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AUTHOR Field, Dorothy; Schaie, K. Warner
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ABSTRACT

While research has examined both life satisfaction and intellectual functioning of older adults, the relationship between these two dimensions has been investigated very little. A study was conducted to explore continuity in intellectual functioning over time in advanced old age, continuity in life satisfaction during the same period, the relationship between these two constructs, and how they are affected by whether the subjects are young-old, old-old, or very-old. Subjects were from the Berkeley Older Generation Study and were the parents of the 1928-1929 Guidance Study and Berkeley Growth Study children. In 1968-1969 and again in 1982-1983, subjects completed: (1) the Wechsler Adult Intelligence Scale; (2) a life satisfaction measure rating zest versus apathy, resolution and fortitude, congruence of goals, self-concept, and mood tone; and (3) five measures of intellectual functioning (intelligence, mental alertness, speed of mental processes, accuracy in thinking, and use of language). At the last follow-up, 61 subjects were aged 75-84 (old-old) and 29 subjects were aged 85-93 (very-old). The results revealed important changes in intellectual functioning and continuity in life satisfaction in advanced old age. Declines were found for most of the oldest people, yet individual differences were apparent in both the old-old and the very-old groups. No predictive relationship between life satisfaction and intelligence over time was found. Future research will examine possible sex differences, the influence of the constructs of such variables as health, and the possibility of non-linearity over time. (NB)

Life Satisfaction and Intellectual Functioning: Continuity Between Young-Old, Old-Old, and Very-Old Age

Dorothy Field and K. Warner Schaie

The Pennsylvania State University

This paper examines continuity in intellectual functioning over time in advanced old age, continuity in life satisfaction during the same period, the relationship between these two constructs, and how these are affected by whether the elderly people are young-old, old-old, or very-old.

Longitudinal studies of cognitive functioning have demonstrated that little normative behavior change occurs until the 60s; after that age substantial decrement occurs for many, but not all, individuals (Schaie, 1979, 1983). Selective attrition in longitudinal studies is commonly found to yield a sample scoring high in IQ (Baltes, Schaie, & Nardi, 1971); yet it has been found (Gribbin & Schaie, 1978; Siegler & Botwinick, 1979) that after adjustments caused by early attrition have occurred, little decline in IQ appears in further years of testing. Other longitudinal studies have found no decline in test scores into young-old age, up to about age 75 (Jarvik & Bank, 1983; Owens, 1966; Rudinger, 1976; Schaie, 1979). In old-old age, however, intellectual decline is found for many, as a larger proportion of the subjects approach the period of terminal drop (Riegel & Riegel, 1972). Nevertheless, the initially more able are likely to show a slower rate of decline (Blum & Jarvik, 1974; Schaie, 1979). Longitudinal studies that have examined individual differences (Schaie, 1983) show

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that even in advanced old age substantial individual differences continue to be found, paralleling those found at earlier ages.

Numerous studies of older people have found a strong relationship between life satisfaction and health (Fooken, 1982; Palmore & Luikart, 1974). Consistent relationships between life satisfaction and various aspects of activity level, such as volunteerism (Fengler, 1984), involvement in outside roles (Chown, 1977), informal social activities (Longino and Kart, 1982), and a feeling of being needed (Thomae, 1980) also have been found.

Although there is a rich literature in each of these topics separately, the relationship between life satisfaction and intellectual functioning has been examined very little. The Bonn Longitudinal Study of Aging found "no direct connection between intellectual ability and general satisfaction with the present life situation" (Grombach, 1976, p.66), and the Duke II study (Palmore & Luikart, 1974) found no correlation between intelligence and a self-ranking of life satisfaction in their sample aged 45-71. Strangely, neither of these longitudinal studies looked at this relationship longitudinally.

Most gerontologists now agree that the elderly do not form a monolithic group. Neugarten (1974) suggested that those 60 to 75 should be considered "young-old" (YO), for they are more like the middle aged in personal and social resources. The "old-old" (OO), aged 75 and over, are said to face much more difficult problems of health, constricting social relationships, and increasing dependency. Only very recently have we recognized another sub-group: the very-old (VO), those age 85 and over (Longino, 1984; National Institutes of Health, 1984; Siegel, 1984). Very little is yet known about this segment of the elderly, but they are more likely to be institutionalized and to require assistance with daily activities (NIH, 1984), and the greatest drop in cognitive functioning is likely to be found among them.

