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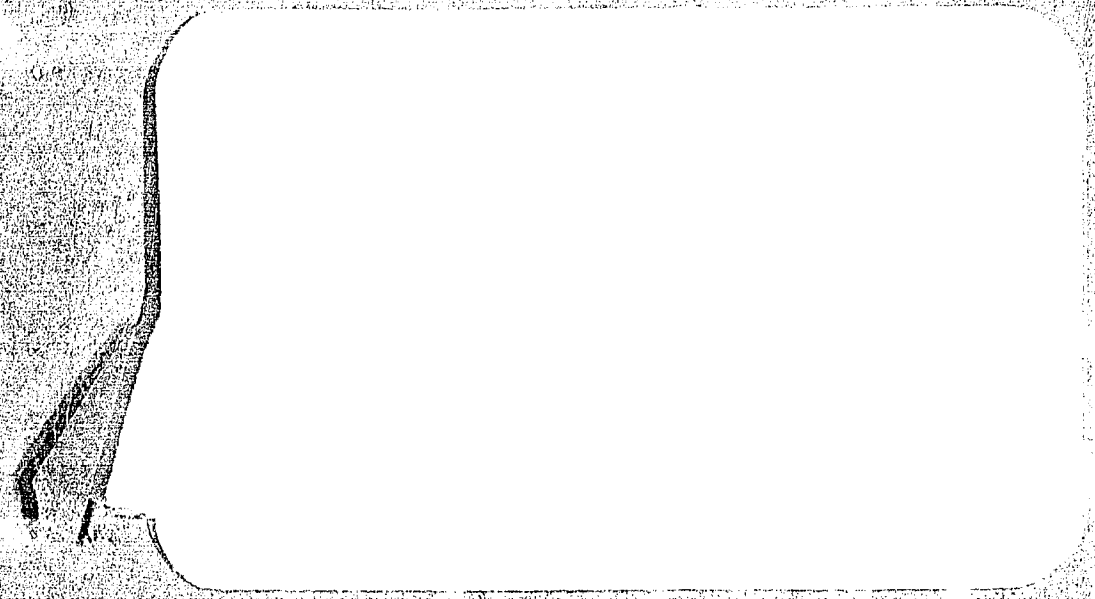
ABSTRACT

This study sought, through a factor analysis of 450 masculine-feminine (MF) items from nine established sources such as the Minnesota Multiphasic Personality Inventory (MMPI), to determine whether in a college sample of 523 students there were a small number of factors common to both sexes, or if the MF scale consisted of so many weak factors that the practice of giving people scores on it should be abandoned. Only 39% of the items discriminated the sexes. Of the nine item factors in females and ten in males, four occurred in both sexes. These MF factors were neuroticism and religiousity (feminine), and power and scientific interests (masculine). The need for four homogeneous, orthogonal MF scales based on these dimensions is requisite for any rational exploration of MF in relation to sex-role identification, achievement, homosexuality, etc. (Author/AG)



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Dimensionality of MF

Patricia W. Lunneborg

The present study sought through a factor analysis of 450 MF items from nine established sources such as MMPI Mf to determine whether in a college sample of 523 Ss there were a small number of factors common to both sexes or if MF consisted of so many weak factors that the practice of giving people scores on "it" ought to be abandoned. Only 39% of the items discriminated the sexes. Of the nine item factors in females and ten in males, four occurred in both sexes. These "true" MF factors were neuroticism and religiousity (feminine), power and scientific interests (masculine). The need for four homogeneous, orthogonal MF scales based on these dimensions is requisite for any rational exploration of MF in relation to sex-role identification, achievement, homosexuality, etc.

