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EO Fairness Effects on Job Satisfaction, Organizational Commitment, and Perceived Work Group Effectiveness: Does Race or Gender Make a Difference?

by

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14. ABSTRACT

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Abstract

A theoretical model investigated by McIntyre, Bartle, Landis, and Dansby (2001) indicated that equal opportunity fairness (EOF) attitudes have significant impact on perceived work group effectiveness, job satisfaction, and, ultimately, organizational commitment. This model was developed and examined with heterogeneous military samples of 5,000 by means of structural equation modeling (SEM). The purpose of the present study is to determine the degree to which the McIntyre et al., model is consistent (invariant) across four large sociocultural groups within the military: enlisted African-American and Caucasian men and women. Four pairs of samples consisting of 5,000 observations each were examined through SEM multiple-group analyses. Technically, results indicated that the model was noninvariant (i.e. inconsistent) across the four groups. However, through a series of post hoc analyses, it became evident that for practical purposes, the model can be considered invariant. Discussion focused on the contrast of the technical versus practical results and recommendations for future research. In addition, a practical flow diagram is presented as a summary of how the results of the theoretical model can be used as a tool in organizational development and training interventions in the context of EOF problems.

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The present study extends research on equal opportunity fairness (EOF) carried out by McIntyre, Bartle, Landis, and Dansby (2001). The concept of EOF is grounded in equity theory (Adams, 1963; Cohen, 1987; Greenberg, 1990) and refers to organization members' perceptions of fair treatment of individuals coming from different sociocultural backgrounds. Within United States military organizations, it is expected that all individuals have equal opportunity to earn the various rewards and outputs provided by the organization. Further, every individual military member has equal rights to respect from other organization members, to participate in social gatherings without discomfort, and to exist as fully-fledged members of the organization. In sum, EOF pertains to organizational members' perceptions that all individuals-without regard to their race, creed, national origin, religion, age, or gender-have access to (a) equitable distribution of rewards such as pay and promotion, (b) equitable distribution of treatments such as special assignments and training, and (c) agreeable social conditions.

What effects do perceptions of fairness have on other attitudes held by organizational members? McIntyre et al., (2001) attempted to address this question through structural equation modeling (SEM) by examining the causal linkages between EOF, perceived work group effectiveness (PWGE), job satisfaction (JS), and organizational commitment (OC). EOF was broken down into two facets: work group equal opportunity fairness (WGEOF) and organizational equal opportunity fairness (OEOF). WGEOF pertains primarily to perceptions of supervisors' treatment of workers perceived within the work group. OEOF pertains to the perceptions of treatment by the organization as a whole.

Background of the McIntyre et al., (2001) Study

In carrying out their study, McIntyre et al., (2001) sampled from a data base that contains the responses to the Military Equal Opportunity Climate Survey (MEOCS) of more than one million participants within the military. One can think of this study as containing two exogenous (input) variables—OEOF and WGEOF—and three endogenous (outcome) variables—PWGE, JS, and OC. The three endogenous variables are defined as formally labeled and reported scales of the MEOCS. JS refers to how military members feel about the military workplace. PWGE refers to the degree to which organizational members perceive their primary work group as productive and effective in accomplishing its mission. OC is a more enduring attitude than JS and refers to the degree to which a respondent identifies with a particular organization.

The two independent (exogenous) variables were formed by McIntyre et al., (2001) in the first phase of their study. To this end, the researchers examined the MEOCS items' content and culled a sample that logically sorted into two groups pertaining to the fairness perceptions of the organization as a whole and work-group fairness perceptions (mostly dealing with supervisory treatment). A confirmatory factor analysis supported the tenability of the five constructs in a separate sample prior to the causal modeling phase. (See McIntyre et al., 2001.)

In the structural-modeling phase of the study in which the theoretical causal model was tested for viability, the researchers drew two random samples consisting of 5,000 observations. The use of relatively large samples (i.e., N=5,000) provided the basis for highly accurate estimates of the hypothesized effects by means of structural equation modeling. The use of two samples provided the basis for replicating the results.

Figure 1 provides a graphic representation of the model proposed and analyzed by McIntyre et al. (2001). Overall, the model was found to have superior statistical fit (Non-normed Fit Index (NNFI) equaled .96, Comparative Fit Index (CFI) equaled .96, and Root Mean Squared Error of Approximation (RMSEA) equaled .029). To ensure that the hypothesized model provided a theoretically and practically useful summary of the relationships among the constructs, it was compared with alternative models. One alternative was considered the "logically next most constrained model." It contained fewer paths and therefore was more parsimonious. The other was considered the "logically next most unconstrained model," containing a greater number of paths. It was less parsimonious. In these comparisons, fit statistics plus crossvalidation indices supported the hypothesized model described in Figure 1. In other words, the model as a whole was a very good representation of the data.

The causal paths. In Figure 1, for each path, four values are given. The first value is the standardized structural (path) coefficient. The second value appearing in braces is the unstandardized structural coefficient. The third value in parentheses is the standard error of the unstandardized structural coefficient. The *t*-value listed is the ratio of the unstandardized coefficient to its standard error. It can be interpreted as a standard normal Z value. Under the latter interpretation, all coefficients are statistically significant, suggesting that every hypothesized effect in Figure 1 was supported.

The causal paths can be broken into four levels of magnitude—High, Moderate, Low, and Negligible. The paths in the "High" category (based on the standardized coefficients) are OEOF➔WGEOF (.84), JS➔OC (.72), and PWGE➔JS (.61). Of these three paths, the most notable is PWGE➔JS given that it has not been specifically discussed in the literature. In contrast, the JS➔OC path has been discussed many times (See Mathieu, e.g.). Further, since perception of fairness might be the underlying component linking OEOF to WGEOF, it is not surprising that these two variables are so strongly linked.

There was one path in the "Moderate" category—WGEOF→PWGE (.36). This is interesting because it speaks to two issues. First, under the assumption that PWGE is analogous to self-efficacy (Bandura, 1982), we might hypothesize that workgroup (team) performance will vary as a function of PWGE. (Of course, before hypothesizing such an effect, it would be necessary to determine whether the PWGE attitudes are shared among group members.) Second, the WGEOF→PWGE path provides a deeper understanding of the antecedent conditions of JS...that it is indirectly affected by WGEOF through PWGE as well as directly affected.

There were two paths in the "Low" category—WGEOF→OC (.11) and WGEOF→JS (.13). The strength of these paths is not high. However, they point to the possible erosive effects of work group EO unfairness on two important outcome variables, OC and JS.

Finally, one path—PWGE→OC (.04)—was so low as to be placed in the "Negligible" category. Given the large sample sizes in the McIntyre et al., study, it seems reasonable to accept the conclusion (as opposed to failing to reject its converse) that PWGE does not have much impact on OC. Perhaps this is due to the fact that OC has to do with the organization as a whole while PWGE has to do with the immediate work group.

