Rowan University

Rowan Digital Works

5-3-2005

Does birth order affect intelligence?

Carolyn M. Lambert
Rowan University

Recommended Citation

Lambert, Carolyn M., "Does birth order affect intelligence?" (2005). *Theses and Dissertations*. 1023.
https://rdw.rowan.edu/etd/1023

DOES BIRTH ORDER AFFECT INTELLIGENCE?

by
Carolyn Lambert

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
Rowan University
May 3, 2005

Approved by
Professor

Date Approved *May 3, 2005*

ABSTRACT

Carolyn M. Lambert
Does Birth Order Affect Intelligence?
2004-2005
Dr. Roberta Dihoff & Dr. John Klanderman
Master's of Arts in School Psychology

The purpose of this exploratory investigation was to determine whether birth order has an affect on intelligence. Seventy-four undergraduate students from Rowan University participated in my study. During class-time, I handed out a questionnaire with questions pertaining to the student's birth order within their family and SAT scores. The SAT scores served as a measure of intelligence. The SAT scores were broken into seven different ranges, between 800 - 1400 & above. The birth order variable was broken down into four levels; firstborn, middle child, youngest and only child. The different levels of birth order and SAT scores were compared to see if significant difference existed between the two variables. The Kruskal-Wallis test, a non-parametric one-way analysis of variance, was used to determine if a significant difference existed between intelligence and birth order. This test found that there was a significant difference found when comparing the different variable of birth order and intelligence.

Acknowledgements

I would like to express my sincere appreciation to Dr. Dihoff and Dr. Klanderman for their guidance and patients with me in the creation of my thesis. I would also like to thank all of the students who participated in my study and the professors that allowed me into their rooms during class time to conduct my research.

Table of Contents

Figures

Chapter One:

The Problem

Need

Is it a coincidence that extraordinary degrees of intelligence are seen in firstborns such as Galileo, Pascal and Newton? Why were twenty-one out of the first twenty-three astronauts sent to outer space firstborns or only children. Additionally, the majority of Nobel Prize winners, classical music composers and prominent psychologist are firstborns (Willett, 2001). Are first-borns truly more intelligent? Does birth order affect intelligence? Many different factors in one's life can mold intelligence: school attendance, whether or not one is breast-fed, the degree of attention and stimulation. Is birth order another factor that affects intelligence?

There is no escaping your birth order. Everyone has a position within their family, whether it is firstborn, middle child, youngest child or an only child. Understanding birth order may give insight into a better understanding of yourself and also friends, family and co-workers.

For years, researchers have noticed that, on average, later-born children seem to score lower on standard IQ tests than their older siblings. First-borns and only children as have been noted as having an academic edge over the other birth categories, with overrepresentation in college, IQ measurements, SAT scores in the UN and equivalent tests in the UK (Guastello & Guastello, 2002). Many researchers believe that birth order has a direct correlation to behavior patterns, way of thinking and emotional responses.

Purpose

The purpose of this study is to find out if there is a correlation between birth order and cognitive abilities in college undergraduates at Rowan University.

Hypothesis

The further down the birth order you are, the lower your IQ is likely to be. The common explanation is that parents only have a limited amount of time and energy to spend teaching their children. Children who are further down in the birth order get less parental stimulation, and as a result wind up with lower IQs (Needleman, 2001). Both, firstborns and only children, perform better academically and have higher IQ's than middle and youngest children.

Theory

One of the first people to research the relationship between birth order and intelligence was Francis Galton. In 1874, he observed what he believed to be a disproportionate number of distinguished first-born British scientists (as cited in Pfouts, 1980). Galton (1874) published *English Men of Science: Their Nature and Nurture*. The book chronicled the lives of 180 eminent men from various scientific fields. He was able to collect birth order data from 99 of his subjects, revealing that 48% of them were firstborn sons or only sons.

Alfred Adler is one of the best-known theorist for his work with birth order and how it affects one's personality. Adler first presented his views on birth order in 1918 (as cited in Manaster, 1974). He said,

"draw attention to the fact that before we can judge a human being we must know the situation in which he grew up. An important moment is the position which a child occupied in his family constellation" (as cited in Manaster, 1974).

His theory looks at first-born children, middle children, last-born children, as well as only children. Adler theorized that an individual's birth order shapes his or her personality because of the unique experiences that each birth order goes through. Adler's theory also includes correlations between birth order and intelligence. He asserts that oldest children tend to be more intelligent (Engler, 1999).

Another popular theorists is University of Michigan Psychologist, Robert B. Zajonc. He explains the effects of birth order and family size through the "confluence model." This model explains intelligence of later-born children as a function of the average intellectual environment of the family. The model contends that intelligence is influenced by family size as well as birth order position and age spacing between siblings. As a family grows the intellectual environment diminishes, so that depending on the spacing of the children, the later-born siblings are raised in a less stimulating world (Science News, 1982). More specifically, Zajonc states that a first-born enters and learns from an intellectual environment consisting of two adults. The second child in that family receives intellectual inputs from two adults and one child. The sixth child in the family enters an environment that is almost completely dominated by children—their thoughts, behaviors and language.

Parental intelligence and child-rearing attitudes are important to the intellectual stimulation of children. According to Zajonc, "children from large families, who spend more time in a world of small-sized minds, should develop more slowly and therefore attain lower I.Q.'s than children from small families, who have more contacts with

grown-up minds" (Science News,1975). He also concluded that firstborns (and older siblings in general) often have to answer questions and explain things to their younger siblings. The act of tutoring helps the older children to cognitively process information. Further, the teaching of others may improve their verbal abilities. In most cases, younger siblings do not get the chance to tutor their brothers or sisters, resulting in a lower IQ or cognitive abilities (as cited in Esping, 2003).

Each birth order has specific characteristics found to be unique to their placement within their family. Firstborns tend to work harder for grades than youngest children. They often grow to be more competitive and to have higher educational and career aspirations. Characteristics that are associated with first-borns are goal setters, high achievers, perfectionist, responsible, organized, rule keepers, determined, and detailed oriented people. Only-children have characteristics much the same as firstborns that have siblings.

