

THE POOLING OF LOGITUDINAL STUDIES OF AGING¹

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ABSTRACT

This report describes the pooling of 5 longitudinal studies conducted during the last 20 years in West Germany. The pooling provides the following improvements: By increasing the number of participants the reliability and precision of the results are improved. The sample becomes representative of the whole area of the FRG. Both cohort and age comparisons are improved by extending their ranges. The time-of-testing range is increased from 5 to 17 years. Since the significance of this factor has been recognized often but since few empirical explorations have been made in the past, the extension of the time-of-testing range represents the most important contribution of the present work. The pooling of different studies is possible only if they share a common set of methods. This requirement is met under the present conditions. Moreover, each study adds unique methods to the pool, thus, supplementing the common explorations in a constructive manner.

The following report describes the pooling of rather sizable studies on aging conducted during the last 20 years in West Germany. The first will be called the *Hamburg Study* and was directed by K. F. Riegel and Ruth M. Riegel, the follow-up studies also in cooperation with G. Meyer. The second, the *Bonn Study I*, is under the direction of H. Thomae in cooperation with various associates, Ursula Lehr, R. Schmitz-Scherzer et al.

Some supplementary samples for the *Bonn Study I* will also be discussed. The first sample was tested in Münster in 1969 by an interdisciplinary team of psychologists, sociologists and physicians and will be called the *Münster Study*.

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The second supplementary sample was tested in 1972/73 in Bonn under the direction of H. Tomae and will be called *Bonn Study III*. An additional sample was tested by A. Angleitner for a study of rigidity among the elderly and will be called *Bonn Study II*. Both the Hamburg Study and the Bonn Study I produced longitudinal data. A second testing of the *Bonn Study II* is planned for 1974. The *Bonn Study III* and the *Münster Study* were not conducted longitudinally.

The Samples

The *Hamburg Study* is the oldest of the five. The first testing was done in the Summer of 1956 and completed in the Spring of 1957. A total of about 500 volunteers above 55 years of age were individually tested for a total of 6 to 10 hours each. Out of the carefully assembled pool five cohort samples were drawn covering five-year age spans beginning with the 55 to 59 year olds and ending with participants above 75 years of age. As shown in Table 1, the oldest cohort represents the years of birth prior to 1881, the next those between 1882 and 1886, etc. Each age group included an equal number of females and males, a total of 76 participants, and was carefully checked against census statistics on the following five criteria: occupation (or former occupation), source of financial support, marital status, refugees vs. local residents, and religious affiliation. Since comparable census information was not available, numerous other criteria had to be used as dependent variables, such as education, amount of income, living conditions, health, etc. In addition to the old participants a young group equally representative of the population and consisting of 60 females and 60 males between the ages of 17 and 19 years were tested. Geographically, the samples were drawn in North Germany, primarily in Hamburg, Schleswig-Holstein, Niedersachsen, Bremen, Hessen and West-Berlin. Subsequently, the samples show higher proportions of Protestants (rather than Catholics) and refugees (rather than natives). Detailed description of the samples and sampling procedures are given by Riegel (1967) and Riegel and Riegel (1959).

Five years after the first testing, that is in 1961-62, all accessible old participants were retested. The timing of the retest study provided for a perfect realignment of the cohorts and the age groups. Each of the latter had, by now, moved precisely into the next higher age bracket. Of the 380 original participants 202 were retested; 62 had died, 32 were too ill, and 84 refused to be retested. Another five years later, that is in 1965-66, a check of all the original participants were made and the time of death of the non-survivors was determined. Details of these investigations are given by Riegel (1971), Riegel and Riegel (1972), and Riegel, Riegel and Meyer (1967 a & b, 1968).

