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ABSTRACT

A within cultural comparative examination of three samples of school-children residing in Saskatchewan, South Australia and Nova Scotia enabled the effects of family size and socioeconomic status on measured intelligence to be ascertained. Samples of schoolchildren in Regina (Canada), Adelaide (Australia) and Sydney (Canada), divided into subgroups according to family size and socioeconomic status, were tested in the first two samples on the Otis Mental Ability Tests, and in the latter on the Henmon-Nelson Intelligence Test, while socioeconomic status allocation was obtained from the occupation of the father of each child in the three samples. In each sample, the results demonstrated the existence of a definite relationship between intelligence (IQ) and sociceconomic status (SES), in favour of the high SES children. However, the usually reported significant negative correlation between family size and IQ disappeared in the 170 predominantly middle-to-upper SES children in Regina, in the 427 school-children from various SES groups in Adelaide, and in the upper SES group only of the 144 school-children in Sydney (even though the overall correlation for the latter sample was negative and significant). In each sample, a clear indiciation emerged--family size, among middle and upper SES families in Western industrialized affluent societies, generally has no detrimental influence on the mean IQ of its members. Evidence from the Canadian and Australian samples point to the same conclusion--at the least, upper SES children perform equally as well on an intelligence test regardless of the family to which they belong. (Author/JM)

A WITHIN CULTURAL COMPARISON:

INTELLIGENCE, FAMILY SIZE AND SOCIOECONOMIC STATUS

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Paper presented at the XIVth Interamerican Congress of Psychology held in Sao Paulo, Brazil, April 14th-19th, 1973.

ABSTRACT

A within cultural comparative examination of three samples of school-children residing in Saskatchewan, South Australia and Nova Scotia enabled the effects of family size and socioeconomic status on measured intelligence to be ascertained. Samples of school-children in Regina (Canada), Adelaide (Australia) and Sydney (Canada), divided into subgroups according to family size and socioeconomic status, were tested in the first two samples on the Otis Mental Ability Test, and in the latter on the Henmon-Nelson Intelligence Test, while socioeconomic status allocation was obtained from the occupation of the father of each child in the three samples.

In each sample, the results demonstrated the existence of a definite relationship between intelligence (IQ) and socioeconomic status (SES), in favour of the high socioeconomic status children. However, the usually reported significant negative correlation between family size and IQ disappeared in the 170 predominantly middle-to-upper SES children in Regina, in the 427 school-children from various SES groups in Adelaide, and in the upper SES group only of the 144 school-children in Sydney (even though the overall correlation for the latter sample was negative and significant). In each sample, a clear indication emerged - family size, among middle and upper SES families in Western industrialized affluent societies, generally has no detrimental influence on the mean IQ of its members.

Evidence from the Canadian and Australian samples point to the same conclusion - at the least, upper SES children perform equally as well on an intelligence test regardless of the size of the family to which they belong. No doubt, the stimulating environment of the middle-to-upper SES home further enhances the realization of the intellectual potential for each and every member of the family. Furthermore, the results, interpreted as reflecting the changing relationship between intelligence and family size, are the possible outcome of a changing fertility pattern within the various SES groups.

These findings suggest that, in Canada and Australia, middle-to-upper SES children perform equally as well on an intelligence test regardless of varying family size among its members.

Numerous studies have related conventional measures of intelligence to home and socioeconomic status environment within modern Western industrialized society. One group of studies (Burt, 1947; Douglas, 1964; Mehrotra & Maxwell, 1949; Nisbet, 1953; Nisbet & Entwistle, 1967) showed that, as the number of children increased in a family, there was a corresponding gradual decline in performance on intelligence tests. Fraser (1959), for example, concluded that the presence of a large number of children in a family is an adverse element in reaching high educational attainment, quite apart from the usual poor performance on intelligence tests associated with children from large families. Further support, based on research collected during the first half of the twentieth century, is given by Floud (in Craft, 1970) who accepted the well-established position that superior performance on intelligence tests occur, on the average, from children of small families at all social levels (Douglas, 1964; Maxwell, 1969).

However, in the 1950's and 1960's social and educational conditions, particularly within the home and school, have undergone considerable changes. Since World War II, within modern Western industrialized society, members have enjoyed a higher living standard in the home and improved educational opportunities. Thus, such important changes, make a renewed examination of the relationship between IQ and family size within, at least, the upper echelons of modern Western industrialized society now in order. In fact, during the 1950's some researchers (e.g. Gille, Henry, Tabah,

Sutter, Bergus, Girard, & Bastide, 1954; Heuyer, Pieron, Pieron & Sauvy, 1950) were reporting the presence of a negative correlation between family size and measured intelligence in the lower socio-economic status (SES) groups while such a relationship was negligible in the professional group.

