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Abstract

Although learning disabilities (LD) are widely discussed in the literature, many aspects of the field remain ambiguous and confusing. The validity of research on LD is compromised by the use of discrepant definitions. These incompatible and often insufficient criteria also make it nearly impossible to draw generalizable conclusions from many studies. Further , there has been surprisingly little research done describing demographic characteristics of the LD population, with most of these studies focusing on children. Prior studies have indicated correlations between learning disabilities and such factors as handedness, gender, prior family history of the disorder and birth trauma. The present study investigates the strength of these correlations in an adult population using more generalizable DSM-III-R criteria. Subjects were 55 adults referred to a psychology clinic and diagnosed as learning disabled. A control group of 39 adults also referred to the clinic for assessment of learning problems but not diagnosed as LD was also employed. All subjects completed an information gathering questionnaire which collected such background data as ethnicity, income, handedness, occupation, family history of LD and childhood illness and injury. Comparisons were made between LD subjects and the learning problem (LP) group and no significant differences were found in handedness, family history of LD, perinatal problems or occurrence of head trauma.

Demographic and Background Characteristics of Learning Disabled Adults

Although learning disabilities (LD) are widely discussed in the literature, the field remains ambiguous and confusing. Prevalence of the disorder can only be estimated due to the absence of universal identification criteria. It is thought that up to 15% of adults have some type of LD (Advisory Committee on Educational Opportunities for Adults, 1984). In addition, 4% of school age children are considered LD according to the U.S. Dept. of Education. The number identified has more than doubled since laws regarding special education took effect in 1975 (Kavale, 1987). This phenomenal increase is a direct result of the lack of uniform criteria and the vulnerability of existing criteria to vague interpretation.

In addition to the overidentification of LD in educational settings, these insufficient criteria also damage the validity of research done in the area. Over half of the published LD research is based on school-labeled learning disabled students (Swanson, 1987). Because criteria vary from school to school, it is often impossible to draw generalizable conclusions from these studies or to replicate them.

The matter is complicated further by the heterogeneity of the disorder. There are numerous subtypes that fall under the heading of LD, making it nearly impossible to create a set of identifying criteria that would encompass the entire disorder. At this point, specific criteria need to be devised for each subgroup relative to the causes of their difficulties. However, at present it is still uncertain what the exact causes are. There have been many proposed etiologies of LD, but a consensus has not been reached and does not look likely in the near future. Full appreciation of the confusion surrounding learning disabilities begins with a review of prevalent attempts to define the construct.

Definitions of LD

Despite its weak points, the definition most frequently cited in research over the past years is that adopted by U.S. federal legislation (Adelman, 1983). It defines LD as:

> A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or do mathematical calculation. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia

> and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing or motor handicaps, of mental retardation, or emotional disturbance or of environmental, cultural or economic disadvantage (Fed. Register, 1973, P.23230).

This definition's widespread use has damaged attempts to uncover etiologies of LD. Including all subtypes of LD in a single category blurs differences between the subtypes that are important in etiological research (Adelman, 1983).

Since the original definition, more operational diagnostic criteria have been proposed. For example:

> A specific LD may be found if a child has a severe discrepancy between achievement and intellectual ability in one or more of several areas: oral expression, written expression, listening comprehension or reading comprehension, basic reading skill, mathematics calculation, math reasoning or spelling. A "severe discrepancy" is defined to exist when achievement in one or more areas falls at or below 50% of the child's expected achievement level, when age and previous

> educational experience are taken into consideration (Federal Register, 1976, p. 52405).

This mathematical formula, proposed by the Bureau of Education for the Handicapped, was rejected as being theoretically unsound and leaving little room for clinical interpretation. The revised definition in the final regulations (Fed Reg, 1977, p. 65083) kept the severe discrepancy between IQ and achievement but remained broad and open to interpretation (Norman & Zigmond, 1980).

The most recent effort to define LD involves The National Joint Committee for LD (NJCLD), which consists of 6 major organizations concerned with LD: The American Speech-Language-Hearing Association (ASHA), the Association for Children and Adults with LD (ACLD), the Council for LD (CLD), the Division for Children with Communication Disorder (DCCD), the International Reading Association (IRA) and the Orton Dyslexia Society. The following definition was devised to resolve the problem of labeling LD as a homogeneous disorder, the prior exclusion of adults and preschool children, the vagueness in regard to etiology and the lack of a specified relationship to other handicapping or environmental conditions:

> Learning disability is a generic term

> that refers to a heterogenous group of disorders manifested by significant differences in the acquisition and use of listening, speaking, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to CNS dysfunction. Even though an LD may occur concomitantly with other handicapping conditions (e.g. sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g. cultural differences, insufficient/inappropriate instruction, psychogenic factors), it is not the direct result of those conditions or influences (reprinted in Hammill, Leigh, McNutt, & Largen, 1981, p. 336).

