

# FaceMood

## Análisis de Depresión en RR.SS.



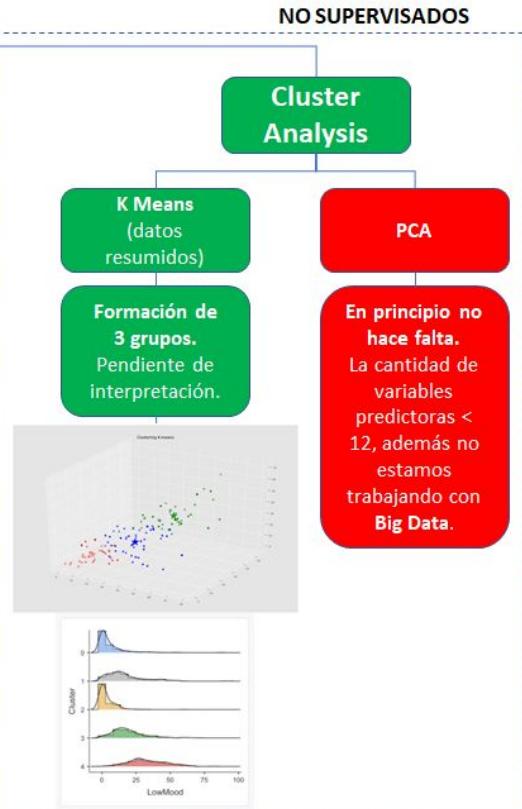
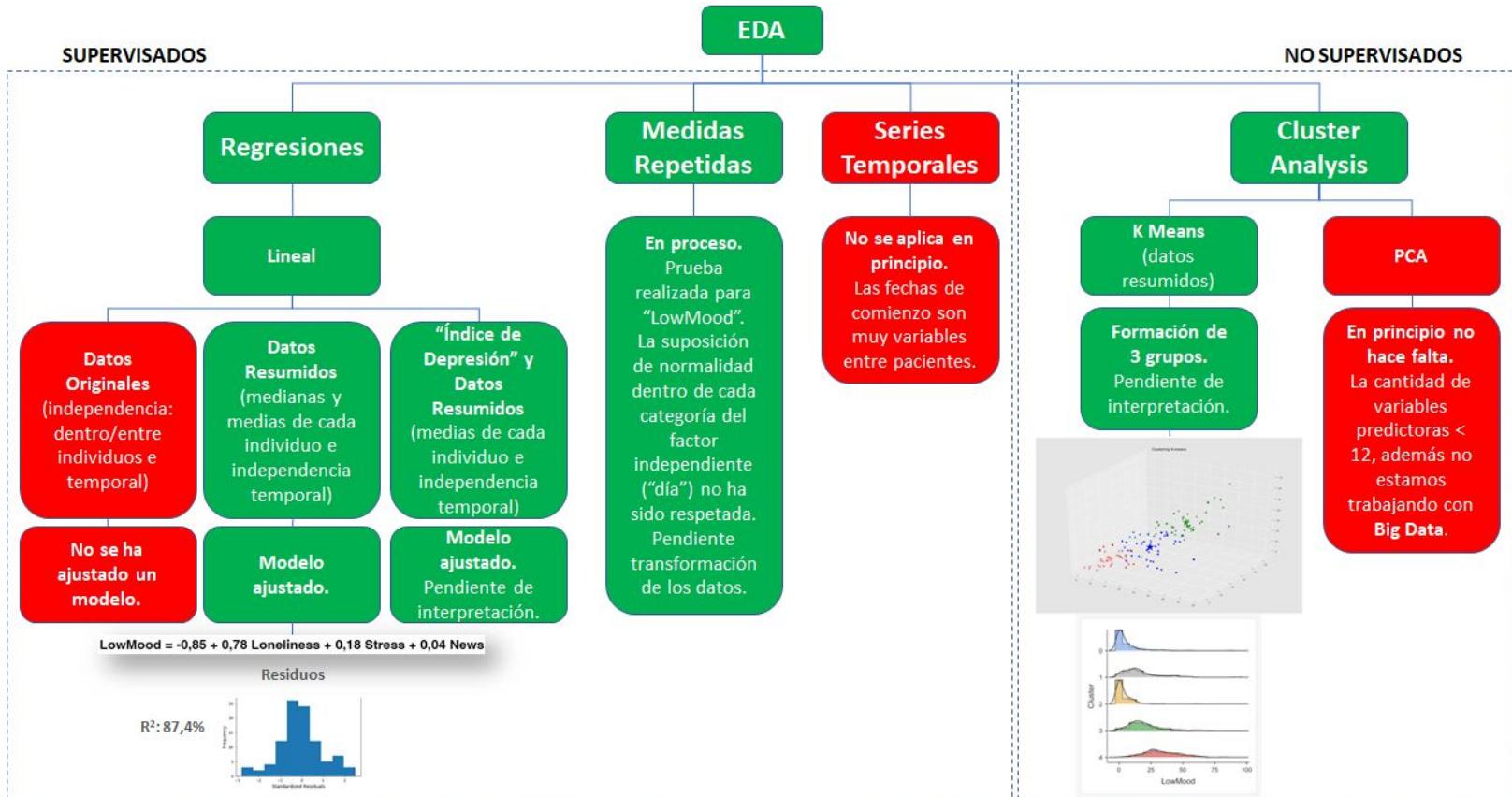
### Miembros del equipo:

- Henry Corazza
- Daniel Alcalá
- Ana Patricia Bautista
- Sergio Hernando
- Sergio Navarro

# Descripción del dataset

- Procedencia:
  - Artículo científico: <https://doi.org/10.1037/xge0000528>
  - Repo en Open Science Framework: <https://osf.io/czs6y/>
- Estructura:
  - 12245 rows x 25 columns
    - rows: 125 sujetos | 14 días | ~5 mediciones diarias
    - columns: 13 metadata (nominal, ordinal) | 8 síntomas depresión (escala) | 4 uso redes sociales (escala)