Middle children are found to be good mediators and have superior cooperation skills. They often make good managers and leaders because of the profound negotiation and cooperation skills. Characteristics associated with middle children are flexible, diplomatic, peacemakers, generous, social and competitive.

Youngest children are typically found to be outgoing and great at motivating other people. They are also found to be affectionate, uncomplicated and a little absent minded. They are often found to be great sales people. Characteristics associated with lastborns are risk takers, idea people, creative, humorous and tend to question authority. (Sutter)

Definitions

Birth order – is a person's rank within their family unit among his or her brothers and sisters.

IQ – is the ratio of tested mental age to biological age.

Intelligence – is the capacity to acquire and apply knowledge. Intelligence can be defined as the mental abilities necessary to effectively adjust to one's environment as well as to effectively shape and select one's environments (Sternberg, 1997).

Blended families – is when two separate families come together through marriage after a divorce or death of a spouse.

Sibship – is the total number of children born to a set of parents. Siblings belong to a sibship. (Medicinenet.com, 2004)

Spacing – is the number of years between siblings within the same family unit.

Assumptions

Several assumptions were made when performing the research. One assumption in the study is that the students understood the questionnaire's questions and answer them accurately. The participant's SAT scores were used to represent one's intelligence. It is also assumed that the students understood the complete anonymity of the questionnaire and were willing to answer the questions honestly. The last assumption is that the sample of undergraduates being tested is a representation of the population being studied.

Limitations

The study does not take into account the socioeconomic or cultural background of the students surveyed, which is believed to have an impact on intelligence. It also does not factor the differences found when there is spacing between the students and their siblings. Gender and IQ's of parents also play a role in the affects of birth order on intelligence, both of which were not taken into account.

The amount of spacing between a child and their siblings can have a great effect on how determine their birth order role. Adler felt that if more than 3 years separated children, sub- groups of birth order might form (Stein). If there is, for example, a 7-year gap between the last members of the family, they may function more as an only child rather than the youngest.

Gender also plays a role in effecting birth order. For example, a youngest born boy can function as a firstborn, since he is the firstborn male. He may demonstrate characteristics of a firstborn and also carry characteristics of the baby of the family.

Lastly, ages of the participants will affect the reliability of this study. The ages are all varied since the subjects are undergraduates in college and not divided by age. The fact that they are all in college is also another limitation because it is not a true sample of the population, as college students tend to be more intelligent.

I only studied undergraduates from Rowan University. The results of this study will not be applicable to the entire population. Along with applicability is generalizability, the results are not generalizable to the entire population. The population I am working with is a small sample population of Rowan University undergraduate students and is not representative of the general population.

Overview

Chapter Two includes both sides of the debate if birth order affects intelligence. It reveals the findings of research in birth order and intelligence studies, as well as different theories created to explain the reason the birth order and intelligence correlation exist. A detailed description of the congruence model and examining whether the model is reliable will also be presented.

Chapter Three will discuss the design of the study. It includes a description of the sample that was used, the measures used and the type of test used to analyze the results.

Chapter Four is comprised of the analysis of the results. It discusses the affect birth order had on SAT scores and other unexpected findings.

Chapter Five concludes the findings, analysis and results of the study. It consists of a summary, conclusion, discussion of the results and suggestions for future research.

Chapter Two:

Review of Literature

Introduction

"Is the oldest the most intelligent?" and "Does the order in which you are born

effect your intellectual development?" these are a couple questions that researchers strive

to answer. Several studies have determined that the first-born child in a family possesses

unique characteristics. These characteristics include being more verbally articulate, less

impulsive, more active, a better performer in school, more likely to go to college and

having a greater need to achieve. (Ernest & Angst, 1983) Early-borns, including only

children, tend to score higher on intelligence and aptitude tests than those born later into

the family. However, not all researchers agree, some believe first-borns and only

children's abilities do not differ from later-born's abilities. Research provides data that

support both sides of the debate.

Robert B. Zajonc, a leading researcher who believes that birth order does impact a

person's intelligence, has developed what has been termed the "confluence model." The

idea of this model is that the intellectual growth of every member of a family is

dependent on the others in the family. (as cited in Evans & McClintic, 2002)

Judith Blake is another researcher who believes that birth order does affect

intelligence. She created a model known as the "dilution model" to illustrate her theory.

It states that the more children there are the lower quality of each child. (Blake,1981)

Her theory emphasizes resource constraints, more specifically that parental resources

8

available for investment are limited. As such, the value of resources allocated to each child shrinks with the birth of each new addition to the sibling group, thus explaining the finding that child welfare declines as the number of children increases. A recent extension to the Dilution Model hypothesis was made by Douglas Downey (1995), he took the theory one step further and stated that there is a causal relationship between the level of parental resources and child educational performance. (Salem, 2004)

Retherford and Sewell tested the mathematical form of the confluence model using aggregate data, between-family data, and with-in family data from the Wisconsin Longitudinal Study and found no support for the theory. (Lowery, 1995) They concluded that birth order affects may be "a social phenomenon that does not exist." (Retherford & Sewell, 1991).

Rodgers, Cleveland, Van den Oord, and Rowe (2000) state that the link between birth order and intelligence is all a "methodological illusion" and in conducting their own studies which used within-family data they found no consistent relationship between birth order and intelligence.

If it is true that first-borns and only children have greater intellectual abilities than later-born children, the question is, why? One possible answer is that something within our genetic composition changes with birth order due to biological factors such as the age of the mother or chemical alterations caused by previous births. Scientists reject these nature explanations in favor of more environmentally based nurture theories. There is little question that the environment in which a child develops can exert strong influences over his or her intellectual capacities and abilities. (Zajonc & Markus, 1975)

Birth Order and Intelligence Theories

Confluence Model

Based on that environment influences intelligence, Robert B. Zajonc created the

"confluence model" to explain the effects of birth order on intelligence. He concluded

that the firstborn IQ advantage was due to the ever-changing intellectual environment

within the family. The model uses a mathematical formula to compute the relative

advantages and disadvantages of these factors. It contends that intelligence is influenced

by family size as well as birth order position and age spacing between siblings. The

model consists of a few different components:

It starts with the theory that firstborns and only children do not have to share their

parents' attention, so they benefit from their parents' complete absorption in the new

responsibility. Later-born children never experience this advantage. Additional siblings

will automatically limit the amount of attention any of the siblings get, including the

firstborn. This would explain the Belmont and Marolla (1973) finding that firstborns

from smaller families have higher IQs than firstborns from larger families.