In addition to federal definitions of LD, most states also have their version of criteria for LD diagnosis. For example, in Iowa students must meet the following requirements to be diagnosed as learning disabled:

> normal hearing and vision (after correction): primary disability not emotional disorder; major IQ test scores above minus one standard deviation; discrepancy between academic achievement and grade placement

(approximately one standard deviation below grade placement on standardized achievement test) not attributable to inconsistent or poor educational experience; and achievement reliably lower than intelligence (Cone, 1985).

As mentioned before, it is difficult to generalize the results of studies using school or state-specific criteria. Using federal or nationwide definitions is not much more reliable due to their failure to distinguish between subtypes of the disorder. Using the DSM-III-R (American Psychiatric Association, 1987) criteria for LD would help solve both concerns. The DSM-III-R is widely accepted in the U.S. as the common language of mental health clinicians and researchers for communication about disorders. It also divides LD criteria in categories according to subtypes; for example:

Criteria for Developmental Arithmetic Disorder

A. Arithmetic skills, as measured by standardized, individually administered tests, are markedly below the expected level, given the person's schooling and intellectual capacity (as determined by an individually administered IQ test).

B. The disturbance in A significantly

interferes with academic achievement or activities of daily living requiring arithmetic skills.

C. Not due to a defect in vision or hearing acuity or a neurologic disorder (American Psychological Association, 1987).

While some of the terminology used in the DSM-III-R may be considered ambiguous (i.e., "markedly", "significantly"), this allows for clinical interpretation on an individual basis. Although this may not be an ideal characteristic in all cases, the DSM's widespread acceptance still makes it's criteria the most viable for research.

Proposed Characteristics and Correlates of LD

Demographic Characteristics

There have been surprisingly few studies describing demographic characteristics of the LD population. The studies that have been done focus largely on children; in particular children school-identified as LD. The data produced are largely ungeneralizable due to a lack of information about subjects and discrepant defining criteria.

One of the first studies of LD characteristics was done by Kirk and Elkins in 1975. Their subjects were

3,000 students enrolled in Child Service Demonstration Centers (CSDCs) for LD in 21 states. In general, children with LD are defined by most CSDCs to be those below grade in educational achievement, especially in reading. They found a 3 to 1 ratio of boys to girls; that reading, math, spelling and language problems were most common, and when teachers were asked to rate each child as (a) severely LD, (b) moderately LD, or (c) mildly LD, they rated students as severely LD more than twice as often as the independent raters (the authors).

In 1980, Norman and Zigmond did a similar study of 2,000 students being served in CSDCs in 22 states. They found similar results with a 3.7:1 ratio of males to females. They also found LD to be proportionate across socioeconomic levels. Disturbingly , they also reported a lack of consistency in applying the criteria of underachievement (i.e. significant discrepancy between IQ and achievement). Nearly 53% of the students were not underachieving when strict criteria were applied. They concluded that large numbers of students in LD programs may not actually be learning disabled.

Shepard, Smith and Vogir (1983) studied the files of 800 children in Colorado identified as LD by educators. A coding form was used to extract relevant information from the case files of the children. Fewer than half the sample had characteristics associated with definitions of

LD in federal law and professional literature. Included in the group were children classified as hyperactive, brain-injured, mildly retarded or who exhibited emotional disorders. Inclusion of these groups significantly confounds the validity of research in the area and warrants consideration on the part of current researchers.

Neurological Correlates of LD

Perinatal Factors

The relationship between perinatal risk factors and learning problems has been a controversial issue since the late 1950's. There have been a variety of studies in the area, the majority focusing on children born prematurely or with very low birthweight.

Fitzhardinge and Stevens (1972) found 25% of the full-term small-for-birthdate infants in their study suffered minimal cerebral dysfunction, hyperactivity, short attention span and learning difficulties. Fifty percent of the boys and 36% of the girls showed poor school performance.

