

```
library(readr)
library(tidyverse)
```

```
## Warning: package 'forcats' was built under R version 4.3.2
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.3      v purrr      1.0.2
## v forcats    1.0.0      v stringr   1.5.0
## v ggplot2    3.4.3      v tibble    3.2.1
## v lubridate  1.9.2      v tidyr     1.3.0
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(factoextra)
```

```
## Warning: package 'factoextra' was built under R version 4.3.2
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
library(forcats)
```

```
possum_raw <- read_csv("possum.csv")
```

```
## Rows: 104 Columns: 14
## -- Column specification -----
## Delimiter: ","
## chr (2): Pop, sex
## dbl (12): case, site, age, hdlngth, skullw, totlngth, taill, footlngth, earco...
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
#View(possum_raw)
```

```
possum <- data.frame(possum_raw, row.names = 1)
possum$site = as.factor(possum$site)
possum$Pop = as.factor(possum$Pop)
possum$sex = as.factor(possum$sex)
#View(possum)
summary(possum)
```

```
##   site      Pop    sex      age      hdlngth      skullw
## 1:33 other:58 f:43  Min.   :1.000  Min.   : 82.50  Min.   :50.00
## 2:13 Vic   :46 m:61  1st Qu.:2.250  1st Qu.: 90.67  1st Qu.:54.98
## 3: 7                Median :3.000  Median : 92.80  Median :56.35
## 4: 7                Mean   :3.833  Mean   : 92.60  Mean   :56.88
## 5:13                3rd Qu.:5.000  3rd Qu.: 94.72  3rd Qu.:58.10
```

```
## 6:13 Max. :9.000 Max. :103.10 Max. :68.60
## 7:18 NA's :2
## totlngth taill footlngth earconch
## Min. :75.00 Min. :32.00 Min. :60.30 Min. :40.30
## 1st Qu.:84.00 1st Qu.:35.88 1st Qu.:64.60 1st Qu.:44.80
## Median :88.00 Median :37.00 Median :68.00 Median :46.80
## Mean :87.09 Mean :37.01 Mean :68.46 Mean :48.13
## 3rd Qu.:90.00 3rd Qu.:38.00 3rd Qu.:72.50 3rd Qu.:52.00
## Max. :96.50 Max. :43.00 Max. :77.90 Max. :56.20
## NA's :1
## eye chest belly
## Min. :12.80 Min. :22.0 Min. :25.00
## 1st Qu.:14.40 1st Qu.:25.5 1st Qu.:31.00
## Median :14.90 Median :27.0 Median :32.50
## Mean :15.05 Mean :27.0 Mean :32.59
## 3rd Qu.:15.72 3rd Qu.:28.0 3rd Qu.:34.12
## Max. :17.80 Max. :32.0 Max. :40.00
##
```

```
possum_clean = na.omit(possum)
str(possum_clean)
```

```
## 'data.frame': 101 obs. of 13 variables:
## $ site : Factor w/ 7 levels "1","2","3","4",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ Pop : Factor w/ 2 levels "other","Vic": 2 2 2 2 2 2 2 2 2 2 ...
## $ sex : Factor w/ 2 levels "f","m": 2 1 1 1 1 1 2 1 1 1 ...
## $ age : num 8 6 6 6 2 1 2 6 9 6 ...
## $ hdlngth : num 94.1 92.5 94 93.2 91.5 93.1 95.3 94.8 93.4 91.8 ...
## $ skullw : num 60.4 57.6 60 57.1 56.3 54.8 58.2 57.6 56.3 58 ...
## $ totlngth: num 89 91.5 95.5 92 85.5 90.5 89.5 91 91.5 89.5 ...
## $ taill : num 36 36.5 39 38 36 35.5 36 37 37 37.5 ...
## $ footlngth: num 74.5 72.5 75.4 76.1 71 73.2 71.5 72.7 72.4 70.9 ...
## $ earconch: num 54.5 51.2 51.9 52.2 53.2 53.6 52 53.9 52.9 53.4 ...
## $ eye : num 15.2 16 15.5 15.2 15.1 14.2 14.2 14.5 15.5 14.4 ...
## $ chest : num 28 28.5 30 28 28.5 30 30 29 28 27.5 ...
## $ belly : num 36 33 34 34 33 32 34.5 34 33 32 ...
## - attr(*, "na.action")= 'omit' Named int [1:3] 41 44 46
## ..- attr(*, "names")= chr [1:3] "41" "44" "46"
```

```
summary(possum_clean)
```

```
## site Pop sex age hdlngth skullw
## 1:33 other:58 f:42 Min. :1.000 Min. : 82.50 Min. :50.00
## 2:10 Vic :43 m:59 1st Qu.:2.000 1st Qu.: 90.70 1st Qu.:55.00
## 3: 7 Median :3.000 Median : 92.90 Median :56.40
## 4: 7 Mean :3.822 Mean : 92.73 Mean :56.96
## 5:13 3rd Qu.:5.000 3rd Qu.: 94.80 3rd Qu.:58.10
## 6:13 Max. :9.000 Max. :103.10 Max. :68.60
## 7:18
## totlngth taill footlngth earconch eye
## Min. :75.00 Min. :32.00 Min. :60.3 Min. :41.30 Min. :12.80
## 1st Qu.:84.50 1st Qu.:36.00 1st Qu.:64.5 1st Qu.:44.80 1st Qu.:14.40
## Median :88.00 Median :37.00 Median :67.9 Median :46.80 Median :14.90
```

```
## Mean :87.27 Mean :37.05 Mean :68.4 Mean :48.13 Mean :15.05
## 3rd Qu.:90.00 3rd Qu.:38.00 3rd Qu.:72.5 3rd Qu.:52.00 3rd Qu.:15.70
## Max. :96.50 Max. :43.00 Max. :77.9 Max. :56.20 Max. :17.80
##
## chest belly
## Min. :22.00 Min. :25.00
## 1st Qu.:25.50 1st Qu.:31.00
## Median :27.00 Median :32.50
## Mean :27.06 Mean :32.64
## 3rd Qu.:28.00 3rd Qu.:34.00
## Max. :32.00 Max. :40.00
##
```

```
V_Possum <- possum_clean[possum_clean$Pop == "Vic", ]
O_Possum <- possum_clean[possum_clean$Pop == "other", ]
str(V_Possum)
```

```
## 'data.frame': 43 obs. of 13 variables:
## $ site : Factor w/ 7 levels "1","2","3","4",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ Pop : Factor w/ 2 levels "other","Vic": 2 2 2 2 2 2 2 2 2 2 ...
## $ sex : Factor w/ 2 levels "f","m": 2 1 1 1 1 1 2 1 1 1 ...
## $ age : num 8 6 6 6 2 1 2 6 9 6 ...
## $ hdlngth : num 94.1 92.5 94 93.2 91.5 93.1 95.3 94.8 93.4 91.8 ...
## $ skullw : num 60.4 57.6 60 57.1 56.3 54.8 58.2 57.6 56.3 58 ...
## $ totlngth: num 89 91.5 95.5 92 85.5 90.5 89.5 91 91.5 89.5 ...
## $ taill : num 36 36.5 39 38 36 35.5 36 37 37 37.5 ...
## $ footlngth: num 74.5 72.5 75.4 76.1 71 73.2 71.5 72.7 72.4 70.9 ...
## $ earconch: num 54.5 51.2 51.9 52.2 53.2 53.6 52 53.9 52.9 53.4 ...
## $ eye : num 15.2 16 15.5 15.2 15.1 14.2 14.2 14.5 15.5 14.4 ...
## $ chest : num 28 28.5 30 28 28.5 30 30 29 28 27.5 ...
## $ belly : num 36 33 34 34 33 32 34.5 34 33 32 ...
## - attr(*, "na.action")= 'omit' Named int [1:3] 41 44 46
## ..- attr(*, "names")= chr [1:3] "41" "44" "46"
```

```
str(O_Possum)
```

```
## 'data.frame': 58 obs. of 13 variables:
## $ site : Factor w/ 7 levels "1","2","3","4",...: 3 3 3 3 3 3 3 4 4 4 ...
## $ Pop : Factor w/ 2 levels "other","Vic": 1 1 1 1 1 1 1 1 1 1 ...
## $ sex : Factor w/ 2 levels "f","m": 2 2 2 1 1 2 1 2 2 2 ...
## $ age : num 2 5 4 5 5 6 3 7 2 3 ...
## $ hdlngth : num 90.1 98.6 95.4 91.6 95.6 ...
## $ skullw : num 54.8 63.2 59.2 56.4 59.6 61 58.1 63 63.2 61.5 ...
## $ totlngth: num 89 85 85 88 85 93.5 91 91.5 92.5 93.7 ...
## $ taill : num 37.5 34 37 38 36 40 38 43 38 38 ...
## $ footlngth: num 66 66.9 69 65 64 67.9 67.4 71.3 72.5 68.7 ...
## $ earconch: num 45.5 44.9 45 47.2 43.9 44.3 46 46 44.9 46.8 ...
## $ eye : num 15 17 15.9 14.9 17.4 15.8 16.5 17.5 16.4 16.4 ...
## $ chest : num 25 28 29.5 28 28 28.5 26 30 30.5 27.5 ...
## $ belly : num 33 35 35.5 36 38.5 32.5 33.5 36.5 36 31.5 ...
## - attr(*, "na.action")= 'omit' Named int [1:3] 41 44 46
## ..- attr(*, "names")= chr [1:3] "41" "44" "46"
```

```
#summary(V_Possum)
#summary(O_Possum)
V_Possum_Numeric = subset(V_Possum, select = -c(Pop, sex, site))
O_Possum_Numeric = subset(O_Possum, select = -c(Pop, sex, site))
str(V_Possum)
```

```
## 'data.frame': 43 obs. of 13 variables:
## $ site : Factor w/ 7 levels "1","2","3","4",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ Pop : Factor w/ 2 levels "other","Vic": 2 2 2 2 2 2 2 2 2 2 ...
## $ sex : Factor w/ 2 levels "f","m": 2 1 1 1 1 1 2 1 1 1 ...
## $ age : num 8 6 6 6 2 1 2 6 9 6 ...
## $ hdlngth : num 94.1 92.5 94 93.2 91.5 93.1 95.3 94.8 93.4 91.8 ...
## $ skullw : num 60.4 57.6 60 57.1 56.3 54.8 58.2 57.6 56.3 58 ...
## $ totlngth: num 89 91.5 95.5 92 85.5 90.5 89.5 91 91.5 89.5 ...
## $ taill : num 36 36.5 39 38 36 35.5 36 37 37 37.5 ...
## $ footlngth: num 74.5 72.5 75.4 76.1 71 73.2 71.5 72.7 72.4 70.9 ...
## $ earconch: num 54.5 51.2 51.9 52.2 53.2 53.6 52 53.9 52.9 53.4 ...
## $ eye : num 15.2 16 15.5 15.2 15.1 14.2 14.2 14.5 15.5 14.4 ...
## $ chest : num 28 28.5 30 28 28.5 30 30 29 28 27.5 ...
## $ belly : num 36 33 34 34 33 32 34.5 34 33 32 ...
## - attr(*, "na.action")= 'omit' Named int [1:3] 41 44 46
## ..- attr(*, "names")= chr [1:3] "41" "44" "46"
```

```
#str(O_Possum)
#summary(V_Possum)
#summary(O_Possum)
```

```
#Vic possum PCA
V_Possum.pca <- prcomp(V_Possum_Numeric, center = TRUE, scale. = TRUE)
summary(V_Possum.pca)
```

```
## Importance of components:
##          PC1      PC2      PC3      PC4      PC5      PC6      PC7
## Standard deviation 2.1553 1.0496 0.97735 0.90228 0.84059 0.73422 0.67372
## Proportion of Variance 0.4645 0.1102 0.09552 0.08141 0.07066 0.05391 0.04539
## Cumulative Proportion 0.4645 0.5747 0.67022 0.75163 0.82229 0.87620 0.92159
##          PC8      PC9     PC10
## Standard deviation 0.6565 0.50935 0.30605
## Proportion of Variance 0.0431 0.02594 0.00937
## Cumulative Proportion 0.9647 0.99063 1.00000
```

```
PCNames = c("age", "hdlngth", "skullw", "totlngth", "taill", "footlngth", "earconch", "eye", "chest", "belly")
```

```
gradient_colors = c("#00AFBB", "#E7B800", "#FC4E07")
```

