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Gender differences in personality: Biological and/or psychological?

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Abstract

The results of three empirical studies are reported in which the hypothesis is tested that differences in personality variables between the morphophenotype sexes can be explained by psychological sex-role orientation variables. Furthermore, it was expected that normative sex-role orientations (measured with the SRO-S and the AWS-S Scales) and gender-related self-concepts (femininity, masculinity, and androgyny measured with a modified BSRI) explain more variance in personality variables than morphophenotype sex. Besides these sex-role orientation variables, test and questionnaire data on verbal fluency, spatial reasoning, self-concept, anxiety, and aggressiveness were obtained in Study I from 50 young adults and their same-sex parents; in Study II, data on verbal fluency, spatial reasoning, self-concept, anxiety, and neuroticism were obtained from 120 university students; and in Study III, data on anxiety, locus of control, and Machiavellianism were obtained from 226 university students. The results confirm both hypotheses for the two aspects of intelligence studied, domain-specific self-concepts, different aspects of anxiety and aggressiveness, neuroticism, powerful others' externality in locus of control, and Machiavellianism. For all these personality variables the effect sizes of the psychological gender variables were larger than those of morphophenotype sex and reached medium to large values.

INTRODUCTION

While for most personality variables there is no or only rather inconsistent support for gender differences (which appears to suggest that similarities in personality exceed the differences between men and women), for other personality variables support is stronger and more consistent. With reference to the many literature reviews in which the empirical results concerning sex differences in personality have been

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analysed (e.g. Deaux, 1977, 1984, 1985; Maccoby and Jacklin, 1974; Merz, 1979; Yuchtman-Yaar and Shapira, 1981), it can be noted that the following sex differences are rather consistently found in empirical investigations: (a) Girls and women have higher test scores in verbal fluency — an ability of crystallized intelligence — than boys and men. (b) Girls and women have lower scores in spatial reasoning and thinking — an ability of fluid intelligence — than boys and men. (c) Girls and women have lower scores in aggressiveness than boys and men. (d) Girls and women show higher scores in trait anxiety than boys and men. (e) Women show higher scores in neuroticism and subjective (psychosomatic) complaints than men. The literature reviews cited above point further toward some trends in sex differences which refer to personality variables like (a) locus of control of reinforcement (women are more external and less internal than men), (b) Machiavellianism (men score higher), and some aspects of achievement motivation (e.g. females show higher fear of failure).

All these qualified differences in personality are, of course, based on mean comparisons, which in numerous empirical investigations have reached statistical significance. In most cases, effect sizes are low to medium, i.e. effect sizes vary between 2 and 10 per cent of the variance of the personality variable; higher values of effect size are reported rarely. However, gender is one of those person status variables (like age and education) which is consistently considered in almost all empirical studies — at least for the description of the sample(s) under investigation, moderately in (differential) analyses of the generalizability of results, and strongly in attempts to differentiate between females and males not only biologically, but also psychologically. Therefore, the question of the substantiation and utility of *this* (biological) gender variable must be reflected. Like for age in developmental psychology, it can be assumed that morphophenotype sex is a substitutional indicator of the dynamic interaction between basic cultural-normative, socialization, and physiological variables, which are considered more adequately in subjective sex-role orientations, i.e. psychological gender variables.

In the vast majority of the prevailing research on gender differences in the personality variables listed above, only morphological sex (more exactly, *morphophenotype* sex) was the 'independent' variable. Therefore, the reported findings do not represent general gender differences in personality, but rather some low to moderate differences between the morphophenotype sexes. However, recent approaches, not only in psychology, but also in biology and physiology, point to the fact that sex is not a distinct and dichotomous, but a continuous and dimensional variable. *Biology* and *physiology* refer to gender definitions and regulations by hormonal variables ('hormonal sex') and by gonadotropin, which is released by the hypothalamus–pituitary system ('hypothalamus sex'; see Dörner, 1977; Wellner and Brodda, 1979). *Psychology* refers to various constructs of subjective sex-role orientations and to gender-related self-concept variables of the individual (e.g. Constantinople, 1973; Cook, 1985; Shaver and Hendrick, 1987). These definitions of the (biopsychological) gender variable are continuous and make it possible to describe gender membership on dimensions. These dimensions are — at least to a relatively large proportion of variable variance — independent of the dichotomous morphophenotype sex variable and more related to cultural-normative as well as socialization variables and their interaction.