It is possible that the slight association between life satisfaction and intelligence found in younger groups will not be duplicated among the very oldest persons. As poorer

health, decreased mobility, and death of friends and other associates provide fewer opportunities for outside activities and thus fewer satisfactions in social realms, cognitive functioning may become a more important component of morale. It may be that intimations of failing cognitive functioning will lead to diminished feelings of satisfaction. If this is the case, then a longitudinal study of elderly persons could find changing interrelationships between life satisfaction and intellectual functioning across the older years.

Method

The Sample

The Berkeley Older Generation Study at the Institute of Human Development, University of California, Berkeley, is comprised of the surviving parents of the original Guidance Study and Berkeley Growth Study children. These men and women have been seen and interviewed since their children were born in 1928 and 1929. At that time they were a representative sample of the young adult population of Berkeley, for their children were a sample of every third baby born in Berkeley during those years. Some 40 (1968-1969) and 53 (1982-1983) years later, most of the surviving parents were interviewed and tested again. At the time of the last follow-up, 61 members were aged 75 to 84, thus old-old (OO), and 29 were very-old, 85 to 93 (VO).

When surviving Berkeley Older Generation study members are compared with the national population of their cohort (Longino, 1984), we find no differences in sex, marital status, or living situation; they differ from the U.S. population as a whole only in education and, to a lesser extent, financial status.

Measures

This paper reports the results of three sets of measures. First, the Wechsler Adult Intelligence Scale was administered in 1969-70 and 1983-84 to most of the surviving Study members.

Second, the life satisfaction measure used in this study was taken from Neugarten, Havighurst, and Tobin (1961); it is comprised of five separate ratings of zest vs. apathy,

resolution and fortitude, congruence of goals, self-concept, and mood tone. Both the 1969-70 and 1982-84 interviews were intensive, structured but open-ended, and covered a number of topics; they usually lasted 4 to 6 hours. Each interview was coded by two raters. Discrepancies between ratings were resolved in conference. In the course of coding many variables, the life satisfaction ratings were made based on the reading of the entire interview. All disagreements were resolved by discussion between the raters, and the resulting scores are conference-agreed. Under no circumstances did a rater read the interview from the other time period, nor did a rater code a spouse's interview. The two time periods, therefore, were rated independently, but by the same well-trained team of judges.

Third, five measures of intellectual functioning were used: intelligence, mental alertness, speed of mental processes, accuracy in thinking and use of language. These ratings were first used when the Berkeley group were young adults, in 1929-30 (Macfarlane, 1938) and were made in 1969-70 and 1983-84 as well. These intellectual ratings were made in the same way as the life satisfaction ratings, and final scores are conference-agreed.

Results

Wechsler Adult Inteligence Scale

The BOGS members are above average in intelligence, as measured by the WAIS. As expected, we find significant decline in their performance IQ (M:1969 = 117; M:1983 = 113). But even at this advanced age, verbal IQ has not declined for the group (M:1969 = 122; M:1983 = 122). A repeated measures ANOVA of the full scale WAIS compared change over time in the two age sub-groups, and found no differences in main effects of time or age group, but there was a strong interaction, $F(1,48) = 17.87$, $p = .001$, between age and time. IQ scores of the VO went down, while the OO increased somewhat. We must remember, however, that the Wechsler IQ score is adjusted for age. It is preferable to use the scaled scores, which are based on actual raw scores, and these are more revealing than the IQ scores.

Figure 1 shows the mean scores of both age groups at both measurement periods. Two-way analyses of variance with repeated measures were used to analyze the scores. The performance scaled scores show a drop over time, and a differences between the age groups, with the younger group scoring higher than the older. The verbal scaled scores reveal a similar drop over time, as well as an age difference, but these changes are less severe. An interaction shows that the drop is greater for the older persons. Age is associated with the verbal scores (r = -.65) for the very-old group, but not for the old-old, and performance scores are not associated with age in either group.