# Estrategia de Análisis

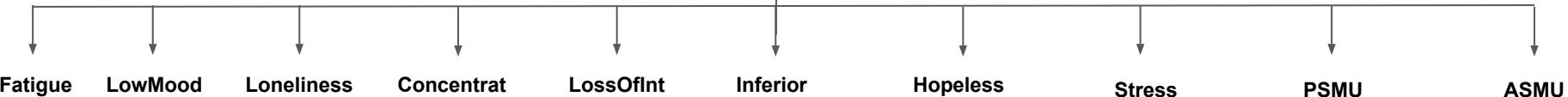


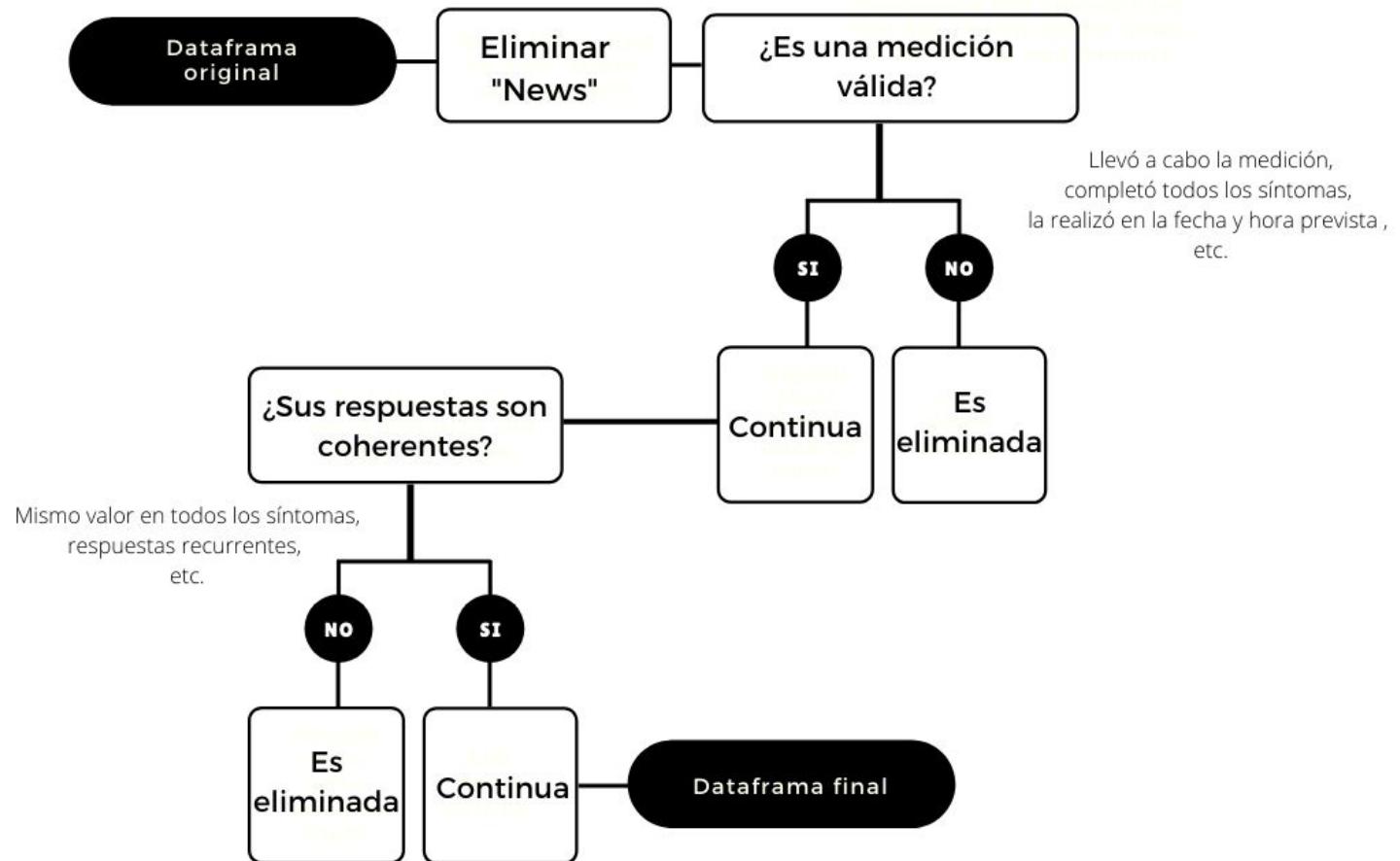
# EDA - Exploratory Data Analysis

Social Media and Depression Symptoms: A Network Perspective



125 participantes x 14 días x 7 mediciones





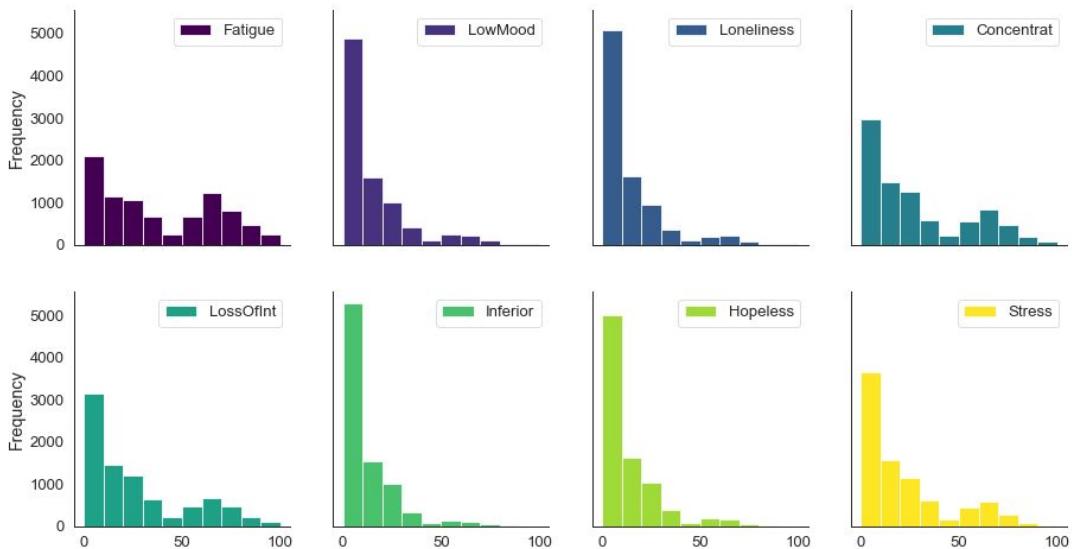
# EDA - Exploratory Data Analysis

8 síntomas depresión

12.245 mediciones

No independientes

~70 mediciones por sujeto



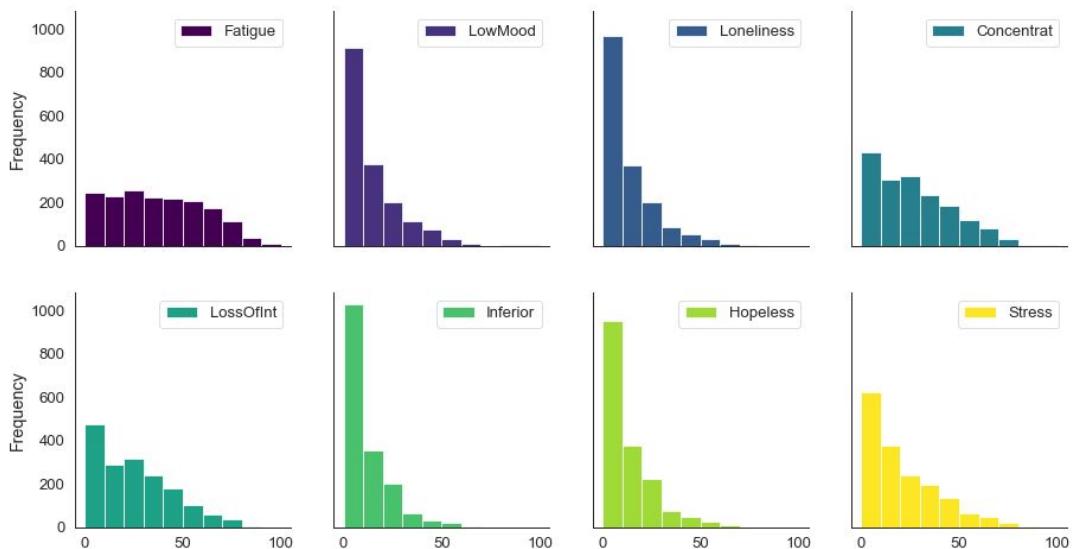
# EDA - Exploratory Data Analysis

8 síntomas depresión

1.727 mediciones

No independientes

14 medias diarias por sujeto



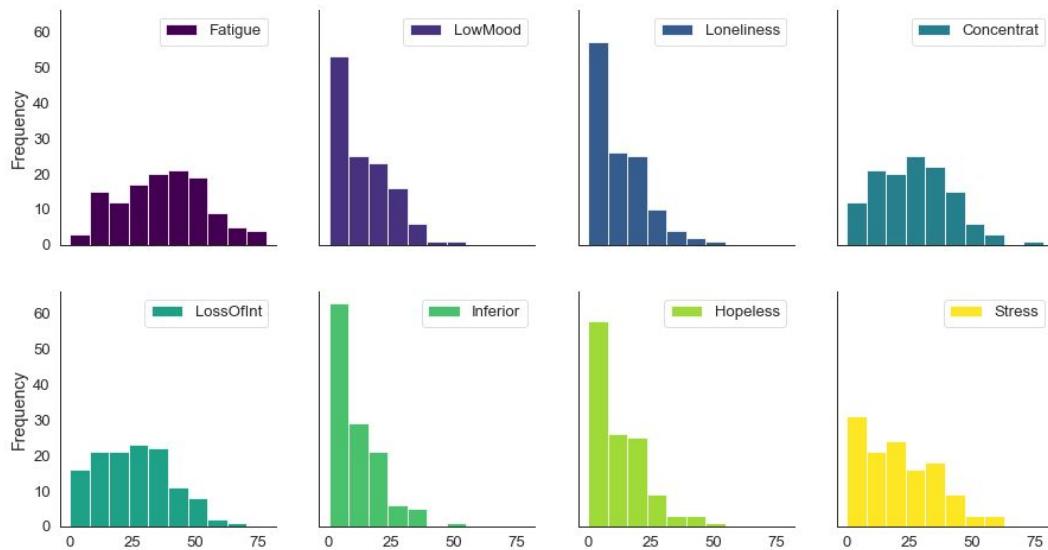
# EDA - Exploratory Data Analysis

8 síntomas depresión

125 mediciones

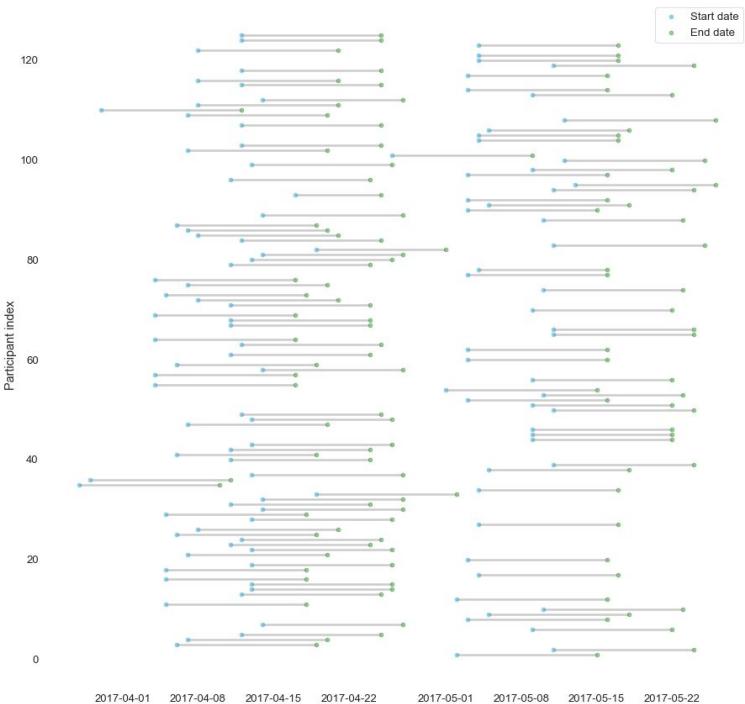
Independientes

media global por sujeto



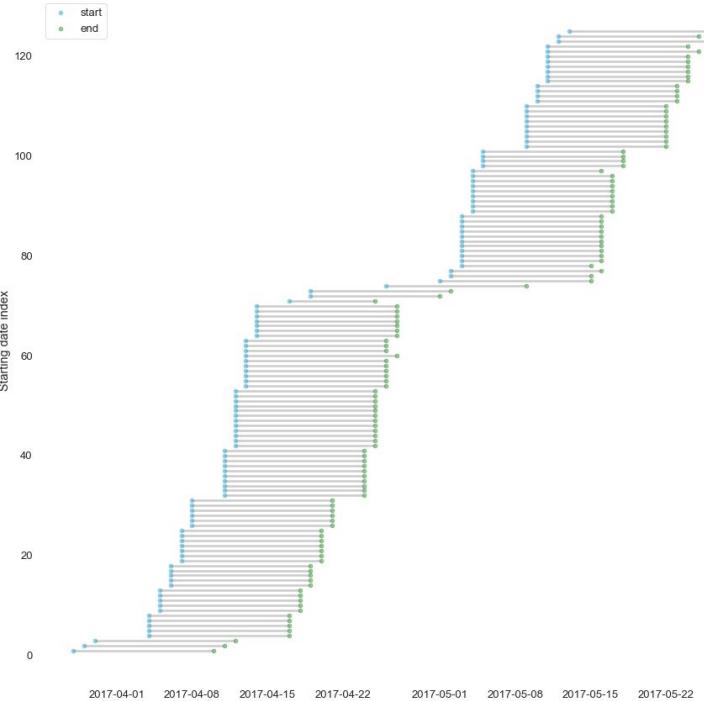
# EDA - Exploratory Data Analysis

- Timeseries:
  - 14 días medidos
  - ~5 mediciones por día



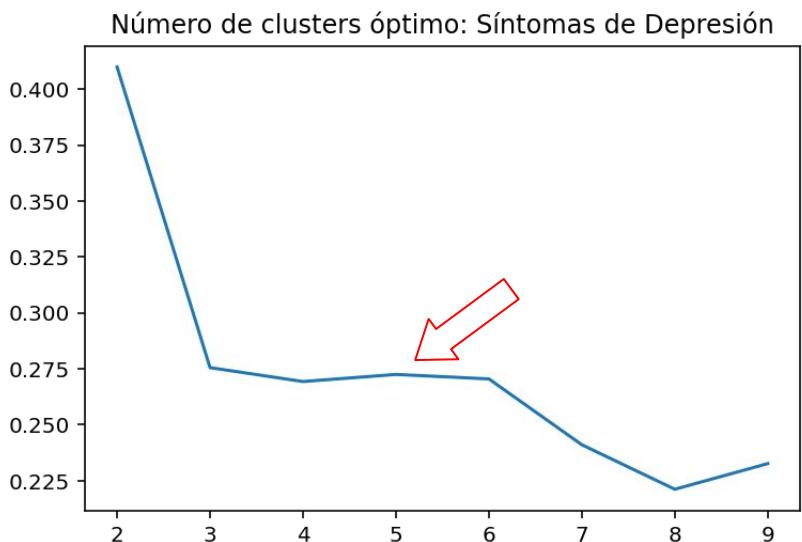
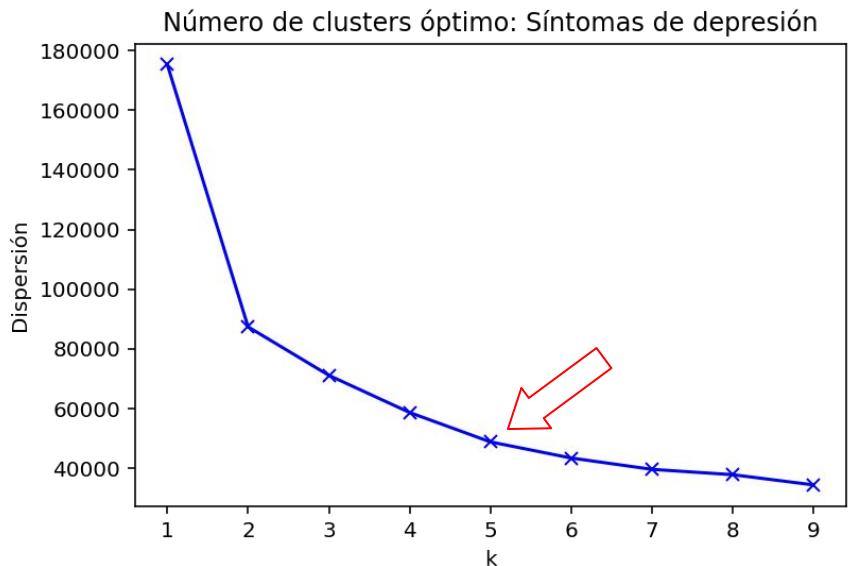
# EDA - Exploratory Data Analysis

- Timeseries:
  - 14 días medidos
  - ~5 mediciones por día

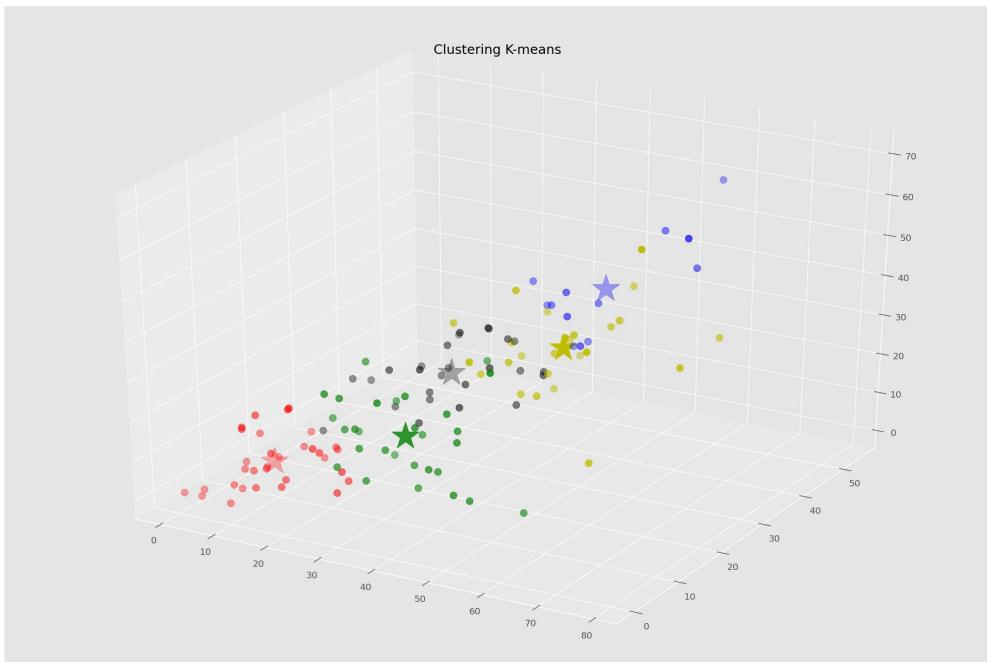


# Análisis 1.1: clustering

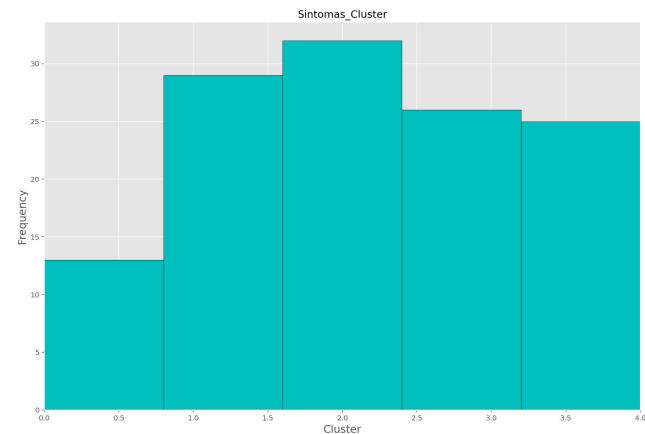
Determinar número de clusters óptimo: Elbow method & sillhouette



