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ABSTRACT

Much attention has been given to generational differences in level and rate of age changes in the study of adult behavioral development. Much less work has been done on generational differences in personality development. This study examined cross-sectional and longitudinal data from the Test of Behavioral Rigidity administered to more than 3,000 subjects over the age range from 22 to 84 years. Data were analyzed from the behavioral flexibility, attitudinal flexibility, and social responsibility questionnaire scales, as well as from performance score measures indexing associational flexibility, instructional set flexibility, copying speed, and associational speed. Data on these scales were obtained for five samples examined 7 years apart (1956, 1963, 1970, 1977, and 1984). Within cohort data are available over 7, 14, 21, and 28 years respectively, allowing direct longitudinal estimates. These data permit analyses of cohort differences and rate of change within cohort over as long as 28 years. Results of the analyses confirm the presence of substantial generational differences, with generally only limited change over time within cohorts. The data suggest that there has been a substantial positive development toward more flexible personality styles, behaviors, and attitudes in successive generations over the past 70 years. (Three data tables and four figures are included.) (Author/NB)

Generational and Age Differences in Adult Personality: Cross-sectional and Longitudinal Analyses

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Short Heading: Generational and Age Differences in Personality

Abstract

This paper presents results from cross-sectional and longitudinal analyses of data from the Test of Behavioral Rigidity for more than 3000 subjects over the age range from 22 to 84 years. Data are presented on the behavioral flexibility, attitudinal flexibility, and social responsibility questionnaire scales, as well as on performance score measures indexing associational flexibility, instructional set flexibility, copying speed and associational speed. Data on these scales were obtained for five samples examined seven years apart (1956, 1963, 1970, 1977, and 1984). Within cohort data are available over seven, fourteen, twenty-one and twenty-eight years respectively, allowing direct longitudinal estimates. These data permit analyses of cohort differences and rate of change within cohort over as long as 28 year periods. Results of the analyses confirm the presence of substantial generational differences, with generally only limited change over time within cohorts.

Generational Differences in Adult Personality: Cross-sectional and Longitudinal Analyses

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Considerable attention has been given to generational differences in level and rate of age changes in the study of adult behavioral development. This work has been limited largely, however, to the assessment of cognitive functioning, where it was found that cross-sectional findings showed inflated age decrement because of positive intellectual gains across successive cohorts (cf. Schaie, 1983). Much less work has been done on generational differences in personality development. In a study of the personality trait of social responsibility, Schaie and Parham (1974; Schaie, 1982) were able to show significant secular trends (period effects), and cohort differences, but virtually no age-related effects. In a broader coverage of the personality spectrum, Schaie and Parham (1976) examined age changes over 14 years on a number of personality dimensions obtained by an item factor analysis of the Test of Behavioral Rigidity (Schaie & Parham, 1975). Here too it was found that apparent socially undesirable age differences shown in cross-sectional data were often an artifact of substantial generational shifts in attitudes

and personality traits, but that there was remarkable longitudinal stability for most traits. Substantial stability over time in many adult personality traits has also been reported by McCrae and Costa (1984) and in the Bonn Longitudinal Study (cf. Schmitz-Scherzer & Thomae, 1983).

Our own reports of estimated cohort gradients have generally depended upon computing differences between successive cohorts at two common age levels (Schaie, 1980, 1983). Such two-point estimates may be particularly sensitive to perturbations caused by sampling variations. With the completion of data collection for the fifth wave of the Seattle Longitudinal Study (SLS), we are now in a position to estimate seven-year cohort shifts that are less sensitive to sampling variations by basing our estimates over at least four common age levels for seven successive cohorts. With the exception of the Schaie and Parham (1974, 1976) studies, personality data from the Seattle Longitudinal Study have been primarily reported at the latent construct level for the derived factors of Motor-Cognitive Rigidity, Personality-Perceptual Rigidity, and Psychomotor Speed. The present paper, by contrast, presents results for the original sub-scales contained in the Test of Behavioral Rigidity for more than 3000 subjects over the age range from 22 to 84 years. The Test of Behavioral Rigidity includes both traditional questionnaire type personality scales and performance measures of personality styles. The particular objective of this paper is first to consider the effect of cohort

differences on our measures, and then to investigate the cohort by age interactions that result in substantial discrepancies in the estimation of age patterns seen in cross-sectional (across cohorts) data, within-cohort independent samples data, and longitudinal (within subjects) data.

Method

Subjects

The data reported in this paper first of all represent the initial tests for 3442 persons (males = 1628; females = 1814) who participated in the five waves of the Seattle Longitudinal Study. All were community-dwelling adults who were randomly selected from each seven-year age stratum of the membership of a metropolitan health maintenance organization. The initial data were collected in 1956 (ages 22 to 70; N = 500), 1963 (ages 22 to 77; N = 997), 1970 (ages 22 to 84; N = 705), 1977 (ages 22 to 84; N = 612), and 1984 (ages 22 to 84; N = 628). Numbers of initial participants by study wave are reported in Table 1. All participants were in good health when tested, and were representative of the upper 75 per cent of the socio-economic stratum. For the total data base educational levels averaged 13.27 years (range: 4 to 20 years), and occupational status averaged 6.25 on a ten point scale using census classifications ranging from unskilled labor to professional.

At each successive assessment point, retrievable subjects from all earlier waves of the study were retested. Data are reported also on within subject age changes over seven years on 2,257 of these subjects.

Insert Table 1 about here

Measures

Throughout the study, subjects have been assessed with the first five primary mental abilities (Thurstone and Thurstone, 1941; Schaie, 1985), the Test of Behavioral Rigidity (TBR, Schaie & Parham, 1975), and a demographic information form. In this paper we confine our discussion to the personality data derived from the Test of Behavioral Rigidity.

