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A Multidomain Study of Adult Development

Michael L. Commons Cheryl Armon
Francis A. Richards Dawn E. Schrader
with
Edwin W. Farrell Mark B. Tappan
Nancy F. Bauer

Piaget claimed that the attainment of "formal operations" in adolescence marks the end point of development for cognitive structure (Inhelder & Piaget, 1958). Current research, however, does not support this claim; forms of thought have been found in adulthood that are qualitatively different from those found in adolescence (Alexander & Langer, in press; Armon, 1984; Colby, Kohlberg, Gibbs, & Lieberman, 1983; Commons, Richards, & Kuhn, 1982; Kuhn, 1979; Pascual-Leone, 1980; Richards & Commons, in press). These adult forms of thought have been given the generic label *postformal* to distinguish them from characteristically adolescent forms (Commons, Richards, & Armon, 1984; Richards & Commons, in press).

A number of models of postformal thought and its development have been proposed. In this and a previous volume (Commons, Richards, & Armon, 1984), several such models and their associated measures have been described. Work in this area has until now been largely confined to single cognitive domains, which broadly correspond to the distinctions among physical reality, social reality, and intrapsychic reality.

Few empirical studies of postformal reasoning in more than one domain have been reported in the literature. Consequently, little is known about either the relationship between postformal cognition in different domains (cf. Kramer, 1984; Commons, Richards, and Armon 1984; King et al. chapter 3, this volume), or the relationship between postformal cognition in any domain and scores on such standard psychological measures as IQ tests or personal, educational, and vocational interest inventories.

Research across domains has been inhibited by theoretical and practical problems. Many theories of postformal development currently lack the operational specificity necessary for developing more than one instrument to measure the

hypothesized developmental sequence of the underlying construct. Additionally, many instruments that do exist are based on insufficiently defined postformal constructs, and thus lack internal validity. On a practical level, the difficulty of locating sufficient numbers of postformal subjects has inhibited empirical studies. How to define a postformal subject a priori and soliciting involvement in a time-consuming study are just a few of the problems encountered in this type of research. Even when such subjects are located, sampling problems remain.

Although this study is not free of these problems, it uses a variety of well-defined theoretical constructs and relatively reliable instruments to investigate empirical relationships among (1) measures of postformal reasoning in the logico-mathematical, interpersonal, and intrapsychic domains and (2) measures of individual interest, education, and socioeconomic background. It is guided by a loosely defined notion of success or achievement, which may occur as (1) cognitive development beyond the formal stage, (2) attaining relatively large income and/or a prestigious social class, (3) advanced education, or (4) adaptation of professional activities to interests.

The above list is not ordered along any dimension. It represents only the first step in an attempt to put together a diversity of empirical information, to synthesize this information, and thus to sketch a broad outline of adult cognitive development and an even broader picture of adulthood. An additional focus is to examine the relation between level of achievement on standard measures of intelligence and the development of postformal reasoning in any domain. Kohlberg (1973) indicates that there is a lack of association between these two dimensions prior to postconventional development. The working hypothesis here is that this association will be even more attenuated at the postformal stage. Put slightly differently, the assumption is that high IQ scores will not necessarily predict postformal development, and for this reason, IQ scores are neither a reliable nor a valid measure of adult cognitive-stage reasoning. However, IQ may relate to other areas of achievement and success.

This study also includes two types of variables that may predict and help to account theoretically for the achievements studied. The first type is background variables, which include age, sex, and the income and socioeconomic class of both parents. The second type is hierarchical or nonstructural or affective correlates of development, that is, the interests that characterize a subject.

While background variables have been used extensively (Herrnstein, 1973; Eysenck, 1981), particularly in relation to variation in IQ (e.g., Feuerstein, 1979; Rand, Tannenbaum, & Feuerstein, 1979), little has been done to relate information about interests to intellectual achievement, particularly to hierarchical stage of development. This is true despite the fact that the concept of interest has played a significant role in Piaget's theory of development and this role has been specifically elaborated.

Piaget (1981) assumed a tightly knit interactive relation between cognitive and affective functions. Affect, in the guise of interest, leads to the selection of environmental features for cognitive processing, interacts with that processing

from its initiation, and determines to some degree when that process has reached a conclusion. Thus, interest plays an essential role in performance prior to, during, and after interactions with the environment, always leading toward equilibration and often toward development. Here, the role of interest has been schematized as

INTEREST * STAGE * OPPORTUNITY = FULFILLMENT.