Secondly, firstborn and only children are exposed to more adult language, while

later-born children are exposed to the less mature speech of their siblings. This may

affect their performance on the verbal scales of intelligence tests. Moreover, the

linguistic environment becomes increasingly less mature as more children enter the

family. This also coincides with the finding that children in larger families have lower IQ

scores.

Additionally, as more children enter the family, the general intellectual

environment becomes less mature. This would explain why firstborns and older children

10

from large families have lower IQs than firstborns and older children from smaller families.

Lastly, the model contends that firstborns (and older siblings in general) often have to answer questions and explain things to their younger siblings. It is believed that the act of tutoring helps the older children to cognitively process information. In addition, teaching others may improve their verbal abilities. Except in very rare cases, youngest siblings do not get the opportunity to tutor their brothers and sisters. This tutoring function explains why only children do not tend to have higher IQs than firstborns. (Esping)

Another component of the confluence model is the actual formula that predicts a given child's IQ. This formula was developed by Zajonc and his associate, Gregory Markus, and it states that a child's IQ = (M/C) x 100. The C stands for "chronological age". The M stands for "mental age" and is a function of the mental ages of everyone in that child's family. This mental age is calculated by the formula $M_{ij}(t) = M_{ij}(t-1) + \alpha_{ij}(t) + \lambda_{ij}(t)$. The M (mental age at time t) of the ith child in a family with j children is determined by three components. The first, $M_{ij}(t-1)$, is the mental age of that child the year before. The second, $\alpha_{ij}(t)$, is how much the total family intellectual climate contributed to the mental age change from time t-1 to time t. The third, $\lambda_{ij}(t)$, is how much the teaching function contributed to the change in mental age from time t-1 to time t. (Shaw, 2004)

The following is a simplified example, which illustrates the computation of predictions from the confluence model. The intellectual environment is quantified by assigning some numerical value; say in mental age units, to each person within the

family. For instance, a value of 30 may be assigned to each of the parents and 0 to the newborn child, for an average of $(30 + 30 + 0)/3 = 20$. If a second child is born into the family when the firstborn is four years old, the average would be $(30 + 30 + 4 + 0)/4 = 16$. Say that after a lapse of three years, there is a third offspring. The average value is reduced further: $(30 + 30 + 7 + 3 + 0)/5 = 14$. Thus, each successive sibling is born into and contributes to a weaker intellectual environment. Whereas at birth the intellectual environment of the firstborn surpasses that of the second born, things change very rapidly. It is interesting to note that when both children in the example above are tested at eight years of age, the averages are $(30 + 30 + 8 + 4)/4 = 18$ for the firstborn and $(30 + 30 + 12 + 8)/4 = 20$ for the second born. The second born benefits from a better environment because the later-born child has an older sibling, whereas at the same age of testing, the firstborn has a less mature sibling, a configuration that reverses the birth order effect at that age. (Zajonc, 2001)

Dilution Model

Another theory that attempts to explain the effect of birth order on intelligence is the "dilution model." It is important to keep in mind that although the dilution model has implications for understanding the relationship between sibship size (the amount of children in a family) and intellectual development specifically, dilution theorists are more broadly interested in how family structure shapes the way in which advantages or disadvantages are generally conferred on children. So, although the relationship between sibship size and intellectual development is the heart of the confluence model and the key point of attack for those claiming that sibship-size effects are spurious, it is merely one

12

path by which siblings may shape life chances for dilution theorists. The confluence model offers no explanation for an effect of sibship size on educational attainment apart from intellectual skills. However, the resource dilution model explains that although some parental resources influence intellectual skills, other parental resources (e. g., money saved for college) affect attainment directly. (Downey, 2001)

The dilution model was developed by Blake in 1981 and states that "the more children, the more parental resources are divided… and hence, the lower the quality of the output". The intellectual development of a child is influenced by the family resources. These resources are divided up into three types.

The first type of resource is termed; "types of home, necessities of life, cultural objects". This would include things like music, educational toys, and books.

The second type of resource is called; "specific chances to engage in the outside world". This includes opportunity for activities like music lessons, traveling and dance lessons.

The last type of resource is; "personal attention, intervention and teaching" done by the parent. Larger families mean that all three of these types of resources are more divided and less available to each child. The resource dilution hypothesis states that decreased resources results in lower IQ. (Shaw, 2004)

Studies Which Illustrate Birth Order Affects Intelligence

In the late 1960s and early 1970s, an extensive research project was carried out in the Netherlands. It studied the effects of malnutrition on the intellectual abilities of children born at the end of World War II. As part of this research, an intelligence test,

called the Raven test, was given to over 350,000 Dutch males when they became 19 years of age. Two of the researchers on that project later reported a discovery that was not anticipated. They found a strong relationship in their data between the birth order of the men and their scores on the Raven test (Belmont & Morolla, 1973). The surprising findings were that scores decreased as family size increased and also declined with birth order. (Zajonc & Markus, 1975)

Wark, Swanson and Mack (1974) created a study where a large and representative sample of students were gathered to see if birth order effects show up. The study examined not only birth order and intelligence, but also a relationship between birth order and plans for college. They began by testing sample of 22,538 females and 22,770 males with the Minnesota Scholastic Aptitude test (MSAT). The test had been in place since 1929, and since 1959 practically every high school junior in the state of Minnesota has taken the MSAT. It is a test, which contains three verbal tasks: same-opposite; verbal analogies; and paragraph comprehension. It has power to predict college grades equal to the well known College Entrance Examination Board Verbal Scholastic Aptitude Test and the American College Testing Program Battery of four tests. At the time of testing, each student also filled out a questionnaire containing items regarding birth order and plans for post graduation.

