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Intelligence, family size and birth order: Some data from Kuwait

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Abstract

The relation between intelligence and family size and birth-order was examined in a sample of 4643, 8–15 years old in Kuwait. There was a correlation of –.05 between intelligence tested with the Standard Progressive Matrices and family size, much smaller than those typically found in a number of studies in the United States and Europe and effectively negligible. There was a slight tendency for first and second born children to have higher IQs than later born but again the effect was negligible. This association was present for children aged 8–10 and for those aged 12–16 years. It is considered that the results are incompatible with the theories of Zajonc and Blake that family size and birth-order have significant effects on IQ, and support the conclusion of Rodgers that family size and birth-order have no significant effects on IQ.
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1. Introduction

There has been interest in the relation between intelligence and family size and birth-order for at least a century. In the United States and Europe it has invariably been found that the relation

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between intelligence and family size is negative, i.e. children in large families (i.e. with large numbers of siblings) have lower IQs than children in small families. The results of 17 studies showing this negative relationship are summarized in Lynn (1996, p. 61). The correlations varied between –.19 and –.34, and average –.26. It has also sometimes but less consistently been found that birth-order is related to intelligence such that first and second born children have higher IQs than third and fourth, etc., and that this relationship holds for each family size. These phenomena have been found in Scotland (Thomson, 1949), the Netherlands (Belmont & Marolla, 1973), and in a number of samples in the United States (Blake, 1981).

A theory to explain these results positing that family size and birth-order have causal effects on intelligence was advanced by Lynn (1959). This theory proposed that parents give more attention to children in small families, and to first born and last born (as compared with intermediates), and this enhances the children's intelligence. Subsequently, four theories have been advanced to explain these results. Two of these have developed the theory that family size and birth-order have causal effects on intelligence. These are the confluence theory of Zajonc (1976), Zajonc (1983), Zajonc (2001a), and the resource dilution theory of Blake (1981) and Downey (2001). A third theory is the admixture theory of Velandia, Grandon, & Page (1978), Page & Grandon (1979) and is sceptical about a causal effect of family size and birth-order on intelligence. The fourth theory advanced by Rodgers (1984, 2001) and his colleagues (Rodgers, Cleveland, van den Ord, & Rowe, 2000; Rodgers & Rowe, 1994) proposes that family size and birth-order have no causal effects on intelligence.

Zajonc's confluence theory states that the child's IQ is partly determined by the attention that parents and siblings give to it. This can explain the negative relation between family size and intelligence, because the smaller the number of children in the family, the greater the amount of attention they are likely to receive from their parents. The result of this will be that children in small families will have higher average IQs than those from large families. The theory also attempts to explain the relation between birth-order and IQ, since first born children should receive more attention from their parents than subsequent children. In larger family sizes, each child should receive progressively less attention from the parents, and IQs should decline steadily with birth-order. However, the data are not so straightforward as this. The confluence theory in this simple formulation encounters two problems. First, several studies reviewed by Zajonc (2001a) have found that only children obtain slightly lower average IQs than first born children in two child families. This is an anomaly, because only children must receive more attention from their parents than first born children in two child families. A second problem for the confluence theory is the inconsistent results, some studies showing a progressive decline in average IQs with successive birth-order, but other studies failing to find this.

In an attempt to resolve these problems, Zajonc (2001a) has proposed that, in addition to the effect of parents, older siblings teach younger siblings and this teaching role enhances the intelligence of older siblings. However, he proposes that this effect does not operate until the older siblings are aged about 11 years. For younger children "the benefits of teaching do not start at birth and at first grow less rapidly than the disadvantages of increasing sibships. The confluence model, therefore, predicts a negative or no influence of birth-order (lower scores for high birth ranks) for ages less than 11 plus or minus 2 years and a positive influence of birth-order (higher scores for high birth ranks) for children older than 11 plus or minus 2 years. These predictions have been confirmed by a large variety of data sets" (Zajonc, 2001a, p. 492).

The resource dilution theory advanced by Blake (1981) and Downey (2001) proposes that "parental resources are finite and that as the number of children in the family increases, the resources accrued by any one child necessarily decline" (Downey, 2001, p. 497). The theory is similar to the confluence theory but broader in so far as it posits that parental resources consist of a variety of phenomena including the material, financial and cultural quality of the home, parental treatment of children, and opportunities afforded to children. It is also broader in its explanatory power in so far as it purports to explain the negative relation between sibship size and educational attainment in addition to the relation with intelligence.