The development of gender identity and sex-role orientations is a very good ex-

ample for the dynamic interaction of biogenetical and psychosocial factors in human development. Biological (i.e. genetical, morphological, hormonal, and gonadotropic) and socialization (i.e. educational, cultural, and psychological) variables interact in the development of gender-related self-concept variables and sex-role orientations. Against the background of an action theory approach to human development (e.g. Brandtstädter, Krampen and Heil, 1986; Lerner and Busch-Rossnagel, 1981) it can be assumed further that within this dynamic interaction there exists some degree of freedom for the individual's actions and efforts in controlling and regulating his/her own (gender identity and personality) development. Thus, these variables — and not (only) morphophenotype sex — have to be the independent variables in investigations of gender differences in personality.

Therefore, the three empirical studies reported below test the following central hypothesis: The relatively consistent significant (low to medium) differences in personality variables, which are reported for the morphophenotype sexes (i.e. spatial reasoning, verbal fluency, aggressiveness, anxiety, neuroticism and complaints, locus of control, and Machiavellianism), can be reproduced using psychological sex-role orientation variables. These psychological sex-role variables, which represent the interaction between biogenetical and psychosocial factors, are specified as (a) normative sex-role orientations (liberal versus traditional valuations of behaviours as right or wrong for women and men), and (b) gender-related self-concept variables (self-perceptions of masculinity, femininity, and androgyny) of the individual. Furthermore, it is expected that these psychological dimensions of gender roles will explain more variance in the personality variables than morphophenotype sex. To sum things up, it is assumed that *morphophenotype sex differences in personality can be described more adequately and effectively as sex-role orientation differences.* Age effects will be considered additionally because age is correlated with some of the personality variables under investigation (e.g. aggressiveness; cf. Hampel and Selg, 1975).

STUDY I: INTELLIGENCE, AGGRESSIVENESS, AND ANXIETY

Methods

Subjects

The analyses reported below are based on test and questionnaire data obtained from 100 West German adults (50 females and 50 males) with high school or college education. The subjects belong to the cohorts of (1) young adults ($n = 50$; age: $M = 22.1$, SD = 3.3 years; 25 females and 25 males) and (2) middle-aged adults ($n = 50$; age: $M = 51.8$, SD = 7.1 years). The members of the second cohort are the same-sex parents of the young adults in Cohort I — a design by which (possible) effects of sociodemographic background variables in cohort comparisons can, to a large degree, be controlled, while the variable variances are maximized by the different ages or cohorts.

Measures

Normative sex-role orientations were measured on the dimension of liberal versus traditional valuations of the appropriate behaviours of women and men with a German 10-item short version of the Sex-Role Orientation-Scale (SRO-S) from

Brogan and Kuttner (1976). This scale has proved to be a reliable and valid measure in former studies with West German samples (Krampen, 1979, 1983).

Masculinity, femininity, and *androgyny* were measured with a German short version of the Bem Sex-Role Inventory (BSRI), which consists of 10 items measuring masculinity, 10 measuring femininity, and 10 measuring social desirability. The androgyny score is computed by the difference between masculinity and femininity scores (cf. Bem, 1974). This German BSRI-S (short version) was constructed and standardized for West German samples in a pre-study using social desirability ratings of Bem's original items for females and males in an independent sample of 36 West German women and 29 West German men. Item selection and test construction followed the criteria and the procedure of Bem (1974). The descriptive parameters and the coefficients of internal consistency of the BSRI-S and SRO-S are presented in Table 1.

For the measurement of the personality variables (intelligence, anxiety, and aggressiveness) tests and questionnaires were employed whose scores had proved to be dependent on morphophenotype sex in the original test construction.

Verbal fluency and *spatial reasoning* were tested by the power versions of the subtests Word Fluency (WG; internal consistency: $r(tt) = 0.96$) and Spatial Thinking (AW; $r(tt) = 0.82$) of the Wilde Intelligence Test (WIT; Jäger and Althoff, 1983) — a test which reflects Thurstone's (1938) structure model of intelligence. These tests were followed by *ad hoc*-constructed questionnaires measuring the *self-concept of own competence in verbal fluency* (SK-WG; 10 items; $r(tt) = 0.81$) and the *self-concept of own competence in spatial reasoning and thinking* (SK-AW; 10 items; $r(tt) = 0.78$). The items of these scales refer to subjective perceptions of own competences in verbal fluency and spatial reasoning in everyday life.