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Dimensionality of MF[1]

Patricia W. Lunneborg

The pioneer researchers in masculinity-femininity (MF), Terman and Miles (1936), defined MF as empirical sex differences in a wide variety of fields and doubted openly that factor analysis would reveal a general factor in any pool of such disparate items. Nonetheless, they treated scores on their many-factored M-F test as if scores represented a unidimensional trait, masculine in the positive direction and feminine in the negative direction, and they hypothesized that MF affected the total personality and had significant behavioral correlates. They concluded that MF was in fact one dominant principle (with two sides, interests and emotions) and one of the basic cores from which the structure of personality emerged (1936, p. 451). Their alternative hypothesis was that MF was highly specific and that its behavioral correlates would turn out to be specific to particular M-F fields.

In the intervening years support has grown for this alternative hypothesis as the number of MF scales has proliferated and, with it, the number of conflicting correlates of MF with other measures using different subject pools. These latterday MF scales have tended to come from heterogeneous item pools assembled to measure other traits, the MF scales consisting of those items which showed reliable sex discriminability. Perhaps because the traits of primary interest to these later test constructors did not include MF, sex differences in trait scores are paid only routine attention. What is suggested here is that any personality trait

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showing large sex differences might reflect one of the many aspects to MF. Indeed, studies such as those of Engel (1966) and Farnsworth (1969) indicate that there may be no end to the number of factors to MF, which is to say, maybe there is no such thing as MF, and the practice of giving people scores on "it" should be abandoned.

The present study sought through a large item factor analysis to determine which of three possibilities for MF was the most tenable. Factoring might reveal: (1) A single dimension underlying MF, or (2) A small number of MF factors common to both sexes capable of psychological definition, or (3) A very large number of weak factors suggesting that sex differences have been tapped over a wide variety of personality traits.

The first possibility seemed remoted. The extensive MF literature shows low intercorrelations among MF scales, inconsistent correlations between MF scales and other variables, as well as the many factors already aluded to. Should the second alternative receive support, it would then seem practical to construct a small set of [illegible] orthogonal MF scales to replace the existing heterogeneous scales. Lastly, should there be evidence that objective MF scales were extremely heterogeneous, then MF should no longer be considered a unitary personality trait.

Method

Subjects. In autumn 1967 college student volunteers were paid $5.00 to participate in two objective personality testing sessions lasting 1½ hours each. The 723 Ss (139 males, $\bar{X}$ age 19.6, and 384 females, $\bar{X}$ age 19.0) who completed the first session provided the primary data for the present study. Second administration (N = 372) data were used to

calculate item reliabilities. Instructions were of the standard, self-descriptive sort ("true or false as applied to you") and were accompanied by the information that these personality descriptions would be studied purely statistically in relation to entrance test scores and college grades.

Test Materials. The mimeographed, machine-scored, experimental inventory consisted of 450 true-false MF items assigned to inventory pages randomly and drawn from the following sources: (1) the 60 items of the MMPI Mf scale (Dahlstrom and Welsh, 1960); (2) the 24 items from the 43-item MMPI Sd scale which did not overlap with MMPI Mf items (Dahlstrom and Welsh, 1960); (3) the 27 items from the 38-item CPI Fe scale which did not overlap with previously selected MMPI items (Gough, 1957); (4) 19 items from an earlier femininity scale by Gough (1952); (5) the 30 items of the Guilford-Zimmerman Temperament Survey M scale rewritten to be self-descriptive (Guilford and Zimmerman, 1949); (6) 62 items from the 67-item Heston Personal Adjustment Inventory M-F scale (Heston, 1949) as rewritten in the statement format by Nichols (1962) less five items which overlapped with MMPI and Guilford-Zimmerman items; (7) 109 of the 112 items in Exercises 6 (Opinions) and 7 (Introversion), from both forms A and B of the Terman & Miles M-F test (1936) rewritten in the first-person statement format and excluding 3 items which overlapped with those previously selected; (8) the 66 items (rewritten in first person) which discriminated the sexes at the .05 level in an early normative sample for the 300-item Edwards Personality Inventory, Form IA (Edwards, 1968); (9) 53 items rewritten from the SVIB for Men (Form MM) Masculinity Scale (Strong, 1959), to bring the total number of MF items to 450.