The admixture theory of Velandia et al. (1978), Page and Grandon, (1979) is sceptical about a causal effect of family size and birth-order on intelligence. It proposes that a variety of between-family phenomena associated with socio-economic status and other variables are related to family size and birth-order and are likely responsible for the relation of these to intelligence.

The fourth theory advanced by Rodgers (1984, 2001) and his colleagues (Rodgers & Rowe, 1994; Rodgers et al., 2000) rejects a causal effect of family size and birth-order on intelligence. They argue that within-family data do not show the relationships between family size and birth-order on intelligence that are present in the between-family data used by the Zajonc, Blake and Downey,

At the present time no consensus had been reached among these different theories. Zajonc (2001b) and Zajonc and Sulloway (in press) have continued to assert that the confluence theory provides the best explanation of the data and have been supported by Armor (2001). Rodgers et al. (2000) and Wichman, Rodgers, and MacCallum (2006) remain unconvinced, while Michalski and Shackelford (2001) are unconvinced by Rodgers and his colleagues.

In this paper we examine the relation between intelligence and family size and birth-order in a large sample of school students in Kuwait. The interest of the study is that the existing data are drawn almost entirely from the economically developed western societies of the United States and Europe. Empirical tests have found an association between family size and birth-order and intelligence in several populations. If the theories that parental resources account for this association are correct, these relationships should be present in other populations where parental resources also matter. Hence, the presence – or absence – of these relationships in a different culture may make it possible to differentiate between the existing theories.

2. Methods

A sample of 4643, 8–15 years old in Kuwait was given the Standard Progressive Matrices as a test of non-verbal intelligence. The sample was drawn by randomly selecting one socially representative elementary, intermediate and secondary school for boys and one for girls from each of the six districts of Kuwait. Children were tested in the year 2002 in classes of 25–30 students. All of them were Kuwaiti citizens and students in the governmental schools. The students also gave the numbers of their brothers and sisters and their birth-order in the family (the eldest was given a score of 1).

The only difference between the English and Arabic versions of the test is that in the Arabic test booklet the main matrix and the six or eight alternatives have been transposed from left to right in the same page. Thus, in the Arabic booklet the problems are in the sequence from right to left, following usage in the Arabic language. The SPM was administered to students by a group of competent and trained testers. The testers in the boys' schools were men, while they were women in the girls' schools. The completed answer sheets were computer-scored. Normative data on the sample are given by Abdel-Khalek and Lynn (2006) and Abdel-Khalek and Raven (2006). Data on the reliability and factorial validity of the Standard Progressive Matrices among Kuwaiti children are given by Abdel-Khalek (2005).

3. Results

The correlations between the SPM score and numbers of siblings were –.08 for boys ($p < .05$) and –.02 for girls (not statistically significant). For the combined sample, the correlation is –.05 ($p < .05$). Descriptive statistics showing mean scores on the Progressive Matrices for family sizes of 1 through 10 are given in Table 1.

The relation between birth-order in the family and SPM score was examined for each family size for 2–10 child families by calculating the Spearman rank correlations between family position and IQ for each of the nine family sizes. These correlations are given in Table 2. Six of the correlations are negative, indicating that first born children have higher scores than later born, while the remaining three are positive. The negative correlations are statistically significant in only two of the family sizes (3 and 10), while in a two family sizes (2 and 8) the correlation is significantly positive.

