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PLANNING FACILITATION AND READING COMPREHENSION: INSTRUCTIONAL RELEVANCE OF THE PASS THEORY

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The purpose of this study was to evaluate whether instruction designed to facilitate planning would have differential benefit on reading comprehension depending on the specific Planning, Attention, Simultaneous, and Successive (PASS) cognitive characteristics of each child. A sample of 45 fourth-grade general education children was sorted into three groups based on each PASS scale profile from the Cognitive Assessment System (CAS). The groups did not differ by CAS Full Scale standard score, chronological age, gender, or pretest reading comprehension scores. After each child's pretest reading comprehension instructional level was determined, a cognitive strategy instruction intervention was conducted. The children completed a reading comprehension posttest at their respective instructional levels after the intervention. Results showed that children with a Planning weakness ($n = 13$) benefited substantially (effect size of 1.52) from the instruction designed to facilitate planning. Children with no weakness ($n = 21$; effect size = .52) or a Successive weakness ($n = 11$; effect size of .06) did not benefit as much. These results support previous research suggesting that PASS profiles are relevant to instruction.

During the past decade, researchers have begun to demonstrate the value of cognitive strategy instruction in general education as well as special education settings (Ashman & Conway, 1997; Pressley & Woloshyn, 1995). Several groups of researchers have studied various approaches to instruction based on the relationships between learning and cognitive processing. For example, Ashman and Conway (1997) developed a cognitively based instructional method called Process-Based Instruction. This classroom-wide instructional method places emphasis on strategy use, or what they called planning, as a fundamental function that every individual should learn and use to solve a host of academic and real life tasks. Process-Based Instruction emphasizes direct teaching of the components of planning to children within all areas of the curriculum. Similarly, Pressley and Woloshyn (1995) stressed the importance of teaching cognitive strategies in specific instructional areas. They provide specific instructional methods for reading decoding, reading comprehension, vocabulary, spelling, writing, math problem solving, and science. In their approach, the teacher explicitly instructs students to discover and use strategies, monitor their performance, and generalize the use of plans to achieve the goal of self-

regulated strategy use. Although these two approaches provide direct instruction of strategy use, other researchers have examined the differential effects of strategy use using guided, rather than direct instruction. One of these methods was termed Planning Facilitation by Naglieri and Gottling (1995).

Planning Facilitation is based on the integration of Planning, Attention, Simultaneous, Successive (PASS) theory (Naglieri & Das, 1997a) with mediated learning concepts initiated by the research of Cormier, Carlson, and Das (1990). These researchers examined the effects of guiding children's verbalizations about strategies as they completed progressive matrix items. The children were instructed to verbalize their thoughts about the strategies that were used as they solved the matrices. The role of the experimenter was to facilitate the discussion with the children by saying, "Now tell me what you see" or "How would you describe it?" (Cormier et al., 1990; p. 443). The researcher did not give students feedback concerning the correctness of the answers. The results of this study demonstrated that children identified as having poor planning improved significantly more in their performance on the matrices than did those children identified as having good planning.

Kar, Dash, Das, and Carlson (1993) extended the research of Cormier et al. (1990) with two experiments in which they identified children as good or poor in planning and examined the effects that facilitating strategies had on a number-matching task. The children were asked to verbalize the strategies they used to complete the task and explain why they chose each strategy. The researchers encouraged the children to talk about what they were doing and why, but did not provide any feedback such as, "That's right" or "Next time, remember to use the same strategy if it worked" (Kar et al., 1993; p. 15). The results demonstrated that children who were poor in planning improved more than the children who were good in planning. These findings were similar to those reported by Cormier et al. (1990) and further strengthened the possibility that children differentially benefit from instruction based on their cognitive characteristics.

Naglieri and Gottling (1995, 1997) and Naglieri and Johnson (2000) extended the research of Cormier et al., (1990) and Kar et al., (1993). They provided the Planning Facilitation intervention to children identified as either good or poor in planning based on the results of the Cognitive Assessment System (CAS; Naglieri & Das, 1997a). These researchers examined the differential effects of strategy instruction in math computation on elementary school–aged children based upon the students' PASS processing scores. In each of the three studies, the researchers found that children who had a weakness in planning improved substantially more in the math computation than did those children who did not have a planning weakness. Similarly, Haddad (2000) employed a single-case design to compare the effects of Planning Facilitation on reading fluency and reading accuracy. He found that the Planning Facilitation intervention had a consistent positive effect on reading fluency and reading accuracy. Haddad (2003) also replicated the Planning Facilitation research conducted by Naglieri and Johnson (2000) and found that children with a planning weakness nearly doubled the number of math problems they could correctly complete after the intervention but children with no planning weakness did about the same during baseline and intervention periods.

