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ABSTRACT

A recent issue of importance in the vast literature on well-being and age concerns the factorial invariance of the construct across age groups. Current wisdom suggests that while differences in loadings exist among age groups, the construction of summary measures introduces little bias. To investigate age and ethnic variation in the meaning of morale, data on Blacks (N=413), Anglos (N=407) and Mexican Americans (N=449) were obtained from interviews which had been conducted with a larger sample of people living in Los Angeles County. Measures of three widely investigated causes of morale (self-assessed health, sex, and income) were included on the survey instrument. Evaluations of three latent structure causal models of morale were conducted. Each model was estimated separately for Blacks, Angelos and Mexican Americans and for those aged 45-54, 55-64 and 65-74 within each of those categories. Analyses of results revealed factorial variance in the meaning of well-being across ethnic groups. In addition to factor structure, differences were uncovered for the causal significance of health and sex. Self-assessed health became less important with advancing age, and sex had markedly different effects for different age groups. The findings indicate that cross-ethnic comparisons of well-being which assume factorial invariance are conceptually flawed. (WAS)

Age, Ethnicity and the Factorial Invariance of Morale

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Abstract

A recent issue of importance in the vast literature on well-being and age concerns the factorial invariance of the construct across age groups. Current wisdom suggests that while differences in factor loadings exist among age groups, the construction of summary measures introduces little, if any, substantive bias. In this paper, we demonstrate that while such may be true for Anglos, considerable differences exist for Blacks and Mexican Americans. This is true not only for subtle differences in factor loadings but for basic differences in factor structure as well. While a single factor model appears adequate for Anglos, a two factor model is more appropriate for minorities of certain ages.

Age, Ethnicity and the Factorial Invariance of Morale

The study of subjective well-being has become one of the most widely studied issues in American Gerontology, occupying over 28% of the space devoted to social gerontology in this journal in the past seven years. During this time, a consensus has emerged regarding the determinants of morale for different age groups (see Larson, 1978). Recently, however, a major debate has surfaced which threatens to call into question much of the current wisdom regarding the distribution of well-being among different age groups. The debate centers around the question of whether morale means the same thing to different age groups. In this paper, we review the evidence surrounding this debate and extend the controversy to include a consideration of minority aging.

Larson (1978), in an excellent review of the literature, suggests that the consistency of the empirical evidence regarding the various indicators of well-being justifies treating it as a single summary construct. Despite the fact that empirical regularities exist in the literature on well-being, especially insofar as health (Edwards and Klemmack, 1973; Palmore and Luikart, 1972; Spreitzer and Snyder, 1974), and socioeconomic status (Cutler, 1973; Edwards and Klemmack, 1973) are concerned, efforts at investigating inter-group differences have had mixed results. It has been particularly difficult to demonstrate such differences in the areas of race/ethnicity and age.. Most studies suggest that older Blacks and Mexican Americans score lower on measures of well-being, with most of these differences disappearing in the presence of controls for socioeconomic status and health (Clemente and Sauer, 1974; Markides et al., 1980; Spreitzer and Snyder, 1974).

In the case of age, there is even less consistency than with race. Some studies show small declines (Bradburn, 1969; Edwards and Klemmack, 1973; Neugarten et al., 1961). Others show that the introduction of controls for health and SES

eliminates age differences (Edwards and Klemmack, 1973; Kivett, 1976), while still others demonstrate positive relationships in the presence of such controls (Alston et al., 1974; Bortner and Hultsch, 1970; Clemente and Sauer, 1976; Czaja, 1975; Witt et al., 1980). One possible explanation for such inconsistency might be that the meaning of well-being varies by age and ethnicity.

Recently, a series of seminal articles has appeared which address this issue. Cutler (1979), for example, takes issue with Larson's (1978) presumption regarding the unidimensionality of well-being. Citing studies showing low inter-correlations among various measures of well-being (Lohman, 1977; Medley, 1976), Cutler factor analyzed 12 life domains which contribute to overall satisfaction. His principal components analysis demonstrated marked age differences in both factor structure and factor loadings.

Cutler's attack on the notion of factorial invariance across age categories was met with an interesting rebuttal by Herzog and Rodgers (1981) who, citing Cunningham (1978), argue that Cutler's analysis was flawed by an inappropriate comparison of standardized correlation matrices. Herzog and Rodgers correctly point out that such are inappropriate for inter-group comparisons since the vectors of standard deviations used to standardize the correlation matrices for each age group will themselves differ across age groups. Cutler's finding of structural differences in the meaning of well-being is, therefore, suspect. Further, their own re-analysis of Cutler's work with the Quality of Life study (Campbell et al., 1976) as well as analyses performed on the 1978 Q.A.L. study demonstrated invariance with respect to age regarding the number of factors but significant variation in factor loadings. On balance, their work implies that cross age comparisons using a summated index of well-being are perfectly appropriate and

that no serious problems of interpretation are so introduced.

Evidence regarding age-group similarities in factor structure for minorities, however, is lacking. Indeed, there is no reason to expect similarities in factor structure between ethnic groups given the marked differences in such basic things as life expectancy, income and health (Markides, 1983).