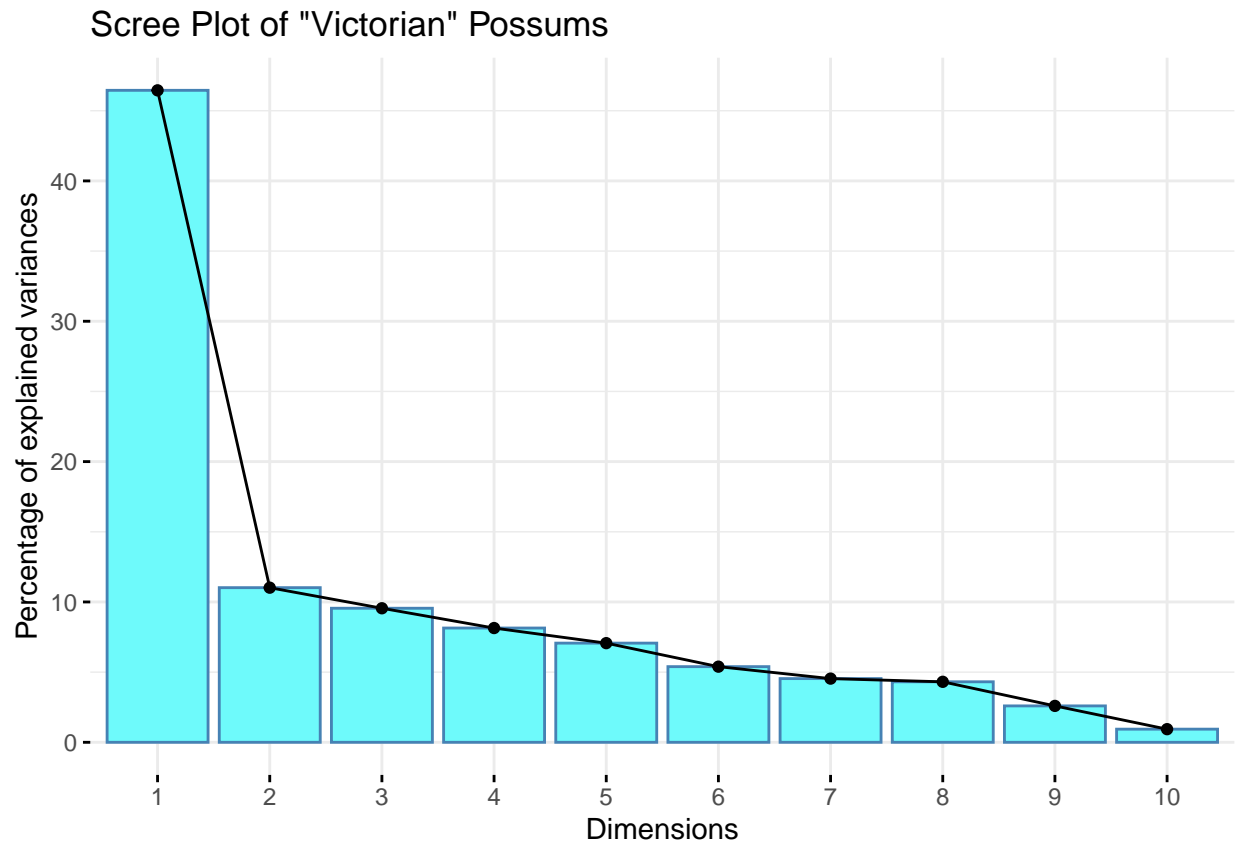
```
V_PC1 = V_Possum.pca$rotation[1:10]
V_PC1_DF = tibble(PCNames, V_PC1)
str(V_PC1_DF)
```

```
## tibble [10 x 2] (S3: tbl_df/tbl/data.frame)
## $ PCNames: chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ V_PC1 : num [1:10] -0.23 -0.412 -0.304 -0.396 -0.34 ...
```

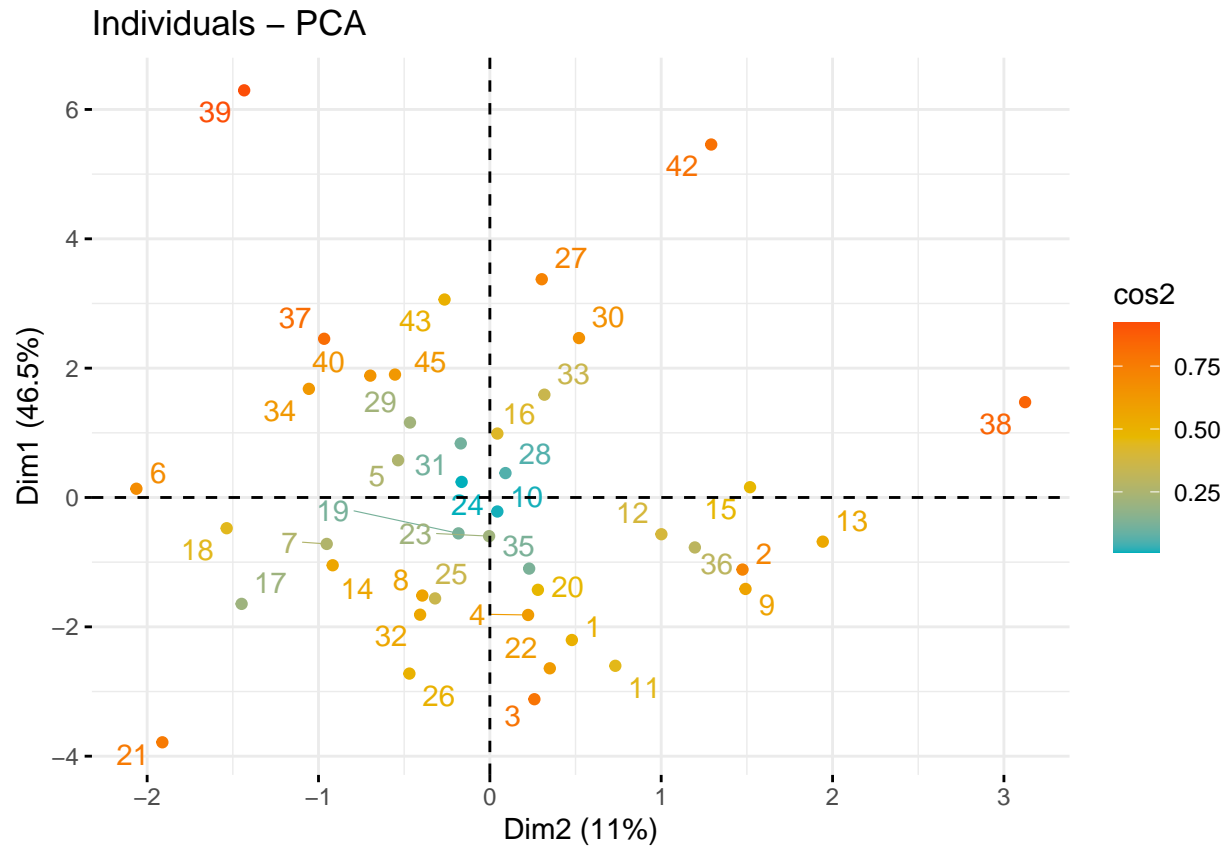
```
V_PC2 = V_Possum.pca$rotation[11:20]
V_PC2_DF = tibble(PCNames, V_PC2)
str(V_PC2_DF)
```

```
## tibble [10 x 2] (S3: tbl_df/tbl/data.frame)
## $ PCNames: chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ V_PC2 : num [1:10] 0.60249 0.00429 0.02207 -0.11005 -0.08697 ...
```

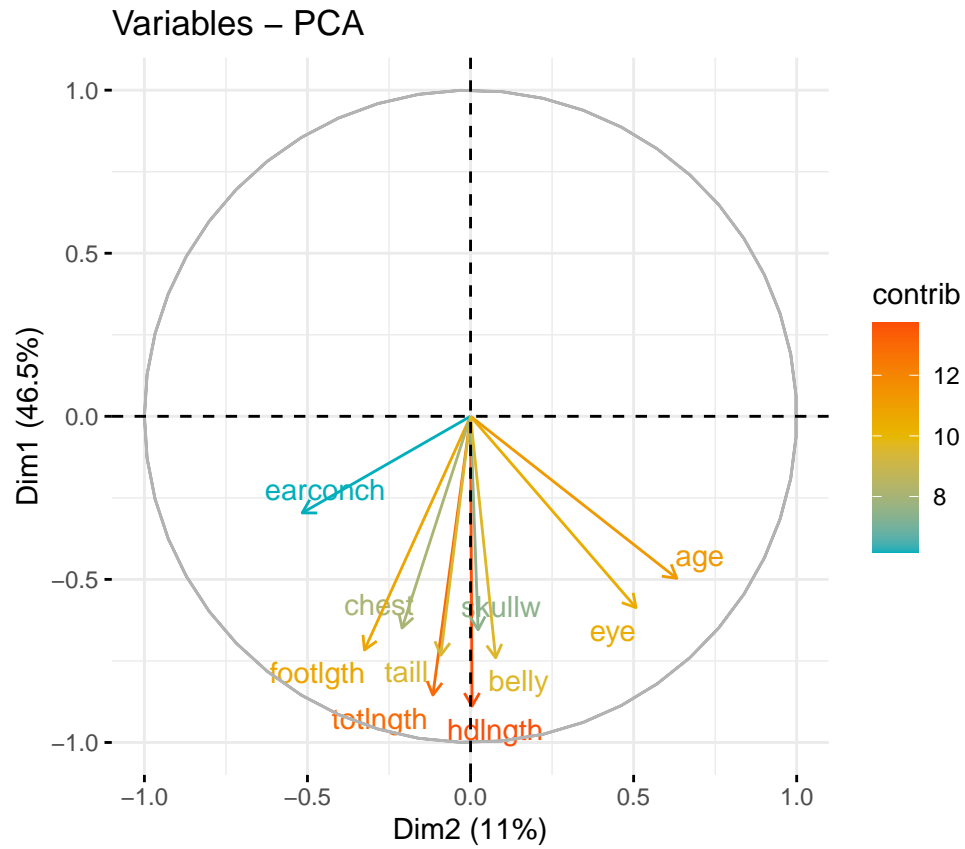
```
fviz_eig(V_Possum.pca, main = 'Scree Plot of "Victorian" Possums', barfill = "#6efafb")
```



```
fviz_pca_ind(V_Possum.pca,
  axes = c(2,1),
  col.ind = "cos2", # Color by the quality of representation
  gradient.cols = gradient_colors,
  repel = TRUE      # Avoid text overlapping
)
```