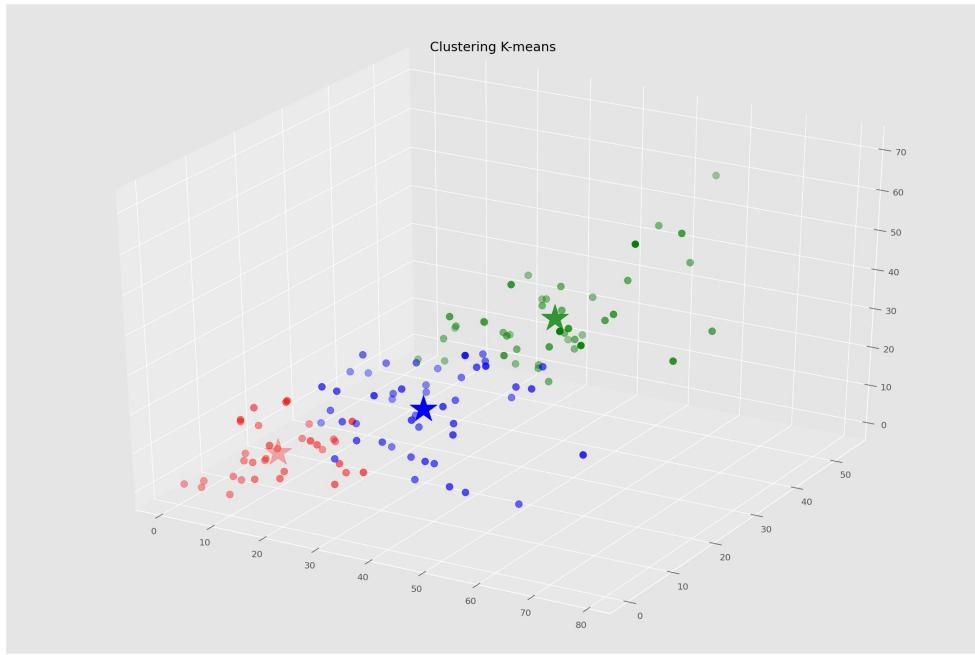
# Participantes agrupados en 5 Clusters



|   | Participantes/cluster |
|---|-----------------------|
| 2 | 32                    |
| 1 | 29                    |
| 3 | 26                    |
| 4 | 25                    |
| 0 | 13                    |

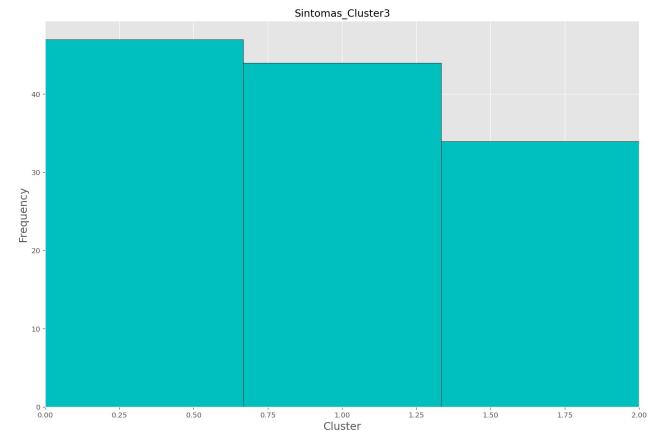


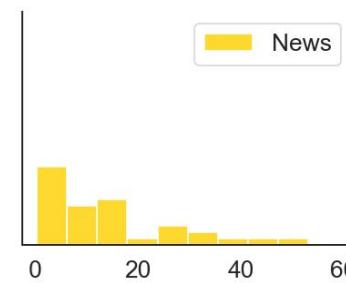
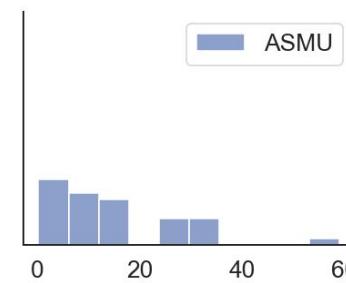
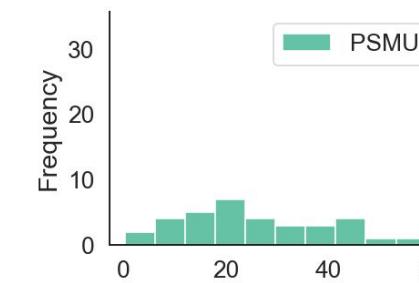
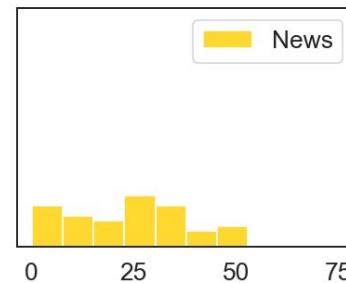
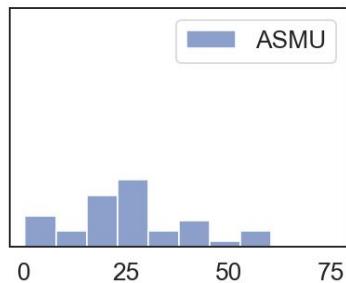
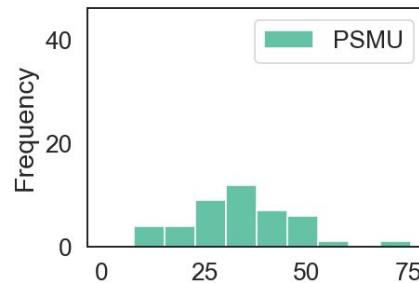
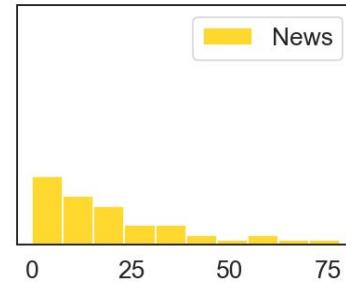
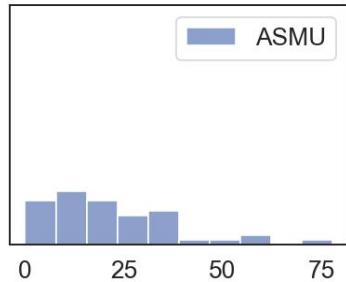
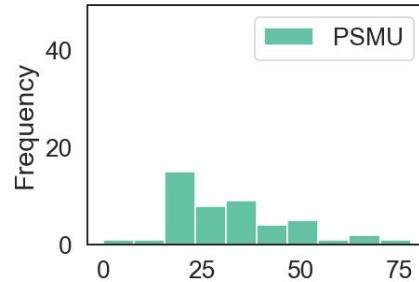
# Participantes agrupados en 3 Clusters



Participantes/cluster

|   |    |
|---|----|
| 0 | 47 |
| 1 | 44 |
| 2 | 34 |





# Medias

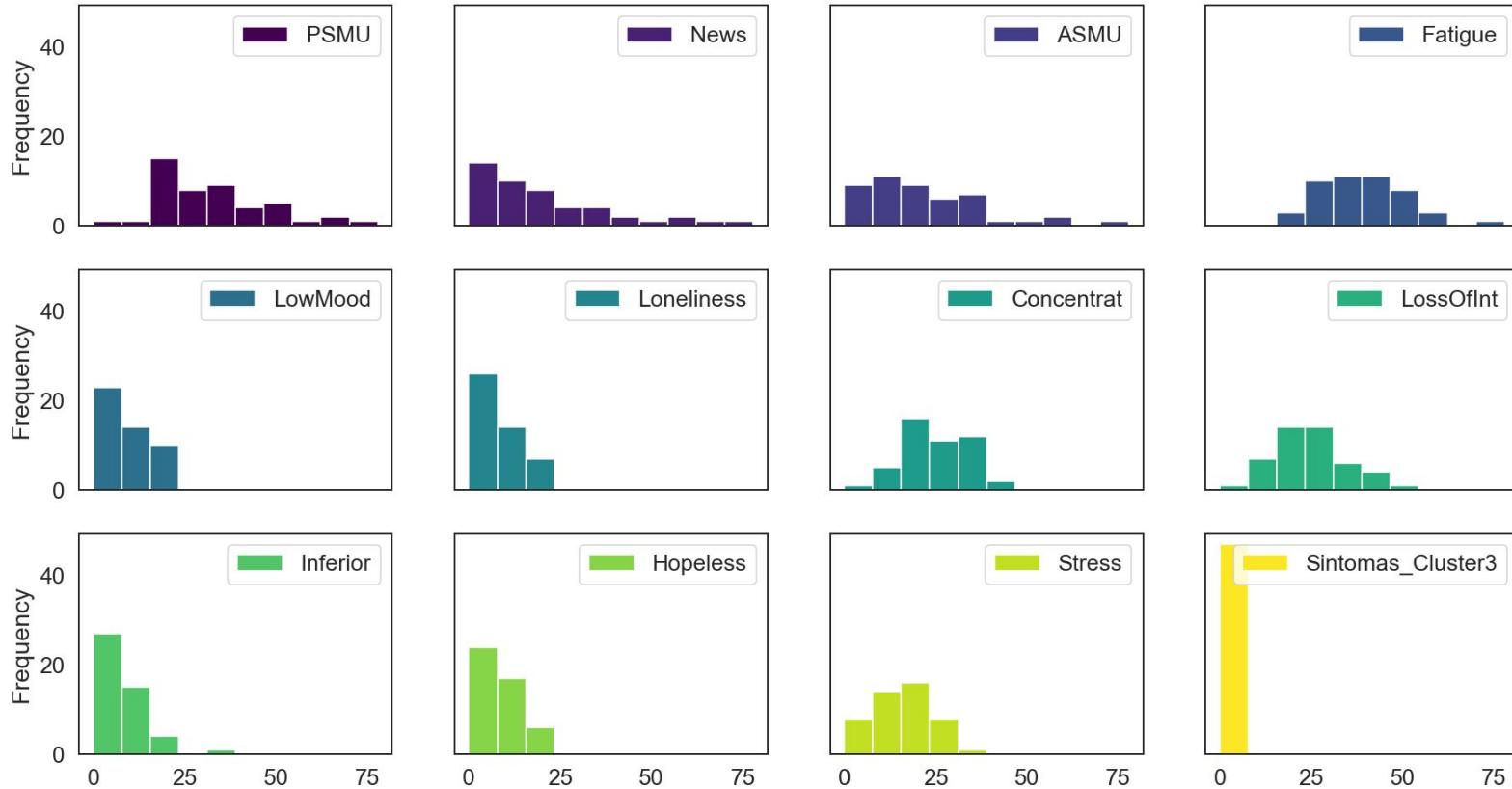
# VS

# Medianas

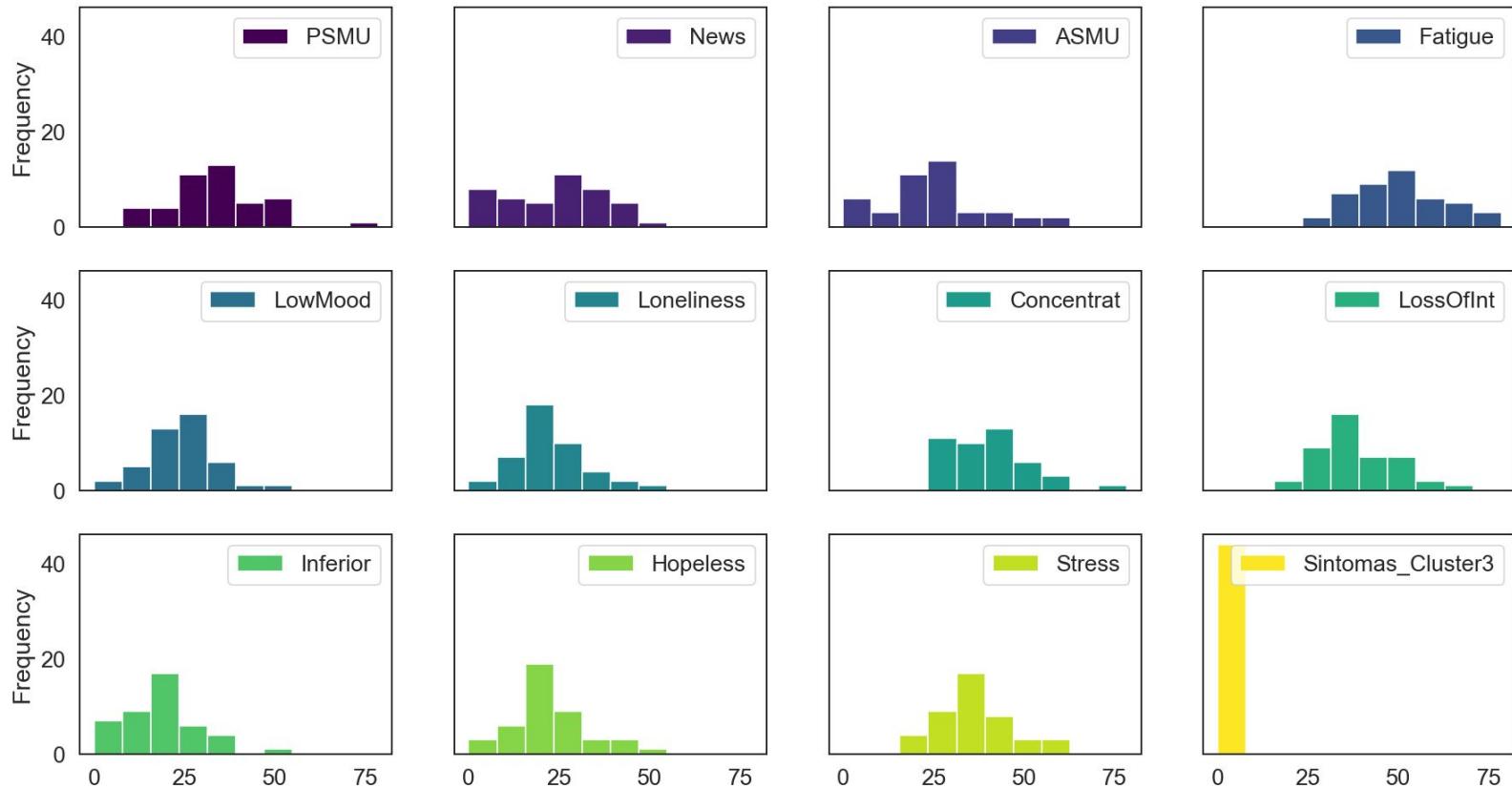
|                          | PSMU      | ASMU      | News      |
|--------------------------|-----------|-----------|-----------|
| <b>Sintomas_Cluster3</b> |           |           |           |
| <b>0</b>                 | 32.828738 | 22.358340 | 21.097926 |
| <b>1</b>                 | 33.850722 | 25.449406 | 24.046184 |
| <b>2</b>                 | 25.760717 | 14.340403 | 14.456431 |

|                          | PSMU      | ASMU      | News      |
|--------------------------|-----------|-----------|-----------|
| <b>Sintomas_Cluster3</b> |           |           |           |
| <b>0</b>                 | 29.862745 | 20.946667 | 15.565789 |
| <b>1</b>                 | 32.467908 | 24.991765 | 24.202008 |
| <b>2</b>                 | 22.604015 | 9.378148  | 9.608057  |