The data showed a striking relationship between birth order and intelligence. "Only children" and "firstborns" have the essentially the same ability score. But as one stair-steps up the birth order, the measure of verbal ability drops significantly. The section of the study that examined the relationship between birth order and plans for post high school education also found significant results. The respondents were asked to

indicate whether they planned to go to the University of Minnesota, a state or private college, a technical school or had no plans for more schooling. The results found that the proportion of those that planned to attend college drops and the proportion of technical training and plans for no more school increases as one goes from first to last in birth order.

The findings in this study are consistent with a majority of studies on birth order and intelligence. Only children and first-borns appear to be brighter. In addition to these children being more intelligent, there is a correlation between birth order and plans for college. Schachter (1963) reports that first-borns were in 12% surplus in the undergraduate college at the University of Minnesota. When sampling among graduate students in Psychology and Child Psychology, he found a 21% surplus of first-borns compared to their number in the general population. He also reported that among medical students there was a 16.7% excess of first-borns. Therefore, besides being brighter, first-borns are more likely to aspire to a higher, more professional, education. (as cited in Wark, Swanson & Mack, 1974).

In another study by Glass, Neulinger and Brim (1974), they presented data that tested whether first and only children are superior to later-born children in reading ability and achievement motivation. Their subjects consisted of a stratified random sample of 2,523 tenth- and twelfth-grade public high school students. The subjects came from one-, two-, or three-child families. A reading comprehension test developed by Project Talent and a questionnaire regarding the educational aspiration was administered to all respondents.

The results showed that first and only children were indeed superior to later-borns on a test of reading ability. Responses to the questionnaire items indicated that first and only children also had higher educational aspirations than later-born children. However, these findings were only true of families of higher socioeconomic background. It found that the well-known birth order effects previously reported; do not occur in persons coming from a lower socio-economic background.

This study also found that the difference between first-born and only children verses other children on achievement-related variables turns out on more detailed analysis to reflect low scores by the third-born child relative to only, first-, and second-born children. This was determined because in the study an analysis was made of birth order effects while controlling for family size. With respect to reading test scores, four comparisons were made: first born in the two-child families, first born in three-child families, second born in two-child families and second born in three-child families. Each grouping was compared with the third-born respondents and the results showed that, even when family size was controlled for, third-born children scored significantly lower in all four comparisons. (Glass, Neulinder, Brim, 1974)

Birth Order and Intelligence - No Correlation

Are only children and first-borns really more intelligent while the rest of us are doomed? Why have so many of these studies showed such similar results? Robert Needlman (2001) points out that these studies suffer from a serious design problem. They are mixing birth order and family size, which are two different factors. For example, all the "number 5" children come from families with at least 5 or more children,

so when you compare the scores of the number 5's with the scores of the number 4's, you're actually comparing people from families with five or more children against people from families with four or more. Thus, you're not just comparing birth order but also family size. The factors of birth order and family size are confounded.

Page and Grandon (1979) have suggested the "admixture hypothesis" to account for the apparently causal link between birth order and IQ. Proponents of this hypothesis argue that other factors, like parental IQ or socioeconomic status, may be responsible for both large families and low IQ, making it appear in cross-sectional studies as though high birth order causes lower IQ. Instead it is possible that parents with lower IQ tend to have more children.

In the study, "Resolving the Debate Over Birth Order, Family Size and Intelligence," psychologist Joseph Lee Rodgers, Ph. D., asserts there is no direct link between birth order and intelligence, and concerns that big families produce less intelligent children are misguided. He pointed out that previous studies were not comparing children within families. (Needleman, 2001) There are two key research designs, between-family designs and within-family designs. Rodgers, Cleveland, van den Oord, and Rowe (2000) used both designs to assess the relationship of birth order to intelligence. Rodgers evaluated data from within families using the 1979 National Longitudinal Survey of Youth, a consolidation of IQ test scores taken biannually from a group of children aged 14 to 21. The sample included 11,406 young people.(Rodgers, 2000) Because their sample included all the children from each family, they were able to measure how children compared to each other within each family. This allowed him to separate out the factors of birth order and family size that had been confounded in the

previous study. The results of the within-family design revealed that birth order is unrelated to intelligence. The results of the between-family design, in contrast, revealed a negative relationship between birth order and intelligence. Rodgers et al. concluded that the belief that birth order affects intelligence is a product of research using between-family designs and the presumption that large families produce low-IQ children. According to Rodgers et al., within-family tests of the relationship between birth order and any behavioral outcome decrease variation from variables extraneous to the family and, therefore, are preferable to between-family tests of these relationships. (Michalski & Shackelford, 2001)

Within-family designs provide several methodological advantages over between-family designs. For example, variations in social class, number of siblings, and parental personality are reduced in a within-family design because data for each sibling are collected. Each sibling is presumed to grow up with the same economic background, family size, parental IQs, and parental personalities. Is it correct to assume that the reduction in variation of these effects makes these within-family designs more appropriate than between-family designs? The answer may be *no*. A within-family model does not account for within-family change over time. Additional confounds can be included in both within-family designs and between-family designs. For example, a man's social status and expendable resources often increase with age (Buss, 1994). Laterborn children therefore may be born into an economic situation different from that of an older sibling. This raises several issues relevant to intelligence. A father with more resources at Time 2 than at Time 1 may be more likely to distribute those resources at the time in development when they may be more important to the intellectual development of

younger offspring. Although parents with low IQ or low socioeconomic status (SES) produce more offspring than high-IQ parents or high-SES parents, there is little reason for a within-family design to fail to address this potential source of variation. (Michalski & Shackelford, 2001)

According to David J. Armor (2001), Rodgers et al. (2000) applied very simple analytic techniques to a very complex question, leading to unwarranted conclusions about family size and intelligence. Loss of cases, omission of an important ability test, and failure to apply multivariate techniques are the biggest problems in their article. Multivariate analyses, described here and published elsewhere, reveal that both birth order and family size have modest impacts on a child's intelligence after controlling for a host of other family variables, including mother's IQ, as do a number of other family characteristics.

