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ABSTRACT

Previous research on intelligence and aging has relied on tests developed for younger adults, which often incorporate many factors that could impede optimal performance in elderly populations. To investigate short-term longitudinal changes in memory, intelligence, and perceived competence in everyday situations among older adults, 227 adults were tested. Seventy-four subjects were middle-aged (55-64, MA), 95 were young-old (65-74, YO), and 58 were old-old (75-84, OO) They completed the Adult Mental Abilities test battery, three word-list tasks and a paragraph task, and the Q-Sort (Scheidt and Schaie, 1978). The tests were administered twice, with a 3-year interval. An analysis of the results showed that in general the MA group scored highest on all measures, while the OO group scored lowest. Sex differences were found for the three word-list tasks, with women remembering more than men. For the spatial tests, men performed better than women. For the time of measurement effects, scores for immediate and delayed recall were significantly higher in the second administration, while word series skills decreased over the time span. Recognizing vocabulary decreased with time for the YO group. Spatial test performance increased over time for the MA group and decreased for the OO group. The YO group performance decreased significantly only for object rotation. For the social dimension, perceived competence increased across all age groups. The MA group rated themselves as active and uncommon, while the OO group rated themselves as passive and common. Women rated themselves as more competent than men in social, common, and supportive situations; men rated themselves as more competent than women in nonsocial, uncommon, and depriving situations. Overall, perceived competence correlated with changes in memory and intellectual abilities. (BL)

Short-Term Longitudinal Changes in Memory, Intelligence and Perceived Competence in Older Adults

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Abstract

The present study investigates longitudinal changes in intelligence as measured by Schaie's Adult Mental Abilities (AMA) test battery, memory as measured by three word-list tasks and one paragraph task, and perceived competence in everyday situations as measured by Scheidt and Schaie's (1978) Q-sort. Tasks were given to 74 middle-aged (ages 55-64), 95 young-old (ages 65-74), and 58 old-old (ages 75-84) adults at two times of measurement over a three-year interval. Age and sex differences were obtained, and results were stable over the interval, indicating that all measures were reliable. Several interactions were obtained between time of measurement, age and sex. Finally, longitudinal changes in ability variables predicted changes in 2 of the 4 independent Q-sort dimensions.

The purpose of the present study is to investigate short-term longitudinal changes in memory and intelligence tests created primarily for older adults, and to relate these changes to change in perceived competence in everyday situations as an external criterion. Although the relationship between intelligence and the Q-sort has already been investigated (Schaie, Gonda, & Quayhagen, 1981), we wanted to investigate these variables longitudinally. Overall decrement would indicate fairly rapid decrement in these abilities over time. Stability, on the other hand, would indicate both the absence of age changes and reliability of the measures. We also wanted to see if it were possible to significantly predict changes in perceived competence by changes in ability.

Because most tests used in previous studies of intelligence and aging, such as Thurstone and Thurstone's (1948) Primary Mental Abilities (PMA) battery, have been developed for adolescents or young adults, the tests incorporate many factors that impede optimal performance in the elderly: small print, computerized answer sheets, and meaningless test items. Schaie (manual in preparation) developed the Adult Mental Abilities (AMA) expressly for older adults. The AMA is similar in content to the PMA with alterations in format to minimize test-taking impediments: large type, improved layout of the test, elimination of computerized answer sheets, and alternate forms containing meaningful test items.

A second difficulty stemming from previous reliance on tests developed for younger adults is the external criterion for intelligence. The major criterion for construct of intelligence in the young has been academic performance. For most older adults, formal education is no longer an issue. Even those who are in school are there for enrichment rather than achievement toward some other goal. For this reason Schaie (1978) argued for competence, or the application of intelligence in life situations, as a more appropriate criterion for mental

ability in older adults than school performance. To measure the construct of competence, Scheidt and Schaie (1978) developed a Q-sort of 80 everyday situations. Subjects rate each situation relative to the others along a competence dimension. The result is a normal distribution of situations ranked from least competent to most competent.

Schaie et al. (1981) have already established a definite relationship between several AMA subtests and Q-sort scores. The present study examines longitudinal changes in the AMA and competence variables and the relationships between them. We also included the memory variables for two reasons. First, no longitudinal study of memory in old age has been published. Second, memory changes may predict competence in certain situations better than intelligence does. That memory could predict perceived competence would add additional support for using competence as an external criterion for ability tests taken by older adults.