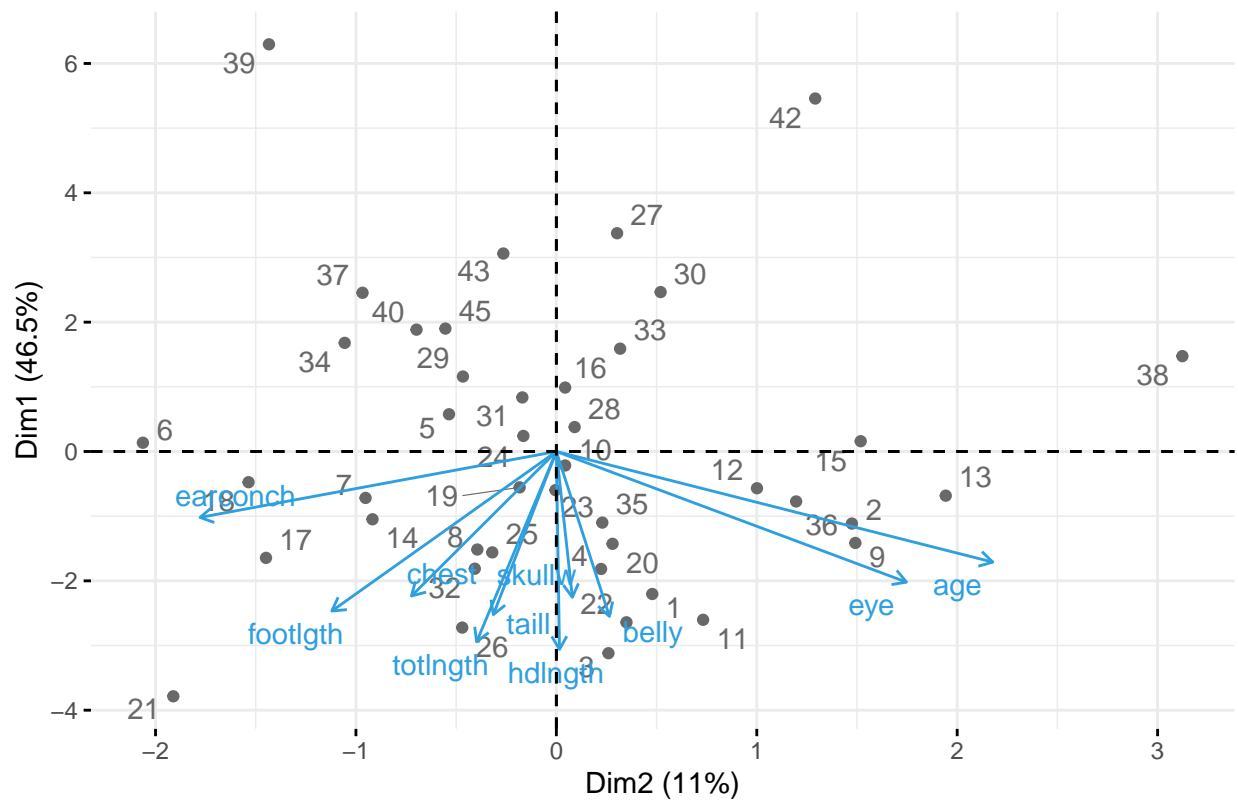


```
fviz_pca_var(V_Possum.pca,
  axes = c(2,1),
  col.var = "contrib", # Color by contributions to the PC
  gradient.cols = gradient_colors,
  repel = TRUE        # Avoid text overlapping
)
```

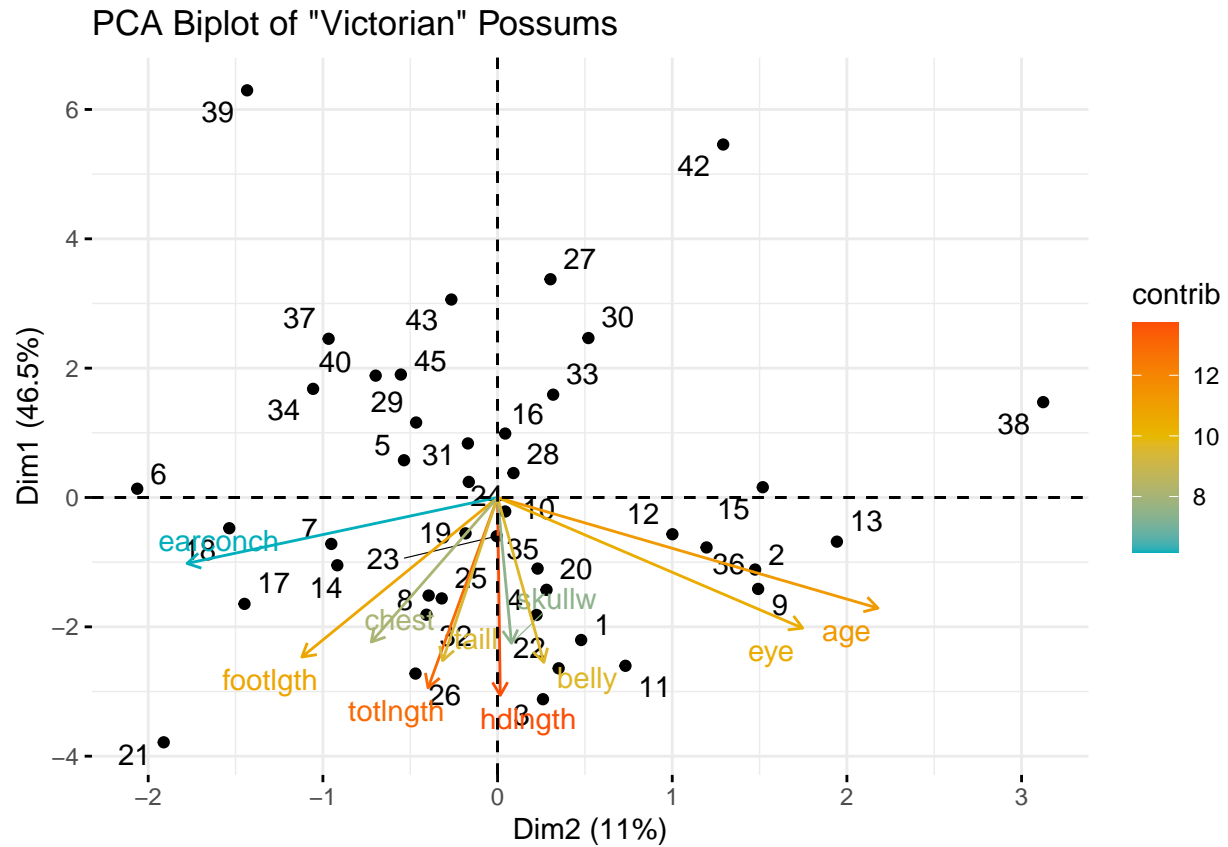


```
fviz_pca_biplot(V_Possum.pca,
  axes = c(2,1),
  repel = TRUE,
  col.var = "#2E9FDF", # Variables color
  col.ind = "#696969" # Individuals color
)
```

PCA – Biplot

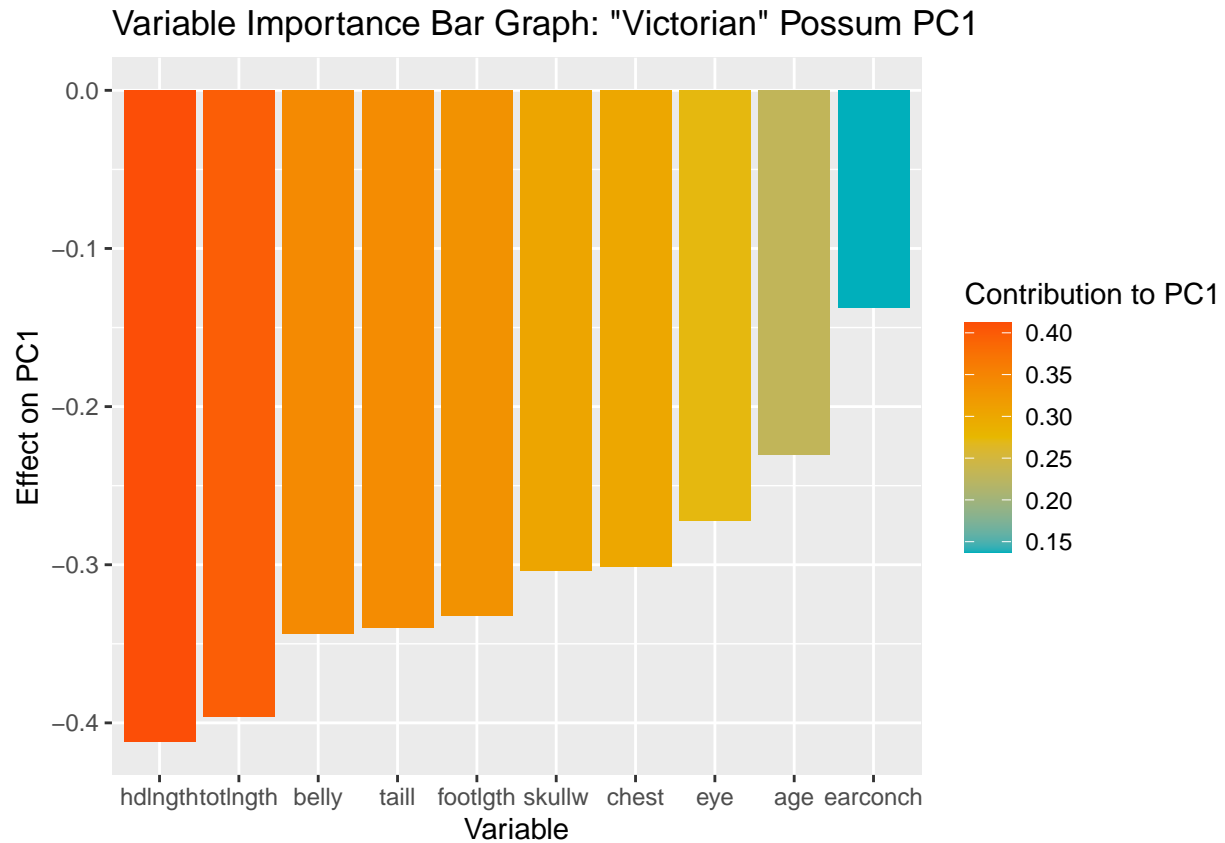


```
fviz_pca_biplot(V_Possum.pca, repel = TRUE,
  axes = c(2,1),
  col.var = "contrib", # Color by contributions to the PC
  gradient.cols = gradient_colors,
  title = 'PCA Biplot of "Victorian" Possums'
)
```