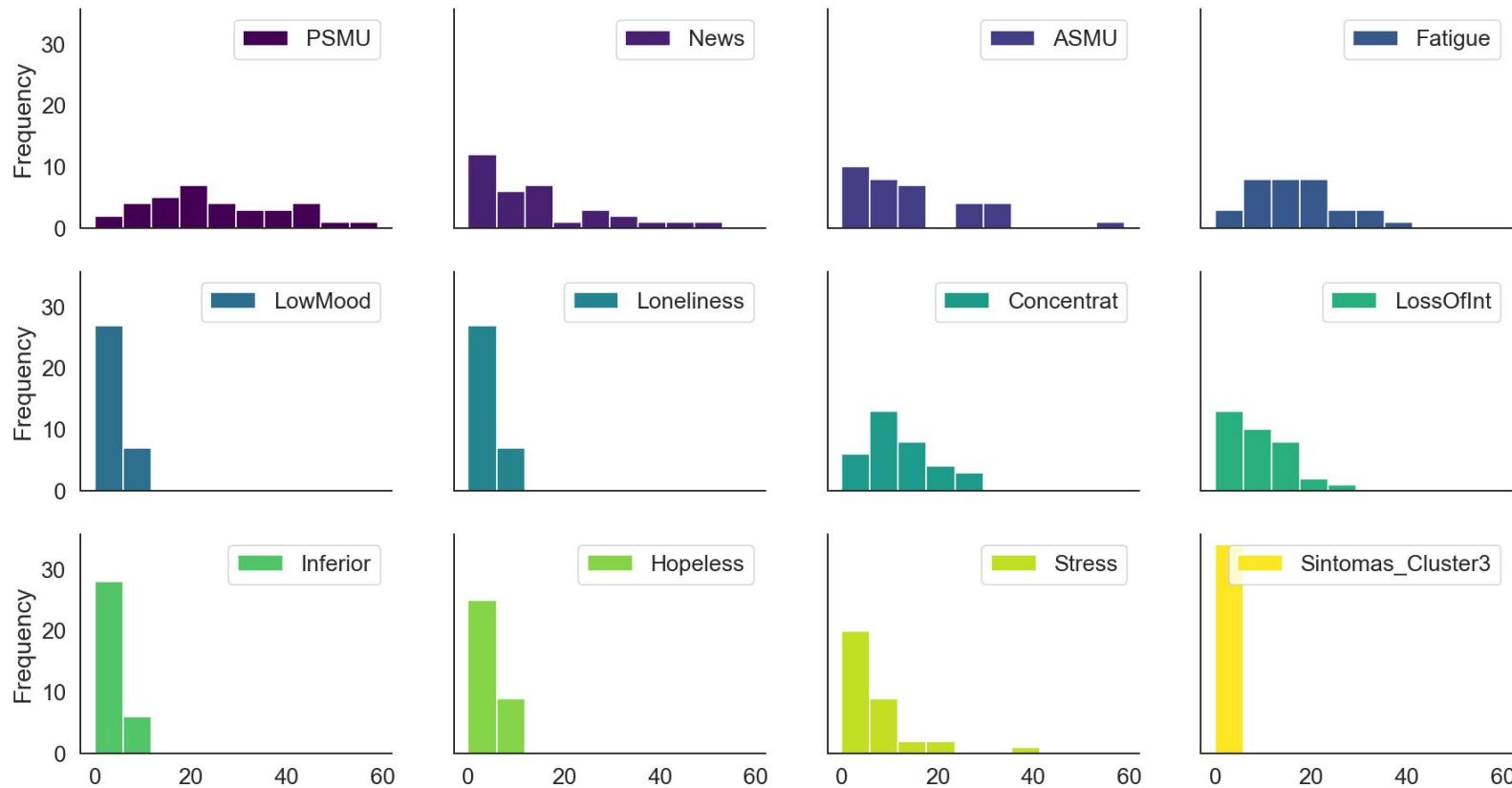
# Cluster 0



# Cluster 1



# Cluster 2



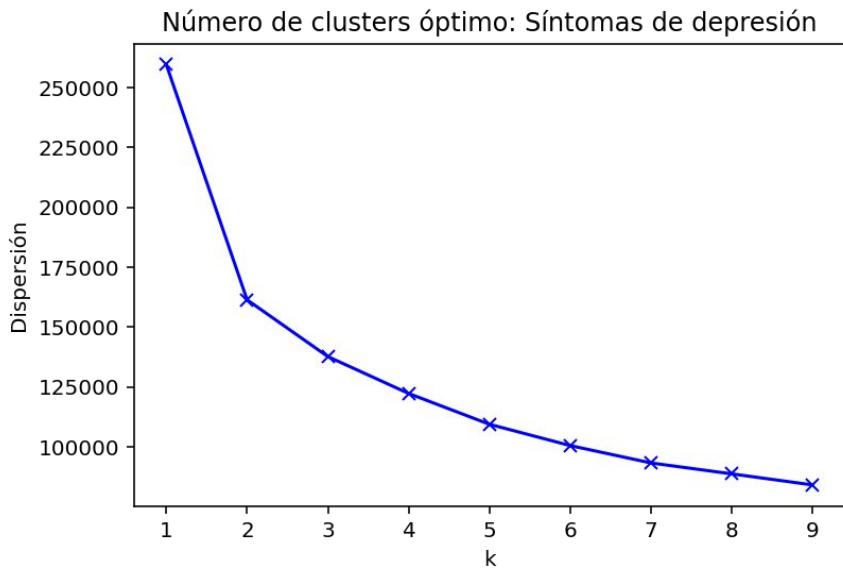
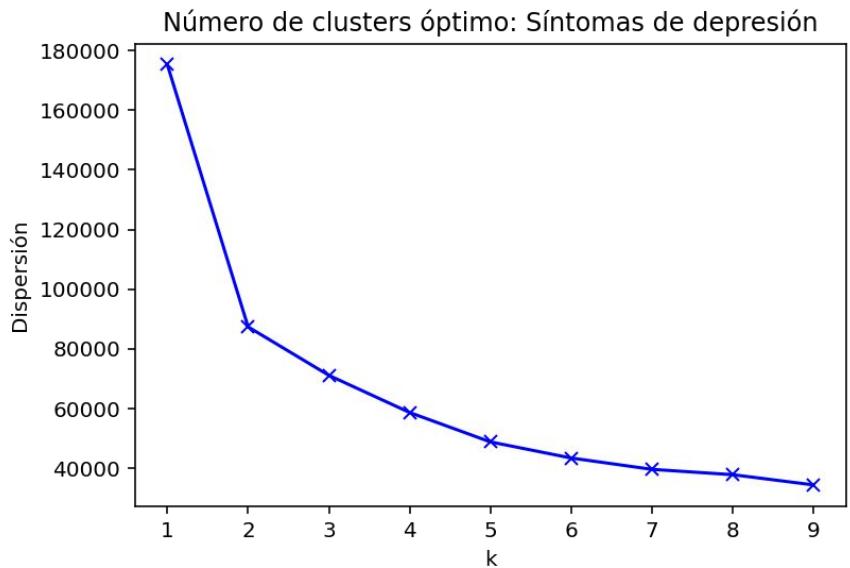
# Medias

|                          | PSMU      | News      | ASMU      | Fatigue   | LowMood   | Loneliness | Concentrat | LossOfInt | Inferior  | Hopeless  | Stress    |
|--------------------------|-----------|-----------|-----------|-----------|-----------|------------|------------|-----------|-----------|-----------|-----------|
| <b>Sintomas_Cluster3</b> |           |           |           |           |           |            |            |           |           |           |           |
| 0                        | 32.828738 | 21.097926 | 22.358340 | 39.207907 | 9.089328  | 7.894220   | 24.752344  | 24.720951 | 7.484238  | 8.162754  | 15.910039 |
| 1                        | 33.850722 | 24.046184 | 25.449406 | 50.521560 | 24.760494 | 22.846137  | 40.236774  | 38.110635 | 19.231795 | 22.342252 | 35.817086 |
| 2                        | 25.760717 | 14.456431 | 14.340403 | 16.694062 | 3.242385  | 3.275091   | 11.389923  | 9.063583  | 2.856649  | 3.377492  | 7.228503  |

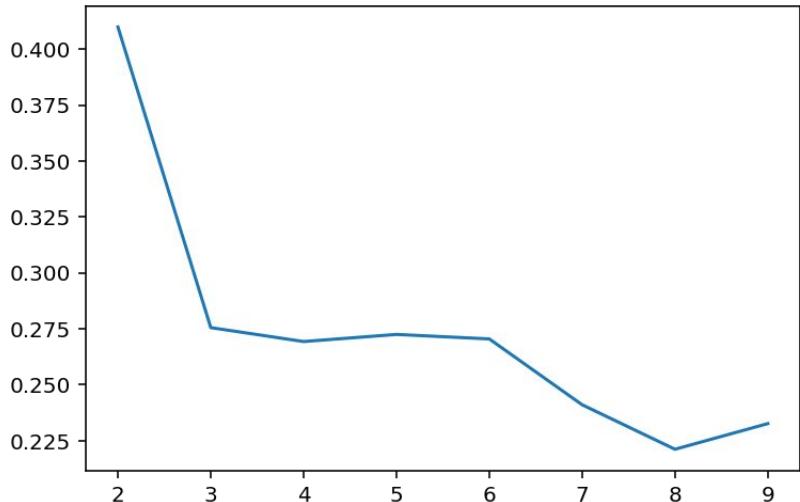
# Medianas

|                          | PSMU      | News      | ASMU      | Fatigue   | LowMood   | Loneliness | Concentrat | LossOfInt | Inferior  | Hopeless  | Stress    |
|--------------------------|-----------|-----------|-----------|-----------|-----------|------------|------------|-----------|-----------|-----------|-----------|
| <b>Sintomas_Cluster3</b> |           |           |           |           |           |            |            |           |           |           |           |
| 0                        | 29.862745 | 15.565789 | 20.946667 | 38.559322 | 8.012658  | 5.461538   | 24.364865  | 23.741935 | 6.040000  | 6.697674  | 16.898305 |
| 1                        | 32.467908 | 24.202008 | 24.991765 | 49.808840 | 24.411009 | 22.504956  | 39.516372  | 37.021325 | 19.319166 | 21.576515 | 34.390741 |
| 2                        | 22.604015 | 9.608057  | 9.378148  | 15.117902 | 2.081583  | 1.884778   | 9.337302   | 8.321078  | 1.060065  | 2.348856  | 5.034091  |