In an article published in the March, *Developmental Psychology*, Richard C. Glabraith, argues against the confluence model, proposed by Zajonc. As mentioned earlier, the confluence model states intelligence level in the family decreases as the number of children increases. The second part of the model claims that the reason for this decrease is due to the fact that the elder children teach the younger children. While teaching the younger children, the older children gain intellectually and since the youngest children are left with no one to teach they suffer. Glabraith reports that the confluence model does not work. Based as it is on large national data sets rather than actual sibling data, it fails to handle individual differences in intelligence among siblings, requiring unrealistic child spacing to account for cases where younger siblings are more intelligent. (Science News, 1982)

Rodgers argued that parents, who are more educated with career paths, often have fewer children because they tend to delay having children. Parents' IQ is an important causal source of the relationship between family size and children's IQ, because low-IQ parents have been having relatively larger families in the U.S. than high-IQ parents, he claims that intelligence is mostly influenced by genetics and the quality of child rearing. Parenting efforts can make all the difference in a child's development. (Rodgers, 2000)

In the study by Wark, Swanson and Mack (1974), where a correlation between birth order and college plans were tested, an alternative reasoning for the results were discussed. Economics, not intelligence, was a possible conclusion. In large families where there are more children to support, the later children may have no other choice but to not be able to pursue college and/or only have the option of a vocational school. Socio-economics may play a very large role in this study.

In the study by Glass, Neulinger and Brim (1974) where a correlation between birth order and reading ability was examined, they, too, discussed alternative possibilities as to why these results were found. They hypothesized that there is more parental concern about children's achievement and conformity for earlier verses later-borns. Parents have less time for concentrated attention; later-born children have more time in the company of and under the supervision of older siblings. The later-born child receives notice from and is rewarded by parents for his or her distinctive actions--bringing something new to the family—more than for repetition of the behavior of older siblings.

Summary

Several studies have been performed to demonstrate whether birth order affects intelligence, but determining every single factor that contributes to intelligence may never be known. As we have seen, there is plenty of empirical evidence which points to a correlation between birth order and intelligence. However, to accept this correlation as unique and significant would be to deny biological science and claim to have solved the age old Nature verses Nurture debate.

Chapter Three:

The Design

Sample

Undergraduate students between the ages of 18 and 24 from a Liberal Arts College in Southern New Jersey participated in the study. The students were freshman, sophomores, juniors, or seniors, enrolled in a psychology class or education class. They participated on a voluntary basis during class time. The data was collected over a 1-month period. Each student signed a consent form to be assured of confidentiality. The total sample consisted of 74 students; there were 30 males and 44 females.

Measures

The students completed a questionnaire similar to that of Henrique Pereira (2000). He created a survey to study the correlation between birth order and sexual orientation. Changes were made to Pereira's survey in order to measure the students' intelligence instead of sexual orientation. The survey used which measured birth order and intelligence, contained 12 questions total. These questions asked for the student's age, gender, SAT scores, place in the birth order within their family and whether they lived in a blended family. The questionnaire was anonymous and was completed individually, but administered in a group. Participants responded by circling the answers that best described them.

Method

In the beginning of 6 different undergraduate classes, I entered the room and explained the purpose of my research and handed out the questionnaires and consent forms to those that agreed to participate. The participants were given as much time as needed to complete the forms. I waited in the room until all participants were finished and then collected the completed questionnaires.

Once I had the different questionnaire, I used those that had taken the SAT's and also only those people who came from a non-blended family.

Hypothesis

Null Hypothesis: There will be no significance difference found between SAT scores and birth order.

Alternate Hypothesis: There will be significance difference found between SAT scores and birth order.

Design

A non-parametric one-way analysis of variance was used to examine the significance difference between birth order and intelligence. Participants were asked to fill out a questionnaire, which took about 10 minutes to complete. The questionnaire asked for information regarding the individuals sex, age, SAT scores, siblings, where they were in the birth order and if they grew up in a blended family. The SAT scores served as a measure of intelligence. Data was analyzed to determine if significance could

23

be found between birth order and SAT scores. The SAT scores were broken into 7 different ranges; 800-900, 901-1000, 1001-1100, 1101-1200, 1201-1300, 1301-1400, 1400 & above. The birth order variable was broken down into 4 levels; firstborn, middle child, youngest and only child. The different levels of birth order and SAT scores were compared to see if significant difference existed between the two variables.

Analysis

The method of analysis chosen for this study was a one-way analysis of variance. A Kruskal-Wallis test, a non-parametric measure, was used to determine if a significant difference existed between the SAT scores and the different levels of birth order.

Summary

Data on birth order and intelligence was collected from a total of 74 undergraduate students from a Liberal Arts College in Southern New Jersey. The data was analyzed to determine if a significant difference exists between birth order and intelligence (specifically, SAT scores). Questionnaire of students that came from a blended family were discarded. The Kruskal-Wallis test was used to determine if a significant difference existed between the two.

Chapter Four:

Analysis of Results

Introduction

The data and analysis of the results yielded some interesting findings. The Kruskal-Wallis test was used to explore the difference between SAT scores and birth order. This test is a non-parametric one-way analysis of variance. The goal was to find out if there was a significant difference between SAT scores and birth order. From these results we can then make general statements about the affect of birth order on SAT scores.

Results

Birth order was found to have a significant affect on SAT scores, $x_{(3)}^2 = 12.073$, which was significant at $p \leq .007$. The Kruskal-Wallis test was used to determine these results. The test found that only children had the highest mean ranking of SAT scores at 51.11 and first-borns were second highest with a mean ranking of 41.77, while the middle child came in last with a mean ranking of 25.83. (see Figure 4.1)

Figure 4.1 - Mean Ranking of SAT Scores

	ORDER	N	Mean Rank
SAT	first-born	37	41.77
	middle	12	25.83
	youngest	16	28.72
	only	9	51.11
	Total	74	

Another interesting finding was that in a random sample there were several more first-borns in the undergraduate classes than any of the other birth orders. These results are depicted in Figure 4.2. Here you can see that the first-borns made up exactly half of