Data Analysis. Interitem phi coefficients among the 450 items were computed separately for the sexes. In these analyses a "true" response was scored one, a "false" scored zero. Each of the two resulting interitem correlation matrices was then factored by a principal components technique. In these two factor analyses, because of the very large number of items, strict computational time (financial) limits, i.e., 1½ hours for each factor analysis, limited the number of factors extracted. Each of the resulting sets of principal components was then rotated using a varimax criterion. Correlations, factor analyses, and rotations were accomplished through the use of a single program for the IBM 7040-7094 DCS. This program is now available for the CDC 6400 (Jensema, 1971).

Results

Of interest is the proportion of these historical MF items which continued to discriminate the sexes in this college sample. Out of 450 items, only 177 (39%) discriminated at the .01 level on both test administrations which meant phi coefficient of .12 on the first occasion, .13 on the second. The scales which contributed the largest proportion of sex differentiation were the Guilford-Zimmerman Temperament Survey and Gough's California Psychological Inventory, while the least effective, no surprise considering its age, was Terman and Miles' MF test.

As Table 1 indicates the factor analyses accounted for only 20% of total item variance among females and 28% among males, in nine and ten factors, respectively. While it is common in factoring intercorrelations of scales with high reliabilities or communalities to account for 70-80% variance, the present figures should be interpreted with reference to the relatively lower

Table 1

Summary of Contributions of Principal Components to MF Items

	Females (N = 384)		Males (N = 139)	
Factors in order extracted	% variance accounted for	Eigenvalue	% variance accounted for	Eigenvalue
1	4.8	21.52	5.1	22.85
2	3.6	16.10	4.8	21.52
3	2.7	12.18	4.4	19.79
4	2.0	8.79	2.6	11.89
5	1.8	7.90	2.3	10.51
6	1.4	6.16	2.1	9.54
7	1.2	5.41	1.8	8.03
8	1.1	5.06	1.6	7.36
9	1.0	4.68	1.6	7.01
10			1.5	6.68

reliabilities and intercorrelations characteristic of true-false items. Table 2 shows the reliabilities of these items as established by the correlations between the two administrations. Average reliabilities were .69 for women and .68 for men and thus the reliable variance in this item pool (mean of r^2_{12}) only amounted to .50 (females) and .49 (males). Given this, the extracted principal axis factors actually determined 40% (female) and 57% (male) of this reliable variance. While the financial rationale for terminating factoring did not take this into account, many more factors would undoubtedly have been required to complete factoring, each factor only accounting for some fraction of 1% of the total variance. Thus, given the practical motivation for the study, i.e., possible construction of a set of unidimensional MF scales, the number of factors realized in the computer time available proved satisfactory.

The nature of multidimensional MF is illustrated in Table 3 by the four items with highest loadings for both female and male rotated factors. Four factors were judged comparable for the sexes: neuroticism, power, scientific interest, and (less significantly) religiousity. Additional factors for females were conforming sociability, aggression, excitability, artistic interest, and people vs. things. Additional factors for males were superstition, philistine, nurturance, thought vs. action, social enjoyment, and self-confidence. For a better appreciation of these factor labels the complete set of items adhering to the factors is available* and makes clearer why, for example, neuroticism is judged an appropriate name for 36 female and 25 male items of which 19 were in common. This report also makes clear that the label aggression is based on acting-out behaviors

Table 2

Frequency Distributions of 450 MF Item Test-Retest Correlations for the Sexes

r_{12}	Males (N = 99)	Females (N = 273)
≤.05	2	3
.06-.10	0	0
.11-.15	0	0
.16-.20	0	0
.21-.25	1	1
.26-.30	3	1
.31-.35	5	0
.36-.40	9	1
.41-.45	14	2
.46-.50	14	14
.51-.55	21	21
.56-.60	44	42
.61-.65	44	59
.66-.70	57	65
.71-.75	68	84
.76-.80	76	77
.81-.85	[illegible]	50
.86-.90	28	24
.91-.95	8	6
>.95	5	0
$\bar{X}_{distrib}$	.68	.69
$SD_{distrib}$	.146	.122