In this schematization, interest plays a central role in a spiraling set of conditions that promote development (Dewey, 1944; Piaget, 1981). Interests motivate the individual to seek experiences and to particularize the nature of the sought experience. Such experience then re-forms and expands interests, which then motivate encounter with a new range of experiences. In this interaction, the greater the range of experience, the higher the probability for development. For a more pragmatic perspective, interest can be thought of as that which makes outcomes more valuable. Thus, at higher stages it is not unreasonable to expect that development itself assumes values as an outcome. This would lead to development becoming a conscious goal of adult achievement.

In summary, this study addresses three principal questions. First, what is the relation between cognitive development in different domains during adulthood? Second, what is the relationship between different areas in which success can be achieved during adulthood? Third, what are the possible antecedents of these different types of success?

METHOD

Subjects

Approximately 300 members of Mensa responded to an advertisement placed in their bulletin and were mailed a battery of instruments. Of these, 160 subjects completed and returned some portion of the instruments and background questionnaire. More males (81) than females (69) returned questionnaires. Ages ranged from 18 to 83.

Instruments

The following instruments measured outcomes in stage or level in cognitive development, including postformal stages:

a. Commons, Richards, and Kuhn's (1982; Richards & Commons, 1984) multisystems problem measured development in the logico-mathematical domain.

b. Kohlberg's (Colby & Kohlberg, 1987) Moral Judgment Interview, Form A, measured development in the domain of interpersonal obligation and justice reasoning.

c. Armon's (1984) Good-Life Interview measured development in the domain of interpersonal ethical reasoning.

d. Loevinger's (1976; Loevinger & Wessler, 1970) Sentence Completion Test measured development in the domain of self and identity reasoning.

A self-report of the time to complete the battery averaged six to eight hours per subject. Attainment of relatively large income and/or a prestigious social class was measured by the self-report of income and socioeconomic class; advanced education was measured by a self-report of highest educational level completed; adaptation of interests to professional activities was measured by computing the difference between the scaled score on the Strong-Campbell Interest Inventory (Form T325) and the occupational area of a subject. This difference, called "Int-Occ," was measured on a seven-point scale ranging from "very dissimilar" to "very similar."

Commons and Richards' Multisystems Task

This task requires the comparison of four stories (Commons, Richards, & Kuhn, 1982). Each story describes relative preference for, or weight of, some combination of objects. Determining the order of objects in the fourth story requires formal operations. The recognition of how many comparisons between combinations of objects requires systematic operations.

Two of the stories have the same order across combinations of objects, while the order in the remaining two stories is different, both from the same-order stories and from each other. Subjects compare each story with all others and indicate the similarity of the order of combinations in the stories by rating these similarities on a scale that ranges from 0 to 9. Subjects are also asked to explain why they rate stories as similar and different. The full comparison of these multiple stories, each of which is a formal system, requires metasystematic operations.

The Moral Judgment Interview and the Good-Life Interview

These instruments assess stages of social-cognitive development in the social domains of justice judgment and ethical evaluations (cf. Armon, 1984; Kohlberg, 1984), using written dilemmas and probes. The probes required a "yes" or "no" answer, followed by a written explanation of the choice.

Loevinger's Sentence Completion Test

This test assesses stages in the conception of identity, self, and ego; it is another measure of social-cognitive development (Loevinger, 1976). It is administered in written form, requiring the completion of sentence stems.

Strong-Campbell Interest Inventory (SCII)

This inventory surveys personal and vocational interests by requiring choices between alternative activities, which are empirically drawn from the interests of people in the outcome occupations on the survey.

Standard adult IQ verbal subtests were taken from the Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1955) and provide a measure of crystallized intelligence; they may also measure fluid intelligence (Cattell, 1963).

A theoretical distinction was made between background variables that were determined early in the subject's personal history (distal correlates) and variables determined later (proximal correlates). Distal background was measured by self-report of age, sex, and parents' income, education, and occupational level (Hollingshead, 1957). Proximal background or interest was measured by the SCII (Campbell & Hansen, 1981), which scores the relative level of interest in realistic, investigative, artistic, social, enterprising, and conventional activities (Holland, 1966, 1973).

Scoring

All developmental measures were scored by professionals who had achieved acceptable levels of reliability, with the exception of the multisystems problem. This was machine-scored, Richards and Commons (in press) using methods derived from those described by Commons and Richards (Commons & Richards 1984b; Richards & Commons 1984). The SCII also was machine-scored. The WAIS subscales were scored according to a standardized key. All other measures were simple self-reports requiring no scoring.