Domain-specific aspects of *trait anxiety* were measured with four subscales of the Interaction Anxiety Questionnaire (IAF; Becker, 1982). They refer to (a) anxiety concerning physical injury (IAF1; $r(tt) = 0.85$), (b) social valuation anxiety (IAF2; $r(tt) = 0.80$), (c) anxiety in connection with authorities or situations demanding self-assertiveness (IAF5; $r(tt) = 0.73$), and (d) general anxiety in test situations (IAF8, summarizing IAF2 and IAF5; $r(tt) = 0.85$).

Aggressiveness was measured by the Questionnaire for the Measurement of Aggressiveness Factors (FAF; Hampel and Selg, 1975). This instrument measures (a) spontaneous aggressiveness (FAF1; $r(tt) = 0.71$), (b) reactive aggressiveness (FAF2; $r(tt) = 0.65$), (c) self-destructive behaviour (FAF4; $r(tt) = 0.70$), and (d) inhibition of aggression (FAF5; $r(tt) = 0.68$) on a trait level.

Data analysis

All scores on tests and questionnaires were computed according to the original procedures. For the BSRI-S, deviations from the original procedure (Bem, 1974) were necessary (because of the reduced item numbers) in the classification of the subjects as masculine ($n = 5$ females, $n = 12$ males), feminine ($n = 12$ females, $n = 8$ males), and androgynous ($n = 33$ females, $n = 30$ males). Subjects were classified as sex-typed if the absolute value of the t ratio ($|t| \geq 2.26$, $df = 18$, $p < 0.05$) reached statistical significance; they were classified as androgynous if the t ratio was less than or equal to that critical value *and* the masculinity as well as the femininity items were rated at least on average with 4.0 (the BSRI-S has answer scales ranging from 1, 'never true', to 7, 'always true for me'). The usage of this classification procedure allows additionally the identification of 'undifferentiated' sex-typed individuals (subjects

Table 1. Means, standard deviations, internal consistencies, and intercorrelations of the different sex-role scales

Study	N	Scale	M	SD	r_{tt}	BSRI				SRO	AWS
						M	F	A	SD		
I	100	BSRI-M: Masculinity	4.20	0.91	0.81	1.00	−0.15	0.84*	0.04	0.22*	—
		BSRI-F: Femininity	4.51	0.66	0.64		1.00	−0.72*	0.16	−0.17	—
		BSRI-A: Androgyny	−0.31	1.28	0.80			1.00	−0.03	0.12	—
		BSRI-SD: Soc. Des.	5.10	0.61	0.69				1.00	0.08	—
		SRO: Sex-role Or.	21.90	9.48	0.91					1.00	—
II	120	BSRI-M: Masculinity	4.40	0.72	0.79	1.00	0.07	0.73*	0.11	—	0.19*
		BSRI-F: Femininity	4.63	0.67	0.66		1.00	−0.69*	0.04	—	−0.15
		BSRI-A: Androgyny	−0.23	0.98	0.76			1.00	0.08	—	0.10
		BSRI-SD: Soc. Des.	4.90	0.58	0.66				1.00	—	−0.10
		AWS: Att. tow. Women	131.72	12.29	0.85					—	1.00
III	226	BSRI-M: Masculinity	4.21	0.80	0.80	1.00	−0.10	0.75*	−0.02	0.15*	—
		BSRI-F: Femininity	4.65	0.63	0.67		1.00	−0.59*	0.10	−0.11	—
		BSRI-A: Androgyny	−0.44	0.84	0.78			1.00	0.03	0.09	—
		BSRI-SD: Soc. Des.	4.72	0.64	0.65				1.00	0.10	—
		SRO: Sex-role Or.	16.61	7.41	0.90					1.00	—

*$p < 0.05$.
— = Not measured in this study.

who rate the femininity as well as the masculinity items on average lower than 4.0). This is realized only with reference to absolute classification criteria (t ratio and absolute mean of the employed self-rating scales) and without reference to distribution characteristics (e.g. with reference to median split methods; e.g. Orlofsky, Aslin and Ginsburg, 1977; Spence and Helmreich, 1978; Taylor and Hall, 1982). The application of such (empirical) distribution characteristics in the classification procedure is problematic, since socially desirable characteristics of women and men — having already been considered in the construction of the BSRI scales — would be considered twice. Therefore, it is more adequate to apply only absolute measurement criteria in the analysis of BSRI data. However, in the present sample, no subjects were classified as 'undifferentiated'.