Table 3

Varimax Rotated Factors among MF Items

Factors in female sample	Four items with highest loadings	Female loading	Male loading for comparable factor	Item source[1]
I Neuroticism (36 items >.40)	I am bothered by inferiority feelings.	.60	.47	H
	I often feel self-conscious.	.58	.49	H
	I often feel rather awkward.	.56	.34	H
	I often get disgusted with myself	.54	.47	G
II Conforming sociability (21 items >.40)	I like to be in many social activities.	.60		G
	I am extremely careful about my manner of dress.	.54		T
	I should like to belong to several clubs or lodges.	.53		M
	I like carelessly dressed people.-	.52		S
III Power (8 items >.40)	I like to make the decisions for a group.	.48	.66	E
	I enjoy activities in which I can exert power and authority.	.46	.58	E
	I am very ambitious to be a leader of others.	.46	.59	E
	I am the sort of person who would enjoy being a famous university professor.	.44	.22	E

[1]Source: MMPI Mf designated M; MMPI Sd, D; CPI Fe, C; Gough 1952, G; Guilford-Zimmerman M, Z; Heston M-F, H; SVIB M, S; Terman & Miles MF, T; EPI items, E.

Table 3 (continued)

Factors in female sample	Four items with highest loadings	Female loading	Male loading for comparable factor	Item source[1]
IV Scientific interest (11 items >.40)	I am very much interested in science.	.63	.54	E
	I like science.	.58	.53	M
	I have little interest in science.	-.56	-.46	E
	I think I would like the kind of work a forest ranger does.	.53	.12	M
V Aggression (10 items >.30)	I would like to go hunting with a rifle for wild game.	.46		Z
	I would like to hunt lions in Africa.	.39		D
	I have more interest in athletics than in intellectual activities.	.36		H
	The thought of hurting a person or animal pains me greatly.	-.36		T
VI Excitability (7 items >.30)	I think a thing over carefully before I do it.	-.43		T
	People have said I talk too much.	.43		T
	I usually plan and think things through before acting.	-.42		H
	I am not easily excited.	-.41		E

Table 3 (continued)

Factors in female sample	Four items with highest loadings	Female loading	Male loading for comparable factor	Item source[1]
VII Artistic interest (12 items >.30)	I enjoy studying art.	.39		S
	I think I would like the work of a dress designer.	.38		C
	I would enjoy being a nationally known artist.	.37		S
	I enjoy fortune tellers.	.37		S
VIII People vs. things (5 items >.25)	I would rather be a building contractor than a nurse.	-.30		Z
	I can correct others without giving offense.	.29		S
	I have a certain talent for understanding the other person and for sympathizing with his problems.	.27		G
	When traveling I am more interested in new things and places than in new people.	-.25		H
IX Religiousity (7 items >.30)	I pray several times every week.	.45	.45	D
	I believe in a life hereafter.	.43	.41	M
	There is plenty of proof that life continues after death.	.38	.46	T
	I believe in the second coming of Christ.	.37	.54	D

Table 3 (continued

Factors in male sample	Four items with highest loadings	Male loading	Female loading for comparable factor	Item Source[1]
I Power (40 items >.40)	I like to make the decisions for a group.	.66	.48	E
	I am very ambitious to be a leader of others.	.59	.46	E
	I can get people to want to do what I want them to do.	.58	.38	E
	I enjoy activities in which I can exert power and authority.	.58	.46	E
II Neuroticism (25 items >.40)	I get very tense and anxious when I think other people are disapproving of me.	.59	.50	C
	I frequently find myself worrying about something.	.57	.50	M
	It makes me very nervous when I get blamed for making a mistake.	.56	.51	G
	I worry a lot over possible misfortunes.	.56	.49	T
III Superstition (12 items >.40)	Green-eyed people are not to be trusted.	.83		T
	In walking I am very careful to step over sidewalk cracks.	.76		M
	I am often frightened in the middle of the night.	.74		T
	Lines in the hand foretell the future.	.60		T