What do these results tell us? Overall, one can safely conclude that fairness attitudes and feelings have impact on important outcome variables. EOF can be viewed as having a sort of chain reaction. These attitudes begin at a distal level and proceed to wend their way through perceptions of how the work group (including the supervisor) performs (PWGE), morale (JS), and dedication to the organization (OC). It is possible that the model presented in Figure 1 might serve as the basis of a template for resolving JS and OC problems within the military command. Along with the literature that supports this model, the informed military command has a variety of "leverage points" with which to improve the function of the unit. Yet, there is a question as to the generalizability of the model to all groups comprising the military. The purpose of the present study is to examine the generalizability to four large sociocultural groups within the military—African-American and Caucasian enlisted men and women.

Generalizability of the McIntyre et al., Model

There are at least two reasons for examining the generalizability of the results of the McIntyre et al., (2001) model (hence forth referred to as the target model). The first seems to be best referred to as "natural" because certain sociocultural groups have suffered inequity and prejudice in society, one naturally questions the generalizability of any study pertaining to EO-related phenomena. The second reason is (or should be) based in theory and published literature. In particular, one must examine theory and published studies that justify an examination of the invariance in the relationships (or causal links) among constructs. There are many studies that discuss mean differences between sociocultural groups on JS, perceptions of fairness, and so on. There are fewer that speak to the issue of difference in causal links across different groups.

Studies by Lefkowitz (1994) and Smith, Smits, and Hoy (1998) indicate that men and women may prefer different work environments. While men lean toward an achievement-oriented climate, women prefer a more affiliative one. It is possible then that PWGE may be construed differently by men and women. If this is the case, relationships between it and other variables such as WGEOF and JS may be notably different.

Russ and McNeilly (1995), in a study of sales representatives within a publishing firm, posited that OC measures may fail to capture the strength of women's commitment to social relationships within the organization. Their argument implied that the factors with causal influence on OC may be different or have different levels of influence for men and women. This possibility leads to the question of whether the JS➔OC link is similarly strong for men and women. It also suggests that the WGEOF➔OC path may be stronger for women if WGEOF is viewed as an indicator of social value and social relationship health for women.

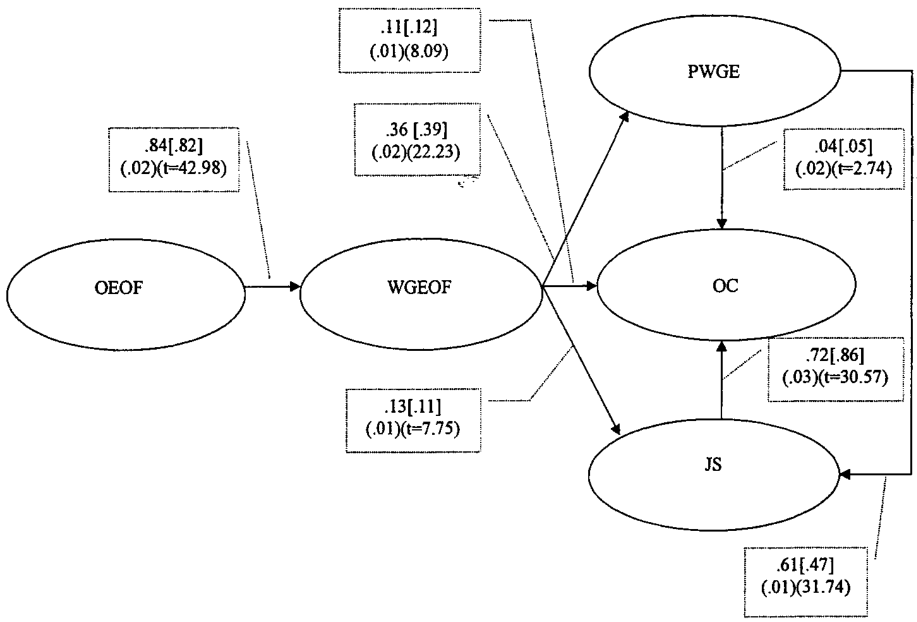
The results of a study by Rosen, Durand, Bliese, Halverson, Rothberg, and Harrison (1996) of Army combat support units provide rationale for suspecting that gender moderates the relationship between perceived fairness and PWGE and JS. Among junior enlisted men in gender-integrated units, acceptance of women (germane to WGEOF in the present study) correlated with combat readiness, vertical unit cohesion (akin to PWGE), and general well-being (akin to JS). Support for similar relationships was not found for junior enlisted women, suggesting potentially different causal paths between WGEOF, JS, and PWGE for men and women.

Next, Mellor, Barnes-Farrell, and Stanton (1999) studied levels of union participation in relation to perceived union effectiveness in promoting fairness. The premise of the study was that promoting fair treatment of union members is an essential union function and to the extent that a union promotes fairness, the union is effective. These researchers found a relationship between levels of union member participation in union activities and perceived union effectiveness in promoting fairness. They also found this relationship to be moderated jointly by gender and ethnicity. These findings provide one more piece of evidence for examining the generalizability of the target model, particularly with regard to the strength of the WGEOF➔PWGE path.

A final rationale for investigating the generalizability of the target model across racial and gender groups comes from an examination of the distributions of ethnic groups. McIntyre (1998) found significant variance differences in Black versus White groups on eight of twelve MEOCS scales. Among these scales were OC, PWGE, and scales pertaining to EOF and racism-sexism. From a purely statistical perspective, these differences suggest the possibility of differences in causal links across the different ethnic groups.

The goal of the study can be presented as a question: Is the target model generalizable or invariant across four large sociocultural groups—African-American and Caucasian enlisted men and women within the military?

Figure 1. The Causal Effects of OEOF and WGEOF on PWGE, OC, and JS (McIntyre et al., 2001)



Method

<u>Participants</u>

At the time of this writing, the Military Equal Opportunity Climate Survey data base contained more than 1,100,000 observations. Prior to sampling, I eliminated from the data base cases that contained missing information on gender, race, and the items comprising the scales. Thereafter, I randomly selected two samples each from the following four groups: enlisted African-American men and women and enlisted Caucasian men and women. Each group contained a pair of samples with a sample size of 5,000 observations in each of the pairs.

<u>Measurement of Variables</u>

The MEOCS was originally developed at DEOMI to measure the perceptions of EO in the military (Dansby & Landis, 1991; Landis, Fisher, & Dansby, 1988; Landis, Dansby, & Faley, 1993). The entire survey (Version 2.3) consisted of 124 questions and can be obtained by contacting the Defense Equal Opportunity Management Institute, Patrick Air Force Base, Florida. For a list of items used in the present study, see Appendix 1.

For the current study, the same latent variables were examined as those in the McIntyre et al. (2001) study. In that study, the authors examined the content of individual items making up the survey and selected 21 that appeared to tap organizational and workgroup fairness. Thirteen of these items came from the first section of the survey and logically pertained to WGEOF. The remaining eight items logically pertained to OEOF.

