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Journal of Cross-Cultural Psychology 1986; 17; 315

DOI: 10.1177/0022002186017003005

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The interrelationships among metamemory, intelligence, attributional beliefs, self-concept, and strategy use were investigated in 102 German and 91 American children. After pretest assessment, children in the experimental conditions were trained to use a cluster-rehearsal strategy on a Sort Recall task. Posttraining assessments included tests of strategy maintenance, near-transfer, and task-related metamemorial knowledge. The two samples differed significantly on metamemorial, attributional, strategic, and performance variables. Causal modeling procedures showed that different causal models were required to explain relationships among the cognitive and personality/motivational variables in the two samples, with metamemory having the most consistent influence on strategy use.

METAMEMORY AND MOTIVATION
A Comparison of Strategy Use and Performance in German and American Children

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Metacognition refers to a person's knowledge about mental states, abilities, and cognitive-communication processes. Metamemory, a specific type of metacognition, is defined as knowledge about memory states and processes (Brown, 1978; Flavell, 1978). Knowledge about strategies provides important

AUTHORS' NOTE: This research was supported in part by Grant AZII/37I29 from the Volkswagen Foundation, and by NIH Grants HD17648 and HD21218.

JOURNAL OF CROSS-CULTURAL PSYCHOLOGY, Vol. 17 No. 3, September 1986, 315-336
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information for the subsequent development of new learning skills and strategies during the early elementary school years. The first generation of research on metamemory established correlational relationships between metamemory and strategy use, with modest success (Schneider, 1985). Metamemory was shown to be a predictor of the acquisition and transfer of newly acquired strategies (Borkowski & Cavanaugh, 1979; Brown, Campione, Barclay, 1979). Nevertheless, an important causal question remained: Is metamemory a prerequisite for strategy use, especially on difficult transfer tests?

The second generation of research of the causal consequences of metamemory is characterized by theoretical and methodological advances (Pressley, Borkowski, & O'Sullivan, 1984; Schneider, Korkel, & Weinert, 1984). At a theoretical level, metamemory has been classified into four major components: specific strategy knowledge (i.e., information about how, when, where, and why to use strategies), relational strategy knowledge (i.e., comparative information useful in identifying similarities and differences among strategies), general strategy knowledge (i.e., recognition and belief that learning outcomes can be improved by effortful strategy deployment), and higher-order knowledge about the use of superordinate, executive processes (Pressley et al., 1984). In terms of methodology, the use of experimental manipulations (Palincsar & Brown, 1984; Paris & Jacobs, 1984) and causal modeling procedures (Kurtz & Borkowski, 1985) have been used to investigate the manner in which the components of metamemory directly influence strategy use and performance. The second-generation approach to metamemory research is particularly important for understanding successes and failures in strategy generalization (Borkowski & Cavanaugh, 1979).

The purpose of the present study was to examine the interrelationships among metamemory (specific strategy knowledge about a to-be-learned strategy as well as knowledge about the "task irrelevant" strategies), intelligence, attributional beliefs, perceived competence, and strategy use in German and American children. The rationale was tied to a hypothesized link between metamemory theory and personality-motivation

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theory (Borkowski, Johnston, & Reid, 1985). For instance, Weiner (1979) found that people who attribute success to their own ability or to effort had greater subsequent achievement motivation and a greater likelihood of engaging in challenging tasks. Carrying the scenario one step further, Fabricius and Hagen (1984) showed that causal beliefs predicted strategy use better than verbalized statements about memory processes. Finally, Kurtz and Borkowski (1984) discovered that among strategy-trained children, those who attributed success to effort were higher in metamemory and more strategic on transfer tests than those who attributed task outcomes to noncontrollable factors.

Cultural differences in performance, motivational beliefs, and metacognitive development might be anticipated between societies in which educational environments in the home and school are distinctively different. Salili, Maehr, and Gillmore (1976) found striking cultural differences in the development of causal attributions. Iranian children chose ability as a reason for successful performance more often than U.S. children, who preferred effort as the most appropriate explanation. Among urbanized, Western countries, metacognitive differences may also be substantial. In this vein, the present study contrasted the emergence of strategy use in young children from two Western cultures (the United States and West Germany) as a function of metacognitive/motivational variables and cognitive training. Galtung (1981) has hypothesized that German and American children develop differential intellectual styles and beliefs about the causes and consequences of intellectual functioning.

