

Influences on flexibility
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Family and Work Environment Correlates
of Behavioral Flexibility

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It has become increasingly important to study Behavioral Flexibility as an integral part of the process of aging. Flexibility is closely related to adjustment to "change", and change characterizes not just capacities of the aging individual but also their family and community context.

The concept of flexibility has a long history in psychology under the name of its complementary polar construct of "rigidity" (see Chown, 1959). Recent work on flexibility has come from researchers dealing with societal and organizational behavior (Bray & Howard, 1983; Kohn & Schooler, 1983). The basic processes underlying the construct of flexibility involve changes of perceptual sets, reversals of habituated behavior, and tolerance to ambiguities. Consequently there is considerable overlap of flexibility with other domains of personality and intelligence (Cattell & Tiner, 1949; Schaie, Dutta, & Willis, 1991; Stankov, 1988), cognitive styles, openness to experience (McCrae & Costa, 1980) and dogmatism (Rokeach, 1960).

There is some consensus that environments requiring the individual to think amidst conflicting stimuli, make independent decisions, or deal with transitory contingencies, i.e. complex environments (Schooler, 1984; Dutta, O'Hanlon, & Schaie, 1988), facilitate the development of flexibility. Early childhood environment and socialization have also been thought to have significant impact.

Variables and their Measures

Flexibility is measured here by the seven subtest scores obtained on the Test of Behavioral Rigidity (TBR; Schaie, 1960).

The Capitals Test: Adapted from Bernstein's (1924) study of quickness and intelligence, this test represents the Spearmanian, or "functional" approach to perseveration or rigidity. Subjects spend 2 1/2 minutes copying a printed paragraph that contains some words starting with capital letters, others spelled entirely in capitals, and some starting with lower case letter and their remainder in capitals. In the second half of the test, subjects copy the paragraph again but in reverse form, i.e. substituting capitals for lower case letters, and lower case letters for capitals. A psychomotor speed score is the number of words correctly copied in the first series (copying speed, Cap). A motor-cognitive flexibility score (instructional set flexibility, Cap-R) results from taking the ratio of the number of words correctly copied in the second series to that of the first.

The Opposites Test. This test was constructed following the work of Scheier and Ferguson (1952). Subjects are given 2 minutes each to work on three lists of words (at a third-grade level of difficulty). The first list requires providing the antonym, and the second list the synonym of the stimulus word. The third list contains selected stimulus words from the previous lists to which the subject responds with an antonym if the stimulus word is printed in lower case letters, but with a synonym if printed in capitals. The psychomotor speed score is the sum of correct responses in the first two lists (associative speed, Opp).

There are two motor-cognitive flexibility scores representing the ease with which the subject shifts from synonyms to antonyms depending on whether the stimulus word is presented in upper or lower case letters. The first score involves the proportion correct in List 3 (associative flexibility 1, Opp-R1), while the second assesses the ratio of correct responses under the perseveration condition in List 3 to the number of correct responses under the standard condition in Lists 1 and 2 (associative flexibility 2, Opp-R2).

The TBR Questionnaire. This is a 75-item true-false questionnaire that contains 22 rigidity-flexibility items (attitudinal flexibility, R-scale) and 44 masking social responsibility items from the California Psychology Inventory (Gough, 1957; Gough, McCloskey, & Meehl, 1952; Schaie, 1959). It also contains 9 items suitable for adults obtained from the Guttman-scaling of perseveration scale first used by Lankes (1915), (behavioral flexibility, P-scale).

The three dimensions of flexibility are weighted linear composites obtained by using regression weights from prior factor analytic work on the measure. They are defined as follows : (1) Motor-cognitive flexibility measuring ease in reversal of a set of rules; (2) Psychomotor flexibility measuring the fluency of responses to familiar stimuli; and (3) Attitudinal flexibility measuring propensity towards change in everyday life. The Attitudinal dimension in particular is hypothesized to be predicted by environments promoting autonomy, innovation, expressivity, and cultural exposure at home and at work.

