Each column is a factor

(these are named according to the extraction method)

Each row is an item (one of our variables)

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
         ML1   ML2   h2   u2 com
item_1  0.02 -0.59 0.35 0.65 1.0
item_2  0.00  0.69 0.48 0.52 1.0
item_3  0.00  0.78 0.61 0.39 1.0
item_4 -0.11  0.61 0.37 0.63 1.1
item_5  0.46  0.41 0.40 0.60 2.0
item_6 -0.68 -0.01 0.47 0.53 1.0
item_7  0.81 -0.02 0.65 0.35 1.0
item_8  0.74  0.03 0.55 0.45 1.0
item_9  0.74 -0.11 0.56 0.44 1.0

                       ML1  ML2
SS loadings           2.45 2.00
Proportion Var        0.27 0.22
Cumulative Var        0.27 0.49
Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of 
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Loadings show the correlation between each item and each factor.

A squared loading reflects the proportion of variance in an item that is explained by a factor.

e.g., $-0.59^2 = 0.35$

35% of the variance in item 1 is explained by Factor 2

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
         ML1   ML2   h2   u2 com
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item_4 -0.11  0.61 0.37 0.63 1.1
item_5  0.46  0.41 0.40 0.60 2.0
item_6 -0.68 -0.01 0.47 0.53 1.0
item_7  0.81 -0.02 0.65 0.35 1.0
item_8  0.74  0.03 0.55 0.45 1.0
item_9  0.74 -0.11 0.56 0.44 1.0

                       ML1  ML2
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Proportion Var        0.27 0.22
Cumulative Var        0.27 0.49
Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Square the loadings for each item and add them up, and you get the proportion of variance in an item that is explained by all the factors. This is the “communality”.

e.g., $-0.11^2 + -0.61^2 = 0.37$

37% of the variance in item 4 is explained by this 2 Factor solution

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
         ML1   ML2   h2   u2 com
item_1  0.02 -0.59 0.35 0.65 1.0
item_2  0.00  0.69 0.48 0.52 1.0
item_3  0.00  0.78 0.61 0.39 1.0
item_4 -0.11  0.61 0.37 0.63 1.1
item_5  0.46  0.41 0.40 0.60 2.0
item_6 -0.68 -0.01 0.47 0.53 1.0
item_7  0.81 -0.02 0.65 0.35 1.0
item_8  0.74  0.03 0.55 0.45 1.0
item_9  0.74 -0.11 0.56 0.44 1.0

                       ML1  ML2
SS loadings           2.45 2.00
Proportion Var        0.27 0.22
Cumulative Var        0.27 0.49
Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

The proportion of variance in each item that is left *unexplained* by the factors is 1 minus the communality.

e.g., 1 - 0.37 = 0.63

63% of the variance in item 4 is left unexplained

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
         ML1   ML2   h2   u2 com
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                       ML1  ML2
SS loadings           2.45 2.00
Proportion Var        0.27 0.22
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Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of 
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

The extent to which a given item loads on to a single factor vs onto multiple factors is termed ‘complexity’.

It equals 1 if an item loads only on one factor, 2 if it loads evenly on 2 factors, and so on.

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
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item_5  0.46  0.41 0.40 0.60 2.0
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item_8  0.74  0.03 0.55 0.45 1.0
item_9  0.74 -0.11 0.56 0.44 1.0

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SS loadings           2.45 2.00
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Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Square all the loadings for each factor and add them up. This gives you the “SS loadings”.

These are the same as the eigenvalues unless an oblique rotation is used. As the variance in each item is scaled to be 1, the total variance in the data is equal to the number of items.

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
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item_6 -0.68 -0.01 0.47 0.53 1.0
item_7  0.81 -0.02 0.65 0.35 1.0
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Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

SS loadings divided by number of items gives the proportion of variance in the data explained by each factor

e.g., 2.45/9 = 0.27

27% of the variance is explained by Factor 1

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
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item_6 -0.68 -0.01 0.47 0.53 1.0
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item_8  0.74  0.03 0.55 0.45 1.0
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Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Taking each factor sequentially, we can calculate the cumulative variance explained.

e.g., 0.27+0.22 = 0.49

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
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item_4 -0.11  0.61 0.37 0.63 1.1
item_5  0.46  0.41 0.40 0.60 2.0
item_6 -0.68 -0.01 0.47 0.53 1.0
item_7  0.81 -0.02 0.65 0.35 1.0
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Proportion Var        0.27 0.22
Cumulative Var        0.27 0.49
Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Out of the total variance explained by all factors, we can calculate the proportion of this that is explained by each factor.

e.g., 0.27/0.49 = 0.55

We can see this cumulatively too

```
> fa(eg_data, nfactors=2, rotate = "oblimin", fm = "ml")
Factor Analysis using method =  ml
Call: fa(r = eg_data, nfactors = 2, rotate = "oblimin", fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
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item_4 -0.11  0.61 0.37 0.63 1.1
item_5  0.46  0.41 0.40 0.60 2.0
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                       ML1  ML2
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Proportion Explained  0.55 0.45
Cumulative Proportion 0.55 1.00

 With factor correlations of 
     ML1  ML2
ML1 1.00 0.06
ML2 0.06 1.00
```

Correlation matrix for the factors. This will depend on whether or not a correlation is estimated (i.e. whether an oblique rotation is used). Shows how related the factors are to one another.