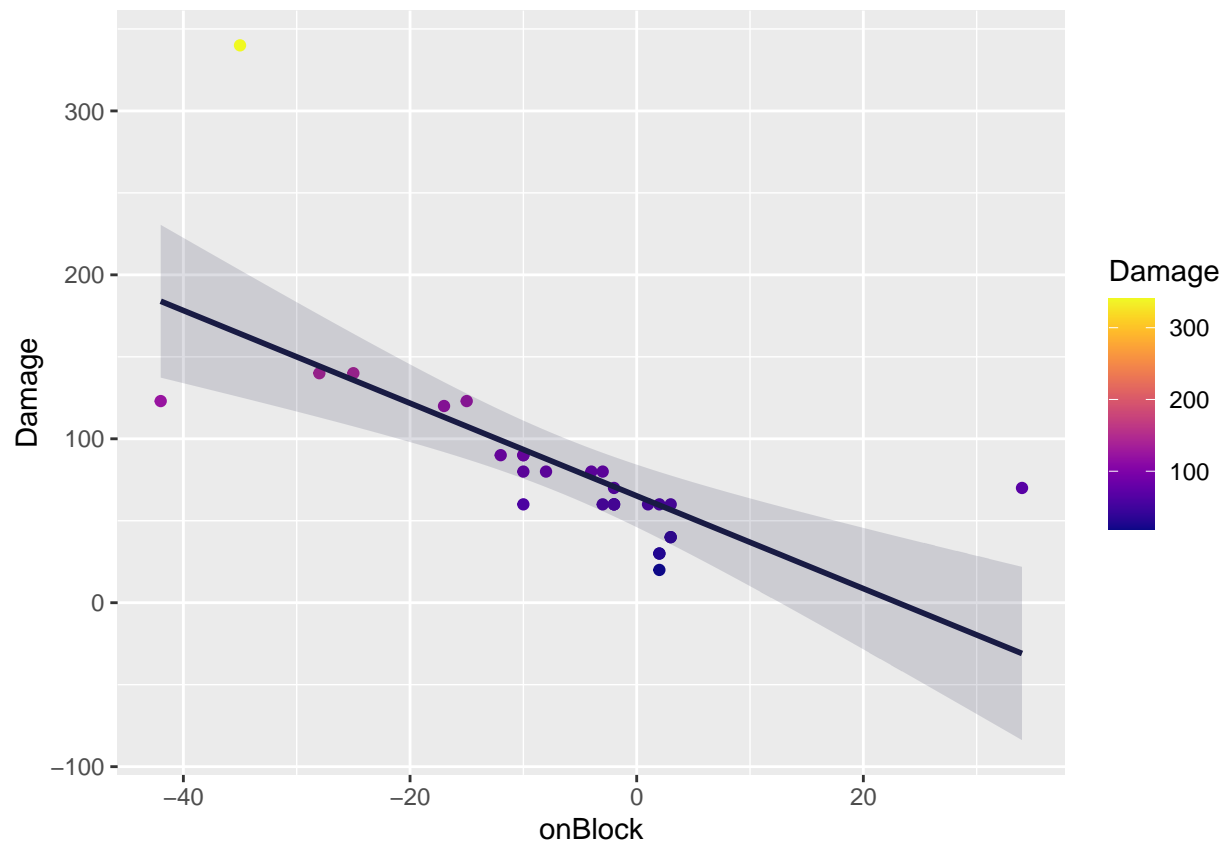
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = 0.61574, df = 28, p-value = 0.543
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2553169  0.4568303
## sample estimates:
##       cor
## 0.1155841
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##    110.9586       0.4624
```

```
scatterplot(
  "data/characters/f_a_n_g.csv",
  "F.A.N.G",
  "#3040a0"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -1.144, df = 28, p-value = 0.2623
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.5311466  0.1612302
## sample estimates:
##        cor
## -0.2113134
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     60.1040      -0.4941
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -2.023, df = 28, p-value = 0.05271
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.635604726  0.003626133
## sample estimates:
##        cor
## -0.3571096
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##     118.203       -1.552
```
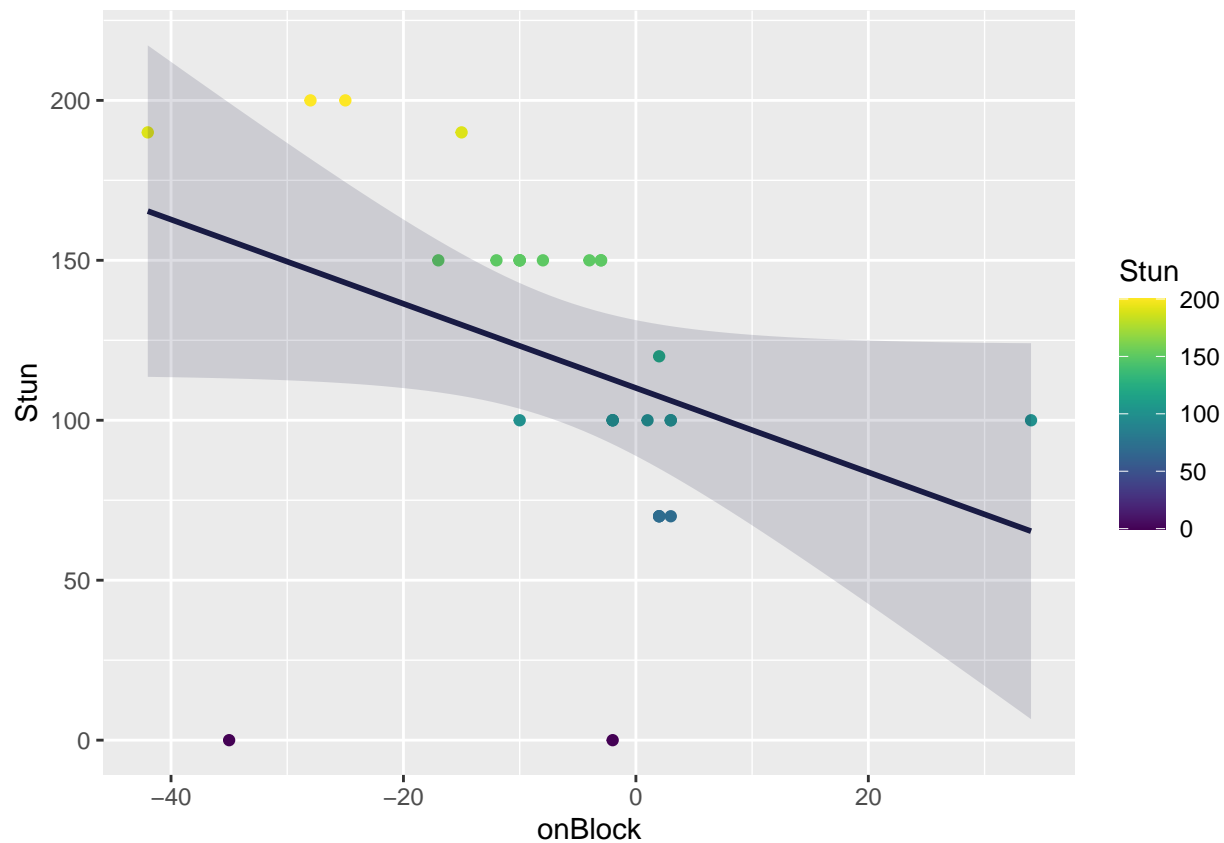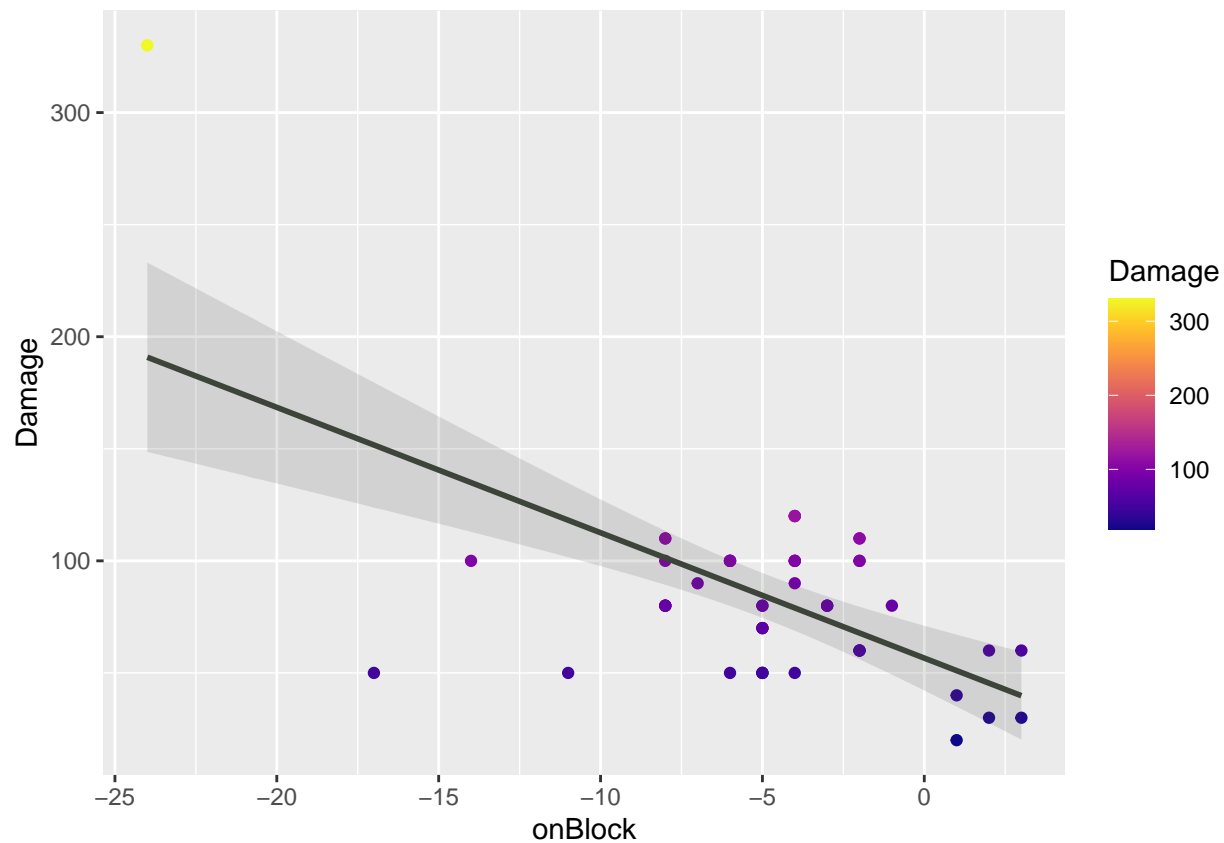
```
scatterplot(
  "data/characters/falke.csv",
  "Falke",
  "#191b44"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -4.7335, df = 26, p-value = 6.792e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8401722 -0.4117970
## sample estimates:
##        cor
## -0.6803504
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      65.159       -2.827
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.9831, df = 26, p-value = 0.05802
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.64792513  0.01227076
## sample estimates:
##        cor
## -0.3624655
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     110.089       -1.317
```
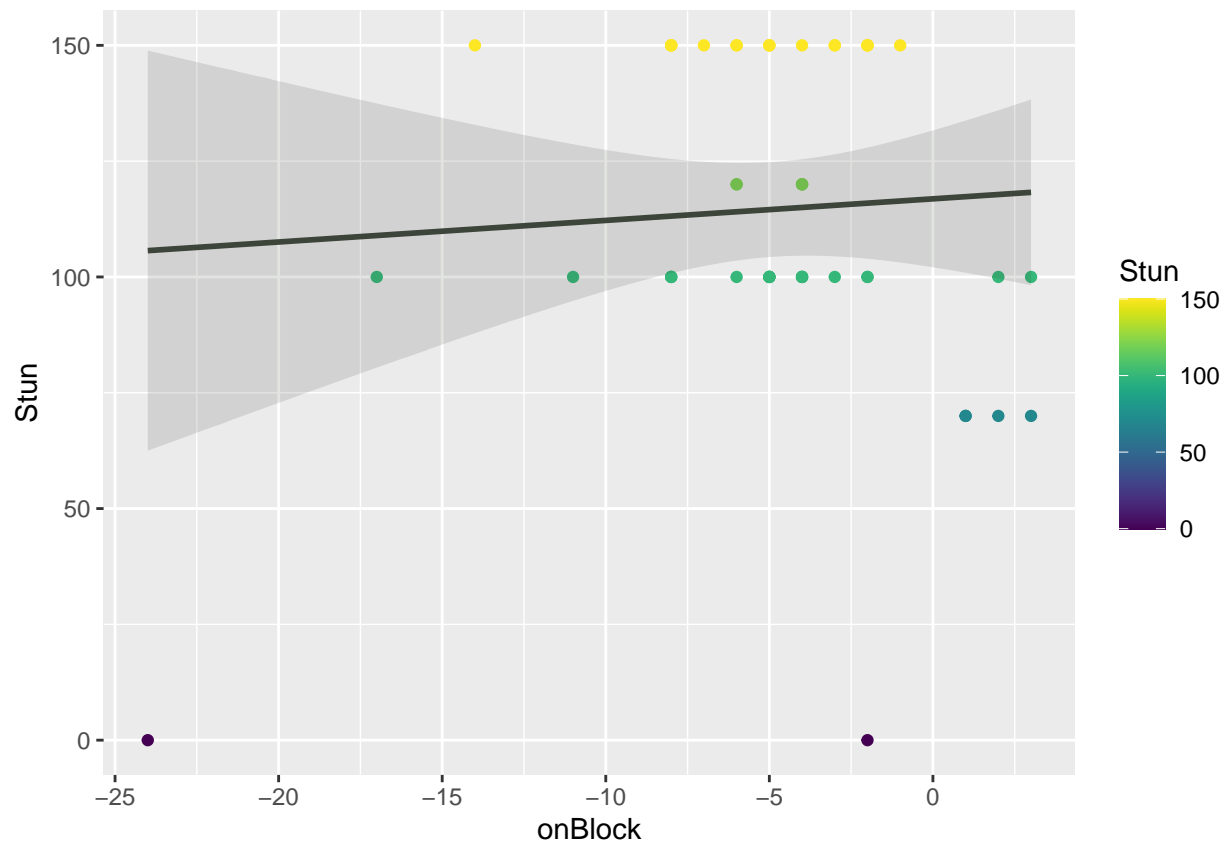
```
scatterplot(
  "data/characters/g.csv",
  "G",
  "#3d453a"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -5.2458, df = 48, p-value = 3.474e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7551176 -0.3909969
## sample estimates:
##        cor
## -0.6036478
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      56.617       -5.593
```
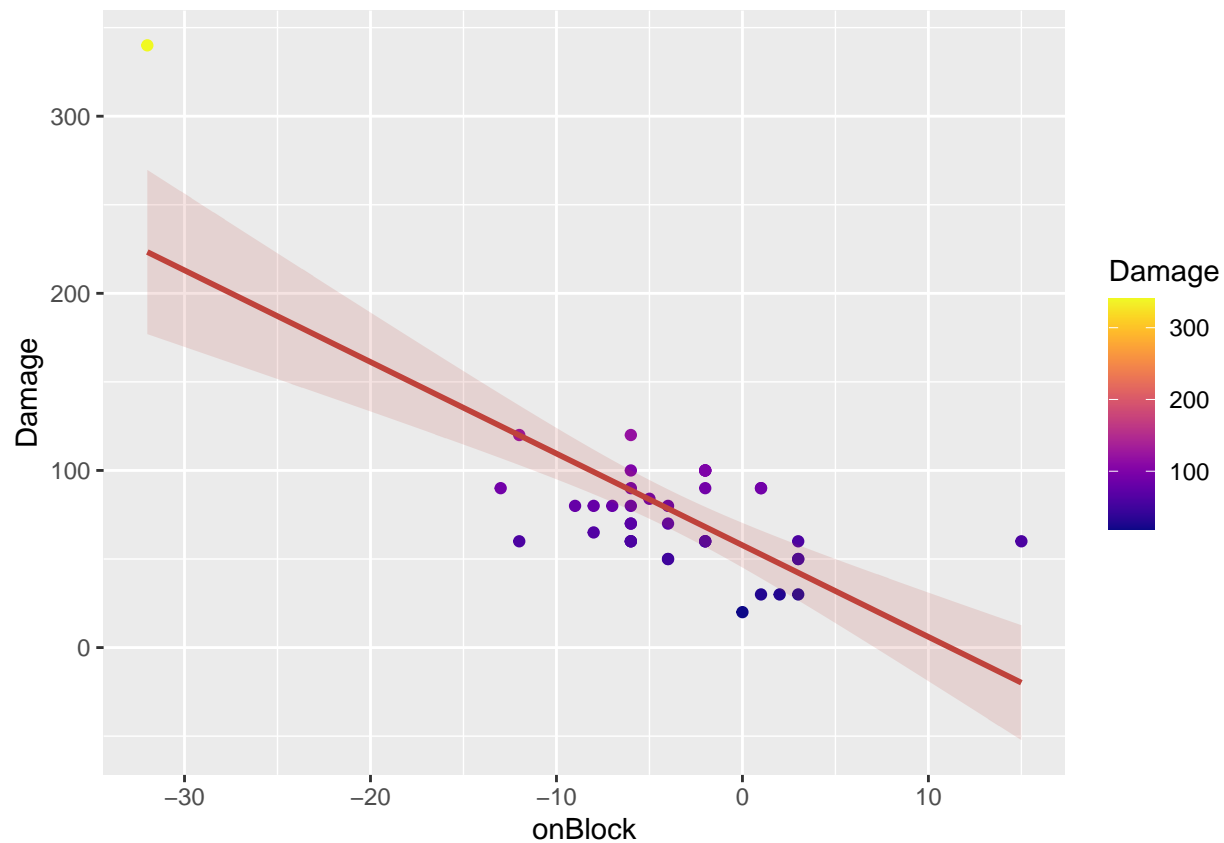
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = 0.42725, df = 48, p-value = 0.6711
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2205755  0.3341737
## sample estimates:
##        cor
## 0.06155128
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##    116.8641       0.4659
```
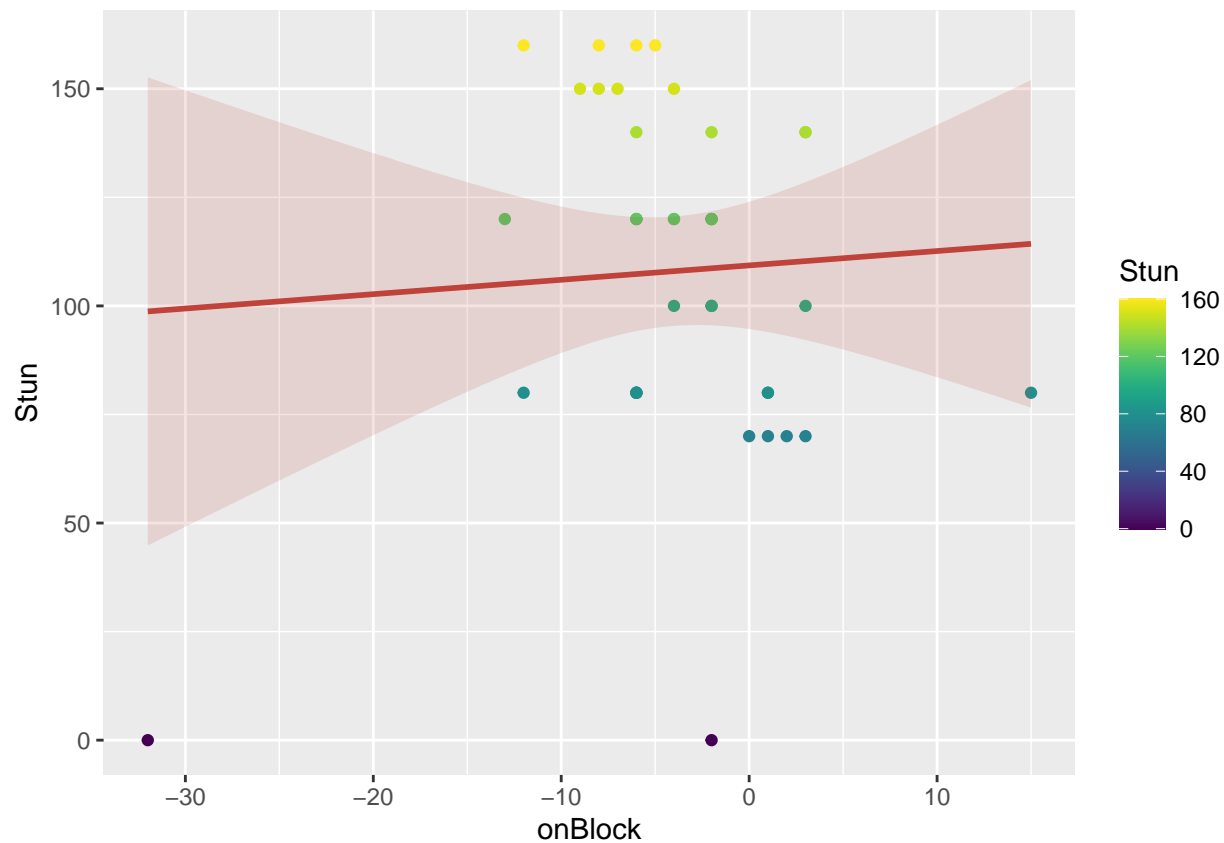
```
scatterplot(
  "data/characters/gill.csv",
  "Gill",
  "#bf423b"
)
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Damage
## t = -6.5047, df = 38, p-value = 1.159e-07
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8460498 -0.5353787
## sample estimates:
##        cor 
## -0.7258364 
## 
## 
## Call:
## lm(formula = Damage ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock  
##      57.782       -5.173  
```
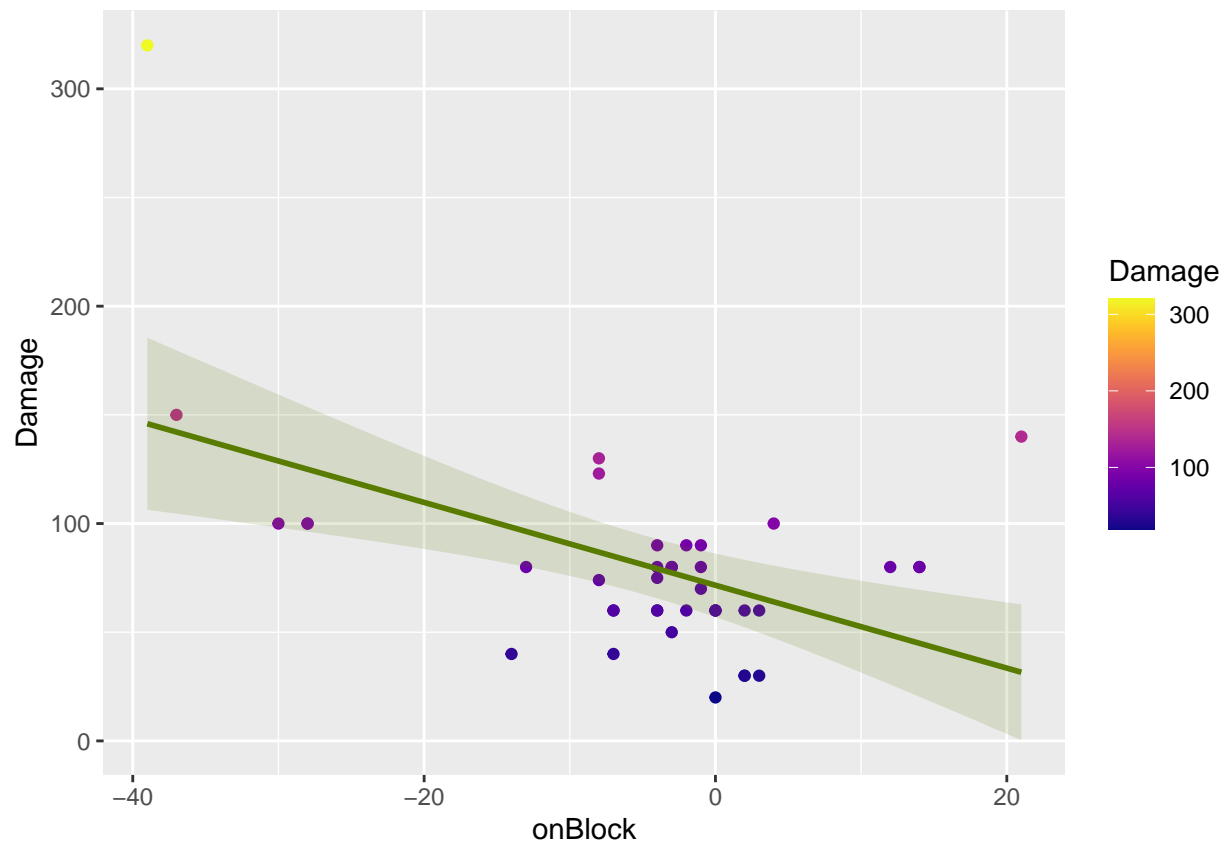
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.3582, df = 38, p-value = 0.7222
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.258165  0.362960
## sample estimates:
##        cor
## 0.05800948
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    109.3245       0.3311
```
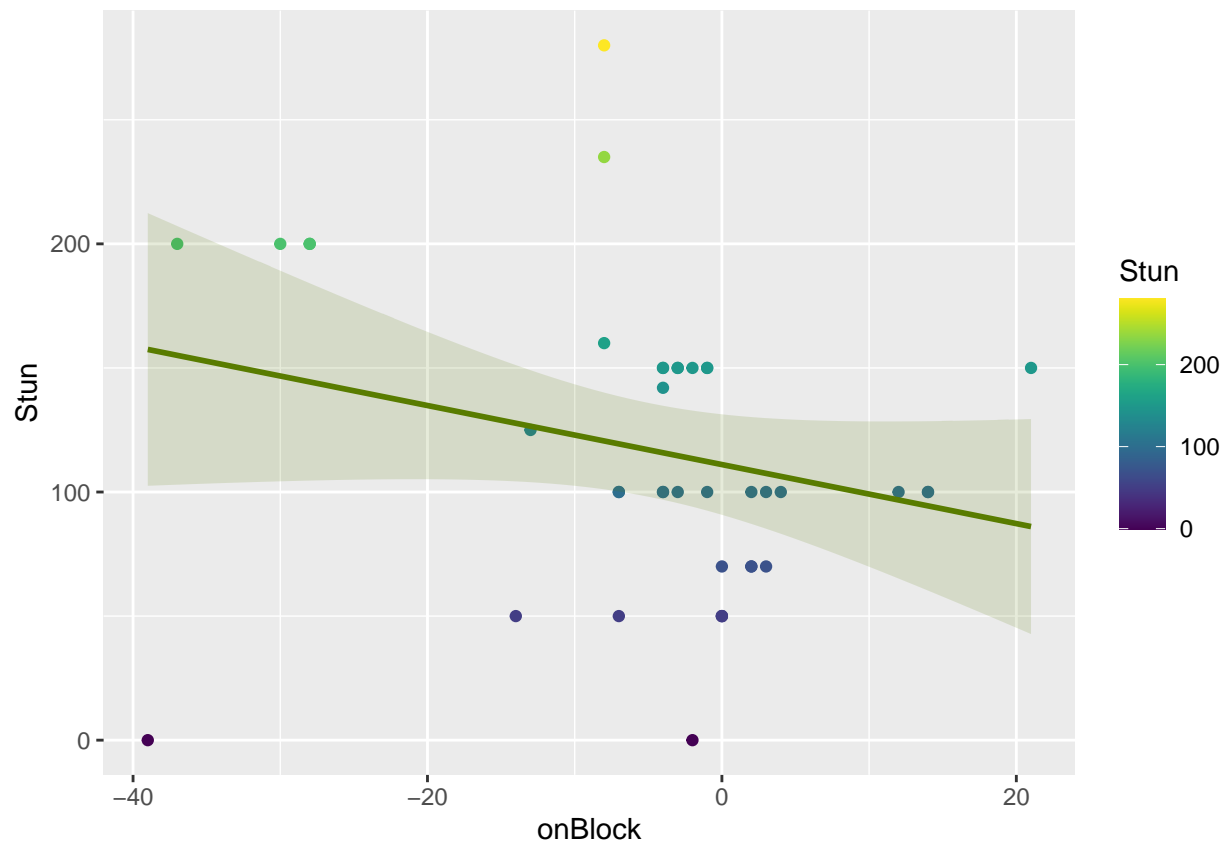
```
scatterplot(
  "data/characters/guile.csv",
  "Guile",
  "#597c00"
)
```