Two versions of the Moos Family Environment Scale (FES; Moos & Moos, 1986) were used; one to assess the current family environment of adult subjects and one with reference to their family of origin (childhood). Separate forms were used for those who live alone. Sub-scales for the dimensions of cohesion, expressivity, conflict, achievement, intellectual-cultural atmosphere, activities and recreation, organization, and control were included. Our versions reduced the sub-scales by half the number of items, but formatted items as 5 point Likert scales. We also reworded a number of items to be suitable for our "current family" and "family of origin" versions.

The subjects also completed a shortened Work Environment Scale (WES; Moos 1986) comprising of three sub-scales: Work Autonomy, Control and Innovation.

These tests were administered in addition to the Tests of Primary Mental Abilities (PMA; Thurstone & Thurstone, 1949), and the Life Complexity Inventory (LCI).

Sample

The data used for this study were obtained from siblings and adult children of target SLS subjects (see Schaie, Plomin, Willis, Gruber-Baldini, & Dutta, 1991 for details). About 375 men and 578 women ranging in age from 22 to 89 years ($M = 46.22$; $SD = 14.5$) tested in 1990-91 were used for these analyses. Most participants reside in the Seattle (Washington) area, have on average 15.3 years of schooling (Range 7-20 years). About 522 of these subjects were working full time and 431 were part time workers, retired, homemakers, and those holding more than one jobs. Subjects reported an average annual income of 42,000 (Range 1,000-70,000). Most felt satisfied with their lives and successful with their jobs.

Analysis

Items from FES and WES were summed to give scaled scores for each individual. Scores from the TBR were scaled to factor scores using factor loadings from prior analyses. Background variables were obtained from the LCI.

Descriptives and t-tests indicated gender differences as well as difference based on employment level in some of the dependent and independent variables (See Tables 1 and 2; Figures 1, 2, and 3). Analyses were done separately by gender and employment level since groups were found different even after controlling for age and education.

The three flexibility dimensions were analyzed using multiple regressions. The models included the three dimensions of WES and the eight dimensions of FES as independent variables,

along with age and education as control variables. Separate models were set up for origin-FES and current-FES. Thereafter, one model was set up including both versions of FES in the same prediction equation in order to obtain direct effects of each version controlling for the other. Based on prior theory and outcome of the multiple regression analysis, path models were formulated, modeling the effects on Attitudinal flexibility of specific Origin-FES dimensions as mediated by current-FES dimensions.

Results

The multiple regression models predicting flexibility were obtained significant for each of the three dimensions. Age and education had significant effects as expected on Motor-Cognitive and Psychomotor flexibility. Similar dimensions of FES were obtained significant for both versions of the test (origin and current) in separate analyses. The multivariate tests for the contribution of the three environmental measures were obtained significant for the overall sample (see Table 3). However, using both current and origin scores of family environment in the same regression equation did not increase the variance explained. Infact, the effect sizes and significance of dimensions of family of origin reduced considerably.

Path models were thus set up to test the indirect effects of origin-FES. These models tested direct paths from origin-FES to current-FES dimensions and subsequent paths to the flexibility constructs. The over identifying condition specifying absence of direct effects of origin family was tested by the F-Drop test specifying that all paths from origin-FES dimensions equal zero. In each of the four groups (Full time and Part time; men and women) the origin scales could be successfully dropped. Table 4 outlines the significant paths for Attitudinal flexibility for men and women. After taking into account the direction in which

scales are scored we find that high cultural, active and recreational family environments are related to greater Attitudinal flexibility. High organization and control on the other hand have negative path coefficients for Attitudinal flexibility. The characteristics of work environment were found to be more salient for predicting flexibility in men than in women. Here too the direction of effects was as expected with high autonomy and innovativeness in work environment related to higher flexibility.