This position is by no means surprising for another group of studies (Anastasi, 1958; Binet & Simon, 1916; Burt, 1922; Davis, 1948; Eells, Davis, Havighurst, Herrick & Tyler, 1951; Kennett, 1969, 1972; Kennett & Cropley, 1970) has investigated the relationship which exists between the ability to do well on conventional intelligence tests and socioeconomic status membership. A marked bias in favour of members of the upper-middle and upper echelons of society was observed in relation to intelligence test scores. Such studies has led to the firmly established and consistent finding that a positive correlation exists between intelligence (IQ) and socio-economic status.

In the lower SES groups it seems correct to say that low scores on intelligence tests are associated with a restricted educational and social environment. On the other hand, higher scores are expected from the upper SES groups because of the "middle class bias" in the tests, which concentrate on the verbal stimuli characteristics of formal language of the middle and upper SES environment (Bernstein, 1958; Davis, 1948; Gordon, 1969; Riessman, 1962).

A positive correlation between IQ and SES has been

demonstrated, while a negative correlation between IQ and family size has existed in the past. Considerable evidence, for example, by Himmelweit (1955), Kirk (1958), Nisbet (1953), and Van der Eyken (1967) suggests that, at least, a substantial part of these relationships is due to environmental influences such as a relative deficiency in parental care in larger families, including verbal limitations. Recently, these lines of research have come closer with the reporting by Douglas (1964) and Nisbet and Entwistle (1967) that the negative relationship between IQ and family size is less pronounced in the professional and semi-professional families, where such deficiencies would presumably be less likely.

Thus, in an attempt to better understand the relationships among measured intelligence, family size and socioeconomic status, the present within cultural comparison examines three samples of school-children residing in Regina (Canada), Adelaide (South Australia) and Sydney (Canada), in order to further investigate the correlation between IQ and family size within various social class groups in Canada and Australia, to determine whether, in fact, the negative correlation between IQ and family size is an artifact of an inverse relationship between family size and socioeconomic status.

METHOD

Sample

The comparative study within similar cultures consisted of

three separate samples, namely 170 Grade Six, Seven, and Eight school-children in Regina (Canada), 427 Grade Five school-children in Adelaide (Australia), and 144 Grade Nine school-children in Sydney (Canada). Table 1 provides the mean, standard deviation (SD), and range of age for males, females and the full sample for the three separate studies, while Table 2 provides similar information relating to IQ. Although the two Canadian samples were predominantly Protestant, the exclusion of Catholics with large families in Canada was considered of minimal importance as the differences in family size between Catholics and Protestants are narrowing, such that by 1961 Catholic women of child-bearing age were producing, on the average, 0.52 more children that their Protestant counterpart (Dominion Bureau of Statistics, 1968).

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insert Table 1 and Table 2 here

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Tests

In each sample the specific intelligence test used was an instrument particularly suited to the measurement of a general intelligence based on verbal skills, and the conventional IQ test regularly used in the school system from which the school or schools were selected. In the Regina sample the Otis Quick-Scoring Mental Ability Test was administered in December, 1968, in the Adelaide sample the Australian version of the Otis Intermediate Test (Forms

AB or CD) were administered in April, 1970, while in the third sample from Sydney, Nova Scotia, the Henmon-Nelson Test (Form A) was administered in January, 1971. At approximately the same time as the intelligence tests were given, relevant information relating to family size and father's occupation was obtained from the School's Record Folders and checked by individual interview with each child in each of the three samples.

Socioeconomic status allocation was made on the basis of the father's occupation (Kahl & Davis, 1955; Kennett, 1972).

Procedure

On the basis of the information collected, each sample of children was divided into four subgroups according to the number of children in their family. These subgroups were children from one- and two-child families, children from three-child families, children from four-child families and children from families of five or more.

A second distribution of the children in the three separate samples was made according to SES allocation (Edwards, 1943). The children from professional homes and from semi-professional homes (SES group I & II combined), children from families whose father belonged to the occupational group of lower managerial, sales, and clerical tasks (SES group III), children from homes where father was a skilled worker or tradesman (SES group IV), and those children whose father was either semi-skilled or unskilled (SES group V & VI combined). Table 3 provides the distribution, in each sample,

within these various SES groups.

insert Table 3 here

Statistical analysis

Differences in mean IQs among SES groups, further subdivided according to sex, were tested using either the two-way or the three-way analysis of variance procedure described by Winer (1962, pp. 241-242, 248-252). Similar procedures were adopted with the data for the relationship among IQ, sex and family size.