RESULTS

Sample Characteristics

The sample can be characterized as economically middle class, with 54 percent earning between $15,000 and $40,000 annually. Income was distributed equally above and below the mean of $27,500. The majority of the sample is highly educated, averaging 16 years of education. Most of the sample—74 percent—had a Hollingshead rating of 6, 7, or 8, indicating professional, white-collar occupations.

Descriptive statistics for distal background variables appear in Table 2.1. Table 2.1 shows no significant sex differences for any of the background variables, indicating homogeneity in these areas for the sample. The levels of education and socioeconomic status are comparable for parents of both sexes in the sample.

Table 2.2 displays descriptive statistics for the interest scales. Sex differences are present for half of the six interest scales. Males and females in this sample have significantly different levels of interest in realistic, investigatory, and artistic activities. Interest is higher for males in realistic and investigatory activities and higher for females in artistic activities. These differences conform to stereotypical notions of male and female interests, as does the SCII itself. However, the fact that there were no sex differences in the remaining scales indicates that

Table 2.1
Descriptive Statistics for Distal (Background) Variables

	Background Variable				
Statistic	Mother Holl.	Mother Ed.	Father Holl.	Father Ed.	Age
Number	142	146	139	144	148
Median	5.0	12.0	6.0	12.0	42.0
Mean	5.4	12.4	5.7	12.8	45.1
Std. Dev.	1.2	2.9	2.0	4.1	13.6
Minimum	1.0	3.0	1.0	4.0	18.0
Maximum	8.0	18.0	9.0	21.0	83.0
Male N	77	79	74	79	81
Male Mean	5.4	12.2	5.5	12.3	46.1
Female N	65	67	65	65	67
Female Mean	5.4	12.7	6.0	13.3	44.0
t: M vs. F	- .06	- 1.09	- 1.59	- 1.51	.94
p of t	ns	ns	ns	ns	ns

there are also strong similarities of interest for the males and females in the sample.

Table 2.3 shows descriptive statistics for developmental outcome variables. This table indicates the presence of gender-related developmental differences on the Good-Life and Ego scales. These differences are most pronounced for ego development, where females in the sample achieve higher ego levels than males, while males achieve marginally higher levels of Good-Life reasoning than females. The remaining developmental measures of logico-mathematical and moral reasoning show no evidence of differential level by sex in this sample.

Table 2.2
Descriptive Statistics for Interest Scales

	Interest Scale					
Statistic	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Number	144	144	144	144	142	144
Median	47.0	57.5	54.5	42.0	45.0	50.5
Mean	49.2	55.7	53.0	42.9	45.8	50.6
Std. Dev.	12.0	9.1	9.0	10.6	8.4	10.8
Minimum	27.0	29.0	27.0	20.0	30.0	29.0
Maximum	75.0	69.0	67.0	70.0	72.0	75.0
Male N	78	78	78	78	77	78
Male Mean	52.7	58.0	51.6	43.7	46.7	51.1
Female N	66	66	66	66	65	66
Female Mean	44.9	52.9	54.7	42.0	44.8	50.0
t: M vs. F	4.09	3.45	- 2.12	.96	1.34	.66
p of t	.001	.001	.02	ns	ns	ns

The descriptive statistics for success/achievement outcome measures appear in Table 2.4. The strongest sex differences in this set of variables are for income and Int-Occ (the difference between interest and occupation). Income differences are to be expected in almost any American sample due to the large social inequities in pay scales for men and women.

The difference in the adaptation of occupation to interest probably reflects a similar difference in the opportunities for occupational mobility available to males and females, as well as the already present differences in income. One statistic of interest for the WAIS scores not reported in this table is its negative

Table 2.3
Descriptive Statistics for Developmental Measures

	Developmental Measure			
Statistic	Multisystem	Moral Judgement	Good-Life	Ego
Number	74	141	79	119
Median	500	400	400	400
Mean	480	392	370	386
Std. Dev.	51	30	38	67
Minimum	350	300	300	200
Maximum	550	500	450	600
Male N	44	77	42	56
Male Mean	484	395	381	370
Female N	30	64	37	63
Female Mean	475	389	365	400
t: M vs. F	.75	1.13	1.90	-2.53
p of t	ns	ns	.03	.006

correlation with age, indicating that the Mensa criteria for membership have been lowered over time.

Relations Between Proximal and Distal Background Variables

The correlations between the distal (or historical) and the proximal (or interest) variables appear in Table 2.5.

This table shows that there is not a strong relation between the background and interest variables. However, significant correlations are found between four of the six interest scales and mother's education, subject's sex, and age. This finding is interesting to note, since none of the father's characteristics or the mother's Hollingshead approached significance.