Three measures of organizational functioning developed by Short (1985) were used as outcome variables for the present study: OC, PWGE, and JS.

Analytic Strategy

A two-step structural equation modeling (SEM) strategy was followed in this study. In order to avoid duplication of information, many of the details for the analytic procedures appear in the Results section along with the results themselves. Suffice it to say that in the first step, the measurement model (underlying the target structural model—M_t) was tested for its invariance across the four groups. For each latent variable, parcels (small groups) of items were created in the same manner used by McIntyre et al., (2001). These parcels were treated as the indicators of the latent variables. The maximum likelihood method was used in all measurement model analyses. An "X-side analysis" was used. (See Byrne (1998).)

In a series on nested measurement model analyses, I examined whether the latent variable (i.e., factor) form, the loadings of the indicators on the factors ($\mathbf{\Lambda}_x$), the variance and covariance among the factors ($\mathbf{\Phi}$), and variance of the observed variables' errors ($\mathbf{\Theta}_\delta$) were consistent across the four sociocultural groups. As will be described in the Results, a specific level of measurement model invariance must be established prior to examining structural invariance (that is, the generalizability of the target model across the groups).

In the second step, the target causal model was tested for structural invariance. All analyses for structural invariance were carried out "from the Y side." See Hayduk (1987) or Byrne (1998) for a discussion of this. Given that at this point in the analyses, the measurement models for the four groups would be shown to be invariant, a single indicator approach was used to examine the invariance of the structural model. In other words, the means of the items comprising a scale were used as the indicator for that latent variable. The following matrices were computed through LISREL 8.3: **B** (Beta—the matrix of hypothesized structural coefficients, and $\mathbf{\Psi}$ (Psi—the diagonal matrix containing the variances of the latent variables). The loadings matrix ($\mathbf{\Lambda}_y$) and the variance of the errors of the indicator variables ($\mathbf{\Theta}\varepsilon$) were set a priori and did not have to be estimated. It should be noted that values of **B** are sometimes referred to as structural coefficients or path coefficients. In the text, I have used the terminology "X➔Y" to represent a particular causal path between causal variable X and outcome variable Y. Once again results from a series of nested models were compared to determine the effect of requiring that all structural coefficients (path coefficients) be held equal. To determine the degree of stability of parameter estimates, two samples each containing 5,000 observations were drawn providing for replication of results.

Large Sample Size Problems in SEM

A sample size of 5,000 is considered large in the (SEM) literature. I chose to use such a sample size for two primary reasons. First, large sample sizes lead to extremely accurate estimates of all parameters. Second, McIntyre et al., (2001)—from which the current study flows—used sample sizes of 5,000. In SEM, however, large sample sizes create certain challenges.

Sensitivity of χ^2 tests. Hayduk (1987) indicates that with very large samples, even minor deviations in fit lead to significant χ^2 values. Fit is defined as the difference between the actual covariance matrix and the model-implied covariance matrix. Jöreskog (1969, in Hayduk, 1987) suggested expressing χ^2 relative to degrees of freedom (df), implying that the value of χ^2/df is a more appropriate index of fit than χ^2 with extremely large sample sizes. Some researchers have recommended that a χ^2 value that is five times df indicates a poor fit. Others have recommended a more conservative value (three times χ^2) is more appropriate. Hoelter (1983) provides a formula for estimating what he labels the critical sample size (N). This critical N represents the size of the sample that would be required to make the observed lack of fit just statistically significant at a standard alpha level. Hoelter found that critical-Ns of 200 or more are reasonable. Hayduk explains that the same decision offered by the critical N statistic can be gained by rerunning all large-sample analyses by editing the syntax to indicate a sample size of 200. A more conservative variation of Hayduk's recommendation is to rerun large-sample analyses after setting the sample size to 500. This approach was followed in a number of points during this study.

Size of the sample and measurement model equivalence. Little (1997) deals with sample size and analysis of the measurement model per se separately from other examinations (such as structural model equivalence). He recommends that the analyst use the practical fit measures such as non-normed fit index (NNFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA) instead of differences in χ^2 as an appropriate tool for judging the equivalence of a measurement model across different samples.

Results

Measurement Model

Table 1 contains the results of the analyses of measurement and construct equivalence. The analyses labeled "Equivalent Factor Form" (1) and "Equivalent Lambda" (2) are most important because these are the necessary conditions for investigating the invariance of causal structure (Byrne, 1998). As described in the Methods section, the analyses summarized in Table 1 were carried out with large sample sizes.

In accord with Little's (1997) suggestions, practical-fit indices were examined to establish measurement equivalence. Analyses 1 and 2 basically examine whether the form of the factors (number of factors with associated indicators) and the values of the factor loadings (Λ_x) are similar. The practical-fit indices associated with analyses 1 and 2 indicate that the measurement model provides an excellent fit to the data (NNFI = 1.0, CFI = 1.0, and RMSEA = .025) leading to the conclusion that measurement equivalence exists across the four groups. Analyses 3 and 4 respectively examine two more conditions: the equivalence of the covariance among the latent constructs and the equivalence of variance and covariance of the latent constructs. Practical fit indices presented in Table 1 indicate that it is reasonable that these conditions hold, although the $\Delta\chi^2$ values suggest that the conditions do not hold. To understand the effect of the large sample size, I followed a suggestion presented by Hayduk and reran the analyses in LISREL 8.3 with identical syntax except for the sample size, which was set to 500. The $\Delta\chi^2$ values are considerably smaller in this condition and indicate that the latter two conditions hold. Analysis 5 (labeled "Equivalent $\mathbf{\Lambda}$, $\mathbf{\Phi}$, and $\mathbf{\Theta}_\delta$) examines whether a final constraint can be applied across the samples...that the error variances of each of the indicators of the latent constructs are equivalent. Once again, the $\Delta\chi^2$ is significant and fairly large. The NNFI and CFI values fall within the usual acceptable range. However, the RMSEA value is very close to the usual poor fit cutoff. This suggests that the final constraint examined in this analysis is not tenable. It should be understood, however, that several authors (e.g., Kline, 1998) have indicated that requiring the error variances associated with the indicator variables to be equivalent is inordinately stringent. Most researchers do not require this condition to conclude that there is measurement invariance.

Structural Invariance

Recall that two random samples were drawn from the population. These pairs were broken into two sets. The first set of samples was used for all model-fitting procedures. The second set was used to replicate the final findings.

Table 2 contains the χ^2 and practical fit indices for M_t for the four groups (first set of samples). Values of χ^2 values are statistically significant which with small samples would indicate poor fitting models. All practical fit indices are close to optimal levels.