Method

Participants were members of a prepaid health plan in Southern California. The sample of 227 adults was divided into three age groups: 1) middle-aged (MA) (41 men and 33 women ages 55-64), 2) young-old (YO) 38 men and 57 women ages 65-74), and 3) old-old (OO) (26 men and 32 women ages 75-84). Age group membership was determined at the first time of measurement, and all subjects returned for a second testing three years later. Subjects volunteered for the first testing, but were offered $12.00 at the second time of measurement. Subjects were of moderate socioeconomic status (SES) and of good health. Age differences obtained for education [Means: MA = 14.1, YO = 12.8, OO = 11.6; $F(2, 170) = 11.207$; $p < .001$], but not for SES, income or health at either time 1 or time 2. There were no sex differences for any of the demographic variables.

Subjects completed a battery of memory and intelligence tests, filled out

several questionnaires about lifestyle and background information, and completed a Q-sort of life situations in a three-hour session. Memory tests consisted of immediate (IR) and delayed (DR) free recall of a 20-item word list, delayed recognition (DRN) of these same 20 words embedded among 10 synonym distractors and 10 unrelated words, and free paragraph recall (PR) of a 227-word essay entitled "Parakeets: Ideal Pets" (Meyer, 1975).

Intelligence measures were subtests of Schaie's AMA. Recognition Vocabulary (RV) is a 50-item multiple-choice vocabulary test. Figure Rotation (FR) is a test of spatial ability requiring the subject to differentiate rotated figures from rotated mirror-images of the target figure. Object Rotation (OR) replaces the abstract figures of FR with concrete objects such as a dog and telephone. Letter Series (LS) is an inductive reasoning test in which the subject must identify the pattern in a series of letters. Word Series (WS) is a parallel form of LS employing days of the week and months of the year instead of letters.

Scheidt and Schaie's (1978) Q-sort requires individuals to sort 80 situations, rating their relative competence in each of the situations. The competence ratings are forced into a normal distribution with higher scores reflecting greater perceived competence. For this study eight dimension scores were obtained: social, nonsocial, active, passive, common, uncommon, supportive and depriving. Sample situations for each combination of dimension are provided in Table 1. The eight dimensions actually form four independent bipolar dimensions, such as social-nonsocial. One's score for one pole (e.g. social) predicts one's score on the other (e.g. nonsocial) perfectly within rounding error.

Table 1 About Here

Half the subjects took the tests in the following order: RV, IR, FR, OR, PR, DR, DRN, LS, WS, and the Q-sort. The remaining subjects took the tests in the same order with the exception of the two tests with dual forms. The second half of the sample took OR before FR and WS before LS. Dependent measures were total items correct for RV, LS and WS, total words recalled for IR and DR, number correct minus errors of commission for FR and OR, total content units recalled for PR, total correct recognitions for DRG, and the average competence ratings for each of the four independent Q-sort dimensions: social-nonsocial, active-passive, common-uncommon, and supportive-depriving. Only the results of the positive dimension (e.g. social) are reported. Group differences for the negative dimension would be of the same magnitude but in the opposite direction. Data were analyzed in a 3 (age) x 2 (sex) x 2 (time of measurement) ANOVA with time as a within-subjects factor. The alpha level for tests of significance was set at .05. Finally, stepwise regressions of changes in the ability variables on changes in the perceived competence measures were conducted. Only variables with regression weights significant at the .05 level allowed to enter the regression equation.

Results

Memory and intelligence. Results are summarized in Table 2. Age differences were obtained for all measures. Generally, the three age groups differed from each other with highest scores in the middle-aged (MA) group and lowest scores in the old-old (OO) group. Sex differences were found for the three word list tasks with women remembering more than men. The F of 3.82 for Paragraph Recall was marginal, given a cutoff of 3.84. Women recalled slightly

more of the essay than did men. Sex differences were also observed for the spatial tests with men performing better than women. No age x sex interaction was reliable.