Table 2.4
Descriptive Statistics for Success Measures

	Measure of Success and Achievement				
Statistic	WAIS	Income	Hollingshead	Total Ed.	Int-Occ
Number	141	143	124	148	138
Median	137	4	7	16	1
Mean	136.7	3.7	6.9	16.7	1.0
Std. Dev.	9.1	2.1	1.3	2.4	1.6
Minimum	110	1	3	12	- 3
Maximum	159	8	9	24	3.0
Male N	78	77	71	81	75
Male Mean	136.7	4.6	7.0	17.0	1.4
Female N	63	66	53	67	63
Female Mean	136.6	2.6	6.7	16.4	.4
t: M vs. F	.11	6.31	1.37	1.28	3.74
p of t	ns	.001	ns	ns	.001

Relations Between Cognitive-Developmental and Background Variables

The relations of interest between the cognitive-developmental and background variables are predictive. Backward stepwise regression (with listwise deletion) was used to predict each developmental measure, using all interest and background variables. Since each developmental measure was reported for a different number of subjects, the number of subjects is reported for these equations. The full number of subjects was used in an attempt to arrive at the most valid estimate of the predictive relation between the independent and dependent variables.

The backward procedure begins by using all variables that contribute independently to predicting the dependent variable, thus removing any variables contributing to multicollinearity. It then removes the single variable with the largest

Table 2.5
Correlations Between Background and Interest Variables

	Realistic	Investigatory	Artistic	Social	Enterprising	Conventional
Mother's Hollingshead	.05	.07	.12	.07	−.03	.02
Mothers Education	.10	.20*	.23*	.21*	.09	.17*
Father's Hollingshead	.02	−.01	.05	−.03	.00	−.07
Father's Education	−.03	.04	.06	.01	−.03	−.10
Sex	−.24*	−.17	.09	−.07	−.08	−.05
Age	−.15*	−.13	−.07	−.13	−.09	−.08

* indicates an alpha level equal to or less than .05

probability-of-F and recomputes the regression equation with the remaining variables. Removal is continued until all variables in the equation have met a probability-of-F smaller than .10 criterion. At each step the multiple R and significance level of the overall model are reported.

The procedure arrives first at a regression equation that accounts for a significant amount of the variance in the dependent variable, given the number of predictors. The regression weights of individual variables may not be significant in this equation, although the overall model is. These equations are referred to as "full" when reported; the equations in which the probability-of-F criterion is met by all variables are referred to as "restricted." Standardized regression weights are used in the report of these equations.

The full regression equation ($N = 59$, $R = .53$, $F = 2.1$; $p < .05$) predicting multisystem scores was

$$MS = 422 - .19\,(Conventional) - .12\,(Artistic) + .08\,(Age) + .25\,(Father's\ Hollingshead) - .08\,(Social) + .52\,(Investigatory) + .20\,(Mother's\ Education) - .30\,(Realistic) - .21\,(Father's\ Education).$$

The restricted equation ($R = .43$, $F = 6.3$; $p < .01$) was

$$MS = 412 + .49\,(Investigatory) - .38\,(Realistic).$$

The full regression equation ($N = 120$, $R = .46$, $F = 2.4$; $p < .01$) predicting moral judgment reasoning scores was

$$MJ = 343 - .13\ (Conventional) - .06\ (Age) + .09\ (Artistic) - .03\ (Sex) + .14\ (Father's\ Hollingshead) - .13\ (Enterprising) + .31\ (Social) + .15\ (Investigatory) + .21\ (Mother's\ Education) - .03\ (Realistic) - .22\ (Father's\ Hollingshead).$$

The restricted equation ($R = .39$, $F = 7.1$; $p < .001$) was

$$MJ = 352 - .15\ (Conventional) + .33\ (Social) + .17\ (Mother's\ Education).$$

The full equation ($N = 65$, $R = .51$, $F = 2.1$; $p < .05$) predicting good-life scores was

$$GL = 294 - .05\ (Artistic) + .07\ (Age) - .11\ (Enterprising) - .13\ (Sex) + .10\ (Mother's\ Hollingshead) + .52\ (Investigatory) + .19\ (Mother's\ Education) - .17\ (Father's\ Education) - .30\ (Realistic).$$

The procedure converged in the restricted equation ($R = .43$, $F = 7.0$; $p < .01$):

$$GL = 276 + .57\ (Investigatory) - .31\ (Realistic).$$

The full equation ($N = 101$, $R = .31$, $F = 2.6$; $p < .05$) predicting ego development scores was

$$EGO = 285 + .11\ (Father's\ Hollingshead) + .23\ (Sex) + .27\ (Investigatory) - .21\ (Father's\ Education).$$