Cohen et al (1988) studied 89 children born preterm (birth weight < 2,500 grams and gestational age equal to or less than 37 weeks). The children's development was monitored from birth to age eight using a variety of measures. The incidence of learning problems for children of normal intelligence (WISC-R Full Scale IQ score above 80) in the study was 25%. Although most of the preterm infants did not show learning problems (75%), the overall rate of 25% is considerably higher than in the general population which is typically estimated to be between 3 to 7% (Lewis, 1986).

Fuller et al (1983) observed the brains of 16 premature infants who died within the first month of life using microscopic examination. They found lesions in the gray-matter and white-matter of many areas, including superficial cortical and deep basal brain structures.

They hypothesized that these lesions may be precursors to later LD syndromes in surviving infants since similar lesions correlate with varying degrees of brain dysfunction.

Lateralization

Many years ago, Orton (1937) put forth the idea that weak or mixed laterality reflects a failure of the left cerebral hemisphere to establish dominance over the right hemisphere. According to this model, the right hemisphere then "seizes the opportunity" to participate in activities such as reading and writing though it normally would not. This results in spatially reversed representations of stimuli and verbal output characterized by reversal errors. Much of the current concern with children's sidedness can be traced to Orton's idea, though most studies have not resulted in conclusive evidence to support it.

Cerebral lateralization refers to a state of cerebral organization in which there are qualitative or quantitative differences between the functions of the left and right hemispheres. It cannot be measured directly; it must be inferred (Hiscock, 1983).

One indirect method of studying lateralization involves lateral preference as measured by handedness, eyedness and footedness. Another is measurement of perceptual asymmetries through dichotic listening and visual half-field presentation (Obrzut, 1986).

Geschwind and Behan (1982) found that strong left-handers (measured by Oldfield's handedness battery) were 10 times more likely to exhibit a learning disability than strong right-handers.

Schacter, Ransil and Geschwind (1987) distributed a questionnaire to 1117 randomly selected professionals. Lateralization scores were calculated for each subject based on the handedness inventory. LD was found to be approximately 6 times more frequent in the left handed subjects than those who were fully right handed.

Genetic Influences

There has been some evidence that LD's or at least some subtypes of learning disabilities may run in families. Dyslexia, a difficulty in the development of reading and spelling in the absence of lowered general intelligence, socioeconomic disadvantage, emotional disturbance, neurological impairment or sensory handicaps, is probably most researched in terms of familiality (Pennington, 1985).

Twin studies have provided a reliable method for separation of genetic and environmental factors. One study compared 31 pairs of monozygotic (MZ) and 31 pairs of dizygotic (DZ) twins between the ages of 8 and 18. They found an 84% concordance rate for MZ twins (26 out of 31), compared to 9 out of 31 or 29% in DZ pairs (Bakwin, 1973).

Subsequent studies have been conducted using more specific age groups. Stevenson et al (1986) examined a large number of adolescent twins in London, some of whom were dyslexic. They found only a modest heritability for reading ability and disability but a significant heritability for spelling ability and disability.

There have also been many family studies of dyslexia. The Colorado Family Reading Study (Decker & DeFries, 1981; DeFries & Decker, 1981) involved 125 reading-disabled children and their immediate families matched with 125 control children and their families.

Subjects were given a battery of reading and cognitive tests, the scores from which were reduced to 3 factors: reading, spatial/reasoning & coding/speed. Dyslexic children and their families scored significantly lower than controls on the reading and coding factors. Dyslexic children were also lower than controls in spatial/reasoning while their families did not differ from the controls.

In reviewing the literature, it becomes obvious that the term "learning disabled" connotes many meanings. To some, the field encompasses all children who are not conforming with expectations of parents and teachers. To others, it includes all handicapped children except those requiring highly specialized programs (i.e., deaf, blind or severely retarded). The preceding studies seem to indicate that a person with a learning disability would most likely be a left handed male who experienced a traumatic birth and has parent or siblings who also have an LD. While evidence for each of these characteristics in the LD population can easily be found in the literature, the strength of these correlations is still uncertain. Existing studies have been ineffective in resolving this ambiguity due to lack of detail and discrepant diagnostic criteria.

Objectives and Rationale

The primary purpose of this study was to provide detailed descriptive data on demographic characteristics of an LD population, an area in which little research has been published (Cone, 1985). This study used widely accepted diagnostic criteria (DSM-III-R) which can be easily generalized. Objectives of the study included the following:

1. To provide detailed generalizable data to the sparse body of existing knowledge regarding demographics of the learning disabled population.
2. To compare demographic characteristics of adults with LD to demographic characteristics of a control group with learning problems but without LD, which has been a weakness of previous LD research.
3. To examine demographic differences in specific subgroups within the LD population, an area that has been sorely neglected.