Data analyses were done either by (non-orthogonal) analyses of variance (involving the variables Cohort, Morphophenotype Sex, and BSRI Sex-types) or by correlation analyses (involving the different dimensional Sex-role Orientation measures and Age). Dependent variables were the personality variables listed above. The significance level was fixed at 0.05. With reference to the literature on sex differences, low to medium effect sizes — in terms of Cohen (1977) — were expected. Given the number of statistical tests applied to the data, we controlled for chance findings within each family of analyses by using binomial tables to determine the number of significant findings likely to arise by chance given the number of statistical tests employed (see Feild and Armenakis, 1974).

Results

Tests of the internal consistencies of the various sex-role orientation measures (see Table 1) and the personality variables (see above) confirmed the reliability of the measures applied in Study I. Further, the means, standard deviations, and intercorrelations (see Table 1) of the dimensional Sex-role Orientation scales employed were consistent with the findings reported in the literature (e.g. Bem, 1974; Krampen, 1983; Schneider-Düker and Kohler, 1988). An exception was the low correlations of the Masculinity and Femininity scales with the Social Desirability scale of the BSRI-S, which confirmed not only the independence of the androgyny difference score, but also that of the sex-typed scores, from social desirability. The independence of the Femininity and Masculinity scale was supported. Normative sex-role orientations were only weak correlates of masculinity (see Table 1), i.e. liberal versus traditional sex-role orientations were rather independent of gender-related self-concepts measured with the BSRI-S.

In the first three columns of Table 2 the percentages of variance in the personality variables explained by the factors Cohort, Morphophenotype Sex, and BSRI Types are presented. In addition to these effect sizes, the significance of the underlying (non-orthogonal) ANOVA main effects are reported. The number of significant ANOVA findings obtained within these analyses can only be attributed to chance with a probability of $p < 0.0003$. The results show that morphophenotype sex differences are observed in (a) spatial thinking (men score higher), (b) anxiety concerning physical injury (women score higher), (c) social anxiety (women score higher), and (d) anxiety in test situations (women score higher). The main effects of the BSRI types of feminine, masculine, and androgynous self-descriptions did reach significance for these variables, too; effect sizes were consistently somewhat higher than

Table 2. Estimates of variance in the personality variables explained by cohort, age, morphophenotype sex, and the different sex-role orientation measures applied in Study I ($N = 100$)

Personality variable	ANOVA main effect (ω^2)			Squared correlation coefficient (r^2)				
	Cohort	Sex	BSRI Types	Masc.	Fem.	Andro.	SRO	Age
Spatial thinking (AW)	01	05*	06*	0.05*	*0.02*	0.08*	0.02	0.01
Verbal fluency (WG)	04	00	02	0.00	0.01	0.01	0.00	0.06*
Self-concept of AW	02	04	04	0.08*	*0.02*	0.08*	0.04*	0.02
Self-concept of WG	00	00	00	0.00	0.00	0.00	*0.01*	*0.01*
IAF1: Anxiety concern. physical injury	02	19*	23*	*0.20**	0.12*	*0.13**	0.03	0.01
IAF2: Social anxiety	05	12*	13*	*0.32**	0.04	*0.21**	*0.01*	*0.05**
IAF5: Anxiety concern. authorities	00	03	05	*0.08**	0.04*	*0.10**	0.04*	*0.01*
IAF8: Anxiety in test situations	02	10*	11*	*0.26**	0.05*	*0.20**	0.00	0.01
FAF1: Spontaneous aggressiveness	07*	02	04	0.01	*0.02*	0.02	*0.01*	*0.09**
FAF2: Reactive aggressiveness	06*	02	05	0.02	*0.02*	0.04*	0.14*	0.06*
FAF4: Self-destruct.	00	00	04	*0.05**	0.04*	*0.03*	0.04*	0.01
FAF5: Inhibition of aggression	27*	00	01	0.00	0.04*	*0.03*	0.21*	0.25*

*$p < 0.05$.
Note: The significance level refers to the ANOVA main effect resp. the correlation coefficient. Italics refer to a negative sign of the underlying correlation coefficient.

for morphophenotype sex. Cohort effects were observed only for three variables of aggressiveness (see Table 2), indicating lower spontaneous aggressiveness as well as higher reactive aggressiveness and inhibition of aggression in the older sample.