The *Bonn Studies* are somewhat smaller in size than the *Hamburg Study*. *Study I* was originally conducted in 1965-66. Retest investigations have been performed almost every year (see Thomae, Angleitner, Grombach and Schmitz-

Table 1. Number of Participants Across Cohorts in Five Studies on Aging at the Times of the First Testing
(Hamburg: 1956/57, Bonn I 1965/66, Bonn II 1969/70, Bonn III, 1972/73, Münster 1968/69)

Cohorts	Hamburg			Bonn I ^a			Bonn II ^b			Bonn III			Münster		
	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total
1881	38	38	76				3	1	4				1	2	3
1882-1886	38	38	76				19	16	35				6	6	12
1887-1891	38	38	76	11	16	27	51	27	78	4	2	6	18	28	46
1892-1896	38	38	76	38	43	81	60	27	87	9	11	20	49	46	95
1897-1901	38	38	76	31	24	55	34	13	47	5	8	13	57	107	164
1902-1906				24	35	59	31	2	33	8	14	22	6	27	33
1907							9	0	9						
1938-1940	60	60	120												
Total	250	250	500	104	118	222	207	86	293	26	35	61	137	216	353

^a For age comparisons, data of 1966/67 ought to be used, i.e., Bonn Study IB (see Table 2).

^b For age comparisons, data of 1971/72 are not available.

Scherzer 1973 a), but until now only selected sets of results from the longitudinal analysis have been reported in the literature (Grombach, 1974; Rudinger, 1971, 1973 b; Thomae et al. 1973 a). A report on the results of the longitudinal study is expected to become available in 1974/75. Reports on the cross-sectional findings are listed in Thomae et al. 1973 a.

The following criteria were used for making the sample as representative of the population as possible: occupation, marital status, religious affiliation, type of residence, size of community and retirement status. While, thus, the *Hamburg Study* and the *Bonn Study I* are comparable in sampling features, the participants in the latter are more irregularly distributed across the age span and by sex, due to the project's particular selection principle. The participants were to constitute groups of 100 men, 100 women from 60 to 69 years and the same number of men and women from 70 to 79. The average age for these groups was 63 and 73 years respectively. Detailed descriptions of the samples and the sampling procedures have been provided by Schmitz-Scherzer (1969) and Rudinger (1971). The distribution across cohorts, shown in Table 1, has been newly derived for our present comparisons from these sources. The sample size was originally 222 and declined to 204 in 1966/67, 186 in 1967/68, 146 in 1969/70 and 123 in 1972/73.

Most notably, the *Bonn Study I* supplements the *Hamburg Study* in regard to its geographical distribution. Most of the participants came from Nordrhein-Westfalen (Bonn, Ruhrgebiet) and Hessen (Frankfurt, Mannheim), some from Rheinland-Pfalz (Ludwigshafen) or Baden-Württemberg (Heidelberg).

The *Bonn Study II* was for the first time conducted in 1969-70. As shown in Table 1 age varies more widely, from 52 to 94 years, with an average age of 75 years. More women (207) participated in the study than men (86). The percentage of married participants (26%) is smaller than in the *Bonn Study I* (61%). Socio-economic status as indicated by education, occupation, and income was higher in the *Bonn Study II* than in the *Bonn Study I*. The *Bonn Study II* sample complements the latter in these respects. However, participants of the *Bonn Study II* constitute a less representative sample. In contrast to the other studies, the participants were primarily recruited from Bavaria (Munich), and Rheinland-Pfalz (Bad Neuenahr). Thus, all three studies taken together cover every State of the Federal Republic of Germany, including West Berlin. Detailed information on the sampling procedures has been provided by Angleitner (1972).

The *Münster Study* data were gathered from 1968-1970 with the cooperation of the local health clinic. The 353 persons in this sample ranged in age from 65 to 93 years, with an average of 72 years. The sample consisted of 216 men and 138 women whose socio-economic status (education, occupation, income) corresponded to that of the *Bonn Study I* sample. The participants lived for the most part in Nordrhein-Westfalen and half of them were married.

The *Bonn Study III* in 1972/73 constitutes an additional sample selected along the same lines as the *Bonn Study I*. The sample included 61 persons from

65 to 84 years with an average age of 72 years. Thirty-one men and 30 women were tested, 34 per cent of them were married. The participants lived in Nordrhein-Westfalen and Hessen. The sample's socio-economic status is comparable to the *Bonn Study I* and the *Münster Study*.