Nevertheless, as has been observed with other groups (Schaie, 1983, 1984), individual differences are apparent at all age levels. Reliable change was determined by computing the confidence band of one standard error of measurement about their observed score in the first test (Dudek, 1979; Schaie, 1984). Only those individuals whose change exceeds the standard error of the difference in verbal scores (5.33) or performance scores (3.58) are deemed to have shown reliable change; smaller differences are considered random error.

Figure 2 shows change in the verbal scores. Reliable decrease is found in many, of course, but more than half the total group (54%) shows no change, and a minority (7%) shows reliable increases in verbal scores. The VO perform less well than the OO, but the patterns of change are not significantly different for the two groups, $\chi^2(4) = 2.78$. The most important finding is that 44%, almost half of the oldest group, aged 85-93, show no decline. Even more, 62% of the younger group, aged 75-84, show no decline in the verbal scores.

The performance score results, shown in Figure 3, reveal that decline here is far more pervasive: there is no reliable increase, and only 6% of the VO and 15% of the OO are stable. All others decline.

Life satisfaction

Figure 4 shows the changes over time in the life satisfaction ratings for the old-old and very-old groups. Two-way ANOVAs with repeated measures were performed on each of the life satisfaction scores. The life satisfaction total score reveals no main effects of age

or time, but a significant interaction shows that while there is no change over time for the younger group, a significant drop in life satisfaction occurs for the older group. There is remarkable stability over time in each of the life satisfaction scores examined separately. Only self concept shows a significant decline for the whole group between 1969 and 1983. For all other ratings the old-old group increased slightly or held its own, and the drops in very-old age are too small to be significant. The over-time correlations show significant continuity for all the measures except one (zest). Age is not significantly correlated with any life satisfaction rating, either for the old-old or the very-old groups, but it is associated with change in life satisfaction (Time 1 - Time 2): $r = .26$, $p = .02$.

The association between intellectual functioning and life satisfaction

To assess this relationship, we used a linear structural relations model (Joreskog & Sorbom, 1978) Causal structural models have the great advantage that they allow the investigator to specify the relationship between the observed and the latent variables and to infer cause, not mere associations. They are well suited to longitudinal study, for time precedence is incorporated within the model as multiple measurement occasions, and the changing interrelationships of variables can be tested. The cross-lagged structural model we used is shown in Figure 6. The intellectual factor consists of three observed variables: WAIS verbal score, WAIS performance score, and the total score of the five intellectual ratings: intelligence, mental alertness, mental speed, accuracy in thinking, and use of language. The life satisfaction factor is comprised of the five variables zest, resolution, congruence, self-concept, and mood tone.

Measurement equivalence was established for this longitudinal model, showing that the structure of the latent variables remains the same over time. The isolated stability model, $\chi^2 = 161.65$, df = 107, was accepted over the measurement model; there is an acceptable fit. Figure 6 shows a cross-lagged model, where the causal influence of each Time 1 factor on the other factor at Time 2 is assessed. This cross-lagged model, $\chi^2 = 159.80$, df = 105, was not accepted over the isolated stability model, because the cross-lagged coefficients do

not significantly increase the fit of the model. The stability of the WAIS factor over time is quite high, and the stability of the life satisfaction factor is rather high. The relationship between the factors at each time is rather low, and there is no change over time in its strength. Both cross-lagged coefficients are low, indicating that the magnitude of the causal relationship between the two factors is quite small. Our hypothesis that the relationship between intellectual functioning and life satisfaction would increase in advanced old age was not borne out.

What does this mean? The measurement model we have presented here is, of course, exploratory. In the first place, in this model our N is small (46). Although the fitting function takes the degrees of freedom into account as the model is contructed, still the greatest caution must accompany any interpretation. Second, we have included in one analysis two groups of people: the old-old and the very-old. It is possible that the interrelationships between intellectual functioning and life satisfaction are not the same at these two life stages. In the future, we will also investigate possible sex differences, examine the influence on the constructs of such variables as health, and explore the possibility of non-linearity over time. Until then, all we can say is that in spite of our expectation, there is no predictive relationship between life satisfaction and intelligence over time.