Table 2 About Here

Several time of measurement effects were statistically significant. Means scores for immediate (IR) and delayed recall (DR) were significantly higher in 1981 than in 1978 by about .5 words. There was also a significant decrease on Word Series by .5 points between the two times of measurement. The time x age interaction for Recognition Vocabulary (RV) was due to a decrease over time for the young-old (YO) adults with little or no increase in the other groups. The time x age interaction for the spatial tests was due to an increase over time for the MA group and a decrease over time for the OO. The YO group decreased significantly only for Object Rotation and did not change over time for Figure Rotation. Third-order interactions were obtained for IR, DR and marginally ($p < .051$) for RV. The source of the interactions for IR and DR was the two-word increase over time for the MA women with increments in the other groups by only as much as half a word. The marginal RV interaction was due to a 2.5 point increase over time for the MA women and OO men, while change in the other groups varied around zero.

Q-sort dimensions. For the social dimension, perceived competence increased across age groups, with a corresponding decrease for the nonsocial dimension. For the active and uncommon dimension, the MA group rated themselves as more competent than the older groups, which did not differ from one another. The older groups perceived themselves more competent in passive and common situations than did the MA group. No age differences were obtained for the

supportive-depriving dimension. Women rated themselves more competent than men in social, common, and supportive situations, while men perceived themselves as more competent than women in nonsocial, uncommon, and depriving situations. None of the within-subjects effects were significant.

Regressions on changes in Q-sort variables. None of the memory or intelligence variables predicted the social-nonsocial or active-passive dimensions. Several of the ability variables did predict a small, but significant, amount of the variance for both the common-uncommon and supportive-depriving dimensions. Changes in delayed recognition accounted for 3% of the variance for changes in the common-uncommon dimension, $B = -0.035$, $t(185) = -2.325$, $p < .05$. The negative sign reflects a negative relationship with the common dimension and infers a positive with the uncommon dimension. Longitudinal changes in the supportive dimension were significantly predicted by Letter Series (LS); $B = 0.028$, $t(184) = 2.475$, $p < .05$; and by immediate recall (IR); $B = -0.030$, $t(184) = -1.987$, $p < .05$. The inverse relationships were obtained for the depriving dimension. LS and IR accounted for 5% of the variance for changes in the supportive-depriving dimension.

Discussion

The pattern of age and sex differences obtained here is similar to that observed by Schaie et al. (1981) at one time of measurement. Direct comparison of the present and previous studies, though, is not possible, because of differences in analyses.

Longitudinal change across three years in this study was observed in only 3 of 9 variables. The increases on both wordlist recall tasks appear to be due to increases for MA women by two words. The decrease in Word Series (WS) is difficult to interpret. If the decrease indicated age changes in inductive reasoning in all age groups, changes should have also been observed for Letter

Series (LS). They were not. Perhaps WS was a harder test and more sensitive to age changes than WS. Task difficulty cannot explain the result because the means for LS were the same or higher than the means for WS. The result may have been due to chance. Although the differences between times of measurement on the three variables were statistically reliable, the overall change of half a point has little practical significance given possible scores of 20 on the recall tests and 54 for WS. Thus, results indicate stability and reliability of the measures rather than age change.

The time x age interaction for Recognition Vocabulary was due to a decrease in scores for the YO with no change or increase in the other groups. One explanation of this result is that the young-old age range is often a period of flux in abilities (Gilewski, 1983). On some tasks the YO perform like younger adults, on others like older adults, and on still others different from all other age groups. There is at present no explanation for this phenomenon. The interaction between time and age for the spatial tests, on the other hand, is quite understandable. The increase for the MA group is probably due to practice or familiarity with the test at time two, while the decrease for OO probably indicates age changes. Schaie and Parham (1977) note age 74 as being the onset of first reliable age decrement over a seven-year interval for spatial abilities. Our OO adults are 75 and older, and the present results suggest that such decrement can even be detected in a time span as short as three years. The third-order interactions were all due in part to increases in ability by the MA women, and the reason behind such a finding is not apparent.

The relationship between some changes in perceived competence with changes in ability was small, but reliable. For delayed recognition and the common-uncommon dimension, it appears that those who decrease in recognition ability believe themselves to be less competent in uncommon or unfamiliar

situations at time two than at time one. Some uncommon situations include "moving into a new and unfamiliar residence" and "entering a darkened nightclub to take dinner." For the supportive-depriving dimension, the significant relationships are a positive one for Letter Series and the supportive end and a positive one for immediate recall (IR) and the depriving end. Many of the supportive situations include relationships with others, such as "seeking aid/advice from a friend or family member." Given the complexity of interpersonal relationships, it is not surprising that reasoning correlates positively with perceived competence in these situations. IR is probably closely associated with new learning, which makes it conceivable that increases in IR predict increases in competence in depriving situations, such as "returning faulty or defective merchandise to the store." This sample situation depends on assertion skills, which must be learned.