Figure 4.2 - Pie Chart of Demographics

26
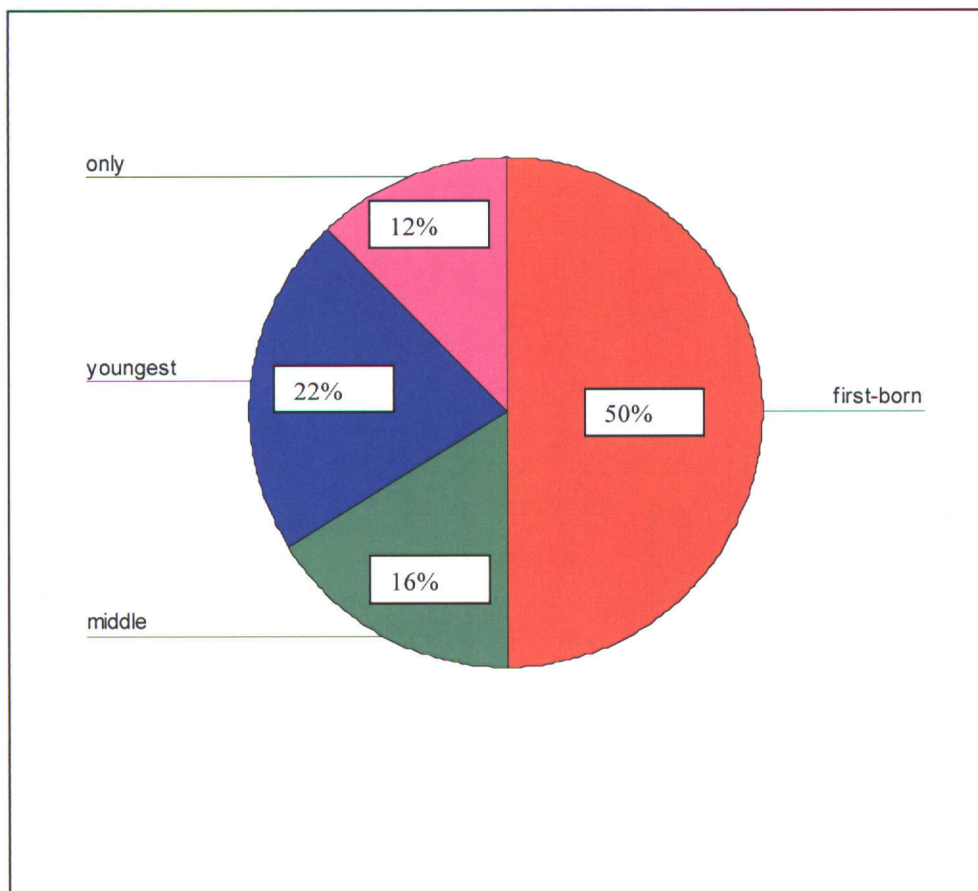
the sample or 50 % of the sample. The youngest were second, making up 22% of the sample. The middle child was next making up 16% of the sample and lastly was the only child making up 12% of the sample.

The results also showed that the majority of students that took the SAT's scored between 1001-1100 as depicted in Figure 4.3. In Figure 4.3, the SAT scores are represented in the first column as 1-7. "1" represents a score between 800-900, "2" represents a score between 901-1000, "3" represents a score between 1001-1100, "4" represents a score between 1101-1200, "5" represents a score between 1201-1300, "6" represents a score between 1301-1400 and "7" represents a score of 1400 & above.

Another interesting result is that the only person to score above 1400 was an only child. The only two people to score in the 1301-1400, the second highest SAT score, was again, an only child and a first-born.

Shown in Figure 4.4, a line graph, which shows the majority of the students, around 24 total, received a score between 1001-1100. In this figure, the SAT scores are represented as 1-7, just as they were in Figure 4.3.

Figure 4.3 - SAT * ORDER

Count

		ORDER				Total
		first-born	middle	youngest	only	
SAT	1.00	1	2	1	0	4
	2.00	4	4	5	0	13
	3.00	12	3	6	3	24
	4.00	14	2	3	3	22
	5.00	5	1	1	1	8
	6.00	1	0	0	1	2
	7.00	0	0	0	1	1
Total		37	12	16	9	74

Figure 4.4 – Distribution of SAT Scores
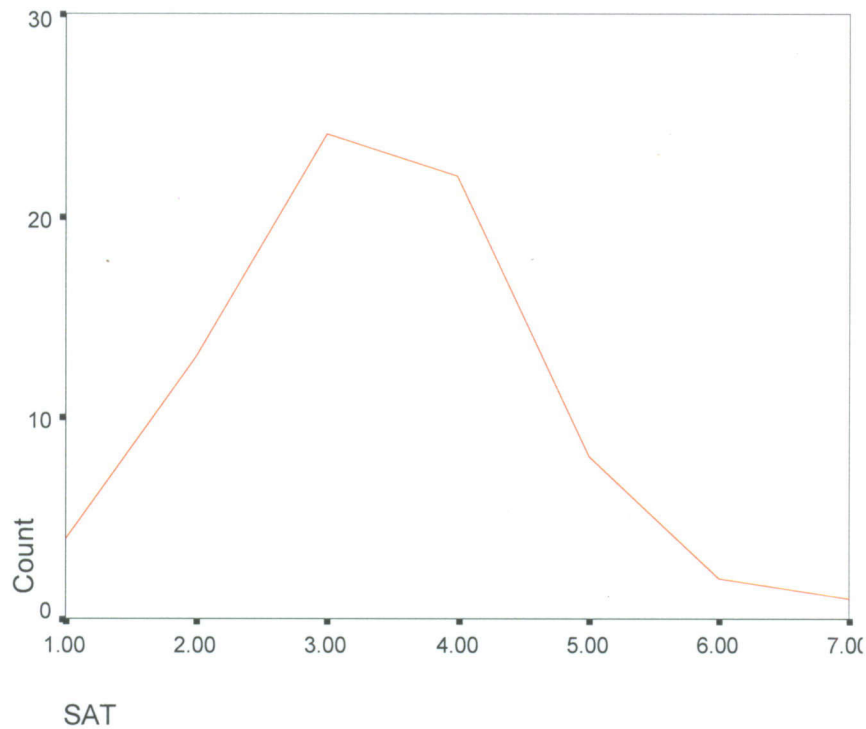
Summary

After analyzing the results from the questionnaire, there are some important conclusions. The alternate hypothesis has been accepted. The results show that there is a significant difference between SAT scores and birth order. The Kruskal-Wallis test found birth order to have a significant affect on SAT scores, $\chi_{(3)}^2=12.073$, which was significant at $p\leq.007$.