Conclusion

We have shown important changes in intellectual functioning and continuity in life satisfaction in advanced old age. As expected, we found decline for most of the oldest people, yet individual differences are apparent in both age groups. In fact, although five or our six members aged 90 or more declined in verbal scores, the oldest one did not. The proportion of decliners is comparable with that found in the Seattle Longitudinal Study of Aging (Schaie, 1984). Over a measurement span of seven years decline was observed in 25% to 33% of his younger group (60-74) and in 33% to 45% of his older group (74-80). In the Berkeley Study, the younger group (73-84) contained 38% who declined in verbal scores

across twice as long an interval, and in the oldest group (85-93) 56% declined during the course of 14 years.

It is curious that other studies have not looked for individual differences, for they have been found when they were searched out (Schaie, 1983, 1984). As we seek explanations for the changes we have described here, we will examine personal and situational characteristics of each group. What is the role of personality, health, socio-economic status, or social supports in the interrelationship of intellectual functioning and life satisfaction in advanced old age? How do personality, health, socio-economic status, and social supports measured in the earlier life stages (young adulthood, middle age, and young-old age) predict the observed outcomes? The phenomena we seek to explain depend on many conditions that are easily ignored when large groups are studied. Yet we must understand what they mean. The careful investigation of a smaller sample that has been intensively studied over many years may yield clues to the processes of change or continuity in late adulthood.

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Table I

Variables used in the Social Relationship Cluster

Have you made any new friends in the past 10-15 years?

1. yes, many new friends
2. yes, a few new friends
3. not really any new friends

Can you tell me about some of your friends? How often do you have contact with them?

1. contacts some friend daily
2. contacts some friend twice a week at least
3. contacts some friend at least once a week
4. contacts some friend at least twice a month
5. contacts some friend at least once a month
6. contacts some friend at least every two months
7. contacts some friend at least every three months
8. contacts some friend at least every six months
9. less than that

Do you still want close friendships?

1. yes, more now
2. yes, same as ever
3. lessening importance
4. not important

Rating of total activity in clubs and informal organizations.

1. once a week or more
2. twice a month
3. once a month
4. two or three times a year
5. once a year
6. less than one a year

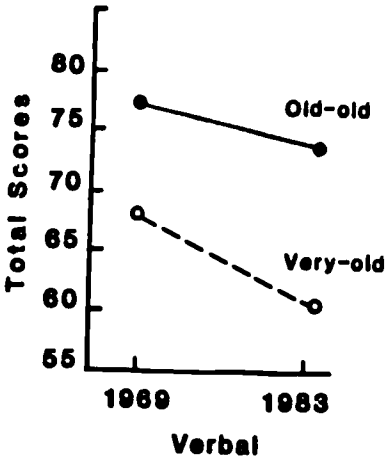
Table I (continued)

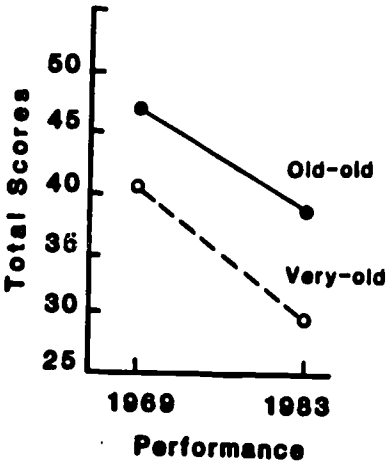
Involvement in other than parental and familial roles. (social, friends, political, organizational, charity, religious, occupational, hobby)

1. very highly involved in one or more interests and activities; expresses high enthusiasm, much energy and time directed toward these activities or roles; defined as highly important in person's life. Zest.
2. highly involved in one or more interests but not as much as #1; interested and enjoys activities, but not highly enthusiastic or energetic in relation to activity.
3. moderately involved; derives some satisfaction from one or more of above activities; does not express much enthusiasm or expend much energy, activity may be regarded as routine
4. some slight involvement; little participation although membership may be sustained; routine activities with casual friends; little meaning left in the activity.
5. virtually no interests; may see friends on occasion; most time spent at home without activity or interest; little affect, enthusiasm, or interest; may be attributed to physical or psychological difficulty.

Social adjustment (Sociability) at present

1. exceptionally easy and quick social contacts
2. shows quick willingness to be friendly
3. easy with certain types of people, not with all, average
4. shy, stands off, detached, more interested in ideas than people
5. exceptionally shy, acute discomfort at meeting new people, complete indifference to people.