This gender difference is exemplified in Figure 4 examining the Rigidity Scale (R-Scale). The only significant path from FES for men is obtained from the Organization dimension of family of origin.

Conclusions

As hypothesized, Attitudinal flexibility was found to be facilitated by environments which promote expressivity, cultural orientation, autonomy, low control, and organization in current family and work environments. It makes intuitive sense that environments which facilitate openness to ideas, expression of opinions, and self direction are conducive to the development of an attitudinal structure that is more flexible. The salience of work environment for full time working males is no surprise either. The fact that no significant differences are found in the model for full time working women versus others is unexpected. The other dimensions of flexibility were less affected as expected, and lend support to the discriminant validity of the three dimensional factors structure of the TBR.

These models are still exploratory in nature. More stringent tests of these models are required using simultaneous estimation procedures such as those used in LISREL for covariance structures.

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Table 1
Description of variables in the Sample by Gender

Variable	Men (N=375)			Women (N=578)		
	Mean	S.D.	Range	Mean	S.D.	Range
Age (yrs)	46.11	14.19	22-85	45.77	14.22	22-89
Education	15.77	2.61	8-20 **	15.14	2.37	7-20
Motor-Cog. Flex.	55.88	5.80	30-68 *	55.04	5.98	30-67
Attitudinal Flex.	54.19	8.94	24-75	54.10	7.74	24-74
Psychomotor Flex.	57.57	9.64	26-77 **	61.41	8.43	22-77
C-Cohesion	20.17	3.79	6-25 **	20.91	3.72	5-25
C-Expressivity	18.01	3.59	7-25 **	19.12	3.65	5-25
C-Conflict	18.00	4.29	6-25	18.31	4.16	5-25
C-Achievement	18.22	3.43	9-25 *	18.78	3.22	8-25
C-Culture	18.22	4.12	8-25 *	18.77	4.18	6-25
C-Recreation	17.72	4.27	5-25	17.88	4.35	5-25
C-Organization	17.06	4.19	6-25	17.08	3.98	5-25
C-Control	14.83	3.84	3-24	14.88	4.09	3-25
O-Cohesion	17.88	4.69	5-25	17.94	4.82	5-25
O-Expressivity	14.59	3.81	5-25	14.45	4.17	5-25
O-Conflict	16.64	4.79	5-25	16.11	5.04	5-25
O-Achievement	18.06	3.45	7-25 *	18.53	3.57	6-25
O-Culture	15.67	5.00	5-25	16.09	5.21	5-25
O-Recreation	16.94	4.43	5-25	16.63	4.68	5-25
O-Organization	18.04	3.82	6-25	18.41	4.08	5-25
O-Control	16.77	4.21	6-25 **	17.96	4.44	7-25
W-Autonomy	21.14	3.80	4-25	21.04	3.71	5-25
W-Control	17.48	4.91	5-25	17.89	4.91	2-25
W-Innovation	17.75	3.85	1-25	17.42	3.88	4-25