METHOD

SUBJECTS

Ninety-one fourth-grade children from South Bend, Indiana, and 102 children from Munich, West Germany, served as

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subjects. All children were Caucasian; approximately half were female and half male. The mean ages of the samples were 9.7 (U.S.) and 9.4 (German). Seven U.S. children and 17 German children failed to complete all of the testing sessions.

DESIGN

Each subject participated in seven 30-minute sessions, with all testing and training conducted within the classroom in groups of 15 to 20. Pretraining assessment of strategic behavior, knowledge, and attributional variables was conducted in Sessions 1 through 3. In Session 1, the Culture Fair Intelligence test (Cattell & Weiss, 1977), the Verbal Comprehension and the Word Classification subtests of the Cognitive Abilities Test (Heller, Gädike, & Weinlader, 1976), three subtests of Harter's (1980) Scale of Intrinsic Versus Extrinsic Orientation in the Classroom, and a general attribution questionnaire (Krause, 1983) were given. In Session 2, the Perceived Competence Scale (Harter, 1979) and a Sort Recall for Pictures task were given. A metamemory battery was administered in Session 3. At this point, children were randomly assigned to experimental (U.S. n = 70; German n = 80) and control conditions. In Sessions 4 and 5, children in the experimental groups were taught how to use taxonomic organization to improve recall on memory tasks. A Sort Recall for Words (a near-transfer test) and Self-Concept tasks were given in Session 6. Posttraining metamemory and strategy maintenance (Picture task) were measured in Session 7. Sessions were separated by 1-week intervals, except for a 5-week period between Sessions 6 and 7.

MATERIALS AND PROCEDURE

The Culture Fair Intelligence Test consists of 12 geometric patterns with one part missing in each item. The children were given five minutes to identify which of five possible answers (per item) correctly completed the geometric patterns. The

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Verbal Comprehension subtest of the Cognitive Ability Test contains 25 items. Children selected which word out of five choices corresponded most closely in meaning to the key word. All items were read aloud to the children as they scanned the booklet. In the Word Classification Test, children viewed three or four semantically related words, then selected from a list of five or six the word that was most closely related to the cue word. The first three items were read aloud by the experimenter; children worked alone for seven minutes on the remaining items.

The Curiosity-Interest, Independence Mastery, and Preference for Challenge subtests of Harter's Scale of Intrinsic Versus Extrinsic Orientation in the Classroom were administered, using six items from each subtest. Items consist of bipolar statements designed to measure locus of control. Children were instructed to choose which of the two clauses in each item most accurately described their feelings, and then to mark their degree of confidence—that is, whether the statement was "really true" or "sort of true" for them (e.g., "Some kids read things because they are interested in the subject, but other kids read things because the teacher wants them to"). Mean scores for the three subtests were computed for each child.

The general attribution questionnaire consisted of four success and four failure situations in the classroom, (e.g., geography test, math homework). For each item, the child ranked two of five conditions as being the first or second most important reason for success and failure. The five conditions were as follows: luck, outside help, effort, ability, and task difficulty. Three points were given for the reason ranked first and one point was given for a reason ranked second. Thus, each child had ten scores: five for success and five for failure questions, each with a maximum of 12 points.

In Session 2, the Perceived Competence Scale and the Picture task were given. Portions of the Cognitive and Social subtests of the Harter scale were used. Three items were included from each category, each containing two bipolar statements, one indicating perceived competence and the other

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indicating perceived incompetence. Children were told to select the statement for each item that most accurately represented their self-perceptions. One point was given for each response that showed high perceived competence.

In the Picture task each child was given a metal board and a set of 24 pictures of common objects, mounted on 4 × 4 cm cardboards with a magnet attached to the back of each. The pictures were classified according to categories (e.g., clothes, vehicles, animals) with six items in each category. The children were instructed to arrange the pictures on the board and then study them. After two minutes of study, the metal boards were collected. The children were first asked to write down their prediction of how many pictures they would remember correctly; then they were given three minutes to write down all of the pictures they remembered. Finally, a second estimate was made of the number of pictures that might be remembered if a new set of 24 pictures was presented, using the same procedure. The arrangement on each metal board was photographed and served as a record of organizational behavior; adjusted ratio of clustering (ARC) scores were computed from the study arrangements (Roenker, Thompson, & Brown, 1971). This score provides a measurement of clustering behavior for each subject independent of the number of correctly recalled items.