In summary, age and sex differences were found for most of the measures, but overall the measures were stable across three years. This probably attests to the reliability of the instruments. Specific changes occurred only in certain groups, such as significant age decrement in the oldest age group on the spatial tests. Changes in memory were as important as changes in ability in predicting changes in perceived competence. The results indicate that the AMA is both reliable and sensitive to identify longitudinal changes in the elderly. Results also support the Q-sort as sensitive to change, and that changes in perceived competence do correlate with changes in some memory and intellectual abilities.

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Table 1. Attributes and Illustrative Content of 16 Classes of Situations (West Los Angeles Elderly).

Situational Attributes	Social	Nonsocial
High Activity		
Common-Supportive	Arguing with person about important point. Being visited by son or daughter and their children.	Gardening in yard, planting seeds, weeding. Doing weekly shopping in crowded supermarket.
Common-Depriving	Pressured by salesperson to buy merchandise. Quarreling with relative.	Climbing several steps to building entrance. Cleaning apartment or household.
Uncommon-Supportive	Having sexual intercourse. Traveling around city looking for new residence.	Preparing large meal for friends. Exercising for a few moments each day.
Uncommon-Depriving	Waiting at end of long line for tickets to entertainment. Returning faulty or defective merchandise to store.	Moving into new and unfamiliar residence. Driving auto during rush-hour traffic.
Low Activity		
Common-Supportive	Seeking aid/advice from friend or family member. Offering money to son or daughter who needs it.	Browsing through family photo album. Making plans for future.
Common-Depriving	Hearing from friend that he/she is considering suicide. Hearing that close friend has recently died.	Eating meal alone in own home. Worrying about ability to pay a debt.
Uncommon-Supportive	Entering darkened nightclub to take dinner. Attending art exhibit.	Recording day's events in diary. Wading in waist-high water in ocean.
Uncommon-Depriving	Opening door to stranger selling product or soliciting opinion. While talking with someone, you feel you have unintentionally hurt their feelings.	Slipping on slick part of floor and falling. Discovering you locked keys in car while shopping.

Reprinted from Scheidt and Schaie (1978).

Table 2

F-Ratios from Age x Sex x Time of Measurement ANOVAs for Memory, Intelligence and Q-Sort Variables

Variable	df[a] error	Age(A)	Sex(S)	AxS	Time(T)	TxA	TxS	TxAxS
				Memory				
Imm. Recall	220	32.68**	21.42**	< 1	5.35*	1.12	< 1	6.24**
Del. Recall	216	28.85**	18.56**	< 1	6.05*	1.58	< 1	3.12*
Del. Recog.	218	11.52**	14.65**	< 1	< 1	< 1	< 1	1.26
Para. Recall	206	5.93**	3.82	1.71	< 1	2.41	< 1	< 1
				Intelligence				
Recog. Vocab.	219	11.41**	< 1	< 1	1.41	4.58*	< 1	3.01
Fig. Rotation	220	19.15**	20.30**	1.60	< 1	8.27**	< 1	2.22
Obj. Rotation	220	33.99**	10.90**	< 1	< 1	9.24**	3.08	2.30
Letter Series	219	26.34**	1.14	< 1	< 1	2.78	2.49	2.16
Word Series	219	29.70**	1.89	1.07	6.45*	2.07	< 1	< 1
				Q-Sort Dimension[b]				
Social (Nonsoc)	201	10.47**	36.23**	2.85	1.94	1.75	< 1	2.71
Active (Pass)	201	5.31**	< 1	< 1	< 1	< 1	< 1	2.24
Common (Uncom)	201	4.94**	15.99**	< 1	< 1	1.61	3.00	< 1
Support (Depr)	201	2.62	15.99**	< 1	1.73	< 1	< 1	< 1

[a] Df = 1 for sex and time and 2 for age. The df varied for the error term due to different numbers of persons with missing data for each variable.

[b] Results are given for the positive dimension. The results parallel those for the negative dimension (in parentheses).

*p < .05.

**P < .01.