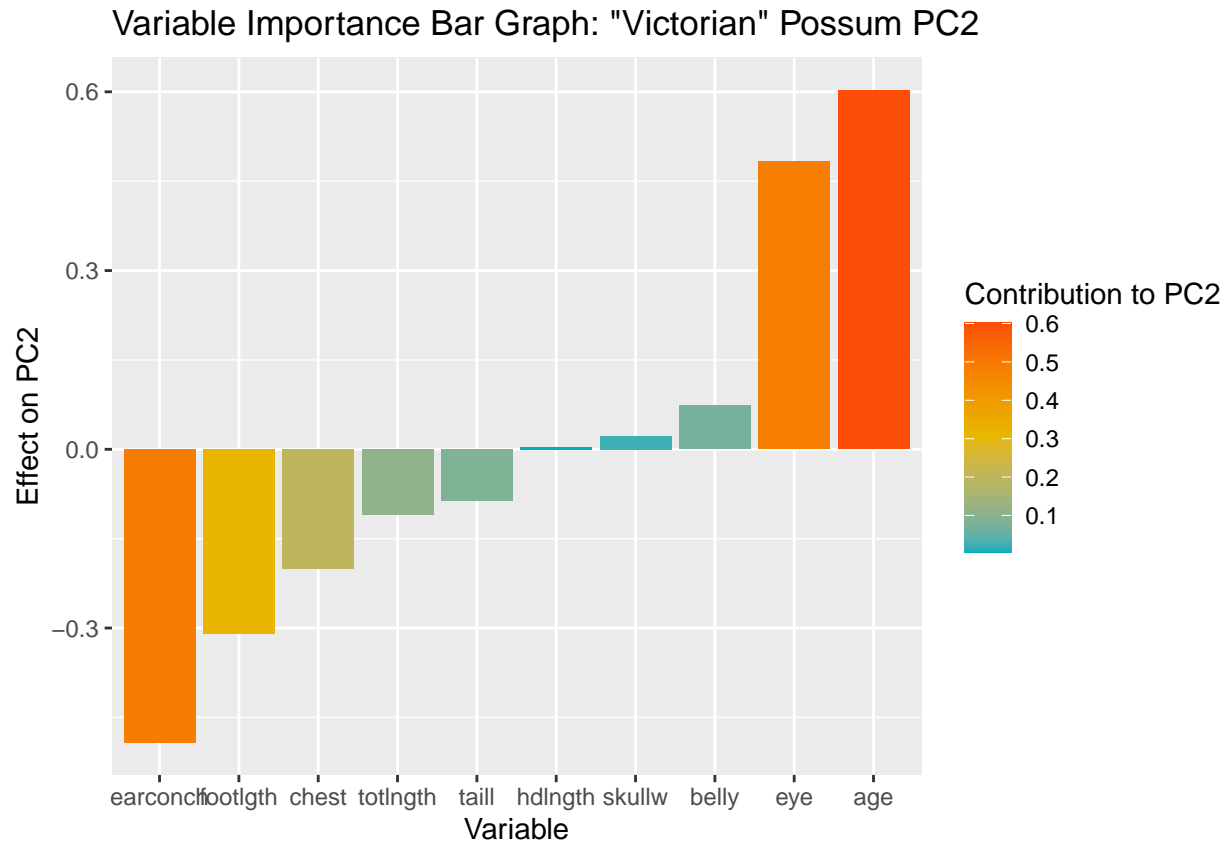



```
summary(V_Possum.pca$rotation)
```

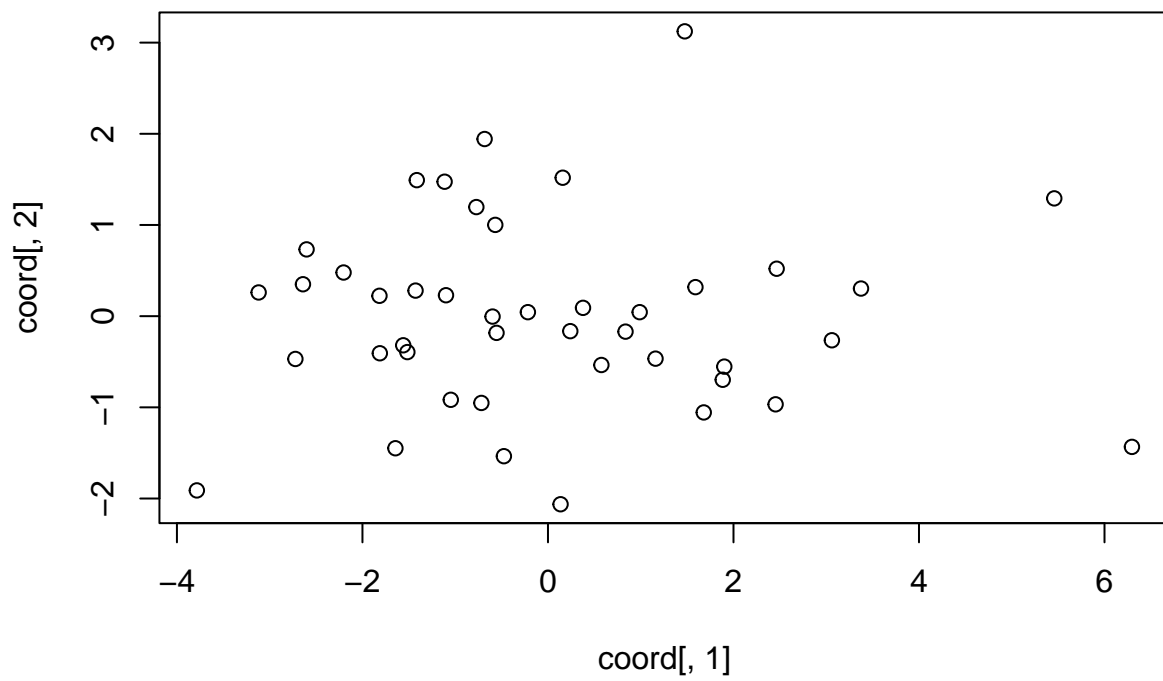
```
ggplot(V_PC1_DF, aes(x = fct_reorder(PCNames,V_PC1) , y = V_PC1)) +
  geom_col(aes(fill = abs(V_PC1)))+
  labs(x = "Variable", y = "Effect on PC1", title = 'Variable Importance Bar Graph: "Victorian" Possum 1
  #scale_fill_gradient2(low = "#00AFBB", mid = "#E7B800", high = "#FC4E07", midpoint = 0.3069)
  scale_fill_gradientn(colors = gradient_colors)
```



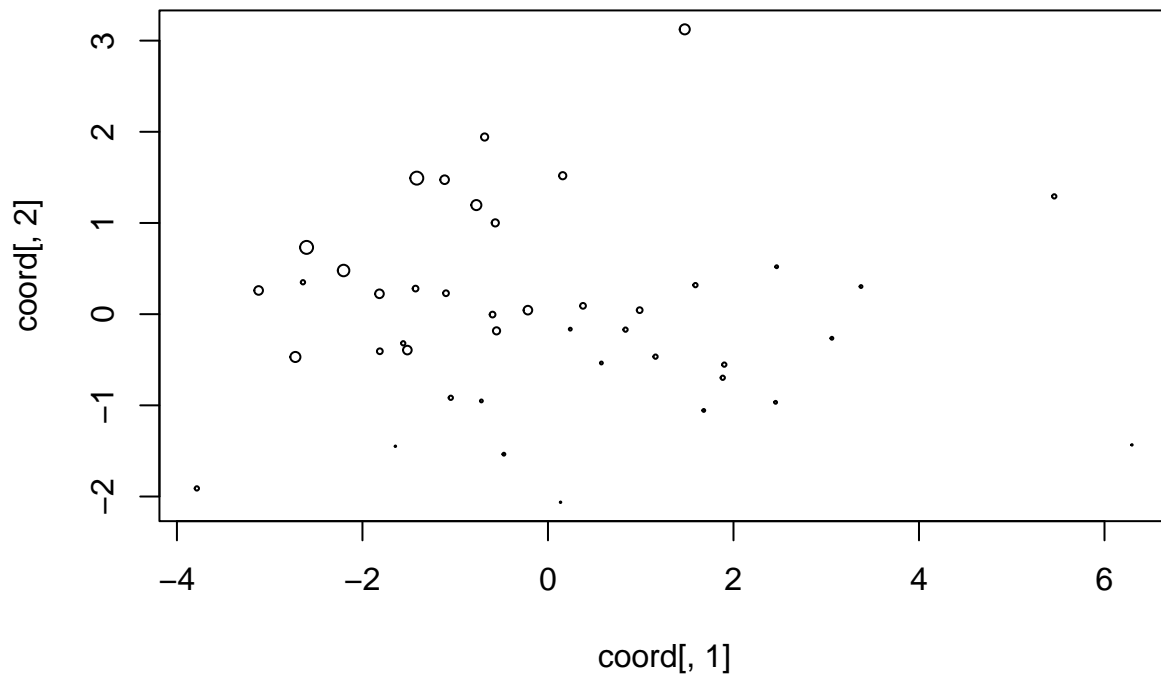
```
ggplot(V_PC2_DF, aes(x = fct_reorder(PCNames, V_PC2) , y = V_PC2)) +
  geom_col(aes(fill = abs(V_PC2))) +
  labs(x = "Variable", y = "Effect on PC2", title = 'Variable Importance Bar Graph: "Victorian" Possum 1') +
  scale_fill_gradientn(colors = gradient_colors)
```



```
#Some plots for Victoria Possums  
coord = V_Possum.pca$x # pulls out just the info from the pca results  
plot(coord[,1], coord[,2]) # plots the first two axes of the pca
```



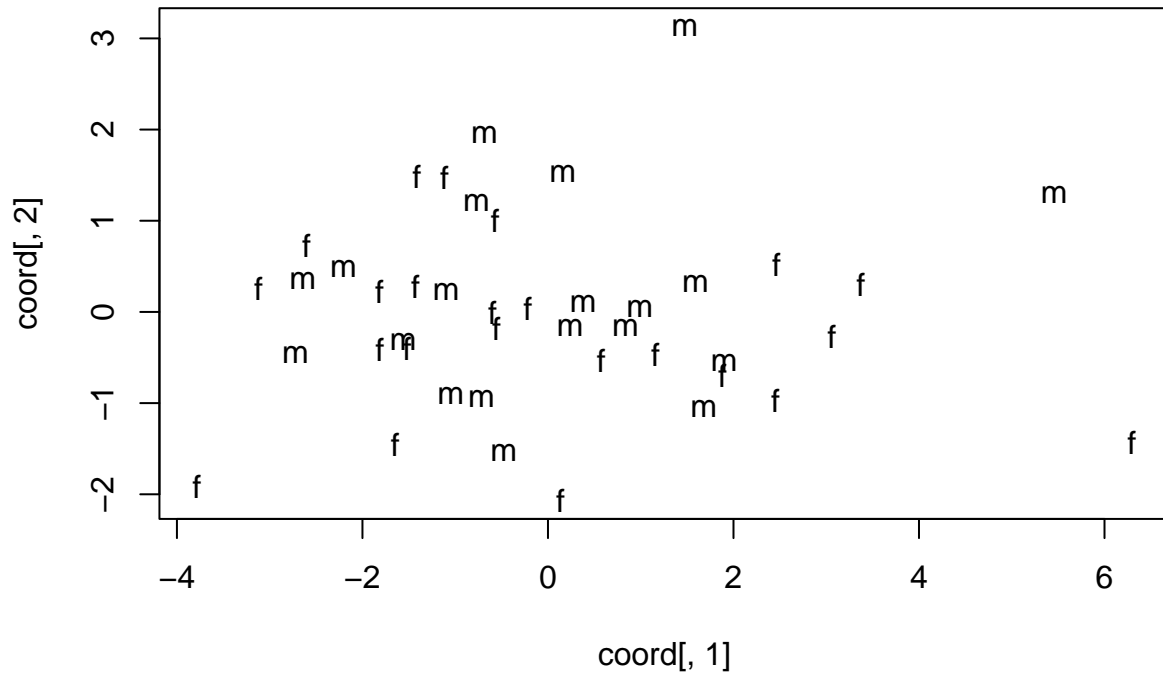
```
plot(coord[,1], coord[,2], cex= 0.1*V_Possum$age) # now the symbol size tells you age
```



```
V_Possum.pca$sex = as.character(V_Possum$sex)
str(V_Possum.pca)
```