A metamemory test was given in Session 3. The test included 11 items, 4 of which were orginally developed by Kreutzer, Leonard, and Flavell (1975). The test measured task-related strategy knowledge (organization and rehearsal) and task-unrelated strategy knowledge (strategies for retrieving information, remembering an event, memory prediction accuracy, and ease of gist versus rote recall). All questions in the battery were read aloud by the experimenter. The total possible score for task-unrelated metamemory knowledge was 16 points, and the maximum score for task-related knowledge was 12 points. (See Kurtz & Borkowski, 1984, for more details about scoring procedures.)

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Sessions 4 and 5 were training sessions. Strategy training generally adhered to procedures developed by Gelzheiser (1984) for teaching clustering-rehearsal. Session 4 focused on the purposes and uses of taxonomic organization. Children in the experimental condition were told that the objective of taxonomic organization is to put things that are alike into groups, and that the purpose of organization is to improve memory. Other methods of organization (e.g., by time, geometric pattern, or random order) were contrasted with taxonomic organization. Emphasis was placed on understanding organization through performing two practice sets and discussing reasons for specific organizational behaviors. In Session 5 the children were taught a four-step study strategy to improve recall. The steps were (1) group objects into taxonomic categories, (2) name each group, (3) study the items in groups using rehearsal, and (4) cluster the items while recalling them. The steps were reviewed several times, until the children could name all of the steps and the reasons they should be used. A quiz was given at the end of each training session to assure that the instructions had been understood.

Subjects in the control condition spent an equal amount of time with the experimenter in Sessions 4 and 5, but received no strategy instructions. They were exposed to the same stimuli (overheads and quizzes), but with different questions and dialogues. For example, pictures from the overheads were used to tell stories; other activities included identifying which of the objects children had seen on the way to school, choosing "favorite" objects, and identifying which could be drawn the most easily.

In Session 6, the Word task was given as a measure of near-transfer. Children were given 24 words, consisting of 6 items within each of 4 categories (e.g., names, fruits, vehicles), and were asked to arrange them on the metal boards in any way they wished in order to aid studying. Two minutes were given to arrange and study the items, and three minutes were given for subsequent recall. Photographs were taken of the item

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arrangements following the study period; from these records, ARC scores were computed as measures of organization activity. Next, a Self-Concept task was presented in which children ranked themselves in terms of their abilities in relation to the rest of the class, ranging from "best in the class" to "worst in the class." Academic (e.g., reading, spelling, memory for texts) and nonacademic (e.g., height, sports) items were included, as well as one item estimating performance on the Picture task. For each item, a child's face on a bar graph was circled to represent relative position in the group. Scores ranged from 12 to -12, with a high score representing a positive self-concept.

In Session 7 the Picture task was given as in Session 2. Prior to recall children predicted how many words they would remember. ARC scores were computed for study and recall behavior. The task-related portion of the metamemory battery was presented at the end of the session to assess changes in metamemorial knowledge due to intervening training.

RESULTS

TRAINING EFFECTS

A significance level of $p < .05$ was used throughout this section. In order to document the absence of pretraining differences between experimental groups, a 2 (country) × 2 (condition) multivariate analysis of variance (MANOVA) was performed, using study ARC, recall ARC, and recall scores from the pretraining Picture task as dependent variables. The main effect of a country was significant, $F(3,188) = 24.94$. The absence of a condition effect or country × condition interaction indicated that pretraining differences between trained and control children were not significant. The main effect of country reflected high pretraining strategic behavior on the part of the German children. For instance, the mean study

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ARC score of the German sample was .615, in contrast to .175 for the Americans. Recall means paralled strategy differences, with German children recalling 13.12 items, compared to 8.09 for American children.