The rationale for the study was based on the following:

1. There is a need for methodologically sound LD research, especially in the area of demographics which has been largely ignored.
2. A demographic profile could be useful in early identification of LD and subsequent intervention.

3. Research on subtype differences would greatly facilitate etiological studies of these subtypes.

Hypotheses

1. It was proposed that there would be a greater number of subjects with perinatal problems in the LD group than in the control group. This hypothesis is consistent with previous studies which have noted larger proportions of LD in premature or very low birthweight infants than in the general population (Fitzharinge, 1972; Cohen, 1988).
2. Also consistent with the existing literature (e.g., Geschwind, 1982; Schacter, 1987), it was predicted that the prevalence of left handedness in the LD group would be greater than in the learning problem (LP) group.
3. As mentioned in the literature review (e.g., Pennington, 1983); Stevenson, 1986), genetic influences were also expected to have an effect on LD diagnosis. It was proposed that there would be a greater prevalence of family members with learning disabilities in the LD group than in the LP group.
4. It was also predicted that the LD group would

have a greater incidence of head injury than the non-LD group. It has been noted in prior literature that children with head injuries account for nearly 1% of the LD population (Shepard, 1983).

5. In the literature, it is noted that spelling problems have been closely linked with genetics while reading problems are not as strongly associated (Stevenson, 1986). It was predicted that in this study LD subjects with expressive writing disorders would have a family history of LD more often than subjects with reading or math disorders.

Method

<u>Subjects</u>

Fifty-five adults (twenty-seven males and twenty-eight females) were included as subjects in Group 1. These subjects were referred to the UCLA Psychology Clinic for assessment of learning problems. Their ages ranged from 18 to 58 years with a mean age of 31.9 years. Subjects were from the Los Angeles area and their median income was $21,000. There were 42 white subjects, seven African-American subjects, four hispanic subjects, one Asian-American and one native american. All subjects in Group 1 were diagnosed as learning disabled (i.e., having an Academic Skills Disorder) according to criteria stated in the DSM-III-R. Group 2 consisted of thirty-nine adults (twenty-three males and sixteen females). These subjects came to the UCLA Psychology Clinic for assessment of learning problems but were not diagnosed as LD. Their ages ranged from 18 to 58 years with a mean age of 29.9 years. These subjects were also from the Los Angeles area and had a median income of $14,760. There were 30 white subjects in this group, four African-American subjects, three hispanic subjects and one Asian-American subject.

Procedure

Subjects were given an intake interview at the time of presentation. The interview covered background information such as medical history, ethnicity, income and handedness. If subjects pursued testing, they were administered a variety of tests such as the Weschler Adult Intelligence Scale-revised (WAIS-R), Woodcock-Johnson Achievement Battery and Minnesota Multiphasic Personality Inventory (MMPI), in three separate sessions. Based on test results and background information subjects were diagnosed using the DSM-III-R. Data were collected from subjects' files for this study and all identifying information was removed.

Measures

In both groups, subjects were asked to complete an intake information form upon arrival at the clinic. The information gathering questionnaire collects such background data as ethnicity, income, handedness, occupation (or parents' occupation), family history of LD, childhood illness, childhood injury and presenting problems.

Design

In addressing hypotheses, a simple, non-randomized between groups design was used. The major comparisons were between LD status groups (i.e., LD and non-LD). For hypothesis #5, comparisons were made between subtypes of LD (i.e., reading/arithmetic and writing).

Analyses

Primary Analyses

All hypotheses were analyzed using tests for significance of difference between two proportions. For hypothesis #1, the LD group was compared to the LP group on perinatal trauma status (i.e., perinatal trauma vs. no perinatal trauma). The LD group was compared to the control (LP) group by handedness for hypothesis #2 and by family history for hypothesis #3. The fourth hypothesis compared LD status groups according to occurrence of head trauma (i.e., head trauma vs. no head trauma). The fifth compares LD subtypes (i.e., expressive writing vs.

reading and arithmetic) on the presence of family history of LD.

Secondary Analyses

Descriptive statistics (means, standard deviations, medians or percentages) were calculated on the LD group for the following characteristics: gender, age, ethnicity, education and diagnosis.