Data and Measures

Data for this study are from the USC Social and Cultural Contexts of Aging project. The sample is a probability sample obtained from interviews with 1269 people living in Los Angeles County. The sample is unique in its oversampling of Blacks and Mexican Americans. The sample was divided into eighteen cells formed by the cross-classification of ethnicity (Black, Anglo, and Mexican American), age (45-54, 55-64, and 65-74), and Duncan's SEI (less than 31 and greater than 31). The sample weights employed in this analysis ensure that each of the ethnic sub-samples (413 Blacks, 407 Anglos and 449 Mexican Americans) are representative of their respective ethnic populations of Los Angeles County.

The survey instrument included an eleven item version of the Philadelphia Geriatric Center Morale Scale developed by Lawton (1975). This version is the same scale used by Dowd and Bengtson (1978) in their paper on double jeopardy and is presented in Table 4. Also included in the instrument were measures of self assessed health, sex and income.

Method

Our aim was to investigate age and ethnic variation in the meaning of morale. Included in this is a consideration first of the variations in factor structure and second of possible variations in causal structure. Toward this end, we selected three widely investigated causes of morale--self assessed health, sex

and income. The first and third are consistently shown to affect morale, while sex is less clearly related.

Dowd and Bengtson (1978), in their analysis of these data, found evidence for a two factor model. One factor, tranquility, consisted of eight items, the other, optimism, loaded highly on the remaining three (see Table 4). Accordingly, in the analysis which follows, we evaluated three latent structure causal models of morale.

Model 1 (Figure 1) is a simple, one-factor model containing 11 indicators of morale (η_1). Morale is considered to be a latent or unobserved construct, the relationship of which to each of the 11 indicators is indicated by the factor loadings, λ_1 to λ_{11}. Morale is causally linked to ξ_1 (self assessed health), ξ_2 (sex) and ξ_3 (family income). These are each latent constructs that are measured by a single item indicator.

Model 2 (Figure 2) is similar in all respects to model 1 except for the fact that two factors--tranquility (η_1) and optimism (η_2) are hypothesized. The relationships between the predetermined variables--health (ξ_1), sex (ξ_2), income (ξ_3) and the latent constructs (tranquility η_1 and optimism η_2) are indicated by γ_1 to γ_6. Finally, we estimate two versions of model 2. The first, model 2a, specifies zero correlation between η_1 and η_2. The second, model 2b, specifies a non-recursive relationship between the two factors (β_1 and β_2 in Figure 2).

These three models were estimated using LISREL IV, a program developed by Jöreskog and Sörbom (1978) that assesses linear structural relationships using the maximum likelihood method. This method of estimation is particularly useful for models which incorporate either non-recursivity or latent constructs such as the ones we analyze here. In addition, it is possible to estimate causal models across

different populations either allowing various parameter matrices to vary or specifying that they be constrained to be equal. By comparing the χ^2 associated with each specification of constraints and equalities, it is possible to assess similarity in factor structure, similarity in the pattern of factor loadings (for those groups with similar factor structures) and finally similarity in causal structure.

Findings

Table 1 reports the results of the analysis of the three candidate models of morale (model 1, model 2a, and model 2b). Each model was estimated separately for Anglos, Blacks and Mexican Americans and within each of these categories for those aged 45-54, 55-64 and 65-74. Thus, nine analyses were performed for each candidate model. This analysis of structure was performed on the standardized variance-covariance matrices, since this phase of the analysis does not involve inter-group comparisons. In this regard, the analysis is acceptable in view of the requirements and procedures outlined in Cunningham (1978).

Columns 1 through 3 in Table 1 present the χ^2 for model 1, 2a and 2b respectively. Model 2b (two factor, correlated) performs the worst for all age/ethnicity combinations: χ^2 for this model is consistently higher than the other two indicating a poorer fit with the data. Model 2a, (two factors, uncorrelated) on the other hand, performs better for Blacks between 45 and 54. Comparison of these two models yields a χ^2 difference of 11 which with three degrees of freedom is significant at the .025 level. There is no such difference in factor structure for the other age groups within the Black category.

For Mexican Americans, model 1 performs best for those between 45 and 54, but model 2a fits better for those 55-74. These differences are both significant at

the .005 level.

It is interesting to note that our analysis of factor structures agrees with the thrust of Herzog and Rodgers (1981) for Anglos, but not for Blacks or Mexican Americans. Thus, these findings should be added to the long list of criticisms of research that assumes that aging is a homogeneous process for all ethnic groups. The analysis in Table 1 argues to the contrary.

Thus far, we have spoken to the issue of factor structure, but have not addressed the issue of factor loadings. This phase of the analysis was carried out separately for each ethnic group. In addition, the matrices anlayzed were not standardized, but instead were the raw variance-covariance matrices. As articulated by Cunningham (1978), such is appropriate since the variances of these variables across age groups is likely.