Extension of the Data Base

One of the main advantages for pooling data from several studies would be to increase the variability along the time and age distributions. In particular, such effects could result in increases in the range of age, cohorts, and time of testings.

The Age Range will not be substantially changed through the pooling of the three studies. The first study, the *Hamburg Study*, employed the widest range, i.e., five age groups starting at 55 years and extending above 75 to 80 years at the time of the first testing. At the time of the second testing, this range was curtailed to 60 years at the lower end but increased to above 80 to 85 years at the upper end. Moreover, the *Hamburg study* used a group of 17 to 19 year-old persons.

The *Bonn-* and *Münster Studies* employed persons within an age range embedded in that of the *Hamburg Study*. Thus, it increases the number of participants in the middle of the age range, but does not extend the range tested. Both the frequencies within the age groups and within the sex groups become irregular through the pooling. Although the rectangular distributions of the *Hamburg Study* do not reflect population properties, they allow for optimally efficient statistical comparisons between various groups.

The Cohort Range could have been markedly affected by the pooling, if the *Bonn Studies* had employed persons spread exactly over the same age range as in the *Hamburg Study*. Since their most recent investigations have been carried out more than 15 years after the first testing in the *Hamburg Study*, the cohort range would have been extended by a corresponding time lag. Unfortunately, the *Bonn Study I* according to its design is limited to the higher age range and thus, increases the cohort range by only five years. The *Bonn Study II* is more promising in this regard because it covers a wider age range than the *Bonn Study I* and, especially, because it reaches into the younger age groups and, thus into the more recent cohorts. It would be advisable if in future work the cohort range would be systematically extended by building up the cohort of 1907 to 1911 and, perhaps, by adding newer one's until, finally, the gap to the young cohort of the *Hamburg Study* is completely bridged.

The Time-of-Testing Range is most strongly affected by the pooling. Since the first testing of the *Hamburg Study* was done in 1956 and the last of the *Bonn Studies I and III* in 1973, the range equals 17 years. Since all time ranges interact however, this effect may not be as strong as it appears. In particular, this conclusion raises the question on how the developmental progressions investigated in each of the studies can be best consolidated in one overall design.

Table 2. Time of Testings for the Five Studies of Aging
 (Note: Each Testing Extended into the Following Year, i.e.,
 Hamburg A from 1956 to 1957, etc.)

Years	Studies			
1955				
6	Hamburg A			
7				
8				
9				
1960				
1	Hamburg B			
2				
3				
4				
1965		Bonn I A		
6	Hamburg C ^a	Bonn I B		
7		Bonn I C		
8				
9		Bonn I D	Bonn II A	Münster
1970				
1				
2		Bonn I E		Bonn III

^a Consisted only in recording of cause and time of death.

The Pooling of the Samples

As shown in Table 2, the *Hamburg Study* has the advantage that the distances between age groups and between testings are equal, i.e., are five years long. If we subdivide the age and cohort ranges of the *Bonn Studies* in such a way that they correspond to those of the *Hamburg Study*, we are still facing the problem of synchronizing the time of testing distances with those of the *Hamburg Study*. Our problem would have disappeared, if the retesting in the *Bonn Studies* had also been done on a five year schedule. Unfortunately, in spite of frequent retesting, this has not been done in the past. For example, the first testing of the *Bonn Study I* was done in 1965-66 but there was no retesting in 1970-71. However, the retesting in 1967-68 was repeated in 1969-70 and 1972-73.

As shown by Schaie (1965) and Baltes (1963), none of the traditional developmental research designs, i.e., cross-sectional and longitudinal designs (which are variously embedded in our studies and in the pooled data) can unconfound changes in the individual from changes in society. There exists, however, a third design, the time-lag-design, which in conjunction with the other two makes such

unconfounding possible. Time lag comparisons are precisely those for which the pooling of the five studies could provide the greatest enrichment, i.e., they are comparisons in which the performance of the particular age group is analyzed as a function of the historical time, for example, the test performance of the 60 to 64 year olds in 1956 and in 1966. The strengthening and extension of the time-of-testing comparisons is, undoubtedly, the greatest gain to be achieved through the pooling of the studies.