Results

Primary Analyses

Tests of significance of difference between two proportions were performed to analyze all of the primary hypotheses. In hypothesis one, I predicted that a greater number of subjects in the LD group would report perinatal problems than in the LP group. After analysis, no significant difference between groups was found ($p>.05$)(see figure 1). Hypothesis two predicted a greater frequency of left handedness in the LD group than in the LP group. This hypotheses was supported. There was a significant difference in handedness between the groups ($z=2.15$; $p<.05$)(see figure 2). Thirty two percent of the LD group were left handed while only eight percent of the LP group were. The third hypothesis proposed a greater prevalence of family history of LD in the LD group than in the LP group. There was, however, no significant difference between the groups ($p>.05$)(see figure 3). In hypothesis four, I predicted that the LD group would have a greater incidence of head injury than the LP group. No significant differences were found between the groups ($p>.05$)(see figure 4). The fifth hypothesis proposed a greater prevalence of family history in the LD subjects with expressive writing disorder than in the LD subjects with either reading or arithmetic disorder. There were, however, no significant differences found between the groups ($p>.05$)(see figure 5).

Secondary Analyses

Descriptive statistics were obtained on the groups for the following variables: gender, age, ethnicity, income, education and diagnosis. T-tests were performed comparing the LD and LP groups for age and income and no significant differences were found ($p>.05$). Ethnicity and gender of both groups were also compared. A chi square analysis was performed and no differences were found between the groups on these variables ($p>.05$). A t-test was also done comparing the education level of the LD and LP groups and no significant difference was found ($p>.05$). The mean education of the LD group was 12.9 years while the mean education of the LP group was 13.2 years. In addition, the frequency of reading, writing and arithmetic disorder within the LD group was also examined. Reading disorders were diagnosed in 62% of the LD sample, followed by writing disorders in 25% and arithmetic disorders in 13%.

Discussion

The support of my second hypothesis, greater prevalence of left handedness in the LD than in the LP group, is consistent with the findings of many of the previous studies. The incidence of left handedness in populations of learning disabled children has consistently been found to be significantly higher than in the general population and this fact has led to the claim that left handedness in and of itself may be a symptom of compromised neurologic integrity (Hartlage and Telzrow, 1986).

However, the fact that most of my hypotheses were not supported raises some interesting questions. There are at least three possible explanations for this lack of support. One would be that the findings of previous studies are inaccurate. This is conceivable considering the controversy surrounding learning disabilities and the discrepancies in previous demographic studies in the area. Another, possibly more plausible explanation, is the control group implemented in my study. It is possible that by using a control group with learning problems, there was not a valid distinction between the groups. A third possibility is that the DSM-III-R criteria did not accurately differentiate the LD subjects from the non-LD subjects. With the wealth of existing diagnostic criteria for LD, it is possible that an alternative definition would perhaps be more valid.

Limitations

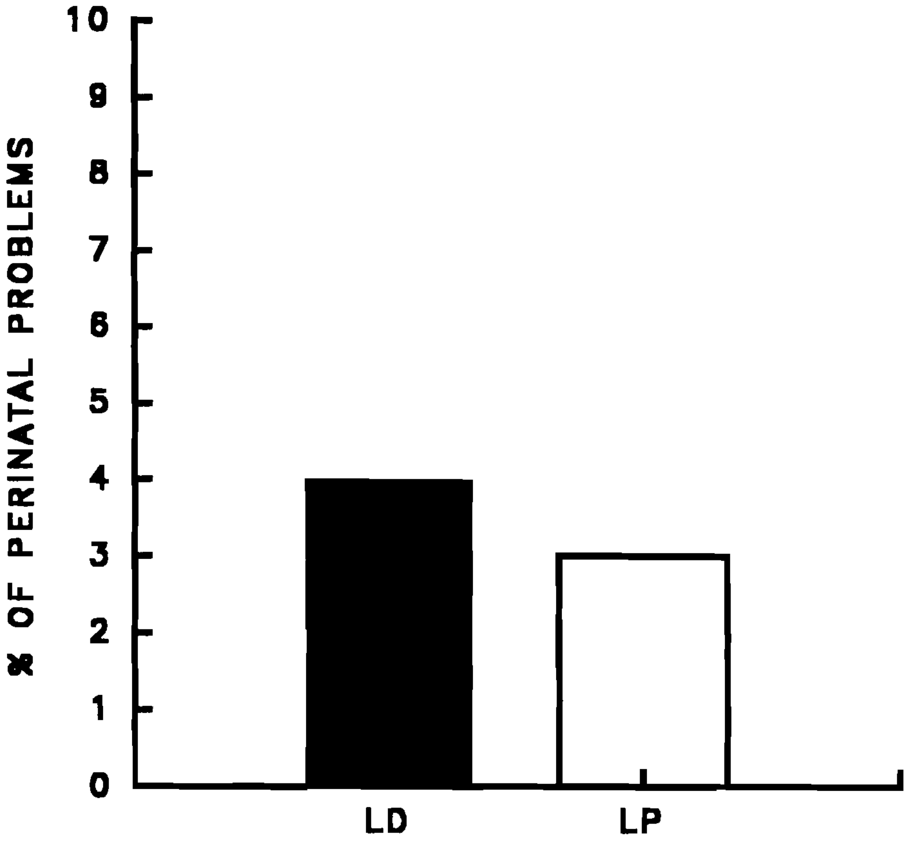
Several limitations of this study should be noted. The first and probably most important limitation of the study is the control group used. The fine distinction between the two groups (LD and LP) may have had an effect on the significance of the results. A second limitation is the limited geographical location from which data were collected. Because all data were gathered in the Los Angeles area, results cannot be generalized to the entire LD population. Another shortcoming of the study is that the data were collected prior to the conception of the study. Therefore we were not able to gather information that may have been useful to the study (e.g., age of onset, information about family background). Also, subjects reported retrospectively on history of illness, head trauma and family history of LD. Since their recollections may be inaccurate, it would be best to get independent data about this. Lastly, all the subjects were self-referred. They may not be representative of the LD population, since most LD subjects do not actively seek treatment. These limitations may, at least in part, account for the lack of findings in the study.