The procedure converged in the equation ($R = .27$, $F = 3.9$, $p < .05$)

$$EGO = = 273 + .22\ (Sex) + .24\ (Investigatory).$$

Tables 2.6 and 2.7 summarize the above relations of background variables to sequential and hierarchical developmental variables. Table 2.6 shows that moral judgment scores are related to the largest number of distal and proximal background variables and that ego development scores are related to the smallest number of these variables. Among the distal background variables, father's education is related negatively to all developmental measures. It is the only such variable related to all developmental measures. Father's Hollingshead is positively related to multisystem, moral judgment and ego scores, while mother's education is related positively to multisystem, moral judgment and good-life measures. Gender and age are related both positively and negatively. A positive relation with age would be expected if development increases over the life span,

Table 2.6
Background Variables Predicting Development in the Full Equations

Developmental Variable	Background Variable											
	Sex	Age	Father Ed.	Father Occ.	Mother Ed.	Mother Occ.	Real-istic	Invest-igatory	Art-istic	Social	Enterp-rising	Conven-tional
Multisystem	0	+	−	+	+	0	−	+	−	−	0	−
Moral Judgement	−	−	−	+	+	0	−	+	+	+	−	−
Good-Life	−	+	−	0	+	+	−	+	−	0	−	0
Ego	+	0	−	+	0	0	0	+	0	0	0	0

Table 2.7
Background Variables Predicting Development in the Restricted Equation

	Background Variable					
Developmental Variable	Sex	Mother Ed.	Realistic	Investigatory	Social	Conventional
Multisystem	0	0	−	+	0	0
Moral Judgement	0	+	0	0	+	−
Good-Life	0	0	−	+	0	0
Ego	+	0	0	+	0	0

and this relation appears for multisystem and good-life scores. The only positive gender relation to a developmental measure occurs for ego development, with women scoring higher than men. The background variable least related to the developmental measures is mother's Hollingshead.

Among proximal background variables, investigatory interests predict higher scores for all developmental measures. Enterprising interests predict lower developmental scores for moral judgment and good-life developmental measures, and conventional interests predict lower for multisystems and moral judgment. It is interesting to note that realistic interests are negatively correlated with all the developmental measures except ego, for which there is no relation. Also, mother's Hollingshead is not related to *any* of the measures except good-life scores, with which it is positively related, while father's Hollingshead is related positively with *all* the measures except good life, where there is no relation. This finding could be due to the Good-Life Interview's inclusion of more subscales about aspects other than work. Father's Hollingshead scores may not influence good-life scores due to fathers' strong traditional roles in ego and moral development, and in logico-mathematical domains, while the good-life score is influenced by mother's Hollingshead scores due to mothers' traditional involvement in areas outside the domain of the developmental variables studied here. In addition, the Good-Life Interview has many subscales, including good friendship, marriage, and sex, that may be influenced by identification with the moth-

er. Overall, moral judgment scores are related to more interest variables than any other measure, and ego development scores are related to the fewest interest variables. The relations of multisystem and good-life scores to interest variables resemble each other, while moral judgment and ego development scores appear to be related sui generis to interest variables.

Table 2.7 shows an identical relation between background variables and both good-life and multisystem scores. Among all variables, investigatory interest predicts the largest number of developmental outcomes, and does so positively. Distal background variables predict less often than proximal background variables. The only developmental measure where this is not the case is ego development, where one proximal and one distal background measure predict scores.

Relations Between Outcome Variables

The correlations between the outcome measures were factor-analyzed (principal components, varimax rotation, and listwise deletion; $N = 34$), yielding four factors accounting for 67.2 percent of the variance. Listwise deletion sharply reduced the number of subjects but was used to increase the internal validity of the analysis. The factor loadings of the outcome variables are shown in Table 2.8.

Table 2.8 shows that the variance recomposed into four factors. The first factor has high loadings for three developmental variables, the multisystem, moral judgment and good-life measures. These loadings indicate that hierarchical or stage development tends to be removed from other dimensions of adult achievement. The second factor has a high negative loading for Loevinger's ego development, a high positive loading for Hollingshead scores, and a moderate positive loading for education. This factor appears to indicate that ego development is somehow hampered by pursuing the perhaps regimented path toward social status. Overall, the factor analysis indicates that developmental stage or level is not related to success and achievement as defined by more standard socioeconomic measures.