The TBR was developed as part of an inquiry concerned with determining the dimensions of behavioral rigidity (Schaie, 1955). It consists of three parts resulting in eight measures as follows:

The Capitals Test was adapted from Bernstein's (1924) study of quickness and intelligence and is representative of the earliest "functional" approach to the study of rigidity and perseveration. In the first part of this test subjects copy a paragraph of writing following the model wherever lower or upper case letters are indicated. In a second part, subjects recopy the paragraph, but now must substitute lower case for upper case in the original and vice versa. A total of 2 1/2 minutes are allowed

for each part of the test. The total number of words copied under the standard condition provides a measure of "copying speed." The ratio of number of words in the perseveration-inducing condition to that in the standard condition yields a measure of "instructional set flexibility;" i.e., the ease responding under conditions that are counter-intuitive and/or inducive of negative transfer or perseveration.

The Opposites Test was newly constructed along lines suggested by Scheier and Ferguson (1952). The test contains three lists of simple words, selected to be at approximately a third grade educational level. Subjects are asked to write antonyms for the words in the first list and synonyms to words in the second list. In the third list subjects are asked to respond with an antonym to words printed in lower case letters and with a synonym to words printed in upper case letters. Two minutes are allowed for each of the three lists. The total number of responses made to the first two lists gives a measure of "associative speed." Two measures of "associational flexibility" are obtained. The first is the proportion of correct responses under the perseveration-inducing condition. The second represents the ratio of the number of correct responses under the perseveration-inducing condition to the number produced under the standard condition.

The TBR Questionnaire consists of 75 true or false items. These items involve three distinct scales: A 22-item "attitudinal flexibility" scale adapted from the California Psychological

Inventory (Gough, 1957); a 44-item "social responsibility" scale adapted from Gough, Meehl and McCloskey (1952; Schaie, 1959); and a 9-item "behavioral flexibility" scale adapted by Guttman scaling of a measure first used by Lankes (1915).

Procedure

All subjects were tested in small groups in sessions which for the first three waves lasted about two hours, for the fourth wave about three hours, and for the fifth wave in two sessions of 2 1/2 hours each (necessary because multiple markers of the abilities, and other additional measures had been added). The TBR Questionnaire was frequently administered on a take-home basis.

Method of Analysis

The basic design of this study is an independent random sampling model, where each cohort at each age is assessed on a separate sample, thus controlling for possible effects of testing, reactivity and experimental mortality (Schaie, 1965, 1973, 1977). Raw cohort differences were obtained by taking the differences between means for each pair of cohorts at all common age levels (four for comparisons of the seven cohorts born between 1896 and 1938, three for those involving cohorts born 1889 and 1945; two for the 1952 cohort, and one for the 1959 cohort). Cohort difference estimates were then obtained by averaging across all estimates to avoid undue weighting in terms of differential sample sizes. Cohort gradients were then constructed by cumulating

cohort difference estimates across the cohorts available for analysis, using the earliest (1889) cohort as the base.

Cross-sectional age differences were obtained by averaging across all subjects of the same age regardless of time of measurement. Longitudinal (within cohort) age changes were estimated by taking differences between means for members of the same cohort assessed at successive times of measurement. Similar to the procedure used for the estimation of cohort differences, we then averaged across all estimates for each seven-year age interval. Longitudinal (within cohort) age gradients were then constructed by cumulating average age changes using the youngest age group as the base. Longitudinal (within subjects) age changes were estimated by aggregating age changes across all individuals followed over the same seven-year age range regardless of the time period over which assessed. The latter data, of course, do not control for practice or experimental mortality. They do, however, provide a direct estimate of age change occurring in the same individuals, avaraged over four seven-year time periods.

To permit comparisons across the different measures, all raw scores were standardized and converted to T-score form ($\underline{M}$ = 50, $\underline{SD}$ = 10).

Results

Cohort Gradients

Differences between successive cohorts as expressed in $\underline{T}$ score points (1/10 $\underline{SD}$) were cumulated from the oldest cohort born

in 1889 up to the most recently measured cohort born in 1959. Virtually all of the resulting cohort gradients shown in Figure 1 have a positive shape, with later born cohorts reporting more flexible attitudes and behaviors. It will be noted that over the 70 years monitored, representing approximately the average life span in industrialized countries, attitudinal flexibility increases by approximately one standard deviation for the questionnaire measures of attitudinal and behavioral flexibility, by approximately 1.2 standard deviations for the measures of associative flexibility and associative speed, and by almost 1 1/2 standard deviations for copying speed. Instructional set flexibility shows only modest increment of a magnitude of about .4 SD. On the other hand there is a modest, but statistically significant, decline in self-reported social responsibility. It is of interest to note that the questionnaire measures of flexibility and the measure of associative speed level off for the "baby boom" cohorts; indeed there appears to be some evidence of a possible negative trend for these cohorts.

Insert Figure 1 about here

Construction of the kind of cohort gradients presented here, requires a "rolling" comparison at the ages at which data are available for each cohort; e.g., the second and the third oldest cohorts are compared at ages 60, 67, 74 and 81, while the third

and the fourth cohorts are compared at ages 53, 60, 67, and 74, and so on. We can obtain further information on the time-lag at each of the ages monitored over the five successive samples. Significant positive shifts ($p < .01$) occurred at all but the oldest age for the measures of copying speed, associative speed, and instructional set flexibility. Similar positive shifts occurred for the measures of associative flexibility except for the youngest and oldest ages. For attitudinal flexibility, significant positive shifts were observed for ages 39 through 74, and for behavioral flexibility for ages 39 to 60. Significant negative shifts were observed for social responsibility at ages 25 and 53.

Age Effects

We next examined the consequences of the highly significant generational differences for our understanding of age patterns in the personality traits here examined. Three different estimates of age patterns are available. The first is a cross-sectional one, that compares age difference findings for individuals at the same age, but measured at the same point in time. The second is a within cohort longitudinal estimate, based on independent random samples, drawn from the same cohort at successive ages, and the third is based on changes observed within the same individuals. All comparsions made are over a seven-year interval.

