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ABSTRACT

A study was made to examine effects of peer collaboration on children's cognitive development and to ascertain whether effects of collaboration varied across American and Russian cultures. A total of 84 girls and boys (42 from a kindergarten in Moscow and 42 from an elementary school in Ithaca, New York), 5 through 7 years of age, initially participated individually in a pretest requiring prediction of the way a beam would tip when different weights were placed at differing distances from a fulcrum. On the basis of pretest results, children were assigned to (1) a control group in which children were again tested individually; (2) an "equal rule" group pairing same-age, same-sex children who had used the same prediction rule on the pretest; or (3) an "unequal rule" group pairing same-age, same-sex children who had used different prediction rules on the pretest. Seven increasingly sophisticated rules for prediction have reliably been differentiated. In the treatment phase of the study, disagreeing subjects discussed their disagreement until agreement was attained. Subjects were individually post-tested and improvement in rule use was recorded. Findings indicated that cognitive conflict in pairs produced different outcomes depending on whether a child's partner was more advanced or less advanced in the use of prediction rules. The only differences across cultures were sex differences. (RH)

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COLLABORATION AND COGNITIVE DEVELOPMENT IN THE USA AND USSR

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Over the course of the last decade, researchers in Europe and the United States have begun to explore the relationship between peer social interaction and cognitive development. The usual form of the research is as follows: nonconservers-conservers pairs are asked to consider some problem (the amount of liquid in differently shaped glasses, for example) and reach a joint decision about it. These researchers report that a highly significant proportion of former nonconservers provided conservation responses and justifications both during the interaction as well as later, on one or more posttests, conducted individually. The mechanism whereby this peer interaction benefits cognitive development is held to be "cognitive conflict", or the conflict of perspectives of the pair members. (See, for example, Ames and Murray, 1982; Doise and Mugny, 1979; Murray, 1982; Perret-Clermont, 1980.)

The conserver-nonconserver relationship may be viewed as akin to an "expert-novice" relationship, however. The conserver, after all, knows all that is to be known within that domain of conservation, and has reached his or her developmental ceiling. The results of this type of collaboration, therefore, may be qualitatively different from those in which development is possible even for the most advanced partner. If one wishes to argue that peer interaction is beneficial for cognitive development in general, one must be able to show its potency in areas

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other than conservation, and in a range of cultures.

One goal of this research, therefore, was to examine the effects of peer collaboration on cognitive development, using a task that was similar to that used by the Piagetian researchers, but in which the more advanced member of the pair could not be considered an "expert". A second goal was to ascertain whether the effects of collaboration varied across culture. The Soviet Union was the choice for one culture, because of the emphasis that is placed there upon the notion of the "collective" both during and after the course of socialization (Bronfenbrenner, 1970; Tudge, 1973). The second culture was the United States, a more individualistically oriented society.

Subjects

84 children, aged from 5 to 7, participated in the research. Half were from a kindergarten in Moscow, USSR, half from an elementary school in Ithaca, NY. The breakdown, by age, gender, and culture, is as follows.

	boys	girls	mean age	SD
Ithaca	24	18	74.6	7.9
Moscow	24	18	78.0	9.3

Procedure

I used a balance beam, similar to that employed by Siegler (1976, 1981). The task required that children predict which way a beam would tip when different numbers of weights were placed at differing distances from

the fulcrum. Seven increasingly sophisticated rules for prediction can reliably be distinguished (Tudge, 1985). The methodology fitted the established form for this type of research - pretest, a treatment a minimum of two days later (mean 3.87 days, SD 1.37 in Ithaca, 3.52 days, SD 1.60 in Moscow), and a posttest two days after than (mean 2.68 days, SD 2.22 in Ithaca, 2.43 days, SD 0.91 in Moscow). For the pretest and posttest the children were tested individually, to establish which rule was used, improvement being measured by the change from pretest rule to that used in the posttest. On the basis of pretest rule, children were assigned to one of three treatment conditions.

1. A control group, in which they were again tested individually.
 2. An "equal rule" group, in which each child was paired with a child of the same age and sex who had used the same rule on the pretest.
 3. An "unequal rule" group, in which each child was paired with a child of the same age and sex who had used a different rule.
- When pairs of children disagreed in their predictions, they discussed their disagreement until agreement was reached.

Results

Given the earlier research cited, one would expect to find that children in the unequal rule condition would improve to a significantly greater extent than children in the other conditions, because of the opportunities for conflicts of perspectives.

In neither the Moscow nor Ithaca sample did this prove to be the case. When pooled across culture, the tendency was for children in the unequal rule condition to improve slightly more than their peers in the other two conditions, but the difference was not significant. (See Figure 1.)

