CONSERVATION OF NUMBER: A COMPARISON BETWEEN CULTURES AND SUBCULTURES

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One of the questions which must be raised with each theory of psychological development is that of its universality. Specifically, how universally, across cultures and subcultures, is the theory applicable? The general position of Piaget and the Geneva group is reflected in the statement by Inhelder and Piaget (1958) that a particular social environment is indispensable for the realization of cognitive possibilities. Their position is that development can be accelerated or retarded as a function of cultural and educational conditions but that the pattern of development is independent of culture.

Given this background we are then faced with the profitable but painstaking task of discovering not whether culture has an influence but exactly how specific environments influence performance on a specific developmental task. Goodnow (1962) has made a valuable contribution to this task. She studied the performance of four different cultural groups living in China. She found that on the tasks of conservation of space, weight and volume, similarities across milieus were more striking than differences.

The purpose of this study is to investigate a different task, the conservation of number, in two subgroups in Medellin, Colombia and to compare the findings of the Colombian sample with the results of a study (Wallach and Sprott, 1964) which tested children in the United States. The question of interest is how well cultural differences across this spectrum influence performance on a task of conservation of number. In light of previous research it is expected that there will be some maturational differences (Meredith, 1969) with th U. S. sample being more precocious. Also the economic and cultural advantages of the Colombian middle class over the Colombian working class is expected to result in comparatively accelerated performance for the middle class children. However, it is expected that as in Goodnow's work (1962) the differences will be overshadowed by the general similarity of the group's performance.

METHOD

SUBJECTS

The data from the children in the U. S. sample was not gathered by this investigator but were collected by Wallach and Sprott (1964).

Fifty-eight conserving and nonconserving males and females were involved. They were from a middle class public school in a small university town. They ranged in age from 6 years, 5 months to 7 years, 11 months.

The children of the Colombian samples were from two groups chosen to represent the two general subcultures typically found in a Latin American city. The middle class Colombian children (males and females) were from a private school in Medellin which is attended almost exclusively by children of professional and entrepreneur classes with a few children coming from families of white collar workers. There were 70 children in this group and they ranged in age from 5 years, 11 months to 7 years, 10 months with the mean of 6 years, 7 months. The 34 children (males and females) in the working class sample were from two schools attended exclusively by children of manual laborers and factory workers. They ranged in age from 5 years, 9 months to 7 years, 10 months with a mean of 6 years, 10 months. All of the children in the Colombian sample spoke Spanish, were taught in Spanish and came from homes in which Spanish was the only language used in everyday communication.

The number of subjects noted does not include all of the children which were tested but only those who were clearly conservers or nonconservers. The rest were eliminated from the tabulations. Including those eliminated there was a total of 66 children in the U. S. sample, 87 children in the Colombian middle class sample and 40 children in the Columbian working class sample.

MATERIALS

Either white five by three inch cards or checkers were used by Wallach and Sprot (1964) with the U. S. sample. Small white paper chips about the size of a U. S. nickle were used with the Colombian sample. Zimilies (1966) and Roll (in press) have found that stimulus characteristics, even across a broad range of attractiveness and desirability do not effect performance on tasks of conservation of number. In light of this it was expected that the small differences in material would not be a contaminating factor.

PROCEDURE

The procedure was based on the design used by Wallace and Sprot (1964) with the U. S. sample. The instructions were given to the Colombian children by a native speaker. The experimenter (*E*) introduced the task to the child (*S*) by telling the *S* that the *E* wanted to see how well he could perform some tasks. Following this there were three diagnostic tasks. They were attempts to find out if the *S* was able to reproduce a particular cardinal number and if he was able to establish and recognize a relationship of numerical

equivalence between two collections of objects. If he did not have these basic numerical abilities he was omitted from the rest of the study. The tasks were:

1. *Number production.* The *S* was given a pile of 12 chips and told "give me six of them."

2. *Number equivalence.* The *E* laid out a row of seven chips and told the *S*, "Now you put down just as many of your chips over here (indicating an imaginary row parallel to the *E*'s row) as I have here."

3. *Recognition of equivalence.* The *E* laid out two rows of seven chips each. The rows were parallel and directly opposite each other. Then the *S* was asked, "Do you have more chips in your row (*E* pointed to the row nearer the *S*) or do I have more chips in my row (*E* pointed to the row nearer himself) ?"

Then the *S* was given six trials to test for presence or absence of conservation of number. Before each trial the "recognition of equivalence question" (number three above) was given to make sure that the *S* noted that there was in fact an equal number of objects in each row. After each trial of the conservation test the following question was asked, "Do you have more chips in your row or do I have more chips in my row or do we have the same number of chips?" The conservation trials were as follow:

1. One row of objects was extended in both directions so that it covered a space twice as long as the original row. (All trials involved two rows of objects.)

2. One row was divided into 2 rows and each of those rows was as long as the unchanged row. Care was taken to make sure that the *S* understood that the two newly formed rows were to be considered as a unit when being compared to the unchanged row.