Cross-sectional data. To obtain maximally stable data, we averaged scores [illegible] all five occasions of measurement. The cross-sectional data are reportedin Table 2. As would be expected from the widely differing cohort gradients, thes cross-sectional age differences differ markedly across the variables studied. Social Responsibility has a virtually flat profile after an initial positive difference of about 1/3 SD to age 39; the oldest subjects still rate themselves as more socialy responsible than the youngest. However, negative age differences (favoring the younger sub-groups; $p < .01$) were found for all measures of flexibility. The magnitude of these differences from the youngest to the oldest group range from approximately 3/4 SD for Behavioral Flexibility and Instructional Set Flexibility to 1 SD for Attitudinal Flexibility, and approximately 1.5 SD for the measure of Associational Flexibility. The measures of Copying and Associative Speed show similarly large magnitudes of negative age differences.

Insert Table 2 about here

Longitudinal Data. We report both the independent samples and repeated measurement data within cohort as mean differences across seven years between each successive data point. These data are provided in Table 3. The cumulative magnitudes of age changes within cohort as estimated from the independent samples from age

25 to 81 are quite modest. They range from a slight (.2 SD) positive change on Social Responsibility and virtually zero cumulative change for Behavioral Flexibility to modest (1/3 SD to .6 SD) negative changes for the remaining variables. Statistically significant positive changes occurred up to age 46 for Behavioral Flexibility, Attitudinal Flexibility and Associational Flexibility. Statistically significant negative changes were first noted in these data for Instructional Set Flexibility by age 46; for Copying Speed by age 60; and for Behavioral Flexibility, Attitudinal Flexibility and Associative Speed by age 67.

Insert Table 3 about here

Variability among measures in change across age is much greater for the estimates based on comparing the same subjects over time. These estimates raise from a substantial (1 SD) increase in Instructional Set Flexibility and a slight (.2 SD) increase in Social Responsiblity, to a modest (1/3 SD to 1/2 SD) on all measures of flexibility and in Association Speed, but a very substantial decrease (2.1 SD) in Copying Speed. Data for the two different approaches to the estimation of pop lation parameters from longitudinal data are generally quite comparable, but with some noteworthy discrepancies that can best be considered in conjunction with the even more noteworthy discrepancies from

the age difference data described earlier. For the repeated measurement data, significant positive changes were noted for Social Responsibility to age 32; for Associational Speed to age 39, for Associational Flexibility to age 46; and for Instructional Set Flexibility to age 60. Statistically significant negative changes were first noted for Copying Sppeed by age 46; for Attitudinal Flexibility by age 60; and for Behavioral Flexibility, Associational Flexibility and Associational Speed by age 67.

Age by Cohort Interactions. Is of interest also to note whether age changes differ in magnitude for successive cohorts. This question can be most directly investigated for the independent samples data by crossing the same two age intervals for all available cohorts covering those intervals. Requisite ANOVAs were computed for each successive seven-year comparison from age 25 to age 81. Statistically significant age by cohort interactions ($p < .05$) were found for all intervals for the measures of Instructional Set Flexibility and Copying Speed. However, no such interactions were observed for Behavioral Flexibility or Associational Flexibility. For Copying Speed, significant interactions were found over the age range from 46 to 60; for Attitudinal Flexibility from age 46 to 53 and from age 74 to 81; and for Social Responsibility from age 39 to 46. age 53 to 60, and age 74 to 81.

Discussion

We have presented data that inform us that personality questionnaire and performance measures of personality styles are not immune from the generational shifts that have previously been documented in the ability domain. As would be expected, in the presence of such cohort effects, we found substantially discrepant findings in the age patterns presented from the analysis of cross-sectional, within cohort independent samples, and repeated measures longitudinal data. We must now examine the implications of the cohort findings for the interpretation of data on personality and age. To do so we have jointly graphed the information on age differences and age changes (from Tables 2 and 3) for the three methods of estimating age patterns (see Figures 2 to 4).

Let us first consider the questionnaire measures, shown in Figure 2. For both Attitudinal and Behavioral Flexibility the within cohort and longitudinal gradients closely coincide, and both diverge markedly from the cross-sectional gradient. This discrepancy is readily explained by the steep positive cohort gradients earlier shown for these traits in Figure 1. Age differences in Attitudinal and Behavioral flexibility favoring young adults, consequently do not represent substantial negative developmental changes, but rather represent primarily generational differences in level attained as part of the early socialization process. In fact there seems to be modest change in a flexible

direction in young adulthood, but moderately increasing rigidity as the sixties are reached.

Insert Figure 2 about here

A somewhat different pattern prevails for Social Responsibility. In the absence of a pronounced cohort trend, cross-sectional and longitudinal data coincide and present a flat profile across the adult life span. The within cohort gradient implies a slightly negative gradient, that may reflect the effect of several small but significant age by cohort interactions that favor later-born cohorts. In sum, however, it seems clear that self-reported Social Responsibility after an early modest rise to the late thirties, remains at a fairly stable level thereafter.

Substantial discrepancies were found also for our measures of personality style, shown in Figure 3. As a consequence of a slightly positive cohort gradient, the within cohort findings are modestly above the cross-sectional data. What is most surprising, however, is the fact that longitudinal gradient for Insturctional Set Flexibility has a strong positive slope. Two factors may be have led to these results. The first involves the effects of practice in reversing instructions, which is controlled for in the cross-sectional and within cohort estimates, but confounds the longitudinal data. Additionally, the significant longitudinal decline in copying speed (see Figure 4) may spuriously result in

higher ratios between performance under the two conditions when performance in both is relatively low. Note also that on this variable significant age by cohor interactions systematically favor the younger cohorts. We conclude than that the longitudinal estimate is inflated, and that the within cohort estimate is the most realistic representation of developmental change, implying stability until age 60 and modestly decreasing flexibility thereafter.

Insert Figure 3 about here

Steep positive cohort gradients for the two measures of Associational Flexibility readily account for the discrepancies between the cross-sectional and longitudinal findings. The large cross-sectional age differences are again a function of earlier attained levels, rather than massive shifts in adulthood. The first measure, primarily indicates the effect of interference in terms of lack of accurate response under the perseveration-inducing condition. For this measure a developmental peak is reaached by age 60, with modest decline in flexibility (approximately 1/2 SD) thereafter. The second measure reflects the ratio of total correct responses under the perseveration-inducing condition as compared to the standard condition. Here the within cohort gradient is virtually flat, while the

longitudinal measure again suggest a peak at 60 and modest decrease in flexibility thereafter.