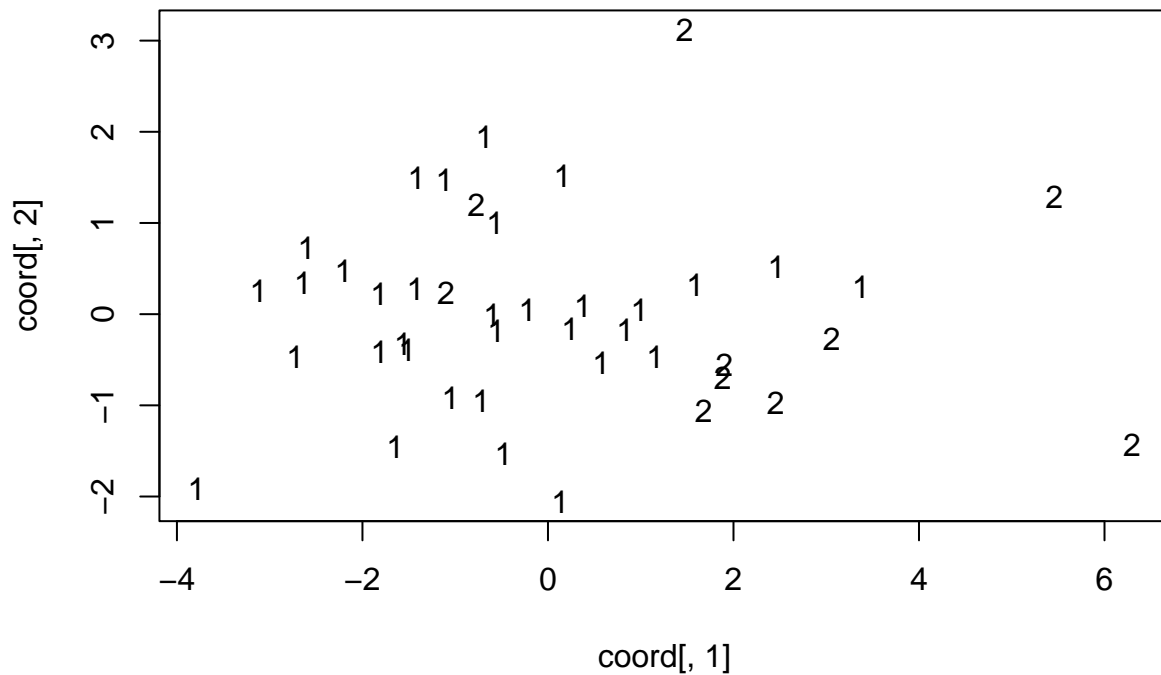
```
## List of 6
## $ sdev      : num [1:10] 2.155 1.05 0.977 0.902 0.841 ...
## $ rotation: num [1:10, 1:10] -0.23 -0.412 -0.304 -0.396 -0.34 ...
##   .- attr(*, "dimnames")=List of 2
##   .. .$ : chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
##   .. .$ : chr [1:10] "PC1" "PC2" "PC3" "PC4" ...
## $ center    : Named num [1:10] 4 92.9 56.8 87.9 36 ...
##   .- attr(*, "names")= chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ scale     : Named num [1:10] 2.13 2.48 2.5 4.59 1.77 ...
##   .- attr(*, "names")= chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ x         : num [1:43, 1:10] -2.203 -1.114 -3.119 -1.816 0.576 ...
##   .- attr(*, "dimnames")=List of 2
##   .. .$ : chr [1:43] "1" "2" "3" "4" ...
##   .. .$ : chr [1:10] "PC1" "PC2" "PC3" "PC4" ...
## $ sex       : chr [1:43] "m" "f" "f" "f" ...
## - attr(*, "class")= chr "prcomp"
```

```
plot(coord[,1], coord[,2], pch=V_Possum.pca$sex)
```



```
#text(coord[,1], coord[,2], row.names(possum_pca))
# plot(coord[,1], coord[,2], pch=possum_pca$sex)

V_Possum.pca$site = as.character(V_Possum$site)
plot(coord[,1], coord[,2], pch=V_Possum.pca$site)
```



```
# possum_pca$Pop = possum_clean$Pop
# plot(coord[,1], coord[,2], pch=possum_pca$Pop)
```

```
#Other Possum PCA
```

```
O_Possum.pca <- prcomp(O_Possum_Numeric, center = TRUE, scale. = TRUE)
summary(V_Possum.pca)
```

```
## Importance of components:
```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7
## Standard deviation	2.1553	1.0496	0.97735	0.90228	0.84059	0.73422	0.67372
## Proportion of Variance	0.4645	0.1102	0.09552	0.08141	0.07066	0.05391	0.04539
## Cumulative Proportion	0.4645	0.5747	0.67022	0.75163	0.82229	0.87620	0.92159

	PC8	PC9	PC10
## Standard deviation	0.6565	0.50935	0.30605
## Proportion of Variance	0.0431	0.02594	0.00937
## Cumulative Proportion	0.9647	0.99063	1.00000

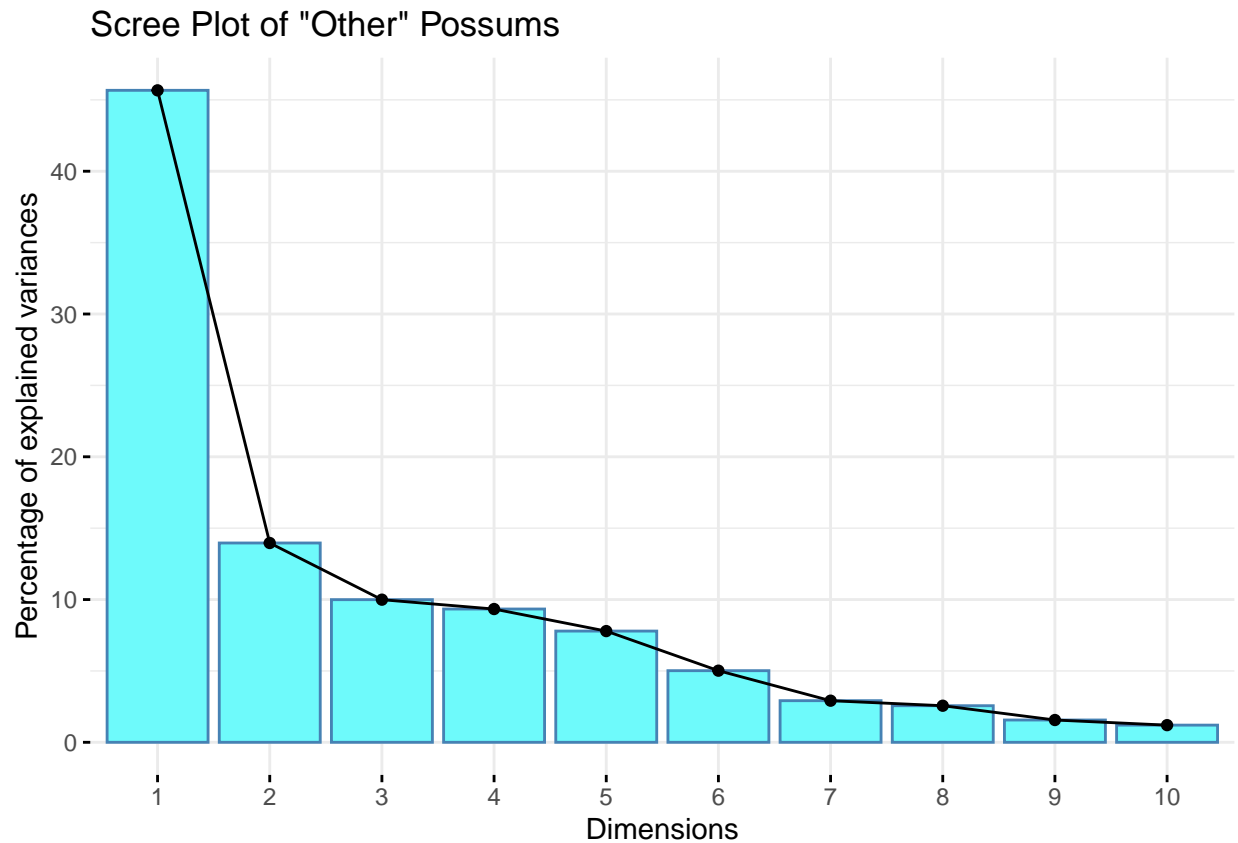
```
O_PC1 = O_Possum.pca$rotation[1:10]
O_PC1_DF = tibble(PCNames, O_PC1)
str(O_PC1_DF)
```

```
## tibble [10 x 2] (S3: tbl_df/tbl/data.frame)
## $ PCNames: chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ O_PC1 : num [1:10] 0.185 0.406 0.389 0.39 0.248 ...
```