Note: Differences in gender means: * = $p < .05$; ** = $p < .01$

Table 2
Description of variables in the Sample by Employment

Variable	Part Time (N=431)			Full Time (N=522)		
	Mean	S.D.	Range	Mean	S.D.	Range
Age (yrs)	50.86	16.73	23-89 **	41.82	10.03	22-76
Education	14.98	2.41	7-20 **	15.72	2.50	8-20
Motor-Cog. Flex.	53.75	6.61	30-68 **	56.71	4.90	30-66
Attitudinal Flex.	53.00	8.59	24-74 **	55.08	7.79	24-75
Psychomotor Flex.	58.13	9.57	24-77 **	61.35	8.47	22-77
C-Cohesion	20.73	3.75	6-25	20.52	3.77	5-25
C-Expressivity	18.42	3.61	7-25 *	18.90	3.70	5-25
C-Conflict	18.01	4.05	7-25	18.34	4.34	5-25
C-Achievement	18.27	3.46	8-25 *	18.80	3.17	9-25
C-Culture	18.49	4.18	9-25	18.61	4.16	6-25
C-Recreation	17.65	4.49	5-25	17.96	4.18	5-25
C-Organization	17.30	4.10	5-25	16.90	4.03	6-25
C-Control	15.43	3.89	5-25	14.39	4.02	3-25
O-Cohesion	17.91	4.83	5-25	17.93	4.72	5-25
O-Expressivity	14.31	4.13	5-25	14.66	3.93	5-25
O-Conflict	16.09	4.72	5-25	16.50	5.13	5-25
O-Achievement	18.36	3.52	6-25	18.34	3.54	6-25
O-Culture	15.76	5.11	5-25	16.07	5.15	5-25
O-Recreation	16.17	4.77	5-25 **	17.24	4.37	5-25
O-Organization	18.45	3.96	7-25	18.10	4.00	5-25
O-Control	17.78	4.34	6-25	17.25	4.42	6-25
W-Autonomy	20.92	3.95	4-25	21.21	3.57	6-25
W-Control	17.58	5.23	2-25	17.85	4.63	5-25
W-Innovation	17.02	4.01	4-25 **	17.98	3.70	1-25

Note: Differences in means by employment level: * = $p < .05$; ** = $p < .01$

Table 3
Model characteristics for Flexibility Dimensions

Variable	Motor-Cognitive Flexibility	Attitudinal Flexibility	Psychomotor Flexibility
Age	-.43 **	-	-.27
Education	.15 **	-	.30
Gender	-.04	-	.24
Employment Level	.07 *	-	.09
C-Expressivity	-	.16 **	-
C-Ach.Orientation	-	-.12 **	-
C-Culture	-	.12 **	-
C-Recreation	-	.07 *	.07
C-Organization	-	-.13 **	-
C-Control	-	-.12 **	-
O-Expressivity	-.13 **	-	-
O-Ach.Orientation	.07 *	-	-
W-Autonomy	-	-	-
W-Control	-	.08 *	.10
W-Innovation	.08 *	.08 *	-
Variance Explained			
	31%	18%	30%
<u>Multivariate Test</u>			
(Wilks' Lambda)	df	F-Ratio	
Current-FES	(8, 929)	5.30 p<.0001	
Origin-FES	(8, 929)	1.69 p<.05	
Work environment	(3, 929)	4.64 p<.0001	

Note: Table presents only the significant standardized beta values.

Table 4
Path Model for Attitudinal Flexibility
(by Gender and Employment Level)

Variable	Men		Women	
	Full Time (N=256)	Part Time (N=119)	Full Time (N=266)	Part Time (N=312)
Age	-	-.22	-	-
C-Expressivity	.13	-	-	-
C-Culture	-	.20	-	-
C-Recreation	-	-	.14	-
C-Organization	-	-	.17	.18
C-Control	-.26	-	-	-.17
W-Autonomy	-.20	-.25	-	-.15
W-Control	.25	-	.16	-
W-Innovation	.14	-	-	-.14

Note: Table presents only the significant standardized beta values at $p < .05$

Table 5
Correlations between Origin and Current FES Dimensions

Variable	Men		Women	
	Full Time	Part Time	Full Time	Part Time
Cohesion	.24	.25	.43	.28
Expressivity	.29	.23	.28	.25
Conflict	.29	.28	.39	.31
Achievement	.54	.29	.34	.34
Culture	.31	.38	.43	.34
Recreation	.35	.37	.29	.20
Organization	.30	.26	.34	.43
Control	.29	.43	.40	.42