Direction for Future Research

The results of this study provide many directions for future research. Most importantly, another study should be done using a control group with no identified learning problems. Perhaps significance could be obtained using a more differentiated control group. A larger number of subjects might also reflect differences not seen in this relatively small sample used in this study. More equally represented diagnostic groups might also aid in making comparisons among these groups, and possibly lead to more significant findings. One last idea would be to use different LD identification criteria to test these hypotheses. This would help us determine if the lack of significance in the present study was caused by limitations in the DSM diagnostic criteria.

FIGURE 1.

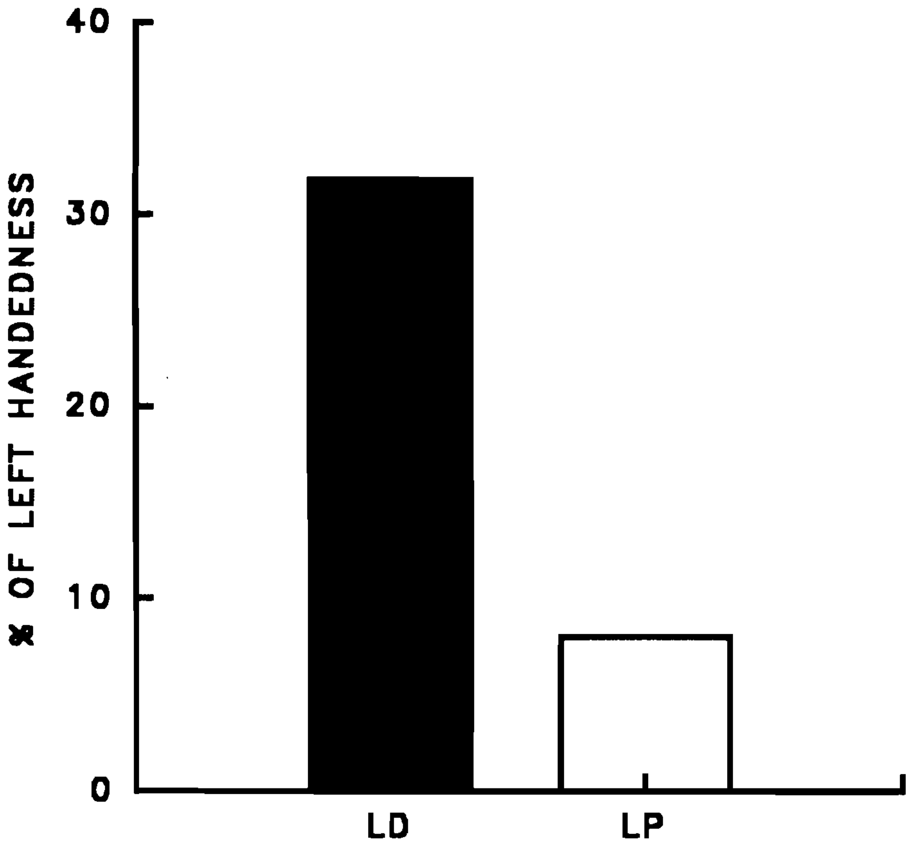
HYP #1: More subjects will have perinatal problems in the LD group than in the LP group.