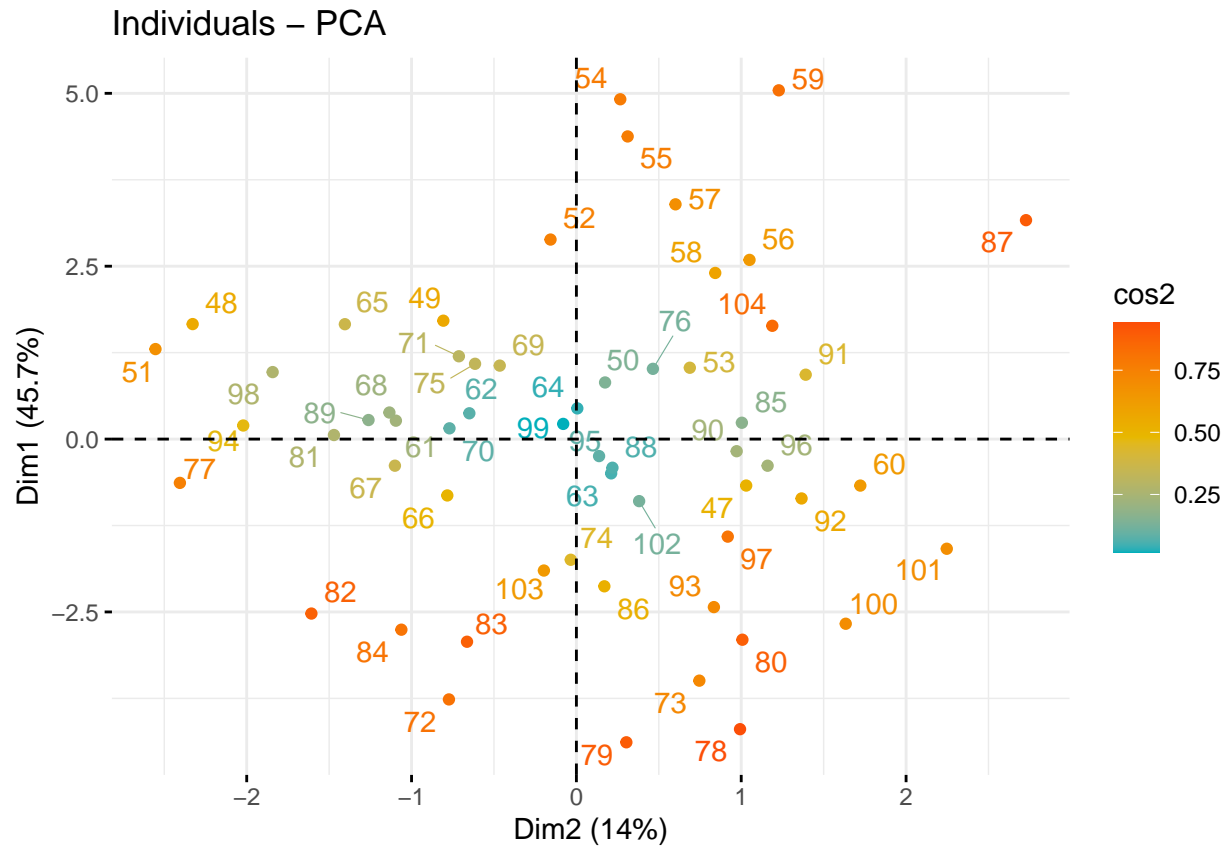
```
O_PC2 = O_Possum.pca$rotation[11:20]
O_PC2_DF = tibble(PCNames, O_PC2)
str(O_PC2_DF)
```

```
## tibble [10 x 2] (S3: tbl_df/tbl/data.frame)
## $ PCNames: chr [1:10] "age" "hdlngth" "skullw" "totlngth" ...
## $ O_PC2 : num [1:10] -0.4964 -0.0392 -0.1045 0.2246 0.4609 ...
```

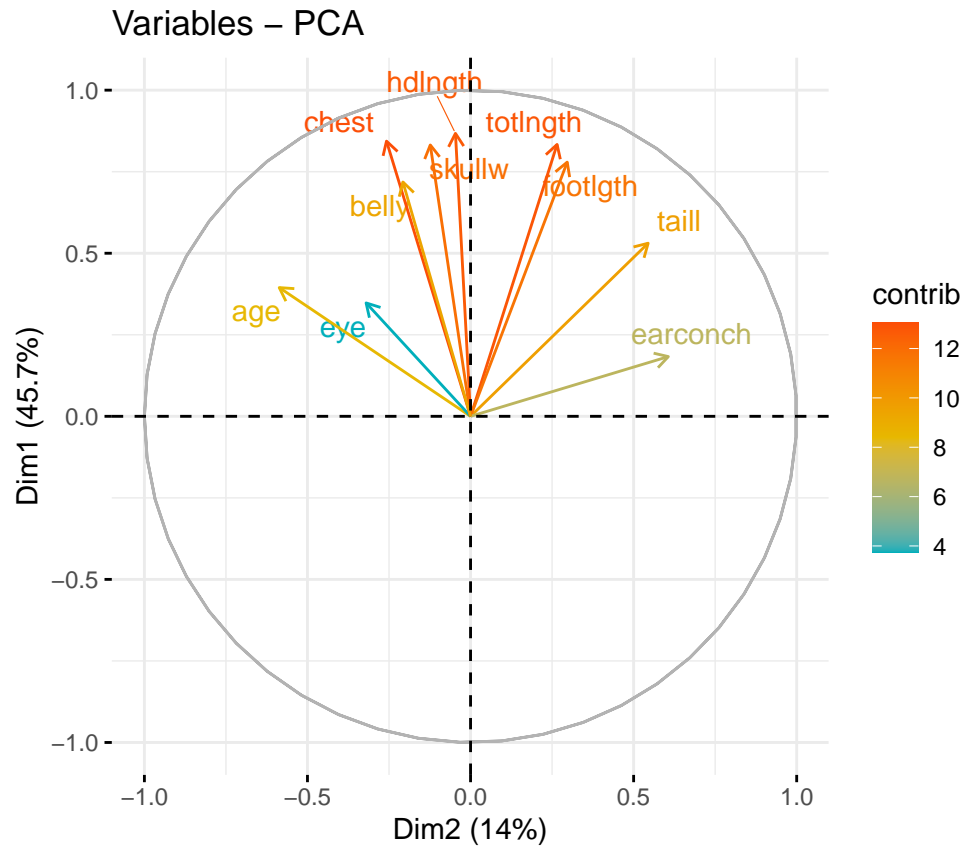
```
fviz_eig(O_Possum.pca, main = 'Scree Plot of "Other" Possums', barfill = "#6efafb")
```



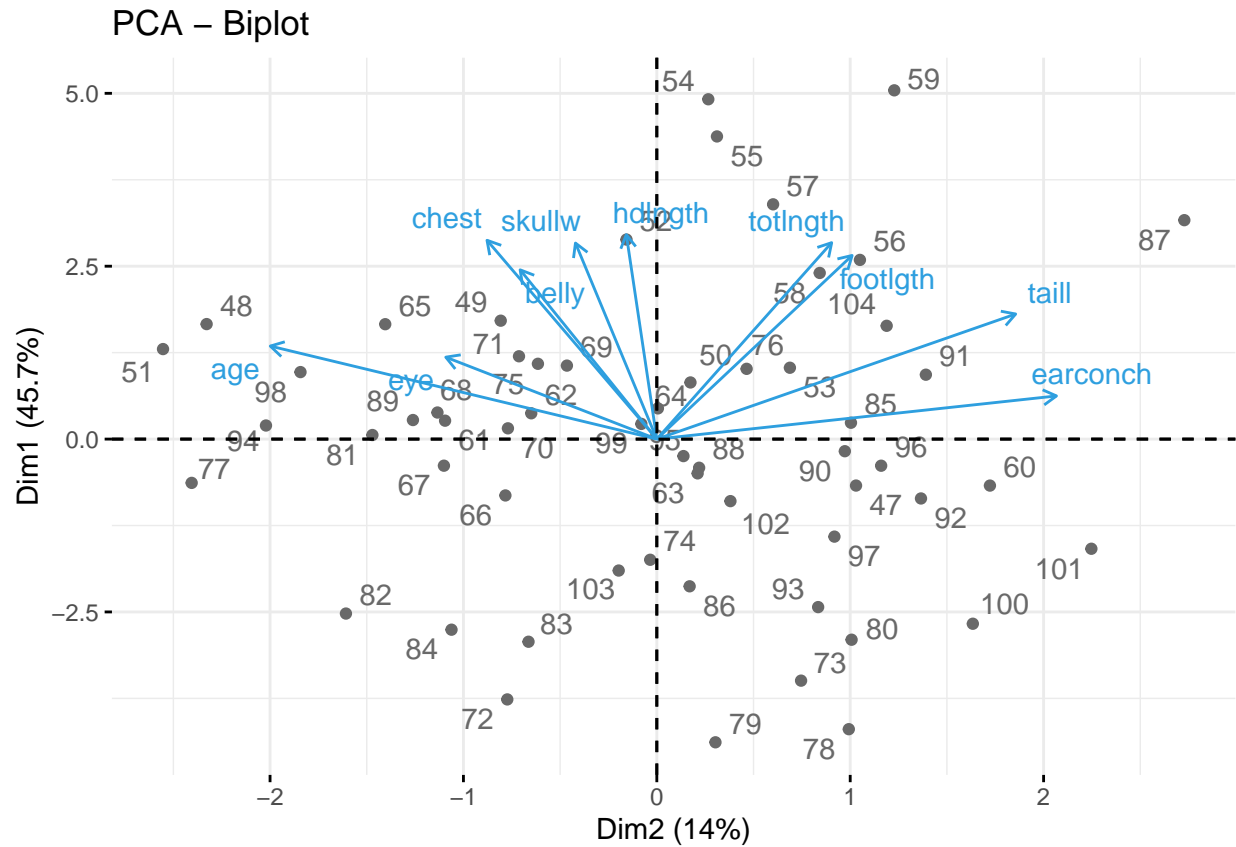
```
fviz_pca_ind(O_Possum.pca,
  axes = c(2,1),
  col.ind = "cos2", # Color by the quality of representation
  gradient.cols = gradient_colors,
  repel = TRUE      # Avoid text overlapping
)
```

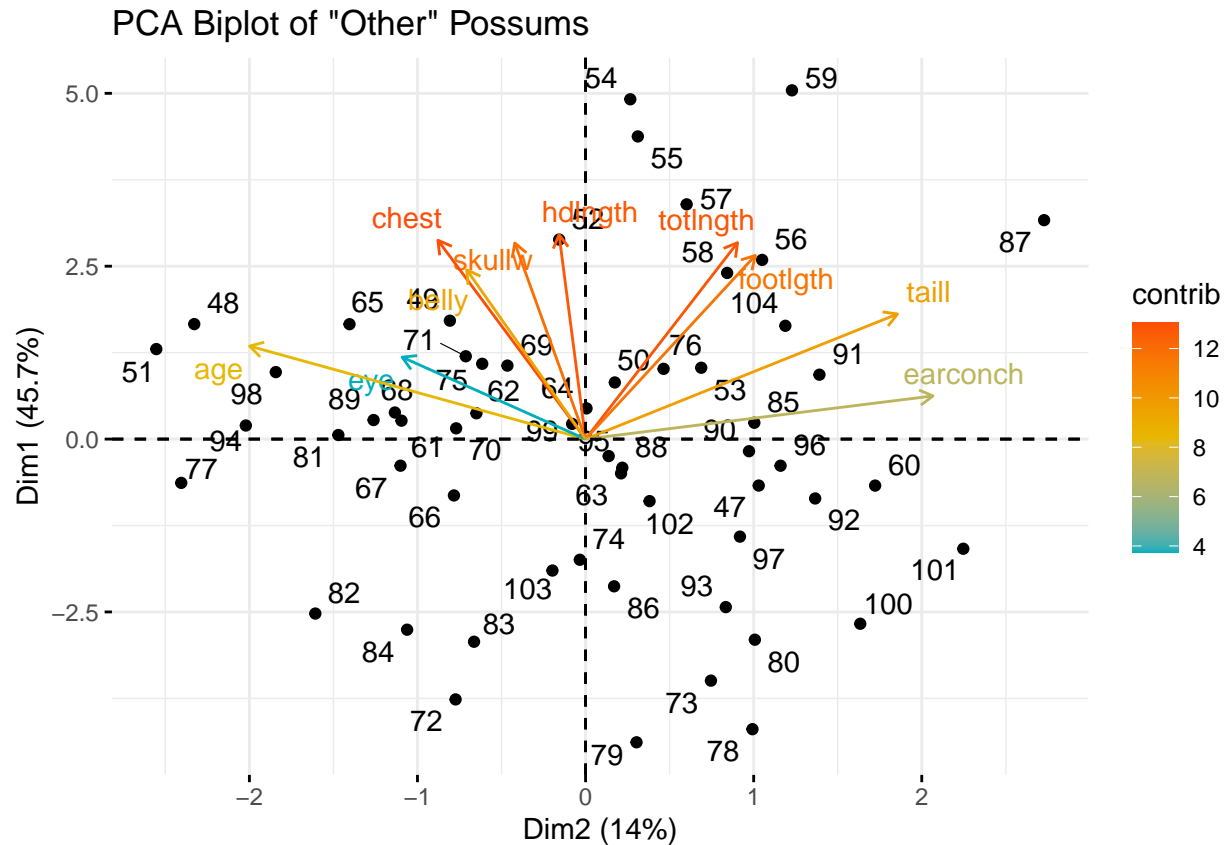
```
fviz_pca_var(O_Possum.pca,
  axes = c(2,1),
  col.var = "contrib", # Color by contributions to the PC
  gradient.cols = gradient_colors,
  repel = TRUE        # Avoid text overlapping
)
```



```
fviz_pca_biplot(O_Possum.pca,
  axes = c(2,1),
  repel = TRUE,
  col.var = "#2E9FDF", # Variables color
  col.ind = "#696969"  # Individuals color
)
```