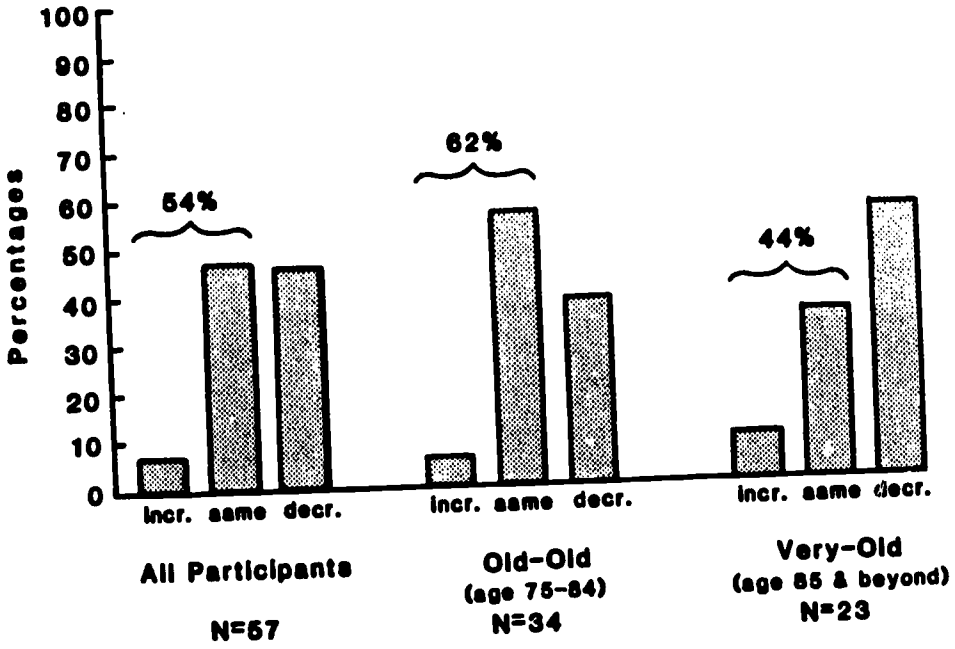
Age: $F(1,54)=8.62$, $p=.005$
Time: $F(1,54)=23.96$, $p=.000$
Interaction: $F(1,54)=3.71$, $p=.059$

Age: $F(1,48)=10.96$, $p=.002$
Time: $F(1,48)=125.52$, $p=.000$
Interaction: NS.

Although the graphs show decline for the groups as a whole, the decline is steeper for the very-old and for the performance scores.

Figure 1

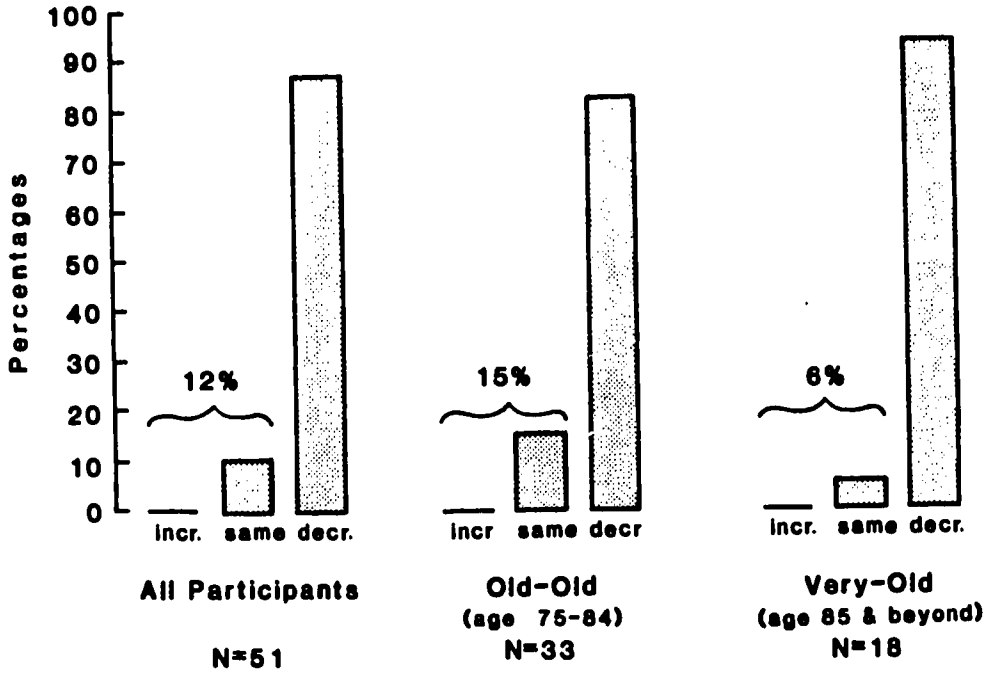
AN OVER-TIME COMPARISON
OF THE OLD-OLD WITH THE VERY-OLD
WAIS VERBAL PERFORMANCE SCORES