The success of the Planning Facilitation intervention for children with a planning weakness reported for nonacademic (general problem solving; Cormier et al., 1990; Kar et al., 1995) and academic (arithmetic computation, reading fluency, and reading accuracy; Naglieri & Gottling, 1995, 1997; Naglieri & Johnson, 2000; Haddad, 2000, 2003) content areas suggests that the intervention method could be applicable to a variety of curriculum areas. The aim of the present study was to extend this line of research to reading comprehension. We anticipated that children with a weakness in Planning on the Cognitive Assessment System (Naglieri & Das, 1997a) would improve more in reading comprehension as a result of exposure to the planning facilitation intervention than would those students who had other PASS weaknesses or no PASS weaknesses.

METHOD

Participants

This study involved a sample of 45 children, 23 girls and 22 boys, from two general education classrooms who attended fourth grade in an elementary school in a suburban school district in Arizona. The sample was composed of 94% White, 3% African American, and 3% Asian students with a mean age of 9.6 years (SD = 0.37 years). The parental education levels of participating students were 4 or more years of college (73%); 1 through 3 years of college or technical school (19%); and graduated from high school (8%).

Instruments

The CAS is an individually administered test of cognitive processing for children aged 5 through 17 years. The test is organized into four scales (Planning, Attention, Simultaneous, and Successive) according to PASS theory (Das, Naglieri, & Kirby, 1994; Naglieri & Das, 1997a). Each PASS scale and the CAS Full Scale standard scores are set at a mean of 100 and standard deviation of 15. Extensive reliability and validity research is presented in the CAS *Interpretive Handbook* (Naglieri & Das, 1997b) and by Naglieri (1999). Naglieri and Das (1997) defined the four processes measured by the CAS as follows: *Planning* is a mental process that provides cognitive control, development of strategies, self-monitoring, self-regulation, and utilization of processes and knowledge to achieve a desired goal. *Attention* is a mental process that provides focused cognitive activity, resistance to distraction, and selective attention over time. *Simultaneous* processing is a mental process that allows the person to deal with many pieces of information at one time and arrange these data into interrelated groups. *Successive* processing is a mental activity that allows a person to work with information in a specific order or series. For more information on the PASS theory, the test, its subtests, reliability, and validity, see Naglieri and Das (1997b) and Naglieri (1999).

Ekwall/Shanker Reading Inventory Fourth Edition (ESRI; Shanker & Ekwall, 2000) was used to measure reading comprehension. The ESRI is designed to assess reading skills using 38 different tests in 10 different areas of reading. The reading passages and related comprehension questions were used in this study. The ESRI Reading Passages Tests contain two passages for

oral reading, identified as A and C, at a primer level through ninth grade and two passages for silent reading, identified as B and D, at a primer level through ninth grade. The oral passages, A and C, and related comprehension questions were used in the present study as the pretest and posttest, respectively. The oral passages are scored using miscue error information and the number of comprehension questions answered correctly to determine a child's independent reading level, instructional reading level, or frustration reading level (Shanker & Ekwall, 2000, p. 26). The parallel forms reliability between the ESRI oral passages A and C is .82 (Shanker & Ekwall, 2000, pp. 10-12).

Procedures

Following receipt of parental permission for all of the children to participate in this study, the experiment was conducted. During the first 3 weeks of the study, the children were administered the CAS and ESRI pretest. During the fourth week, the Planning Facilitation intervention occurred in a regular education classroom setting for 30 minutes on each of two consecutive days (1 hour total). The ESRI posttest was administered during Friday of the fourth week.

The sample was divided into three subgroups based on weaknesses identified in each child's PASS profile. Naglieri and Das (1997b, p. 99) discussed two types of CAS weaknesses. A cognitive weakness is present when any PASS scale standard score is 85 or lower. A relative weakness is present when any PASS standard score is significantly lower than the mean of the four scales. One subgroup was composed of children whose PASS scores were not significantly different from each child's mean and no child's PASS scores indicated a cognitive weakness. This No Weaknesses subgroup was composed of 9 females and 12 males whose mean age was 9.6 years (*SD* of 0.36 years). A second subgroup was composed of 11 children with a weakness in Successive processing (6 females and 5 males) whose mean age was 9.7 years (*SD* of 0.32 years). One male and one female had a Successive processing score that met the criteria for both a cognitive weakness and a relative weakness, while the remainder of the CAS profiles indicated a relative weakness. The third subgroup was composed of 13 children (8 females and 5 males) with a weakness in Planning (mean age was 9.7 years; *SD* of 0.31). Two females and one male had a Planning score that met the criteria for both a cognitive and relative weakness, while the remainder of the CAS profiles indicated a relative weakness. No child in the study had a cognitive or relative weakness in Attention or Simultaneous processing.