Two important points need to be raised, however. Children whose partner was at the same level actually declined, on average -- a finding at marked variance with results reported by researchers working within the conservation paradigm. The second is that attention should be paid to the individual members of the unequal rule condition. One of them had used a lower rule on the pretest, the other a higher rule. The mean differences in improvement between partners with unequal rule pairs proved to be highly significant ($p < .0005$). There was no significant difference between partners within the equal rule pairs. As Figure 2 indicates, children whose partner had used a higher rule were the only group to improve, on average, from pretest to posttest (improvement significant, $p < .001$), while those whose partner had used a lower rule declined to a significant degree ($p < .01$), despite precisely the same conflict of perspectives. Overall, the effect of condition, when broken into four groups, was significant at the $p < .004$ level.

Turning now to the effects of cultural differences between the two samples, there was a tendency for the Ithaca children to benefit rather more from collaboration than their Moscow counterparts, although this difference was not significant ($p > .2$). The effect of being socialized in a country that emphasizes the notion of the collective did not exert a significant influence upon the ability to gain, cognitively, from collaboration. The pattern of results in the two samples was surprisingly similar. As Cole and Means (1981) point out, a common fallacy is to ascribe differences in results between two comparative groups to putative differences between the groups. This is a particular problem when the differences are at the level of culture. Similarities of findings, by the same token, cannot be taken to mean a similarity between the two groups.

The lack of significant differences between them could result from many factors. In this case, however, interpretation may be somewhat easier because the pattern of results was so similar. These data may thus be taken as providing some support for the generalizability of the role of peer collaboration on a task of this nature.

The data, however, did reveal some differences between the two samples. While none of the two-way interactions ("culture by condition", "culture by gender", and "condition by gender") were significant, the three-way interaction of "culture by condition by gender" proved significant. The analysis revealed that the only significant differences related to the "low partners" (who had used the lower rule at the time of the pretest), and the "high partners", and only in the Ithaca sample. As Figure 3 shows, while boys and girls performed significantly differently in Ithaca this was not the case in Moscow. In Ithaca, the low partner boys performed significantly better than their female counterparts ($p < .05$), while the high partner girls did significantly worse than the boys ($p < .10$). In Moscow, there were no differences in performance between the boys and girls. It should be pointed out, however, that the cell sizes are so low that these results should only be seen as suggestive.

Implications and conclusions

The aim of this study was to keep the form of the research as similar as possible to that done earlier, while removing the content from the conservation paradigm. The data presented here suggest that the findings based on peer collaboration in the context of conservation may be applicable not to peer collaboration in general, but primarily to a class of collaboration -- between peer "experts" and "novices". In a situation

in which development was possible even for the most advanced members of a pair (none of these subjects used the highest rule possible), "cognitive conflict" brought about by a difference in perspectives had a different outcome for a child depending on whether his or her partner was more or less advanced. This proved to be precisely the case in two different cultures.

The sole difference in outcomes between the two cultural groups related to sex differences. It would be a little foolhardy to put too much weight upon a finding based on a small number of cases, but one interpretation of these data appear plausible. The task is one that is primarily scientific or mathematical. For this reason, insofar as boys in the United States are socialized to think of themselves as being more adept at such tasks, they would show more interest in it, and therefore perform better than girls. In the Soviet Union, on the other hand, despite the fact that the most prestigious jobs are still overwhelmingly a male preserve, girls are not brought up to think of themselves as inferior to boys at mathematics or science. Indeed, their role models (at least in the form of the teachers of these subjects) are virtually all female.

Whatever the reason for the cross-cultural differences, the data as a whole strongly suggest that when we remove peer collaboration from the conservation paradigm we require a more complex model of the relationship between social interaction and cognitive development than has been suggested by previous research.

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"CONDITION" WAS NOT A SIGNIFICANT FACTOR

TABLE 1

Mean cognitive change from pretest score, by condition

	A	B	C	F(2,75)	p
Mean change	-0.20	-0.21	0.09	1.23	.299
SD	(0.62)	(0.59)	(1.04)		

A = individuals (n=20)
B = equal rule partners (n=24)
C = unequal rule partners (n=35)