Once again, the hypersensitivity of χ^2 with large samples makes the interpretation of findings in this phase challenging. In accord with recommendations presented by Hayduk for understanding the effect of large sample size, I again reran the analyses with the identical LISREL syntax with the exception that the sample size for each analysis was set at 500 (Hayduk, 1987). In these new analyses, the approximate values of χ^2 were consistently **10%** of the values appearing in Table 2, with probability values exceeding the standard .05 level. In other words, with smaller yet extremely reasonable sample sizes, the fit of the models within each sample was excellent.

Table 3 contains the values of the standardized path coefficients ($\underline{\mathbf{B}}_i$s) for each of the four groups. (Note that these standardized path coefficients indicate that the PWGE➔OC path was not very strong in any group and nonsignificant in three of the four groups). Based on this finding, the model was reestimated after deleting the weak path. Although reestimation based on findings within a sample is usually criticized because it involves "data snooping," it is allowable in these circumstances because all analyses are replicated with different random samples of equal size.

Table 4 contains the fit statistics for the re-estimated model (without the PWGE➔OC path) in Sample 1.

Table 5 contains the path coefficients in the revised theoretical model for the first of the pairs of samples for all groups. Values of all path coefficients are extremely similar to those found prior to the re-estimation.

Table 6 contains the fit statistics for the revised model for the second of the pairs of samples for all groups. Table 7 contains the path coefficients (betas) for the second of the pairs of samples for all groups. Results from the analysis of the second pair of random samples indicate extremely similar results across random sample pairs. This suggests high stability of the solutions.

<u>Analysis of Structural Invariance</u>

In order to determine whether the causal models as a whole are invariant across the four groups, several preparatory analyses were required. First, for each of the pairs of random samples, a multi-group (four-group) analysis was carried out in the which the structural coefficients were constrained to be equal across the four groups. Second, a four-group analysis was carried out in which the structural coefficients were estimated freely within each group. In effect, these analyses represent nested models in the sense that the second is nested in the first. This provided the statistical basis for testing whether constraining the structural (path) coefficients to be equal in all groups results in a less well fitting model than if they had been freely estimated within each group. The third step in the assessment of structural invariance involves computing $\Delta\chi^2$ –the difference between the χ^2 associated with the subsuming model and that for the nested model.

The first four rows of Table 8 present the χ^2 and the $\Delta\chi^2$ values for both samples, along with the practical fit indices associated with all models. The $\Delta\chi^2$ values are statistically significant beyond traditional levels of Type I error rate. This suggests that there are differences among the four groups on some of the causal paths. When the sample size was reduced to 500, the $\Delta\chi^2$ values were still statistically significant at the .01 level. On the other hand, the practical fit indices suggest that the fact that there are differences seems not to lead to obviously poor fitting models.

The next set of analyses reported in Table 8 (rows five through eight) represent the results of what might be called partially constrained models. A technique for identifying which groups are relatively dissimilar is described in Appendix 2. The following rank ordering of average dissimilarity was found (from most dissimilar to least dissimilar): Caucasian men, African-American women, African-American men, and Caucasian women. With this information, partially constrained models were analyzed.

In the first partially constrained model, the path coefficients for the Caucasian men were freely estimated while the remaining groups' coefficients were constrained to be equal. This partially constrained model was compared with the model in which all paths were freely estimated for all groups. The result of this comparison was a statistically significant $\Delta\chi^2$ value (that is the difference between the χ^2 of the free model and χ^2 of the partially constrained model) ($\Delta\chi^2(6) = 185.42$, $\underline{p} < .0000001$). (Similar results were computed for the second of the pairs of samples—see Table 8.) However, after specifying a sample size of 500, the $\Delta\chi^2$ value dropped to a nonsignificant level. This, along with the superior values of the practical fit indices, suggests that the Caucasian male group (in both samples) sample contributed most to non-invariance of the model. By allowing free estimation of **B** with this group alone, there seems to be a reasonable fit. It was unnecessary to compare other partially constrained models thereafter given that the Caucasian male sample seems to account for the primary lack of fit.

I also attempted to determine whether the non-invariance may have been attributable to certain causal paths as an alternative to certain groups. To accomplish this goal, the standard deviations (SD) of each of the estimated values of **B** across the four groups were examined. The corresponding paths were rank ordered in terms of standard deviations from lowest SD value to highest as follows: PWGE➔JS, WGEOF➔JS,OEOF➔WGEOF,WGEOF➔OC,WGEOF➔PWGE, and JS➔OC. In other words, the value of an estimated **B** with the most similarity was PWGE➔JS while that with the least similar value was JS➔OC.

A series of analyses was carried out in which the paths with the smallest SD value were successively entered into the model as constrained to be equal. The $\Delta\chi^2$ values were computed representing the difference between the constrained model and the freely estimated model. If a $\Delta\chi^2$ value is statistically significant, then one can conclude that by constraining the corresponding **B** values to be equal resulted in a significant decrement in fit in the multiple group analyses. Results are presented in Tables 9 and 10 (for Samples

1 and 2, respectively). Once again, the sample size created a challenge for interpretation. Therefore, parallel analyses were carried out in which the sample sizes were reduced to N=500. By doing this, it appeared as there were two paths that created the greatest degree of noninvariance across the four groups: WGEOF➔PWGE and JS➔OC. Before constraining these two paths to be equal across the four groups, with sample size set to 500, the $\Delta\chi^2$ were not significant.

A final analysis was carried out to determine the degree of agreement in the estimated values in **B.** This involved computing the mean value of each estimated path coefficient across the pair of samples for each group. Kendall's concordance ratio ($\underline{W}$) with 5 df equaled .879, $\underline{p} < .004$. This suggests fairly strong agreement in the rank-ordering of the values of the path coefficients for all groups.

Figure 2 presents the overall model from the first of the pairs of samples. Structural coefficients are the mean of the standardized values across the four groups. From a practical perspective, given the concordance among the groups on the standardized structural coefficients, this depiction is a useful one.

Figure 2. Final Model with Mean Standardized Path Coefficients (Sample 1)