The other columns of Table 2 present the results concerning the percentages of variance of the personality variables explained by the different dimensional sex-role orientation measures and age. Squared correlation coefficients are used, because they are analogous to the parameters presented in the analyses of variance above. Again, the significance of the correlation coefficient underlying these estimates of common variance is also reported. The italics refer to the direction of the dependence between the (two) variables considered. The number of significant findings within this analysis can only be attributed to chance with a probability of $p < 0.0007$.

First, it was found that for all those personality variables for which morphophenotype sex differences were observed there was a stronger relationship for the BSRI scales of Masculinity, Femininity, and/or Androgyny. In part, effect sizes even reached large values. Second, the sex-role orientation also explained variance in personality variables, for which no morphophenotype sex differences were observed. This is especially true for the relations of masculinity, androgyny, and normative sex-role orientations to (a) the self-concept of own competence in spatial thinking, (b) anxiety concerning authorities and situations demanding self-assertiveness, (c) reactive aggressiveness, and (d) self-destructive behaviour. Third, age was related positively to verbal fluency, reactive aggressiveness, and inhibition of aggression, and negatively to social anxiety and spontaneous aggressiveness.

In sum, it can be concluded that the sex-role orientation variables explain at least the same proportion, and in most cases a greater proportion, of variance in the personality variables under consideration than morphophenotype sex. Especially masculinity, androgyny, and normative sex-role orientations showed medium to large effect sizes for (a) spatial thinking, (b) the self-concept of own competence in spatial thinking, (c) all measured domains of anxiety, (d) reactive aggressiveness, (e) self-destructive behaviour, and (f) inhibition of aggression.

STUDY II: INTELLIGENCE, ANXIETY, AND NEUROTICISM

Methods

Subjects

In Study II, test and questionnaire data were gathered in a sample of 120 West German university students of various scientific disciplines. Their mean age was 24.8 years (SD = 3.7). The sample consisted of 60 females and 60 males.

Measures

Again, the German BSRI-S was applied to measure *masculinity*, *femininity*, *androgyny*, and *social desirability*, as well as the corresponding gender-related typifications of the individuals. Instead of the SRO-S Scale, used in Study I, the short form of the Attitudes toward Women Scale (AWS-S; Spence, Helmreich and Stapp, 1973) was employed. To maximize variable variance in this university student sample, the answer format for the AWS-S items was changed to 6-point rating scales. The AWS measures normative attitudes toward sex-role behaviour, focusing on *liberal vs. traditional valuations of appropriate female behaviour*. The descriptive parameters and the coefficients of internal consistency of the BSRI-S and AWS-S are reported in Table 1.

Similar to Study I, *verbal fluency* and *spatial reasoning* were measured by the speed versions of the subtests WG ($r(tt) = 0.86$) and AW ($r(tt) = 0.79$) of the WIT (Jäger and Althoff, 1983). These tests were followed by the questionnaires measuring the *self-concept of own competence in verbal fluency* (SK-WG; $r(tt) = 0.71$) and the *self-concept of own competence in spatial reasoning* (SK-AW; $r(tt) = 0.77$).

Trait anxiety was measured with the G-Scale of the State-Trait Anxiety Inventory (STAI-G; Spielberger, Gorsuch and Lushene, 1970; $r(tt) = 0.90$) in the German adaptation from Laux, Glanzmann, Schaffner and Spielberger (1981).

Neuroticism ($r(tt) = 0.80$) and *extraversion* ($r(tt) = 0.77$) were measured with Form B of the German Eysenck Personality Inventory (EPJ; Eysenck and Eysenck, 1964; Eggert, 1974). Subjective (mainly psychosomatic) *complaints* were gathered with the Complaints List (B-L '; von Zerssen and Koeller, 1976; $r(tt) = 0.89$), a German checklist including 24 symptoms.