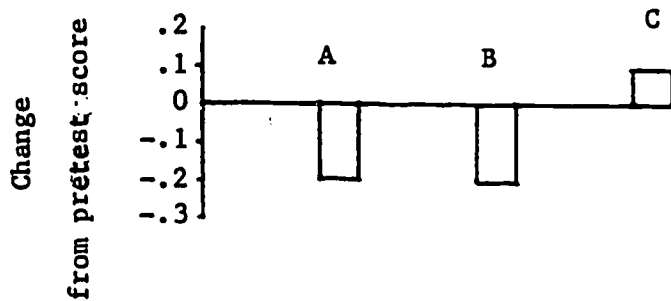


Figure 1: Mean cognitive change from pretest score, by condition

LOWER PARTNERS WERE THE ONLY CHILDREN TO IMPROVE, WHILE
HIGHER PARTNERS DID WORSE THAN ALL OTHERS

TABLE 2

Mean cognitive change, separating unequal partners

	A	B	C	D	F(3,74)	p
Mean change	-0.20	-0.21	0.65	-0.44	4.80	.004
SD	(0.62)	(0.59)	(0.93)	(0.86)		

A = individuals (n=20)
B = equal rule partners (n=24)
C = lower partners (n=17)
D = higher partners (n=18)

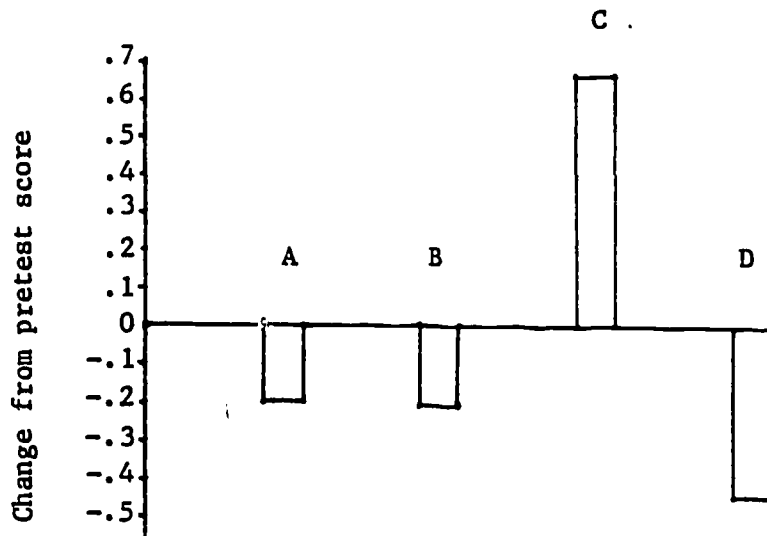


Figure 2: Mean cognitive change, examining lower and higher partners

TABLE 3

Mean cognitive changes by culture, sex, and condition

	Boys (n=5)	Girls (n=4)	F	p
LOWER PARTNERS				
Mean change (Ithaca)	1.60	0	7.16	0.037
SD	(0.82)	(0.82)		
Mean change (Moscow)	0.40	0.33	0.10	0.766
SD	(0.55)	(0.58)		
HIGHER PARTNERS				
Mean change (Ithaca)	0	-1.00	4.06	0.091
SD	(0.82)	(0.82)		
Mean change (Moscow)	-0.50	-0.33	0.58	0.475
SD	(0.84)	(1.53)		

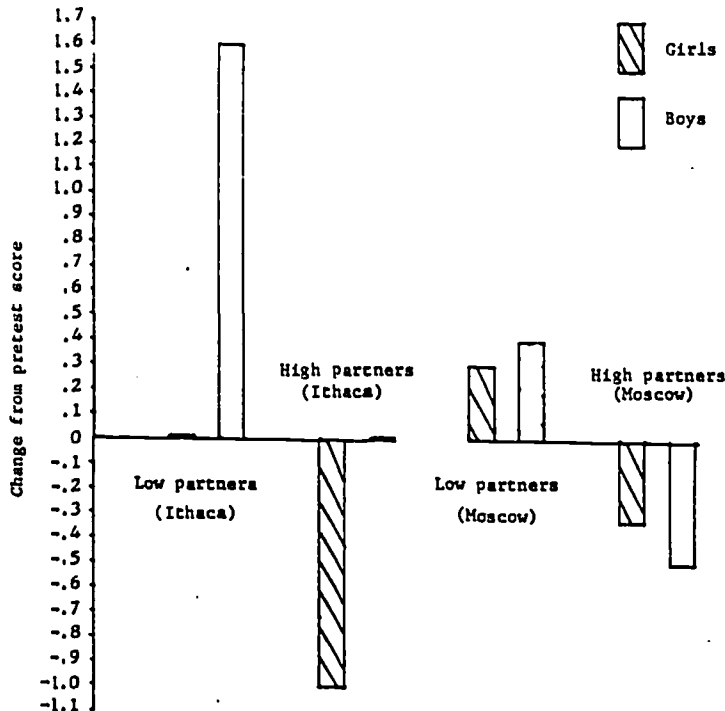


Figure 3: Mean cognitive change, by culture, condition, and sex