Table 3 (continued)

Factors in male sample	Four items with highest loadings	Male loading	Female loading for comparable factor	Item source[1]
IV Philistine (31 items >.40)	I like carelessly dressed people.	-.56		S
	I am inclined to be radical in my religious or social attitudes.	-.55		H
	I do not like to see women smoke.	.54		D
	I like regular hours for work.	.52		S
V Scientific interest (11 items >.40)	I enjoy making a radio or hi-fi set.	.61	.39	S
	I think I would like the work of a garage mechanic.	.57	.37	C
	I am very much interested in science.	.54	.63	E
	I like science.	.53	.58	M
VI Nurturance (8 items >.40)	I feel deeply sorry for a bird with a broken wing.	.57		Z
	I feel deeply sorry for a mistreated horse.	.55		Z
	I cannot stand any form of cruelty to animals.	.55		E
	The thought of hurting a person or animal pains me greatly.	.53		T

Table 3 (continued)

Factors in male sample	Four items with highest loadings	Male Loading	Female loading for comparable factor	Item source[1]
VII Thought vs. action (13 items >.30)	When I work at something I like to read and study about it.	.42		G
	I can express myself better in speech than in writing.	-.41		H
	I prefer reading a book to watching TV or going to a movie.	.40		S
	I spend considerable time trying to improve my knowledge of things.	.40		E
VIII Religiousity (12 items >.30)	I believe in the second coming of Christ.	.54	.37	D
	There is plenty of proof that life continues after death.	.46	.38	T
	I pray several times every week.	.45	.45	D
	I believe there is a Devil and a Hell in afterlife.	.41	.34	M
IX Social enjoyment (11 items >.30)	I enjoy having numerous social engagements.	.41		H
	I can correct others without giving offense.	.38		S
	I would be very disappointed if prevented from having numerous social contacts.	.37		H
	I think I would like the work of a clerk in a large department store.	.34		C

Table 3 (continued)

Factors in male sample	Four items with highest loadings	Male Loading	Female loading for comparable factor	Item source[1]
	I am hesitant about forming decisions.	-.35		H
X				
Self-confidence	I feel lacking in self-control.	-.34		T
(4 items >.30)	I would enjoy preparing the advertising for a new automobile.	.32		S
	I am very strongly attracted by members of my own sex.	.32		M

expressed in items other than those in Table 3, such as "I like to tease people till they cry" (loading .31) and "I have found school a hard place to get along in" (loading .33). It should be noted that for the other shared factors, power among men was represented by 40 items including 7 of the 8 items which defined power among women; similarly, scientific interest was tapped by 11 items for each sex, seven of which were shared. Religiousity involved five common items for the sexes, of the seven among women and twelve among men.

What should be said about the fact that females were found to respond to these items in terms some of which men did not, i.e., in terms of factors labeled conforming sociability, aggression, etc.? Or that men alone organized their responses in terms of superstition and thought vs. action? Obviously, men do not lack aggression or artistic interests any more than women have no need to nurture and no self-confidence.

It is hypothesized that these single sex factors represent dimensions on which the sexes differed in fact in past samples. Today in this college group they no longer do differ, but it is proposed that if one were to ask subjects to behave as they think most men or women do, these very factors would reappear in the "male" and "female" samples. Artistic interest and self-confidence, then, are herein considered stereotypic MF, i.e., traits on which sex differences are judged to exist but which were not in this instance confirmed in self-description, much as self-confidence and unsociable nonconformity were earlier found to be stereotypic (Lunneborg and Lunneborg, 1970).