Data analysis

All tests and questionnaires were analysed according to the original procedures. The method of classification of the subjects as masculine ($n = 4$ females, $n = 10$ males), feminine ($n = 15$ females, $n = 11$ males), androgynous ($n = 41$ females, $n = 39$ males), and undifferentiated ($n = 0$) agrees with the method applied in Study I. Data analysis strategies conform to those used in Study I as well.

Table 3. Estimates of variance in the personality variables explained by morphophenotype sex, age, and the different sex-role orientation measures applied in Study II ($N = 120$)

Personality variable	ANOVA main effect (ω^2)		Squared correlation coefficient (r^2)				
	Sex	BSRI Types	Masc.	Fem.	Andro.	AWS	Age
Spatial thinking (AW)	02	02	0.03*	*0.01*	0.05*	*0.01*	0.02
Verbal fluency (WG)	01	02	0.00	0.06*	*0.01*	0.01	0.06*
Self-concept of AW	00	01	0.02	*0.02*	0.05*	0.00	0.01
Self-concept of WG	00	01	0.09*	0.08*	*0.02*	0.01	0.01
Anxiety (STAI-G)	04*	09*	*0.21**	0.05*	*0.12**	0.03*	*0.01*
Neuroticism (EPI-N)	09*	10*	*0.18**	0.01	*0.05**	0.03*	*0.02*
Extraversion (EPI-E)	03	07*	0.13*	0.04*	0.02	0.00	0.01
Psychosomatic complaints (B-L')	14*	13*	*0.17**	0.05*	*0.10**	0.01	*0.03**

*$p < 0.05$.
Note: The significance level refers to the ANOVA main effect resp. the correlation coefficient. Italics refer to a negative sign of the underlying correlation coefficient.

Results

Tests of the internal consistencies of the various sex-role orientation measures (see Table 1) and the personality variables (see above) confirmed their reliability. The intercorrelations of the dimensional Sex-role Orientation scales (see Table 1) are consistent with those found in Study I and confirm their fitness for further analyses. Again, only masculinity was a significant (but weak) correlate of (traditional) attitudes toward the subjectively appropriate behaviour of women (AWS-S).

Significant ANOVA main effects of Morphophenotype Sex (see Table 3) were observed for anxiety (women score higher), neuroticism (women score higher), and psychosomatic complaints (women score higher), but not for the intelligence and self-concept measures. This is in part (verbal fluency, self-concepts) consistent with the results of Study I, and in part not (spatial thinking). Consistent with the results of Study I, the main effects of the BSRI Types did reach significance for anxiety, neuroticism, and complaints. The number of significant findings obtained within these ANOVAs can only be attributed to chance with a probability of $p < 0.0001$.

Again, the dimensional Sex-role Orientation variables explained on average more variance of the personality variables than Morphophenotype Sex and BSRI Types. In part, effect size reached medium to large values. The results presented in Table 3 show that all significant morphophenotype sex differences can be reproduced better (i.e. large effect sizes) by the BSRI-S scales. Furthermore, the results show that masculinity, femininity, and androgyny explained low to medium proportions of the variances of spatial thinking, verbal fluency, and the self-concept of own competence in verbal fluency, for which no morphophenotype sex differences were observed. Finally, it was found that AWS-S and age were only weak correlates of some personality variables. The number of significant results within this analysis can only be attributed to chance with $p < 0.0001$.

In sum, it can be concluded that the dimensional BSRI variables explained in all cases essentially more variance in the personality variables under consideration than morphophenotype sex. Large effect sizes were observed in particular for the

relation of masculinity to anxiety, neuroticism, psychosomatic complaints, and extraversion.

STUDY III: ANXIETY, LOCUS OF CONTROL, AND MACHIAVELLIANISM

Methods

Subjects

The analyses reported below are based on questionnaire data obtained from 226 West German university students (average age = 23.9 years; SD = 2.9 years). The sample consisted of 137 females and 89 males who were studying various scientific disciplines.

Measures

The same instruments as those in Study I were used for the measurement of *normative sex-role orientations* and *gender-related self-concepts*: SRO-S and BSRI-S, respectively. Their descriptive parameters and coefficients of internal consistency are reported in Table 1.