*The LD group did not differ significantly from the LP group ($p > .05$).

FIGURE 2.

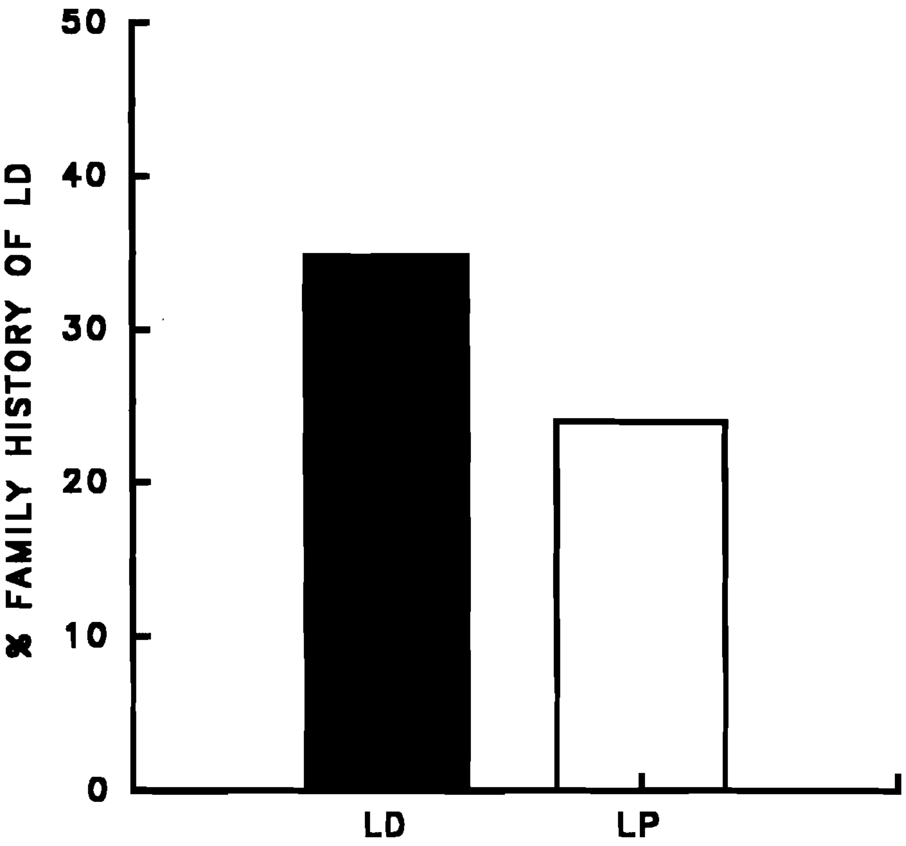
HYP #2: Prevalence of left handedness will be greater in the LD group than in the LP group.



*The LD group differed significantly from the LP group ($p<.05$).

FIGURE 3.

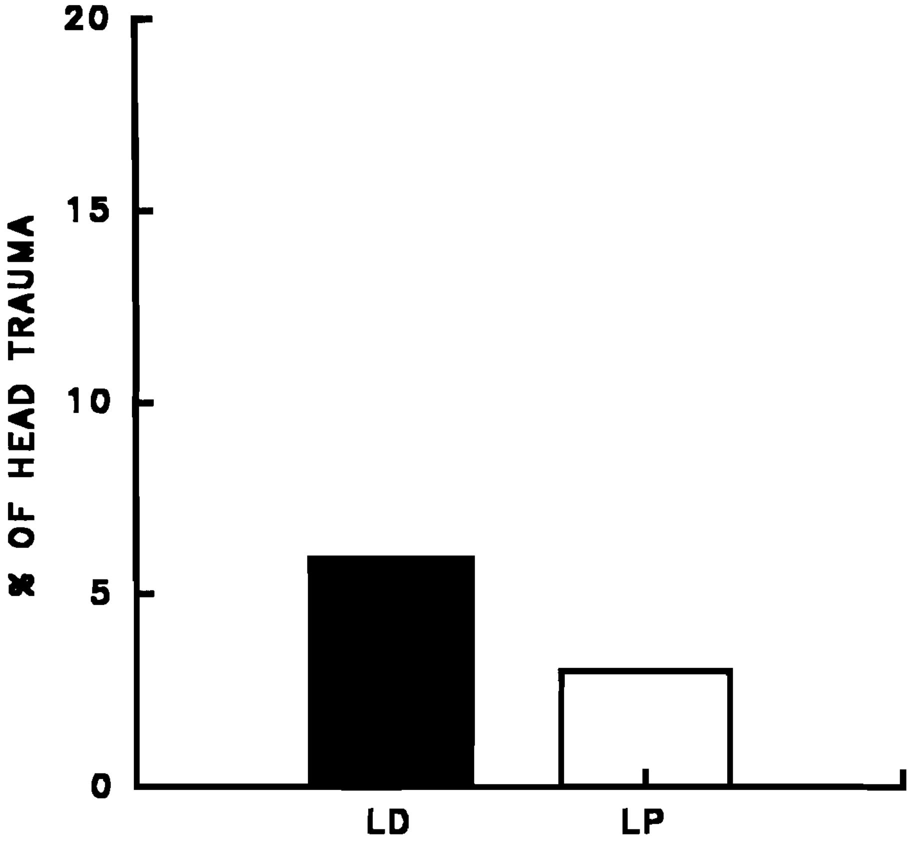
HYP # 3: Prevalence of family members with LD will be greater in the LD group than in the LP group.