The third factor is primarily composed of IQ and income, indicating a convergence of standard conceptions of intelligence with the pursuit of economic success. Education and Int-Occ load on the fourth factor, suggesting that education facilitates the adaptation of occupation to interests.

The factors were used to arrange the correlation between the outcome measures, which are displayed in Table 2.9.

In Table 2.9 the intrafactor correlations appear on and near the diagonal; the interfactor correlations appear in the interior of the matrix. The table shows that factors are based on moderate-to-weak correlations, but the correlations between variables loading on different factors are generally so small as to be nonexistent. The factors, then, result as much from this contrast as from strong correlations among their members. The only case where there is a significant correlation across factors is the correlation between multisystem and WAIS (IQ) scores.

Table 2.8
Factor Loadings of Outcome Variables

	Factor			
Variable	Structural Development	Self Development	Economic Success	Adaptive Success
Total Education	.09	.49	−.01	.55
WAIS(IQ)	.17	.15	−.77	.18
Intocc	−.05	−.07	.00	.84
Multisystem	.75	−.23	−.26	.18
Moral Judgement	.64	−.21	.43	.18
Good-Life	.85	.08	.00	−.26
Ego	.26	−.70	.21	.14
Income	.10	.21	.77	.16
Hollingshead	−.03	.80	.19	.10
Percent Variance	23.0%	17.5%	15.7%	11.9%

Relations Between Developmental Measures and Other Outcomes

The predictive relations between each developmental variable and the remaining outcome variables were explored using regression analysis based on the correlations above. The same 34 subjects used in the factor analysis were used, as was the same background stepwise procedure described earlier. Multisystem scores were predicted by the full equation ($R = .61$, $F = 2.63$; $p < .05$):

$$MS = -168 + .20\ (IQ) + .34\ (Good\ Life) + .09\ (Int\text{-}Occ) + .29\ (Ego) - .16\ (Income) + .17\ (Moral\ Judgment).$$

Table 2.9
Correlations Between Outcome Measures

	GL	Ms	MJ	Ego	Holl.	Income	IQ	Int-Occ
Ms	.44**							
MJ	.41**	.31**						
Ego	.00	.13	.22					
Holl.	-.02	-.14	-.14	-.25				
Income	.02	-.11	-.11	.10	.28*			
IQ	.08	.21	-.20	-.10	-.02	-.27		
Int-Occ	-.11	.09	.12	.02	.09	.05	.06	
Tot. Ed.	-.09	.03	.08	-.11	.25	.12	.12	.16

* indicates an alpha level at or less than .05

** indicates an alpha level at or less than .01

The procedure converged in the restricted equation ($R = .53$, $F = 6.00$; $p < .01$):

$$MS = 819 + .41\ (Good\ Life) + .29\ (Ego).$$

The full equation ($R = .63$, $F = 2.45$; $p < .05$) predicting moral judgment reasoning was

$$MJ = 291 - .24\ (IQ) - .28\ (Hollingshead) + .37\ (Good\text{-}Life) + .15\ (Int\text{-}Occ) + .15\ (Total\ Education) + .25\ (Income) + .17\ (Multisystem).$$

The procedure converged in the restricted model ($R = .41$, $F = 6.5$; $p < .05$):

$$MJ = 221 + .41\ (Good\text{-}Life).$$

The full model ($R = .58$, $F = 2.87$; $p < .05$) predicting good-life scores was

$$GL = 186 + .15\ (Hollingshead) - .18\ (Int\text{-}Occ) + .37\ (Multisystem) - .13\ (Total\ Education) + .36\ (Moral\ Judgment).$$

Table 2.10
Predictive Relations Between Outcome Variables in the Full Equation

	Predictors								
Predicted Variable	Multi-system	Moral Judgment	Good Life	Ego	Total Ed.	Income	Hollings-Head	Int-Occ	WAIS (IQ)
Multisystem		+	+	+	0	-	0	+	+
Moral Judgement	+		+	+	+	+	-	+	-
Good-Life	+	+		0	-	0	+	-	0
Ego	+	0	0		-	+	-	0	0

The procedure converged in the restricted model ($R = .53$, $F = 6.00$; $p < .01$):

GL = 173 + .35 (*Multisystem*) + .30 (*Moral Judgment*).

The full equation ($R = .53$, $F = 2.88$; $p < .05$) predicting ego scores was

EGO = 326 − .33 (*Hollingshead*) − .14 (*Total Education*) + .29 (*Income*) + .32 (*Multisystem*).

The procedure converged in the restricted equation ($R = .52$, $F = 3.7$; $p < .05$):

EGO = 27.7 − .37 (*Hollingshead*) + .28 (*Income*) + .32 (*Multisystem*).