With LISREL, it is possible to analyze several groups simultaneously, specifying various constraints across the groups. There are two matrices that are of interest here. First is the matrix of factor loadings (the LY matrix). These are shown in Figures 1 and 2 as λ_1 through λ_{11}. Second, the GA (gamma) matrix is the matrix of causal parameters that specifies a relationship between ξ_1, ξ_2 and ξ_3 and η_1 (in model 1) and η_1 and η_2 (in models 2a and 2b). We analyzed group differences in these two matrices by specifying first that LY be allowed to vary across all age groups. In a second step, both LY and GA were allowed to vary across age groups with all other matrices constrained to be equal. Finally, all matrices were allowed to vary across all age groups. Throughout, each specification was compared to the fixed case, that is with all parameter matrices specified to be equal across all age groups. The resulting χ^2 difference reported in Table 2 then, is the difference between each specification of freedom and the

invariant case which assumes that all parameter matrices (including those for factor loadings LY and causal structure GA) are equal for all age groups.

Among Anglos, the first specification that LY be allowed to vary across age groups yielded a decrease in χ^2 of 22.36 over that obtained from the invariant model (with all matrices constrained to be equal). With 10 degrees of freedom, this is a significant improvement in the fit of the model at the .02 level.

Similar findings were obtained when GA, the matrix of causal effects, was allowed to vary with all other parameter matrices (including LY) constrained to be equal across age groups. A χ^2 difference of 24.61 with 6 degrees of freedom is significant at the .001 level. The final two possibilities for Anglos also yielded significant reductions in χ^2. By allowing both LY and GA to be estimated uniquely for each age group a significant improvement in the fit of the model was obtained. Finally, the best fit was obtained by the model that specifies all parameter matrices to be uniquely estimated for each age group. With a χ^2 difference of 157.88 and 56 degrees of freedom the unconstrained model achieves a significant improvement in the fit of the model at the .001 level.

Thus far, our analysis for Anglos replicates those of Herzog and Rodgers (1981) who found structural similarity across age groups, but age differences in variances and factor loadings. But we also found significant differences in factor structure for Blacks and Mexican Americans. Now we turn to a consideration of age differences in factor loadings and causal relationships among minorities who share similar factor structures.

Recall that for Blacks, a single factor model (model 1) provided an adequate fit for the two oldest age groups (55-64 and 65-74). Table 2 reports the results of the analysis of differences between these two age groups in both loadings and

causal structure.

As before, significant improvements in fit are obtained by freeing all of the parameter matrices. Not only are there significant differences in factor loadings, but also in the relationship between health, sex and income on the one hand, and morale on the other.

For Mexican Americans, a two factor model (2a) achieved the best fit for those age 55 and over. Results are similar to those for Anglos and Blacks: significant improvements result when parameter estimates are allowed to vary by age.

Having established significant ethnic differences in the factor structure of morale, as well as age differences in loadings and causal relationships, it is appropriate to examine the parameter estimates themselves. These are presented in Table 3.

These estimates were computed using the best fitting model for each group. Thus model 1 was estimated for Anglos, for Blacks (55-64 and 65-74) and for Mexican Americans 45-54. Similarly model 2a was estimated for Blacks 45-54 and for Mexican Americans 55-64 and 65-74.

First, we consider the rank-order similarities between the loadings for the three age groups of Anglos and, the two age groups of Blacks for whom model 1 was appropriate. In each case, the correlation (Spearman's ρ) between ranks is below .4. It would appear that some degree of bias would be introduced when making age comparisons even for those groups with similar factor structures. At the least, responses across age categories should probably be weighted by their factor score coefficients.

Next, we consider the causal relationships between health, sex, income and

morale. For all groups there is a good approximation to the results reported in Larson (1978).

Overall, we find a relatively strong relationship between poor health and low morale. However, there is a surprising drop in the importance of health for each successive age group. This is true for both Anglos and Blacks where model 1 was estimated for more than one age group (λ_1) and for Mexican Americans where model 2a was estimated (λ_1 and λ_4). Why should older age groups for whom health is problematic be less dependent on health for their morale? The answer is not to be found in the literature on morale since causal models of the sort used here have not been compared across age categories.

There are at least three potential explanations: shifting reference groups, defensive denial of illness, and age differences in the meaning of perceived health. First it is worthwhile noting that despite the fact that perceived health has been shown to be more closely associated with well-being than actual health--physician ratings, functional health, (Maddox, 1962)--anomalies emerge when one examines the age distribution of perceived health. The old-old, for example, are as likely as the old to consider their health to be excellent, despite the presence of disabilities. Further, the old-old tend to be more optimistic regarding their own health. Such findings suggest that the old "contextualize their ratings of health with regard to their age and the expectations of others" (Ferraro, 1980:330). We refer to this as the reference group hypothesis.

Alternatively, one may explain age declines in the importance of health to morale psychoanalytically, as a defensive denial of vulnerability. McCrae, Bartone and Costa (1976), for example, found that high anxiety predicted increased reporting of symptoms among young and middle aged men, but not among older men.