Analysis of variance procedures involved examination of data divided into discrete groups. Relationships among the different variables with which the study is concerned were also examined by calculating correlation coefficients, corrected for range restriction, whenever appropriate, using the procedures described by Guilford (1965, pp. 341-344).

RESULTS

The mean family size distribution for the three samples is given in Table 4, which shows the mean family size for each full sample and the respective distribution for males, females and the five SES groups.

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insert Table 4 here

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Analysis of variance showed a definite relationship between measured intelligence and socioeconomic status (Regina sample: $F = 11.03$, $df = 3/162$; $p < 0.01$; Sydney Sample: $F = 3.56$, $df = 3/139$, $p < 0.01$; Adelaide sample: $F = 3.16$, $df = 3/395$, $p < 0.01$), and further confirmed the numerous studies which have reported a positive correlation between IQ and SES.

Means and standard deviations of IQ scores for the four family groups, in the three samples, are shown in Table 5. The analysis of variance showed no significant differences between mean IQ for groups of children coming from families of varying size (Regina sample: $F = 0.63$, $df = 3/162$; Sydney sample: $F = 2.1$, $df = 4/139$; Adelaide sample: $F = 1.27$, $df = 3/419$). General confirmation of these results, shown here in Table 6, was obtained from correlational data for the SES groups for males, for females, and for the full sample, when IQ was examined in relation to family size.

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insert Table 5 & 6 here

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DISCUSSION

Additional support to the numerous studies was given by the findings of the three samples, each of which showed a definite relationship between measures of conventional intelligence and socioeconomic status, in favour of children coming from upper SES families.

However, the present within cultural comparative study is primarily concerned with the relationship which now exists between measured intelligence and size of family. Each of the three samples showed that no significant mean differences exist for groups of children coming from families of varying size, except in so far as socioeconomic status membership influenced the relationship. In the predominantly middle-to-upper SES sample from Regina no significant correlation between IQ and family size was obtained, when the effects of socioeconomic status were uncontrolled, nor when they were controlled. Presumably, the biased distribution within this sample eliminated the usually reported inverse relationship between family size and IQ. Again, in the Adelaide sample no significant relationship existed within the full sample, possibly because the positive correlation (+0.12) in the upper SES Australian groups masked the significant negative correlation between IQ and family size of family in the groups of children coming from semi-skilled and unskilled families (-0.30; $p < 0.01$). Like the Regina sample but to a lesser degree, the Adelaide sample was more than normally weighted

with upper SES children.

However, in contrast, stands the Sydney sample where significant negative correlations between IQ and family size suggested that as the size of the family increases, the mean IQ of the children decreases, in all but the upper SES groups of children belonging to professional or semi-professional parents. This situation was predicted as Sydney, being situated on an island close to the mainland of Nova Scotia, is a more isolated city to those of Regina and Adelaide, and in social structure reflects more the way of life in the nineteen-twenties and thirties. In fact, family size is more representative of that period, for example, semi-skilled and unskilled parents in Sydney produce, on the average, two children more than their counterparts in Regina or in Adelaide.

Never-the-less, in each sample the results point to the direct influence of socioeconomic status membership, for whenever low SES membership was involved, mean IQs dropped as the size of the family increases (e.g., Australian sample (Adelaide): SES V & VI -0.30 $p < 0.01$; Canadian sample (Sydney) SES III -0.36 $p < 0.01$; SES IV -0.42 $p < 0.01$; SES V & VI -0.36 $p < 0.01$). Initially, the results seem to point to, at least, limited environmental opportunities rather than merely the quantity of children. Thus, the usually reported inverse relationship between IQ and family size seems nowadays to be an artifact of socioeconomic status; an outcome which should be examined not in terms of quantity (number of children in a family) but rather in terms of quality (the environmental opportunities to realize intellectual potentials).

As mentioned previously, the insignificant correlations between IQ and family size in the Regina and Adelaide samples resulted from full samples which are biased by the more than usual number of high SES children and the less than usual number of low SES children included. A similar, but reverse effect, would be expected in large samples distributed proportionally to the general population as far as SES is concerned. In this case, (with some similarities to the Sydney sample) the heavily weighted low SES families would tend to disguise the lack of, or slight positive correlation between IQ and family size in the high SES groups, and would suggest the existence of a general negative relationship between IQ and family size. Thus, the negative correlations reported in other studies, especially those based on previous generations or present samples like the one reported from Sydney, may well reflect the preponderance of low middle and low SES children in large randomly-selected samples of children such as the Scottish Mental Surveys (Scottish Council for Research in Education, 1933, 1949).