Note that 62% of the old-old and 44% of the very-old did not show reliable decline in verbal scores.

Figure 2

RELIABLE CHANGE IN WAIS VERBAL SCORES OVER 13 YEARS OF LATE LIFE

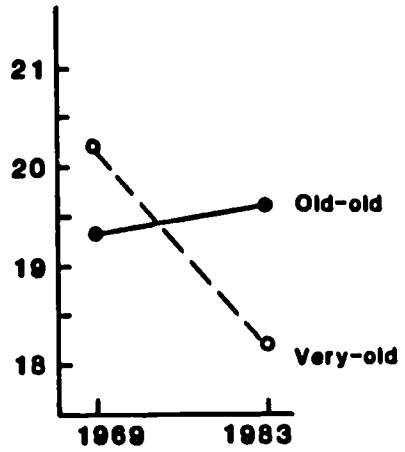


Note that 15% of the old-old and 6% of the very-old did not show reliable decline in performance scores.

Figure 3

RELIABLE CHANGE
IN WAIS PERFORMANCE SCORES
OVER 13 YEARS OF LATE LIFE

Repeated Measures Life Satisfaction

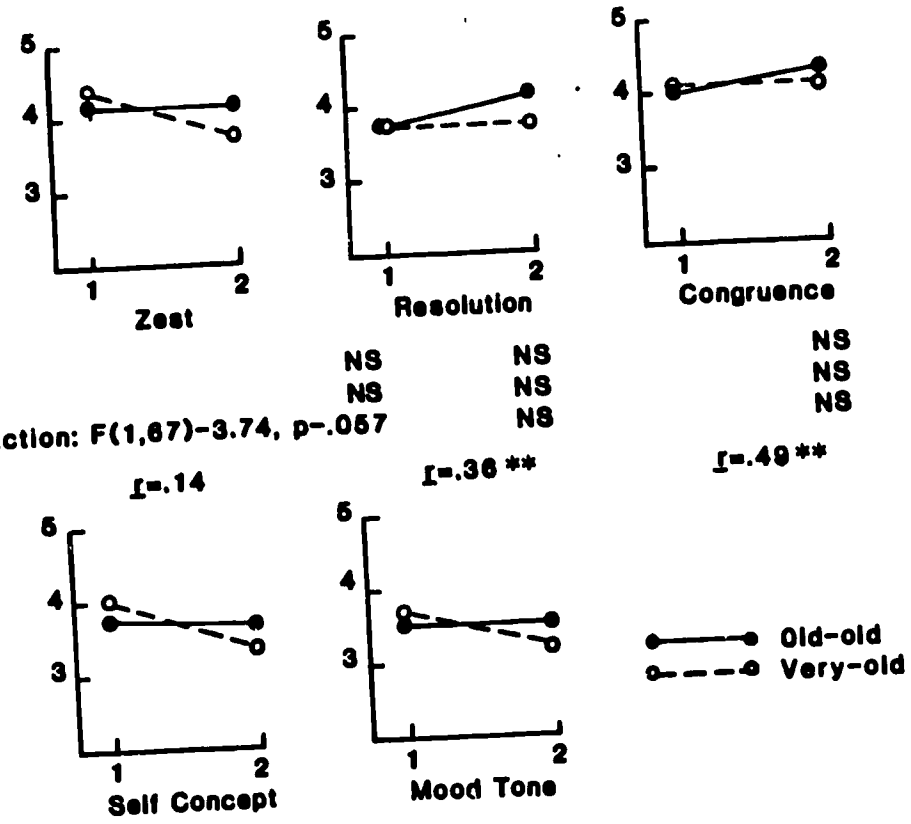


Age: NS
Time: NS
Interaction: $F(1,66)=5.762$, $p=.019$

For the Very-Old group, life satisfaction was significantly lower in 1983 than in 1969: correlated t test $(25)=2.21$, $p=.036$.