Some comments are in order also for the masures of response speed, which are part and parcel of any performance type of assessing personality styles (see Figure 4). Positive cohort gradients occurred for both measures, and as a consequence the within cohort gradients reflex substantially less age-related decline in speed than would be inferred from the cross-sectional measures. For Associational Speed within cohort and longitudinal gradients virtually coincide. For Copying Speed, however, the longitudinal gradient suggests even steeper decline in speed than was suggested by the cross-sectional age differences. This discrpancy can be reconciled when we note the effect of statistically significant age by cohort interactions favoring more recent cohorts at all age levels. The longitudinal gradients are based on data equally weighting all individuals. Greater decline in copying speed occurring for the earlier-born and more heavily represented cohorts therefore have greater impact, than in the within cohort gradient that uses unweighted means in averaging across cohorts. In sum, our data suggest significant but modes decline in response speed beginning by age 53 for Copying Speed and by age 60 for Associational Speed.

Insert Figure 4 about here

Some Concluding Comments

Our detailed analysis of personality questionnaire and performance test personality style data has shown that substantial cohort effects can be found in this domain for some but not all measures investigated. In addition to the measures discussed here we have also conducted a new factor analysis of the questionnaire items in the Test of Behaviroal Rigidity and have identified an additional ten replicable personality traits. Substantial cohort effects for some of these traits also lead to the identification of generational shifts, with subbstantial stability within individuals. Time constraints motivated us to restrict this presentation to the original TBR scales, the findings on the additional factor scales to be reported on another occasion.

The data presented today suggest specifically that there has been a substantial positive development towards more flexible personality styles, behaviors and attitudes in successive generations over the past 70 years. These generational differences have led us to assume erroneously that most individuals become substantially more rigid as they age. Our results suggest, however, that cross-sectional data on measures of flexibility are unduly pessimistic. While there is indeed some average drop in flexibility beginning in the sixties it is much more modest in nature than heretofore suggested. By contrast, examination of the trait or Social Responsibility shows a significant early increment, but then virtual stability into late life.

Most work on aging and personality in the past has heavily relied on cross-sectional data and have consequently identified large adult age differences. Work of a longitudinal nature, by contrast, suggests that these differences reflect largely generational shifts, and that stability of the adult personality would seem to be the rule rather than the exception. Nevertheless, as our data show, age changes do appear for selected variables as the sixties are reached, and more pronounced findings of age changes in at least some personality dimensions may be expected as older and older populations become available for systematic study.

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Author Note

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Table 1.

Number of Study Participants Assessed at Various Ages

	Time of Test					
Age	1956	1963	1970	1977	1984	Total
25	76	100	71	56	83	386
32	70	122	65	62	56	374
39	71	130	84	74	70	449
46	65	155	87	69	65	441
53	70	143	89	77	66	445
60	72	122	80	73	79	426
67	76	127	91	73	82	449
74	-	78	88	70	75	311
81	-	-	50	58	52	161
All	500	997	705	612	628	3442

Table 2

Cross-Sectional Age Patterns in T-Scores

Age	25	32	39	46	53	60	67	74	81
Behavioral Flexibility	52.6	52.1	50.9	51.5	49.8	50.1	47.2	45.6	45.4
Attitulinal Flexibility	54.3	53.6	52.5	52.3	50.4	48.4	45.9	44.2	44.4
Social Responsibility	47.7	49.6	51.0	50.7	51.1	51.0	50.0	48.8	49.3
Instruct. Set Flexibility	52.9	52.9	52.3	50.2	50.5	49.2	46.8	46.7	45.1
Associational Flexibility 1[a]	54.5	54.5	53.2	52.4	51.1	48.6	45.3	43.9	40.5
Associational Flexibility 2[a]	57.6	55.1	52.4	52.1	49.4	47.1	44.7	44.0	42.7
Copying Speed	54.8	53.9	53.0	52.1	50.4	48.6	45.8	43.8	41.6
Associaonal Speed	55.5	55.6	53.8	52.6	50.9	48.1	44.6	42.0	39.2

[a]Associational Flexibility 1 = proportion correct; Associational Flexibility 2 = proportion of standard performance

Table 3

Longitudinal Age Changes in T-Scores

Age		25 to 32	32 to 39	39 to 46	46 to 53	53 to 60	60 to 67	67 to 74	74 to 81
N	(I)	606	696	754	751	733	720	678	372
	(R)	135	238	341	364	407	359	284	129
Behavioral Flexibility	(I)	+ .3	-1.0	+2.3**	- .6	+1.3	-1.5*	-1.5	+ .4
	(R)	+ .6	+ .3	+ .5	- .4	+ .4	-1.5**	- .9	-2.1*
Attitudinal Flexibility	(I)	- .2	- .5	+1.3*	-1.0	-1.0	-1.9*	- .7	+1.0
	(R)	+ .8	+ .1	+ .2	- .3	- .6*	-1.2**	-1.6**	- .7*
Social Responsibility	(I)	+1.3	+ .7	-1.2	+ .3	- .7	-1.2	-1.6	+ .5
	(R)	+2.0*	+ .6	+ .4	- .4	+ .2	+ .1	+ .3	- .9
Instruct. Set Flexibility	(I)	- .1	- .1	-1.3*	+1.1	- .7	-2.6**	+ .2	-1.7
	(R)	+ .9	+1.0	+2.1**	+2.0**	+2.0	+1.2	- .6	+2.0
Associational Flexibility 1[a]	(I)	+ .3	- .3	+ .5	+ .1	- .5	-1.4	+ .2	-2.2
	(R)	+ .6	+ .6	+ .6	- .1	+ .8*	-1.4**	-1.8**	-4.2**
Associational Flexibility 2[a]	(I)	-1.1	-1.1	+1.4*	-1.3*	- .2	- .8	+ .5	- .7
	(R)	+ .8	+ .3	+ .1	- .6	+ .8	-1.3**	-1.0	-2.4**
Copying Speed	(I)	+1.4	+ .4	+ .7	- .7	-1.5*	-1.9**	-1.5	- .5
	(R)	+ .6	- .6	-2.5**	-2.6**	-3.4**	-3.5**	-3.3**	-5.1**
Associational Speed	(I)	+1.1	- .8	+ .5	+ .1	-1.1	-2.0**	-1.9**	-1.6
	(R)	+ .6	+ .7*	+ .2	- .1	- .2	-1.1**	-1.6**	-3.5

[a]I = Data from independent random samples of same cohort at successive ages; R = Data from the repeated measurement of the same individuals.

