



Study 7

Factor Analysis of Body Hair Distribution.

Source:

Barker, D. G. (1976) Factor analysis of body hair distribution. *American Journal of Physical Anthropology*, 44, 27-30

Aim of Barker's study:

The author used data collected by Setty to classify and describe patterns and distributions of hair on the scalp.

Method:

700 white adult males were examined for the presence or absence of terminal hair in 13 locations on the back and front of the trunk. Each individual was coded 0 (hair absent) or 1 (hair present) for each of the following locations

1 Acromial Top of shoulders	6 Infrascapular Below scapular above lumbar	10 Infraclavicular Below the collar bones
2 Infracervical Lower part of back of neck	7 Circumareolar Around the nipples	11 Sagittal Narrow upward extension of pubic hair along the midline
3 Scapular Shoulder blade regions	8 Pectoral On the breasts	12 Acuminate Triangular upward extension of pubic
4 Lumbar Loin areas	9 Sternal Center or lower part of breastbone	13 Disperse Distributed over most of lower abdomen in quadrangular pattern
5 Sacral Between and just above buttocks		

Procedure of data analysis:

The variables were intercorrelated (using phi coefficients), factor analyzed (principle axis), and rotated to simple structure (Varimax routine). A five factor solution was selected for presentation.

Table 1

Input for factor analysis

```
1
.55 1
.40 .39 1
.60 .48 .41 1
.21 .19 .03 .27 1
.49 .51 .51 .60 .18 1
.12 .13 .09 .15 .16 .15 1
.28 .32 .18 .30 .27 .31 .48 1
.23 .26 .18 .17 .25 .20 .38 .47 1
.31 .41 .20 .29 .25 .30 .28 .46 .47 1
.09 .13 .07 .12 .15 .11 .33 .34 .34 .22 1
.12 .13 .08 .14 .16 .14 .39 .42 .41 .23 .84 1
.30 .15 .22 .31 .10 .31 .18 .26 .02 .10 .17 .21 1
```

Variable names see above.

Eigenvalues:

4.35 2.11 1.17 0.93 0.86 ...

Varimax results

The following Varimax results have been obtained by recalculation.
They differ only slightly from Barker's Varimax results.

Table 2

Varimax-rotated loadings of PCA factors

Nos.	F1 Upper Trunk ?	F2 Breasts Pubic	F3 ?	Variables
1	.76	.02	.20	Top of shoulders
2	.67	-.02	.37	Lower part of back of neck
3	.69	.05	.00	Shoulder blade regions
4	.79	.07	.15	Loin areas
5	.16	.07	.50	Between and above buttocks
6	.79	.08	.12	Below scapular above lumbar
7	.06	.52	.39	Around the nipples
8	.27	.46	.54	On the breasts
9	.09	.34	.71	Center or lower part of breastbone
10	.28	.12	.72	Below the collar bones
11	.02	.88	.11	Pubic hair along the midline
12	.05	.90	.15	Upward extension of pubic hair
13	.51	.41	-.29	Over most of lower abdomen
%	24.6	18.4	15.7	

Varimax factor interpretation:

F1: The loadings seem to group upper trunk locations. But incomprehensible exceptions also exist: loadings have Loin areas (4), above lumbar (6), lower abdomen (13); and no loadings have upper trunk breast areas (5, 7, 8, 9, 10).

F2: Breasts and pubic area are apparently areas of sexual characteristics.

F3: These body parts (10, 9, 8, 5) do not seem to have anatomical or functional commonalities.

Criticism:

Only one of three Varimax factors can be regarded as plausible.

Varimin results

Table 3

Varimin-rotated loadings of PCA factors:

No.	F1 General Hair Growth	F2 Upper Back vs. Lower Front ?	F3 Pubic Region vs. Other Regions	Variables
1	.60	-39	.32	Top of shoulders
2	.57	-.24	.45	Lower part of back of neck
3	.50	-.45	.15	Shoulder blade regions
4	.64	-.43	.26	Loin areas
5	.33	.22	.36	Between and above buttocks
6	.64	-.44	.23	Below scapular above lumbar
7	.51	.41	-.04	Around the nipples
8	.67	.33	.16	On the breasts
9	.53	.50	.31	Center or lower part of breastbone
10	.52	.29	.51	Below the collar bones
11	.62	.40	-.49	Pubic hair along the midline
12	.67	.42	-.47	Upward extension of pubic hair
13	.52	-.36	-.34	Over most of lower abdomen
%	32.3	14.8	11.7	Sum = 59.7

Interpretation of Varimin factors:

F1: This is a general factor that indicates variance of body hair growth irrespective of locations on the body's surface.

F2: This is a bipolar factor with negative loadings for upper trunk (upper back locations) and positive loadings for lower front (breast and belly locations). Two less explainable exceptions are noticeable: Lower abdomen, 13, and above lumbar, 6, oddly have negative loadings.

F3: This is the pubic hair location

Evaluation:

Varimin F1 and F3 are plausible, but F2 is less so. The cluster of Varimax F2 (area of sexual characteristics) does not fully reappear in Varimin F3 because in Varimin F3 the nipples and breast area is not included. The usual interpretive advantages of Varimin rotated factors over Varimax rotation is less convincing here, although the advantage of Varimin factor F1, explaining general body hair differences (“much” vs. “sparse”) without specification is manifest only with Varimin.

Table 4

Minimal pairs :

Bold numbers represent loadings of pairs of variables for a focal factor. Non-bold numbers are loadings of paired variables for non-focal factors				
Var. No.	F1 General Hair Growth	F2 Upper Back vs. Lower Front	F3 Pubic Region vs. Other Regions	
3	.50	-.45	.15	Shoulder blade regions
9	.53	.50	.31	Center or lower part of breastbone
1	.60	-39	.32	Top of shoulders
9	.53	.50	.31	Center or lower part of breastbone
11	.62	.40	-.49	Pubic hair along the midline
10	.52	.29	.51	Below the collar bones
12	.67	.42	-.47	Upward extension of pubic hair
5	.33	.22	.36	Between and above buttocks

Comment:

Paired variables for F2 have been selected here not without some arbitrariness