```
##
##   Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -3.5439, df = 38, p-value = 0.001064
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7010686 -0.2212468
## sample estimates:
##        cor
## -0.4984058
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      71.605       -1.906
```
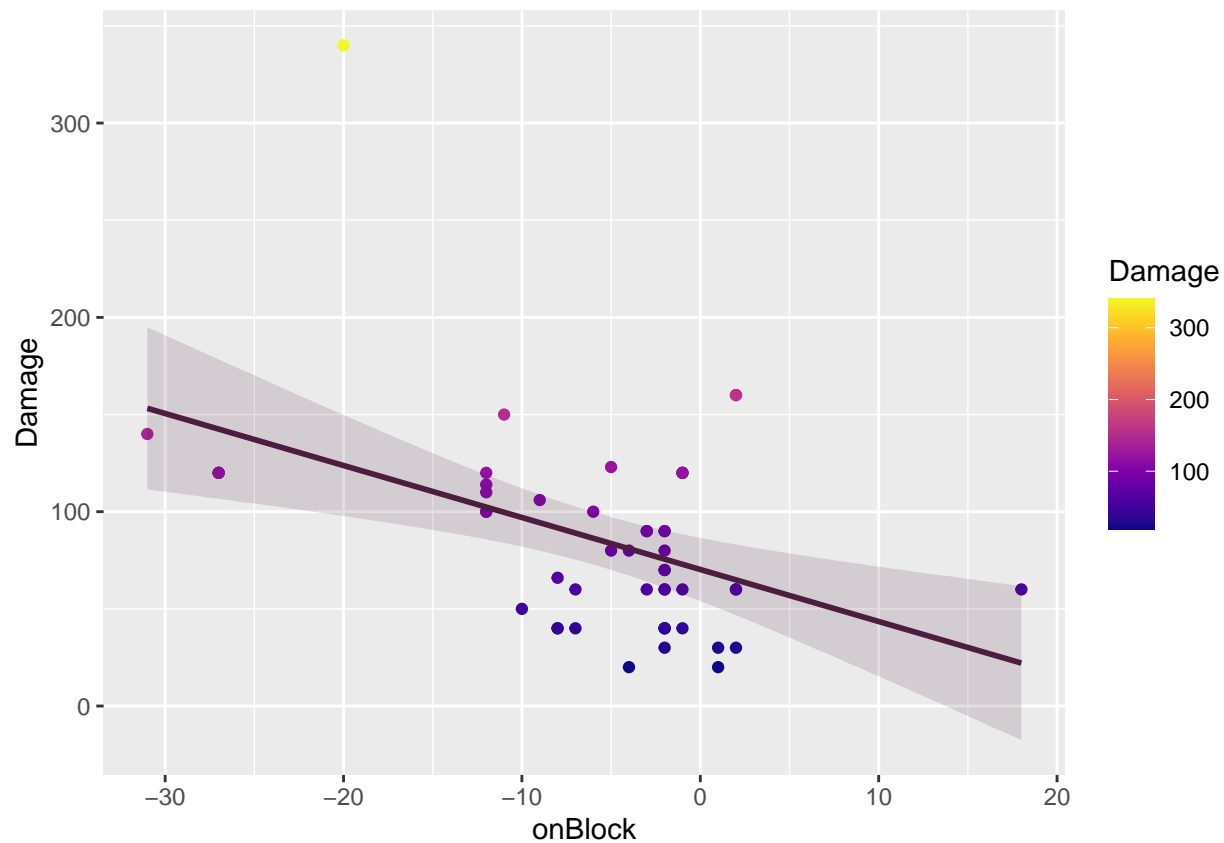
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.5951, df = 38, p-value = 0.119
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.52133234  0.06616775
## sample estimates:
##        cor
## -0.250505
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      111.06        -1.19
```
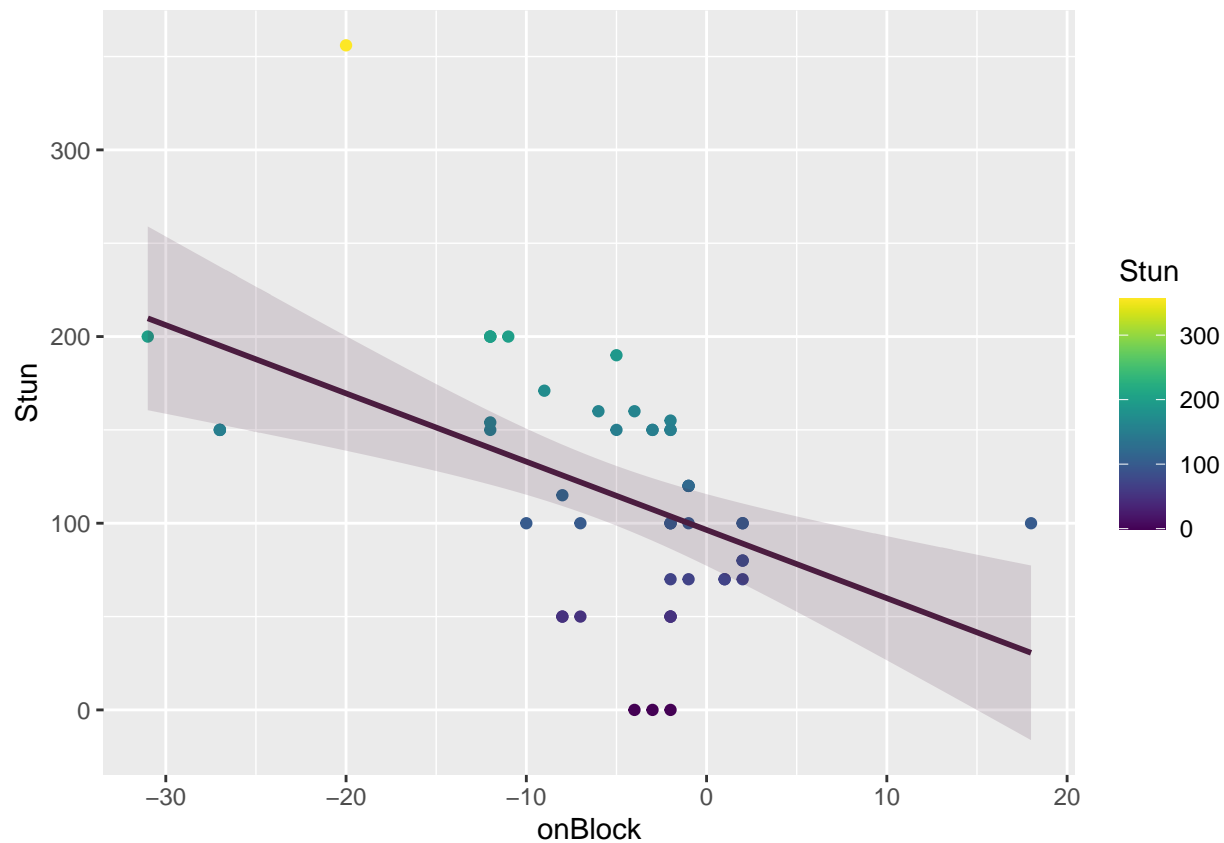
```
scatterplot(
  "data/characters/ibuki.csv",
  "Ibuki",
  "#4b1d40"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -3.4336, df = 48, p-value = 0.001236
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6429362 -0.1890798
## sample estimates:
##        cor
## -0.4440568
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      70.260       -2.676
```
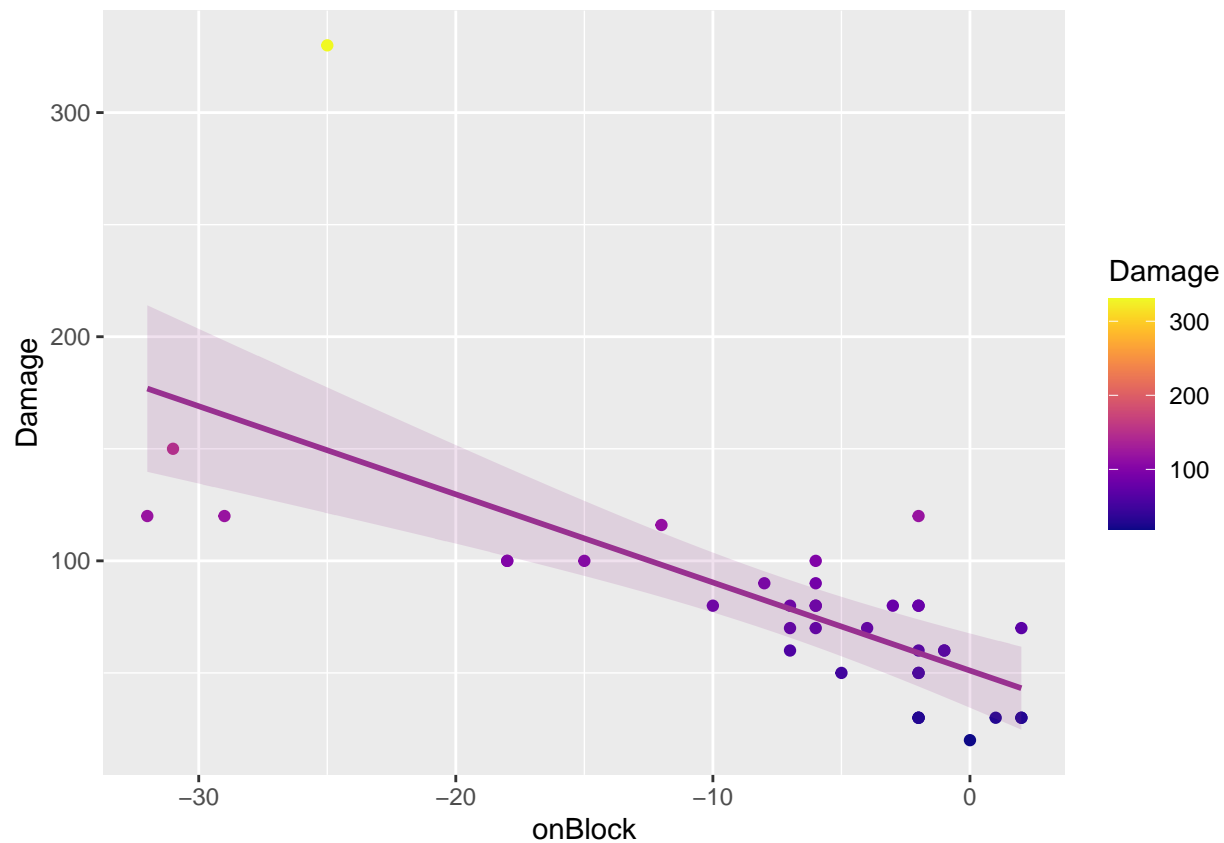
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -3.9785, df = 48, p-value = 0.0002333
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6818231 -0.2549808
## sample estimates:
##        cor
## -0.4979849
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      96.409       -3.657
```
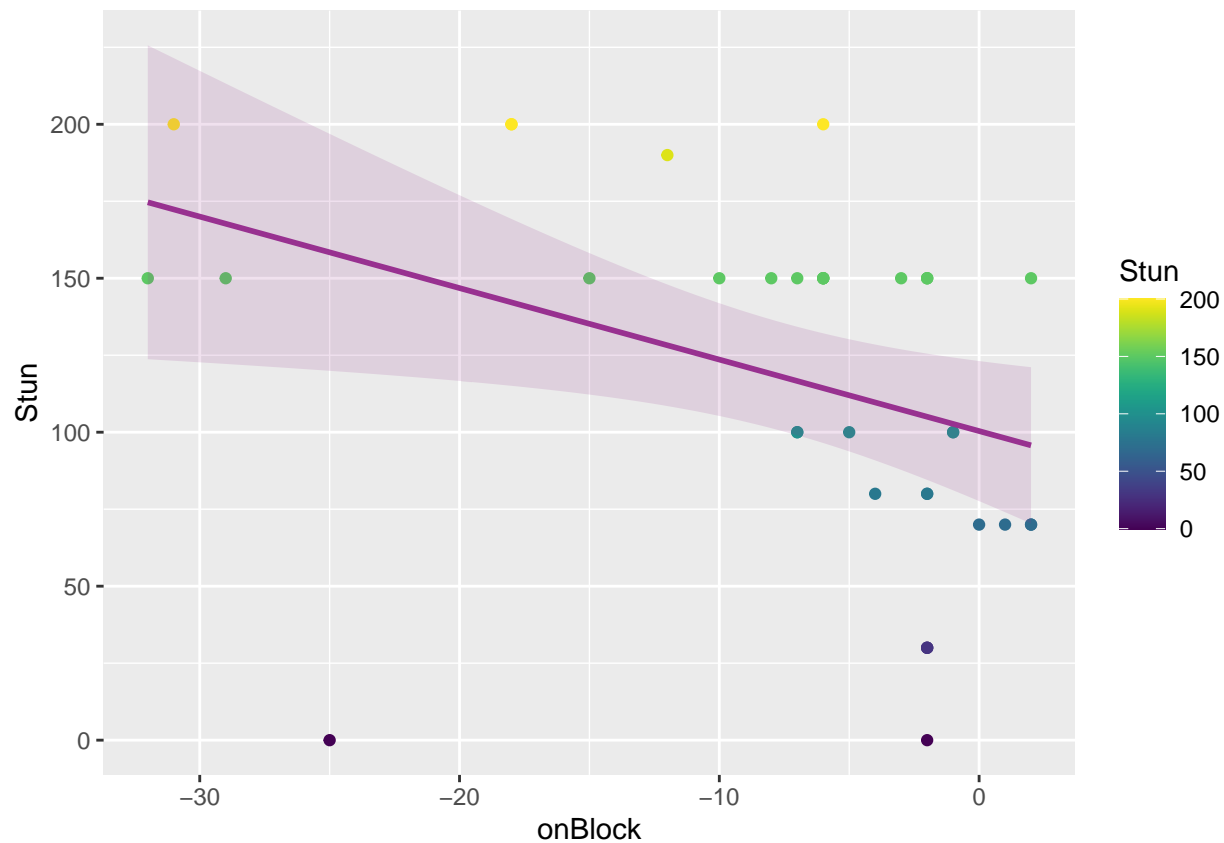
```
scatterplot(
  "data/characters/juri.csv",
  "Juri",
  "#983190"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -5.6304, df = 35, p-value = 2.371e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8283788 -0.4704791
## sample estimates:
##        cor
## -0.6894027
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      51.044       -3.932
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.4235, df = 35, p-value = 0.02068
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.62618133 -0.06276476
## sample estimates:
##        cor
## -0.3790745
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     100.375       -2.322
```