Fig 1: Mean Differences on Composite Flexibility Scores

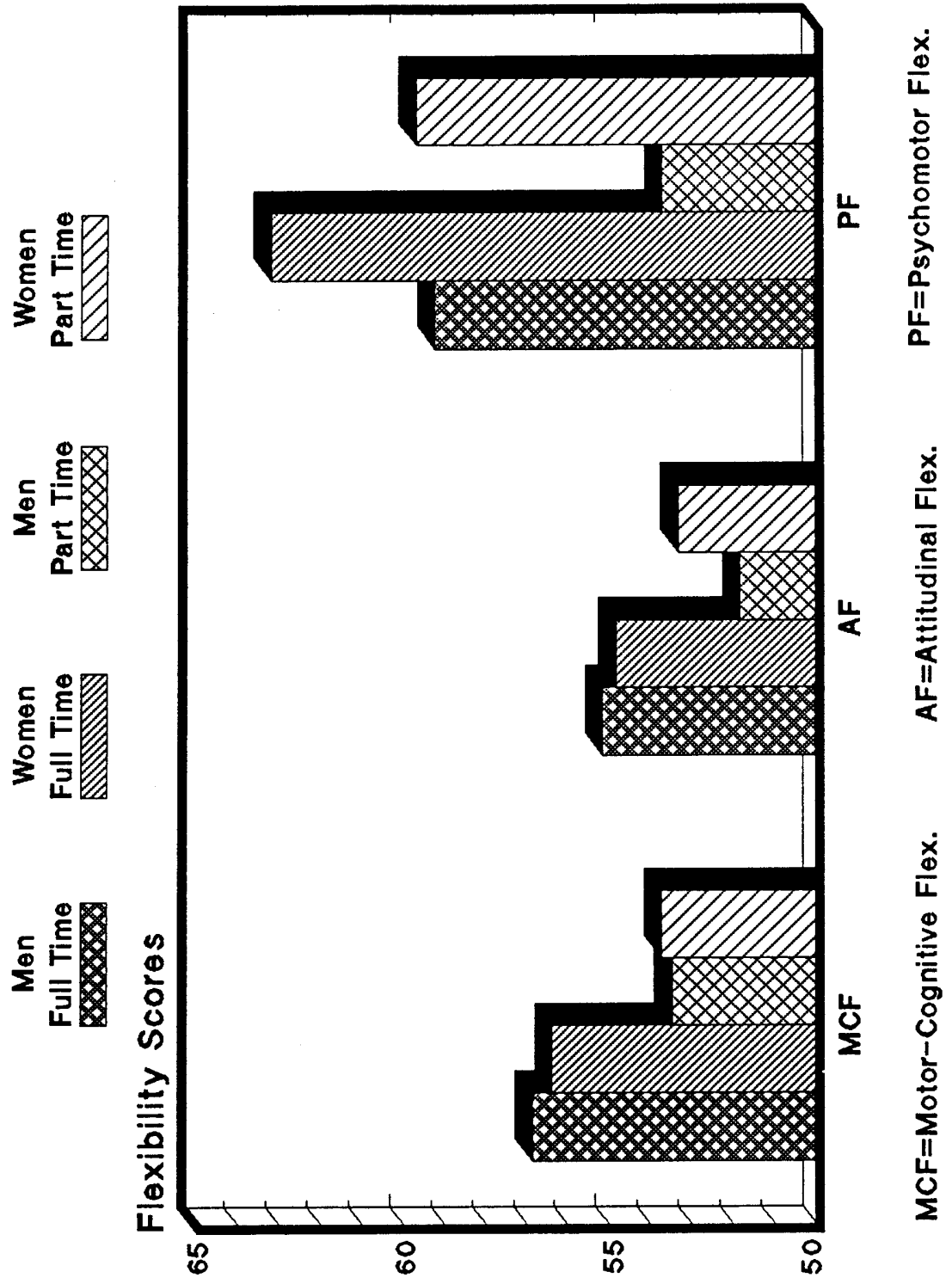


Fig 2: Employment and