

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

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This paper examines continuity in intellectual functioning over time in advanced old age, continuity in life satisfaction during the same period, the changing relationship between these two constructs, and how these differences 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 75 years (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). The initially more able, however, are likely to show a slower rate of decline (Blum & Jarvik, 1974; Schaie, 1979). Longitudinal studies that have examined individual differences (Schaie, 1983) show 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 (Fookien, 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 ~~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, as shown in Table 1.

Measures

This paper reports the results of 3 sets of mea

of topics; they usually lasted 4 to 6 hours. Each interview was coded by two raters. Discrepancies between ratings were resolved in conference. 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. 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.

Third, five measures of intellectual functioning were used: intelligence, mental alertness, speed of mental processes, accuracy in thinking and use of language. These intellectual ratings were made in the same way as the life satisfaction ratings, and final scores are conference-agreed. These ratings were first used when the Berkeley group were young adults, in 1929-30 (Macfarlane, 1938). Mussen et al. (1980) examined the stability of these ratings across the almost 40 years between young adulthood and young-old age, ~~in the much larger group of women who survived into young-old age.~~ The correlations they found averaged .363, similar to those we found between young-old and old-old age: average .386 (Field & Weishaus, 1983). These intellectual ratings were compared with the WAIS scores: at the first test, in 1969-1970, the ratings correlated with the verbal scores on average ~~.48~~⁴⁸ and with the performance scores ~~.42~~^{.42}. In 1983-84, the similar correlations were ~~??~~^{.62} for verbal and ~~.57~~⁵⁷ for performance scores:

WARNER: I THINK WE MUST PUT THIS IN IF WE DO THE "IR" LISREL, DON'T YOU?

Results

Wechsler Adult Intelligence Scale.

The BOGS members are above average in intelligence, as measured by the WAIS. As expected, we find reliable 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, $F(1,48) = 17.87$, $p = .0001$, 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 ($r = -.45$) for the very-old group, but not for the old-old, and performance scores are not associated in either group.

Nevertheless, as has been observed with other groups (Schaie, 1983), individual differences are apparent at all age levels. Reliable change was determined by computing the standard error of the difference with the following formula: $(s.d. T_1) \sqrt{(1 - r_{T_1, T_2})}$ (Dudek, 1979). Only those individuals whose change exceeds the standard error of verbal scores (in this case, 5.33) and performance scores (3.58) are deemed to have shown reliable change; smaller differences ~~ARE~~^{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. There is very little change over time in life satisfaction. Only self concept shows a significant decline between 1969 and 1983. 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. 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.

Ratings of intellectual functioning.

The five intellectual ratings show ^{satisfactory} continuity over time, with correlations from .30 to .44, as shown in Figure 5. Three of the ratings, intelligence, accuracy of thinking, and use of language significantly decline for the group as a whole, but the old-old do not differ from the very-old in any of these ratings.

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 9. The intellectual factor consists of three observed variables: WAIS verbal, WAIS performance, and the total score of 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 described above.

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. Figure 9 7 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 also rather high. Both cross-lagged coefficients are low, indicating that the magnitude of the causal relationship between the two factors is quite small.

THIS SECTION IS AN ALTERNATIVE FOR THE ABOVE. I would prefer to use the WAIS analysis, because that is what we have been talking about and it is what people understand, but the N is really ludicrous. I checked back to be sure 46 was all we really could rustle up, and it is true. WHAT DO YOU THINK?

Measurement equivalence was established for this longitudinal model, showing that the structure of the latent variables remains the same over time. Figure 9A shows a cross-lagged model where the causal influence of each Time 1 factor on the other factor at Time 2 is assessed. The stability of the intellectual ratings is satisfactorily high, but there is considerable shift in the life satisfaction constructs across time. It is interesting that the Time 1 intellectual rating is better able to predict life satisfaction at Time 2 than is Time 1 life satisfaction. We chose the IR model over a WAIS model because it gave us a larger N. Owing to funding problems, we were not able to administer the WAIS tests until after all interviewing was completed. In the intervening time a number of participants died, sadly, and we did not get to test them. The average ^{of the} correlations of the intellectual ratings with the WAIS scores was .485 at Time 1 and .598 at Time 2.