The lack of a significant relationship between IQ and family size in two of the samples (Regina and Adelaide) may partly be explained by the minimization of factors reported as possible causes of poor performance on conventional intelligence tests, especially verbal tests, by members of large families. In upper SES families a variety of stimulation, that comes from individualized attention by adults when the infant is small, is probably as common in four-to-five-child families as in one- or two-child families.

Compensatory factors may have intervened in these first two samples (Regina and Adelaide). The opportunity to acquire adult habits of speech and thought, considered to be gravely limited in large families (Nisbet, 1953), may well have been available to many, if not all, of the children involved. Indeed, apart from a few exceptions and those children in SES V and VI groupings in Australia, both samples demonstrated a more than adequate verbal ability according to the scores they obtained on standardized achievement tests.[1]

Furthermore, both samples of children lived in cities (e.g. Regina and Adelaide) where excellent medical facilities existed, thus minimization the occurence of brain damage and neuro-psychiatric disorders associated with continued child-bearing (Pasamanick, 1963). Congenital factors tending, in less serviced areas or more heterogeneous societies, to reduce the intellectual potential of children experiencing poor pre-natal and immediate post-natal care probably did not affect the children in these two samples.

However, the compensatory factors suggested might well be of secondary importance. Another feasible reason for the new relationship might well centre on the possibility that the relationship between fertility and socioeconomic status is changing, and

[1] Based on results obtained from Stanford Achievement Tests applicable to the Grade level in each of the samples.

that this change is directly influencing the relationship between intelligence and family size. The findings of this within cultural study are thus consistent with the hypothesis that the negative correlation between intelligence and family size, reported consistently during the first half of the twentieth century, is primarily an artifact of an inverse relationship between family size and socioeconomic status which existed during those years and is reflected in the findings of the Sydney sample.

Thus, the numerous findings relating IQ and family size are meaningful only when the SES membership of the children is examined and in accord with the fertility pattern which exists, at a point in time, within those socioeconomic status groups. Changes in the fertility pattern in modern Western industrialized societies, such as Australia and Canada, seem to be moving towards a uniform position of the two- to four- child family (Day, 1967 in Australia; Elkin, 1964 in Canada), and in the direction predicted by Hawley (1950, pp. 118-120) who pointed to a reversal of the relationship between family size and SES taking place by the middle to late seventies, with the larger families predominantly in the upper SES groups. Such trends must have an influence on the relationship between IQ and family size. To date, in Britain, Douglas (1964) and Nisbet and Entwistle (1967) have suggested that the usually reported negative relationship between IQ and family size is less pronounced in the upper, professional class, while the Sydney sample confirms that no such relationship exists in the same upper echelons of that

society.

Evidence from the other two samples (Regina and Adelaide) is even greater - upper middle and upper SES children perform equally as well on an intelligence test regardless of the size of the family to which they belong. On the other hand, evidence exists that children from low SES, large families demonstrate consistently poor performances on intelligence tests. Thus, on the evidence of these three separate samples, it seems correct to conclude that, in modern Western industrialized cities such as those found in Australia and Canada, family size in the middle and upper echelons has no significant relationship to how well a child performs on a conventional intelligence test.

Table 1

Means, SDs and Range of Age for the Three Separate Samples.

		Canadian Sample I (Regina)	Australian Sample II (Adelaide)	Canadian Sample III (Sydney)
Age for males	n	91	217	74
	Mean	12 years 9 months	9 years 11 months	14 years 6 months
	SD	12.4 months	6.8 months	8.7 months
	Range	11 years 2 months to 15 years 9 months	8 years 8 months to 12 years 0 months	13 years 5 months to 18 years 1 month
Age for females	n	79	210	70
	Mean	12 years 8 months	9 years 10 months	14 years 8 months
	SD	11.7 months	6.3 months	8.1 months
	Range	11 years 2 months to 15 years 3 months	8 years 5 months to 12 years 11 months	13 years 6 months to 17 years 10 months
Age for full sample	n	170	427	144
	Mean	12 years 9 months	9 years 11 months	14 years 7 months
	SD	12.1 months	6.6 months	8.3 months
	Range	11 years 2 months to 15 years 9 months	8 years 5 months to 12 years 11 months	13 years 5 months to 18 years 1 month