Mean study, ARC, recall ARC, and recall scores from maintenance and transfer tests and posttraining metamemory scores are displayed in Table 1. Because the two samples differed before training, analysis of covariance (ANCOVA) was used to analyze training effects, using pretraining strategy and recall scores as the covariates. Several 2 (country) × 2 (condition) × 2 (sessions) repeated measures ANCOVAs were performed separately on study ARC, recall ARC, and recall scores from the memory tasks, using tasks as the repeated factor. The Bryant-Paulson generalization of Tukey's test was used for all contrasts among means adjusted for covariates

TABLE 1
Strategy, Recall, and Metamemory Means After Training

	USA		German	
	Trained	Untrained	Trained	Untrained
Maintenance Study ARC	.674 (.449)*	.409 (.506)	.886 (.274)	.886 (.315)
Transfer Study ARC	.578 (.470)	.166 (.406)	.786 (.358)	.777 (.356)
Maintenance Recall ARC	.588 (.310)	.419 (.333)	.614 (.368)	.640 (.428)
Transfer Recall ARC	.590 (.344)	.540 (.343)	.601 (.368)	.760 (.376)
Maintenance Recall	12.90 (3.31)	12.45 (4.38)	13.61 (4.00)	12.04 (3.91)
Transfer Recall	12.40 (3.95)	10.80 (4.73)	12.59 (3.74)	11.42 (2.98)
Posttraining Metamemory	7.86 (3.15)	6.00 (3.08)	5.65 (1.87)	4.92 (2.22)
	n = 70	n = 20	n = 80	n = 24

*Standard deviations appear in parentheses.

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(Huitema, 1980). Harmonic means were used in comparisons involving unequal cells.

The ANCOVAs on study ARC and recall ARC scores showed significant country × condition interactions for both variables, $F(1,187) = 9.04$, and 6.50, respectively. Analyses of the country × condition interactions showed that, within the U.S. sample, the trained group was more strategic than the nontrained group both at study and recall, $Op(1,285) = 7.47$, and 2.95. Differences within the German sample were nonsignificant.[1] Main effects of country and condition were significant for study ARC scores. German children were more strategic during study than the American children, and trained children were more strategic than controls, $Op(1,2,189) = 5.65$ and 5.45, respectively.

The ANCOVA on recall scores showed significant main effects of country and condition, $F(1,189) = 14.03$ and 9.34. Strategy-trained children recalled more items than control children, and Americans recalled more than Germans with pretraining differences controlled. An examination of the unadjusted means showed that German posttest recall was higher than American. Adjusted means reflected the opposite trend; recall for German children was better before training, whereas training gains for American children were more substantial. In summary, strategy training was effective, particularly for the American children. Pretraining analyses showed that, although American children were higher in metamemory, German children had higher strategy and recall scores on the memory tasks.

A 2 (country) × 2 (condition) analysis of covariance was performed on posttraining metamemory scores, using pretraining metamemory as the covariate. The main effects of country and condition were significant, $F(1,189) = 9.92$ and 10.61, respectively. American children were higher in metamemory than German children, and trained children were more metacognitively aware than control children in both countries.

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PREDICTING MEMORY BEHAVIOR AND PERFORMANCE

In order to determine the most important predictors of performance in the two samples, multiple regression analyses were performed using metamemory, IQ, pretraining strategy use, academic self-concept, task self-concept, causal attributions, intrinsic motivation, and perceived competence as the predictor variables. The dependent variables examined were posttraining metamemory, maintenance study ARC, transfer study ARC, and recall scores. In general, metamemory was the best predictor of strategy use in the American sample, whereas pretraining strategic behavior was the best indicator for the German children. Pretraining metamemory was the best predictor of metamemory at posttest for both samples. Additional step-wise regression analyses found that pretraining metamemory accounted for 32.7% of the variance in posttraining metamemory in the U.S. sample, and 20.4% of the variance for the German children. Metamemory was also an important predictor of recall in both samples.

CAUSAL MODELING

A causal modeling procedure was used to assess the impact of intelligence, self-concept, attributional style, and intrinsic motivation on strategy use at pretest, metamemory scores, strategy use on the transfer and maintenance tasks, and recall accuracy on the maintenance task. Identical structural equation models were constructed for both the German and American samples (experimental groups only). The computer program LVPLS (Latent Variable Partial Least Squares) developed by Lohmoller (1983, 1984) was used to estimate the model. Given the fact that sample sizes were relatively low and that the multivariate normality assumption did not hold for all variables included in the analysis, important requirements for the use of confirmatory maximum-likelihood estimation procedures such as LISREL were not met. As a consequence, an