This, along with the finding that anxious older men evidence greater vigilance against poor health suggests that older men are either denying illness and vulnerability or else are more realistic about their health concerns.

Finally, it may be that perceived health is itself an indicator of morale in old age and as such may not truly reflect health itself. Thus, the meaning of perceived health may differ by age.

The findings for sex (coded as 1 if male, 0 if female) are reported in the row for γ_2 (one factor model) and in γ_2 and γ_5 (two factor model). For Anglos, there are virtually no sex differences. For Blacks, males are somewhat lower than females on morale for those in old age (65-74) but higher in middle age (55-64). These differences are significant at the .01 level. No such sex differences exist for Blacks in early middle age either for tranquility (-.092) or optimism (-.043). For Mexican Americans between 45 and 54, there are almost no sex differences (γ_2 = -.014), but for middle aged (55-64) and older Mexican Americans (65-74), there are some interesting differences. For the middle aged, men report higher levels of tranquility and optimism while for older Mexican Americans, there is no sex difference for tranquility, but a strong sex difference favoring women for optimism (λ_5 = -.246). Finally, our measure of socioeconomic status (total family income, ξ_3 and ξ_6) yields consistently negative results.

Discussion

In this paper we have addressed an emerging issue of major significance in the literature on morale and aging. Building on the work of Herzog and Rodgers (1981), we have extended the debate on the factorial invariance of well-being to include Blacks and Mexican Americans. While our work strongly supports the general conclusions of Herzog and Rodgers, we have presented convincing evidence

of factorial variance among ethnic groups. The fact of the matter is that the meaning of well-being is not equivalent across ethnic groups. This extends beyond differences in factor loadings to include fundamental differences in structure.

In addition to factor structure, differences were uncovered for the causal significance of health and sex. In general, self-assessed health becomes less important with advancing age, most likely due to either changes in meaning of the construct, changes in reference group, defensive denial of declining health or a combination of these. Sex has markedly different effects for different age groups that do not yield as readily as health to simple post-hoc explanations. Our purpose, in demonstrating such differences in factor and causal structure, however, is well served by observing that prior studies of general populations have found mixed results for sex differences in well-being (Markides, 1980). Perhaps such inter-group variability in factor structure as we demonstrate herein may help future investigators pursue sex differences in morale further.

Finally, it is possible to offer some general comments regarding cross-ethnic comparisons in well-being. First, it should be clear from the analysis presented in this paper that cross ethnic comparisons of well-being that assume factorial invariance are conceptually flawed. Any assessment of ethnic variations in the subjective assessment of well-being demands explicit consideration of factor structure. Second, the results of this analysis are especially pertinent to the debate regarding the possibilities of age-ethnicity interactions. This "double-jeopardy" hypothesis having received mixed support in the literature (Dowd and Bengtson, 1978; see Markides 1980 for an excellent review of this issue) would appear to be highly amenable to study using the principles and procedures articulated herein.

Table 1: Tests of significance for candidate models of morale with alternative factor structures, by age and ethnicity.

	χ^2					Degrees of Freedom					Probability	
MODEL	1[1]	2a[2]	2b[3]	1-2a[4]	2a-2b	1	2a	2b	1-2a	2a-2b	1-2a	2a-2b
Anglo												
45-54	185	198	428	13	230	77	74	76	3	2	.005	.005
55-64	189	190	279	1	89	77	74	76	3	2	.9	.005
65-74	152	146	219	6	73	77	74	76	3	2	.1	.005
Black												
45-54	114	103	182	11	79	77	74	76	3	2	.025	.005
55-64	343	337	522	6	185	77	74	76	3	2	.100	.005
65-74	241	237	284	4	47	80	77	76	3	2	.100	.005
Mexican American												
45-54	288	287	694	1	406	77	74	76	3	2	.9	.005
55-64	212	164	434	48	270	77	74	76	3	2	.005	.005
65-74	203	182	245	21	63	77	74	76	3	2	.005	.005

[1] One factor

[2] Two factor, uncorrelated

[3] Two factor, correlated

[4] Difference between χ^2 for Model 1 and Model 2

Table 2: Age differences in factor and causal structure of the Philadelphia Geriatric Morale Scale by ethnicity

		Model 1			Model 2a		
	Matrices allowed to vary across age groups	χ^2 difference from invariant model(1)	Degrees of freedom	Significance	χ^2 difference from invariant model	Degrees of freedom	Significance
Anglos	Ly	22.36	10	.02	-	-	-
	GA	24.61	6	.001	-	-	-
	Ly, GA	78.77	26	.001	-	-	-
	All Unconstrained	157.88	56	.001	-	-	-
Blacks(2)	Ly	26.59	10	.01	-	-	-
	GA	14.53	3	.01	-	-	-
	Ly, GA	40.67	13	.001	-	-	-
	All Unconstrained	153.35	28	.001	-	-	-
Mexican Americans(3)	Ly	-	-	-	59.06	9	.001
	GA	-	-	-	15.12	6	.02
	Ly, GA	-	-	-	79.46	15	.001
	All Unconstrained	-	-	-	134.20	31	.001

(1) The invariant model was computed by forcing all parameters to be equal across all age groups. The χ^2 difference was assessed from this base model of equivalence.