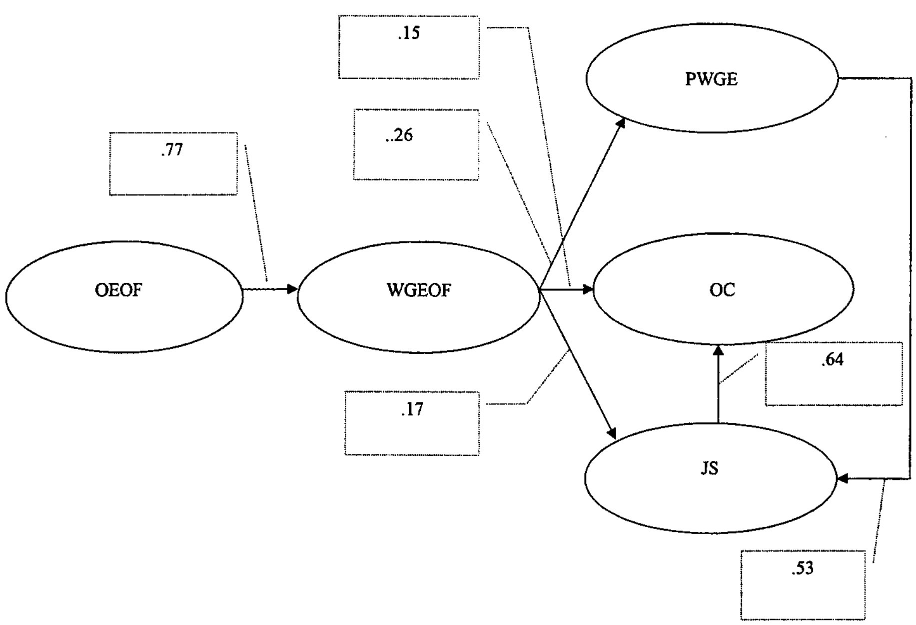


Table 1

Chi-Square Statistics and Goodness-of-Fit Indices for the Measurement Model: Overall Invariance Across All Groups on Parcels

Measurement model	Chi-square Statistic			Goodness-of-fit Indices			Difference Statistics	
	df	χ^2	p<	NNFI	CFI	RMSE.	df	$\Delta\chi^2$
(1) Equivalent Factor Form	72	292.19	.00	1.0	1.0	.025	--	--
(2) Equivalent Λ	84	335.56	.00	1.0	1.0	.024	12	43.37*
(3) Equivalent Λ and Covariances of Latent Constructs	114	1273.19	.00	.98	.99	.045	30	937.63*
(4) Equivalent Λ and Variances and Covariances of Latent Constructs (Φ)	129	1561.35	.00	.98	.98	.047	15	243.16*
(5) Equivalent Λ, Φ, and Θ_δ	153	2995.26	.00	.97	.97	.060	24	1433.91*

Note. NNFI = Nonnormed fit index, CFI = Comparative fit index, and RMSEA = Root mean square error of approximation; *=p<.00001

Table 2
M_t : Chi-Square Statistics and Goodness-of-Fit Indices for Individual Groups (Sample 1)

	Chi-square Statistic			Goodness-of-fit Indices		
	df	χ^2	*p*<	NNFI	CFI	RMSEA
African-American Men	3	35.43	0.00	.98	.99	0.047
White Men	3	77.45	0.00	.96	.99	0.071
African-American Women	3	53.38	0.00	.97	.99	0.058
White Women	3	34.07	0.00	.98	.99	0.046

Note. NNFI = Non-normed fit index, CFI = Comparative fit index, and RMSEA = Root mean square error of approximation.

Table 3

Standardized Path Coefficients (Betas) for each Group for M_t (Sample 1)

Causal Paths	Black Men	Black Women	White Men	White Women
OEOF➔WGEOF	.81	.78	.69	.77
WGEOF➔PWGE	.22	.20	.34	.29
WGEOF➔OC	.18	.22	.09	.12
WGEOF➔JS	.22	.19	.11	.18
PWGE➔OC	.02	.04	.01	.03
PWGE➔JS	.57	.52	.53	.68
JS➔OC	.56	.56	.73	.49

Table 4

M_t : Chi-Square Statistics and Goodness-of-Fit Indices for Revised Model for Individual Groups (Sample 1)

	Chi-square Statistic			Goodness-of-fit Indices		
	df	χ^2	*p*<	NNFI	CFI	RMSEA
African-American Men	3	36.46	0.00	.99	.99	0.040
White Men	3	77.78	0.00	.97	.99	0.061
African-American Women	3	58.18	0.00	.98	.99	0.052
White Women	3	36.65	0.00	.99	.99	0.041

Note. NNFI = Non-normed fit index, CFI = Comparative fit index, and RMSEA = Root mean square error of approximation.

Table 5

Standardized Path Coefficients (Betas) for each Group for Re-estimated M_t (Sample 1)

Causal Paths	Black Men	Black Women	White Men	White Women
OEOF→WGEOF	.82	.78	.69	.77
WGEOF→PWGE	.22	.20	.34	.29
WGEOF→OC	.18	.22	.09	.12
WGEOF→JS	.22	.19	.10	.18
PWGE→JS	.56	.56	.53	.49
JS→OC	.59	.55	.73	.69

Table 6

M_t : Chi-Square Statistics and Goodness-of-Fit Indices for Individual Groups on the Re-estimated Model (Sample 2)

	Chi-square Statistic			Goodness-of-fit Indices		
	df	χ^2	$p<$	NNFI	CFI	RMSEA
African-American Men	4	35.29	0.00	.99	.99	0.039
White Men	4	50.39	0.00	.98	.99	0.048
African-American Women	4	25.83	0.00	.99	1.0	0.033
White Women	4	40.51	0.00	.98	.99	0.043

Note. NNFI = Non-normed fit index, CFI = Comparative fit index, and RMSEA = Root mean square error of approximation.

Table 7

Standardized Path Coefficients (Betas) for each Group for Re-estimated M_t (Sample 2)

Causal Paths	Black Men	Black Women	White Men	White Women
OEOF→WGEOF	.82	.78	.73	.76
WGEOF→PWGE	.20	.15	.32	.30
WGEOF→OC	.22	.24	.06	.15
WGEOF→JS	.17	.18	.12	.16
PWGE→JS	.57	.54	.53	.51
JS→OC	.57	.54	.75	.67

Table 8

Chi-Square Statistics and Goodness-of-Fit Indices for the Revised Model with Structural Coefficients Free to Vary and Constrained to be Equal (Samples 1 and 2)

	Chi-square Statistic			Goodness-of-fit Indices			Difference Statistics	
	df	χ^2	$p<$	NNFI	CFI	RMSEA	df	$\Delta\chi^2$
Revised M_t—B Free (S1)	16	209.97	.00	.98	.99	.049	—	—
Revised M_t—B Constrnd (S1)	34	540.18	.00	.98	.98	.054	18	330.21*
Revised M_t—B Free (S2)	16	152.86	.00	.99	.99	.041	—	—
Revised M_t—B Constrained (S2)	34	522.28	.00	.98	.98	.053	18	369.42*
Revised M_t—B Constrnd 3 grps(S1)	28	354.76	.00	.98	.99	.048	6	144.79*
Revised M_t—B Constrnd 2 grps(S1)	22	296.87	.00	.98	.99	.050	6	86.90*
Revised M_t—B Constrnd 3 grps(S2)	28	321.64	.00	.98	.99	.046	6	168.78*
Revised M_t—B Constrnd 2 grps(S2)	22	251.09	.00	.98	.99	.046	6	98.23*

Note. * = $p < .00001$

Table 9

Chi-Square Statistics and Goodness-of-Fit Indices for the Models successively constrained by Path (Sample 1)