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exploratory "soft modeling" approach was chosen that relied on a distribution-free, least-square estimation procedure.[2]

With regard to the measurement model that related observed variables and latent constructs, several assumptions were made: (1) The intelligence factor was assumed to consist of the subtest matrices of the Culture Fair Intelligence Test and the two subtests of the Cognitive Abilities Test mentioned above. (2) The Self-Concept construct included three variables—namely, the cognitive and social competence subscales of Harter's Perceived Competence Scale and the subtest of the Self-Concept Task assessing academic self-concept. (3) The three subtests of Harter's Scale of Intrinsic Versus Extrinsic Orientation in the Classroom were used to represent intrinsic motivation. (4) The attribution factor was represented by two components—namely, effort attributions in success and failure situations.

These four latent variables (intelligence, self-concept, locus of control, and attributions) were used as exogenous factors in the model. Therefore, they are not further explained in the model. It was assumed that the exogenous constructs should influence strategy use during pretest (represented by the two ARC scores for the study and recall organization), which in turn should influence metamemory (represented by the test-related and general metamemory components). The exogenous constructs, pretest strategy use and metamemory, were expected to predict strategy use at transfer and maintenance, both of which should directly influence recall performance during posttest. Both strategy factors were represented by ARC scores for study and recall organization, whereas the performance factor had only a single observed variable to define it. It should be noted that the specification of the model was determined by the (short-term) longitudinal character of the study: The logic behind it is that variables assessed earlier in the course of the study should influence subsequent variables.

Figures 1 and 2 show the path diagrams obtained for the American and German samples, respectively. Only the structural coefficients among the nine latent variables are included,

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in order to guarantee greater clarity. The intercorrelations among the four latent exogenous constructs and the other latent variables are depicted in Table 2. The results of the LVPLS analyses indicate that different structural models must be assumed for the German and American samples. Obviously, a more parsimonious solution was obtained for the American sample. The model estimated for the American sample explained more variance in the posttest strategy and recall measures (44% and 44%) than the model for the German sample (38% and 35%).

By and large, the IQ variable had the largest impact on strategy use and metamemory in both samples, compared with the influence of the remaining exogenous constructs. IQ predicted strategy use during pretest in the German sample but not in the American sample. The path structures of the two models reflect different relationships between performance and strategy use at pretest and the differential effects of training for the two samples. Although strategy use at pretest did not have an important influence on metamemory and subsequent strategy use in the American sample, there was a stronger impact of strategy use at pretest on metamemory and strategy use during transfer and maintenance for the German children. Given the relatively high levels of strategy use in the German sample for all three memory tasks and the lack of inherent attractiveness in this type of task, it is not surprising that intrinsic motivation influenced strategy use at transfer and maintenance. On the contrary, differences in motivation did not play an important role in the prediction of strategy use after training for the American children, probably due to the fact that training gains were sizable for most children.

An interesting difference in the structural patterns concerns the roles of self-concept and causal attributions in the two samples. (1) In the German sample, self-concept was related to strategy use at pretest, whereas causal attributions primarily influenced metamemory. (2) In contrast, attributional style influenced strategy use at pretest in the American sample, and self-concept had a strong impact on metamemory. Taken