Trait anxiety was measured with the STAI-G (Laux *et al.*, 1981; $r(tt) = 0.90$); *Machiavellianism* with a German adaptation of the MACH IV Scale (Christie and Geis, 1970; $r(tt) = 0.73$); and *locus of control orientation* with the German version of the IPC Scales (Levenson, 1974; Krampen, 1981), measuring Internality (I; $r(tt) = 0.72$), Powerful Others' Control (P; $r(tt) = 0.73$), and Chance Control (C; $r(tt) = 0.76$).

Data analysis

Methods of data analysis conform to the procedures applied in Studies I and II. The classification of the subjects with reference to the BSRI scales as masculine ($n = 11$ females, $n = 14$ males), feminine ($n = 32$ females, $n = 14$ males), androgynous ($n = 94$ females, $n = 61$ males), and undifferentiated ($n = 0$) resulted in relative frequencies similar to those in Studies I and II.

Results

The coefficients of internal consistency of the different sex-role orientation scales (see Table 1) and of the personality scales (see above) were satisfactory. Again, the intercorrelations of the dimensional sex-role orientation measures (see Table 1) were in accordance with former results. Normative sex-role orientations were (again) correlated significantly only with the BSRI-S Masculinity scale.

Significant ANOVA main effects of Morphophenotype Sex (see Table 4) were observed for anxiety (women score higher), powerful others' (external) locus of control (women score higher), and Machiavellianism (men score higher), but not for internality or for chance control in generalized control orientations. The BSRI Types explained greater proportions of variance for anxiety, powerful others' control, Machiavellianism, and internality compared with Morphophenotype Sex. The number of significant results obtained within these ANOVAs can only be attributed to chance with a probability of $p < 0.0001$.

The dimensional Sex-role Orientation scales again explained more variance of

Table 4. Estimates of variance in the personality variables explained by morphophenotype sex, age, and the different sex-role orientation measures applied in Study III ($N = 226$)

Personality variable	ANOVA main effect (ω^2)		Squared correlation coefficient (r^2)				
	Sex	BSRI Types	Masc.	Fem.	Andro.	AWS	Age
Anxiety (STAI-G)	03*	04*	*0.12**	0.02*	*0.07**	0.00	0.01
Internality (IPC-I)	00	07*	0.19*	0.00	0.09*	0.01	0.00
Powerful others' control (IPC-P)	02*	03*	*0.01*	0.05*	*0.01*	0.10*	0.02*
Chance control (IPC-C)	00	01	*0.02**	0.00	*0.03**	0.06*	*0.01*
Machiavellianism (MACH)	03*	04*	0.03*	*0.01*	0.05*	0.07*	0.03*

*$p < 0.05$.
Note: The significance level refers to the ANOVA main effect resp. the correlation coefficient. Italics refer to a negative sign of the underlying correlation coefficient.

all personality variables than Morphophenotype Sex and BSRI Types. In part, medium to large effect sizes were obtained. This is especially true for the relationship between masculinity on the one hand, and (low) anxiety and (high) internality, on the other hand. Normative sex-role orientations, femininity, and androgyny reached medium effect sizes for some personality variables. Again, age was only weakly correlated with the personality variables under consideration. The number of significant results obtained within this analysis can only be attributed to chance with $p < 0.0002$.

SUMMARY AND GENERAL DISCUSSION

Thus, our central hypothesis that morphophenotype sex differences can be reproduced by psychological sex-role orientation variables, and its extension to the thesis that these psychological variables explain more variance than morphophenotype sex, was confirmed for most of the variables under consideration. The results show consistently that differences between males and females in (a) spatial thinking, (b) domain-specific self-concepts of own competence, (c) general and domain-specific aspects of anxiety, (d) different aspects of aggressiveness, (e) neuroticism, (f) psychosomatic complaints, (g) powerful others' externality in generalized control orientations, and (h) Machiavellianism can be described more adequately and powerfully by sex-role orientation variables than by morphophenotype sex. In all cases, the effect sizes of the psychological gender variables were larger than those of morphophenotype sex and reached in a large number of cases medium to large values.

This is also true for personality variables, for which in contrast to the majority of the prevailing findings (e.g. Deaux, 1985; Maccoby and Jacklin, 1974; Merz, 1979; Yuchtman-Yaar and Shapira, 1981) no morphophenotype sex differences were observed (verbal fluency, chance control, and internality). In a large part of the current literature about sex differences in personality, data from rather large samples are used without taking into account the relation between sample size and statistical significance (see Cohen, 1977), which has been considered here. Thus, it can be assumed that many of the morphophenotype sex differences described in the literature are founded on an incorrect methodological strategy which produces statistical sig-

nificances leading to an overestimation of such differences. This overestimation increases further in such empirical studies, which do not take into account the problem of using multiple tests of significance for analyses of the data from one sample (e.g. Feild and Armenakis, 1974), considered here by the use of binomial tables for the probability of obtaining X significant results in Y statistical tests due to chance.