	Chi-square statistic			Goodness-of-fit Indices			Difference Statistics	
	df	χ^2	$p<$	NNFI	CFI	RMSEA	df	$\Delta \chi^2$
Revised M_t—B Free (S1)	16	209.97	.00	.98	.99	.049	--	--
Constrained PWGE→JS	19	218.77	.00	.98	.99	.046	3	8.80 *
Constrained PWGE→JS, WGEOF→JS	22	229.81	.00	.98	.99	.043	6	19.80 **
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF	25	295.74	.00	.98	.99	.047	9	85.77 ***
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF, WGEOF→OC	28	311.90	.00	.98	.99	.045	12	101.93 ***
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF, WGEOF→OC, WGEOF→PWGE	31	433.44	.00	.98	.98	.051	15	223.47 ***
All Constrained	34	540.18	.00	.98	.98	.054	18	330.21 ***

* = $p < .05$; ** = $p < .01$; *** = $p < .0001$

Table 10

Chi-Square Statistics and Goodness-of-Fit Indices for the Models successively constrained by Path (Sample 2)

	Chi-square statistic			Goodness-of-fit Indices			Difference Statistics	
	df	χ^2	$p<$	NNFI	CFI	RMSEA	df	$\Delta \chi^2$
Revised M_t—B Free (S1)	16	152.86	.00	.99	.99	.041	--	--
Constrained PWGE→JS	19	158.01	.00	.99	.99	.038	3	6.00 ns
Constrained PWGE→JS, WGEOF→JS	22	159.20	.00	.99	.99	.035	6	6.34 ns
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF	25	219.73	.00	.99	.99	.040	9	66.87 ***
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF, WGEOF→OC	28	262.61	.00	.99	.99	.041	12	109.75 ***
Constrained PWGE→JS, WGEOF→JS, OEOF→WGEOF, WGEOF→OC, WGEOF→PWGE	31	410.42	.00	.98	.98	.049	15	257.56 ***
All Constrained	34	522.28	.00	.98	.98	.053	18	369.42 ***

* = $p < .05$; ** = $p < .01$; *** = $p < .0001$

Discussion

The primary goal in this research was to determine the degree to which the McIntyre et al., (2001) causal model—the target theoretical model that clarifies the effects of EOF attitudes on WGEOF, JS, and OC—is stable across four large groups within the United States military. In order to accomplish this goal, multiple-group SEM was used. Simultaneous multiple-group procedures in SEM allow the researcher to statistically test for the existence of noninvariance (or inconsistancy) in causal structures across different groups. If statistically significant lack of fit is discovered, the researcher may conclude that the causal (structural) model is not the same across the different groups.

The use of large sample size in SEM yields more precise estimates of effects such as structural coefficients. It can also interfere with the clarity of interpretation. Most researchers do not face this quandary because their sample sizes are relatively small—perhaps on the average no greater than 200 (Hayduk, 1987). To answer whether the target theoretical model is tenable across four major groups within the U.S. military in light of the interpretation obstacles, a series of statistical tests were carried out designed to help the reader come to a conclusion about the results. The following discussion of the results is developed to reflect on the technically precise findings from the study and the practical conclusions that can be drawn from these findings.

Technical Findings with Practical Implications

The first technical finding in this study was that the measurement model, which described the "mapping" of the observable variables to the latent constructs was similar across the four groups. Little (1997) and others hold that prior to dealing with questions concerning the similarity or difference in a structural model across groups, the measurement model must show equivalent factor form and equivalent values of the loadings of the observed variables on the latent constructs (i.e., the values comprising Λ_x). Little goes on to explain that the practical fit indices may be used to establish these two conditions. Table 1 indicates that the practical fit indices used in this study (NNFI, RMSEA, and CFI) support the two conditions. Technically, there is evidence of differences among the variances and covariances among the latent constructs, as well as the variances of the measurement errors of the indicator variables. However, practically, one can conclude that there is evidence that the latent constructs (OEOF, WGEOF, PWGE, JS, and OC) have sufficiently similar mean across the four groups to allow for the focal investigation in this study.

The second technical finding was that within each of the groups, although the chi-square values surpassed cutoff values for statistical significance, the practical fit indices indicated that the target theoretical model fit the data quite well in samples 1 and 2. This suggests reasonable support for the hypothesized model. It should be noted that when the sample size is reduced from 5,000 to 500, then the chi-square values describing the fit of the models with each of the groups correspondingly reduced by a factor of 90%. Practically speaking, therefore, the hypothesized model holds for each group.

A third technical finding pertained to one of the causal paths in the hypothesized model. An examination of results of each of the groups (Samples 1 and 2) suggested that the path—PWGE➔OC—was extremely weak. The largest value of the standardized coefficient for this path was .04. Although, in a precise sense, this value was statistically significantly greater than zero, the path was dropped from the model because it appeared to be of little practical value.

The fourth technical finding was that the revised hypothesized model (revised as a function of dropping PWGE➔OC) was not invariant across the four groups for either of the samples. This noninvariance is evidenced by a statistically significant $\Delta\,\chi^2$ value in Samples 1 and 2. Further, the difference cannot be simply explained away by large sample size, given the fact that the $\Delta\chi^2$ value was statistically significant with a sample size of 500. The bottom line is this: technically, the structural model cannot be viewed as invariant across the four groups. What does this mean from a practical perspective?

In order to answer this question, a variety of follow-up analyses were carried out. The first set was intended to identify one or more outlier groups...groups that might stand apart from the rest with regard to the estimated values of **B**. It was hypothesized that the Caucasian male group stood apart from the others. Table 8 indicates technically that the freeing the values of **B** for the Caucasian male group (both samples) did not, strictly speaking, lead to an acceptable fit because the $\Delta\chi^2$ values were statistically significant (see lines 5 and 7 in Table 8). However, this technical noninvariance disappears after adjusting the sample size downward from 5,000 to 500. In addition, practical fit indices are very close to optimal. Therefore, it appears as though the Caucasian male sample may account for the lack of invariance in the revised hypothesized model.

Another series of follow-up analyses were carried out as well. The goal in these analyses was to identify, not groups, but paths that may account for the lack of invariance of the target model. Therefore, in an iterative fashion, paths were successively constrained to be equal across the four groups. Results indicate that the following two paths are extremely similar across the groups: PWGE➔JS, WGEOF➔JS, OEOF➔WGEOF, WGEOF➔OC, after adjusting the sample size downward. This leaves two paths to lead to the greater discrepancies among the four groups: JS➔OC and WGEOF➔PWGE.

One of the reasons why it is important to examine the invariance of a causal model is to determine whether it is a reliable basis for creating practical interventions such as training and organizational development tools. It seems useful, therefore, to ask the question whether the sources of the noninvariance (the Caucasian male group and the JS➔OC and WGEOF➔PWGE paths) are so different that training and interventions would need to be specifically tailored to accommodate the differences.