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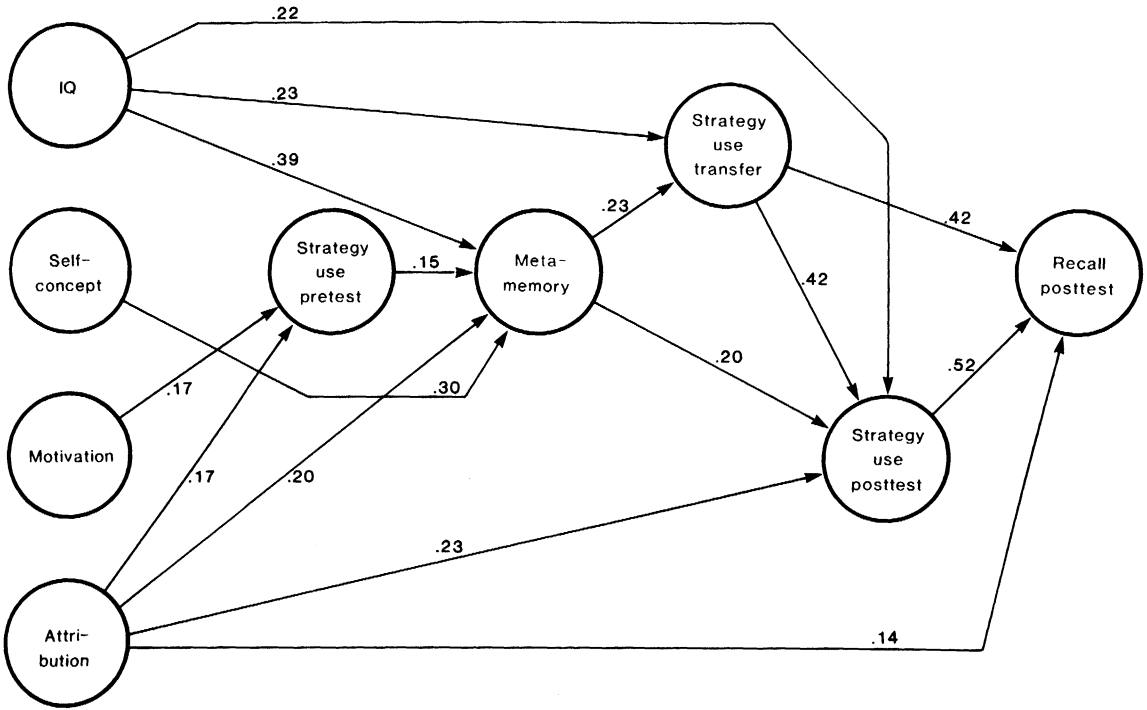

Figure 1: A causal model of strategy use and recall in U.S. children.

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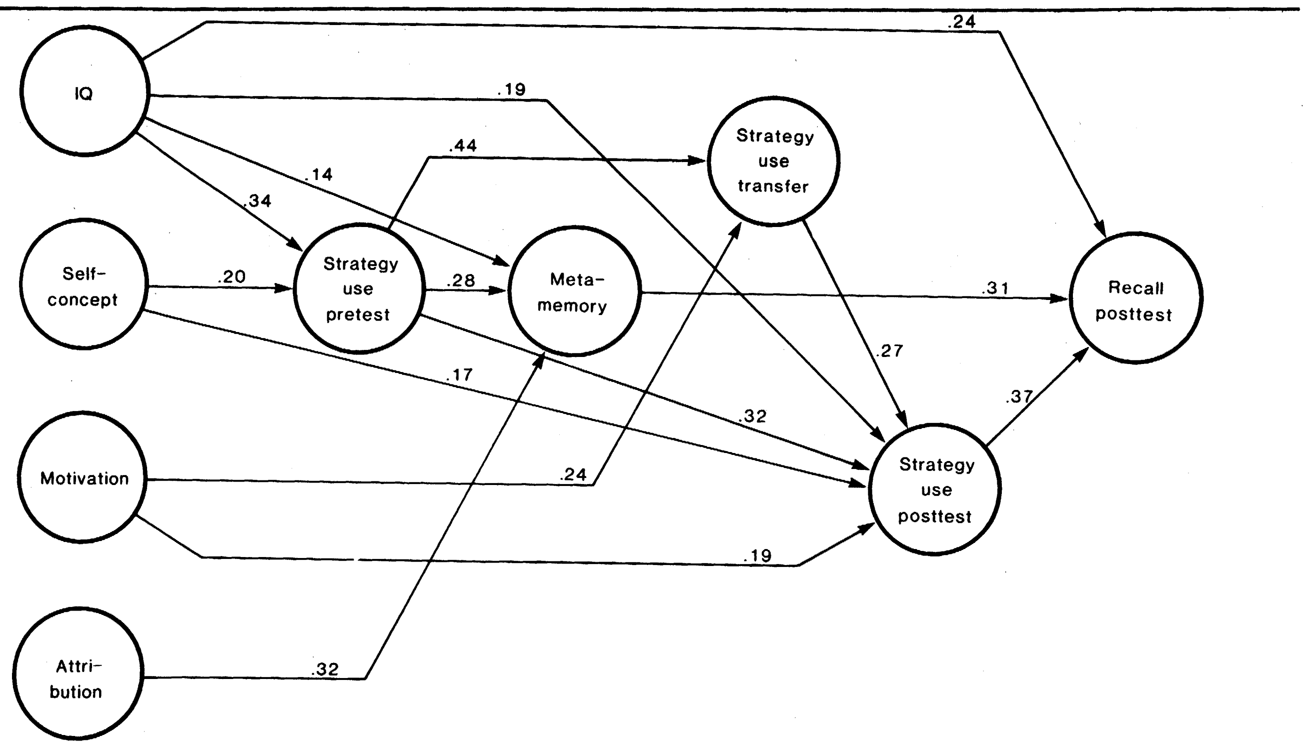