A factor was defined as "true MF" if two conditions were met. The first condition was that the items which defined the factor must be consistent in the signs of their factor loadings and of their sex discrimination phi's.

There were thus two types of true MF factors. If a factor had its strongly positively loading items more often endorsed by females than males and its strongly negatively loading items more often endorsed by males than females, it was typified as feminine, e.g., for Factor I (neuroticism) in the female sample all but three of its 36 high loading items were of these two kinds. The second type of true MF factor, typified as masculine, had its strongly positively loading items endorsed by males and its negatively loading items endorsed by females, e.g., all eight items to Factor III (power) in the female sample were of these two kinds. The second condition was that the same factor was found in both sexes. Table 4 describes the distribution of highly loading items on each of the 19 factors and provides the basis for identifying four true MF factors: neuroticism and religiousity (feminine), power and scientific interests (masculine).

Items which did not conform to the typification given above deserve comment. Examining the female sample first, Factor I had three "nonconforming" items all of which would be disregarded in future MF scale construction inasmuch as their sex discrimination phi's were insignificant, .00, .01, and -.02. The exception of Factor II (conforming sociability) was a single item, "I want to be an important person in the community," endorsed by more males than females and of distinctly different content than the other items. The three disparate items contribution to Factor IV (scientific interest) referred to gardening activities and drew greater feminine support in contrast to other "scientific" interests. The single nonconforming items for Factors V (aggression) and VIII (people vs. things) had near zero phi's, while the one item incompatible with Factor IX (religiousity) had aberrant content, "I like to tease people till they cry."

Table 4

Consistency among MF Items of Signs of Significant Factor Loadings and of Sex Discrimination Phi's[1]

Factor sample and name	Number of items: Positive factor loading + Ø (M true>fem)	Positive factor loading - Ø (Fem true>M)	Negative factor loading + Ø (M true>fem)	Negative factor loading - Ø (Fem true>M)	Type of Factor
I Females					
Neuroticism	2	25	8	1	True Fem
II Females					
Conforming sociability	1	15	5	0	Fem
III Females					
Power	6	0	0	2	True Masc
IV Females					
Scientific interest	7	3	0	1	True Masc
V Females					
Aggression	7	1	0	2	Masc

[1]First administration

Table 4 (continued)

Factor sample and name	Number of items: Positive factor loading + Ø (M true>fem)	Positive factor loading - Ø (Fem true>M)	Negative factor loading + Ø (M true>fem)	Negative factor loading - Ø (Fem true>M)	Type of Factor
VI Females					
Excitability	0	3	4	0	Fem
VII Females					
Artistic Interest	0	11	1	0	Fem
VIII Females					
People vs.	1	2	2	0	Fem
IX Females					
Religiousity	1	6	0	0	True Fem
I Males					
Power	18	12	1	9	True Masc
II Males					
Neuroticism	1	22	2	0	True Fem
III Males					
Superstition	4	7	1	0	?

Table 4 (continued)

Factor sample and name	Number of items: Positive factor loading + Ø (M true>fem)	Positive factor loading - Ø (Fem true>M)	Negative factor loading + Ø (M true>fem)	Negative factor loading - Ø (Fem true>M)	Type of Factor
IV Males					
Philistine	5	9	10	7	?
V Males					
Scientific interest	9	1	0	1	True Masc
VI Males					
Nurturance	0	6	2	0	Fem
VII Males					
Thought vs. action	5	3	3	2	?
VIII Males					
Religiousity	1	10	0	1	True Fem
IX Males					
Social enjoyment	1	9	1	0	Fem
X Males					
Self-confidence	2	0	0	2	Masc