Each child was individually administered the ESRI by a classroom teacher. As the child read the passage aloud, the teacher recorded miscues. When the child finished the passage, the text was removed and the child attempted to answer orally the 10 comprehension questions asked by the teacher. If the teacher determined the child's reading to be at the independent level, the next more difficult passage was administered in the same fashion. This process continued until the teacher determined the instructional level of each child. If the teacher scored the first passage read by a child and found it to be at a frustration level, the child was administered the next lower passage until the instructional level was determined. This process ensured and provided pretest scores in reading comprehension at each child's instructional level. Each child's

posttest score was obtained at the respective instructional level after the Planning Facilitation method was presented in the children's classroom.

The classroom teacher led the two 30-minute Planning Facilitation intervention sessions. The teacher initiated discussion for the first 5 minutes, asking six different children to describe the procedure during the reading pretest. The procedure was recalled and presented accurately by the children. Next, the teacher led the remainder of each intervention by saying, "This Friday each of you will read another passage and answer questions about it the same way you did the first time. I want you to think about how you can answer more questions correctly." The teacher facilitated discussion that encouraged the children to consider ways to be more successful but made no direct statements such as "That is correct" or "Remember to use that strategy," nor did the teacher provide any direct reading instruction.

The role of the teacher was to help the children reflect on how they completed the reading comprehension task and to help clarify what was said and encourage self-reflection. The teacher used the following probes when appropriate: "Talk about how you completed them. Why did you do it that way? What can be done to get more correct? What else did you notice about the questions? What will you do next time?" The children made responses during the two intervention sessions as follows: "Read slower to remember better. Think back in your head. Try to remember important parts. Read slower and get it in your mind. Don't get distracted. Read the story more carefully. Think of the best answer. Answer from words in the story. Think back. Try to remember in your eyes. Listen to what the story is about as I read."

Data Analyses

A chi-square was computed to examine differences in gender for the three groups. Chronological ages and the reading comprehension pretest scores for the three groups were examined for differences with ANOVA. The CAS Full Scale across the three groups was examined for differences with ANOVA. The total reading comprehension raw score correct for each of the ESRI reading pretests and posttests was used in the analyses. Repeated measures ANOVA and ANCOVA were used to evaluate differences between reading pretests and posttests for the three different CAS groups. Multiple comparisons with the ESRI posttests with the CAS Planning Weakness group as the dependent variable were made using the Bonferroni procedure. The data were analyzed using SPSS, and alpha was set at .05 for all statistical tests. Effect sizes were computed using the means and *SDs* of the pretest-posttest reading comprehension tests provided in Table 1 in the following formula:

$$(X_1 - X_2) \;/\; \text{SQRT}\;[(n_1 * SD_1^2 + n^2 * SD_2^2)/(n_1 + n_2)]$$

RESULTS

The three groups were not significantly different by gender, χ^2 (2, $N = 45$) = 2.68, $p > .05$; in chronological age, $F(2, 42) = 0.4$, $p > .05$; or on the reading comprehension pretest, $F(2, 42) = 1.85$, $p > .05$. Descriptive statistics for the PASS and Full Scale standard scores, the pre- and posttest reading comprehension raw scores, and effect sizes for the three groups are presented in Table

1. The Planning Weakness, Successive Weakness, and No Weakness subgroup CAS Full Scale scores ranged from 109.9 to 115.5. The difference between the three means was not significant, $F(2, 42) = 1.16$, $p > .05$. The mean scores for all three samples are above the normative mean, indicating that in general these subgroups are above average in general intelligence. Despite an overall Full Scale score of 110.2, the Planning Weakness group's planning mean score was 93.0 ($SD = 7.2$), illustrating that this group of children earned relatively low scores on this scale. The Successive Weakness group showed a similar Full Scale (115.5) and a Successive mean of 97.0, also demonstrating the relative weakness of this group in Successive processing.

Table 1
CAS Means, SDs, and Pre/Post Reading Comprehension Means, SDs, Pre/Post Effect Sizes for the No Weakness, Successive Weakness, and Planning Weakness Groups.