Figure 2: A causal model of strategy use and recall in German children.

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together, the findings underline the universal importance of metamemorial knowledge for children's performance in sort/recall tasks, compared to the differential effects of the motivational and personality variables assessed in the present study.

Some of the differences in the structural patterns of the causal modeling approach are reflected in the intercorrelations among the latent constructs depicted in Table 2. An inspection of Table 2 reveals that the most striking differences between samples were the correlations of self-concept and pretest strategy use with the remaining factors. Whereas the differences found for the strategy use variable are not surprising (see below), the considerable differences found for the self-concept construct may indeed reflect cross-cultural differences in educational practices. That is, they may be due to a more pronounced emphasis on the formation of positive academic self-esteem in American children. As there are no empirical data available comparing educational practices in American and German elementary schools, one can only speculate about this point.

DISCUSSION

Flavell (1978) has suggested that cognitive experiences have contextual roots in the home, school, and community. Little is known, however, about the exact ways in which these sources influence the emergence of cognitive skills in young children. The present study attempted to discover whether motivational and cognitive factors, some of which are cultural specific, require different or similar theoretical models in order to explain strategy-based performance in German and American children. The data lead us to conclude that distinct models are necessary to understand the remote causes—but not the proximate cause—of strategy transfer.

In both countries, the proximate cause of recall was the same: an appropriately applied strategy. This is consistent with a large body of evidence (Borkowski & Cavanaugh, 1979),

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TABLE 2
Intercorrelations Among Latent Factors

		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	IQ	.26 (.13)	.29 (.12)	.14 (.05)	.10 (.37)	.51 (.26)	.34 (.22)	.48 (.36)	.42 (.39)
(2)	Self-concept		.35 (.10)	.20 (.23)	.07 (.25)	.45 (.00)	.20 (.08)	.21 (.03)	.17 (.06)
(3)	Moti-vation			−.02 (−.01)	.17 (.11)	.27 (.08)	.18 (.29)	.25 (.30)	.29 (.18)
(4)	Attri-bution				.15 (.14)	.33 (.36)	.02 (.14)	−.09 (−.08)	.12 (−.15)
(5)	Strategy use (pretest)					.23 (.36)	.01 (.47)	.15 (.47)	.25 (.21)
(6)	Meta-mémory						.34 (.15)	.46 (.25)	.57 (.41)
(7)	Strategy use (transfer)							.57 (.46)	.33 (.24)
(8)	Strategy use (posttest)								.61 (.45)
(9)	Recall (posttest)								

NOTE: Values for the German samples are in parentheses.

showing the essential role of strategic behavior in producing superior performance, especially in young children or deficient learners. In addition, metamemory (which in both samples was influenced by personal or motivational factors) was directly related to high levels of recall for all children.

The remote causes of strategy use, however, were disparate in the two samples. For German children, who displayed high levels of spontaneous use of clustering prior to training, strategy use at pretest showed the strongest path to strategy use at posttest, with self-concept and intrinsic motivation also

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having direct links. In contrast, the attributional style and IQ of American children showed the strongest relationships with strategy use at posttest. Hence, an interesting picture of different causes of strategy use and metamemory emerged in the two samples. Although both stategy use and metamemory are predictive of superior recall independent of cultural contexts, the factors that influence these constructs appear to be different in the two cultures. What seems clear is that the personal-motivational factors are related to both strategy use and metamemory; how these patterns develop, however, remains an unanswered question. The data point in two constructs that might clarify the issue: spontaneous strategy use and attributional style.