(2) For Blacks, model 1 fit better for those age 55-64 and 65-74 while model 2a fit better for those age 45-54.

(3) For Mexican Americans, model 2a fit better for those age 55-64 and 65-74, while model 1 was adequate for those age 45-54. Therefore the stability of parameter estimates by age was assessed using model 2a for the latter two groups.

Table 3: Parameter estimates for causal models of morale by age and ethnicity

	Anglos			Blacks				Mexican Americans				
	45-54	55-64	65-74	45-64		55-64	65-74	45-54	55-64		65-74	
				Factor 1	Factor 2				Factor 1	Factor 2	Factor 1	Factor 2
λ_1	1.00	1.00	1.00	1.00	0.0	1.00	1.00	1.00	1.0	0.0	1.00	0.0
λ_2	.761	.524	.242	.208	0.0	.369	.393	.450	.430	0.0	1.26	0.0
λ_3	.675	.798	.998	.618	0.0	.935	.581	.784	.892	0.0	.486	0.0
λ_4	.682	.524	.483	.340	0.0	.543	.486	.684	.431	0.0	.895	0.0
λ_5	.881	.854	.647	.581	0.0	1.121	.744	.765	.758	0.0	1.96	0.0
λ_6	1.00	1.06	.509	.525	0.0	.990	.746	.521	.713	0.0	1.74	0.0
λ_7	1.09	.871	1.06	.739	0.0	1.04	1.07	.483	.955	0.0	1.88	0.0
λ_8	.959	1.23	.673	.823	0.0	.855	.852	.984	.942	0.0	2.19	0.0
λ_9	1.00	1.39	.921	0.0	1.00	.927	1.35	.736	0.0	1.0	0.0	1.0
λ_{10}	.725	1.15	.737	0.0	1.13	-.249	.996	.553	0.0	.838	0.0	1.17
λ_{11}	.738	1.32	.259	0.0	1.86	.640	.950	.617	0.0	1.01	0.0	-.691
γ_1	-.239	-.141	-.117	-.208		-.241	-.127	-.345	-.133		-.076	
γ_2	.020	-.024	.007	-.092		-.109	-.139	-.014	.164		.023	
γ_3	.045	.019	.012	.033		-.002	.033	.007	.017		.014	
γ_4	-	-	-	-.140		-	-	-	-.351		-.298	
γ_5	-	-	-	-.043		-	-	-	.220		-.246	
γ_6	-	-	-	.011		-	-	-	-.038		.021	
ϕ_{21}	.462	.117	.412	.071		.254	.204	-.245	.250		.272	
ϕ_{31}	-.062	-.104	-.045	-.127		-.085	-.119	-.126	-.119		-.206	
ϕ_{32}	.035	.018	.032	.021		.030	.013	.054	.021		-.009	

Table 4: Philadelphia Geriatric Morale Scale: Eleven Item Version Factor Analyzed by Dowd and Bengtson (1978).

Tranquility:

1. Do you have a lot to be sad about?
2. Do you feel that life isn't worth living?
3. Do you worry so much that you can't sleep?
4. Do you feel afraid?
5. Do you feel bored?
6. Do you feel lonely these days?
7. Do you get upset easily?
8. Do you feel that life is hard for you?

Optimism:

9. Do you feel that things keep getting worse as you get older?
10. Do you feel that you have as much pep as you did last year?
11. As you get older, do you feel less useful?