```
scatterplot(
  "data/characters/kage.csv",
  "Kage",
  "#553fad"
)
```
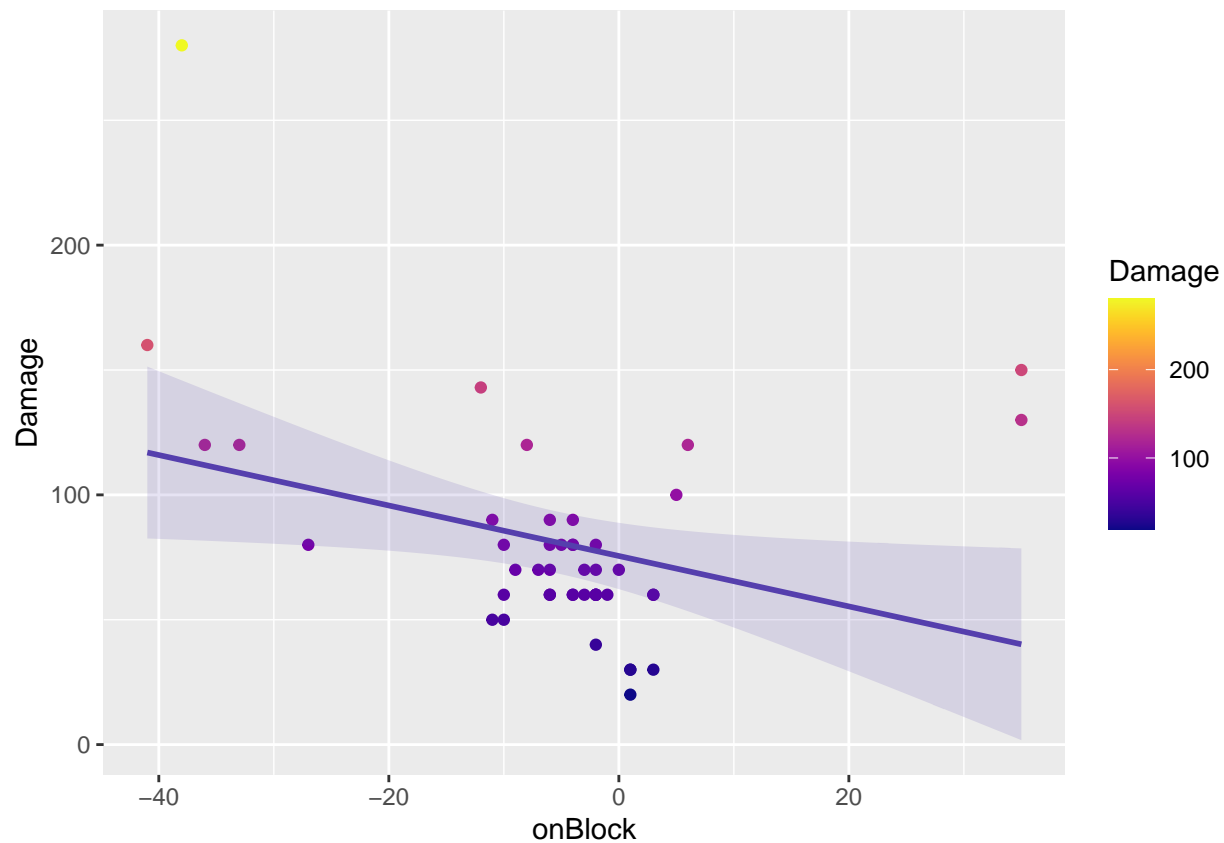
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -2.2604, df = 44, p-value = 0.0288
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.56037547 -0.03558193
## sample estimates:
##        cor
## -0.3225483
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##       75.53        -1.01
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.010494, df = 44, p-value = 0.9917
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2888487  0.2917461
## sample estimates:
##          cor
## 0.001581991
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    1.155e+02     5.412e-03
```
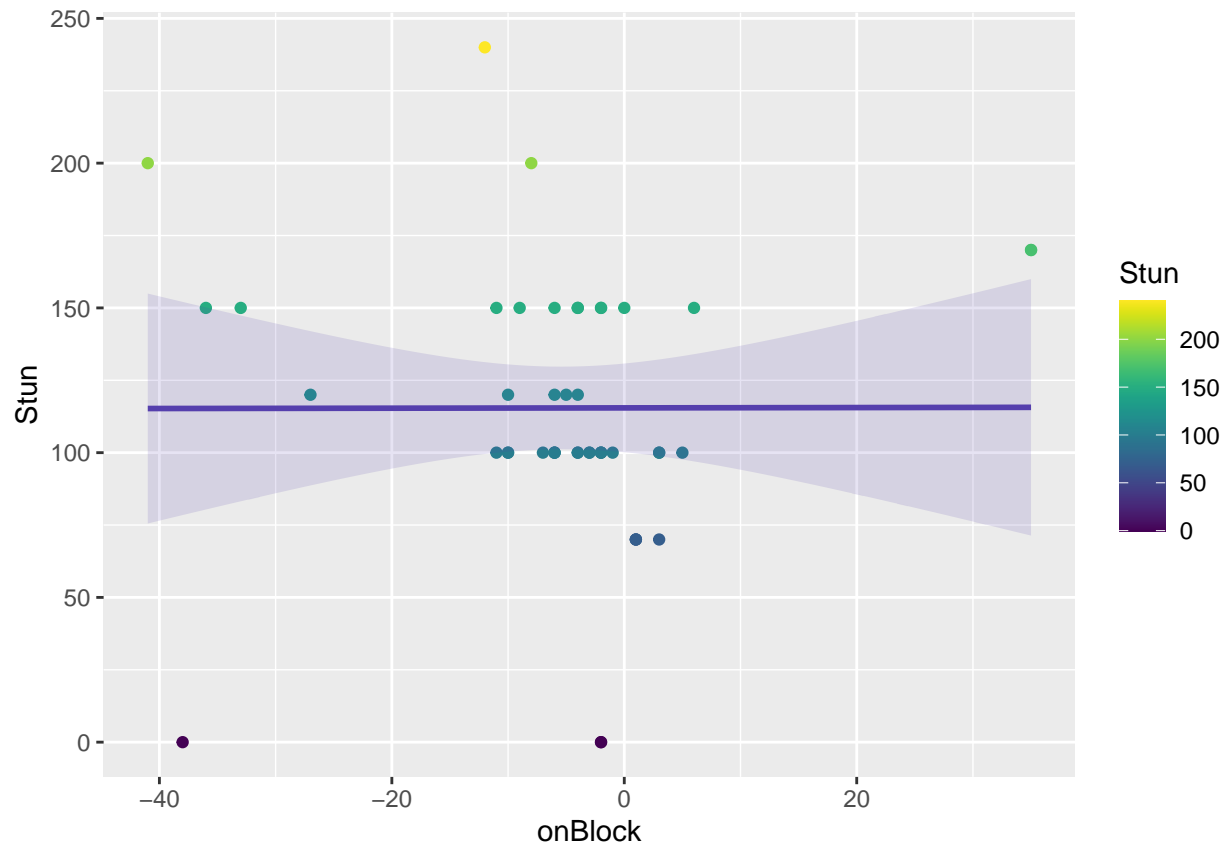
```
scatterplot(
  "data/characters/karin.csv",
  "Karin",
  "#e93824"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -3.4299, df = 38, p-value = 0.001468
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6927893 -0.2058822
## sample estimates:
##        cor
## -0.4862089
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      69.801       -2.981
```
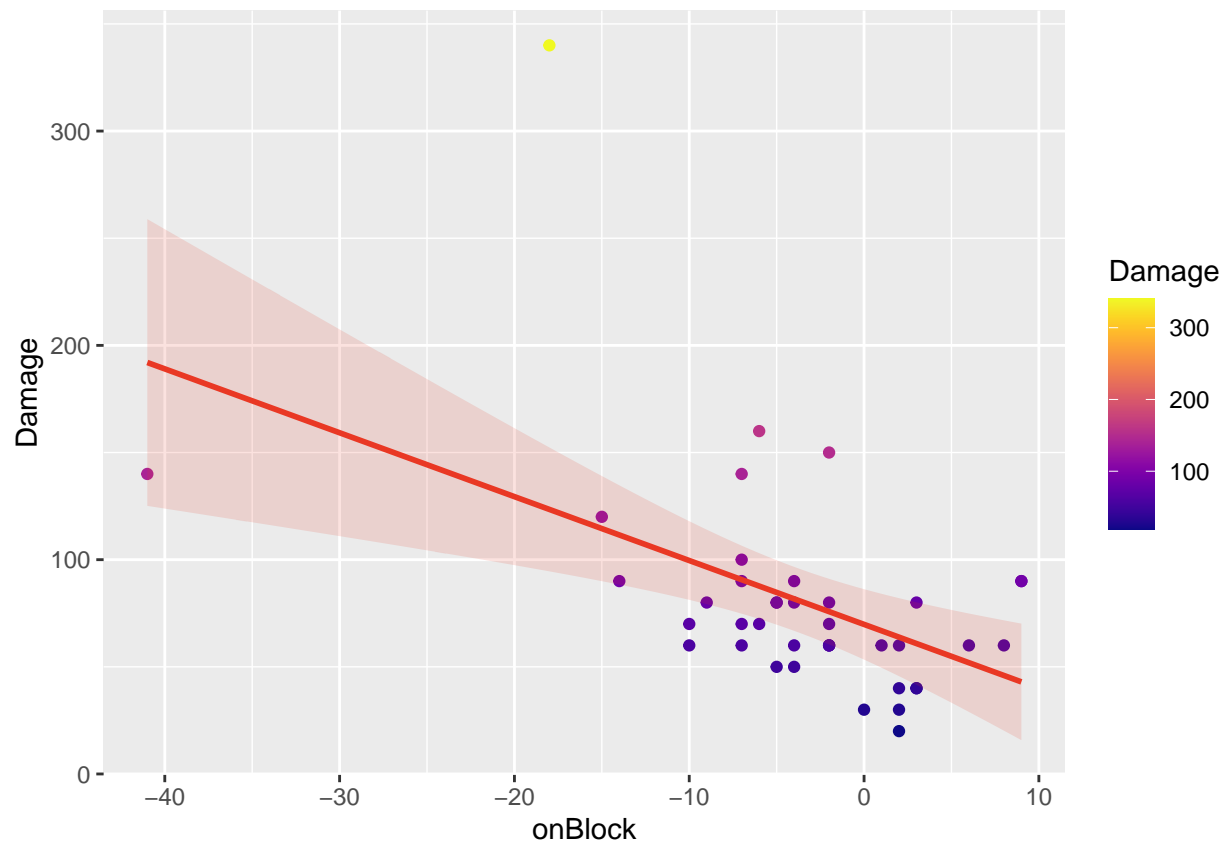
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -0.74005, df = 38, p-value = 0.4638
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4152853  0.1997297
## sample estimates:
##        cor
## -0.1191957
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    108.2672      -0.6963
```
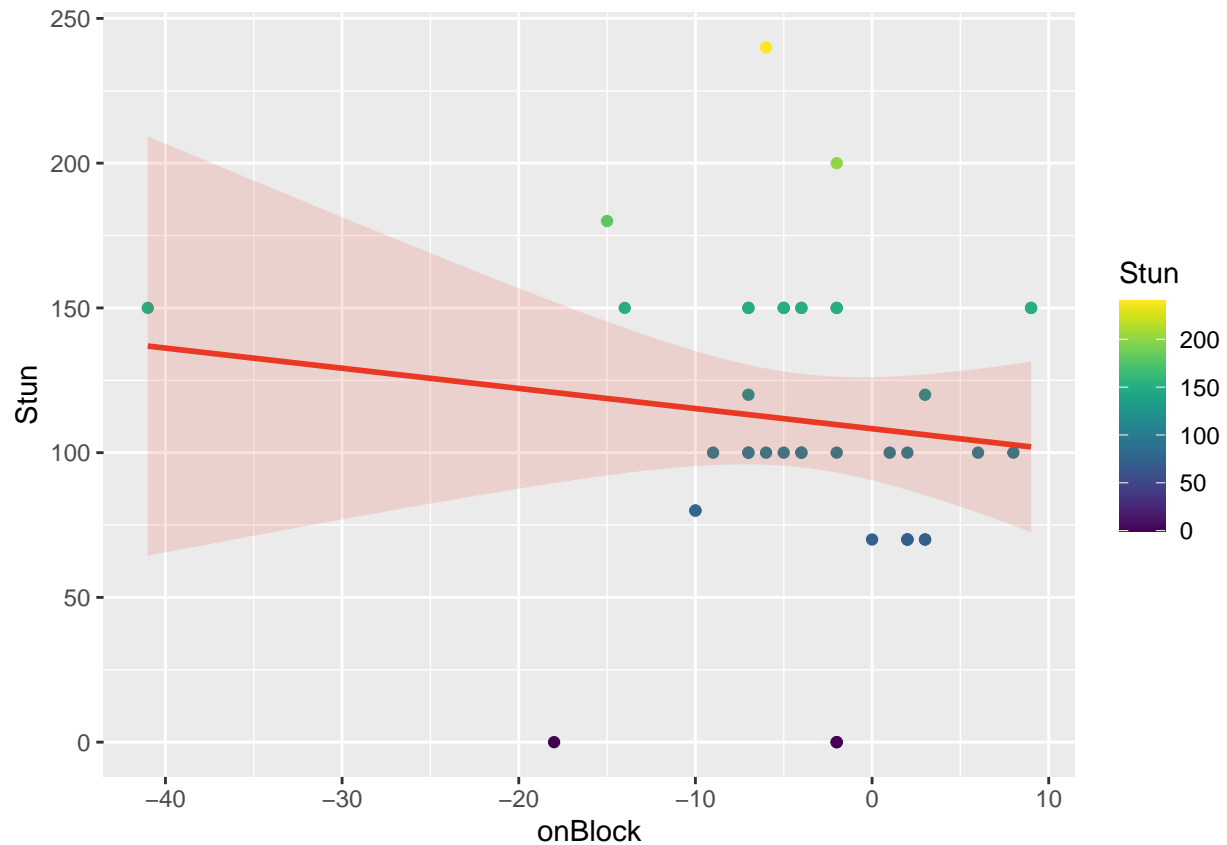
```
scatterplot(
  "data/characters/ken.csv",
  "Ken",
  "#ff0000"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -4.5977, df = 39, p-value = 4.417e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7616079 -0.3488522
## sample estimates:
##        cor
## -0.5928729
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      62.346       -2.132
```
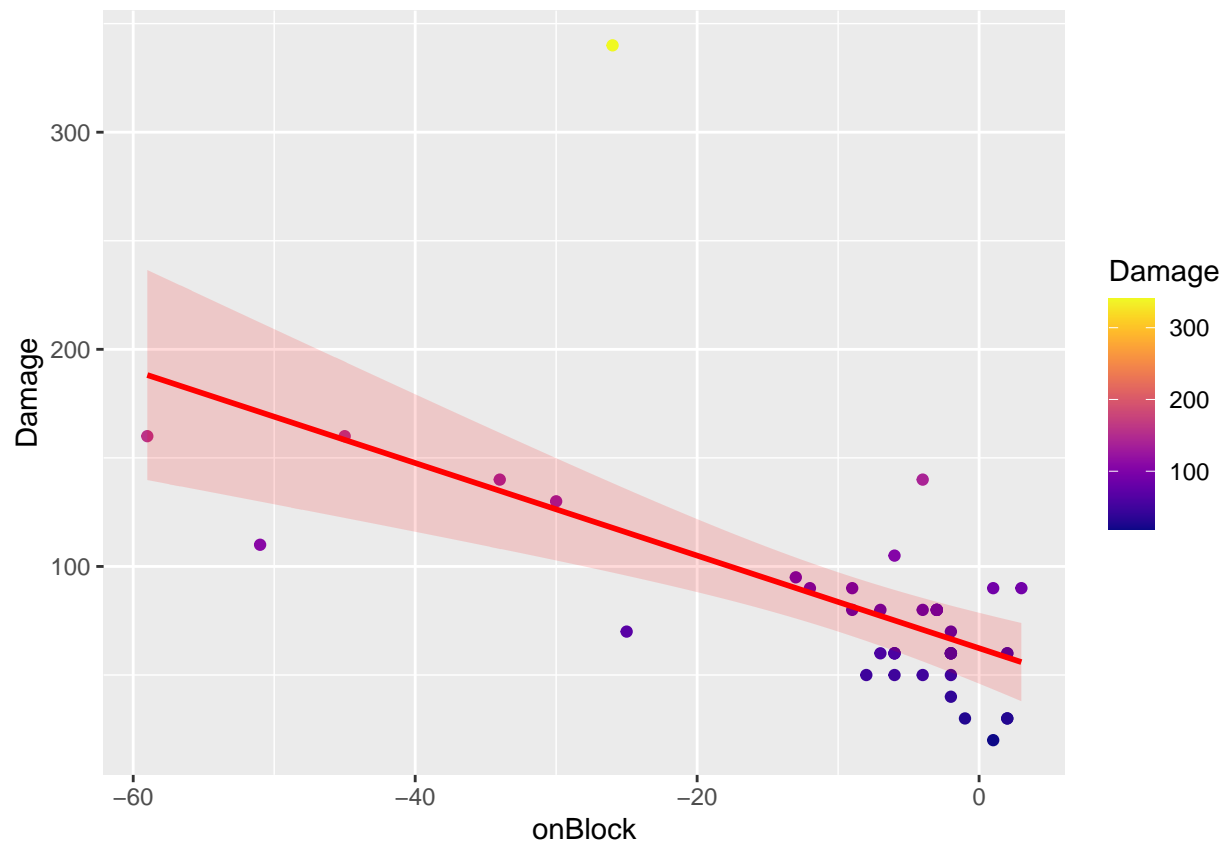
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.8845, df = 39, p-value = 0.006353
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6439071 -0.1282138
## sample estimates:
##       cor
## -0.419324
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      99.612       -1.376
```
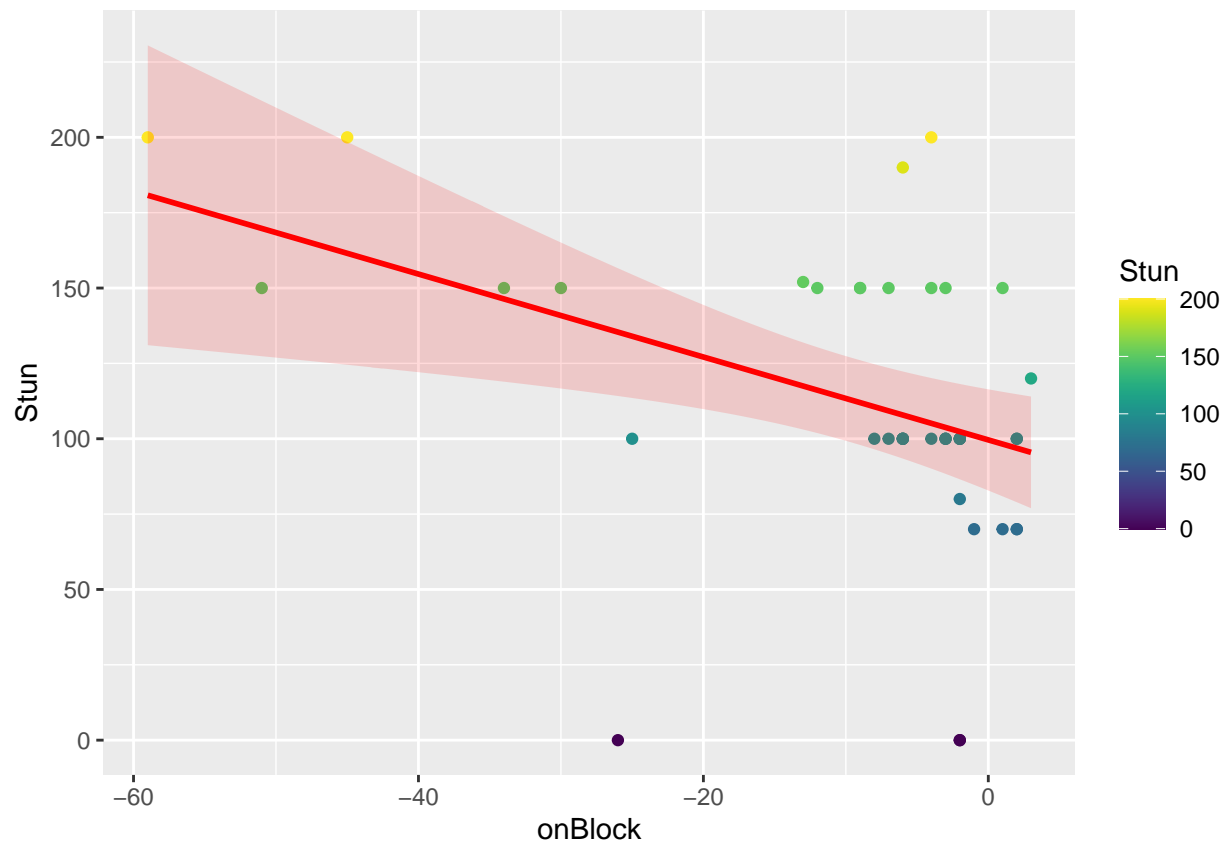
```
scatterplot(
  "data/characters/kolin.csv",
  "Kolin",
  "#394057"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -2.7221, df = 47, p-value = 0.00907
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.58910240 -0.09801277
## sample estimates:
##        cor
## -0.3690383
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      78.665       -1.487
```
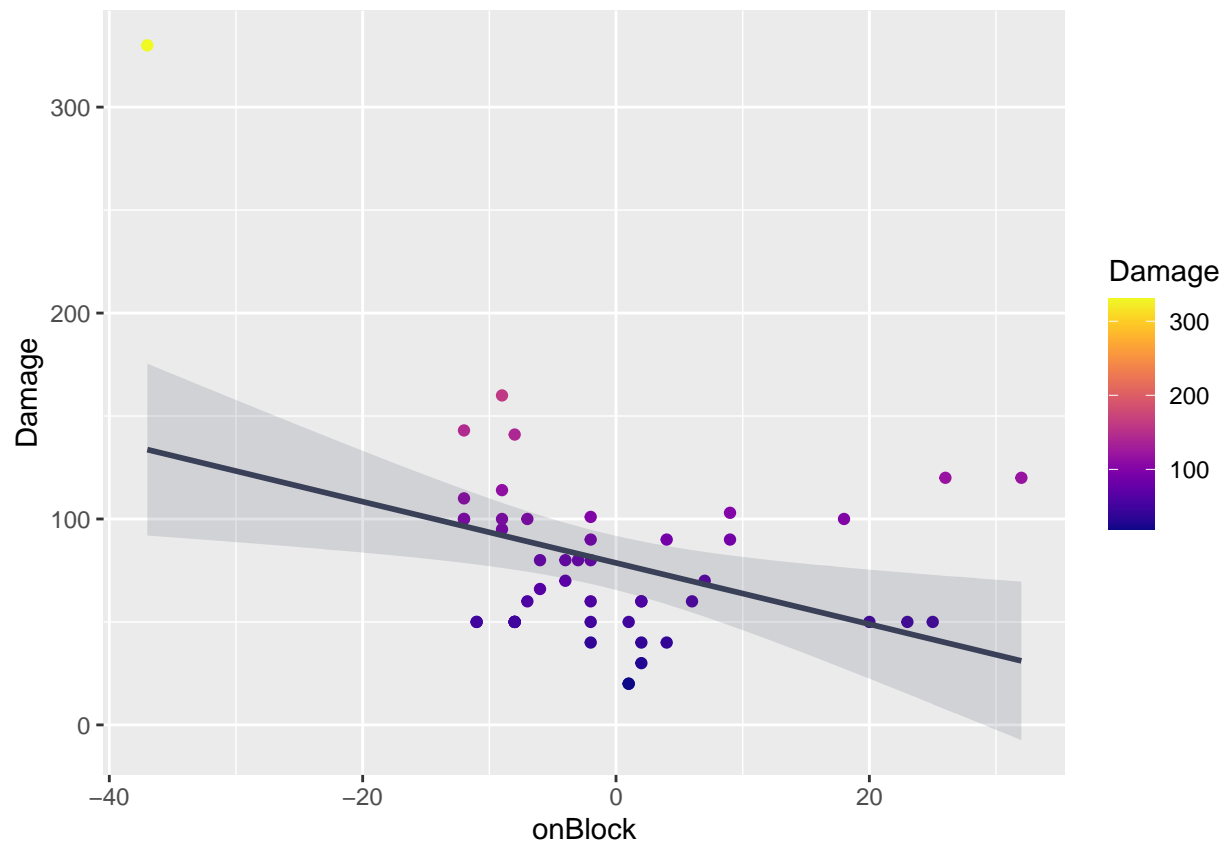
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 2.4669, df = 47, p-value = 0.01733
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.06342482 0.56590093
## sample estimates:
##       cor
## 0.3385828
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     135.769        1.949
```