To address this question, it seemed useful to compare the magnitude of the four groups' path coefficients. These values appear in Tables 5 and 7. An examination of these tables indicates that the values are very similar for the most part across the four groups. At the very least, one gets an impression that the relative ordering of the path coefficients for each group is very similar. This hypothesis was verified by computing the Kendall's concordance ration (W), which showed a high degree of similarity in the rank ordering of the standardized path coefficients. Thus, it seems as though the noninvariance that exists across the samples is due more to absolute value of differences between standardized coefficients rather than a difference in their ordering. This leads to the practical conclusion that training and other organizational development interventions can use the theoretical model as a tool for identifying problems associated with the model's variables with little loss of generality (at least across these four large groups). This practical conclusion acknowledges that there may be greater connection for Caucasian males and the rest of the groups between JS and OC and less of a connection for this same group between OEOF and WGEOF. Nonetheless, the rank ordering of the structural coefficients for all groups is reasonably close.

Interventions, Training, and Other Practical Benefits

This paper is "littered" with esoteric statistical information. Such information provides the reader who is so inclined and so trained to examine the foundation for the recommendations that are presented below. Indeed, the presentation of statistical esoterica was not offered as a way of proving anything. The fact of the matter is that statistics are sometimes complicated tools to provide very practical guidelines for intervening within organizations such as the United States military. To summarize the practical value of the hypothesized model, a decision tree has been designed, based on the findings in this and the McIntyre et al., (2001) studies. See Tables 11, 12, and 13. This decision tree summarizes directions that organization development interventions might take within military commands when faced with certain problems. It is assumed in this decision tree format that an extremely important outcome for the military is OC. Therefore, the tree begins at this point and works its way back to possible causes of substandard OC, providing simple guidelines as to the source of the problem and ways of dealing with the problems. Note that the tree as presented is "bare bones" in the sense that details on indicators of problems and solutions are not elaborated upon.

Limitations of the Study

This study has certain limitations. First, from a methods' perspective, it must be acknowledged that the current study is based on self-reported data all collected by means of the same instrument. This means that there may be certain built-in measurement biases that account for the relationships among observed data. There is no simple rebuttal to this apparent flaw. One can point out that there really is no other practical way of assessing causal links among key organizational processes with large samples except through the use of self-report data. One can also point out that it is relatively common

Table 11. Flow Diagram for Organizational Development (Part 1)

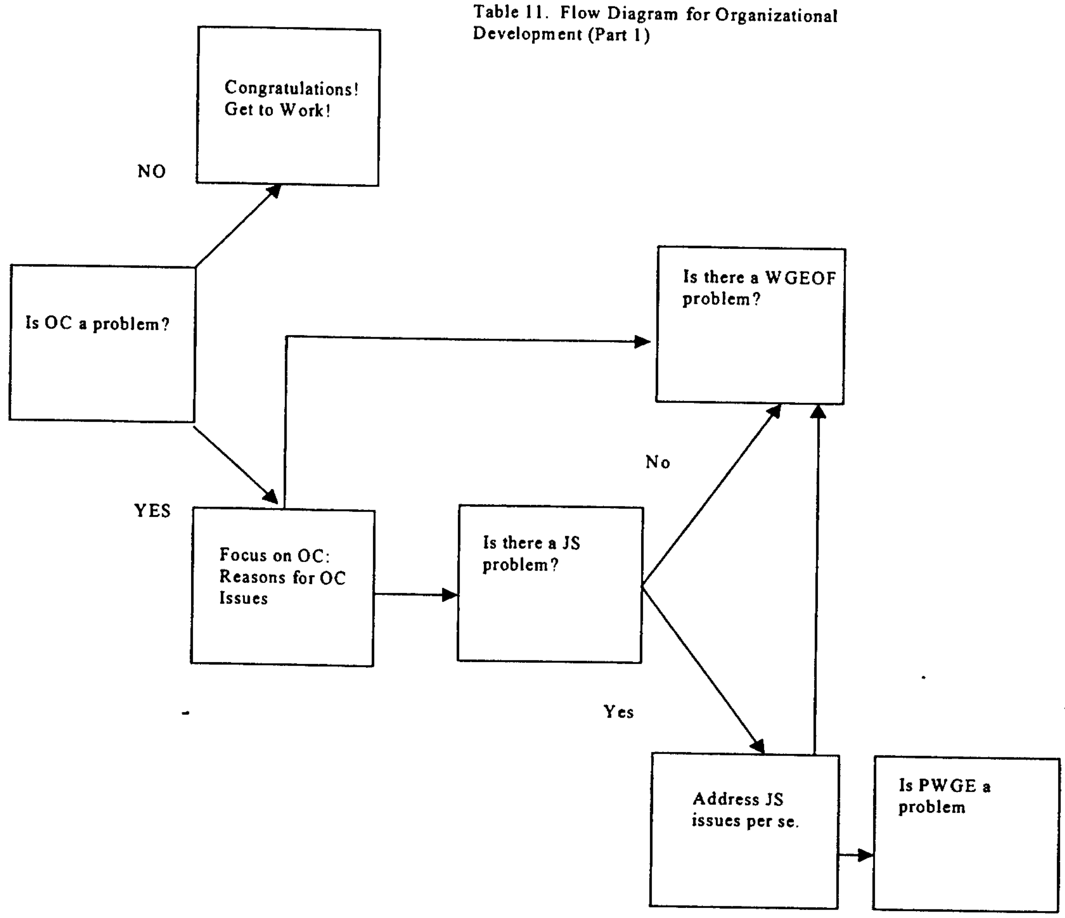


Table 12. Flow Diagram for Organizational Development (Part 2)