		No Weakness	Successive Weakness	Planning Weakness
CAS				
Planning	Mean	105.4	116.3	93.0
	SD	6.7	9.9	7.2
Simultaneous	Mean	113.3	119.1	114.7
	SD	12.1	9.0	7.4
Attention	Mean	106.7	115.8	115.5
	SD	12.0	8.3	9.3
Successive	Mean	106.6	97.0	108.5
	SD	9.5	9.4	9.7
Full Scale	Mean	109.9	115.5	110.2
	SD	11.1	10.6	10.4
Reading Pretest	Mean	7.62	8.09	7.85
	SD	1.24	1.30	0.99
	n	21	11	13
Reading Posttest	Mean	8.19	8.00	9.15
	SD	0.93	1.48	0.69
	n	21	11	13
Effect Size		0.52	0.06	1.52

Note.—CAS values are standard scores and reading values are raw scores.

Despite the similarity of the groups' CAS Full Scale and pretest reading scores, the posttest reading comprehension scores showed substantial gains for the Planning Weakness group (effect size = 1.52). The reading comprehension pre/posttest for the No Weakness and Successive Weakness groups were substantially lower (effect size of 0.52 and 0.06, respectively). These differences were evaluated further using repeated measures ANOVA, and significant results were found. All tests within subjects were significant, $F(1, 42) = 8.11$, $p < .01$, partial eta squared of .16 and observed power of .80. All interaction multivariate tests (between groups and pre/posttest) were significant, $F(2, 42) = 3.21$, $p < .05$, partial eta squared of .13 and observed power of .58. ANCOVA indicated a significant interaction in the posttest reading groups, $F(2, 42) = 4.70$, $p < .01$, R squared = .18, and adjusted R squared = .14. Post hoc comparisons among the means of the posttest reading groups indicated that reading comprehension of the Planning Weakness group (9.15) was significantly higher than the reading comprehension of the No Weakness group (8.19). The Planning Weakness group mean (9.15) was also significantly higher than the

mean of the Successive Weakness group (8.00). The posttest means of the No Weakness group (8.19) and Successive Weakness group (8.00) were not significantly different.

DISCUSSION

This study examined the importance of each child's PASS characteristics and the relationship between those characteristics and the amount of benefit from Planning Facilitation instruction. Children who had a CAS weakness in Planning benefited most from the Planning Facilitation intervention compared to children who had no CAS weakness and children who had a CAS weakness in Successive processing. The present results, like those reported by Naglieri and Gottling (1995, 1997), Naglieri and Johnson (2000), and Haddad (2000, 2003) as well as earlier studies (Cormier et al., 1990; Kar et al., 1992), suggest that cognitive strategy instruction using the Planning Facilitation method is especially useful for those that need it the most—children who earn low scores on the Planning scale of the CAS. The results of the present study also illustrate that even though Planning Facilitation does not use rigidly formatted procedures it can be successfully applied across teachers and settings. Additionally, this study suggests that the Planning Facilitation method has utility in reading comprehension, extending previous research using nonacademic and academic tasks including math computation, reading fluency, and reading accuracy. These findings and those that preceded it suggest that information about the child's basic psychological processes, when defined by PASS, has relevance to instruction.

The results of this study suggest that changing the way aptitude is conceptualized (e.g., as PASS rather than traditional IQ) and measured (using CAS) increases the probability that aptitude-by-treatment interactions (ATIs) may be detected. Past ATI research may have suffered from inadequate conceptualizations of aptitudes that are very different from the basic psychological processes represented by the PASS theory and measured by the CAS. The current findings are also different from previous ATI research that found that students with low general ability improve little, whereas those with high general ability improve a lot with instruction. In contrast, children with a weakness in one of the PASS processes (Planning) benefited more from instruction matched to that weakness compared to children who had no such weakness or a weakness in a different PASS process. This finding suggests that PASS profiles were related to children's response to the reading comprehension intervention in predictable ways. These data, when combined with previous Planning Facilitation research, suggest that school psychologists should take PASS profiles into consideration when designing instructional plans, as suggested by Naglieri and Pickering (2003).

This study, like all research investigations, has limitations. First, although the present samples were sufficient, larger more diverse populations would allow for greater generalization of the findings. Second, the extent to which the improvements in reading comprehension would remain over time was not examined. Future research should determine if the gains in performance last and, in addition, if they transfer to other content areas (e.g., reading decoding, math word problems, and so on). Third, the sample did not have proportionate representation of racial and ethnic groups or sampling that would allow

examination of samples grouped by parental education levels. Despite these limitations, the current findings in conjunction with previous research suggest that the Planning Facilitation method was effective and therefore warrants further study with larger samples of children and additional content areas.

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