```
scatterplot(
  "data/characters/laura.csv",
  "Laura",
  "#80dc00"
)
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Damage
## t = 6.3223, df = 39, p-value = 1.848e-07
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.5169389 0.8360934
## sample estimates:
##       cor
## 0.7114438
## 
## 
## Call:
## lm(formula = Damage ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##      71.924        2.823
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 3.1074, df = 39, p-value = 0.003513
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1597268 0.6623577
## sample estimates:
##       cor
## 0.445486
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      98.598        1.677
```
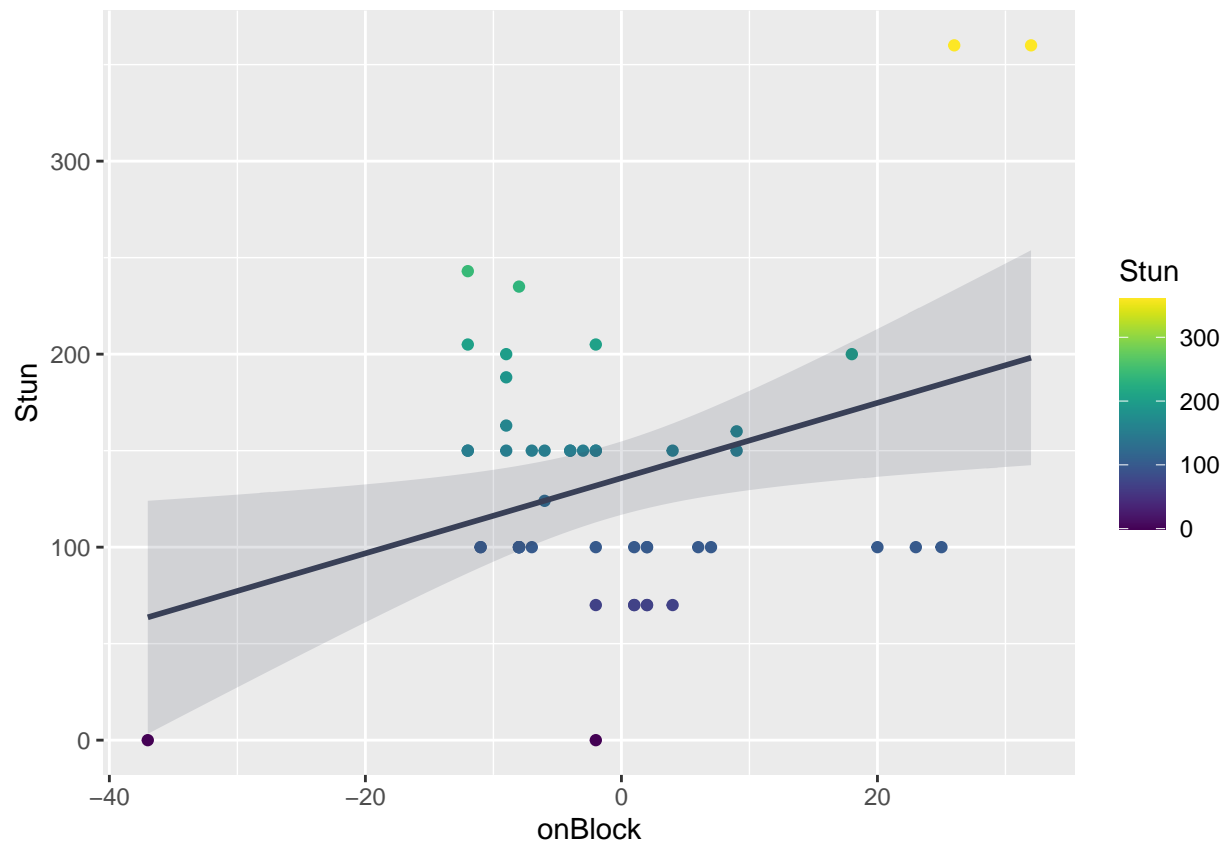
```
scatterplot(
  "data/characters/lucia.csv",
  "Lucia",
  "#3e77b1"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -2.8143, df = 46, p-value = 0.007171
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6018516 -0.1112347
## sample estimates:
##        cor
## -0.3832564
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      77.327       -1.295
```
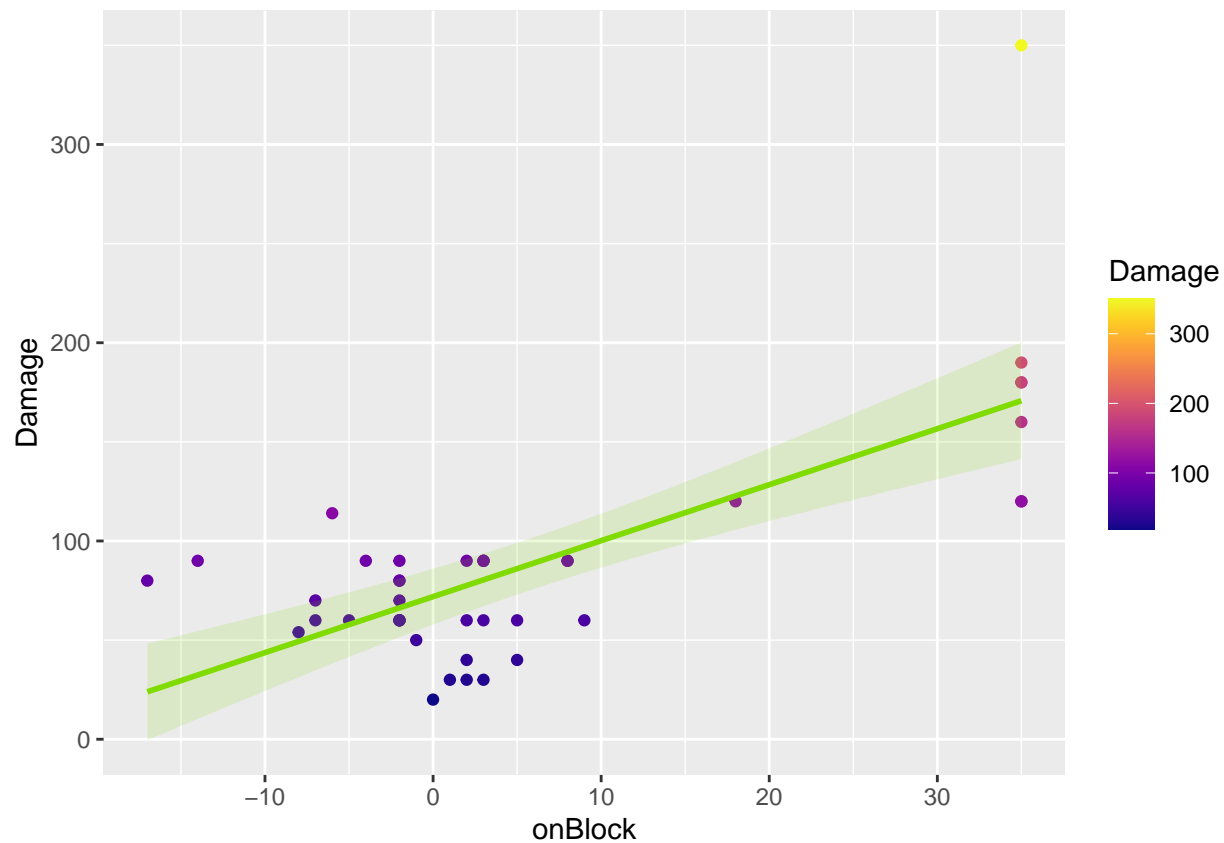
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.0959, df = 46, p-value = 0.2788
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4244102  0.1305402
## sample estimates:
##        cor
## -0.1595109
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    113.3249      -0.5327
```
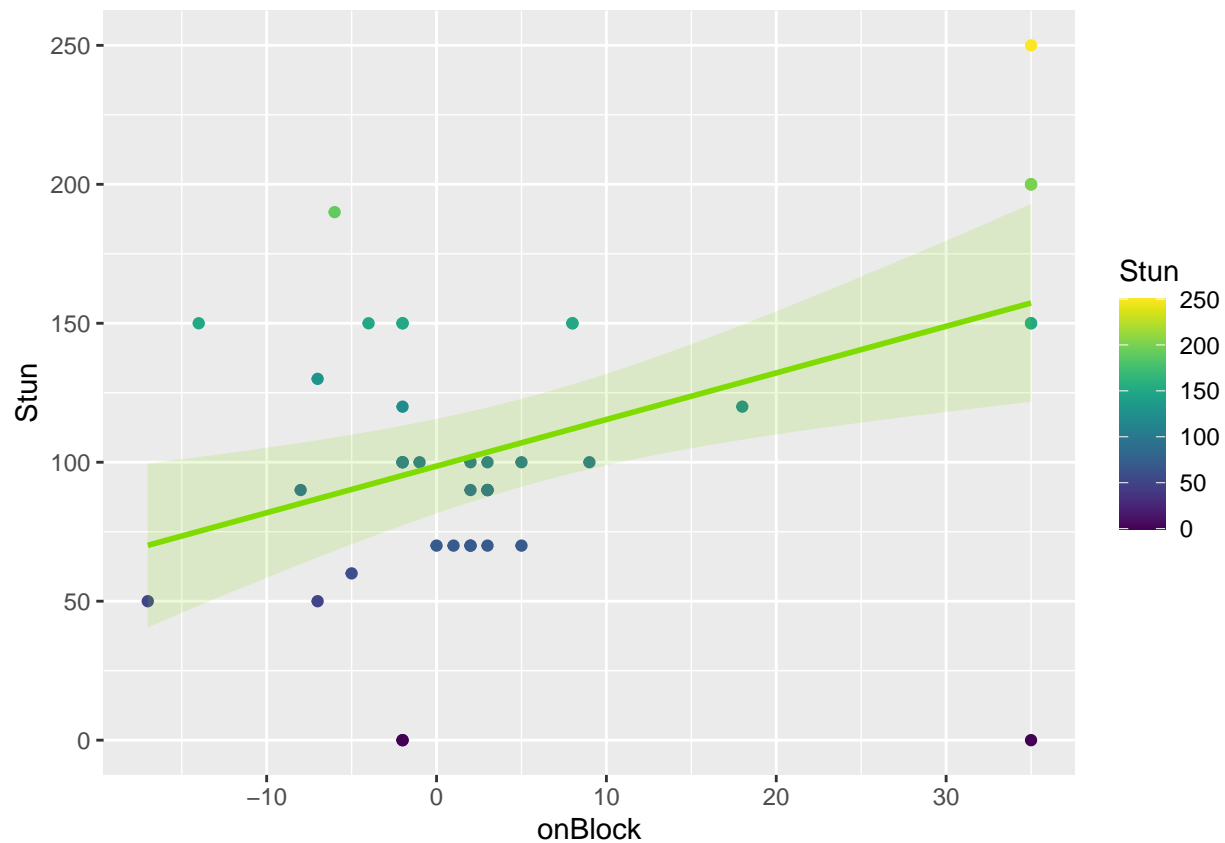
```
scatterplot(
  "data/characters/m_bison.csv",
  "M. Bison",
  "#480e07"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -5.4615, df = 32, p-value = 5.186e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8363085 -0.4658246
## sample estimates:
##        cor
## -0.6945765
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      74.733       -4.266
```
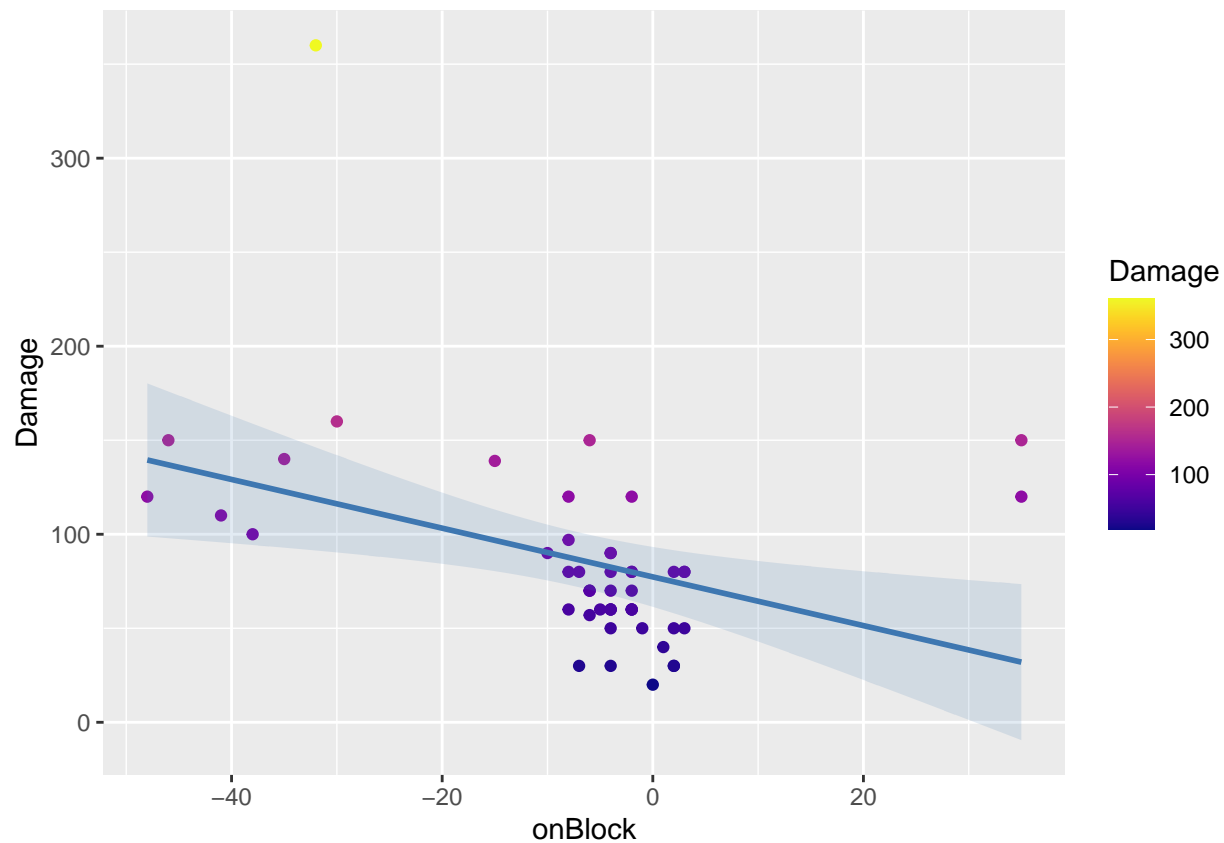
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.91021, df = 32, p-value = 0.3695
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.1894845  0.4716867
## sample estimates:
##       cor
## 0.1588605
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    118.1442       0.9506
```
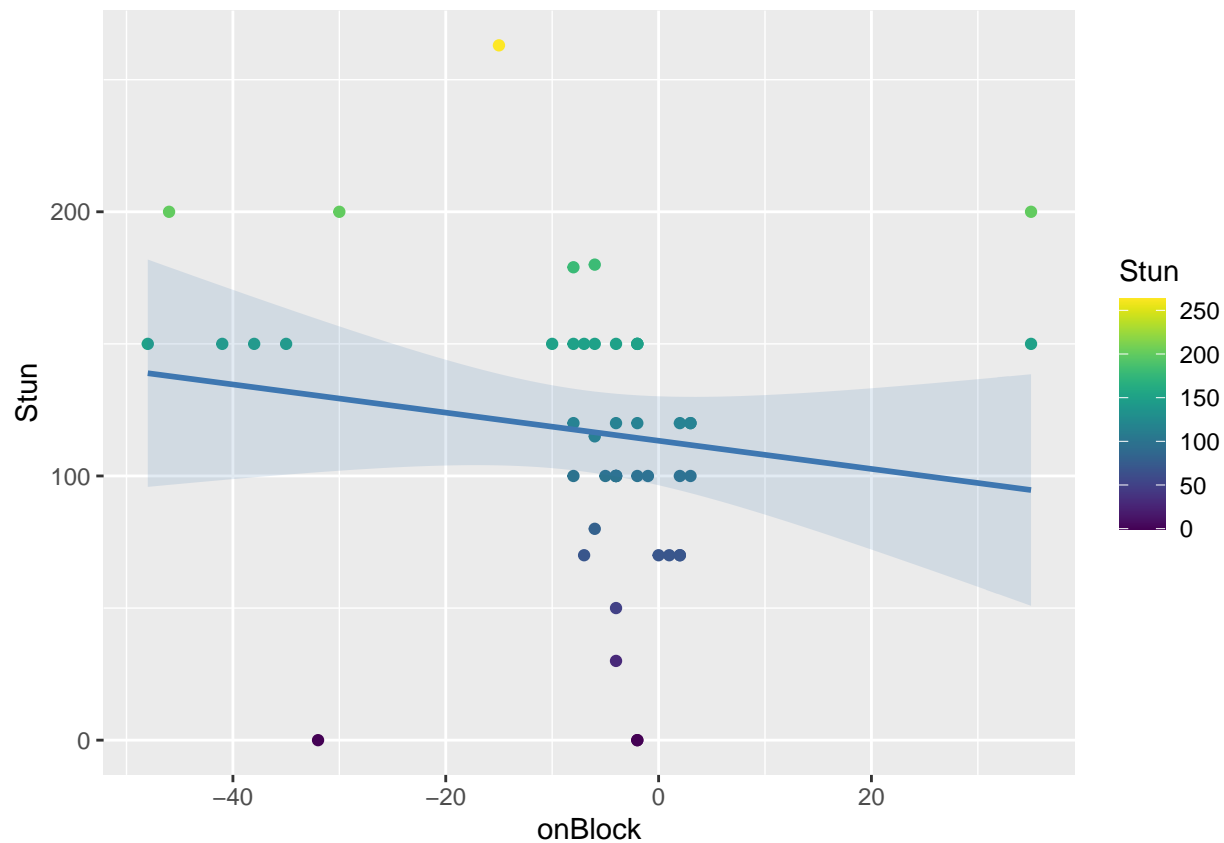
```
scatterplot(
  "data/characters/menat.csv",
  "Menat",
  "#3d224b"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -6.9553, df = 40, p-value = 2.164e-08
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.852167 -0.562391
## sample estimates:
##        cor
## -0.7398595
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      45.417       -3.986
```
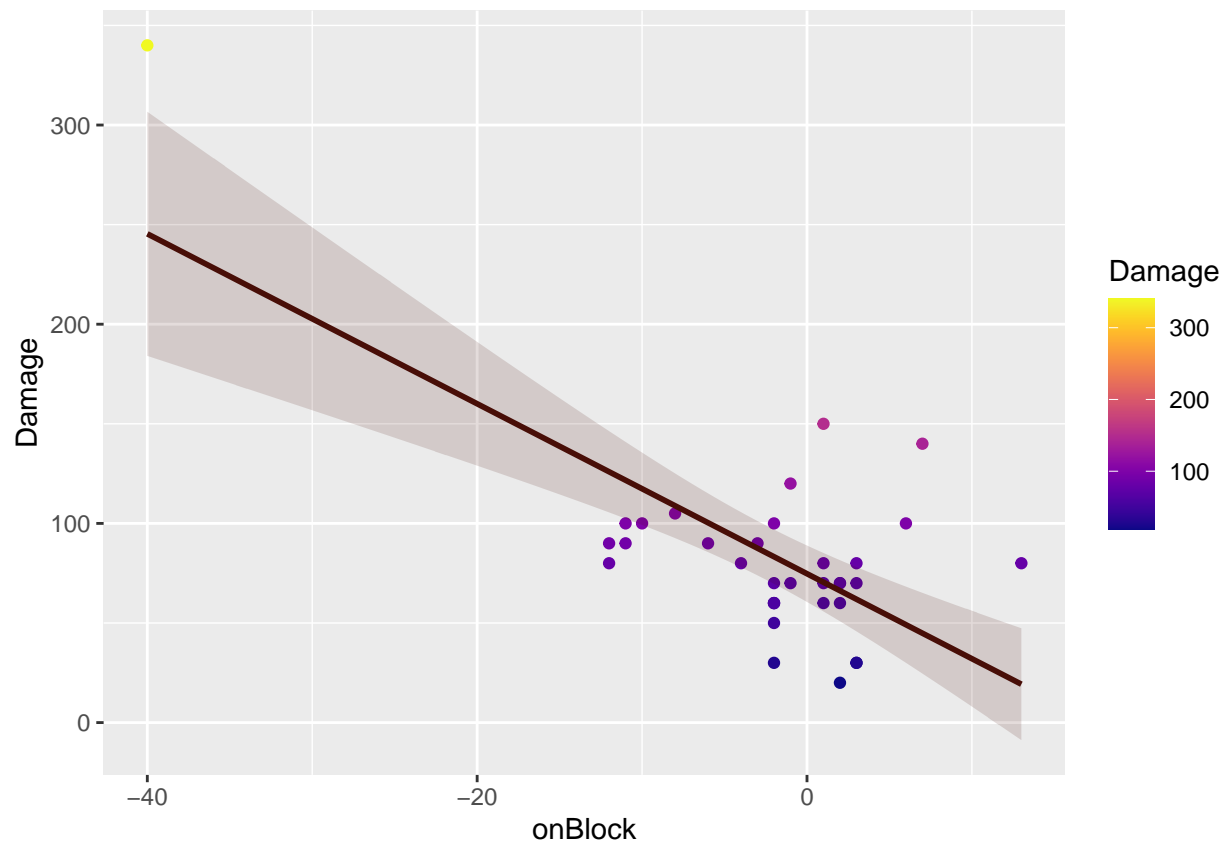
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -0.30938, df = 40, p-value = 0.7586
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3476282  0.2589172
## sample estimates:
##         cor
## -0.04885902
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    102.5065      -0.2548
```
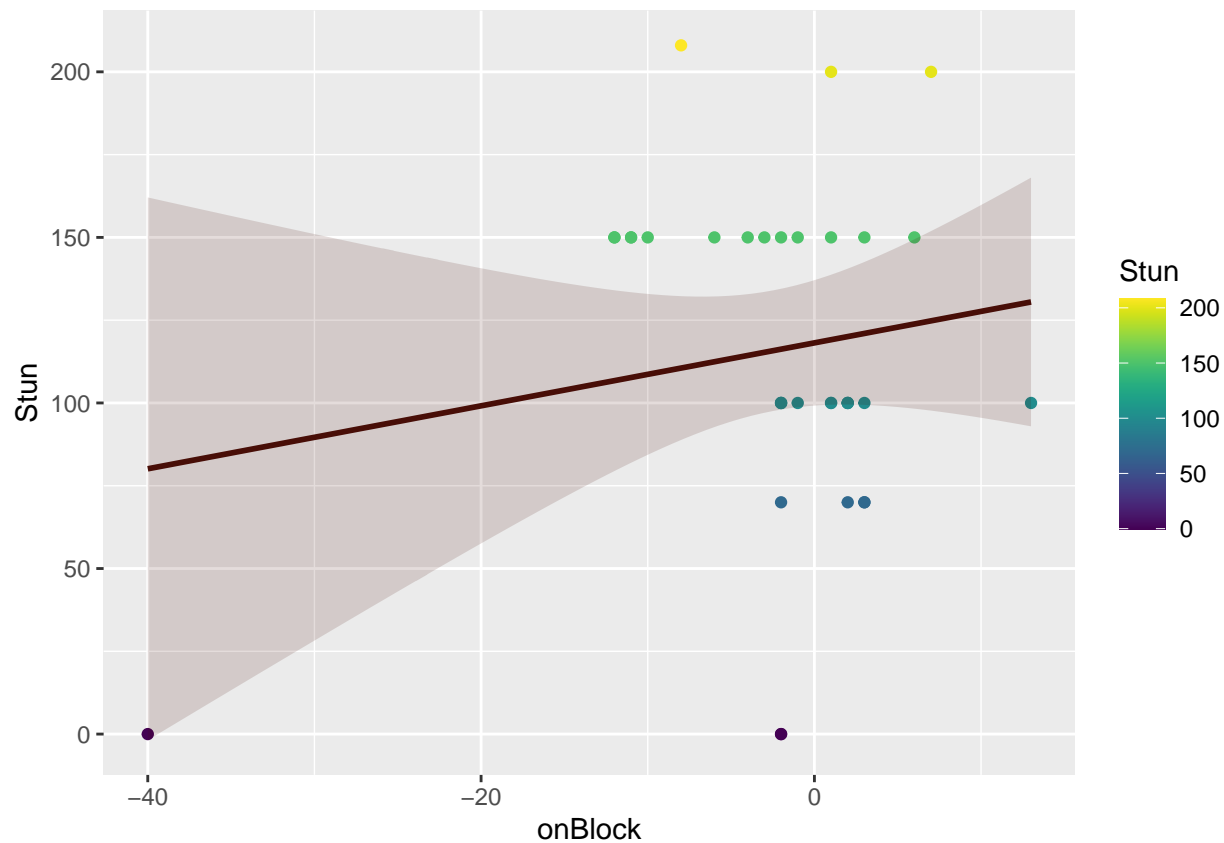
```
scatterplot(
  "data/characters/nash.csv",
  "Nash",
  "#3a8455"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -8.7962, df = 48, p-value = 1.417e-11
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8730302 -0.6491925
## sample estimates:
##        cor
## -0.7855842
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      63.608       -5.426
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.0253, df = 48, p-value = 0.04841
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.518445968 -0.002431866
## sample estimates:
##        cor
## -0.2805897
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     114.338       -1.944
```

```
scatterplot(
  "data/characters/necalli.csv",
  "Necalli",
  "#581e0d"
)
```
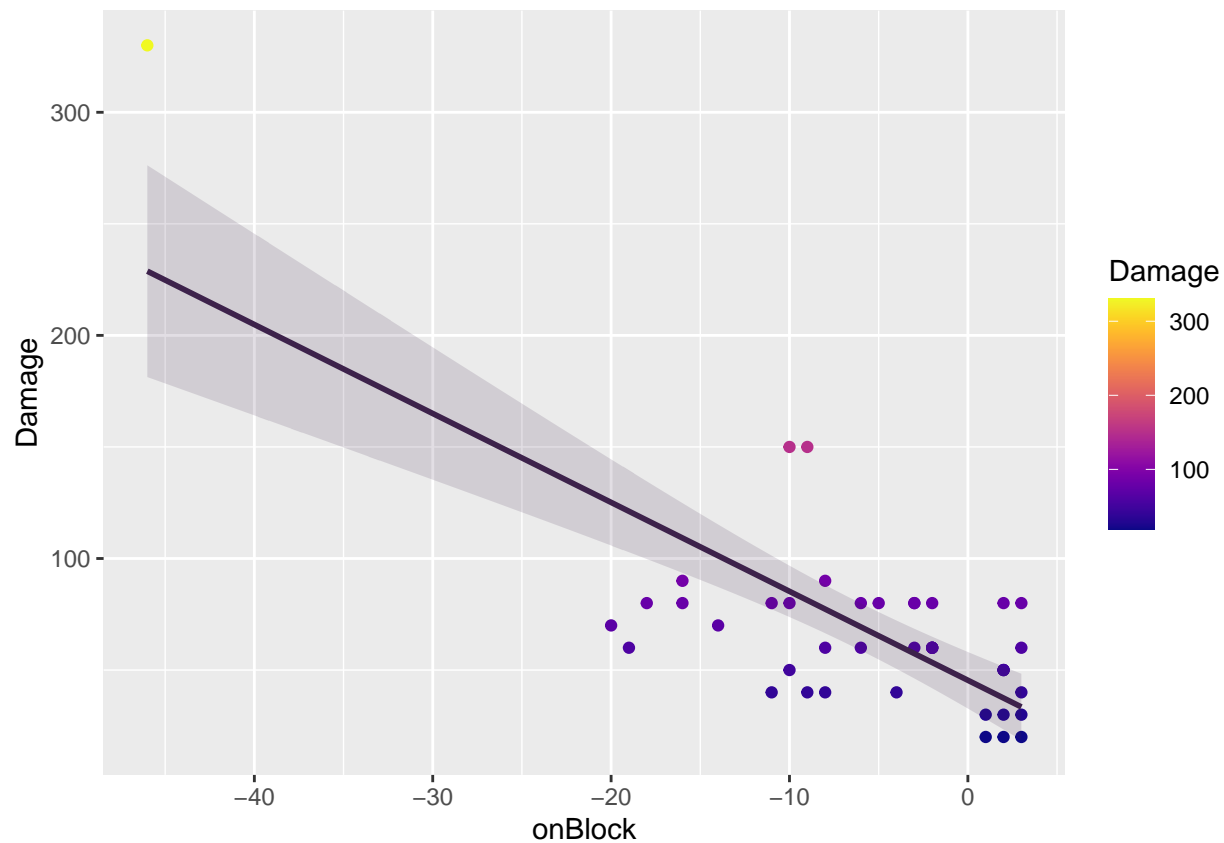
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -2.2194, df = 34, p-value = 0.03324
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.61265749 -0.03078308
## sample estimates:
##        cor
## -0.3557213
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      84.905       -1.393
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.1445, df = 34, p-value = 0.2604
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4901311  0.1451075
## sample estimates:
##        cor
## -0.1926106
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    119.0843      -0.8104
```
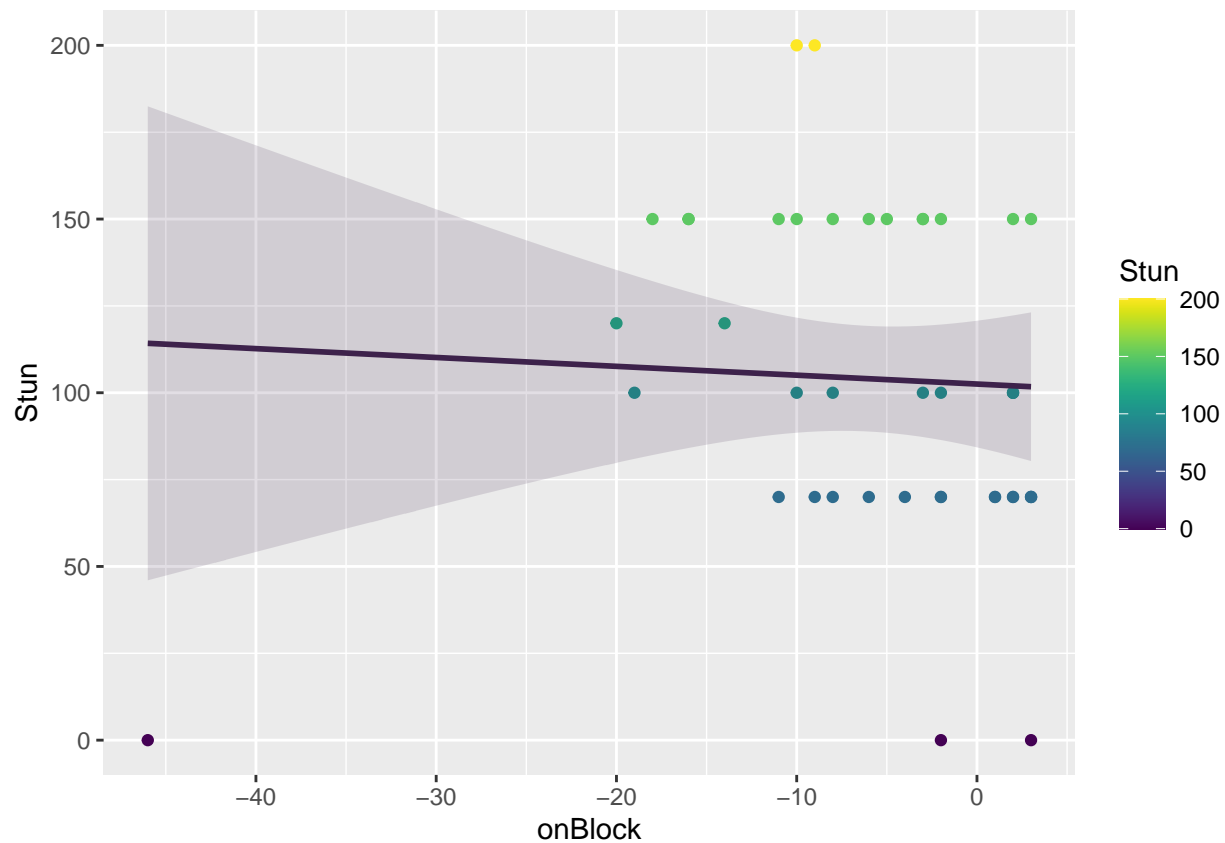
```
scatterplot(
  "data/characters/poison.csv",
  "Poison",
  "#d14461"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -1.6515, df = 33, p-value = 0.1081
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.55815065  0.06272648
## sample estimates:
##        cor
## -0.2762956
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      84.956       -1.049
```
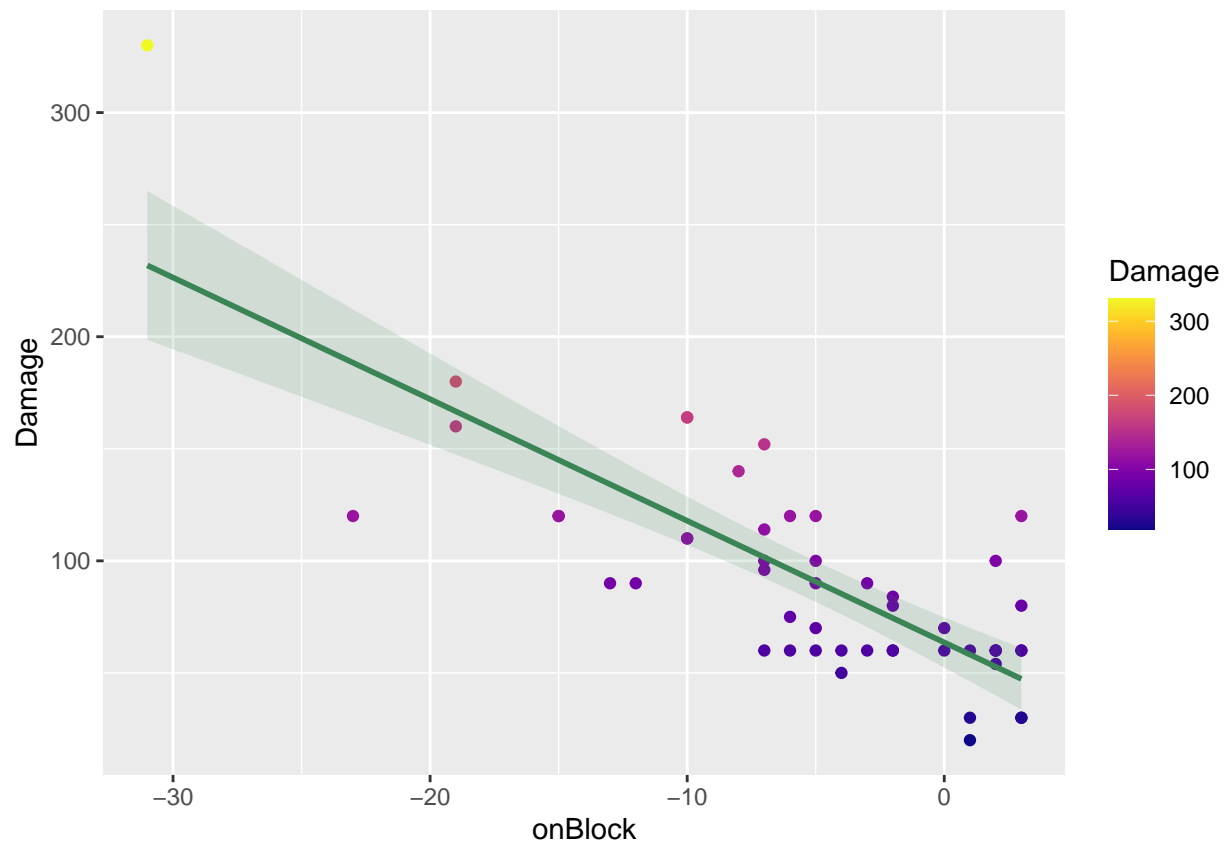
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.78839, df = 33, p-value = 0.4361
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2066435  0.4488741
## sample estimates:
##       cor
## 0.1359661
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    119.8887       0.5011
```
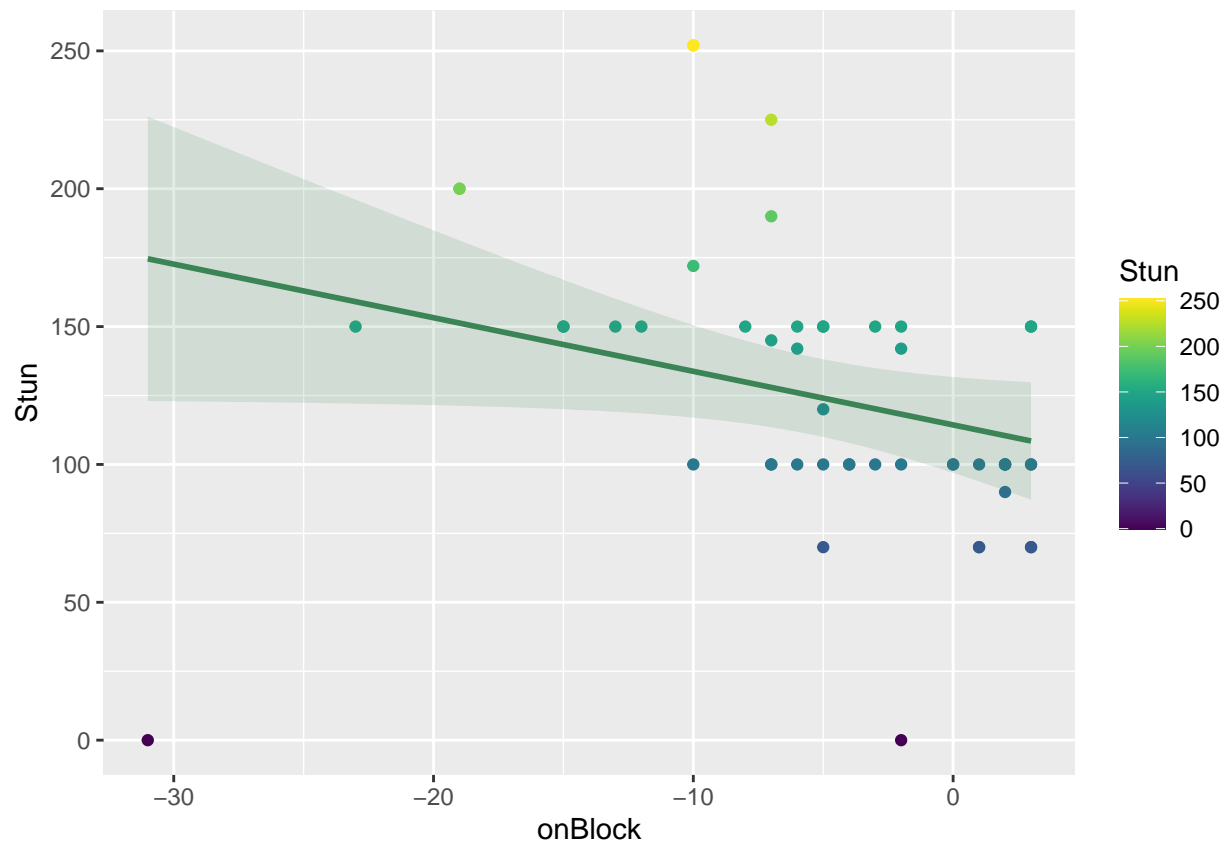
```
scatterplot(
  "data/characters/r_mika.csv",
  "R. Mika",
  "#68e6f7"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = 5.4903, df = 48, p-value = 1.49e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.4143748 0.7668607
## sample estimates:
##       cor
## 0.6210863
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)       onBlock
##      78.997         1.479
```
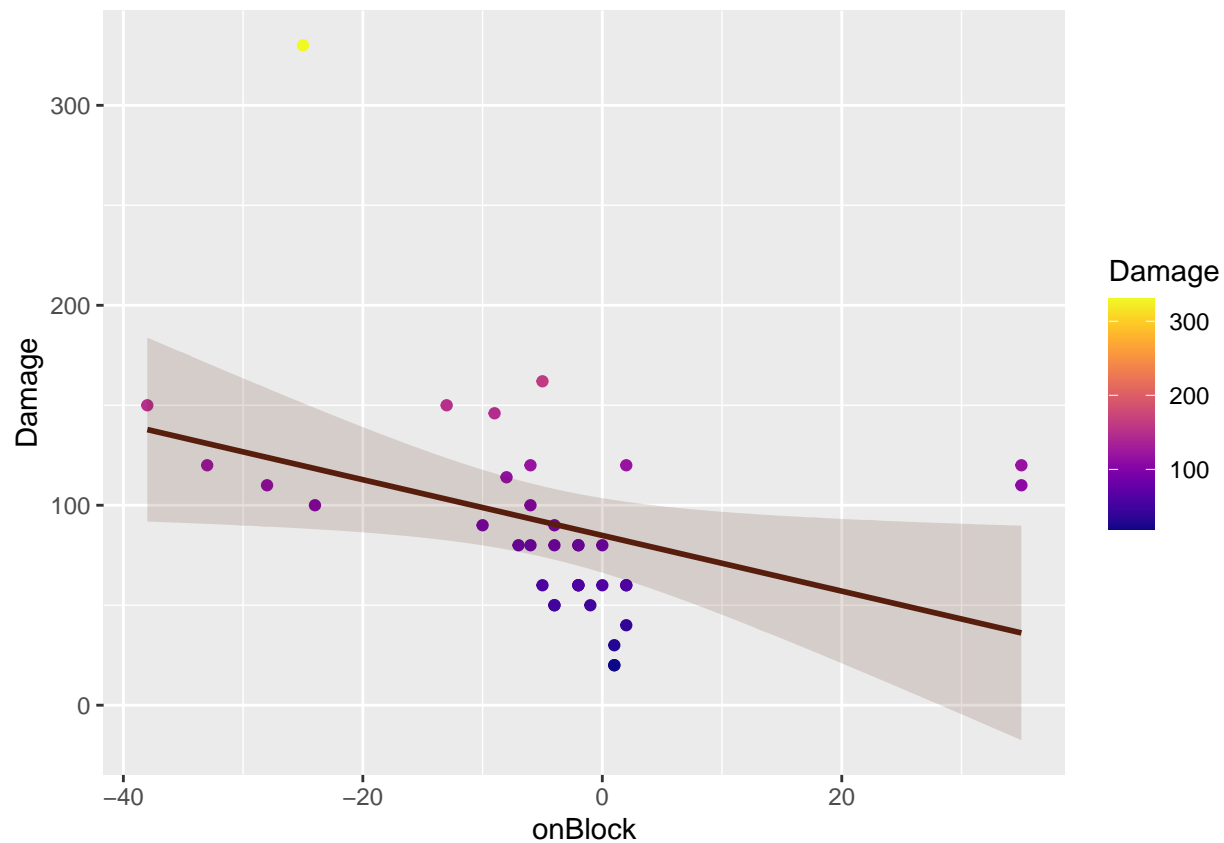
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 2.6711, df = 48, p-value = 0.01029
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.09043279 0.57999872
## sample estimates:
##       cor
## 0.3597256
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    117.9646       0.9265
```
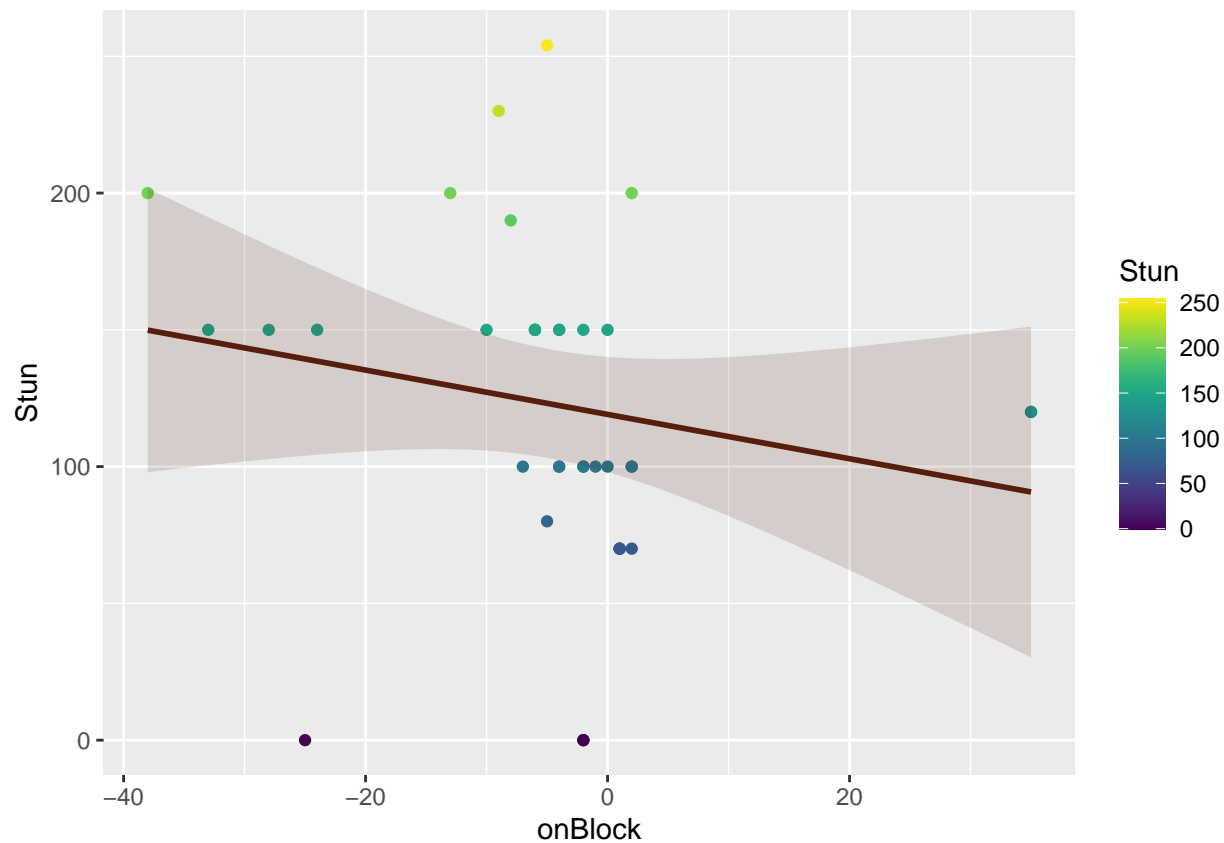
```
scatterplot(
  "data/characters/rashid.csv",
  "Rashid",
  "#375963"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -3.8223, df = 59, p-value = 0.0003207
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6269911 -0.2181672
## sample estimates:
##        cor
## -0.445512
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      81.898       -1.094
```
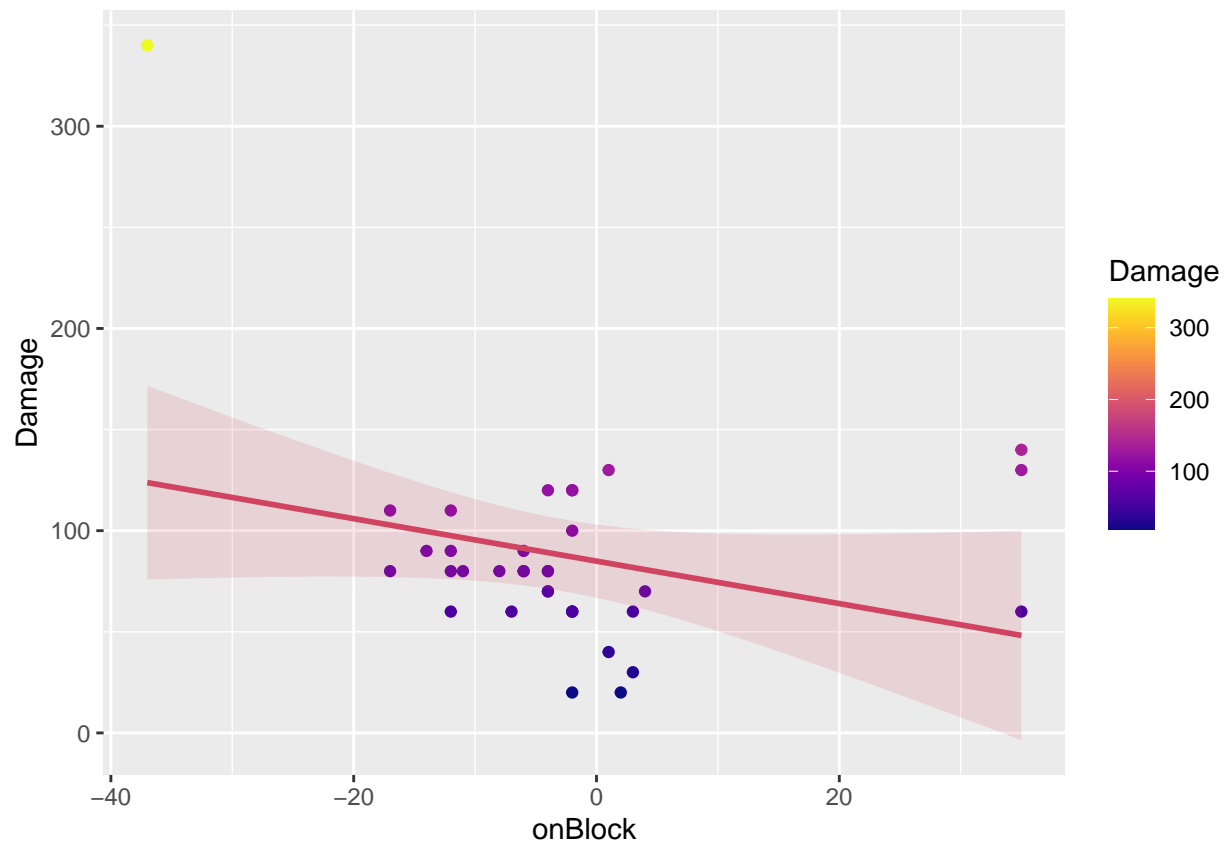
```
##
##   Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.0873, df = 59, p-value = 0.04119
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.48220929 -0.01114673
## sample estimates:
##        cor
## -0.2622314
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    132.7483      -0.7444
```