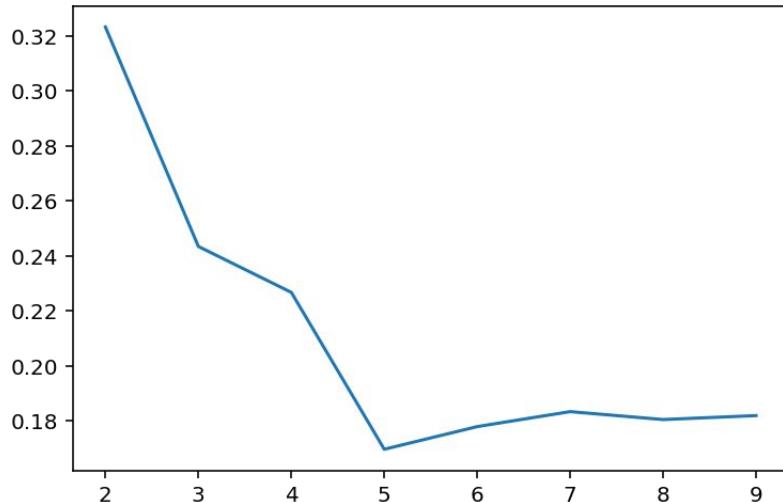


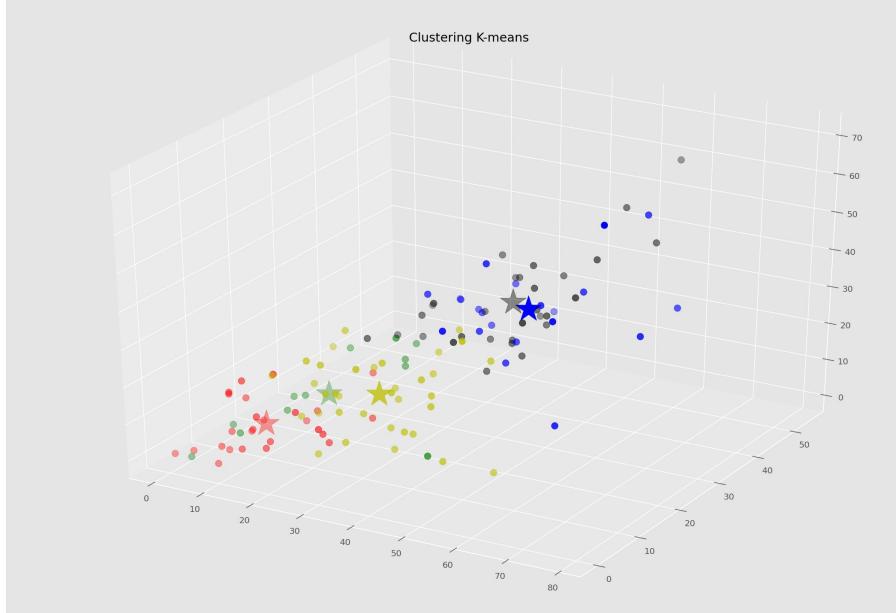
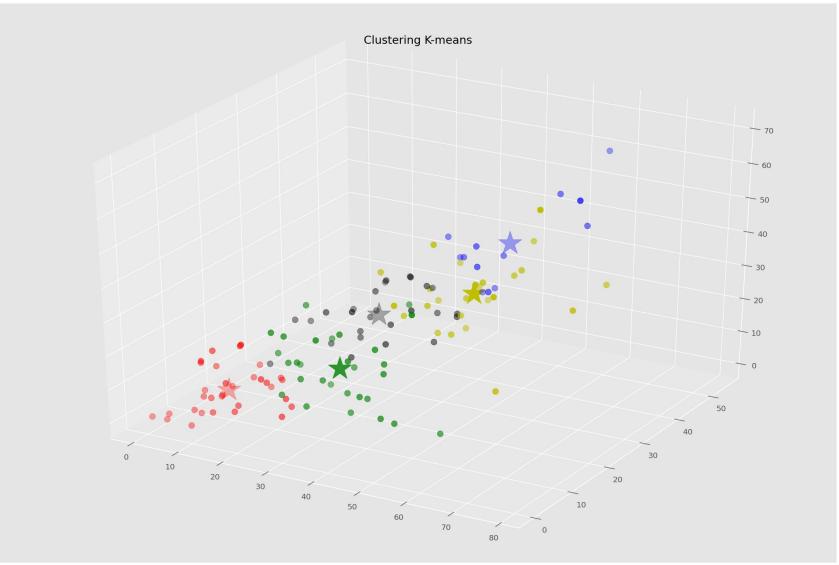


Número de clusters óptimo: Síntomas de Depresión



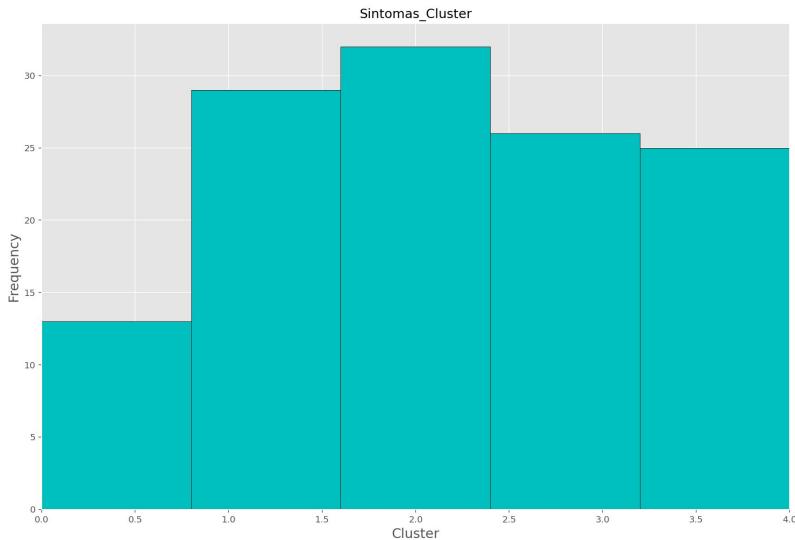
Número de clusters óptimo: Síntomas de Depresión





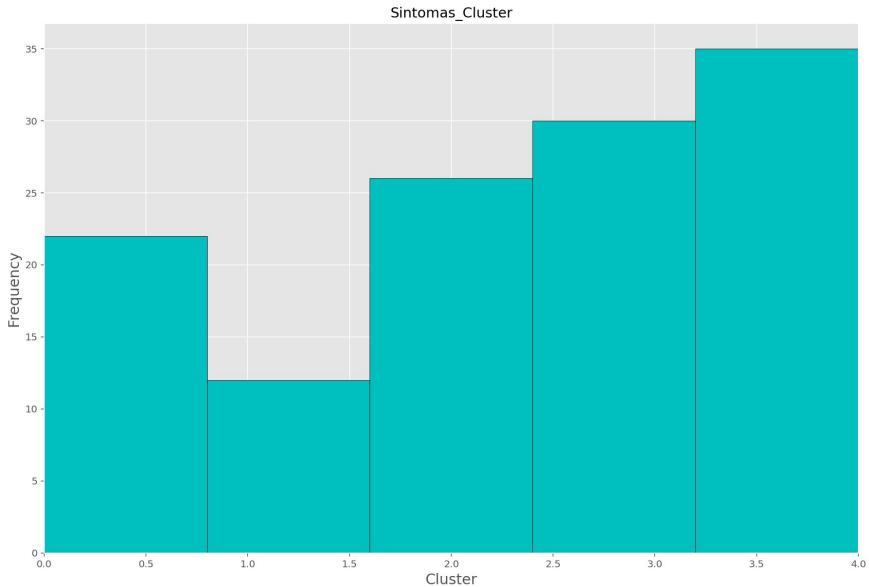
### Participantes/cluster

|   |    |
|---|----|
| 2 | 32 |
| 1 | 29 |
| 3 | 26 |
| 4 | 25 |
| 0 | 13 |

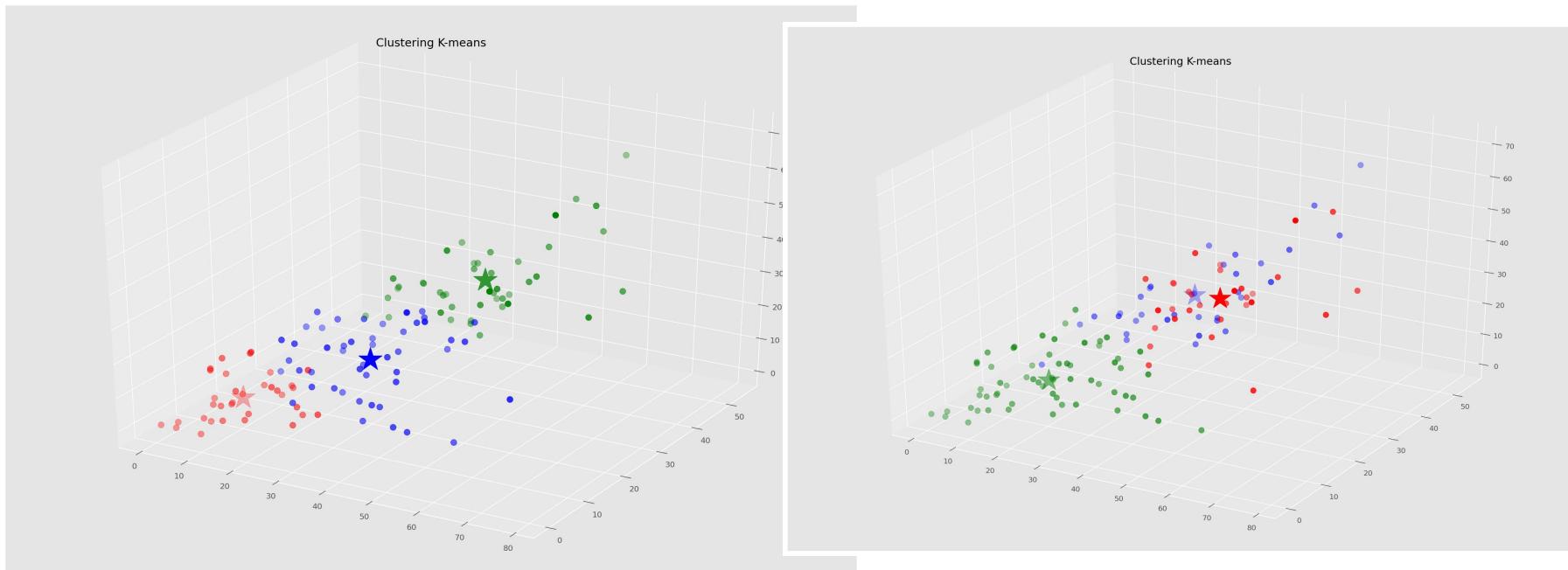


### Participantes/cluster

|   |    |
|---|----|
| 4 | 35 |
| 3 | 30 |
| 2 | 26 |
| 0 | 22 |
| 1 | 12 |



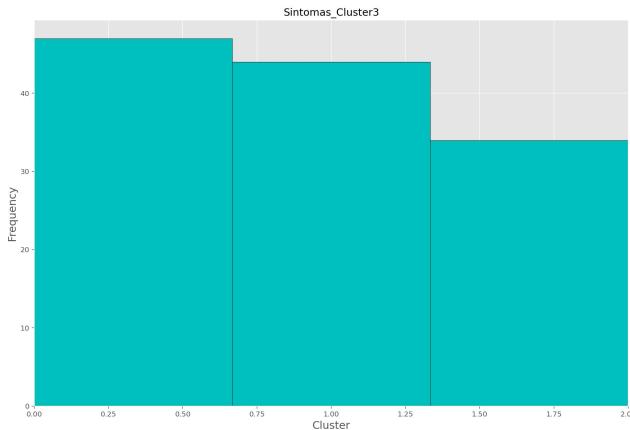
# Participantes agrupados en 3 Clusters



# Participantes agrupados en 3 Clusters

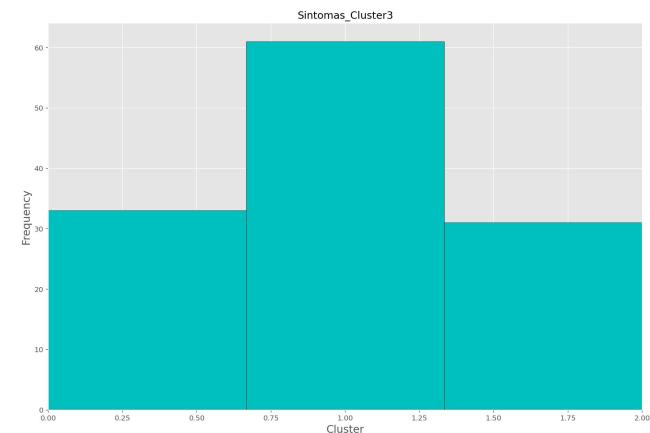
Participantes/cluster

|   |    |
|---|----|
| 0 | 47 |
| 1 | 44 |
| 2 | 34 |



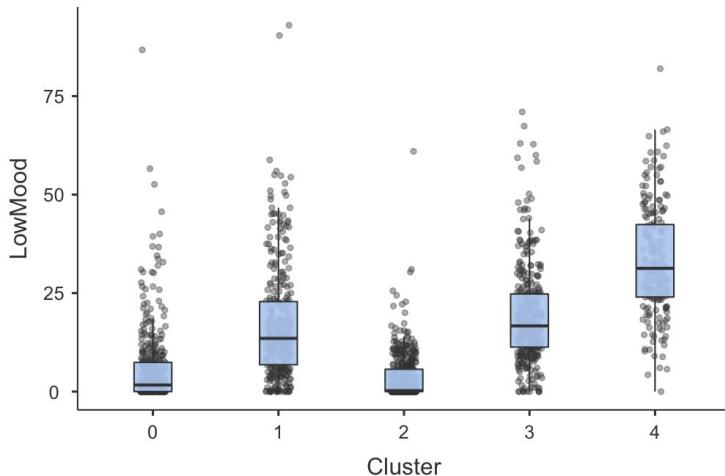
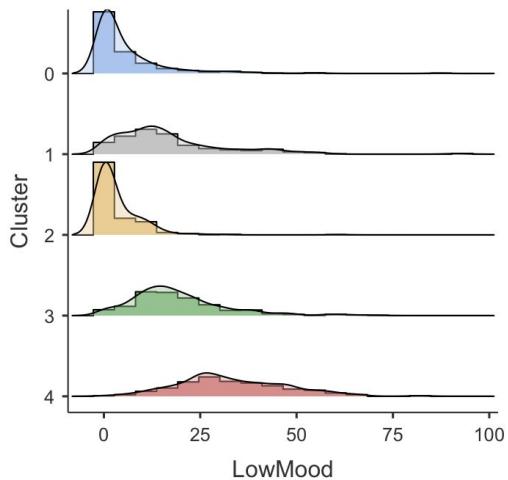
Participantes/cluster