Summary tables of predictive relations among outcome variables for both full and restricted equations appear below. Table 2.10 shows that moral judgment has the largest number of predictors among outcome measures. It is positively predicted by every other type of cognitive development as well as by total education, income, and the adaptation of occupation to interest (Int-Occ). Moral judgment is predicted negatively by WAIS scores and Hollingshead status. Multisystem has the next largest number of predictors among other outcome variables, and is related positively or neutrally on every variable except income. Like moral judgment, this type of development is predicted by development in all other domains measured. Also like moral judgment, it is predicted positively by

Table 2.11
Predictive Relations Between Outcome Variables in the Restricted Equation

	Predictors					
Predicted Variable	Multi-system	Moral Judgement	Good Life	Ego	Income	Hollings-Head
Multisystem		0	+	+	0	0
Moral Judgement	0		+	0	0	0
Good-Life	+	+		0	0	0
Ego	+	0	0		+	-

successful adaptation of occupation to interests (Int-Occ). Unlike moral judgment, it is predicted positively by WAIS scores and negatively by income.

Good-life scores are predicted only by moral judgment and multisystem scores among the developmental measures. It is the only developmental measure to be positively predicted by Hollingshead status. In contrast with moral judgment, it is predicted negatively by total education and Int-Occ. Ego scores are predicted by only the multisystem developmental measure. Like moral judgment, it is predicted positively by income and negatively by Hollingshead status. Like good-life, it is predicted negatively by total education.

The results of the restricted equations are summarized in Table 2.11. This table shows that ego scores have the largest number of strong predictors, but still the fewest developmental predictors because it is predicted by income and Hollingshead status. Ego is the only developmental measure with strong success/achievement predictors. None of the other developmental measures have any strong predictors of this type. Multisystem scores are predicted by good-life and ego measures, and good-life scores are predicted by multisystem and moral judgment scores. Moral judgment scores have only good-life scores as a strong predictor.

Relations Among Developmental Stage and Level Measures

One of the questions of interest when exploring the correlations of developmental measures is how much a given correlation is mediated by other correla-

Table 2.12
First-Order and Partial Developmental Correlations

Measures	First Order Correlation	Measures Partialled Out of Correlation									
		MS	MJ	GL	EGO	(MS,MJ)	(MS,GL)	(MS,EGO)	(MJ,GL)	(MJ,EGO)	(GL,EGO)
MS, MJ	.28			.14	.24						.10
MS, GL	.40		.39		.45					.40	
MS, EGO	.13		.05	.15					.11		
MJ, GL	.26	.25			.36			.30			
MJ, EGO	.25	.26		.31			.29				
GL, EGO	.11	-.09	-.14			-.17					

tions. This question is usually explored by partialing out the variance due to other variables and examining the effect on the correlation. The aim of this is to determine whether a primary correlation disappears when a third (or third and fourth) variable is partialed out, because the argument can then be made that the variables partialed out mediate or account for the observed primary correlation.

The primary and partial correlations reported in Table 2.12 come from the same 34 subjects reported in the above regression equations.

Table 2.12 shows that the correlations between multisystem and good-life scores, between moral judgment and ego scores, and between moral judgment and good-life scores are most independent of all other sources of mediating variation. Thus, the correlation between multisystem and moral judgment scores is mediated by the correlation of moral judgment and good-life scores, and the correlation of multisystem and ego scores is mediated by the correlation between ego and moral judgment scores.

Finally, the correlation between ego and good-life scores is mediated by both the correlation of ego and moral judgment scores and the correlation between multisystem and good-life scores. In summary, while there is a good deal of interdependence among the developmental measures, two relatively independent developmental dimensions appear to be defined by the multisystem/good-life and moral judgment/ego correlations. However, as the factor analysis and the first-order correlations indicate, there is better evidence for a multisystem/good-life dimension than there is for a moral judgment/ego dimension.

Sequential Relations Among Developmental Measures

Sequential precedence in the developmental measures was analyzed with the sign test on ordinal-dominance curves (Darlington 1978). This test determines whether the stage scores of a subject in two different domains tend to be in any order (e.g., whether moral judgment scores tend to be at a higher level than multisystem scores for subjects in a sample). Data from this analysis are tabulated elsewhere (Richards & Commons, in press) and show that within subjects the multisystem stage score is equal to or higher than the good-life stage score at every stage. The same is true for the relation between multisystem scores and moral judgment scores, with the exception of stage 3.5 (concrete operations and early conventional morality), where some moral judgment scores are higher than the scores of Piagetian cognition. On the whole, a transitive "higher than" relation appears to exist across multisystem, moral judgment, and good-life scores. Multisystem scores also ordinally dominate Loevinger ego scores. However, no further transitive relations appear to exist between ego scores and moral judgment or good-life scores.