```
scatterplot(
  "data/characters/ryu.csv",
  "Ryu",
  "#457272"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -0.8525, df = 41, p-value = 0.3989
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4158351  0.1753191
## sample estimates:
##       cor
## -0.131974
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     88.2779      -0.4931
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = 0.15427, df = 41, p-value = 0.8782
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2782716  0.3220991
## sample estimates:
##        cor
## 0.02408522
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##    133.9391       0.1042
```
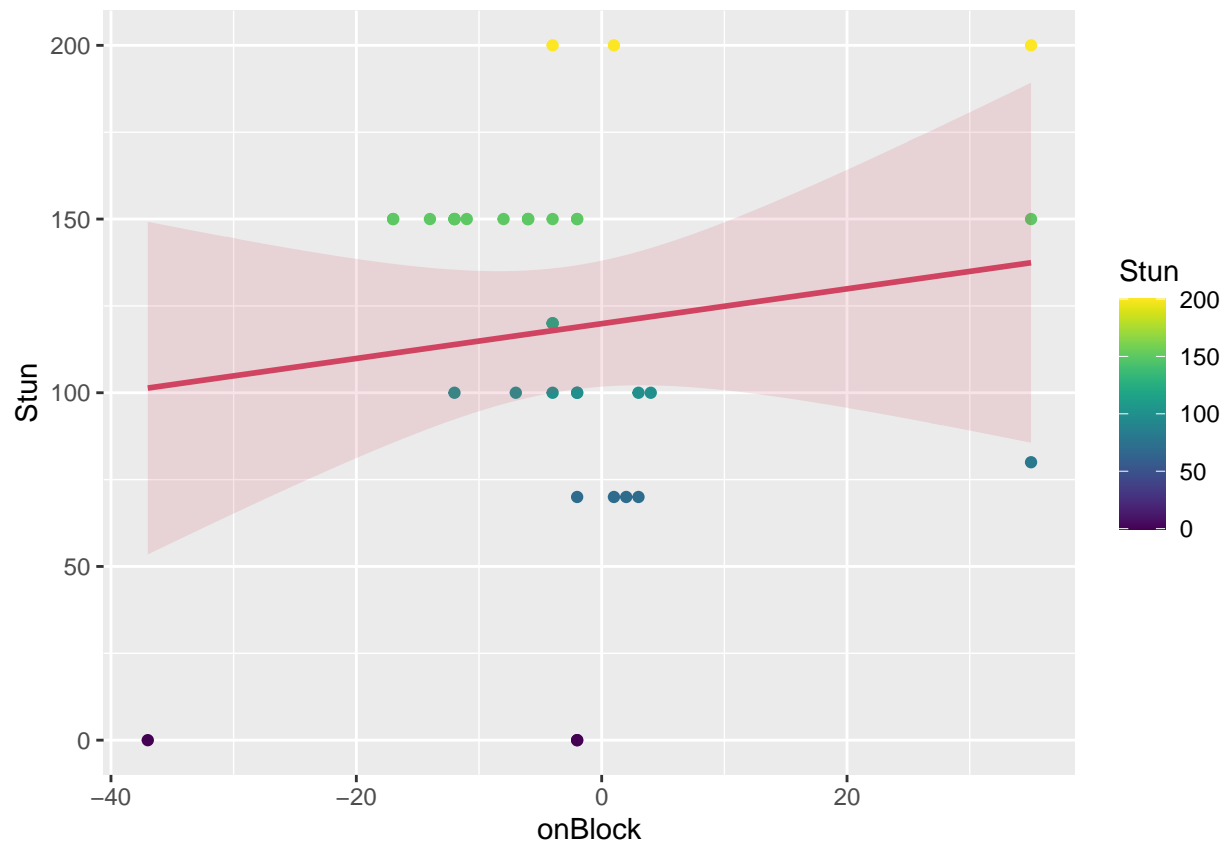
```
scatterplot(
  "data/characters/sagat.csv",
  "Sagat",
  "#a16a46"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -5.7167, df = 39, p-value = 1.281e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8138157 -0.4639469
## sample estimates:
##        cor
## -0.6752207
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      72.785       -2.349
```
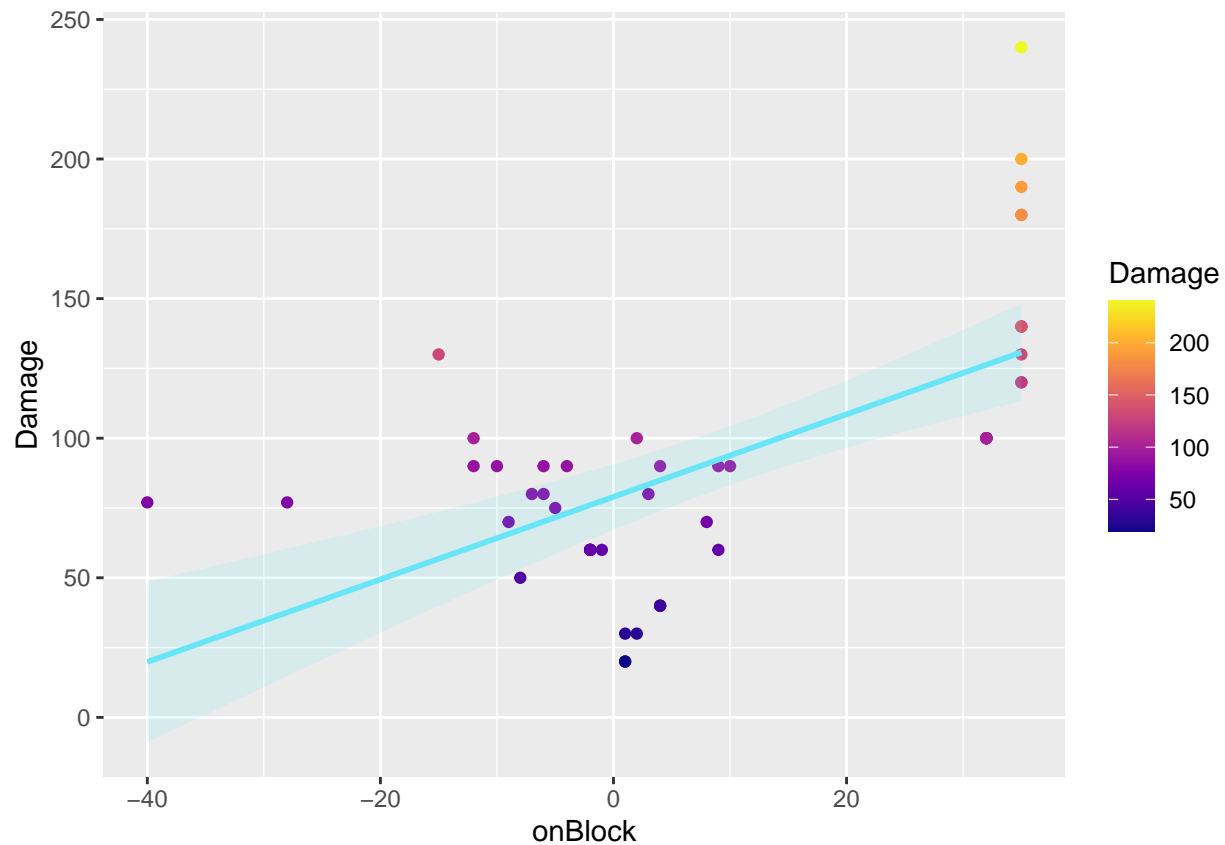
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -0.46718, df = 39, p-value = 0.643
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3736739  0.2385253
## sample estimates:
##         cor
## -0.07459948
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##    120.3498      -0.2211
```
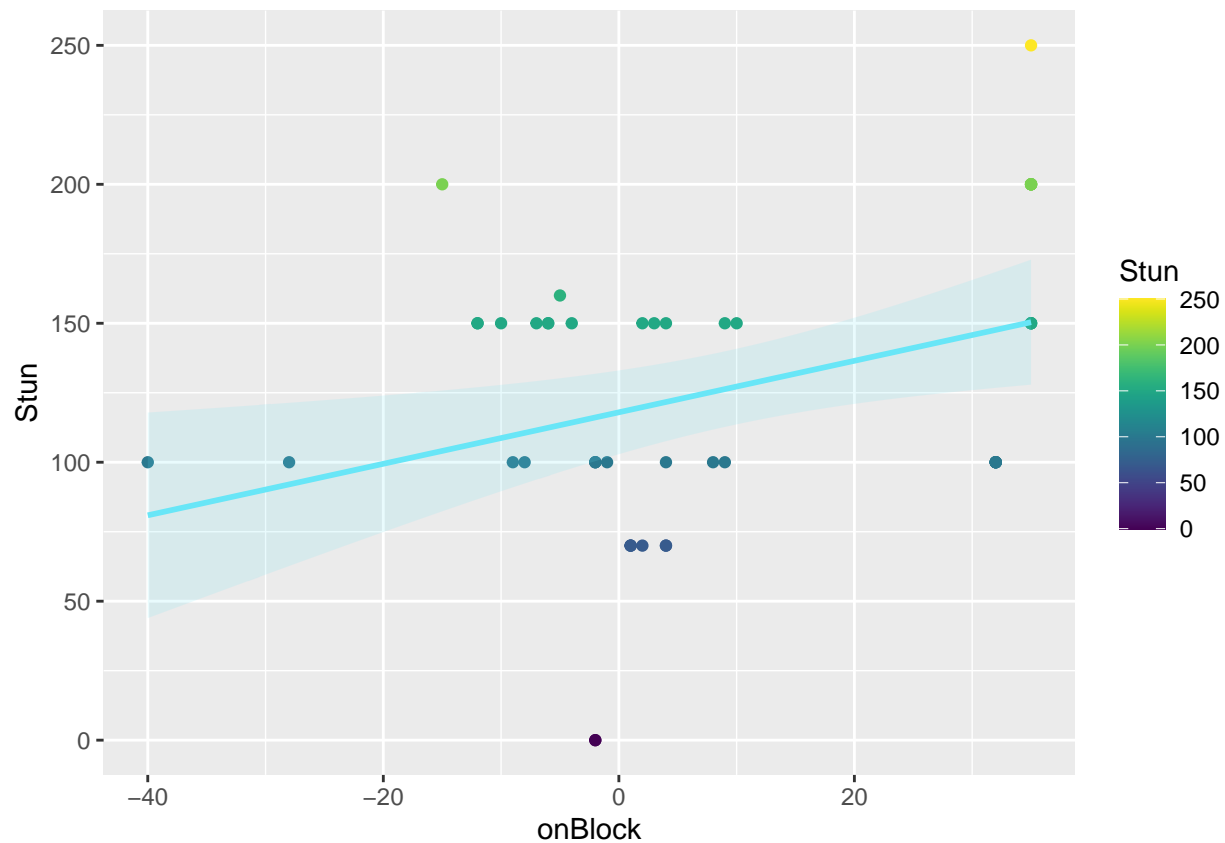
```
scatterplot(
  "data/characters/sakura.csv",
  "Sakura",
  "#ff83fa"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -4.2482, df = 39, p-value = 0.0001295
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7417532 -0.3081224
## sample estimates:
##        cor
## -0.5624554
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      67.735       -1.962
```
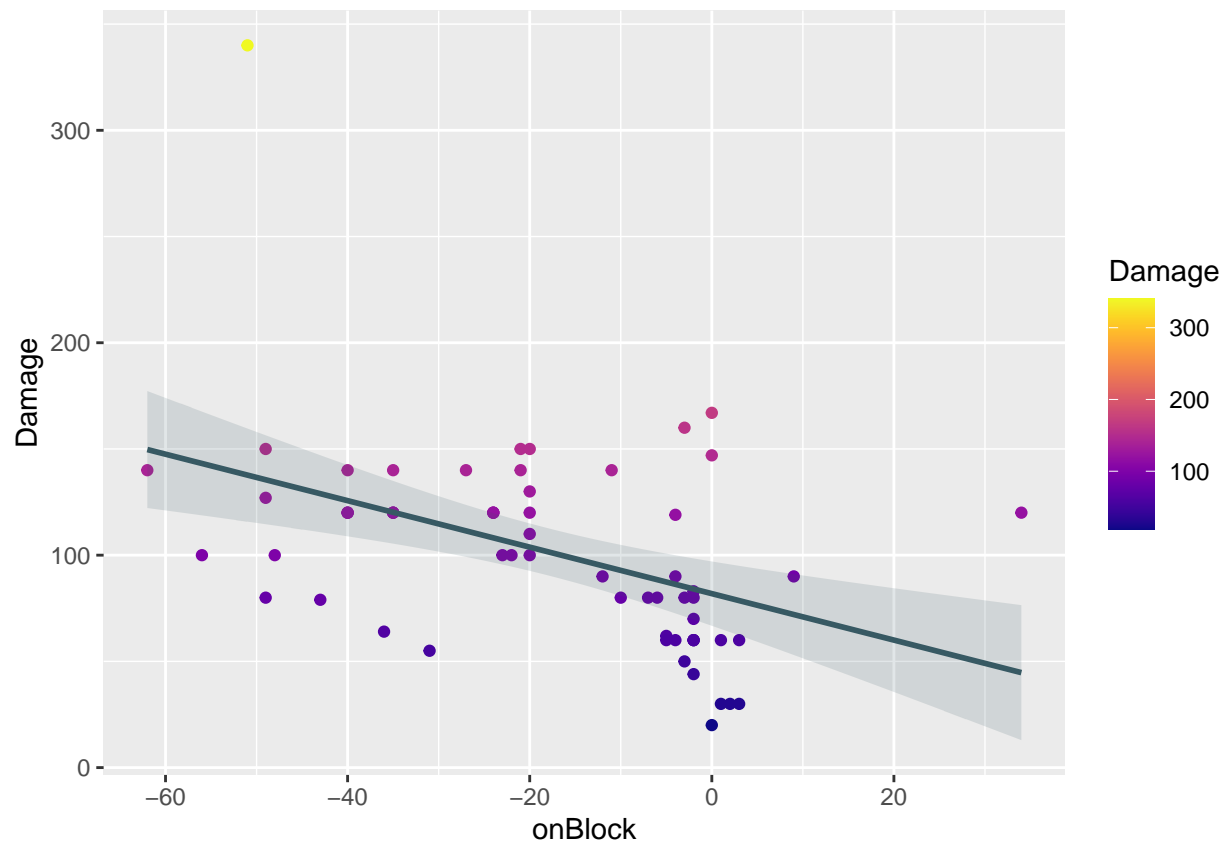
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -1.2515, df = 39, p-value = 0.2182
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4754089  0.1183041
## sample estimates:
##        cor
## -0.1964982
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    108.9301      -0.8177
```
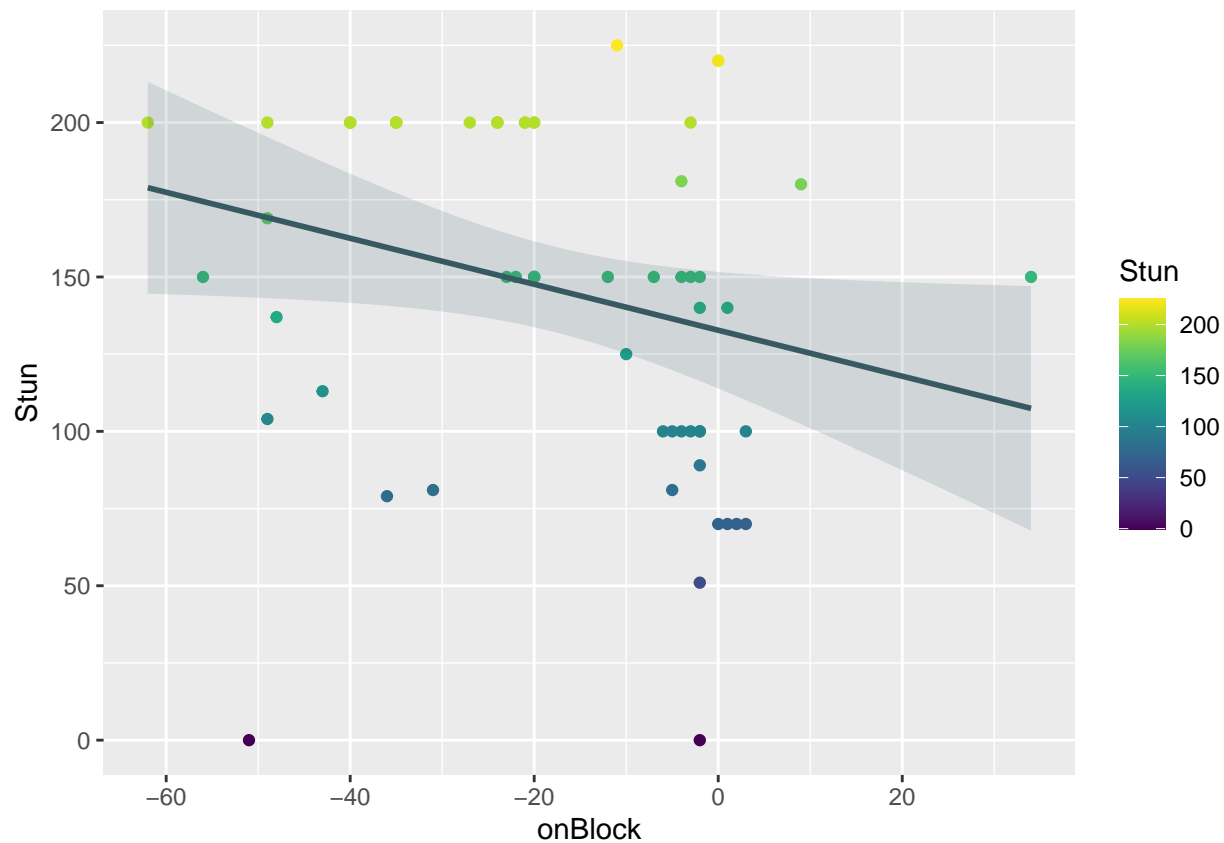
```
scatterplot(
  "data/characters/seth.csv",
  "Seth",
  "#6d7293"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -3.9727, df = 90, p-value = 0.000143
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.5477423 -0.1970280
## sample estimates:
##        cor
## -0.3862581
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      74.662       -1.545
```
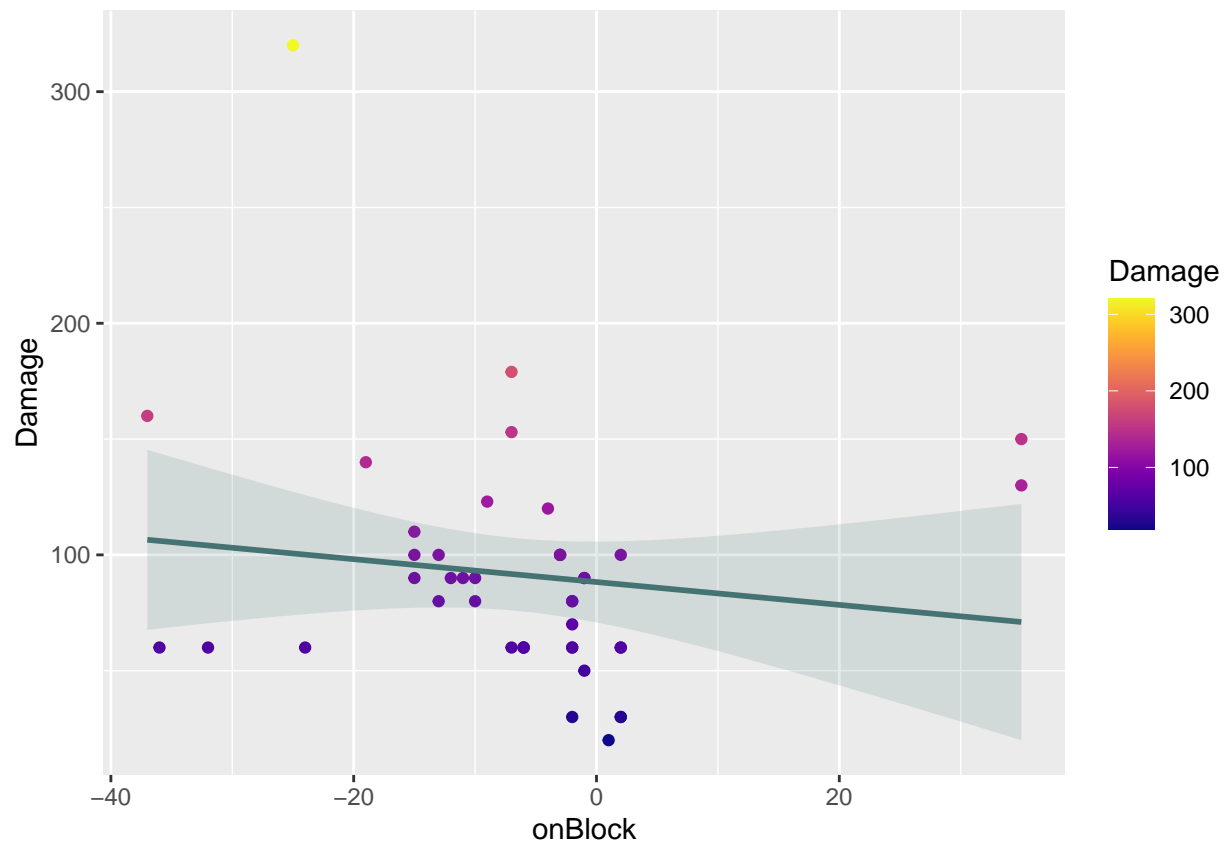
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -1.7178, df = 90, p-value = 0.08927
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.36950798  0.02765133
## sample estimates:
##        cor
## -0.1781752
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##    113.2510      -0.8269
```
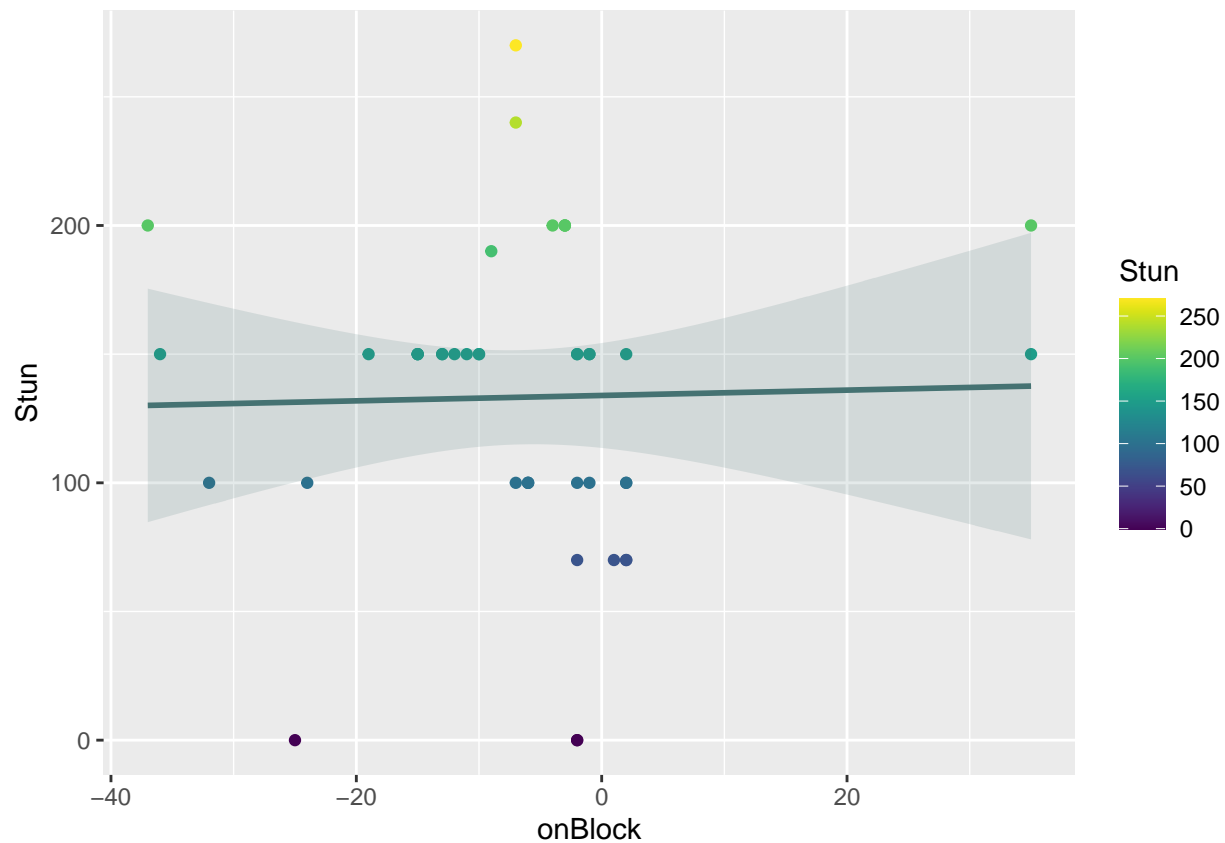
```
scatterplot(
  "data/characters/urien.csv",
  "Urien",
  "#714661"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -7.3151, df = 57, p-value = 9.493e-10
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8079619 -0.5351316
## sample estimates:
##        cor
## -0.6958554
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##       80.63        -3.22
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.1255, df = 57, p-value = 0.03789
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.49287132 -0.01602213
## sample estimates:
##        cor
## -0.2709925
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     114.414       -1.624
```