Table 2

Means, SDs and Range of IQ for the Three Separate Samples

		Canadian Sample I (Regina)	Australian Sample II (Adelaide)	Canadian Sample III (Sydney)
Verbal IQ for males		91	217	74
	Mean	110.7	110.1	102.3
	SD	10.2	14.7	11.6
	Range	83 to 129	70 to 136	80 to 124
Verbal IQ for Females		79	210	70
	Mean	113.0	112.5	104.2
	SD	9.7	13.8	11.5
	Range	87 to 133	70 to 136	83 to 130
Verbal IQ for full sample		170	427	144
	Mean	111.8	111.3	103.2
	SD	10.1	14.3	11.6
	Range	83 to 133	70 to 136	80 to 130

Table 3

Distribution, in Each Sample, of Subjects According to Socioeconomic Status Membership

	Canadian Sample I (Regina)		Australian Sample II (Adelaide)		Canadian Sample III (Sydney)	
	n	%	n	%	n	%
SES I (professional)	37	21.8	72	16.9	15	10.4
SES II (semi-professional)	46	27.1	89	20.9	33	23.0
SES III (Clerical, sales)	47	27.6	76	17.8	28	19.4
SES IV (skilled, trades)	26	15.3	75	17.6	50	34.0
SES V & VI (semi-skilled and unskilled)	14	8.2	115	26.9	18	13.2

Table 4

Mean family size for the Three Separate Samples, According to Socioeconomic Status, Sex, and Full Sample Distribution.

	Canadian Sample I (Regina)	Australian Sample II (Adelaide)	Canadian Sample III (Sydney)
	Mean family size	Mean family size	Mean family size
SES I & II	3.1	3.3	3.9
SES III	3.0	3.1	3.5
SES IV	3.2	3.3	4.6
SES V & VI	3.6	3.7	5.6
Males	3.2 (SD = 1.1)	3.4 (SD = 1.2)	4.2 (SD = 2.2)
Females	3.1 (SD = 1.1)	3.3 (SD = 1.3)	4.4 (SD = 2.3)
Full Sample	3.2 (SD = 1.1)	3.4 (SD = 1.3)	4.3 (SD = 2.2)

Table 5

Mean IQs and SDs, of the Three Separate Samples for both Sexes and for the Full Sample in Relationship to Family Size

	Family Size	1 or 2	3	4	5 or more
MALES	n	29	29	25	8
Sample I	Mean IQ	111.5	111.1	111.1	105.4
	SD	9.8	9.6	10.6	11.1
	n	51	79	51	36
Sample II	Mean IQ	112.0	107.4	116.9	103.9
	SD	13.7	13.1	11.0	19.0
	n	11	35	14	24
Sample III	Mean IQ	100.5	104.8	99.6	101.9
	SD	11.0	10.9	9.4	13.1
FEMALES	n	26	26	19	8
Sample I	Mean IQ	112.4	114.3	111.7	113.5
	SD	7.0	10.8	9.4	12.9
	n	61	70	41	38
Sample II	Mean IQ	112.8	114.6	116.6	103.7
	SD	9.7	13.1	12.4	17.9
	n	14	18	10	28
Sample III	Mean IQ	109.9	105.5	106.8	99.6
	SD	11.5	12.1	13.1	8.2
FULL SAMPLE	n	55	55	44	16
Sample I	Mean IQ	111.9	112.6	111.4	109.5
	SD	8.5	10.2	10.1	12.0
	n	111	149	92	74
Sample II	Mean IQ	112.4	110.6	116.8	103.8
	SD	11.7	13.6	11.6	18.4
	n	25	43	24	52
Sample III	Mean IQ	105.8	105.4	103.9	99.8
	SD	12.4	11.6	12.5	10.3

Table 6

Correlations, for the Three Separate Samples, Between IQ and Family Size for SES Groups, Both Sexes and the Full Sample

	Canadian Sample I (Regina)	Australian Sample II (Adelaide)	Canadian Sample III (Sydney)
SES I & II	+0.04	+0.12	0.00
SES III	-0.17	-0.03	-0.36 **
SES IV	-0.07	-0.14	-0.42 **
SES V & VI	-0.09	-0.30 **	-0.36 **
Males	-0.14	-0.08	-0.23 *
Females	+0.03	-0.21 *	-0.39 **
Full Sample	-0.06	-0.15	-0.31 **

* $p < 0.05$

** $p < 0.01$

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