|   |    |
|---|----|
| 1 | 61 |
| 0 | 33 |
| 2 | 31 |



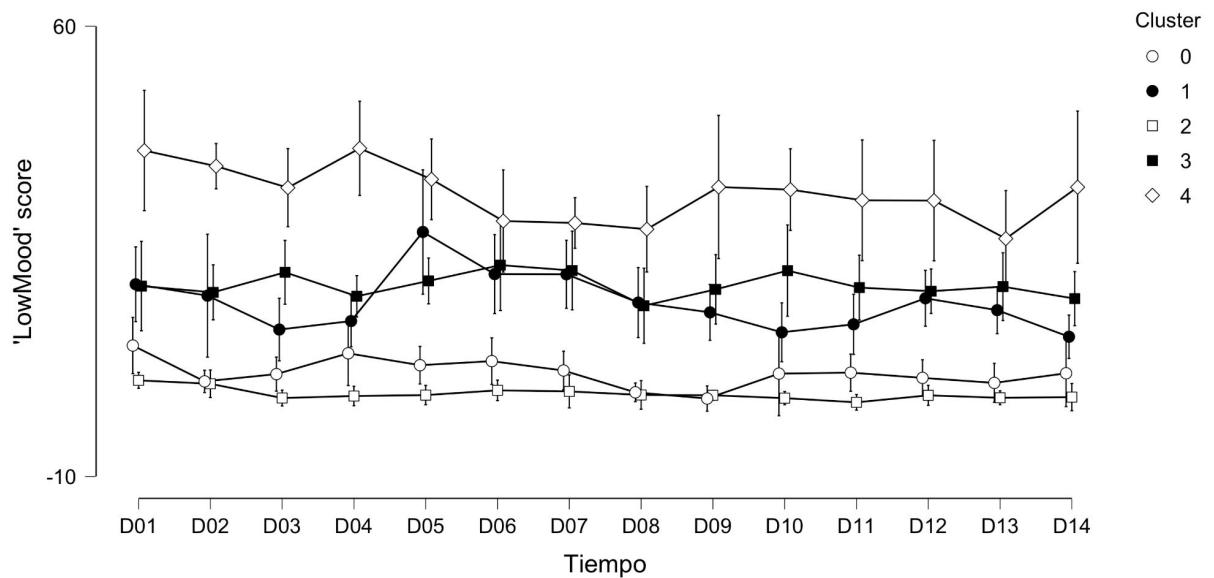
# Análisis 1

## 1.2 ANOVA de medidas repetidas



# Análisis 1

## 1.2 ANOVA de medidas repetidas



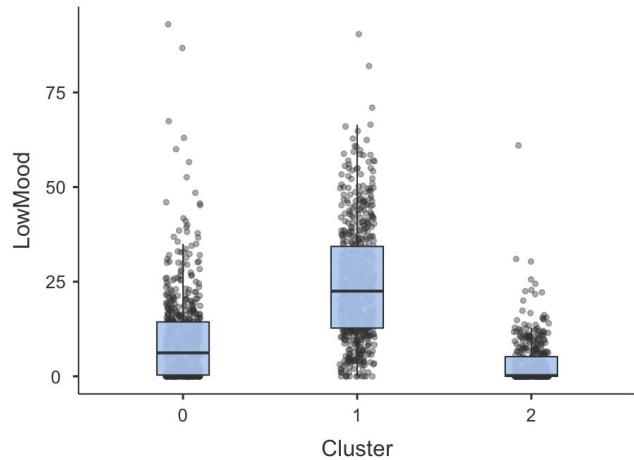
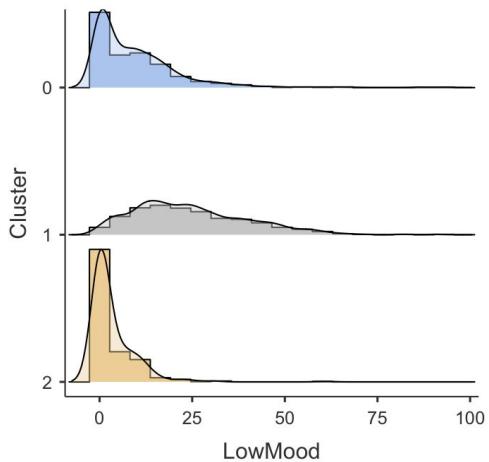
# Análisis 1

## 1.2 ANOVA de medidas repetidas

| Shapiro-Wilk p | 0 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 |
|----------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                | 1 | 0.201  | < .001 | 0.018  | 0.224  | 0.013  | 0.017  | 0.046  | 0.005  | 0.049  | 0.025  | 0.007  | 0.004  | 0.002  | 0.042  |
|                | 2 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 |
|                | 3 | 0.028  | 0.305  | 0.307  | 0.890  | 0.947  | < .001 | < .001 | 0.004  | 0.037  | 0.002  | 0.003  | 0.067  | 0.018  | 0.059  |
| →              | 4 | 0.768  | 0.554  | 0.698  | 0.139  | 0.189  | 0.657  | 0.994  | 0.724  | 0.055  | 0.036  | 0.155  | 0.242  | 0.771  | 0.215  |

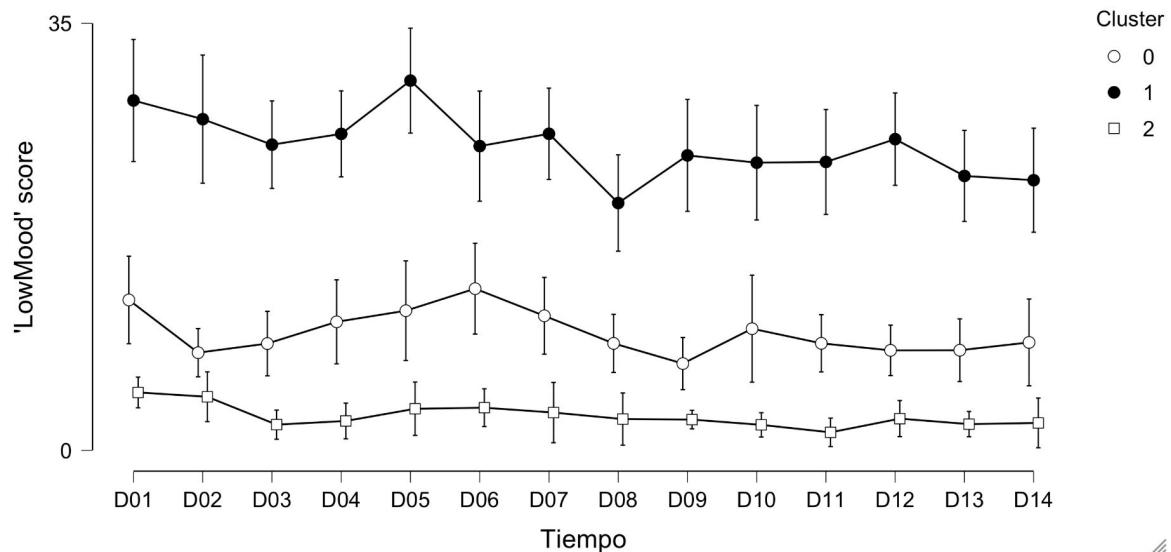
# Análisis 1

## 1.2 ANOVA de medidas repetidas



# Análisis 1

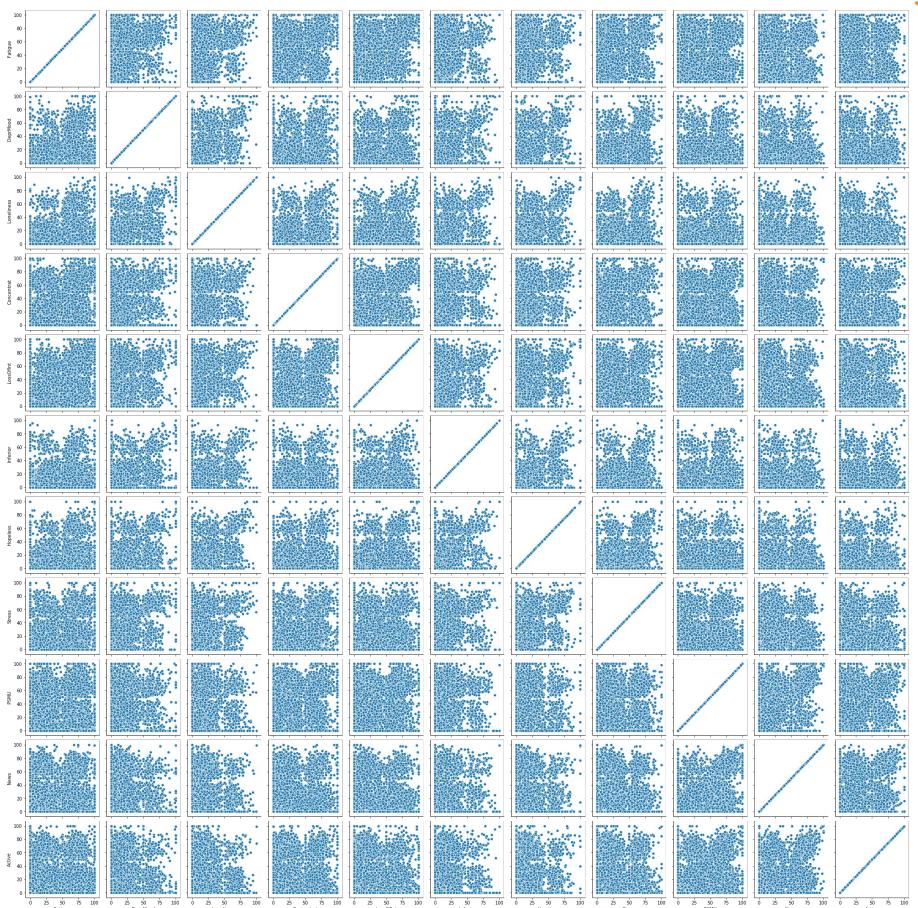
## 1.2 ANOVA de medidas repetidas



# Análisis 2: Regresión

## 2.0 Análisis Descriptivo

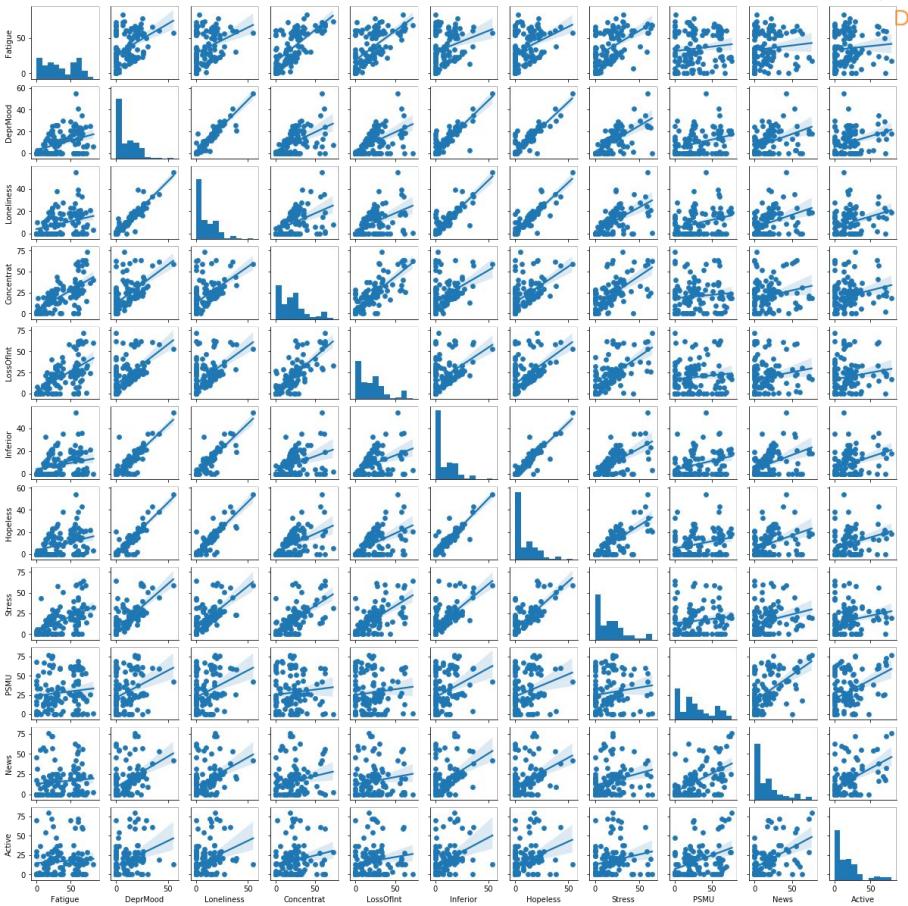
- Matriz de dispersión de las 11 variables (8 depresión + 3 social media)



# Análisis 2: Regresión

## 2.1 Análisis Descriptivo “Medianas”

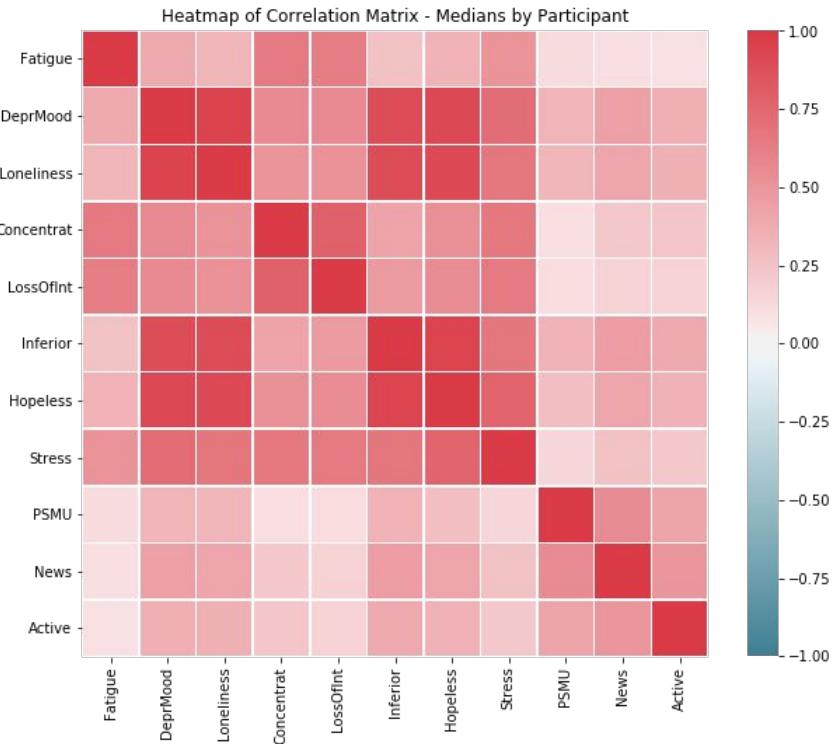
- Matriz de dispersión de las medianas de las 11 variables por participante (8 depresión + 3 social media)