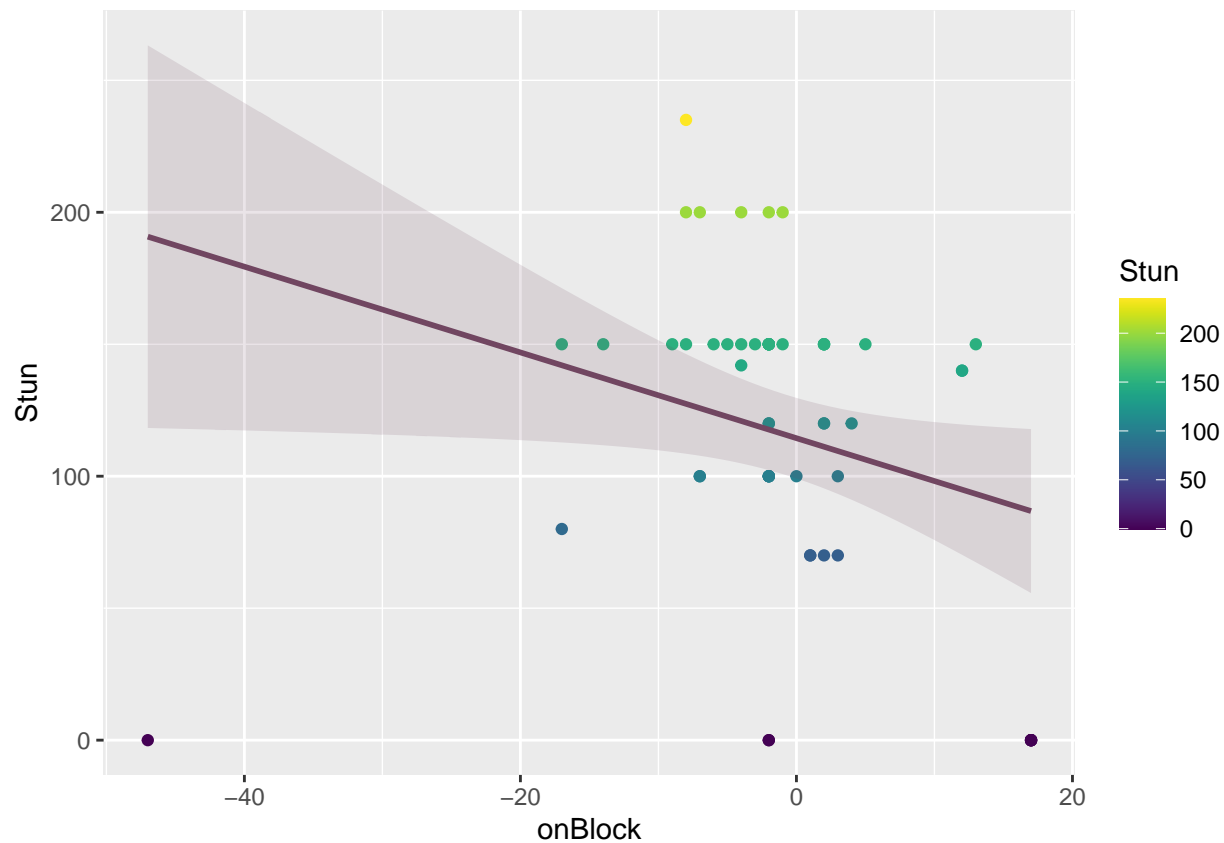
```
scatterplot(
  "data/characters/vega.csv",
  "Vega",
  "#ed5971"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -2.6583, df = 44, p-value = 0.01091
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.59774279 -0.09158693
## sample estimates:
##        cor
## -0.3719946
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      88.307       -2.191
```
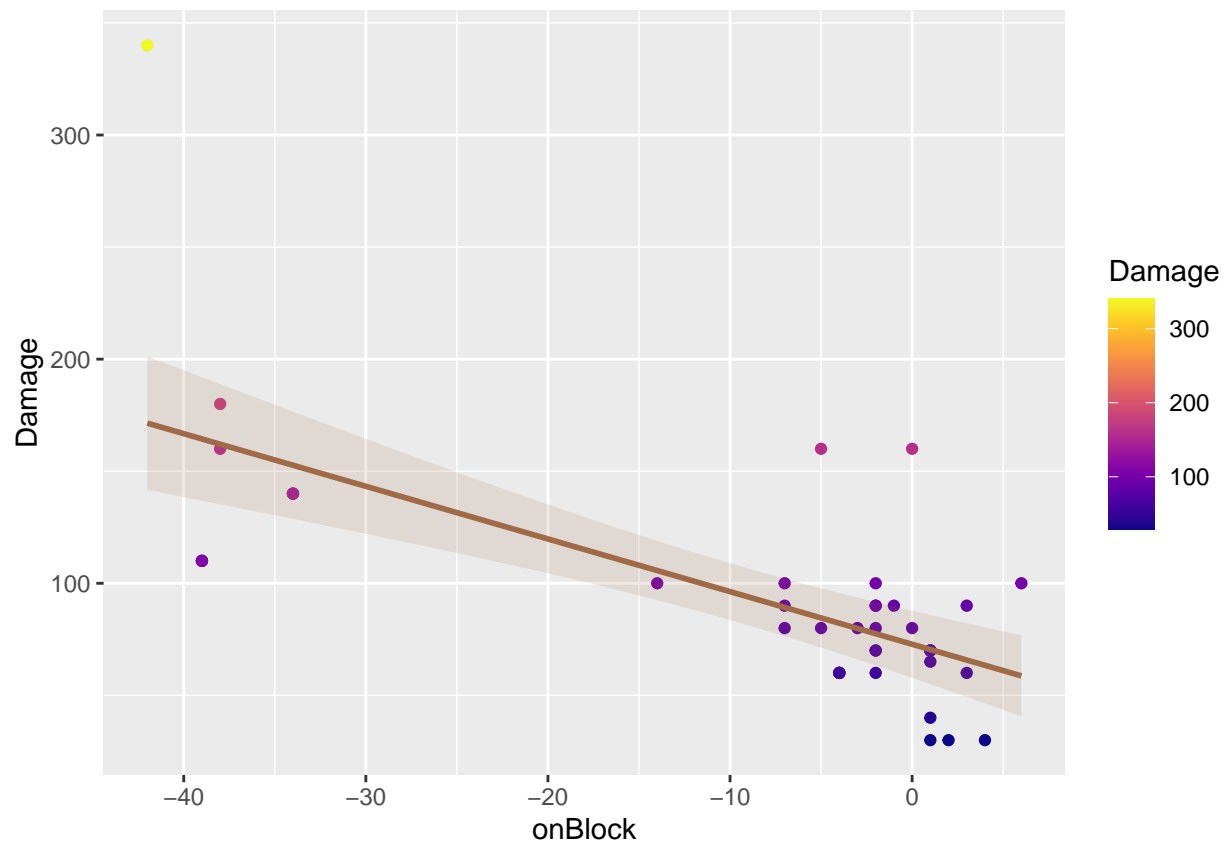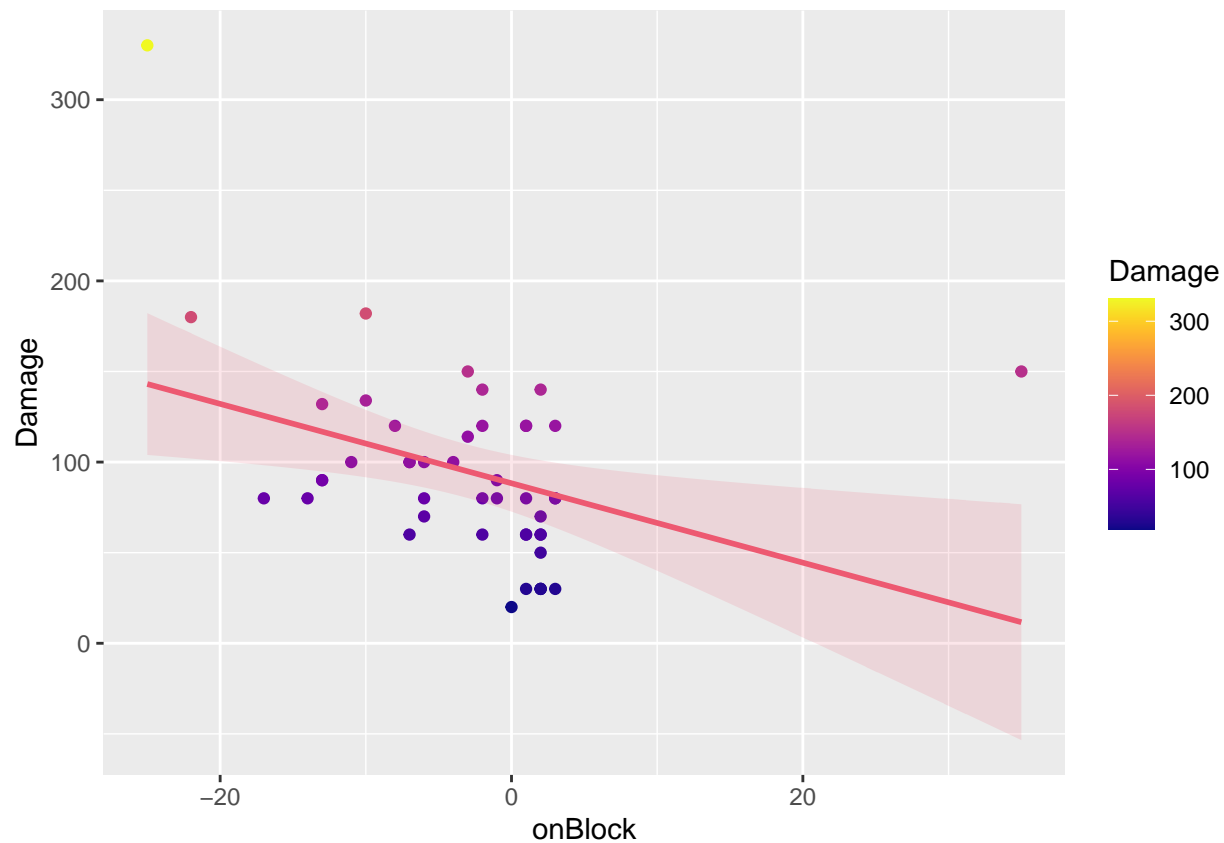
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = 0.041098, df = 44, p-value = 0.9674
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2846142  0.2959614
## sample estimates:
##         cor
## 0.006195707
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##   134.69163      0.03983
```
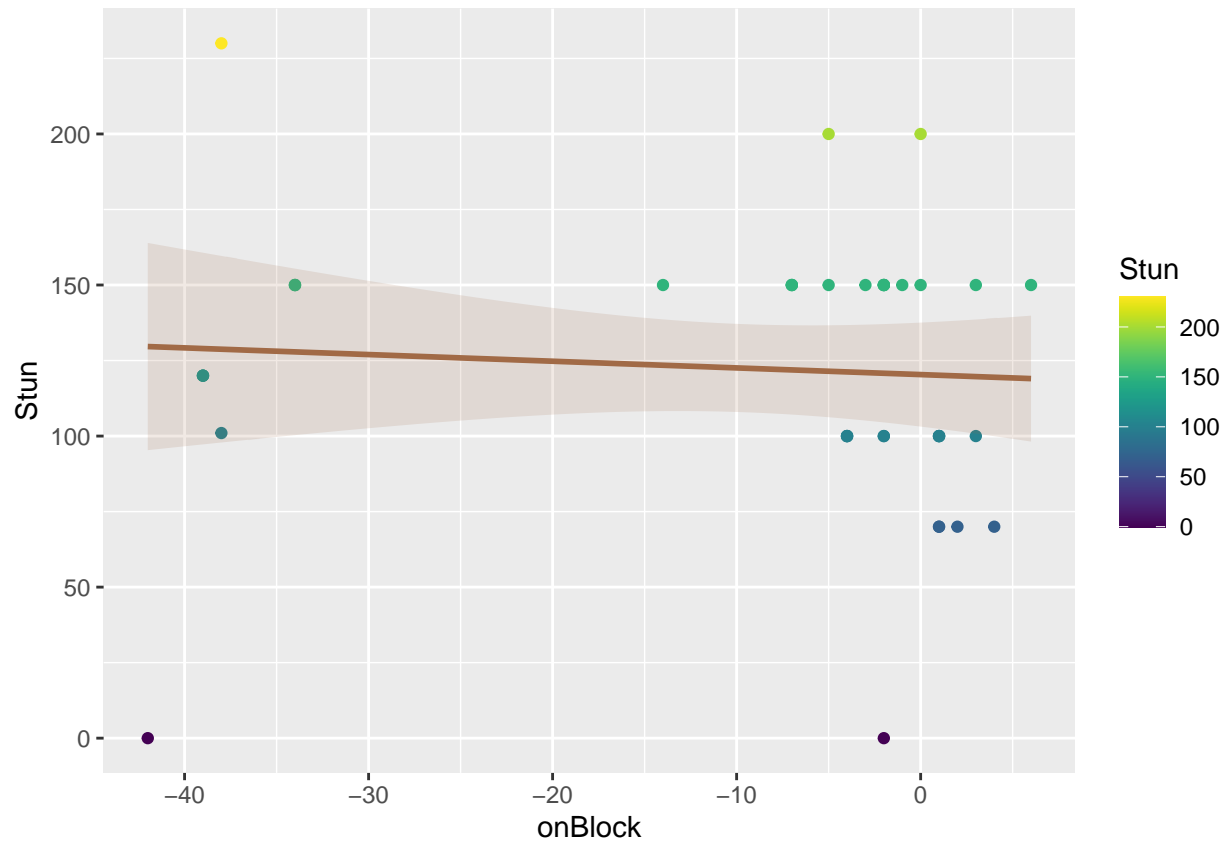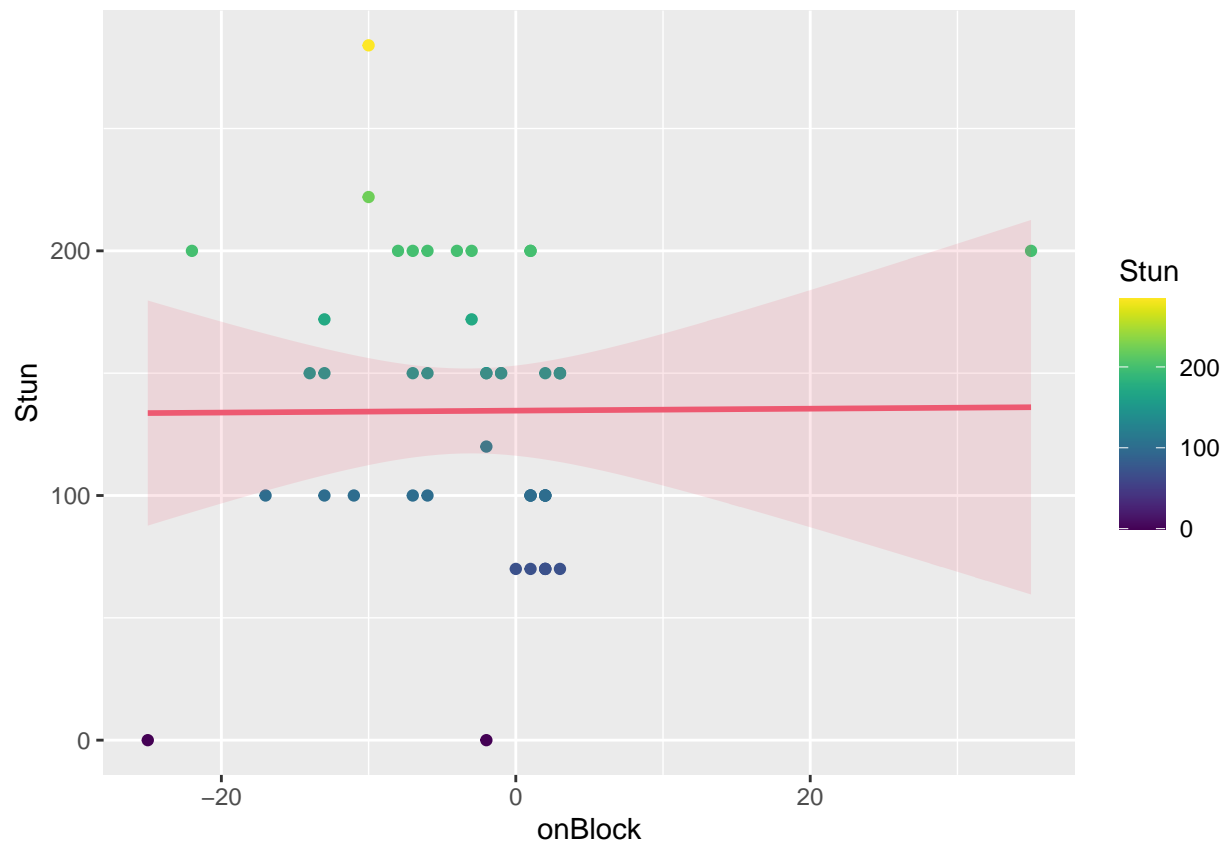
```
scatterplot(
  "data/characters/zangief.csv",
  "Zangief",
  "#e52a0e"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -0.36984, df = 22, p-value = 0.715
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4671881  0.3354272
## sample estimates:
##        cor
## -0.0786056
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     74.1040      -0.2501
```
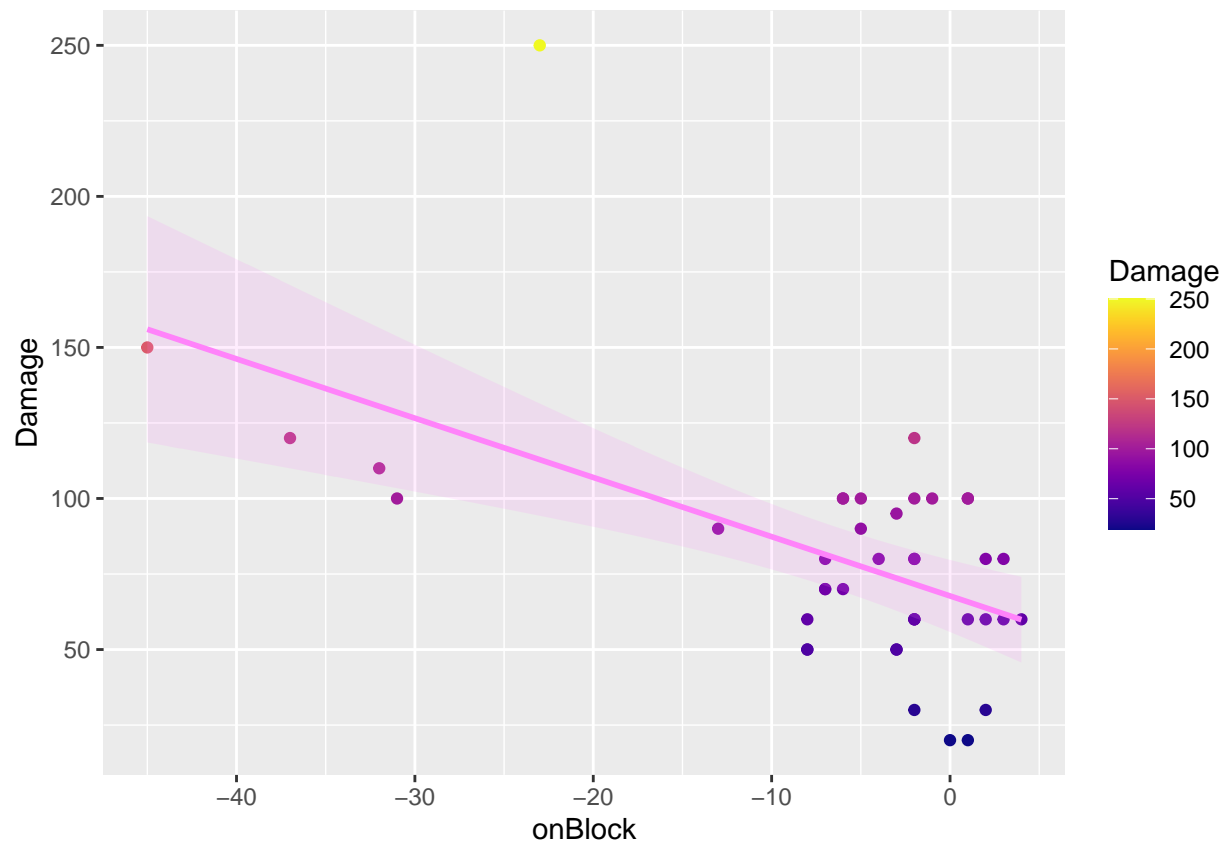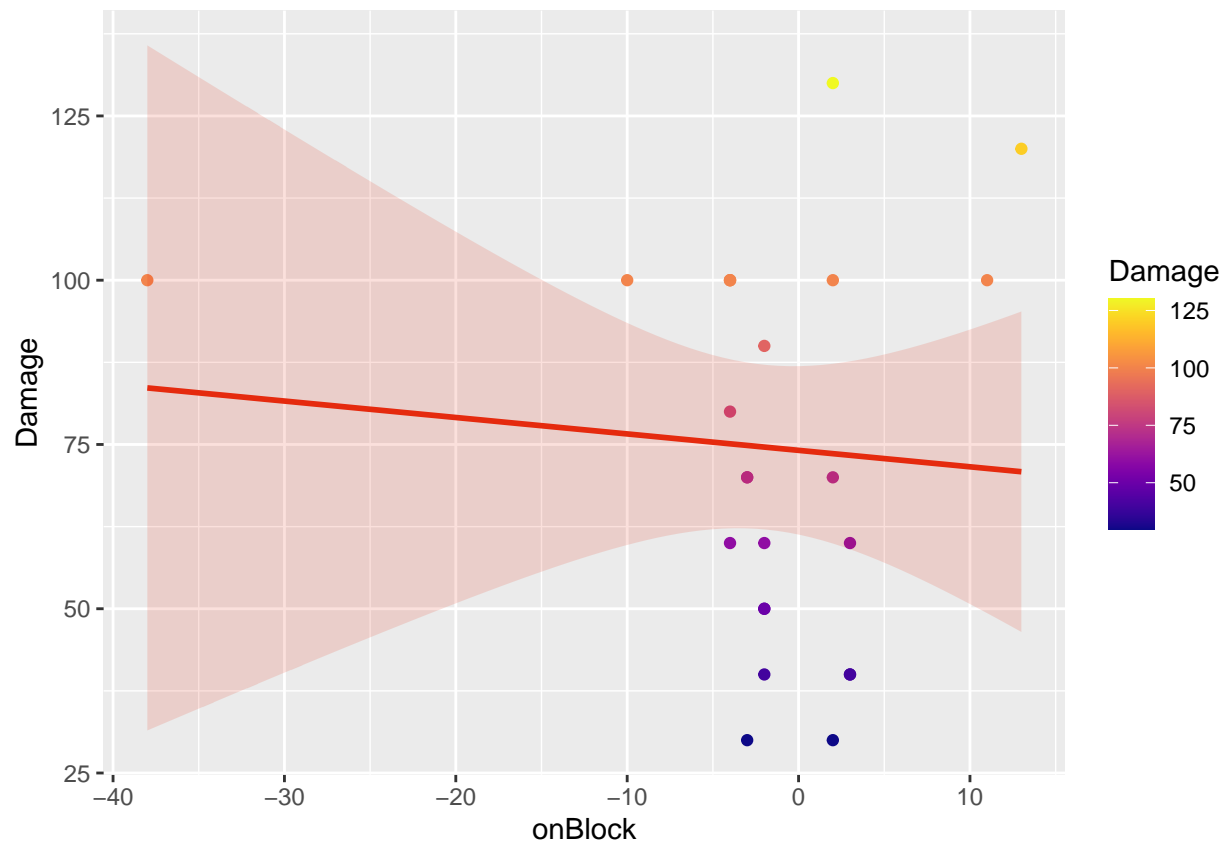
```
## 
##  Pearson's product-moment correlation
## 
## data:  df$onBlock and df$Stun
## t = -0.88107, df = 22, p-value = 0.3878
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.5472571  0.2363845
## sample estimates:
##        cor
## -0.1846167
## 
## 
## Call:
## lm(formula = Stun ~ onBlock, data = df)
## 
## Coefficients:
## (Intercept)      onBlock
##     112.423       -1.127
```
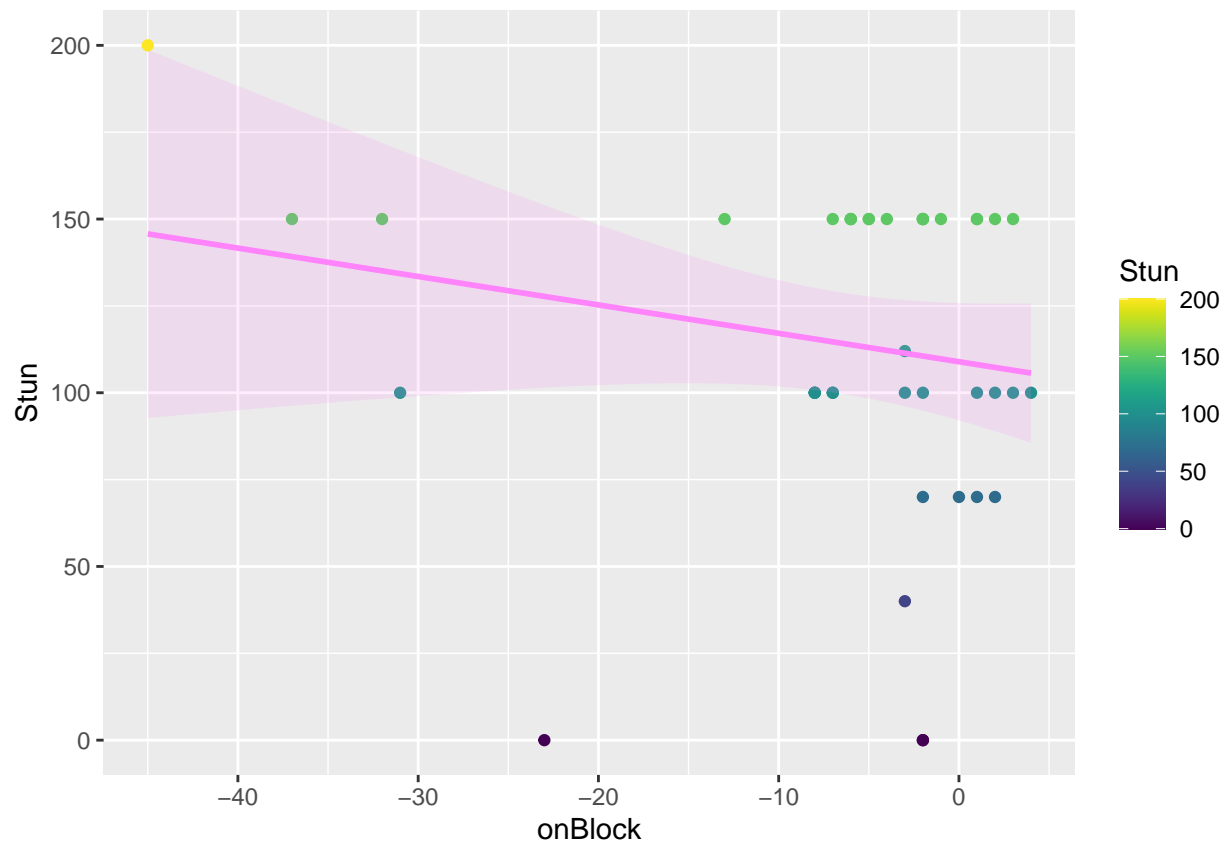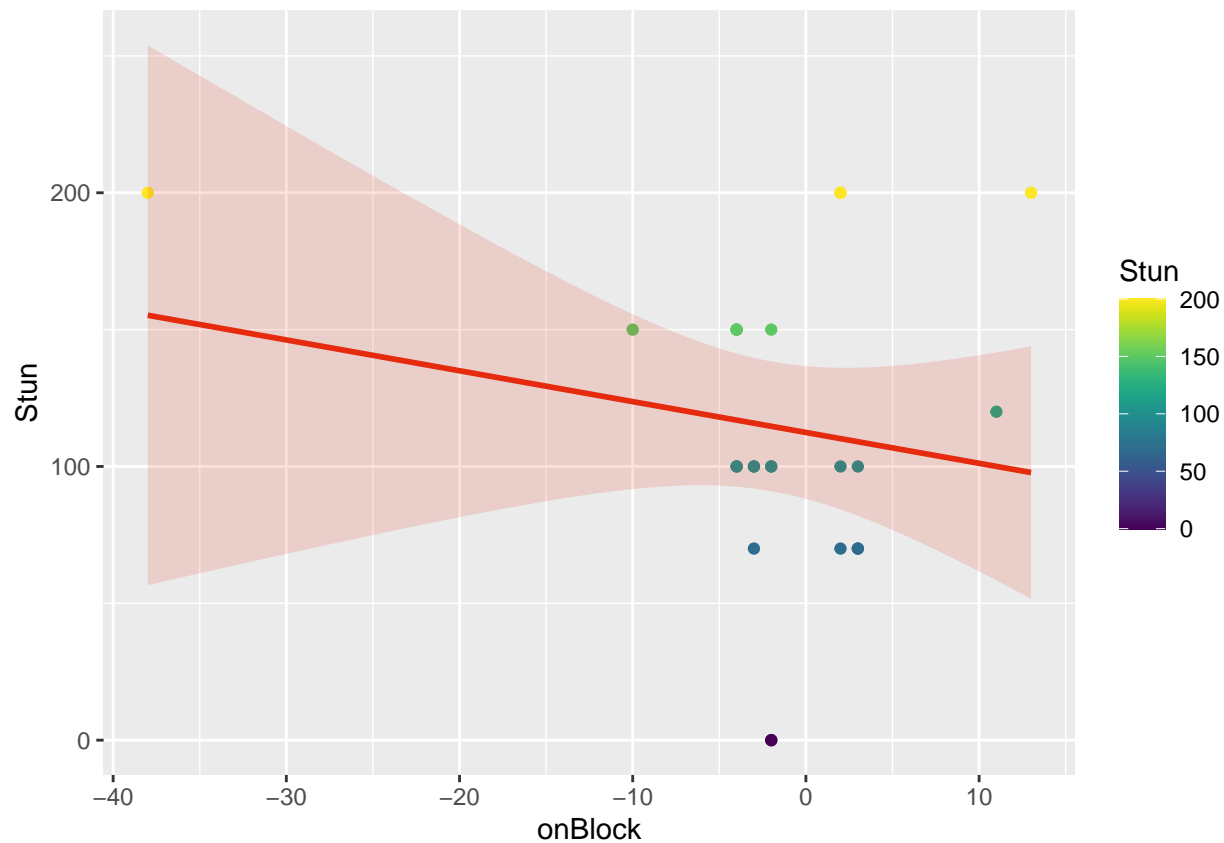
```
scatterplot(
  "data/characters/zeku_old.csv",
  "Zeku (Old)",
  "#545345"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -4.6191, df = 47, p-value = 3.01e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7259091 -0.3293178
## sample estimates:
##        cor
## -0.5587705
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      78.072       -2.185
```
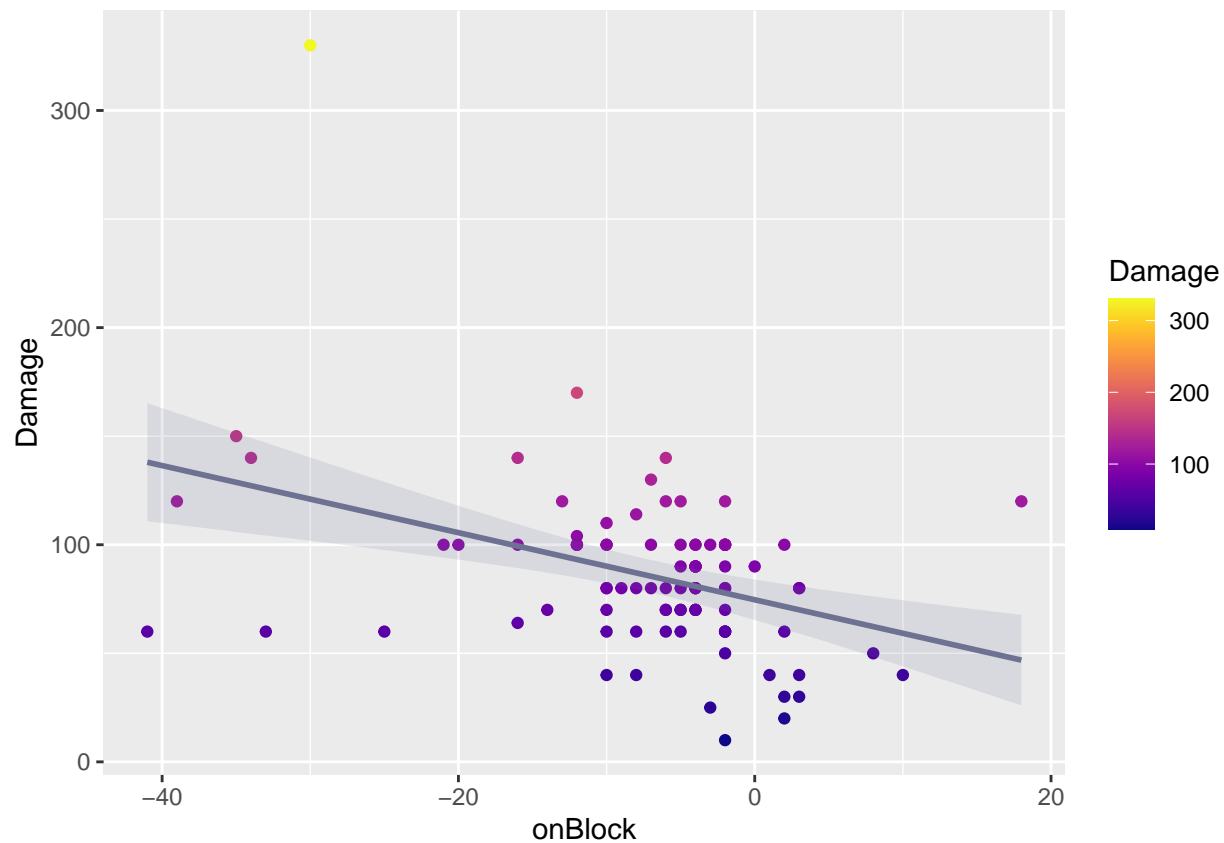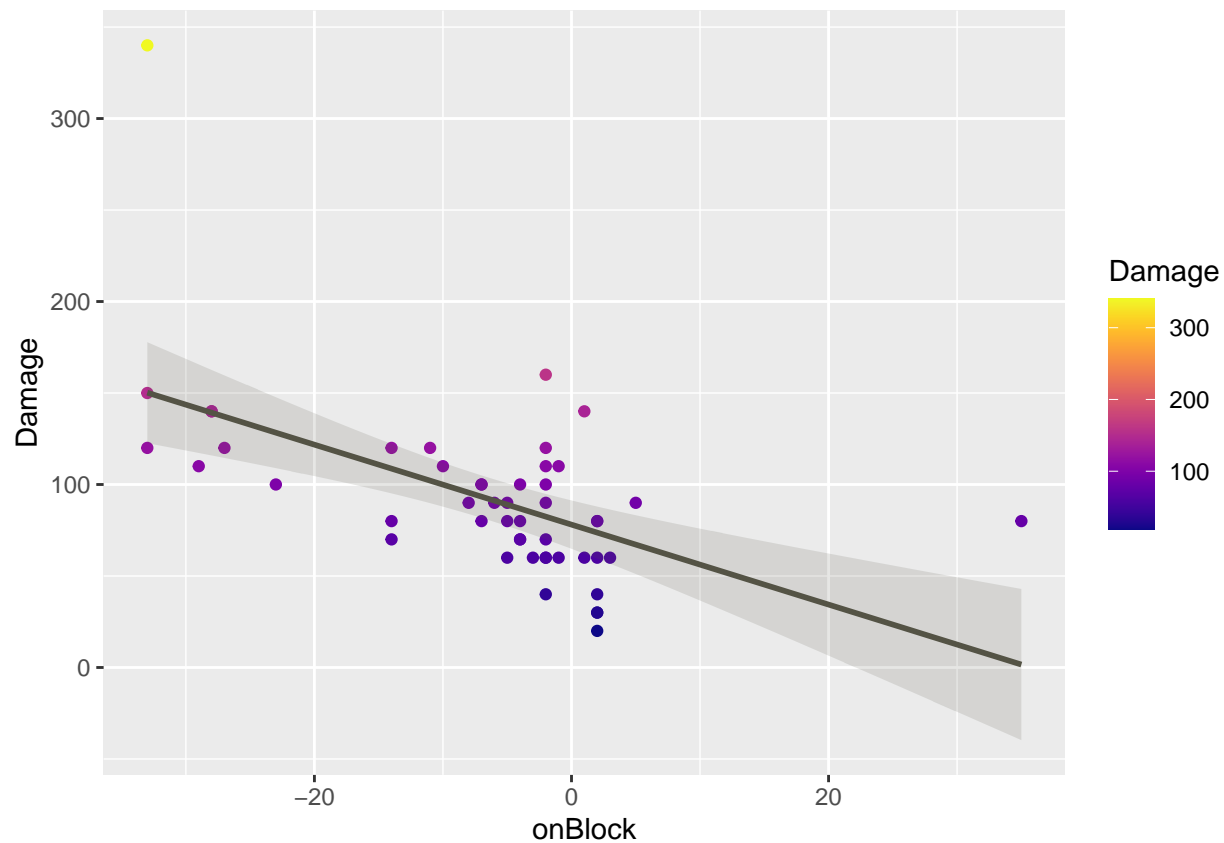
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -2.2532, df = 47, p-value = 0.02895
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.54553598 -0.03402865
## sample estimates:
##        cor
## -0.3122375
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##     114.147       -1.275
```
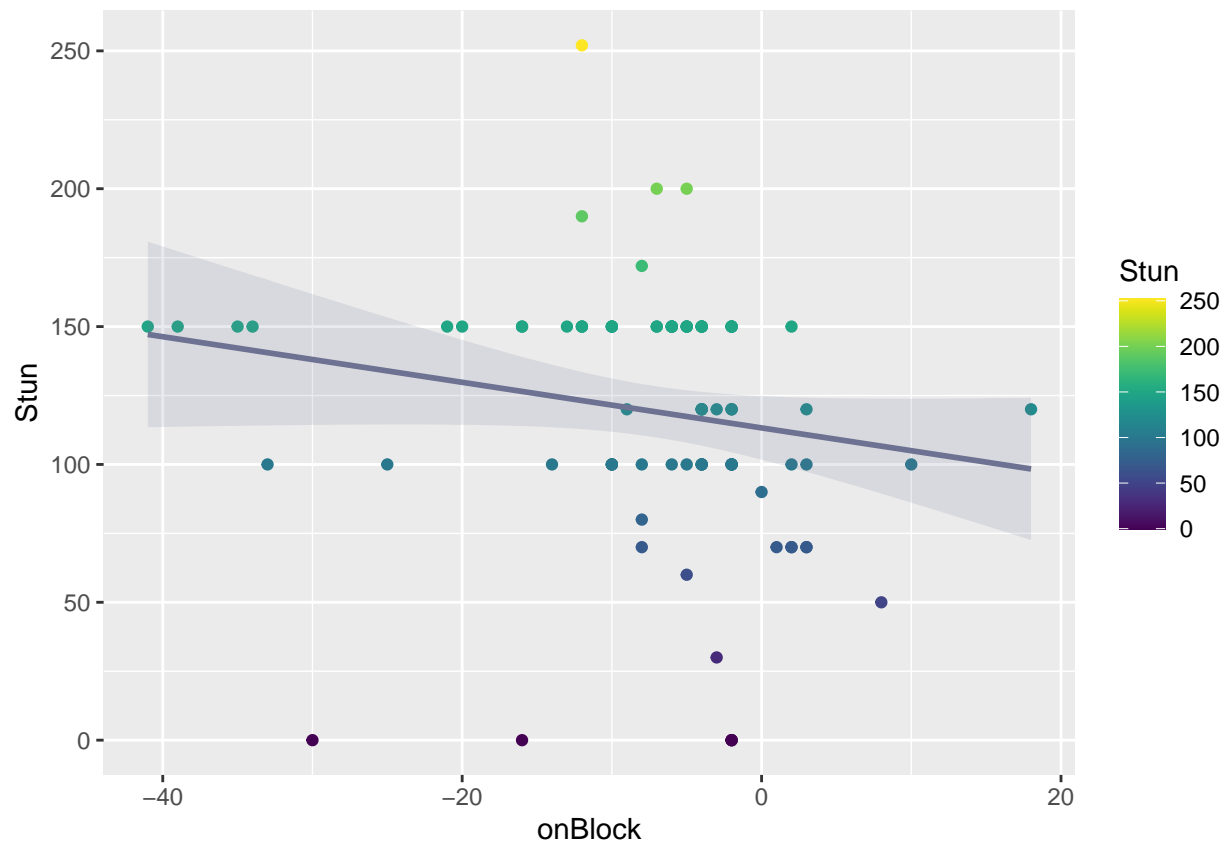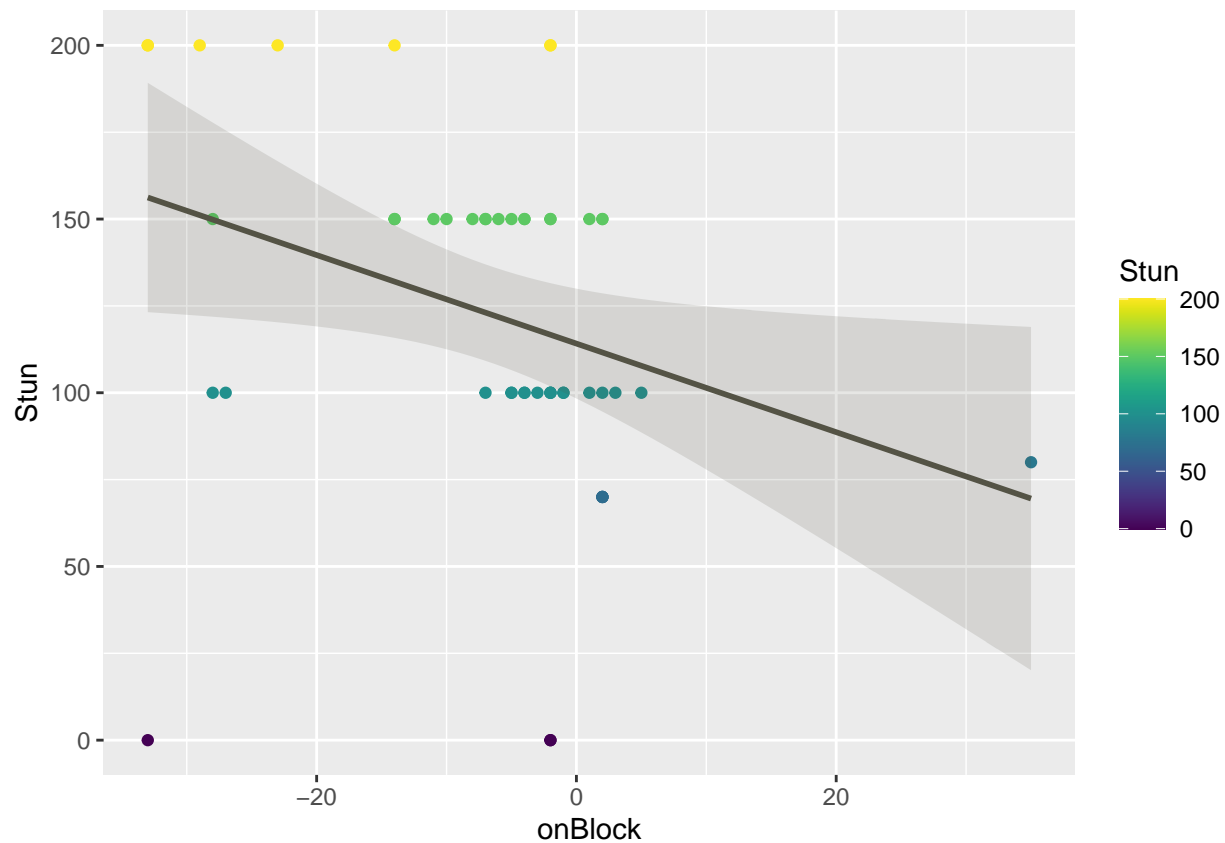
```
scatterplot(
  "data/characters/zeku_young.csv",
  "Zeku (Young)",
  "#351f0a"
)
```

```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Damage
## t = -5.6394, df = 38, p-value = 1.778e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8151086 -0.4602541
## sample estimates:
##        cor
## -0.6749881
##
##
## Call:
## lm(formula = Damage ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##      68.587       -3.994
```
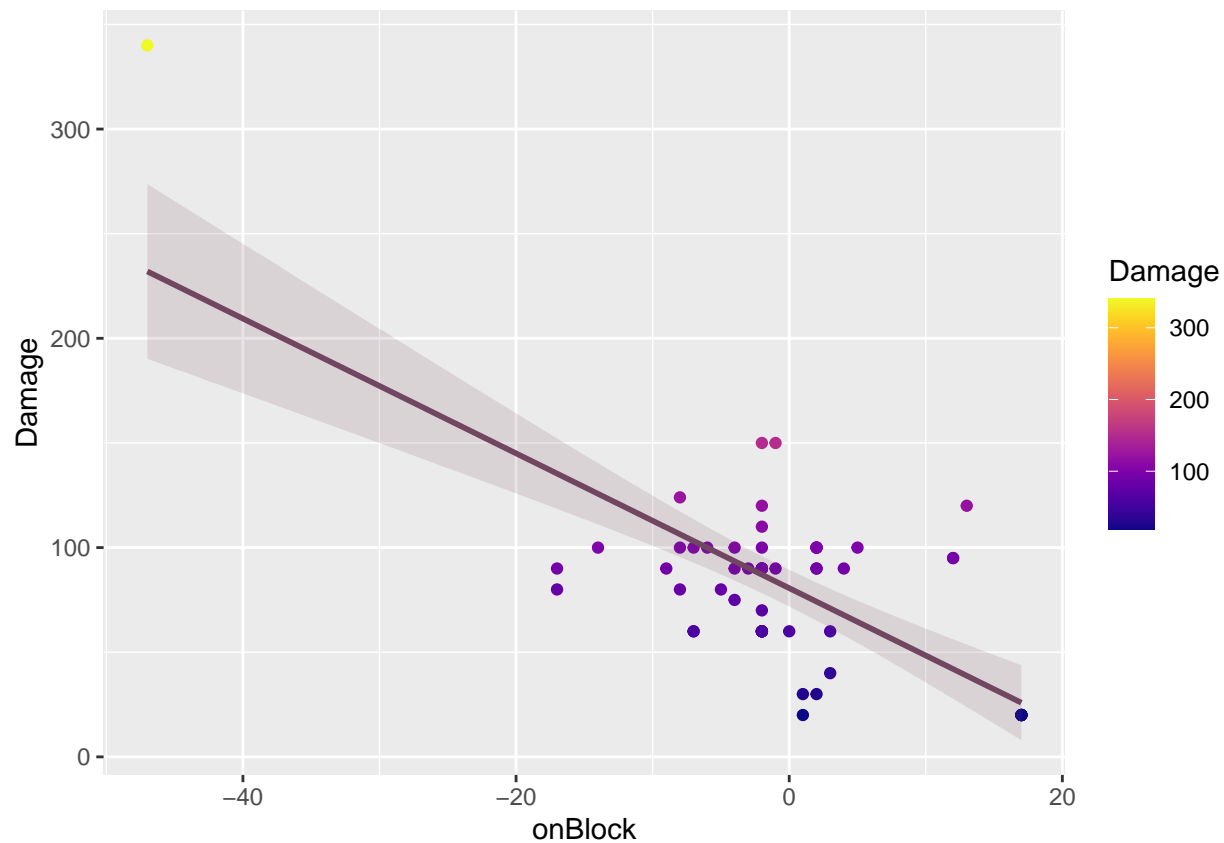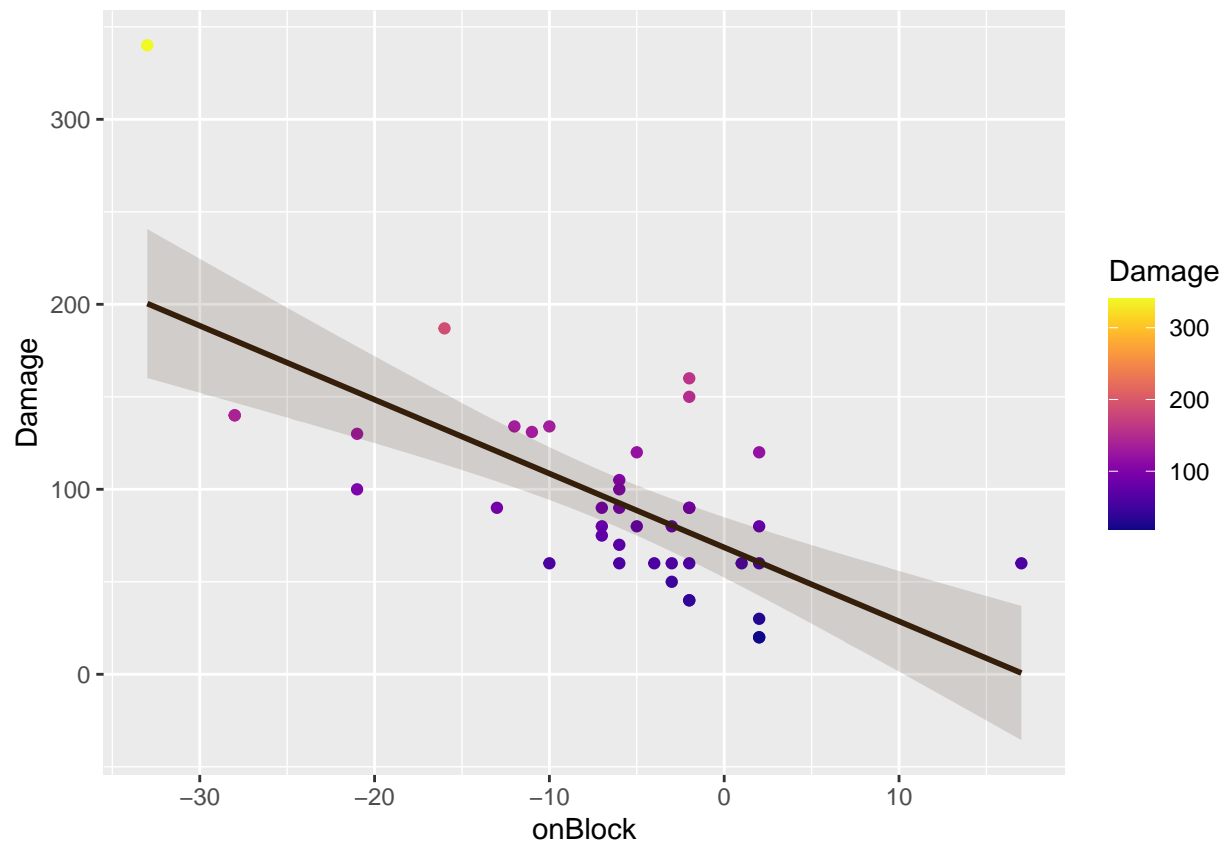
```
##
##  Pearson's product-moment correlation
##
## data:  df$onBlock and df$Stun
## t = -0.9065, df = 38, p-value = 0.3704
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4371846  0.1739018
## sample estimates:
##        cor
## -0.145489
##
##
## Call:
## lm(formula = Stun ~ onBlock, data = df)
##
## Coefficients:
## (Intercept)      onBlock
##    125.7539      -0.9879
```
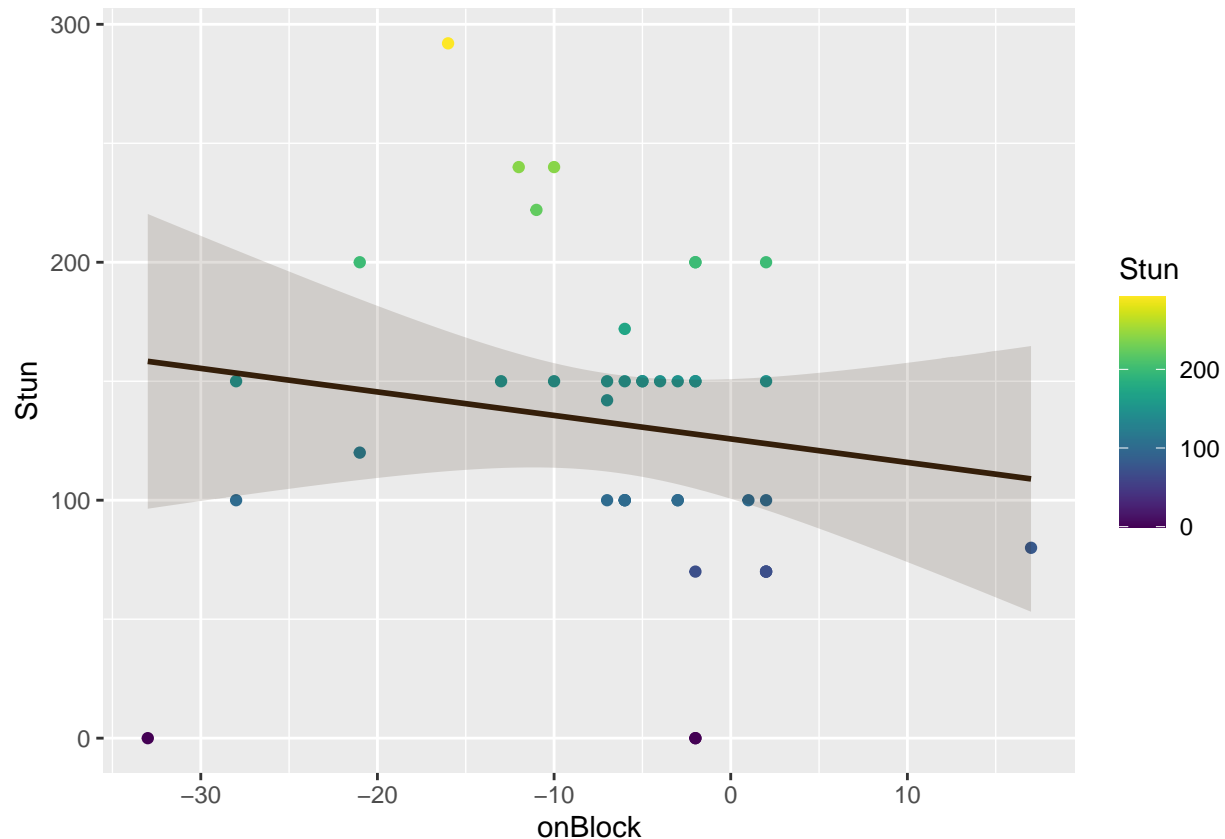
Module 3: Prediction (regression)