German children generally displayed an effective use of the clustering-rehearsal strategy without experimenter prompting. We suspect that early school experiences lead German children to approach problem-solving tasks with a greater emphasis on the deployment of strategic skills. Although U.S. children were superior to German children in memory knowledge, they were less likely to display that knowledge through task-appropriate strategic behavior at pretest. With minimal training, however, they successfully learned and utilized the strategy to the same extent as the German children. We are tentatively persuaded that German children are superior in "attack" or deployment skills that lead them to use existing metamemorial knowledge more efficiently. This scenario squares with pretest and posttest strategy use scores, which, in both instances, were influenced by IQ and, in the latter case, by prior strategy use. If this hypothesis is correct, cultural differences are likely to be found in tests of problem solving and executive functioning (see Borkowski et al., 1985).

With respect to attributional styles, interesting differences emerged. Kurtz and Borkowski (1984) found that young American children who successfully acquired and generalized a new strategy tended to attribute their final successes to effort expended rather than to noncontrollable factors such as luck or ability. Consistent with these data, attribution styles (reflecting the importance of effort) were directly linked to

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strategy use in the U.S. but not in the German sample. In fact, in explaining the reason for successful classroom performance in a hypothetical situation (e.g., a spelling test), American children were twice as likely to choose effort as German children, who tended to choose effort, luck, and ability with equal probability. Children in the U.S. sample rarely selected luck as the reason for their classroom successes. With respect to failure outcomes, the same pattern emerged: German children were twice as likely as the Americans to claim they were simply unlucky when explaining classroom failures.

Weiner and colleagues hypothesized that cultural contexts may alter the motivational pattern for causal attributions (Weiner, 1979; Weiner & Peter, 1973). With cognitive development, the child has an increased capacity to reflect on the reasons for academic achievements and failures in a more complex fashion. Whereas the younger child typically focuses on outcome rather than effort expended, the older child understands more about the value of work in actualizing learning potential. It is important to recognize that culture alters this pattern in Iranian and U.S. children and adolescents, with ability more positively valued in Iran but effort dominant in both cultures in explaining positive outcomes. In the same vein, the present data suggest differential attributional patterns in U.S. and German children (with both ability and luck chosen more frequently in the German sample). More importantly, cultural differences in self-attributions produced different linkages with spontaneous and acquired strategy use.

In summary, culturally linked attributional styles were underlying factors explaining individual differences in strategy use for U.S. children but not for German children. It should be noted that in the latter group, but not the former, self-concept was highly related to strategy use on multiple occasions, lending credibility to our interpretation of differential personal-motivational factors influencing metacognition and cognition in German and American grade-school children. We believe that theoretically salient environment factors in the home and school need to be measured and then related to personal, motivational, and metacognitive factors to create

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more accurate and comprehensive models of cognitive performance in different cultural settings. The net results should be broader theories of cognition that focus on the multiple causes and multiple consequences of metacognition and motivation.

NOTES

1. It is possible that the significant country × condition interaction could be due to a ceiling effect at pretest for the German data. Although this possibility does not hold for recall scores (German subjects recalled only 13 out of 24 items on average), it is more plausible for the study ARC scores. Consequently, we attempted to replicate the analysis with subsamples having similar pretraining distributions for study ARC scores. Unfortunately, it was not possible to select representative subsamples from both countries that were equivalent with regard to pretest ARC scores. This was mainly due to the small sample sizes of the American ($n = 24$) and German ($n = 22$) control groups and the fact that the two groups' ARC scores differed markedly. In order to get roughly comparable pretest ARC scores for the two experimental groups, about two-thirds of the high-scoring German subjects had to be excluded from analysis, making the two groups highly discrepant on other measures. Given these problems, we were led to conclude that the data were not suited for such a reanalysis.

2. It should be noted that LVPLS and LISREL are basically similar procedures. However, different algorithms are used to estimate the structural equation models. As a consequence, systematic differences in the LISREL and LVPLS solutions result. Typically, residual variances are smaller for LVPLS than for LISREL solutions, and thus higher loadings are obtained for the latent variables in LVPLS models. Simulation studies have shown that there are no substantial differences between LISREL and LVPLS solutions relying on large sample sizes ($N > 200$) and multivariate normal variable distributions. But these simulation studies have also shown that LISREL yields biased estimates whenever one of these two requirements is not met (see Wold, 1982). In this case, LVPLS is preferred instead, because its estimation procedure is not affected by these problems.

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