DISCUSSION

This study must be considered exploratory for many reasons. First, the nature of the sample is such that it restricts the range of many of the variables measured. Such restriction will have the general effect of lowering correlations and hiding relationships that would appear over a fuller range of values. Second, since the sample was selected to increase the probability of finding subjects with advanced developmental stages or levels, the relations that are found within this sample, particularly with respect to socioeconomic measures, may not be representative of relations that exist within broader contexts.

Third, although some developmental stage and level instruments used here have relatively lengthy histories of use, some, such as the multisystem problem and Good-Life Interview, have been used only a handful of times and their performance characteristics are still largely unknown. Fourth, even for those measures with established histories, self-paced paper-and-pencil administrations are relatively new. In addition, little is known about the practice effect each test has on the subsequent tests when given as a battery, as in this study. Finally, the self-report of such information as income, education, and social status is known to be inaccurate to some degree.

Nevertheless, it is important to make the most of the information and relations that have appeared in this study, so that efforts to relate developmental stage and level (structural development) to other types of achievement background variables can be more focused. First, it should be noted that there is little evidence for a direct link between background and interest variables leading to any sort of stage or level of development in the domains considered. This is not to say that background and interest variables do not relate to stage or level of development:

there is evidence that they do. However, there is no pattern of correlations between background and interest variables that would indicate that background variables shape interests and interests then shape directions in stage and level of development. Instead of supporting this sequence, the evidence indicates that some background variables may exert a lasting effect on the trajectory of developmental stage or level that operates more or less simultaneously with the effects that interests exert on that trajectory.

Second, it is not the case that either interest or background variables appear to exert the same effect on the different developmental domains investigated. The exception to this is the investigatory interest, which appears to exert a consistently positive effect on stage or level of development across domains. This means that the effects of both background and interest variables are configured differently for the different domains of development, and these differences should be a focus of investigation. For example, moral judgment alone seems to be promoted by social interests. Yet, with the possible exception of logicomathematical development, it would be expected that all other areas of developmental stage and level studied here would be similarly promoted by a social interest. Pursuing this further would require specific analysis of the type of social interest defined on the SCII with an eye toward isolating the particular kind of interest that seems to be associated with the development of moral judgment. This would allow the definition of alternative types of social interest whose relation to good-life and ego development could be investigated.

The consistently negative relations of enterprising, conventional, and, especially, realistic interests to any type of developmental stage or level is intriguing and warrants further investigation. These interests appear to be confined to lower developmental stages and levels, and seem to actively impede development of higher stages across the life span. Clearly, they represent some sort of adaptation to the environment that is inimical to developmental interests. Or perhaps the tasks that measure multisystem, moral judgment, and good life are not the tasks on which those with realistic interests can excel. Defining these interests more sharply and isolating the environments in which they seem to flourish might lead to a better understanding of why development terminates.

The facts that development terminates, that interests are tied to different types of development, and that developmental stage and level appear to proceed along two dimensions seem to point to a closer relation between environment and developmental stage conditions than typifies childhood and early adolescence. The study confirms what other studies have already shown: that adult development becomes less tied to a regimented schedule and to distal characteristics, and becomes more idiosyncratic. The fact that age is only a weak predictor of any type of developmental stage or level in this sample suggests that adult development must throw away the index of age as an aid in the definition of stages and rely much more heavily, if not exclusively, on analytic criteria in the construction of postformal stage sequences (Commons & Richards, 1984a).

The examination of the analytic criteria upon which stage sequences are con-

structed may prove a helpful tool in untangling the results of this study. One of the troubling results that should merit future attention is the relative isolation of ego development from development in the other domains studied. With the exception of moral judgment, ego development does not appear to be strongly tied to other developmental-stage strands. Before ego development is discarded as an aberrant measure, however, it should be recalled that the other three structural measures have been analytically defined in Piagetian structural terms, while ego development has not. This means that ego development may be capturing a valid aspect of development; but what that aspect is, at least in relation to the other types of development investigated, will be undefined until an analysis of the structural properties of ego development is performed. Thus, in conclusion, this study suggests that there are intriguing differences in structural development in the domains studied, but that only part of these differences will be clarified by further empirical study. Analytic study of the constructs must accompany this in order for us to better understand why the developmental trajectories explored here differ.

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