Which regression model will make more accurate predictions of damage+stun, and/or be a better fit: simple linear or elastic net?

```r
library(reticulate)
use_virtualenv("sfv_attacks", required = TRUE)
```

```r
py_config()
```

```
## python:         /Users/eren/bin/virtualenvs/sfv_attacks/bin/python
## libpython:      /usr/local/opt/python@3.11/Frameworks/Python.framework/Versions/3.11/lib/python3.11/
## pythonhome:     /Users/eren/bin/virtualenvs/sfv_attacks:/Users/eren/bin/virtualenvs/sfv_attacks
## virtualenv:     /Users/eren/bin/virtualenvs/sfv_attacks/bin/activate_this.py
## version:        3.11.3 (main, Apr  7 2023, 19:29:16) [Clang 14.0.0 (clang-1400.0.29.202)]
## numpy:          /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/numpy
## numpy_version:  1.24.3
##
## NOTE: Python version was forced by use_python function
```

Python version

```python
import regression

columns, data, train, test, kf = regression.data_splits("all.csv", "d", True, True)
```

```
cols = columns[2:]
regression.plot_parameters(train[0], train[1], cols)
```

```
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinate
##   model = cd_fast.enet_coordinate_descent(
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinate
##   model = cd_fast.enet_coordinate_descent(
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinate
##   model = cd_fast.enet_coordinate_descent(
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinate
##   model = cd_fast.enet_coordinate_descent(
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinate
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```