[b]Associational Flexibility 1 = proportion correct; Associational Flexibility 2 = proportion of standard performance.

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

Figure Captions

Figure 1. Cumulative cohort changes for the raw scores from the Test of Behavioral Rigidity from a base cohort born in 1889.

Figure 2. Cross-sectional, within cohort, and longitudinal age effects for measures of behavioral flexibility, attitudinal flexibility and social responsibility.

Figure 3. Cross-sectional, within cohort, and longitudinal age effects for measures of instructional set flexibility and associational flexibility.

Figure 4. Cross-sectional, within cohort, and longitudinal age effects for measures of copying speed and associational speed.

Table 1.

Number of Study Participants

Assessed at Various Ages

	Time of Test					
Age	1956	1963	1970	1977	1984	All
25	76	100	71	56	83	386
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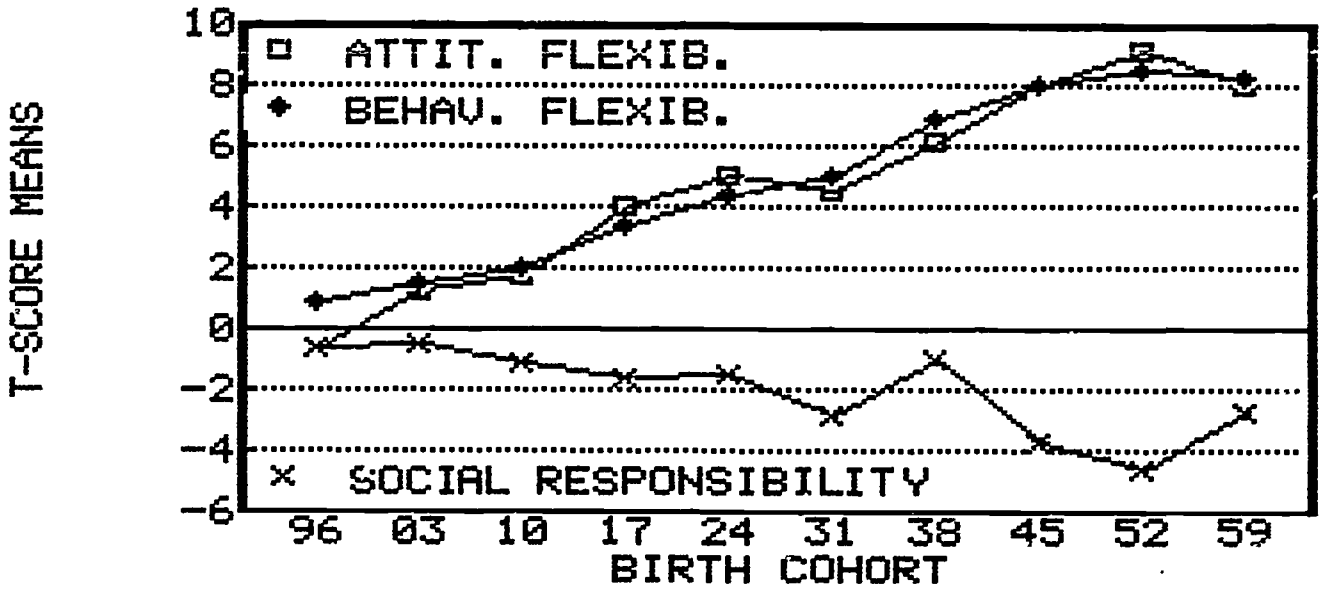
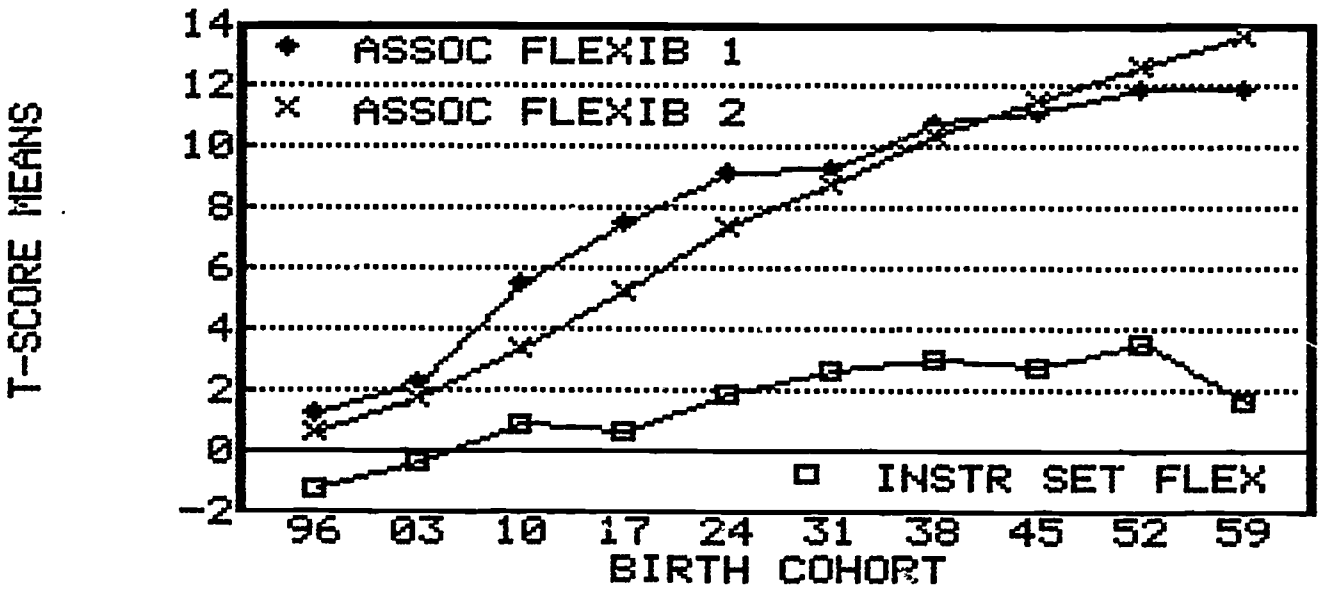
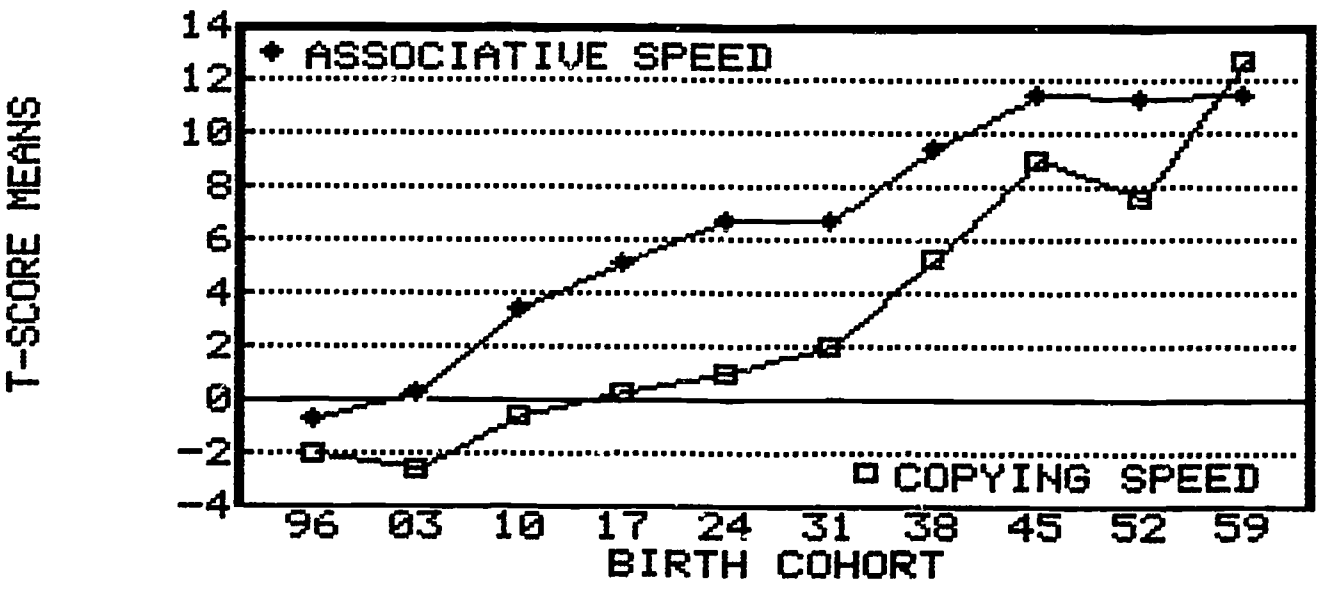
67	76	127	91	73	82	449
74	–	78	88	70	75	311
81	–	–	50	58	52	161
All	500	997	705	612	628	3442