In consequence, the variable of Morphophenotype Sex which is easily and economically obtained in personality research and psychodiagnosis is — like the physical variable of Age in developmental psychology — nothing but a bad and simplifying (reductive) biological substitute for more complex socio-psychological variables. If research and psychodiagnosis are interested in the analysis of gender differences, psychological sex-role orientations measures must be applied.

In addition, the results showed that the applied *dimensional* Sex-role Orientation measures were more effective in the analyses of relationships with sex differences in personality than the *discontinuous, typological* BSRI approach of classifying subjects. Those typologies have been criticized before (Bierhoff-Alfermann, 1983) because they simply add one (androgyny) or two more types (androgyny and undifferentiated) to the two types (feminine and masculine) which have existed for a long time. Dimensional approaches deal more differentially with personality differences and are — especially important for a *biopsychological* theory of gender — compatible with recent continuous definitions of gender in biology and physiology (e.g. Dörner, 1977) as well as with *psychosocial* theories about the development of gender identity (e.g. Richmond-Abbott, 1983; Worell, 1981).

Typological approaches should be overcome in personality research and differential psychology because of their simplifications of reality and the corresponding dangers in research and psychodiagnosis. This is also true for research on gender and gender differences. With reference to the results presented here, it must be added that the usage of alternative classification procedures [i.e. Bem's (1974) original criterion-based classification and various types of median split methods; e.g. Orlofsky *et al.*, 1977; Taylor and Hall, 1982] led in all three studies to very similar results with reference to the personality variable variance (ω^2) explained by the typology (the distributions of the subjects within the various types differ, of course).

So, if a dimensional approach must be preferred in psychological research on gender and gender differences, the core question is *which* and *how much* of such dimensions of sex-role orientations or psychological gender must be applied. First, the presented results of the three empirical studies are in accordance with the findings of other authors (e.g. Bem, 1974; Cook, 1985; Schneider-Düker and Kohler, 1988; Taylor and Hall, 1982), confirming empirically the independence of the Masculinity and Femininity dimensions. In contrast to implicit personality theories in which masculinity and femininity are perceived as the extremes of one dimension (see Foushee, Helmreich and Spence, 1979), masculinity and femininity can be measured reliably and independently with psychological methods. Thus, one-dimensional measurements of femininity versus masculinity should no longer be applied (e.g. Hofstede, 1980; see also Constantinople, 1973). Second, the results of all three studies showed that gender-related self-concepts (femininity, masculinity, and androgyny) were rather independent of normative sex-role orientations, defined as the prescriptive and proscriptive attitudes of individuals about the appropriate behaviour of women and men (Brogan and Kuttner, 1976; Krampen, 1979; Spence *et al.*, 1973). Thus,

such normative sex-role orientations should be considered in addition to measures of femininity, masculinity, and androgyny in empirical research. Perhaps, even more than these four aspects of sex-role orientations and gender-related self-concepts should be taken into account in the future (e.g. Bernard, 1981; Bierhoff-Alfermann, von Busch, Cramm and Hauser, 1988; Spence and Helmreich, 1978). However, such variables/scales should have satisfying coefficients for the reliability of their differences. This is assured for the scales measuring masculinity, femininity, and normative sex-role orientations applied in the three studies presented.

In accordance with the results of Taylor and Hall (1982), Bierhoff-Alfermann *et al.* (1988), and Whitley (1988), the findings of the three studies presented point toward the special relevance of the dimension of Masculinity. For most of the personality variables under investigation the Masculinity scale explains more variance than the Femininity scale and the normative sex-role orientation measures. Only the Androgyny (difference) scale, which is, of course, directly dependent on the Masculinity scale, shows similarly large effect sizes for the personality variables. Whitley's (1988) interpretation, that this results from the strong relation between the Masculinity scale and a high self-esteem and positive self-concept, was weakly confirmed by the results presented here with reference to domain-specific self-concepts of own competence.

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