What does this mean? In the first place, our N is small (46 or 66, DEPENDING ON WHICH WE CHOOSE), and 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, recent thinking may question this strategy. It is possible that the interrelationships between

*If we use the
the ratings?*

intellectual functioning and life satisfaction are not the same at these two life stages. The younger (albeit hardly young!) group had an average age at the time of the first testing of 65.8, range 59-71. At the second testing their mean age was 80.3, range 73 to 84. The older group, the YO, was 73.9, range 70 to 80, and 88.8, range 85 to 93. Indeed, examining the zero-order correlations of the WAIS scores and life satisfaction measured at the same time, we find differing strengths of association for different age groups, as shown in Figure 10 and Table 4. There is little correlation between the life satisfaction ratings, for those who were on average 68 at testing. The group aged 74 had rather consistent moderate correlations both with verbal and performance scores. The 80-year-olds (the same people as the 68s but at a later time) showed no association between life satisfaction and intellectual scores. Finally, the 89-year-olds (the same people as the 74s) showed strong correlations with the performance scores but not for the verbal. [If anything, we are showing a cohort effect rather than an age effect, but I am inclined to view this as one of the hazards of working with small Ns. I DON'T KNOW WHAT ELSE TO MAKE OF THIS.]

Sex differences.

I THINK THERE IS NOT ROOM TO DISCUSS SEX DIFFERENCES IN THIS PAPER. NEVERTHELESS, FOR COMPLETENESS, I NOTE WHAT I HAVE FOUND SO FAR. Looking at the results of t-tests, there are consistent and significant sex differences in WAIS scores, in intellectual ratings, and in life satisfaction in YO, but these have disappeared in OO. In all cases, men are judged as "better" or score higher. This is shown in Table 2. Note differences in Ns. However, I did the more interesting repeated measures anovas and found that sex differences are still apparent in OO for all intellectual measures (Figure 6 and Figure 7) and for life satisfaction as well. (Figure 8) I don't like incongruities like that! Can anything besides the differences in N be causing this? I haven't had time to stop and think about this.

However, there are no sex differences in the amount of change over time. Comparing those who showed reliable decline with those who maintained their scores, we find no differences between men and women in verbal score change for the old-old, $\chi^2(1) = .20$, or the very-old, $\chi^2(1) = .909$. Similarly, performance change showed no sex differences for the old-old, $\chi^2(1) = .157$, or the very old, $\chi^2(1) = 2.748$.

Association of personal situations and personality characteristics with change in intellectual functioning.

ONCE AGAIN, I DON'T THINK THIS SHOULD GO IN THE APA PAPER, BUT HERE IS WHAT I HAVE SO FAR. The situational variables I looked at are: education, occupation, financial strain, number of children, frequency seeing child, relationship with child, contact with friends, happy childhood, marital adjustment, club activities, anomie, health, comparative health, energy, involvement outside family, involvement with family, and emotional tone of family. All these were rated at both times.

I compared verbal score decliners with non-decliners on all the above with t-tests. I looked at present circumstances and also looked to see if earlier circumstances predicted the changes. Table 3 shows how little effect these variables have on change in verbal scores. Even health in YO does not predict decline in OO, nor are decliners significantly less healthy in OO than non-decliners.

Similarly, I looked at decliners vs. non-decliners in several personal ratings: personal appearance, freshness, poise, cheerful, worry, self-esteem, and open-minded, all measured at both times, with very uninteresting results, as shown in Table 3. Maybe I should have done correlations of difference scores with each of these ratings, rather than comparing groups of decliners vs. non-decliners. Actually, I think the personality variables need more "cleaning" before they are used.

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