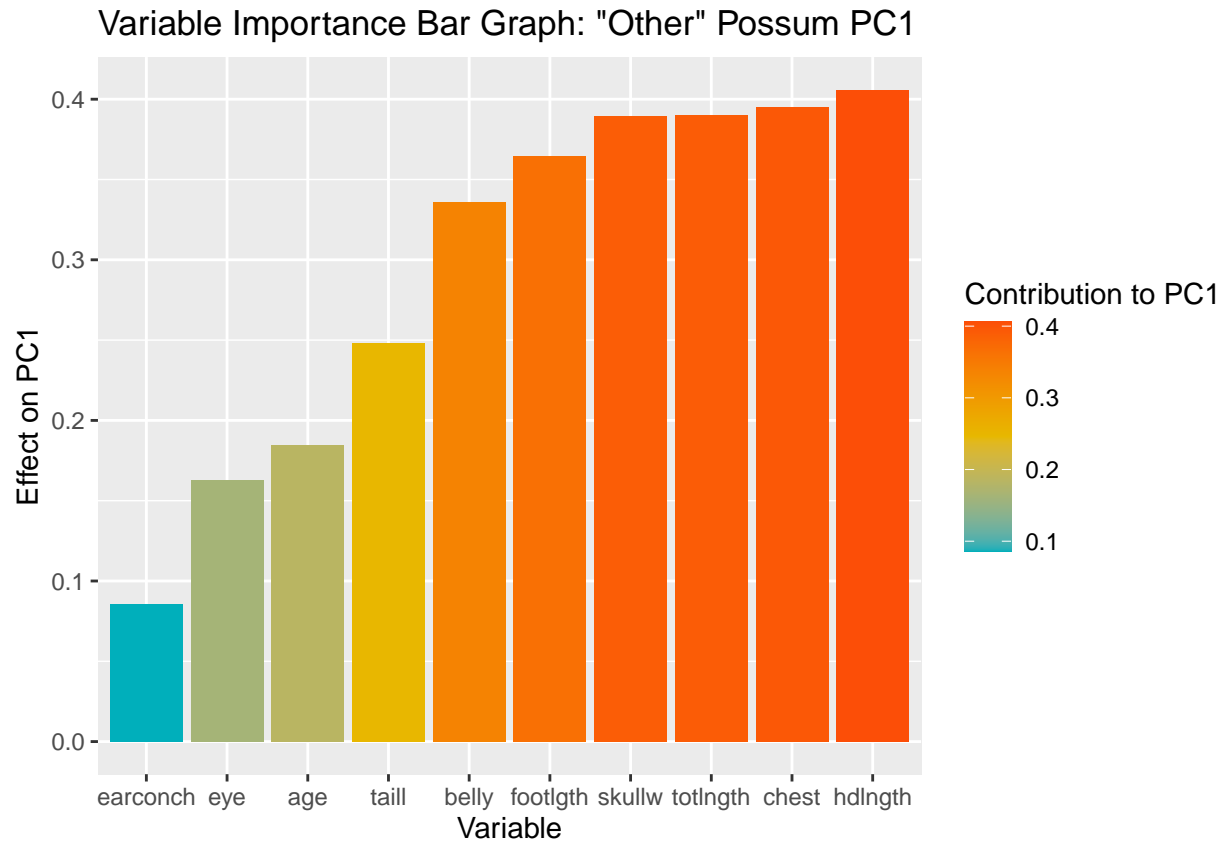
```
fviz_pca_biplot(O_Possum.pca, repel = TRUE,
  axes = c(2,1),
  col.var = "contrib", # Color by contributions to the PC
  gradient.cols = gradient_colors,
  title = 'PCA Biplot of "Other" Possums'
)
```



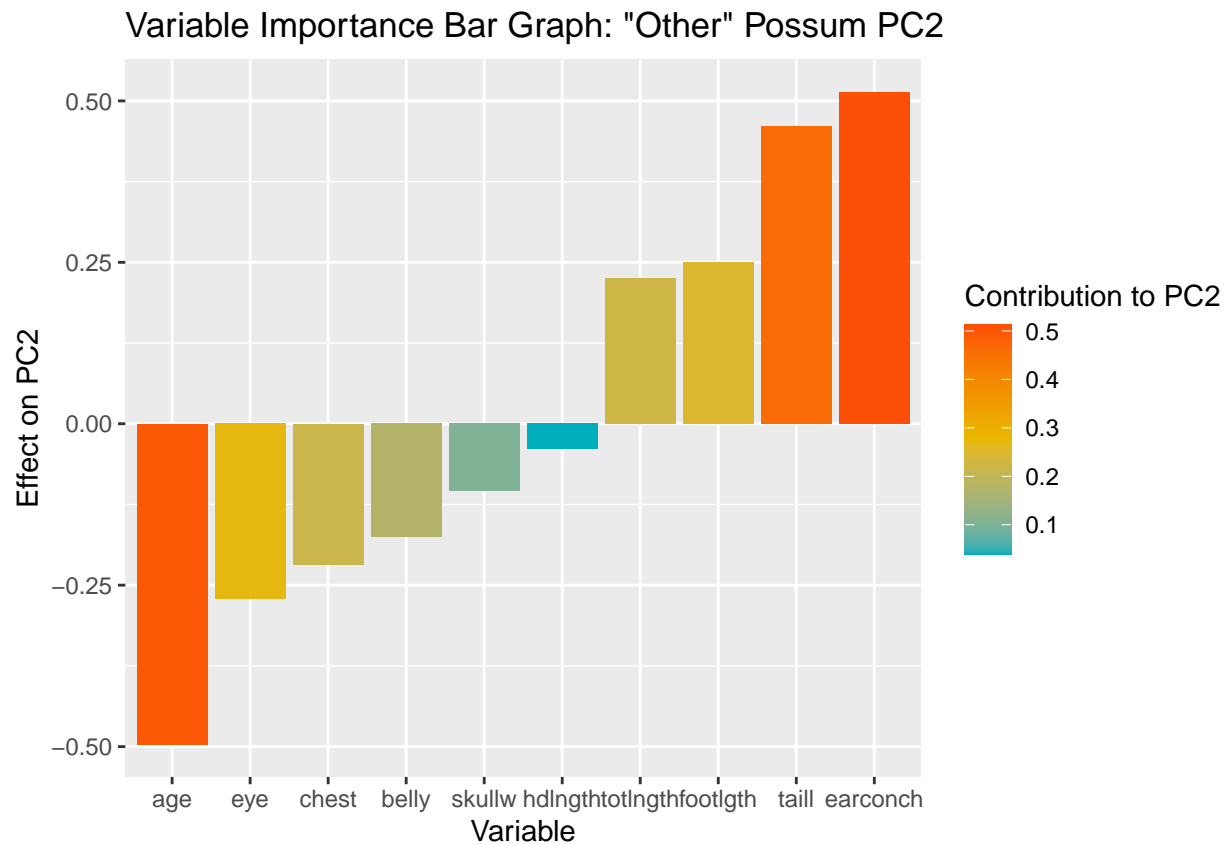
```
summary(O_Possum.pca$rotation)
```

##	PC1	PC2	PC3	PC4
##	Min. :0.08566	Min. : -0.49645	Min. : -0.68760	Min. : -0.35337
##	1st Qu.:0.20060	1st Qu.: -0.20748	1st Qu.: -0.26619	1st Qu.: -0.22969
##	Median :0.35042	Median : -0.07183	Median : 0.04192	Median : 0.01271
##	Mean :0.29624	Mean : 0.01447	Mean : -0.03732	Mean : 0.02194
##	3rd Qu.:0.38989	3rd Qu.: 0.24428	3rd Qu.: 0.20386	3rd Qu.: 0.15012
##	Max. :0.40596	Max. : 0.51329	Max. : 0.41354	Max. : 0.78660
##	PC5	PC6	PC7	PC8
##	Min. : -0.33214	Min. : -0.33472	Min. : -0.419665	Min. : -0.65430
##	1st Qu.: -0.19103	1st Qu.: -0.13281	1st Qu.: -0.188996	1st Qu.: -0.04565
##	Median : 0.05711	Median : -0.02686	Median : -0.066744	Median : 0.10377
##	Mean : 0.08494	Mean : 0.04150	Mean : 0.005034	Mean : 0.03007
##	3rd Qu.: 0.36490	3rd Qu.: 0.15143	3rd Qu.: 0.132073	3rd Qu.: 0.23230
##	Max. : 0.55792	Max. : 0.78449	Max. : 0.706137	Max. : 0.46859
##	PC9	PC10		
##	Min. : -0.700802	Min. : -0.519837		
##	1st Qu.: -0.141745	1st Qu.: -0.075087		
##	Median : -0.001804	Median : 0.059552		
##	Mean : -0.016102	Mean : 0.005763		
##	3rd Qu.: 0.080511	3rd Qu.: 0.143903		
##	Max. : 0.562554	Max. : 0.631399		