3. One row was placed vertical to the horizontal row and made to cover an area twice as long as the unchanged row.

Tasks four through six were identical to tasks one through three respectively, with the exception that in the first three trials there were 7 objects in each row and in the second three trials there were 12 objects in each row.

Those *S*s whose responses indicated that they were able to consistently ignore spatial and orientational cues and make decisions related to the actual number of objects were judged as "conservers." Those *S*s who consistently ignored equality of number of the objects and made decisions related to spatial and orientational cues were judged to be "nonconservers." In this context "consistently" is defined as a minimum of 5 out of 6 responses consistent with a "conservation" or a "nonconservation" response category. Those *S*s who

did not perform consistently were judged to be "partial conservers" and are not included in the tabulations. Those *Ss* who could not perform the three diagnostic tasks were eliminated from the testing for conservation of number. Chi square procedures were used to analyze the data.

Results

Table I was adapted from the results reported by Wallach and Sprott (1964). It shows the number and mean age of children in the U. S. sample who were either conservers or nonconservers.

Table I

Number and Mean Age of Children in each Category of the U. S. Sample

Category	N	Mean Age*
Conservation	28	6-11
Nonconservation	30	6-11
Total	58	6-11

*All ages in years and months.

Table 2 includes the number and mean age of children in the entire Colombian sample who were either conservers or nonconseervers. In Tables 3 and 4 is found the same information broken down according to Colombian subculture (middle class and working class, respectively).

Table 2

Number and Mean Age of Children in each Category in Colombian Middle Class Sample

Category	N	Mean Age
Conservation	26	6-8
Nonconservation	44	6-6
Total	70	6-7

Table 3

Number and Mean Age of Children in each Category in the Laboring Class Sample

Category	N	Mean Age
Conservation	14	7-0
Nonconservation	20	6-10
Total	34	6-10

When the U. S. sample was compared with the total sample, the resultant chi square was 3.79 which was less than the 3.84 needed for statistical significance at the .05 level.

TABLE 4

Number and Mean Age of Children in each Category in the Combined Colombian Sample

Category	N	Mean Age
Conservers	40	6-9
Nonconservers	64	6-7
Total	109	6-8

When the working class Colombian subgroup was compared with the middle class Colombian subgroup the resulting chi square was .85 while one greater than 3.84 was needed for significance.

DISCUSSION

The expected slight but statistically significant differences between groups were not found. There was no statistical difference between the proportion of conservers in the U. S. sample when compared with the Colombian sample. Nor was there any significant difference in the proportion of middle class children who conserved when compared with working class children. These findings are relevant in the light of the definite cultural, educational and economic factors which differentiate these three groups. It seems that whatever the influence of these factors, they were not potent enough to create any difference in the proportion of children who showed conservation of number. These findings strongly endorse Goodnow's (1962) conclusion that the similarities across milieus are more striking than their differences. This not only reflects the power of Piaget's theory but also suggests that there are important uniformities in the cognitive development of children even across the broad cultural spectrum which includes much of the Western hemisphere.

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ABSTRACT

To test the effects of cultural variation on conservation of number in children a United States middle class sample was compared

with a Colombian sample. Also 2 Colombian subgroups (middle class and working class) were compared. The U. S. data was gathered by previous investigators who worked with 58 conserving and nonconserving children. The Colombian sample consisted of 104 conserving and nonconserving children. This sample included 34 laboring class children and 70 middle class children. None of the comparisons were statistically significant leading to the conclusion that the general variation within the cultural spectrum involved was not great enough to affect conservation of number.

RESUMEN

Con objeto de comprobar los efectos de la variable cultural en la conservación del número, se comparó una muestra de niños de la clase media en los Estados Unidos con una mestra equivalente de niños Colombianos. También fueron comparados dos subgrupos Colombianos (clase media y laboral). Los datos de Estados Unidos fueron proporcionados por investigaciones previas con 58 niños "conservadores" y "no conservadores". La muestra Colombiana constó de 104 niños "conservadores" y "no conservadores". Esta muesta incluye 34 niños de la clase laboral y 70 de la clase media. Ninguna de las comparaciones resultó estadísticamente significativa, concluyéndose que la variación general involucrada dentro del espectrum cultural no fué lo suficientemente grande para afectar la conservación del número.

RESUMO

Uma amostra de crianças da classe média nos E.E.U.U. foi comparada com uma amostra de crianças colombianas para verificar os efeitos de variação cultural na conservação de número. Dois subgrupos colombianos (classe média e classe trabalhadora) foram comparados. Investigadores nos EEUU haviam prèviamente colhido os dados de 58 crianças que conservavam e 58 que não conservavam. A amostra colombiana incluíu um total de 104 crianças que conservavam e que não conservavam. Esta amostra contou com 34 crianças da classe trabalhadora e 70 da classe média. Nenhuma das comparações revelou-se significativa, tendo-se concluido que a variação geral dentro do ambiente cultural estudado não foi suficientemente grande para afetar a conservação de número.