In the male sample Factor 1 (power) had 13 nonconforming items some of which had insignificant phi's but others of which reflected gregariousness akin to male Factor IX (social enjoyment). Factor II (neuroticism) had one nonconforming item with a phi of .01. Ten of 12 phi coefficients for male Factor III (superstition) were insignificant so that this factor did not qualify as a true MF factor. Factor IV (philistine) as such was a true MF factor either. It embraced 19 items tapping feminine acceptance of conventionality and 12 items tapping masculine rejection of the arts as defined by female Factor VII (artistic interest). Male Factor V (scientific interest) had a single disparate item with a phi of -.01. While most of the content to male Factor VII could be characterized as "thought vs. action," there was neither consistency of factor loadings and phi coefficients nor sufficient significance in the latter--ten of 13 phi's were insignificant. The two nonconforming items in Factor VIII (religiousity) were, "It does not bother me that I am not better looking" with greater male endorsement, and "I like to wear expensive clothes" with greater female endorsement. Lastly, there was a phi of .02 for the one exceptional item to Factor IX.

Discussion

How do these results compare with other attempts to clarify the nature of MF? Studies supporting the notion that the number of factors in MF items might be legion include that of Engel (1966) who found 24 factors in five MF tests. The five item factors accounting for the most variance had significant sex effects and were described as scientific interest, domestic interest, cultural interest, aversion to technical detail, and business interest.

Women were more likely to show domestic and cultural interests and an aversion to the other three interests, men vice versa. Similarly, Lunneborg and Lunneborg (1970) found eleven factors in the items from four MF tests. Again, the five factors worth paying attention to, i.e., those with significant correlations with sex, were feminine interests, philistine vs. artistic attitudes, masculine interests, indifference, and social adequacy. Although these two studies had only two MF scales in common, factors based sex-role activities and interests dominated both factor structures of MF. The difference in results, it is hypothesized, lay in differences between the samples: whereas Engel used art, business administration, and social work graduate students and seniors with strong divergent occupational interests, Lunneborg and Lunneborg used an undifferentiated group of sophomores in a humanities course.

In contrast to the conclusion of the above authors who felt such complexity ought to be faced by researchers and clinicians alike, Terman and Miles said, even though prophetically cognizant of the facts, that "...the final scene has two aspects--two sides of the same picture--one showing differences in the direction of interest, the other differences in the direction of emotions and impulses (1936, p. 447)." They found greater scientific interest and self-assertion (power) in males than in females, and severer morality and greater emotionality (neuroticism) in females than in males, but felt only two basic factors were being represented. While Ford and Tyler (1952) found two factors in each sex in a factor analysis of twelve groups of Terman and Miles items, they cautioned against using MF scores in making judgments about individuals, suspecting that if a wider variety of MF tests were factored, still more factors would be identified.

It is interesting that in Sweden, factor analyses of subscales of items very much like Terman and Miles, MMPI, and Strong items consistently produced two factors in different groups of subjects--sex-role activities and emotionality (Urbina et al., 1970).

It must be concluded that much of the MF literature, i.e., studies exploring the relationships of masculinity-femininity to school achievement, sex-role identification, occupations, homosexuality, field independence, creativity, etc., must be interpreted very guardedly, for what exactly was the measure of MF employed measuring? Judging from the factors present in the MMPI Mf and CIP Fe, for example, a high masculinity score could be achieved in a variety of ways (Lunneborg and Lunneborg, 1970). The time has come to use factor analysis as a basis of MF test construction in addition to the time-honored basis of contrasted groups. Dimensions which might possibly contribute to several scales of MF would be suggested by the most recently identified sex differences in personality scale scores. One would want to locate, for example, the sex differentiating items within a recent neuroticism scale. The present study suggests this is a worthwhile and necessary task for it looks as though MF is neither the unidimensional, mythical belief popularly held, nor is it nonexistent. It consists instead of very labile, culturally determined, population-bound phenomena within which it appears at least four orthogonal dimensions have withstood the passage of time--scientific interest, power, neuroticism, and religiousity. Four new scales are needed so that a given individual could be described, for example, as feminine in regard to neuroticism, but masculine in interests, power, and religiousity.

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