The Effect of Color-Coded Notation on Sight-Reading Skills as Tested on Reading a Single Melodic Vocal Line in Collegiate Level Music Students

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Abstract

The purpose of this experimental study is to test the effect of color-coded versus black and white notation on music students' ability to sight-read with the least amount of error. Thirty collegiate music students were given an identical musical melodic phrase, one group receiving the melody using black and white notation, the other using color-coded notation. Problems with this study were mainly caused by an inconsistency in sight-reading abilities across the test subjects. As students were tested, it was found that students singing the color-coded score performed with fewer inaccuracies in intonation, rhythm, and duration. The purpose of this study was to identify the possible benefits of including color-coded notation in Pre K – 5th grade general music classes, as well as beginning method books for instrumental courses.

Review of Literature

In elementary school music class, nearly every piece of paper handed to young children features a bright splash of color somewhere on the page. Sheet music was designed to grab attention, and made every chance to sing an exciting new opportunity to gather information. As students progress in the school system, scores gradually become more and more featureless – white paper, black notes. Band, orchestra, and choir classes being no exception to that rule. Method books are consistently printed in black and white, filling pages after pages with repetitive exercises. What if color was kept in students' musical lives far longer? Could students learn faster or easier? Would they be able to sight-read more efficiently?

My topic centers around the potential role of color in musical notation. I am interested in discovering if color-coded notation positively enhances beginning music

students' ability to sight-read music. The purpose of this experimental study is to test the effect of color-coded versus black and white notation on music students' ability to sight-read with the least amount of error. For the purposes of this experiment, the test subjects will consist of 30 college students currently studying at The University of Kansas School of Music. The independent variable (color coded versus black and white notation) will be defined as a vocal sight-singing passage: one utilizing color-coded notation and one in black and white print. The dependent variable (number of mistakes made) will be defined as the number of incorrect solfége syllables vocalized, incorrect pitches sung, and incorrect rhythmic pattern per excerpt.

Previous studies on this subject have focused on one specific demographic. Students with disabilities (Lyngra 2011), elementary band students (Rogers 2011), and piano students (Brunner 2010) have tested the use of color-coded musical notation with each of their students. However, each study focused on small testing groups. Therefore, the results of these studies were varied, largely influenced by the few outlying members on the testing group. Other studies of the use of color-coded notation in music have focused solely on elementary-age students and their initial introduction to pitches (Primus 2013), note durations (Off 1993), and rhythms (Plass). These studies all came to the same conclusion; that the introduction of color in tandem with pitch and note duration increased students' abilities to recognize and cognitively process those musical elements. Although forming a solidified basis for my research, I have chosen to specifically study the correlation between color-coded notation and sight-singing in college-level music students. This demographic has been overlooked in this area of research, mostly due to the belief that university students studying music are fluent in

musical notation, therefore rendering the study invalid. However, music theory classes are required of all music emphasis majors - aural and visual training fall under that category. I am interested in researching how color-coded notation effects advanced students abilities to sight-read a passage of vocal music upon 5 seconds of exposure, the study directly correlating with curriculum in which these advanced skills are being taught.

Basing my hypothesis on previous studies researching a younger demographic, I believe that my research with find that students who sight-sing using a color-coded score will have less mistakes in regard to pitch, rhythm, and note duration than students who sight-sing using a black and white notated score.

Methods

Participants

Participants in this study consisted of 30 college students currently studying at The University of Kansas School of Music. Subgroups within the selected participants were divided as such: Music Education (n=19), Music Therapy (n=7), and Instrumental Performance (n=4). The requirements for participating in this study were as follows: currently studying at the University of Kansas School of Music, passed (with a B or above) Music Theory courses 1 and 2, and are proficient in vocal performance. All personal data aside from major and completion of courses was left anonymous on all data collection forms. Participant ages ranged from 19 – 23 years, with 18 participants identifying as female in gender, and 12 identifying as male in gender.

Materials

Each participant was paired with a score through the use of random selection. Thirty slips of paper were put into an opaque bag, labeled color (n=15) or black (n=15). As each slip was selected, they were omitted from the rest of the continuous selection for later participants. Based on the slip randomly selected, participants were given either a sight-reading example scored in black and white or color-coded notation. Participants were given a starting pitch on the piano, and were asked to sing the presented score without any assistance from the piano, a metronome, any pitch correction devices, or established key.

The sight-reading example selected for this study consists of a single-note melodic line, the length of which is eight full bars. Written in the key of F Major, this selected melody was converted into color-coded notation (n=15) based on a selection of six colors. Classification for color-coded notes are as follows:

C4 – blue	F4 – red	G4 – yellow
A4 – green	Bflat4 – purple	C5 – blue
D5 – light pink		

Colors were assigned to each note based on their contrast to their surrounding notes. For example, the colors blue and purple were not assigned to notes that fell next to each other in diatonic order. This decision was made in order to provide the least amount of error for students when relying on color for intonation accuracy i.e. mistaking red for pink or purple for blue when sight-reading. Notes were not assigned separate colors for differences in rhythmic duration.

Sight-reading example can be found in Appendix A.

Design

This study primarily employed a quantitative approach. Mistakes in both intonation and rhythm made per participant were measured and collected at one point for each mistake. This study was designed following the methods of Correlational Research, studying how the effects of color-coded notation improved, incapacitated, or did not affect students' ability to sight-read with the least amount of mistakes.

Procedure

Participants selected for this research study were selected based on the following criteria: currently studying at the University of Kansas School of Music, passed (with a B or above) Music Theory courses 1 and 2, and are proficient in vocal performance.

Participants were verbally asked if they were willing to participate in a study involving sight-reading and sight-singing, and were asked to schedule a five-minute time block with the researcher within a 24-hour period to complete the study. Upon arriving for their scheduled time block, participants entered an isolated office located in Murphy Hall. This room was consistently used for each participant, and was chosen for its soundproof qualities, blocking out any nonessential noise from the surrounding environment. Each student was given an identifying number, as well as a marking indicating whether they sung a black and white or color-coded score. The researcher selected one slip from an opaque back. Slips were labeled as such: color (n=15) and black (n=15). Based on the slip randomly selected, students were either given a copy of the sight-reading score printed in black and white notation, or color-coded notation. Each participant was given five seconds to review the sight-reading excerpt before being asked to sing through it. Participants were given a starting pitch on the piano, and

were asked to sing the presented score without any assistance from the piano, a metronome, any pitch correction devices, or established key.

Protocols on mistake-measurement and random selection will be equal for both participants selected for black and white notation, as well as color-coded notation.

All data was manually entered into a database, keeping only number as identifying factors for each participant. All preliminary data aside from major and completion of courses was left anonymous on all data collection forms.

Measurement Tools

The study will utilize a T-test, divided into "color" and "black and white" labeled columns. This chart will be used to organize and score students as they complete the study. Mistakes made in both intonation and rhythmic accuracy per participant will be measured on a one-point scale, each mistake results in the deduction of one point. This data will be recorded in a separate chart, pairing each student with the number of mistakes they made ranging from 0 – 31 (number of intonation mistakes), and 0 – 27 (number of rhythmic mistakes).

Data Analysis

All quantitative data collected within the study was grouped and separated according to notation color. Under the categories "Black and White" and "Color-Coded", each participants' number of mistakes made in both rhythmic and intonation performance was recorded in a separate sub-group. The study was then quantified into a T-test analysis, in which the performance of the groups was compared to calculate the highest rate of success.

Results

Proposing the use of color-coded notation in sight-reading exercises seems to suggest a higher rate of success in music students. Results of this study concluded that students who sight-read and vocally performed the excerpt utilizing color-coded notation performed marginally better than students performing the melodic line in standard black and white notation. Differences were slight, however, students randomly selected into the color-coded category performed with less intonation-based mistakes than students who performed with a black and white notated score. It should be noted, however, that inaccuracies in rhythmic notation appeared nearly identical in both categories, with rhythmic mistakes made by participants ranging from 0 – 2 mistakes with an outlier of 3.

Test Statistics[a,b]

		Rhythm	Intonation
Observed Control Group		21	27
Span	Sig. (1-tailed)	.003	.299
Trimmed Control Group		20	19
Span	Sig. (1-tailed)	.064	.030
Outliers Trimmed from each End		1	1

Test Statistics[a,b]

		Number of Runs	Z	Exact Sig. (1-tailed)
Rhythm	Minimum Possible	4[c]	-4.274	.000
	Maximum Possible	29[c]	5.017	1.000
Intonation	Minimum Possible	6[d]	-3.530	.000
	Maximum Possible	15[d]	-.186	.424

Discussion/Conclusion

Results of this study are compatible with pervious research conducted in the field of color-coded notation in relation to sight-singing abilities. It has been found across multiple platforms that, when introduced to color-coded notation, students perform with more intonation accuracy than students using scores in traditional back and white notation. However, much like the previous studies, this research focused primarily on one age group with a specified set of abilities. In order to challenge this collected data, I propose considerations in continuing research to follows this study.

Although selected participants for this study were all music majors at the University of Kansas, the abilities of these students varied greatly between each individual. This study neglected to either exclusively include or omit those with vocal emphasis backgrounds. However, it should be considered that even the sight-reading abilities of students with instrumental backgrounds differed greatly across the span of participants. For continuing research, I suggest regulating participants based on their ability to both sight-read and sight-sing presented passages.

Not considered in this study is the possibility of colorblind participants. Colorblindness effects 4.5% of the current population, a certain number of that percentage being musicians. Participants who are color blind would be unable to participate in a portion of the study in which color-coded notation is being tested. Although it is assumed that participants will be able to view a full range of colors, participants who are colorblind would effectively render the color-coded notation tests ineffective.

References

Benzuly, S. (2011). Color-coded music. *The Mix Journal, 35*, 14. Retrieved from http://search.proquest.com/docview/928935721?accountid=14556

Brunner, H. (2010). Color and music: A review of resources to enhance beginning instruction in piano pedagogy. Retrieved from Southern Illinois University. 1-58.

Kuo, Y. (2013). A proposal of a color music notation system on a single melody for music beginners. *International Journal of Music Education*, *31*, 394-412.

LaCour, F. (June 1983). Commentary: Letters to the editor – color-coded music. *Billboard Magazine, 95,* 10-12.

Lyngra, S. (2011). Color-coded music simplifies the challenge of reading. *Clavier Companion, 3,* 34-37.

Off, D. (1993). The color cognition of children. *Journal of Cognitive Science, 48*, 121 137.

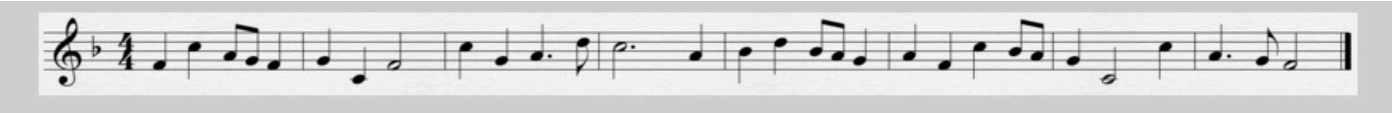
Palmer, S. (2013). Music-color associations are mediated by emotion. *Proceeding of the National Academy of Sciences. 110,* 36-88.

Plass, Jan L. (2014). Emotional design in multimedia learning: Effects of shape and color on affect and learning. *Journal of Learning and Instruction. 29*, 128-140.

Primus, M. (April 2013). The color code success. *Montreal Community Contact, 23,* 20 25.

Rogers, G. (2011). Effect of color-coded notation on music achievement of elementary instrumental students. *Journal of Research in Music Education, 39,* 64-73.

Appendix



Ranks

	Color	N	Mean Rank	Sum of Ranks
Rhythm	Black and White	15	15.27	229.00
	Color-Coded	15	15.73	236.00
	Total	30		
Intonation	Black and White	15	19.80	297.00
	Color-Coded	15	11.20	168.00
	Total	30		

Test Statistics[a,b]

		Rhythm	Intonation
Observed Control Group		21	27
Span	Sig. (1-tailed)	.003	.299
Trimmed Control Group		20	19
Span	Sig. (1-tailed)	.064	.030
Outliers Trimmed from each End		1	1

a. Moses Test

b. Grouping Variable: Color

Test Statistics[a,b]

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Rhythm	Minimum Possible	4[c]	-4.274	.000
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