Differences on Environment Scales

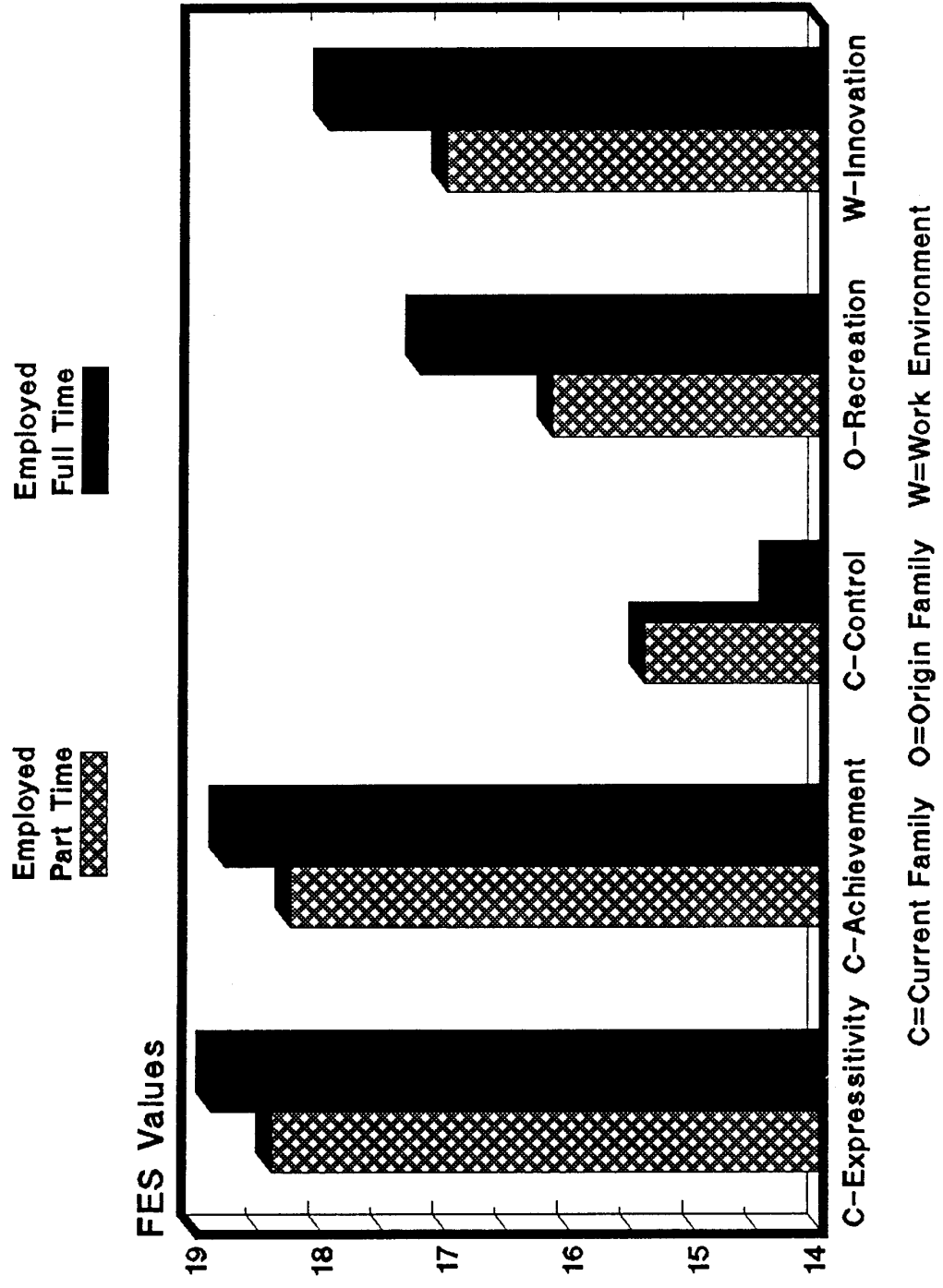


Fig 3: Gender Differences on Environment Scales