The majority of students were found to score in the range of 1001-1100 on their SAT's. Another surprising and interesting finding was the astounding percentage of first-borns found in a random sample of undergraduates. They consisted of half of the total sample.

Chapter Five:

Summary and Conclusions

The purpose of this study was to determine whether birth order affects intelligence. The study was performed by comparing data of birth order and SAT scores from undergraduate students. The SAT scores served as a measure of a student's intelligence.

The overall findings for research previously conducted in this area have been split. Some feel very strongly that birth order does affect intelligence, and have gone as far as creating different models to show how and why this occurs. Others criticized these results and preformed their own studies to show that birth order has absolutely no affect on intelligence.

The prediction made for this study is that birth order does have an affect on intelligence. The null hypothesis assumes that birth order does not have an affect on intelligence. The variables that were examined were birth order and SAT scores. Birth order was broken down into four variables, including: first-born, middle child, youngest and only child. SAT scores were broken into seven variables, including: 800-900, 901-1000, 1001-1100, 1101-1200, 1201-1300, 1301-1400 and 1400 & above.

One unexpected finding was in a random sample of students; there were several more first-borns in the undergraduate classes than any of the other birth orders. They made up 50% of the total sample.

Conclusion

The data collected in the study was analyzed using a Kruskal-Wallis test. The results of the calculation determined that birth order has a significant affect on SAT scores, $x_{(3)}^2=12.073$, which was significant at $p \leq .007$. The results also showed that in a random sample of undergraduate classes, half of the population consisted of first-borns.

The results of the study conclude that birth order does affect SAT scores. Specifically, only children preformed better on the SAT scores than first-borns, middle children and youngest children.

Discussion

Students who were only children performed better than first-borns, middle children and youngest children on SAT's. These finding were consistent with the research studies found in the literature. These results can be explained through Robert B. Zajonc's confluence model. Zajonc would not be at all surprised from my results, since his theory includes that only children do not have to share their parents' attention, so they benefit from their parents' complete absorption in the new responsibility of a child. Secondly, he believes that only children are exposed to more adult language and the linguistic environment becomes increasingly less mature as more children enter the family. According to Zajonc, this may affect their performance on the verbal scales of intelligence tests. Lastly, his theory includes that as more children enter the family, the general intellectual environment becomes less mature.

The unexpected finding that first-borns were the largest percentage in a random sample of undergraduate classes would support Schachter (1963) findings. Schachter

studied the correlation between birth order and plans for college at the University of Minnesota. He found a 12% surplus of first-borns in the undergraduate college.

Suggestions for Future Research

There were several factors that may have skewed the results. The sample used can be seen as a great limitation for the results. It was too small of a sample to represent the entire population. The sample also consisted of all undergraduate students at a liberal arts college in New Jersey. All of the students were all of a similar background, socioeconomically, and studying the same subject. The results may have varied drastically if the researcher had expanded the search into other subjects, schools, age groups and differing socioeconomic classes.

Another limitation to the study was the test used to measure intelligence. The SAT scores are only test that was supposed to represent a person's intelligence. Intelligence is determined by more than simply one test. If this experiment were to be researched further, several measures would be necessary to examine intelligence.

Lastly, this study compared SAT's of students to SAT scores of other students, it would be interesting to compare SAT scores within each family. For example, to see what a first-born scores on their SAT's, in comparison to their younger sibling. This study does not study SAT scores or intelligence within the family.

References

Armor, D. J. (2001). On Family Size and Intelligence. *American Psychologist*, 56, 521.

Belmont, L. & Marolla, F. (1973). Birth order, family size and intelligence. Science, 182, 1096-1101.

Birth Order and Intelligence. (1982, March, 27) *Science News*, 121, 218.

Blake, J. (1981). Family Size and the Quality of Children. *Demography*. 4, 421-442.

Buss, D. M. (1994). *The evolution of desire*. New York: Basic Books.

Diluting the intellectual environment. (1975, February 8). *Science News*, 107, 82.

Downey, D. B. (1995). When Bigger is not Better: Family Size, Parental Resources, and Children's Educational Performance. *American Sociological Review* 60: 746-761.

Downey, D. B, (2001). Number of Siblings and Intellectual Development: The Resource Dilution Explanation. *American Psychologist,* 56, 6/7.

Engler, B. (1999). Personality Theories: An introduction. Boston: Houghton Mifflin.

Esping, A. (2003). Does Birth Order Affect Intelligence? Retrieved September 23, 2004, from http://indiana.edu/~intell/birthorder.shtml#classic

Evans, J. E. & McClintic, M. (2002). Does Birth Order Impact Intelligence? Retrieved September 23, 2004, from http://clearinghouse.mwsc.edu/manuscripts/335.asp.

Ernst, C. & Angst, J. (1983). *Birth Order: Its influence on personality*. New York: Springer-Verlag.

Galton, F. (1874). *English men of science*. London: Macmillan.

Glass, D. C., Neulinder, J,. & Brim, O. G. (1974). Birth Order, Verbal Intelligence and Educational Aspiration. *Child Development*, 45, 807-811.

Guastello, D. D. & Guastello, S, J. (2002). Birth Category Effects on the Gordon Personal Profile Variables. *JASNH,* 1, 1-7.

Lowery, S. (1995). The Effect of Birth Order on Intelligence. Retrieved September 14, 2004, from http://www.mwsc.edu/psychology/research/psy302/fall95/lowery.htm

Manaster, G. J. (1974). Birth Order: An Overview. *Journal of Individual Psychology*, 33, 3-6.

MedicineNet.com (2004). Retrieved on November 3, 2004 from
www.medterms.com/script/main/art.asp?articlekey=8415 - 22k.

Michalski, R. H. & Shackelford, T. K. (2001). Methodology, Birth Order, Intelligence, and Personality. *American Psychologist,* 56, 520.