```
l_optimal, a_optimal = regression.cross_validation(train[0], train[1], kf, cols)
```

```
## /Users/eren/bin/virtualenvs/sfv_attacks/lib/python3.11/site-packages/sklearn/linear_model/_coordinat
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##   model = cd_fast.enet_coordinate_descent(
```
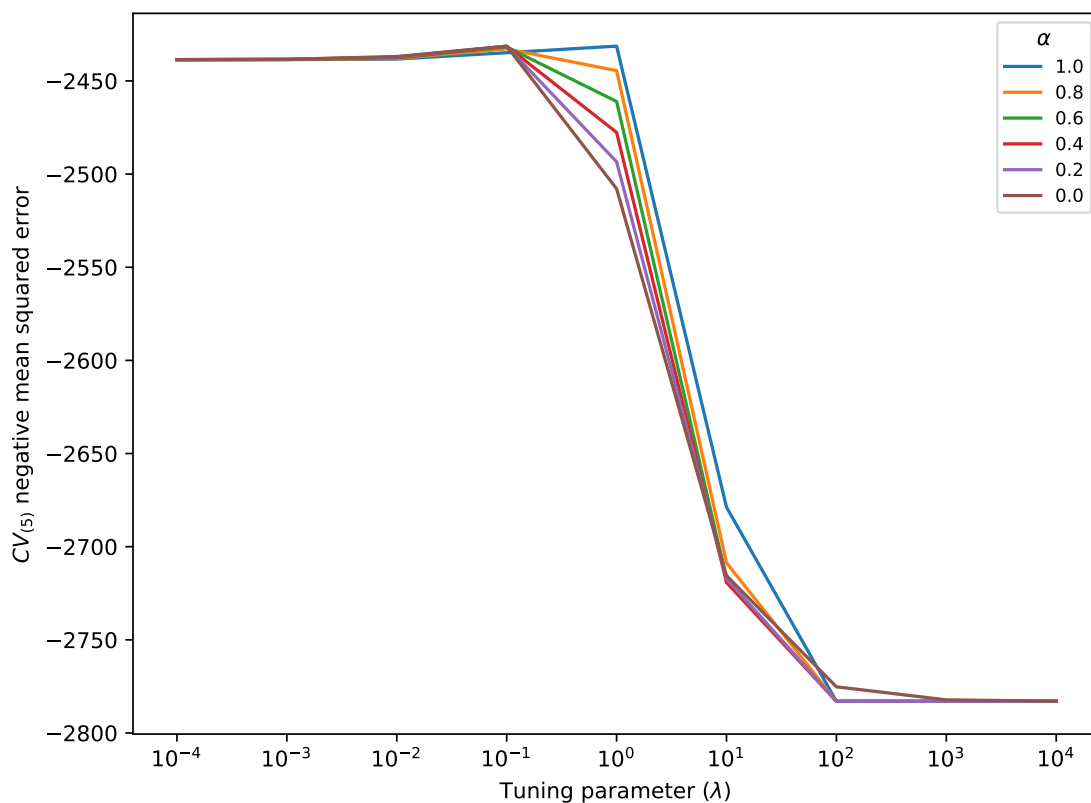


```
print(l_optimal, a_optimal)
# --- Playing around with simple LR ---
```

```
## 1.0 1.0
```

```
lm_cv = regression.simple_lr(train[0][:, 0], train[1], kf, True)  # standardized
slope = regression.simple_lr(train[0][:, 0], train[1])
print(lm_cv, slope)
```

```
## -2640.9784169874124 (0.2251171182893305, -12.833022891125966)
```

```
lm_cv = regression.simple_lr(data[:, 2], data[:, 18], kf, True)
slope = regression.simple_lr(data[:, 2], data[:, 18])  # same data, but notstandardized
print(lm_cv, slope)
```

```
## -2533.44464264142 (83.83296587103683, -0.9870400323632516)
```

```
scores, tables = regression.testing(train, test, data[:, 18].mean(), l_optimal, a_optimal)
print(scores)
```

```
## [[8.24566739e-02 2.14440398e+03]
##  [1.49761972e-01 1.98710378e+03]]
```

```
print(tables.shape)
```

```
## (2, 362, 4)
```

Exact same thing, but with R

```
regression <- import("regression")
np <- import("numpy")
plt <- import("matplotlib.pyplot")

v <- regression$data_splits("all.csv", "d", TRUE, TRUE)
v[[3]][[2]] <- np$array(as.numeric(v[[3]][[2]]))
v[[4]][[2]] <- np$array(as.numeric(v[[4]][[2]]))
train_X <- np$array(v[[3]][[1]])
train_y <- v[[3]][[2]]
cols <- np$array(v[[1]][3:19])
regression$plot_parameters(train_X, train_y, cols)
t <- regression$cross_validation(train_X, train_y, v[[5]], cols)
print(c(t[[1]], t[[2]]))
```

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

```
# --- Playing around with simple LR ---
train_x <- np$array(train_X[, 1])
lm_cv <- regression$simple_lr(train_x, train_y, v[[5]], TRUE)
slope <- regression$simple_lr(train_x, train_y)
print(c(lm_cv, slope))
```

```
## [[1]]
## [1] -2640.978
##
## [[2]]
## [1] 0.2251171
##
## [[3]]
## [1] -12.83302
```

```
og_x <- np$array(v[[2]][, 3])
og_y <- np$array(v[[2]][, 19])
lm_cv <- regression$simple_lr(og_x, og_y, v[[5]], TRUE)
slope <- regression$simple_lr(og_x, og_y)
print(c(lm_cv, slope))
```

```
## [[1]]
## [1] -2533.445
```

```
##
## [[2]]
## [1] 83.83297
##
## [[3]]
## [1] -0.98704
```

```r
results <- regression$testing(v[[3]], v[[4]], mean(og_y), t[[1]], t[[2]])
print(results[[1]])
```

```
##                [,1]       [,2]
## [1,] 0.08245667 2144.404
## [2,] 0.14976197 1987.104
```

```r
print(dim(results[[2]]))
```

```
## [1]   2 362   4
```