Extension of the Methods

The pooling of studies becomes feasible only if there are shared methods between any two of them, better yet, between all of them. In addition, each study ought to introduce novel extensions which are not shared by the others. In the past, even single longitudinal studies have been plagued by shifts in methods brought about by different interests or orientations of new investigators. For these reasons large parts of the often quoted longitudinal study of gifted children by Terman, for example, seem rather useless to the present writers. The unique opportunity offered by the present studies consists in a solid basis of shared methodologies supplemented by original extensions of significant topics.

All studies applied the best standardized intelligence test available in Germany, the Hamburg Wechsler Intelligence Test (Wechsler 1956, Riegel and Riegel 1959, Rudinger 1971); three applied, in addition, the Coloured Progressive Matrices (Raven 1962). Four studies applied a set of attitude scales developed for use with adult and aged persons. These are scales on rigidity, dogmatism and attitudes toward life (Riegel and Riegel 1960). All studies applied some general questionnaire on the social and living conditions of adult and aged persons regarding their past and present status (Riegel, Riegel and Skiba 1962). Finally medical records were obtained in four of the five studies.

In extension of this set of shared tools, the investigations are specialized in the following manner.

The *Hamburg Study* and the *Bonn Study I* have given special consideration to language and cognitive functions. In the *Hamburg-Study* a special test of verbal intelligence has been developed, SASKA (Riegel 1959, 1967). The dimensions analyzed by this test have been elaborated in several supplementary experimental studies (Riegel 1965, 1968 a & b) as well as through an extensive use of free word association tests for which five year follow-up data are available (Riegel, 1968 a & b; Riegel and Riegel 1964). Finally factoranalytical comparisons between age groups have been made for the intelligence test (Riegel and Riegel 1962; Riegel, R. M., 1960; Riegel, R. M. and Riegel, 1962).

The *Bonn Studies I and III* were designed to explore the adult individuals' world. Data were gathered in the following areas: a) Perceived social situation leisure-time activities, interpersonal contact, psycho-ecological condition, sub-

jective health ratings, etc., b) Psychomotor abilities (Beck reaction time apparatus, Mierke's multiple task test), c) Personality variables as ascertained by behavior observation (see Thomae, 1968, for observational categories), ratings based on interviews, and questionnaire data (Riegel and Riegel, 1960), d) medical records.

Bonn Studies I and III provide the most comprehensive sets of data. In these studies each participant underwent one week of testing and of retesting at the Department of Psychology in Bonn (Thomae et al. 1973 a).

Bonn Study II explores whether an increase in rigidity and dogmatism with age can be assessed through the use of tests and questionnaires together with tests of moderating variables, e.g. intelligence and anxiety (Angleitner 1972, 1973; Angleitner, Rudinger, Bierhoff, and Schmitz-Scherzer 1973, Erlemeier and Angleitner 1971).

The *Münster Study* analyses the interaction between psychological, clinical and sociological data (Schmitz-Scherzer, Berghoff and Rudinger, 1970; Schmitz-Scherzer and Oberwittler, 1972; Thomae, Schmitz-Scherzer, Angleitner, Steffens, Grombach, and Rudinger 1973 b).

Summary

The first attempt to pool five large studies on adulthood and aging may provide the following contributions:

1. The pooled data, by increasing the number of participants to a considerable extent, improve the reliability and precision of the results.
2. The pooling produces a set of data highly representative for the whole geographical region of the Federal Republic of Germany (including West Berlin) rather than being representative for regional areas only.
3. Both the cohort and age comparisons will be improved, especially if steps are taken to select the most appropriate years for future retest studies.
4. The major gain under the present conditions consist in extending the time-of-testing range from about five to 17 years. Since in former investigations the time of testing dimension has been generally disregarded (although it has been shown to be of greatest significance for the unconfounding of the changes in the individual and in society) this opportunity deserves primary attention.
5. The pooling of different longitudinal studies is possible only if they share a common set of methods. This prerequisite is appropriately met under the present conditions. Moreover, each of the five studies adds unique methods and data to the pool, thus supplementing and elaborating common conceptions in a constructive manner.

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