# Análisis 2: Regresión

## 2.1 Correlaciones para las “Medianas”

- Heatmap de las correlaciones entre medianas de las 11 variables por participante  
(8 depresión + 3 social media)



# Análisis 2: Regresión

## 2.1 Correlaciones para las “Medianas”

Coeficientes de Correlación de Pearson

|            | Fatigue  | LowMood  | Loneliness | Concentrat | LossOfInt | Inferior |
|------------|----------|----------|------------|------------|-----------|----------|
| Fatigue    | 1.000000 | 0.388624 | 0.322274   | 0.655198   | 0.626204  | 0.259637 |
| LowMood    | 0.388624 | 1.000000 | 0.949128   | 0.563623   | 0.566066  | 0.897216 |
| Loneliness | 0.322274 | 0.949128 | 1.000000   | 0.511942   | 0.522927  | 0.897224 |
| Concentrat | 0.655198 | 0.563623 | 0.511942   | 1.000000   | 0.782571  | 0.429409 |
| LossOfInt  | 0.626204 | 0.566066 | 0.522927   | 0.782571   | 1.000000  | 0.475468 |
| Inferior   | 0.259637 | 0.897216 | 0.897224   | 0.429409   | 0.475468  | 1.000000 |
| Hopeless   | 0.340497 | 0.921116 | 0.910543   | 0.524931   | 0.549720  | 0.938407 |
| Stress     | 0.508896 | 0.725804 | 0.664148   | 0.660198   | 0.655638  | 0.668883 |
| PSMU       | 0.120300 | 0.333257 | 0.325784   | 0.104106   | 0.115973  | 0.342550 |
| News       | 0.103161 | 0.438256 | 0.410461   | 0.220152   | 0.176854  | 0.456311 |
| ASMU       | 0.086841 | 0.360601 | 0.352487   | 0.235048   | 0.169266  | 0.388539 |
|            | Hopeless | Stress   | PSMU       | News       | ASMU      |          |
| Fatigue    | 0.340497 | 0.508896 | 0.120300   | 0.103161   | 0.086841  |          |
| LowMood    | 0.921116 | 0.725804 | 0.333257   | 0.438256   | 0.360601  |          |
| Loneliness | 0.910543 | 0.664148 | 0.325784   | 0.410461   | 0.352487  |          |
| Concentrat | 0.524931 | 0.660198 | 0.104106   | 0.220152   | 0.235048  |          |
| LossOfInt  | 0.549720 | 0.655638 | 0.115973   | 0.176854   | 0.169266  |          |
| Inferior   | 0.938407 | 0.668883 | 0.342550   | 0.456311   | 0.388539  |          |
| Hopeless   | 1.000000 | 0.764252 | 0.274597   | 0.412981   | 0.345499  |          |
| Stress     | 0.764252 | 1.000000 | 0.140877   | 0.263730   | 0.222095  |          |
| PSMU       | 0.274597 | 0.140877 | 1.000000   | 0.554896   | 0.420723  |          |
| News       | 0.412981 | 0.263730 | 0.554896   | 1.000000   | 0.505136  |          |
| ASMU       | 0.345499 | 0.222095 | 0.420723   | 0.505136   | 1.000000  |          |

# Análisis 2: Regresión

## 2.1 Modelo Final “Medianas”

### Modelo Final

**LowMood = -0,52 + 0,89 Loneliness + 0,05 LossOfInt + 0,07 Stress**

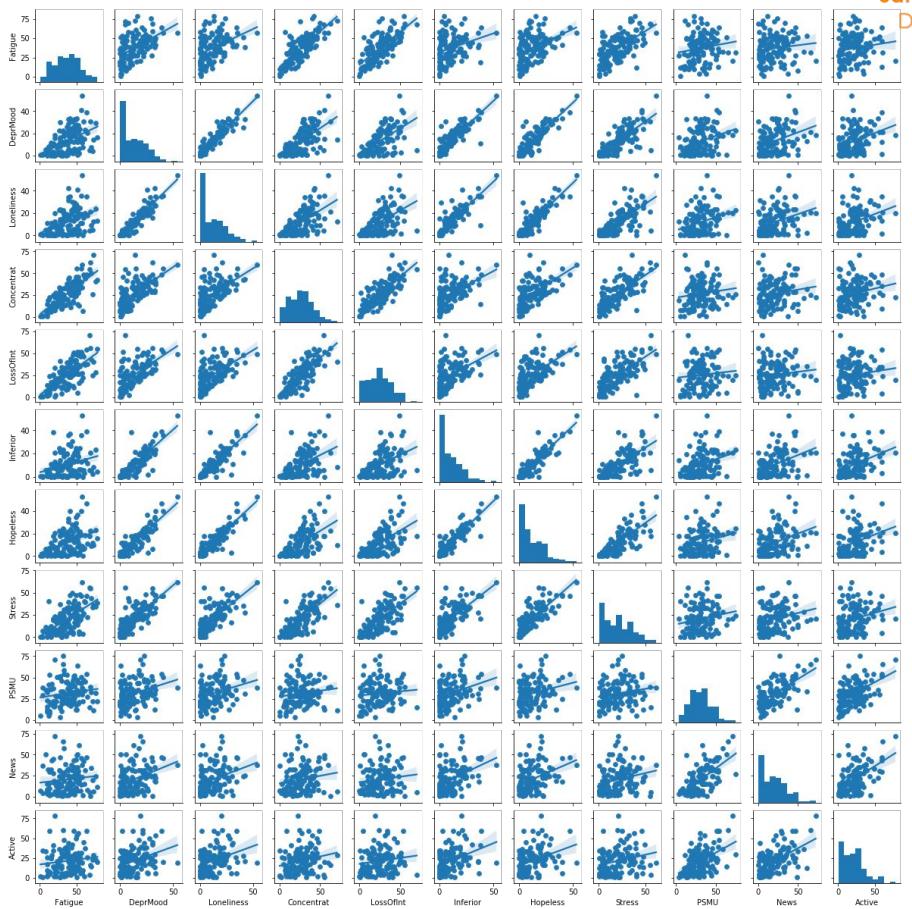
**Conclusiones:** El Coeficiente de Determinación (R2) del modelo ajustado para las "medianas" es alto (85,2%), indicando que el ajuste puede ser considerado aceptable bajo un punto de vista estadístico.

```
R2 Coefficient for Linear Regression Model with Training Data: 0.931
R2 Coefficient for Linear Regression Model with Testing Data: 0.852
```

# Análisis 2: Regresión

## 2.2 Análisis Descriptivo “Medias”

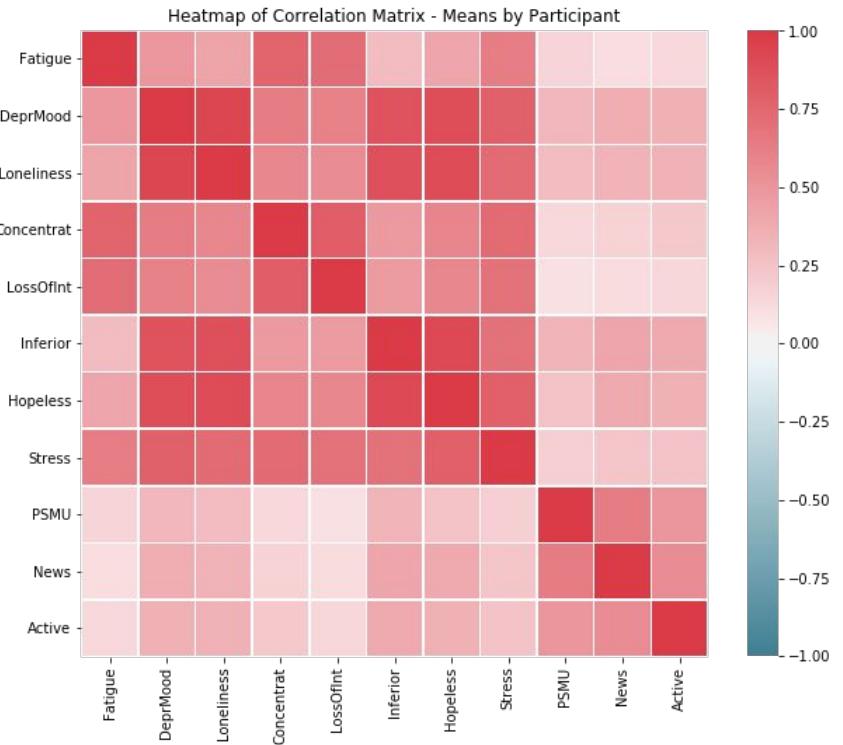
- Matriz de dispersión de las **medias** de las 11 variables por participante (8 depresión + 3 social media)



# Análisis 2: Regresión

## 2.2 Correlaciones para las “Medias”

- Heatmap de las correlaciones entre medias de las 11 variables por participante  
(8 depresión + 3 social media)



# Análisis 2: Regresión

## 2.2 Correlaciones para las “Medias”

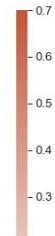
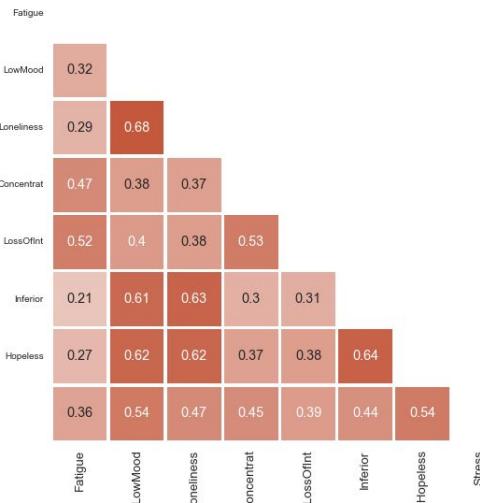
Coeficientes de Correlación de Pearson

|            | Fatigue  | LowMood  | Loneliness | Concentrat | LossOfInt | Inferior |
|------------|----------|----------|------------|------------|-----------|----------|
| Fatigue    | 1.000000 | 0.495489 | 0.414944   | 0.765596   | 0.724377  | 0.294038 |
| LowMood    | 0.495489 | 1.000000 | 0.936039   | 0.637160   | 0.608748  | 0.863215 |
| Loneliness | 0.414944 | 0.936039 | 1.000000   | 0.584262   | 0.554562  | 0.867703 |
| Concentrat | 0.765596 | 0.637160 | 0.584262   | 1.000000   | 0.800439  | 0.478082 |
| LossOfInt  | 0.724377 | 0.608748 | 0.554562   | 0.800439   | 1.000000  | 0.473098 |
| Inferior   | 0.294038 | 0.863215 | 0.867703   | 0.478082   | 0.473098  | 1.000000 |
| Hopeless   | 0.408797 | 0.886901 | 0.903660   | 0.587749   | 0.584380  | 0.906741 |
| Stress     | 0.629350 | 0.783958 | 0.727096   | 0.729697   | 0.694639  | 0.687907 |
| PSMU       | 0.158909 | 0.314198 | 0.295886   | 0.139219   | 0.100333  | 0.328546 |
| News       | 0.115318 | 0.372362 | 0.340172   | 0.169265   | 0.124075  | 0.411115 |
| ASMU       | 0.137964 | 0.353302 | 0.351500   | 0.220335   | 0.142297  | 0.386622 |
|            | Hopeless | Stress   | PSMU       | News       | ASMU      |          |
| Fatigue    | 0.408797 | 0.629350 | 0.158909   | 0.115318   | 0.137964  |          |
| LowMood    | 0.886901 | 0.783958 | 0.314198   | 0.372362   | 0.353302  |          |
| Loneliness | 0.903660 | 0.727096 | 0.295886   | 0.340172   | 0.351500  |          |
| Concentrat | 0.587749 | 0.729697 | 0.139219   | 0.169265   | 0.220335  |          |
| LossOfInt  | 0.584380 | 0.694639 | 0.100333   | 0.124075   | 0.142297  |          |
| Inferior   | 0.906741 | 0.687907 | 0.328546   | 0.411115   | 0.386622  |          |
| Hopeless   | 1.000000 | 0.795686 | 0.255122   | 0.390167   | 0.357633  |          |
| Stress     | 0.795686 | 1.000000 | 0.189035   | 0.240480   | 0.251279  |          |
| PSMU       | 0.255122 | 0.189035 | 1.000000   | 0.633571   | 0.505431  |          |
| News       | 0.390167 | 0.240480 | 0.633571   | 1.000000   | 0.548528  |          |
| ASMU       | 0.357633 | 0.251279 | 0.505431   | 0.548528   | 1.000000  |          |