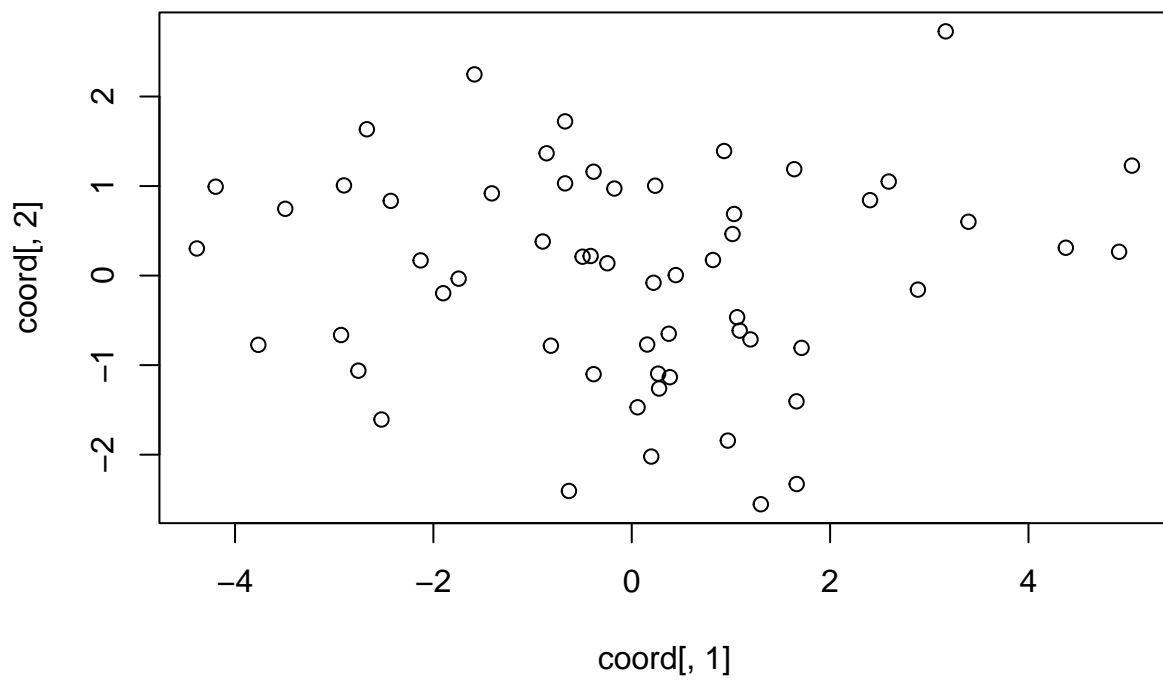
```
ggplot(O_PC1_DF, aes(x = fct_reorder(PCNames,O_PC1) , y = O_PC1)) +
  geom_col(aes(fill = abs(O_PC1)))+
  labs(x = "Variable", y = "Effect on PC1", title = 'Variable Importance Bar Graph: "Other" Possum PC1')
#scale_fill_gradient2(low = "#00AFBB", mid = "#E7B800", high = "#FC4E07", midpoint = 0.29624)
scale_fill_gradientn(colors = gradient_colors)
```



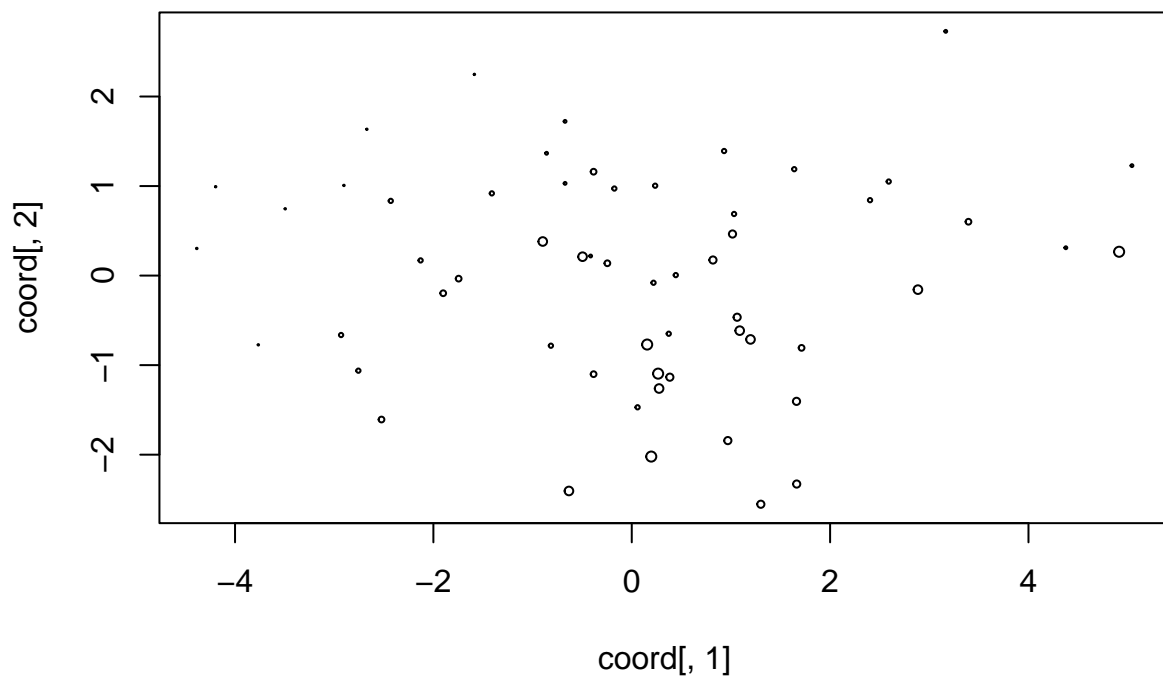
```
ggplot(O_PC2_DF, aes(x = fct_reorder(PCNames,O_PC2) , y = O_PC2)) +
  geom_col(aes(fill = abs(O_PC2)))+
  labs(x = "Variable", y = "Effect on PC2", title = 'Variable Importance Bar Graph: "Other" Possum PC2')
scale_fill_gradientn(colors = gradient_colors)
```



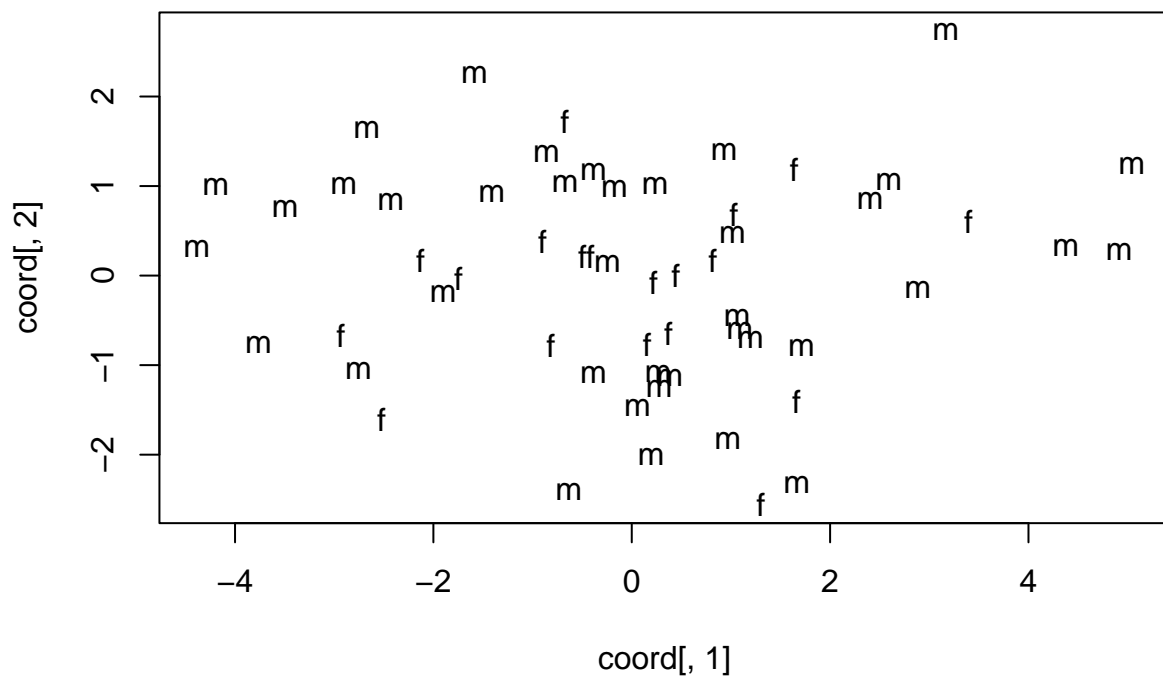
```
coord = O_Possum.pca$x # pulls out just the info from the pca results
plot(coord[,1], coord[,2]) # plots the first two axes of the pca
```



```
plot(coord[,1], coord[,2], cex= 0.1*O_Possum$age) # now the symbol size tells you age
```

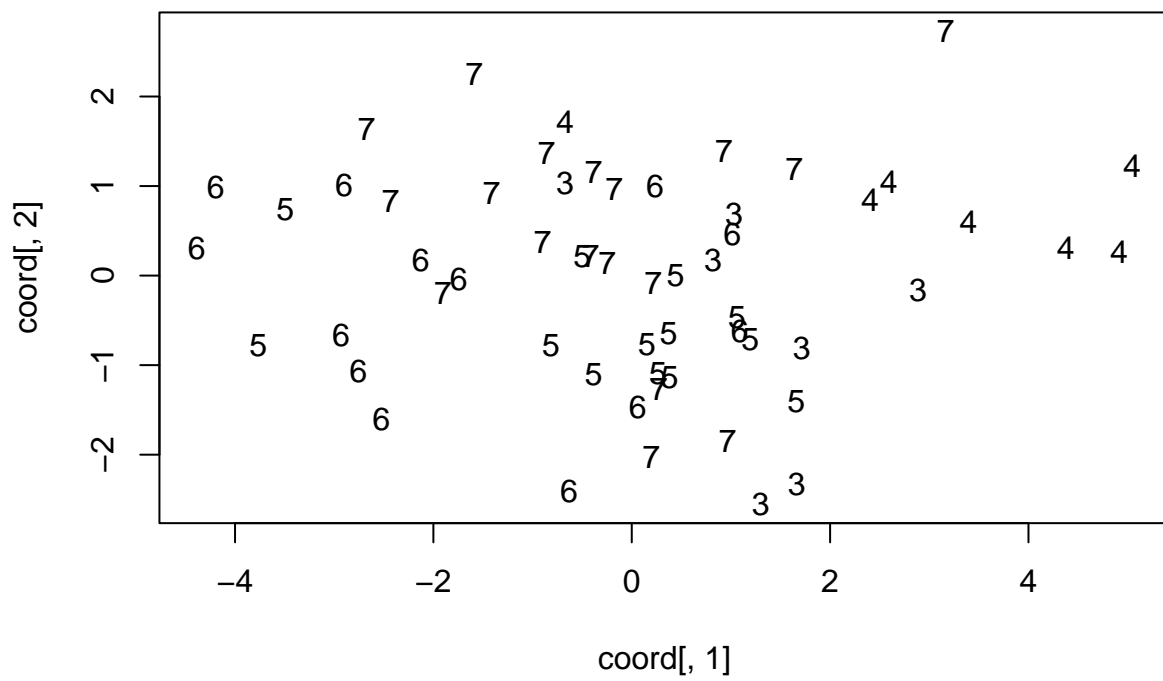


```
0_Possum.pca$sex = as.character(0_Possum$sex)
plot(coord[,1], coord[,2], pch=0_Possum.pca$sex)
```

```
# #text(coord[,1], coord[,2], row.names(possum_pca))
# plot(coord[,1], coord[,2], pch=possum_pca$sex)

O_Possum.pca$site = as.character(O_Possum$site)
plot(coord[,1], coord[,2], pch=O_Possum.pca$site)
```



```
# possum_pca$Pop = possum_clean$Pop
# plot(coord[,1], coord[,2], pch=possum_pca$Pop)
```