Figure 4

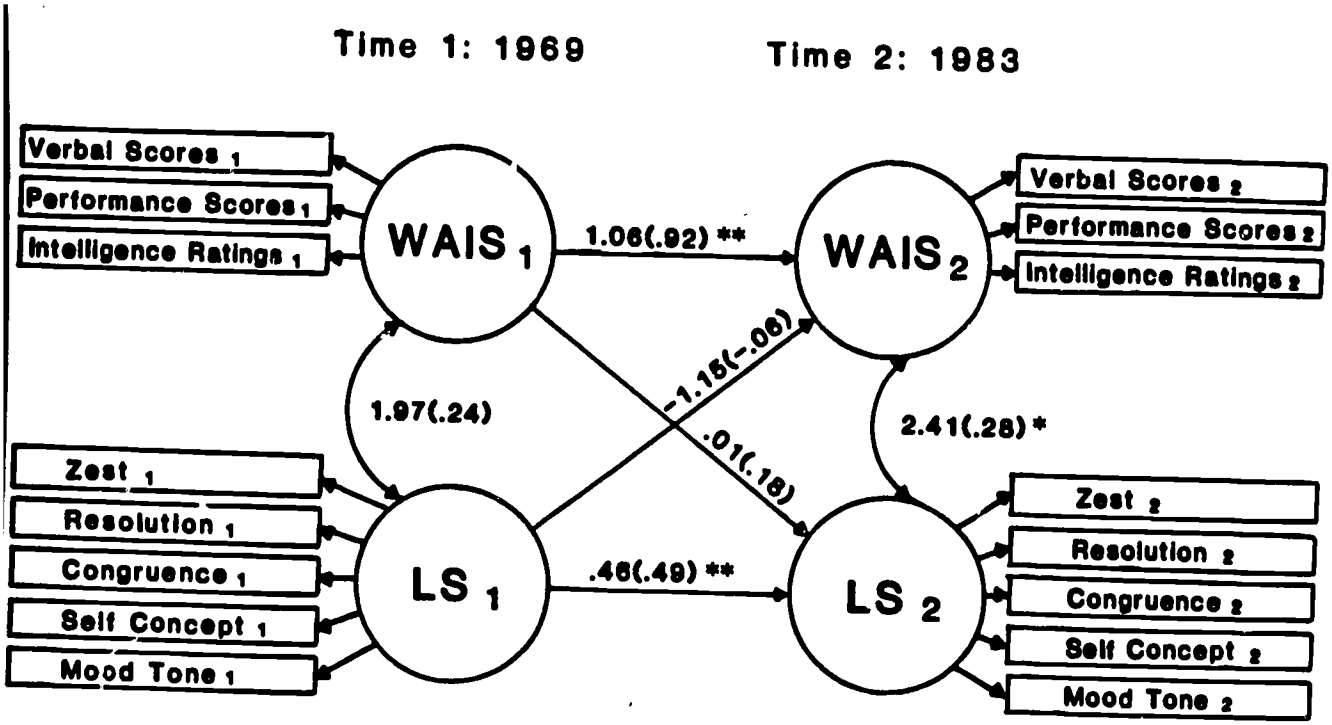
AN OVER-TIME COMPARISON OF THE OLD-OLD WITH THE VERY-OLD TOTAL LIFE SATISFACTION RATINGS



Note: r=cross-time correlation for total group.
* =p<.05
** =p<.01

Figure 5

TWO-WAY ANALYSIS OF VARIANTS
OF LIFE SATISFACTION COMPONENT SCORES
BY AGE GROUPS



Note: * = $p < .05$
** = $p < .01$
( ) = correlation
N=46

Figure 6

STRUCTURAL MODEL FOR INTELLECTUAL RATINGS AND LIFE SATISFACTION OVER TIME