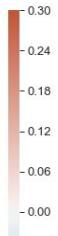
# Análisis 2: Regresión

## 2.2 Correlaciones para las “Medias”

Pearson correlations of ESM questionnaire variables



Partial correlations of ESM questionnaire variables



# Análisis 2: Regresión

## 2.2 Modelo Final “Medias”

### Modelo Final

**LowMood = -0,85 + 0,78 Loneliness + 0,18 Stress + 0,04 News**

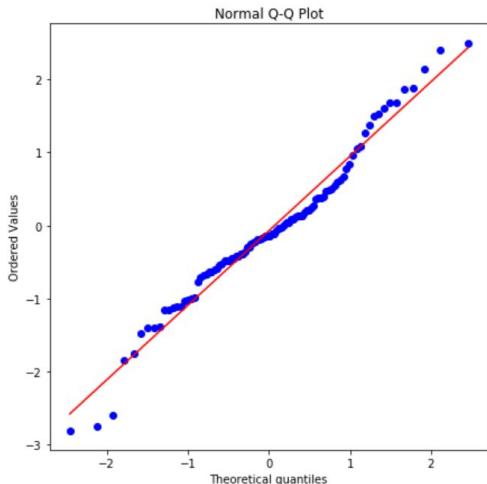
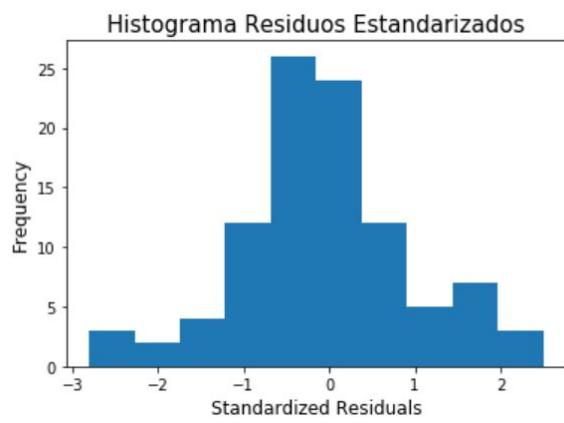
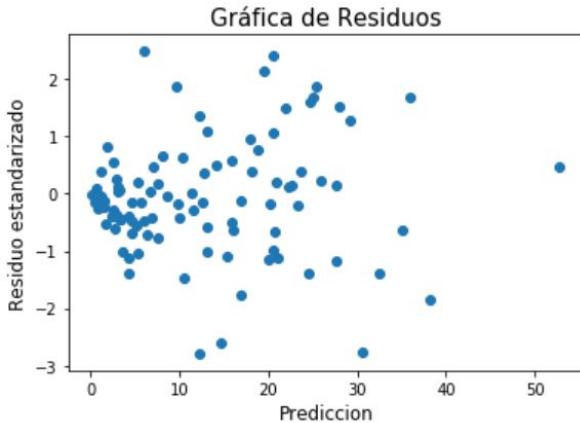
**Conclusiones:** El Coeficiente de Determinación (R2) del modelo ajustado para las "medias" es alto (87,4%). Como el Análisis de Residuos también ha sido considerado satisfactorio, se valida el modelo bajo un punto de vista estadístico.

```
R2 Coefficient for Linear Regression Model with Training Data: 0.931
R2 Coefficient for Linear Regression Model with Testing Data: 0.874
```

# Análisis 2: Regresión

## 2.2 Análisis de Residuos Satisfactorio (Modelo Final “Medias”)

$$\text{LowMood} = -0,85 + 0,78 \text{ Loneliness} + 0,18 \text{ Stress} + 0,04 \text{ News}$$



# Análisis 2: Regresión

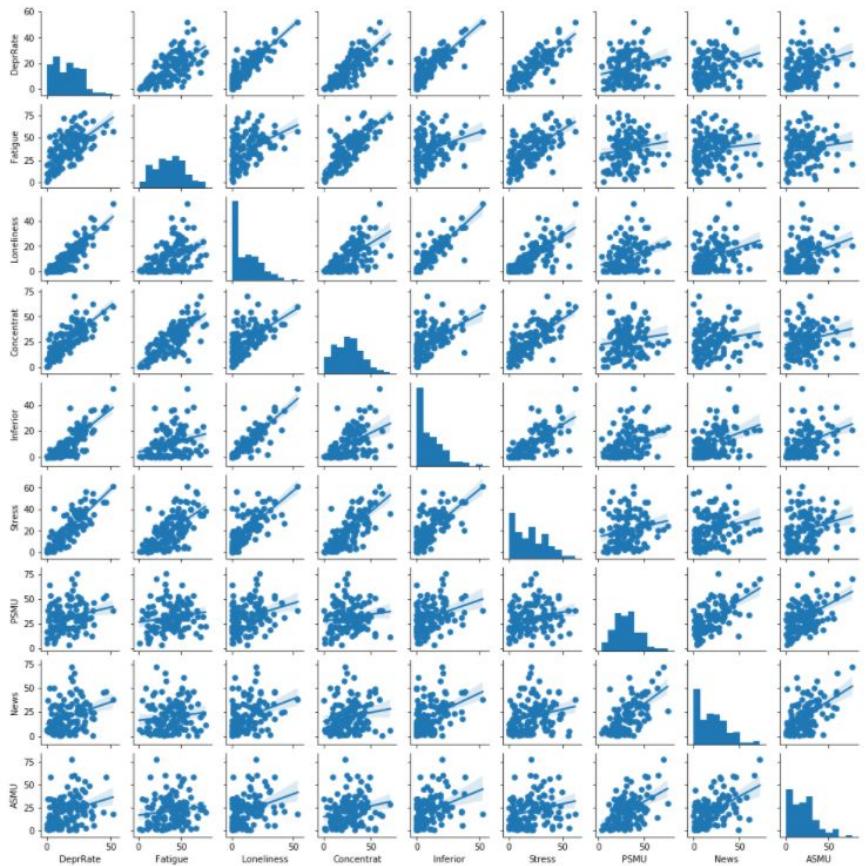
## 2.3 Creación “Índice Depresión”: DeprRate

```
df["DeprRate"] = 0.33334*df["LowMood"] + 0.33334*df["LossOfInt"] + 0.33334*df["Hopeless"]
```

# Análisis 2: Regresión

## 2.3 Análisis Descriptivo “Medias”

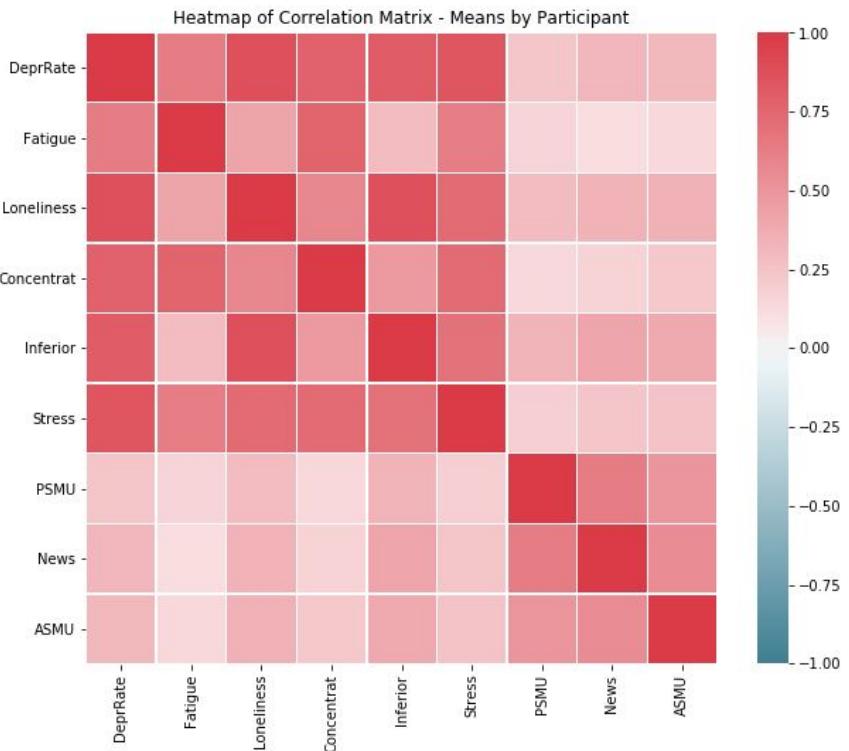
- Matriz de dispersión de las **medias** de las 9 variables por participante (6 depresión + 3 social media)



# Análisis 2: Regresión

## 2.3 Correlaciones para las “Medias”

- Heatmap de las correlaciones entre medias de las 9 variables por participante  
(6 depresión + 3 social media)



# Análisis 2: Regresión

## 2.3 Correlaciones para las “Medias”

Coeficientes de Correlación de Pearson

|            | DeprRate | Fatigue  | Loneliness | Concentrat | Inferior | Stress   |
|------------|----------|----------|------------|------------|----------|----------|
| DeprRate   | 1.000000 | 0.632913 | 0.873127   | 0.775639   | 0.812381 | 0.847804 |
| Fatigue    | 0.632913 | 1.000000 | 0.414944   | 0.765596   | 0.294038 | 0.629350 |
| Loneliness | 0.873127 | 0.414944 | 1.000000   | 0.584262   | 0.867703 | 0.727096 |
| Concentrat | 0.775639 | 0.765596 | 0.584262   | 1.000000   | 0.478082 | 0.729697 |
| Inferior   | 0.812381 | 0.294038 | 0.867703   | 0.478082   | 1.000000 | 0.687907 |
| Stress     | 0.847804 | 0.629350 | 0.727096   | 0.729697   | 0.687907 | 1.000000 |
| PSMU       | 0.238592 | 0.158909 | 0.295886   | 0.139219   | 0.328546 | 0.189035 |
| News       | 0.314299 | 0.115318 | 0.340172   | 0.169265   | 0.411115 | 0.240480 |
| ASMU       | 0.304916 | 0.137964 | 0.351500   | 0.220335   | 0.386622 | 0.251279 |
|            |          |          |            |            |          |          |
|            | PSMU     | News     | ASMU       |            |          |          |
| DeprRate   | 0.238592 | 0.314299 | 0.304916   |            |          |          |
| Fatigue    | 0.158909 | 0.115318 | 0.137964   |            |          |          |
| Loneliness | 0.295886 | 0.340172 | 0.351500   |            |          |          |
| Concentrat | 0.139219 | 0.169265 | 0.220335   |            |          |          |
| Inferior   | 0.328546 | 0.411115 | 0.386622   |            |          |          |
| Stress     | 0.189035 | 0.240480 | 0.251279   |            |          |          |
| PSMU       | 1.000000 | 0.633571 | 0.505431   |            |          |          |
| News       | 0.633571 | 1.000000 | 0.548528   |            |          |          |
| ASMU       | 0.505431 | 0.548528 | 1.000000   |            |          |          |

# Análisis 2: Regresión

## 2.3 Modelo Final “Medias”

### Modelo Final

**DeprRate = -0,025 + 0,308 Loneliness + 0,250 Inferior +  
+ 0,190 Concentrat + 0,154 Stress + 0,059 Fatigue**

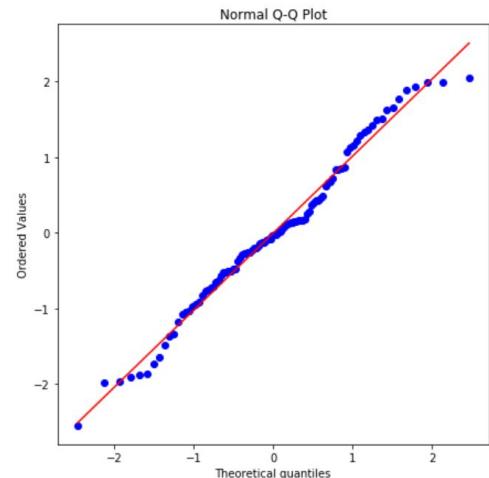
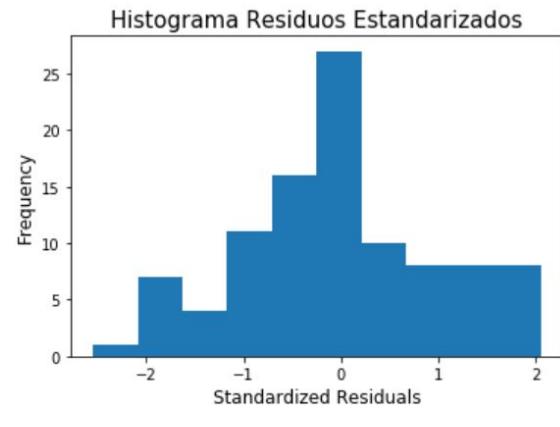
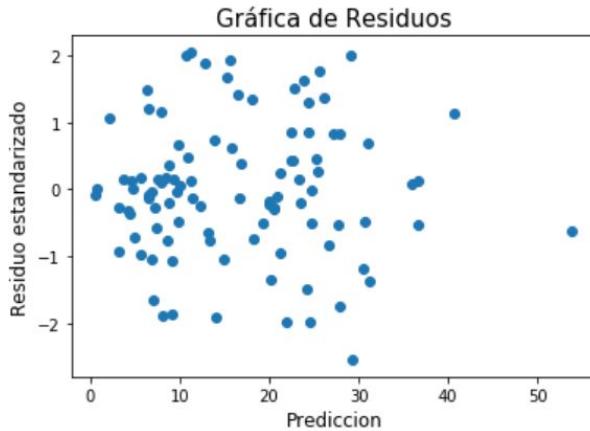
**Conclusiones:** El Coeficiente de Determinación (R2) del modelo ajustado para las "medias" es alto (91,3%). Como el Análisis de Residuos también ha sido considerado satisfactorio, se valida el modelo bajo un punto de vista estadístico.

```
R2 Coefficient for Linear Regression Model with Training Data: 0.908
R2 Coefficient for Linear Regression Model with Testing Data: 0.913
```

# Análisis 2: Regresión

## 2.3 Análisis de Residuos Satisfactorio (Modelo Final “Medias”)

$$\text{DeprRate} = -0,025 + 0,308 \text{ Loneliness} + 0,250 \text{ Inferior} + \\ + 0,190 \text{ Concentrat} + 0,154 \text{ Stress} + 0,059 \text{ Fatigue}$$



# Estándar Presentación:

- Tamaño de letra “Título”: 28
- Tamaño de letra “Subtítulo”: 24
- Tamaño de letra “Comentarios”: 16
- Código de colores: