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ABSTRACT

One of the changes in the test stimuli of the Wechsler Intelligence Scale for Children III (WISC-III) was the addition of color artwork on the Picture Completion (PC) and Picture Arrangement (PA) subtests. While the reactions of children and examiners to the color were positive during pilot testings and tryout, studies examining the effect of color on students' performances on the PC and PA subtests are lacking. This study compared the performances of elementary-age students on color and black-and-white versions of the two subtests. Subjects were 90 elementary-age students (42 males and 48 females), with a mean age of 10 years, 10 months, randomly selected from grades 3 through 6 from a suburban, middle-class elementary school in the Midwest. Both versions were administered in counterbalanced order to each student. T-tests for related samples were computed for both the raw scores and the scaled scores of the PC and PA subtests. Nonsignificant results were obtained, suggesting that the addition of the color stimuli did not affect performance on the two subtests. Boys and girls performed at an equivalent level on both versions. Three tables present study findings. (Contains four references.) (Author/SLD)

Does the use of Color on the WISC-III Affect Student Performance?

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Abstract

One of the changes in the test stimuli of the WISC-III was the addition of color artwork on the Picture Completion (PC) and Picture Arrangement (PA) subtests. While the reaction of children and examiners to the color was positive during pilot testings and tryout, studies examining the effect of color on students' performance on the PC and PA subtests are lacking. Therefore, the purpose of this study was to compare the performance of elementary age students on both color and black and white versions of the two subtests. Subjects were 90 elementary age students (42 males and 48 females), with a mean age of 10 years, 10 months, randomly selected from grades three through six from a suburban, middle class elementary school in the Midwest. Color and black and white versions of the PC and PA subtests were administered in counterbalanced order to each student. T-tests for related samples were computed for both the raw scores and the scaled scores of the PC and PA subtests. Nonsignificant results were obtained, suggesting that the addition of the color stimuli did not affect performance on the two subtests. These results and analyses by gender of student are discussed.

In 1991, the third edition of the Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991) was introduced. One of the changes in the instrument, as compared to the WISC-R, was the addition of color artwork on the Picture Completion (PC) and Picture Arrangement (PA) subtests. This change, as noted by Dersh (1991), was intended to make the artwork more interesting and relevant to the child. In addition, it was designed to fulfill the goal of refining and updating the artwork of the tests. As reported in the WISC-III Manual, the addition of color occurred "after a review of literature on the effects of color in psychological testing indicated that color would heighten attentiveness and the perception of realism in artwork" (p. 13).

Previous research with color versions of PA and PC is limited. Jones (1976) had an amateur artist add color to the WISC-R PA stimulus cards and then compared children's performance on the standard black and white cards and the color cards. These results, as cited in the WISC-III Manual, "indicated a slight decrease in difficulty and completion time" (p. 13). Dersh, O'Donnell, Prifitera and Weiss (1991) conducted a preliminary study on the effect of updated artwork on PC and PA by comparing student performance on the WISC-R with the WISC-III. Their findings were inconclusive as the color version of PA resulted in a minimal enhancement of performance and there was no significant difference in performance on the two versions of PC.

Although the WISC-III Manual states that the reaction of children

and examiners to the color was positive during pilot testings and tryout, studies examining the effects of color on children's performance on the PC and PA subtests of the WISC-III are lacking. Therefore, the purpose of this study was to compare the performance of elementary age students on both color and black and white versions of the PC and PA subtests.

Method

The sample consisted of 90 elementary age students (42 males and 48 females) selected from grades three through six of a suburban, middle class elementary school in the Midwest. Students ranged in age from 8 years, 9 months, to 13 years, 7 months, with a mean age of 10 years, 10 months. Letters describing the research project and asking parent permission for student participation in the project were sent to the parents of a random sample of 150 regular education students. Ninety nine signed permission forms were returned for a return rate of about 67%. Each child also gave permission for participation in the study before testing began. Due to time constraints at the end of the school year, nine students were not tests

Prior to initiating the study, permission was obtained from The Psychological Corporation to modify the test materials for the PC and PA subtests so that a black and white version could be created. The black and white version consisted of photocopies of the stimulus materials for the two subtests. Participants in the study were administered the color and the black and white versions of the two subtests in counterbalanced

order by advanced graduate students in school psychology. Each student has a Master's degree in school psychology and had been trained in the administration and interpretation of the WISC-III. In order to establish the ability level of the students in the study, the Kaufman Brief Intelligence Test (K-BIT; Kaufman & Kaufman, 1990) was administered after the initial administration of the PC and PA subtests (either color or black and white) and was followed by the alternate version of the PC and PA subtests (either black and white or color). Thus, testing was a three-step process.

Results and Discussion

The mean K-BIT composite score was 113.93 with a standard deviation of 11.53 and a range of 65 points from 85 to 140. Overall, the sample was above average in ability but encompassed students ranging from low average to superior ability.

In order to determine if significant differences in performance on the color and black and white versions of PC and PA occurred, t-tests for related samples were computed for both the raw scores and the scaled scores obtained for the two subtests. Nonsignificant results were obtained for PC and PA raw scores and scaled scores. For both subtests the differences in raw scores was less than one-half point for the color and the black and white versions. These results are presented in detail in Table I.

Insert Table 1 about here

Pearson product moment correlations were computed for the raw scores and scaled scores of both subtests under the two test conditions. Significant correlations were obtained for PC ($r = .73$, $p < .001$ for raw scores and $r = .71$, $p < .001$ for scaled scores) and for PA ($r = .38$, $p < .01$ for raw scores and .37, $p < .01$ for scaled scores). The correlations between the color and the black and white versions of PC indicate a strong relationship between the two versions of the subtest. The PA correlations are somewhat lower and suggest a moderate relationship between the two versions of the subtest.

To further analyze performance patterns on the PA subtest, t-tests for related samples were computed for response times to each PA subtest item. Since only five students completed items 1 and 2, these items were excluded from the analyses. For the remaining 12 items (subtest items 3 through 14), faster response time was indicated on seven items for the color administration and on five items for the black and white administration. Only one t-test (subtest item 7) was significant ($t = 2.51$, $p < .02$) with a significant difference in response time for the color administration (mean of 12.78 seconds) as compared to the black and white administration (mean of 15.90 seconds). These results are presented in detail in Table 2.

Insert Table 2 about here

An inspection of the data in Table 2 does not indicate a consistent pattern of performance on the two versions of the PA subtest. Faster response time for the black and white version occurred on the two easiest items (items 3 and 4) as well as two of the most difficult items (items 12 and 14). Overall, response time was faster on seven color items and five black and white items with a statistically significant difference on item 7 only. Thus, the pattern of performance appears random.

In order to determine possible gender differences in performance, a series of one-way analyses of variance were conducted with gender as the independent variable and scores (raw scores and scaled scores) on the PC and PA subtests as dependent variables. Nonsignificant results were obtained in each analysis. Thus, boys and girls performed at an equivalent level on both the color and the black and white versions of the two subtests. These results are presented in detail in Table 3.

Insert Table 3 about here

Summary and Conclusions

The results of this study indicate that the use of color stimuli on the PC and PA subtests of the WISC-III has minimal effects on overall subtest performance. Students in the present study performed equally well on the color and the black and white version of the two subtests. Response time on the PA items were facilitated by color stimuli on seven items with a significant difference on only one item of 12. On five items the use of

color impaired performance.

The sample for the current study was above average in ability, as measured by the K-BIT, and did not exhibit any learning or behavioral difficulties. Whether these results generalize to students with disabilities, such as Attention Deficit Hyperactivity Disorder, is unknown and should be examined in future studies. For the present however, examiners can be assured that the addition of the color artwork on the WISC-III subtests of PC and PA produces minimal effects on student performance.

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Table 1

Raw Scores and Scaled Scores

	Color Version	Black and White Version	t	r
Picture Completion				
Raw Score	21.38	21.12	1.10	.73*
Scaled Score	11.57	11.37	.94	.71*
Picture Arrangement				
Raw Score	36.33	36.31	.02	.38**
Scaled Score	12.31	12.57	-.53	.37**

Note. N=90

* $p<.001$
** $p<.01$

Table 2

Response Time* by Item for Picture Arrangement Subtest

Item Number	N	Color Version	Black and White Version	t
3 (WALK)	88	6.59	**6.47**	.20
4 (MILK)	88	9.77	**9.51**	.30
5 (CHASE)	90	**11.60**	11.77	-.16
6 (CASH)	89	11.81	**11.72**	.08
7 (WORMS)	90	**12.78**	15.90	-2.51**
8 (SMOKE)	88	**10.63**	10.93	-.37
9 (BENCH)	85	**12.46**	12.95	-.46
10 (DUCK)	80	**10.74**	11.28	-.59
11 (STORM)	79	**13.05**	13.78	-.78
12 (WETDOG)	77	18.18	**17.90**	.22
13 (FARM)	67	**13.28**	13.70	-.37
14 (SHADOW)	51	23.53	**23.27**	.13

* In seconds
** $p<.02$

Table 3

Raw Scores and Scaled Scores by Gender

	Male	Female	F
Raw Scores			
Picture Completion			
Color	**21.86**	20.96	1.93
Black and White	**21.33**	20.94	.42
Picture Arrangement			
Color	36.24	**36.42**	.01
Black and White	**37.74**	35.06	1.18
Scaled Scores			
Picture Completion			
Color	**11.86**	11.31	.35
Black and White	**11.50**	11.25	.65
Picture Arrangement			
Color	12.26	**12.35**	.01
Black and White	**12.86**	12.31	.36

Note. N=90