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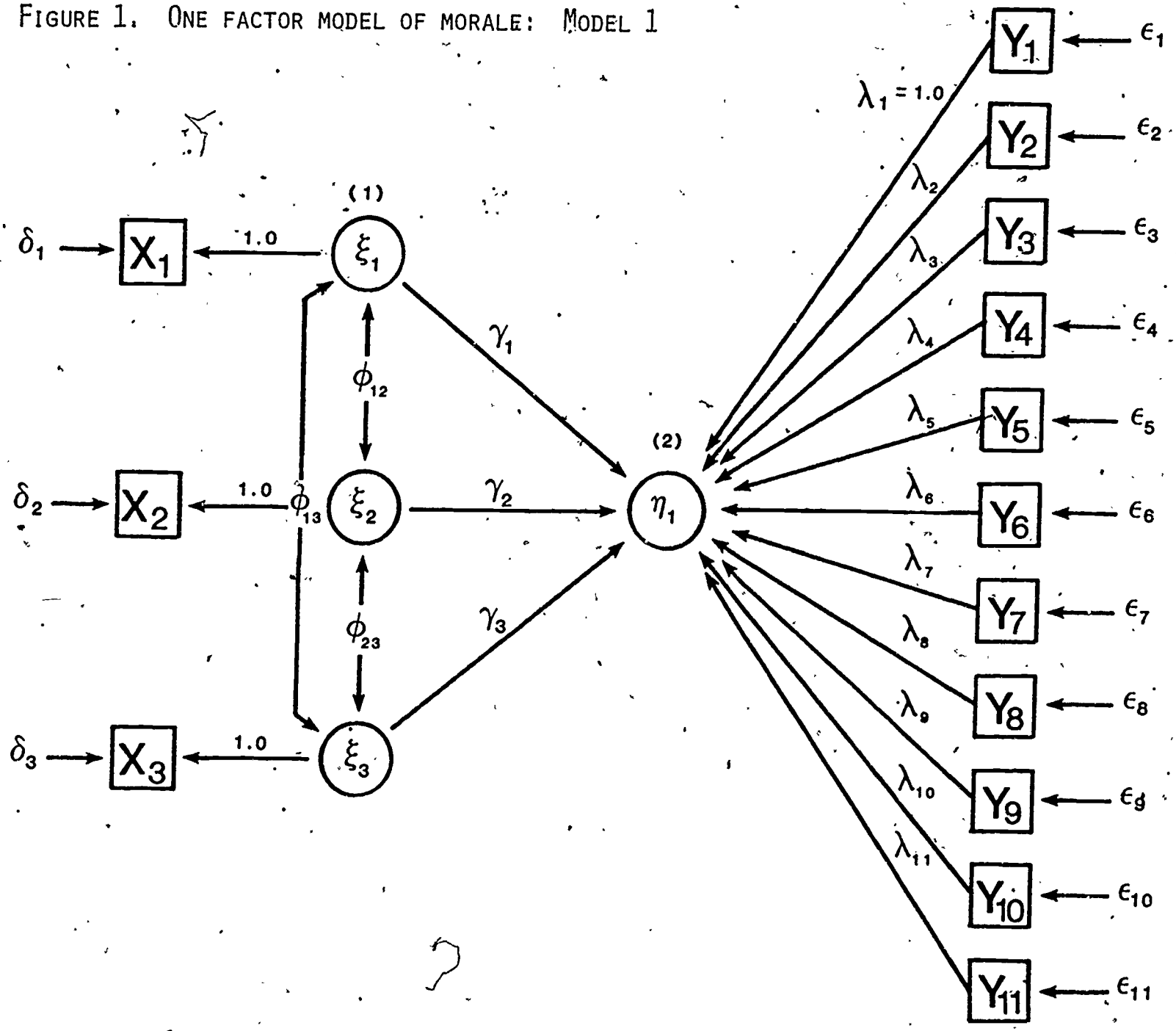
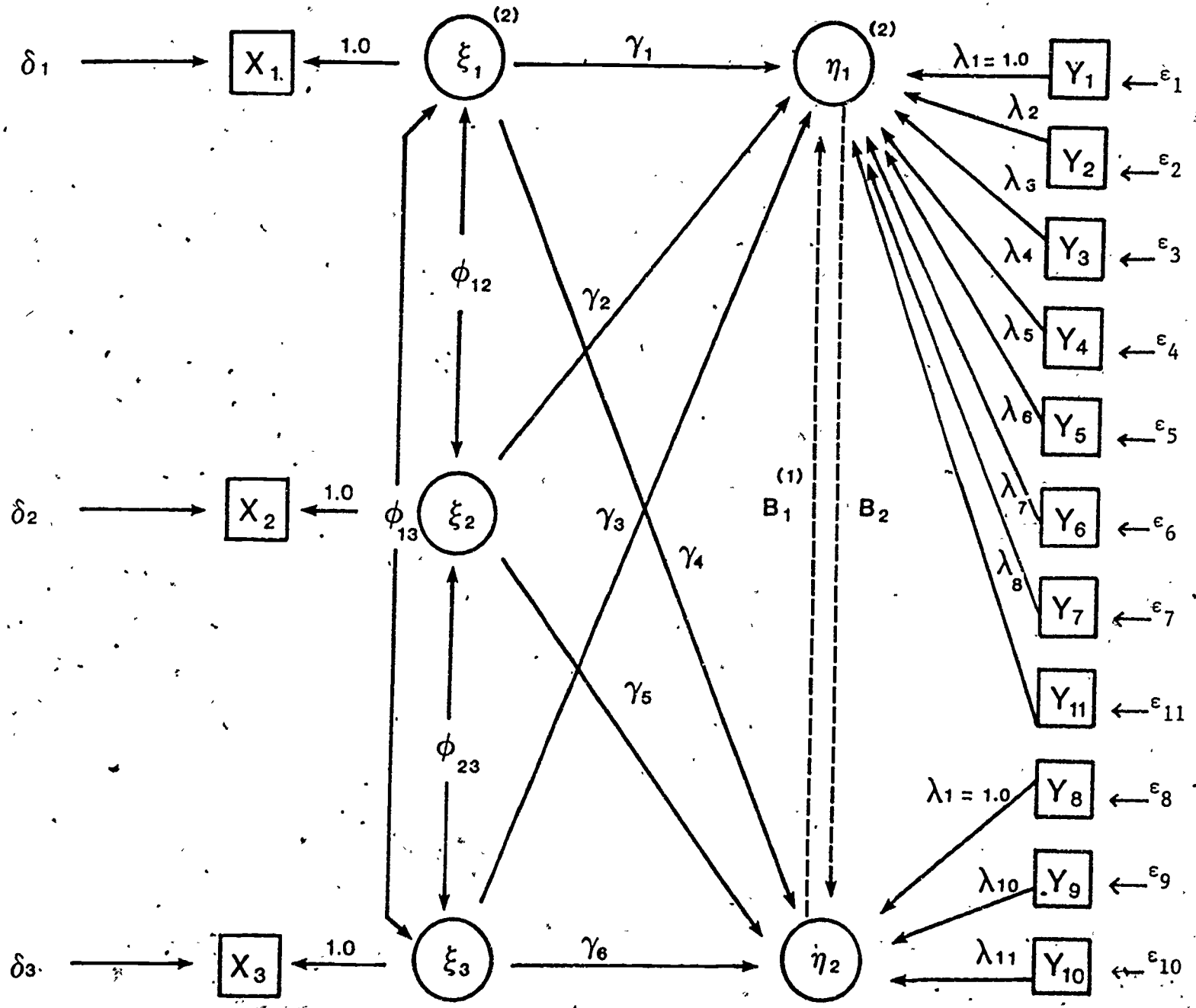
FIGURE 1. ONE FACTOR MODEL OF MORALE: MODEL 1