Needleman, R. (2001). Birth Order and Intelligence. Retrieved September 14, 2004, from http://www.drspock.com/article/0,1510,5629,00.html

Page, E. B. & Grandon, G. (1979). Family configuration and mental ability: Two theories contrasted with U.S. data. *American Sociological Review,* 56, 141-158.

Pereira, H. (2000). Sexual Orientation and Fraternal Birth Order. Retrieved October 14, 2004, from http://www.my3q.com/home2/19/henrique/21334.phtml?intPrint=1&id=

Pfouts, J. H. (1980). Birth Order, age spacing, IQ differences, and family relations. Journal of Marriage and the Family, 42, 517-531.

Retherford, R. D., & Sewell, W. H. (1991). Birth order and intelligence: Further tests of the confluence model. American Sociological Review, 56, 141-158.

Rodger, J. (2000). Are Firstborns Smarter? *Psychology Today,* 33, 20.

Rodgers, J. L., Cleveland, H. H., van den Oord, E. & Rowe, D. C. (2000). Resolving the debate over birth order, family size, and intelligence. *American Psychologist,* 55, 599-612.

Row, A. G., Birth Order and Intelligence: Is there a Correlation? Retrieved June 22, 2004, from http://www.clearinghouse.mwsc.edu/manuscripts/290.asp

Salem, R. (2004). Sibling Configuration: Impact on Educational and Health Outcomes of Adolescents in Egypt. (MSc Thesis, University of Oxford, 2004) Retrieved November 3, 2004 from www.sociology.ox.ac.uk/admin/salem.doc.

Schachter, S. (1963). Birth order, eminence and higher education. *American Sociological Review,* 28, 757-768.

Shaw, C. (2004). The Relationship Between IQ and Family Size. (Senior Thesis, 2004). Retrieved on October 30, 2004, from www.hillsdale.edu/academics/downloads/shaw.doc

Stein, H.T. Adlerian Overview of Birth Order Characteristics. Retrieved October 5, 2004, from http://ourworld.compuserve.com/homepages/hstein/birthord.htm.

Sutter, L. M. Ohio State University Extension Fact Sheet. *Birth Order*. Retrieved from
http://ohioline.osu.edu/hyg-fact/5000/5279.html

Sternberg, R. J. (1997). The concept of intelligence and its role in lifelong learning and
success. *American Psychologist*, 52, 1030-1037.

Wark, D. W., Swanson, E. O., & Mack, J. (1974). More on Birth Order: Intelligence and
College Plans. *Journal of Individual Psychology*, 30, 221-226.

Willett, E. (2001). Birth Order. *Science Columns*. Retrieved October 3, 2004, from
http://www.edwardwillett.com/Columns/birthorder.htm

Zajonc, R. B. & Markus, G. B. (1975). Born First, Born Smarter? *Psychology Review*, 82,
74-88.

Zajonc, R. B. (2001). The Family Dynamics of Intellectual Development. *American
Psychologist*, 56, 6/7

Appendixes

Appendix A

Consent Form

I agree to participate in a study entitled "Does Birth Order Affect Intelligence?" which is being conducted by Carolyn Lambert, a graduate student at Rowan University. The research project will be preformed under the supervision of Dr. Roberta Dihoff and Dr. John Klanderman of the Psychology Department, Rowan University.

The purpose of this study is to determine if the order in which one is born within their family has an affect on one's intelligence.

The data collected in this study will be combined with data from previous studies and will be submitted for publication in a research journal.

I understand that I will be required to complete a survey, which will ask general information including; my age and gender, my birth order and my SAT scores. I will be assigned to work independently. My participation in the study should not exceed 20 minutes.

I understand that my responses will be anonymous and that all the data gathered will be confidential. I agree that any information obtained from this study may be used in any way thought best for publication or education provided that I am in no way identified and my name is not used.

I understand that there are no physical or psychological risks involved in this study, and that I am free to withdraw my participation at any time without penalty.

I understand that my participation does not imply employment with the state of New Jersey, Rowan University, the principal investigator, or any other project facilitator. If I have any questions or problems concerning my participation in this study I may contact Dr. Roberta Dihoff at (856) 256- 4500 ext. 3776 or John Klanderman at (856) 256-4500 ext. 3797.

_____   _____
(Signature of Participant)   (Date)

_____   _____
(Signature of Investigator)   (Date)

Appendix B

Questionnaire

1.   Your age:

below 16   16-18   19-21 22-24 25-27 28+

2.   Your gender:

Male   Female

3.   Your SAT score:

800-900   901-1000   1001-1100

1101-1200   1201-1300   1301-1400

1401-1500   1501-1600

4.   Do you have any brothers or sisters?
      If your answer is "Yes", please continue.
      If your answer is "No", your participation ends here. Thanks

Yes   No

5.   Are all brothers and/or sisters of the same biological parents?

Yes   No

6.   Are you:

Oldest Child   Youngest Child

Middle Child   Only Child

7.   Consider all your brothers and/or sisters. Select the ONLY option for your case.
      If your answer is "2nd or more", please continue.
      If your answer is "1st", your participation ends here. Thanks!.

I am the 1st brother/sister of all my brother(s)/sister(s)

I am the 2nd brother/sister of all my brother(s)/sister(s)

I am the 3rd brother/sister of all my brother(s)/sister(s)

I am the 4th (or more) brother/sister of all my brother(s)/sister(s)

Please select the ONLY option that best describes your case.

8.   In case you are the 2nd of your brothers/sisters:
        My older brother is a man

        My older sister is a woman

9.   In case you are the 3rd of your brothers/sisters:

        I have a 1st older brother, and a 2nd older brother

        I have a 1st older brother, and a 2nd older sister

        I have a 1st older sister, and a 2nd older brother

        I have a 1st older sister, and a 2nd older sister

10   In case you are the 4th of your brothers/sisters, please describe your order:
e.g. 1st man, 2nd man, 3rd woman, 4th me

_____

_____

11   In case you are the 5th of your brothers/sisters, please describe your order:

_____

_____

12   In case you are the 6th or more of your brothers/sisters, please describe your order:

_____

_____