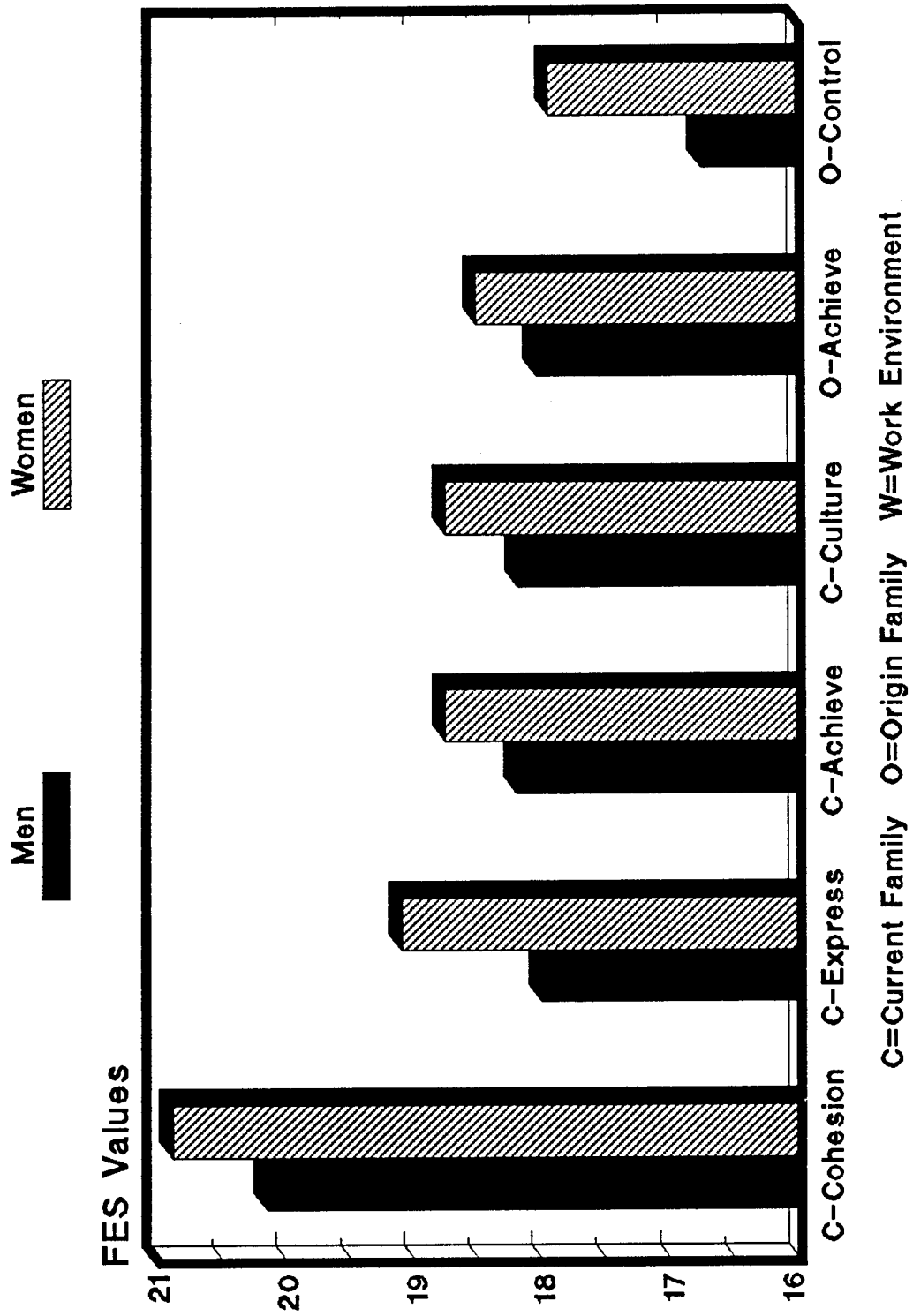


Figure 4
Environmental Correlates for Attitudinal Flexibility (R-Scale)