[1] ξ_1, ξ_2, ξ_3 = Health, Sex, Income, respectively

[2] η_1 = Morale

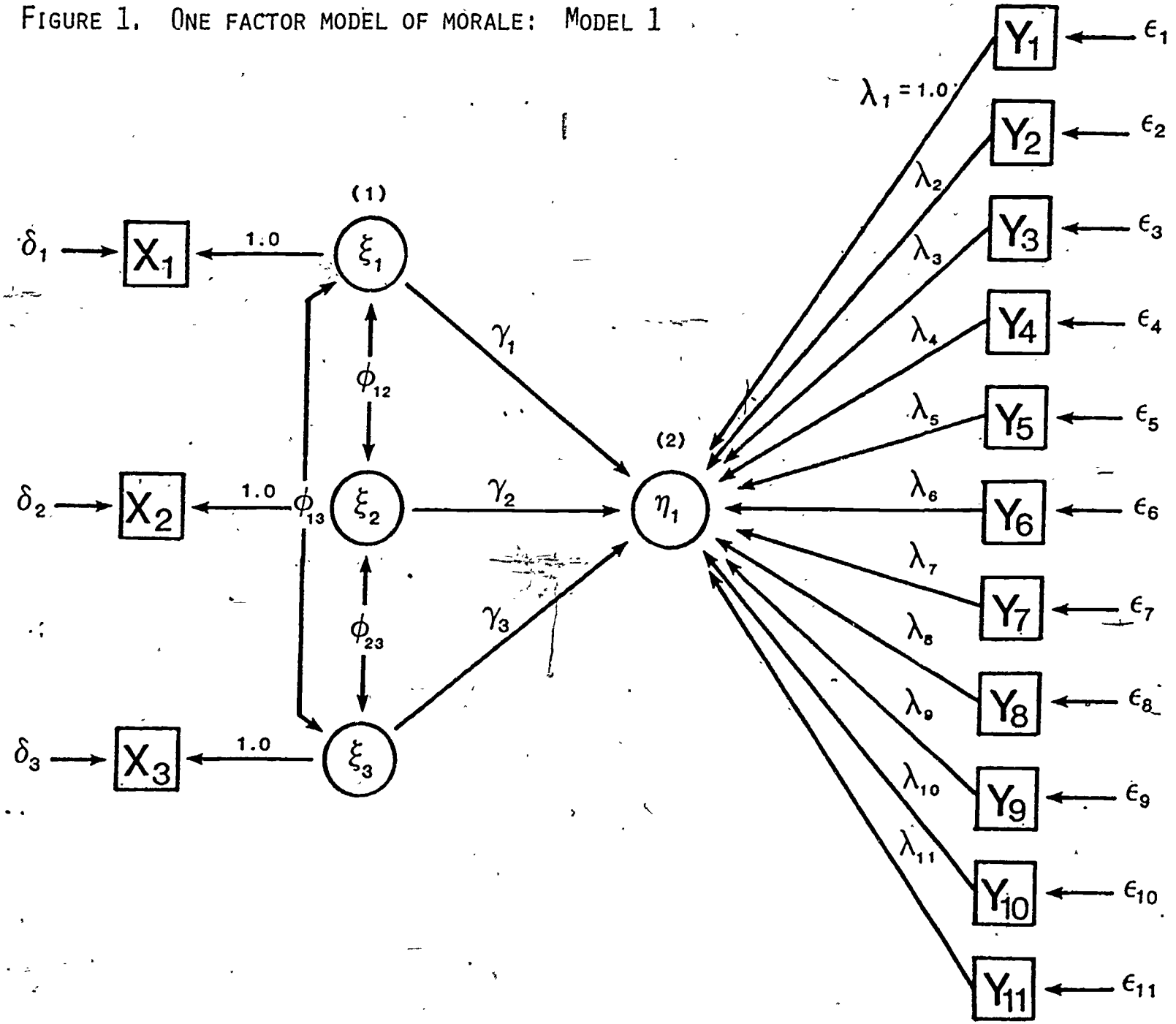
FIGURE 2. TWO FACTOR MODEL OF MORALE: MODEL 2A (FACTORS UNCORRELATED) AND MODEL 2B (FACTORS CORRELATED).