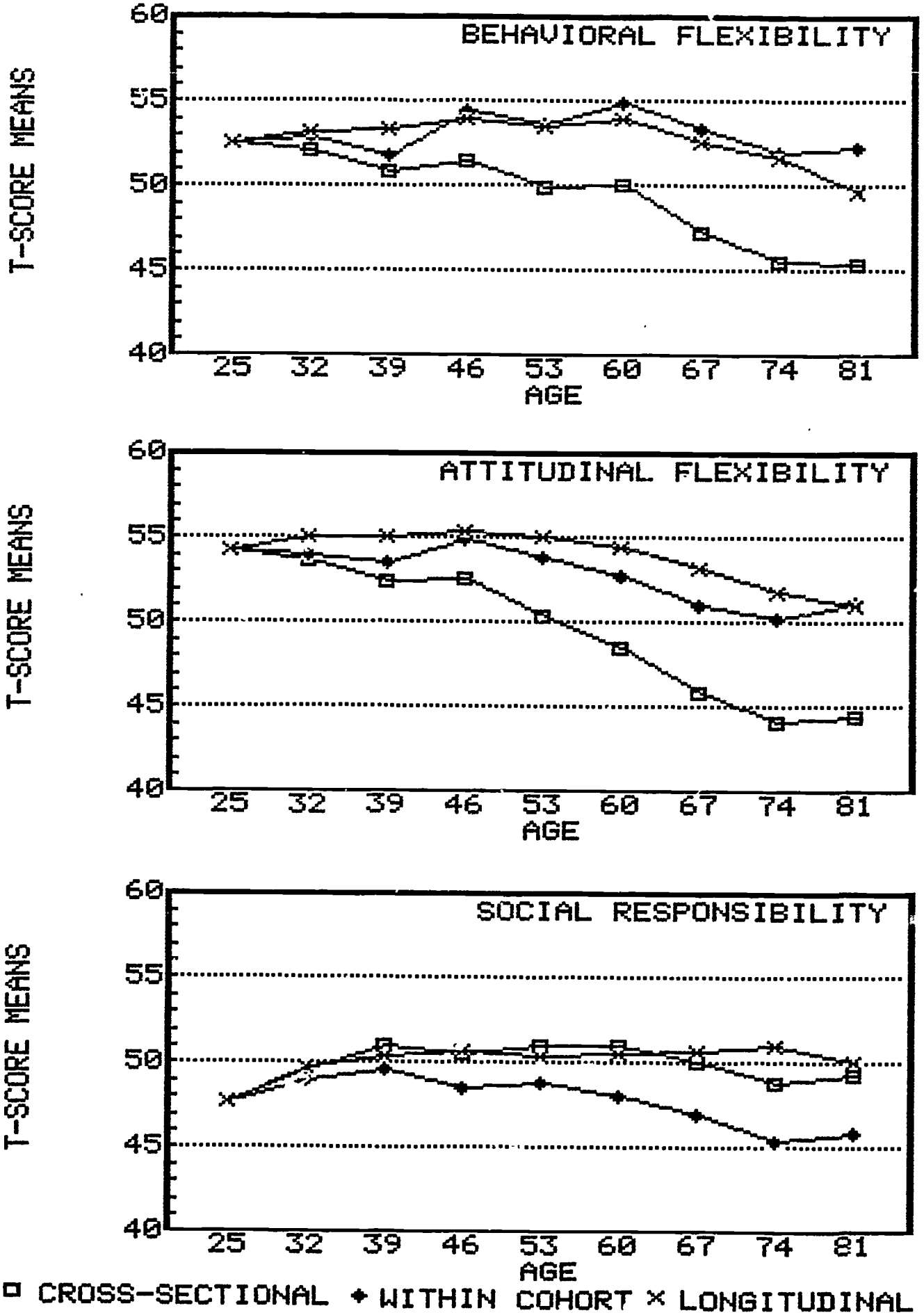
Cumulative Cohort Change



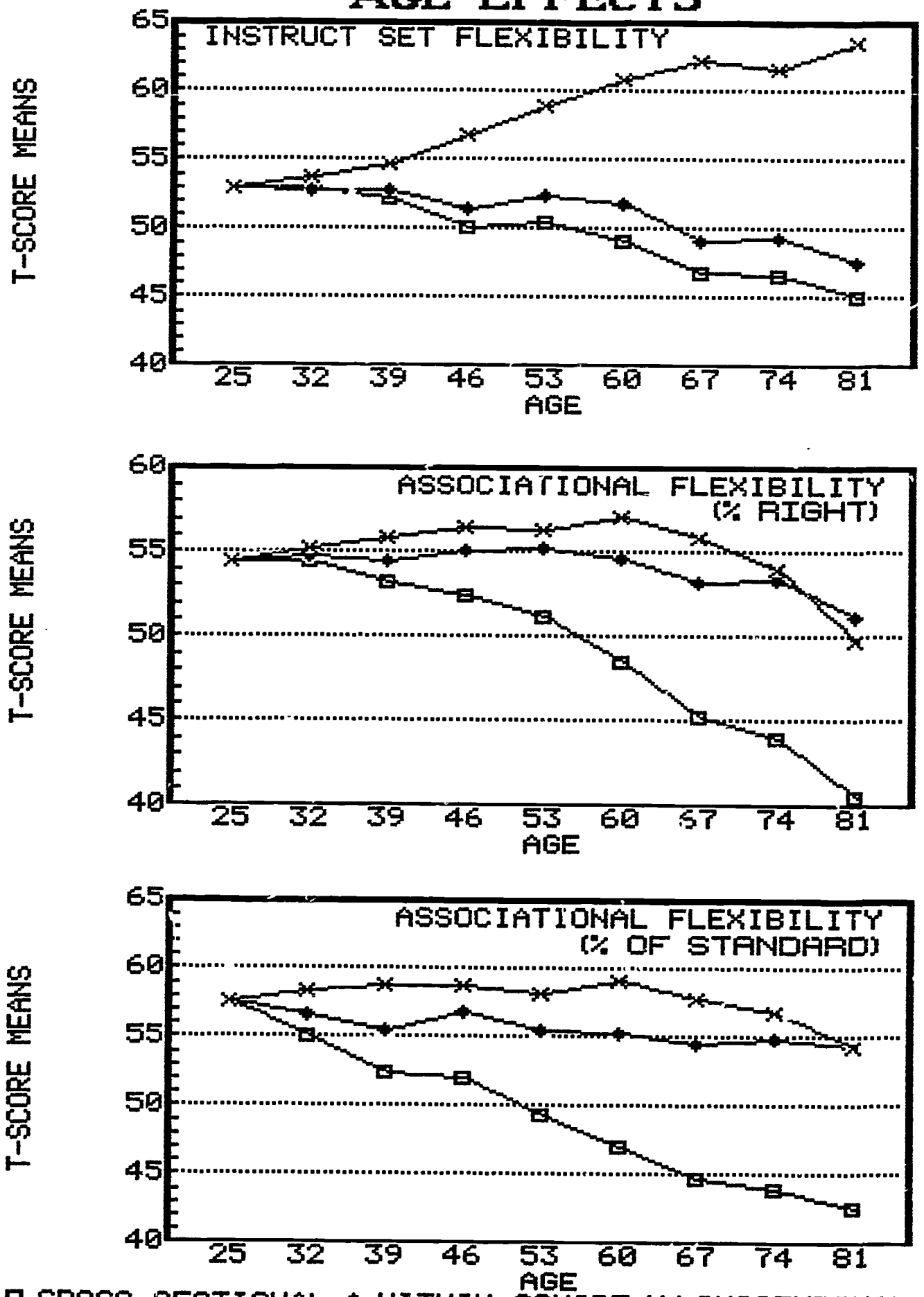




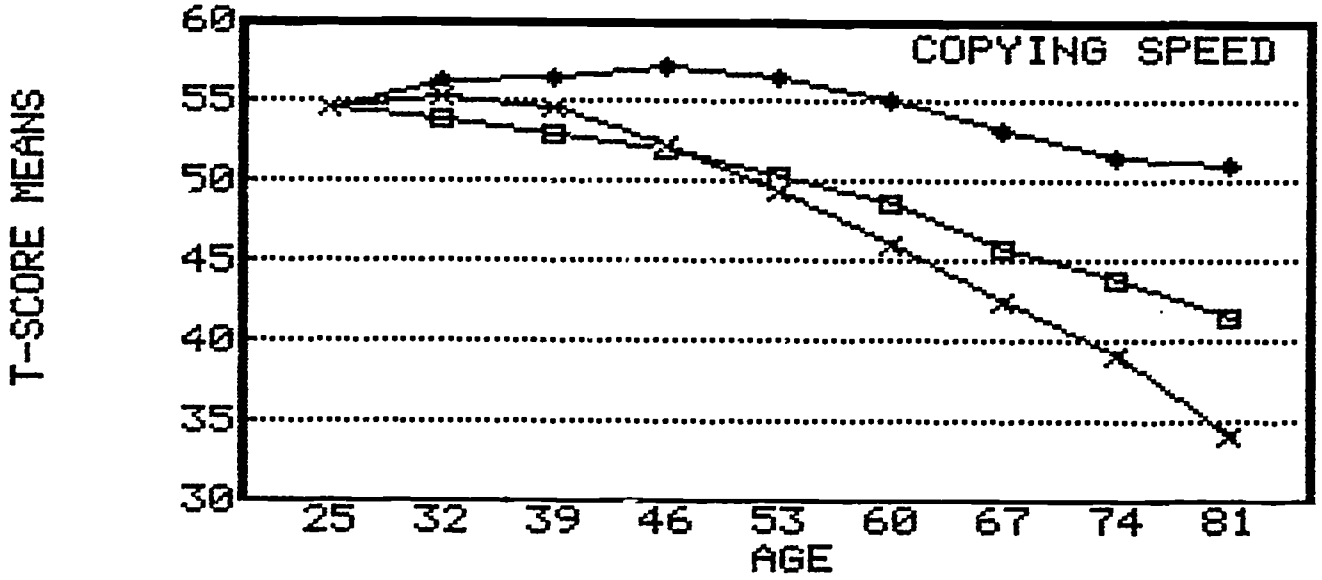
AGE EFFECTS

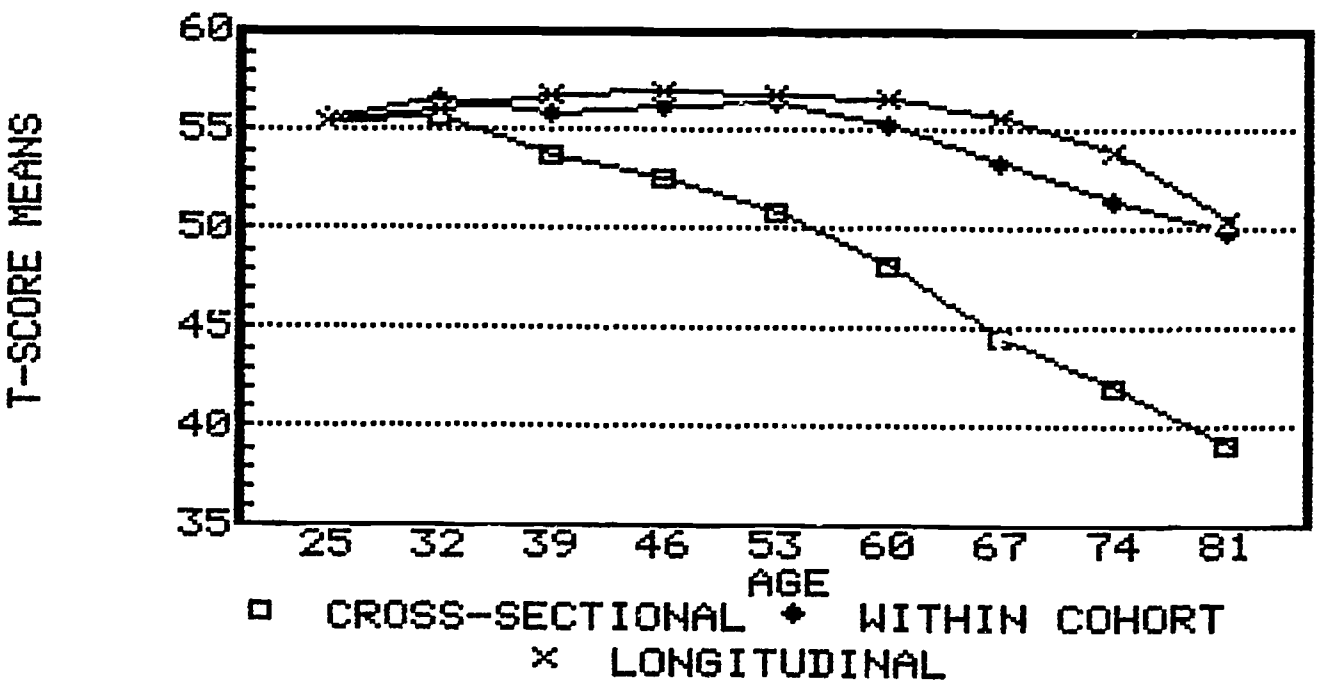

BEHAVIORAL FLEXIBILITY
ATTITUDINAL FLEXIBILITY
SOCIAL RESPONSIBILITY
T-SCORE MEANS
60
55
50
45
40
25 32 39 46 53 60 67 74 81
AGE
□ CROSS-SECTIONAL ✦ WITHIN COHORT × LONGITUDINAL

AGE EFFECTS


INSTRUCT SET FLEXIBILITY
ASSOCIATIONAL FLEXIBILITY (% RIGHT)
ASSOCIATIONAL FLEXIBILITY (% OF STANDARD)
T-SCORE MEANS
AGE
65
60
55
50
45
40
25
32
39
46
53
60
67
74
81
□ CROSS-SECTIONAL ◆ WITHIN COHORT × LONGITUDINAL

AGE EFFECTS


T-SCORE MEANS
60
55
50
45
40
35
30
COPYING SPEED
25 32 39 46 53 60 67 74 81
AGE


ASSOCIATIONAL SPEED
T-SCORE MEANS
60
55
50
45
40
35
25 32 39 46 53 60 67 74 81
AGE
CROSS-SECTIONAL
WITHIN COHORT
LONGITUDINAL