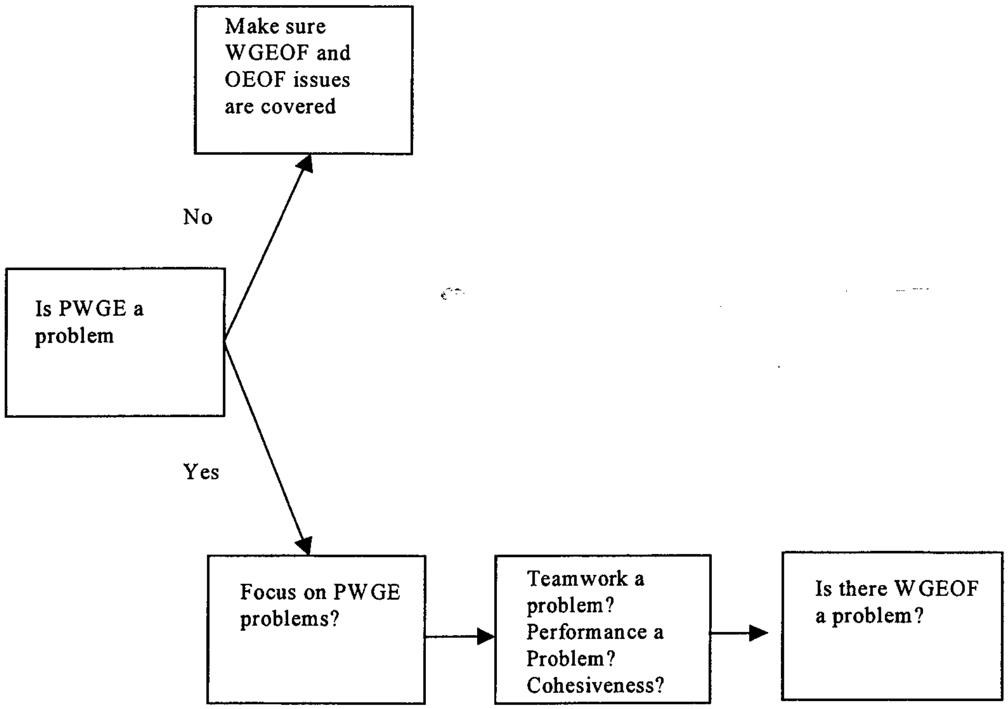
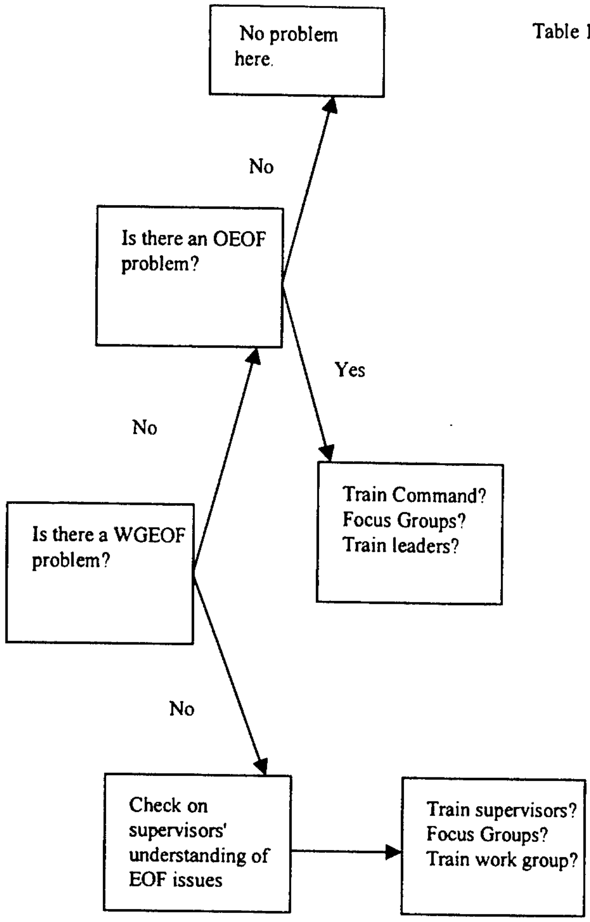


Table 13. Flow Diagram for Organizational Development (Part 3)



practice within the organizational behavior literature to use self-report data from the same instrument to draw conclusions on organizational behavior processes. Finally, one can emphasize that the care taken in this research, along with the very large samples, make the study perhaps as good as it gets in dealing with the focal phenomena.

There are other substantive limitations. For example, only four groups were examined within this study to determine the invariance of the hypothesized model. All samples comprised individual respondents from the enlisted ranks. Perhaps similar samples from the officer and warrant officer ranks could be investigated? Further, perhaps other sociocultural groups (such as Latino Americans, Native Americans, Asian Americans, and Pacific Islanders) should also be investigated. This seems as though it would be a useful follow-up study to ensure that the effects of status in the organization and unique cultures are better understood. To this end, such a follow-up study is being planned.

Future Theoretical Work

Organizational behavior researchers—particularly those within the military community—would do well to examine further several interesting findings. First and foremost is the direct effect of PWGE on JS and its mediated effect on OC. This effect seems to imply that team self-efficacy, experienced by team members, leads to individual JS, which in turn leads to OC. Within the military, teams are critical. If perceptions of work group and team performance are low, then what might ensue are reduced JS and ultimately OC. Why does this happen? How? These are important questions.

Another interesting phenomenon is the impact of WGEOF on PWGE. This may be a cogent way of construing the tie in between feelings of fair treatment and combat readiness. The logic for this statement goes as follows. If PWGE can be thought of as akin to self-efficacy, then as it increases, performance in the work group increases. Attitudinal variables such as EOF in influencing PWGE ultimately influence performance. This may be a line of reasoning that military researchers should investigate seriously.

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Appendix 1
Final Scale Items

Work Group EOF

1. A supervisor gave a minority subordinate a severe punishment for a minor infraction. A majority member who committed the same offense was give a less severe penalty. R
2. A qualified minority first level supervisor was denied the opportunity for professional education by his/her supervisor. A majority first-level supervisor with the same qualifications was given the opportunity. R
3. A majority supervisor did not select a qualified minority subordinate for promotion. R
4. A majority supervisor frequently reprimanded a minority subordinate but rarely reprimanded a majority subordinate. R
5. A minority member was assigned less desirable office space than a majority member. R

Organizational EOF

1. Minority members get more extra work details than majority members. R
2. Majority members get away with breaking rules that result in punishment for minorities. R
3. Majority men have a better chance than minority women to get the best training opportunities. R

Organizational Commitment

1. For me, this organization is the best of all possible ways to serve my country.
2. I am proud to tell others that I am part of this organization.
3. I find that my values and the organization's values are very similar.

4. This organization really inspires me to perform my job in the very best manner possible.

5. I am extremely glad to be part of this organization compared to other similar organizations that I could be in.

Job Satisfaction

Satisfaction with ...

1. The chance to help people improve their welfare through the performance of my job.

2. The recognition and pride my family has in the work I do.

3. The chance to acquire valuable skills in my job that prepare me for future opportunities.

4. My job as a whole.

Work Group Efficacy

1. The amount of output of my work group is very high.

2. When high priority work arises, such as short suspenses, crash programs, and schedule changes, the people in my work group do an outstanding job in handling these situations.

3. My work group's performance in comparison to similar work groups is very high.

4. The quality of output of my work group is very high.

Note. R indicates items that were reversed scored.

Appendix 2
Technique for Identifying Dissimilar Groups

In order to carry out these analyses described in Table 8 (rows five through eight), the following set of procedures was carried out.

1. The mean of each of the path coefficients presented in Tables 3 and 5 was computed across each pair of samples for each path.
2. The mean and standard deviation for each mean path coefficient across the four groups was then computed.
3. The absolute value of the z-score was computed for each mean path based on the standard deviation of values across the four groups. This value indicates the degree to which a particular group's path coefficient (B_i) is deviant.

The mean of the absolute value of these z-scores across the six paths for each group was computed as a logical tool for detecting groups with extreme groups. Groups were rank-ordered with regard to the average absolute value of the z-scores.