[1]Dotted line paths (β_1, β_2) included in model 2b only

[2]ξ_1, ξ_2, ξ_3 = Health, Sex, Income respectively; η_1 = Tranquility, η_2 = Optimism

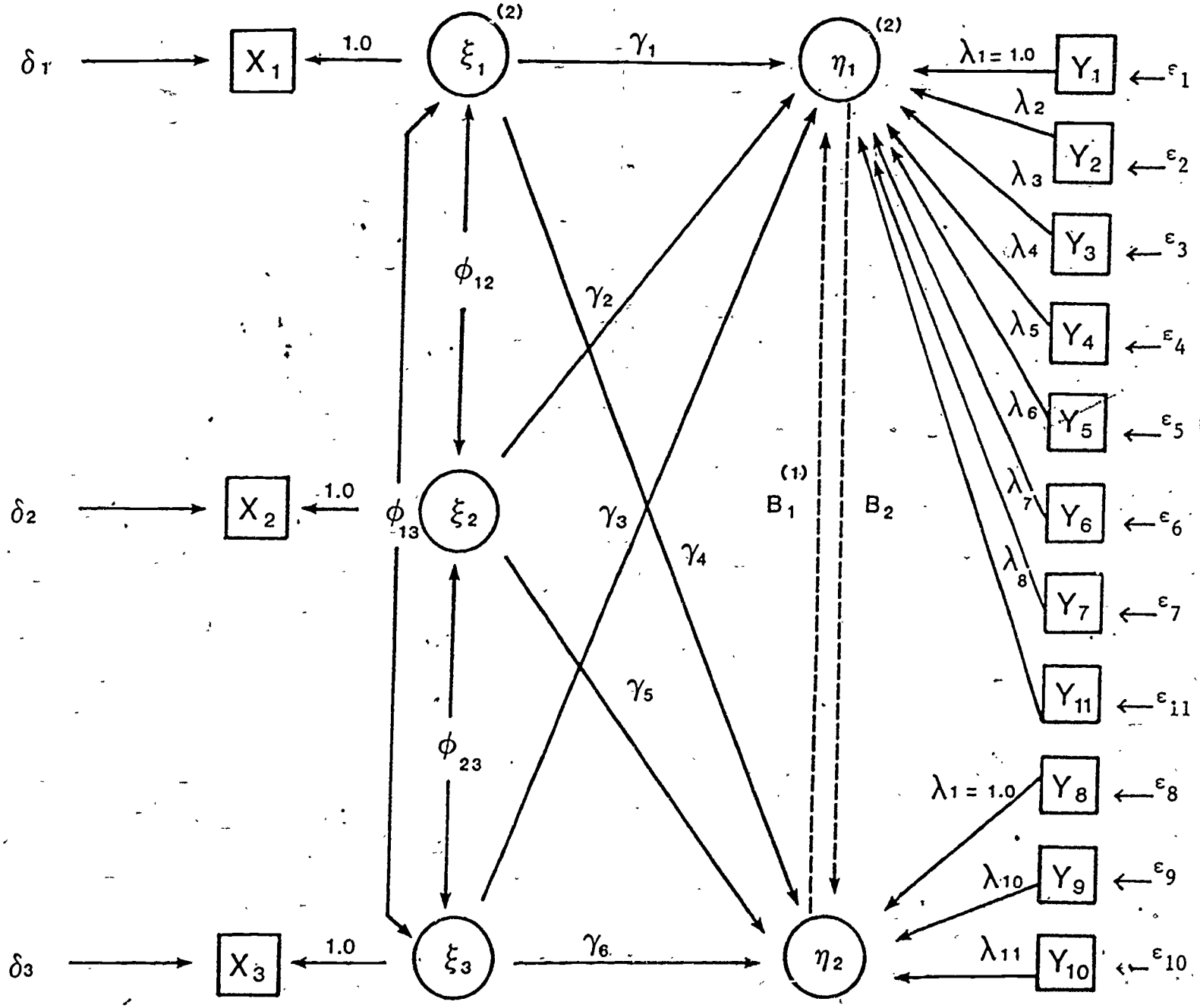
FIGURE 1. ONE FACTOR MODEL OF MORALE: MODEL 1



[1] ξ_1, ξ_2, ξ_3 = Health, Sex, Income, respectively

[2] η_1 = Morale

FIGURE 2. TWO FACTOR MODEL OF MORALE, MODEL 2A (FACTORS UNCORRELATED) AND MODEL 2B (FACTORS CORRELATED).



[1]Dotted line paths (β_1, β_2) included in model 2b only

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