*The LD group did not differ significantly from the LP group ($p > .05$).

FIGURE 4.

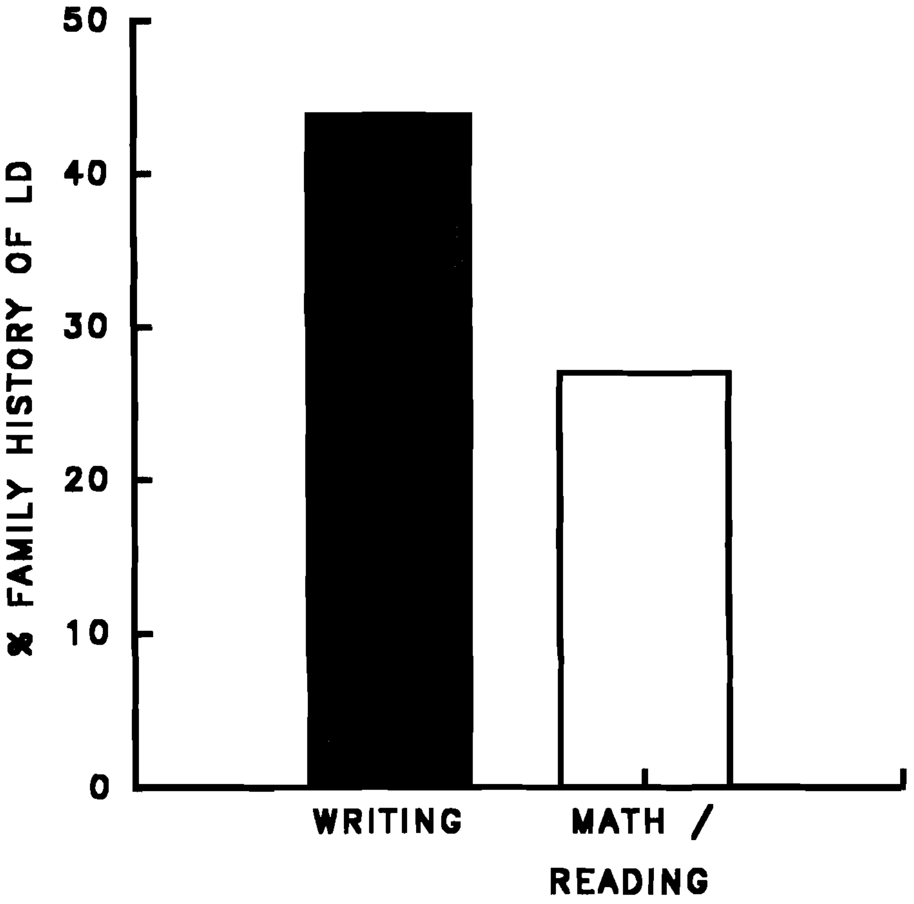
HYP # 4: The incidence of head injury will be greater in the LD group than in the LP group.



*The LD group did not differ significantly from the LP group ($p > .05$).

FIGURE 5.

HYP # 5: LD subjects with expressive writing disorder will have a family history of LD more often than subjects with reading or math disorders.



*The LD group did not differ significantly from the LP group ($p > .05$).

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