To test Zajonc's theory that there should be a negative or no association between birth-order (lower scores for high birth ranks) for ages less than 11 years and a positive association of birth-order (higher scores for high birth ranks) for children older than 11 years, we have divided the sample into those aged 8–10 years and those aged 12–16 years and averaged the correlations between birth-order and IQ in these two subsets. The results are that the correlations are negative in both the young (aged 8–10 years, $n = 2026$) and older (aged 12–16 years, $n = 2617$) sub-samples

Table 1
Mean Progressive Matrices scores for family sizes (FS) 1 through 10

FS	1	2	3	4	5	6	7	8	9	10
N	85	329	780	1050	883	607	388	244	184	93
Mean	32.8	36.3	35.8	36.1	36.1	35.4	34.0	33.6	33.2	33.0
SD	12.4	11.6	11.9	11.6	11.7	11.5	12.1	12.3	12.2	12.3

Table 2
Spearman rank correlations (p) between birth-order and IQ for family sizes (FS) 2 through 10

FS	2	3	4	5	6	7	8	9	10
N	329	780	1050	883	607	388	244	184	93
p	.024*	−.014*	−.065	−.069	−.061	−.122	.015*	.139	−.003**

* $p < .05$
** $p < .01$

($-.069$, $p < .02$; $-.097$, $p < .01$, respectively). Although both correlations are statistically significant they are so small as to be negligible.

4. Discussion

The results contain five points of interest. First, the negative correlation between family size and intelligence (children in larger families tend to have lower IQs) that has been found in numerous studies in the United States and Europe is barely present in Kuwait. The correlation in this Kuwait sample is $-.05$ and has to be regarded as negligible. Furthermore, we see in Table 1 that only children have the lowest IQ. These results have to be interpreted as disconfirming Zajonc's confluence theory and Blake's dilution theory, which predict that the relationship between family size and intelligence should be appreciable in all societies.

Second, the birth-order effect that early born children tend to have higher IQs than later born children, found in a number of studies in the United States and Europe, does not appear to be present in this sample from Kuwait. These correlations are given in Table 2 for nine family sizes from 2 to 10 child families and show inconsistent results in so far as two are significantly positive while two are significantly negative. In the five remaining family sizes the correlations are not statistically significant. The results as a whole indicate that there is no association between family position and IQ in this sample.

Third, Zajonc's theory that there should be a negative or no association between birth-order (lower scores for high birth ranks) for ages less than 11 years is disconfirmed; the results are the reverse of Zajonc's theory in so far as there is a slight but negligible tendency for the higher birth ranks to obtain higher average IQs ($r = .069$). For older children aged 12–16 years Zajonc's theory that there should be a positive association of birth-order (higher scores for high birth ranks) is confirmed ($r = .097$), but while this correlation is statistically significant it is so low that it has to be regarded as negligible.

Fourth, our results showing negligible relationships between family size and birth-order suggest that the amount of attention that children receive from their parents, and that older siblings may give to younger, has no significant effect on the children's intelligence. Of the four theories summarised in the introduction, the results do not support the theories of Zajonc or Blake, since these predict that the postulated effects of family size and birth-order on intelligence should be present in all cultures, and this is evidently not so in Kuwait. The results support the conclusion reached by Rodgers (1984, 2001) and his colleagues (Rodgers & Rowe, 1994; Rodgers et al., 2000) that family size and birth-order have no causal effects on intelligence. Rodgers and his colleagues have reached this conclusion by examining within-family effects. Our interpretation of the Kuwait results reaches the conclusion by a different route, by finding virtually zero relationships between family size and birth-order and intelligence.

Fifth, it appears that the negative relationships between family size and birth-order and intelligence found in a number of studies in the United States and Europe must be attributable to factors other than those proposed by Zajonc and Blake. It seems probable that the relation between family size and intelligence is largely due to the tendency of more intelligent couples to have fewer children, for which direct evidence has been found in several studies summarized by Lynn (1996) and by Lynn and Van Court (2004). Since intelligence is transmitted from parents to children (the magnitude of the correlation between the average IQ of both parents and the IQ of their children is .72 according to Bouchard (1993, p. 54), the result of this will be that children in small families will have higher average IQs than those from large families.

With regard to the birth-order effect found in some studies in the United States and Europe, such that earlier born children tend to have lower average IQs than later born, the explanation may be that later born children tend to have older parents and that older mothers tend to have a higher incidence of conditions that adversely affect the intelligence of their children. In particular, several studies have found that older mothers tend to have a greater incidence of low birth weight babies, which is associated with lower intelligence. This was particularly true of the older studies according to Aliya, Jolly, Ehiri, and Salihu (2005) who report that these have found some relation between later births and adverse birth outcomes including underweight babies, while the more recent studies have not found this relation because of improvements in the quality of obstetric care. This may explain the inconsistent results found in American and European studies.

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