

Musical Instrument Education and Inhibitory Control in Adolescent Youth

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Submitted in Partial Fulfillment of the Requirements for the
Degree of Master in Education

July, 2018

Graduate Programs in Education

Goucher College

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ABSTRACT

The purpose of this study was to compare the inhibitory control of students in an instrumental music program (Instrumentalists Group) to those of the same age with no experience in instrumental music (Non-Instrumentalists Group). The measurement tool was an adjusted version of the Stroop color test to assess the level of inhibitory control displayed in each group. Inhibitory control scores in each group were compared and it was determined that there was no statistically significant difference in the levels of inhibitory control displayed by the Instrumentalists and Non-Instrumentalists. It is important to note that this study was limited in terms of sample size, sampling type, and the characteristics of the students. Research in this area through studies that include a more representative sample of adolescent youth should be conducted to determine if these results can be replicated.

CHAPTER I

INTRODUCTION

Music instruction is often considered an “extra” part of education- something that comes second to more traditional school subjects like math and reading. Since most schools are evaluated based on their students’ math and reading scores, there is an increased emphasis on accountability in those subjects, and special area subjects like music and the arts have fallen to lower priority. However, research suggests that enrolling a child in music classes can have a significantly positive influence on one’s academic success. Much of the benefit of music education has been traced back to music’s unique capacity to exercise the brain, developing plasticity and building a skill area known as executive functioning which includes the cognitive capacity to problem solve, set goals, and make informed decisions. In times when music education has often taken a back seat to other tested academic areas, research into the connections between music and these vital cognitive skills would support the inclusion of music performance classes in a public school education. Several studies have already shown promising correlational evidence of the connection between music education and cognition, including that of Dege, Kubicek, and Schwarzer (2011), who found significant associations between music lessons and five areas of executive functioning in children ages 9-12. This study, and others, gives evidence of the cognitive benefits of music education and could encourage public schools to invest in music education to enhance the learning and development of their students, and set them on a path to future success.

Statement of the Problem

This study will compare the inhibitory control of students in an instrumental music program to those of the same age with no experience in instrumental music. The relationship between studying a musical instrument and inhibitory control will be investigated, to determine whether music education can contribute to the neurological development of adolescents, specifically in aiding the development of one of their executive functions.

Hypothesis

Null Hypothesis: There is no statistical difference in the inhibitory control of adolescent youth enrolled in an instrumental music program and the inhibitory control of those not enrolled in an instrumental music program.

Alt Hypothesis: There is a statistical difference in the inhibitory control of adolescent youth enrolled in an instrumental music program and the inhibitory control of those not enrolled in an instrumental music program.

Operational Definitions

Instrumental Music Education: Subjects in this study who have received an instrumental music education have been members of a band or orchestra class in the public school system for at least one year.

Adolescent Youth: Children between the ages of 10-15 years old

Executive Function: Several cognitive processes that affect people's ability to self-regulate their own behavior, including working memory, mental flexibility, and inhibitory control.

Inhibitory Control: The ability to discern relevant information in a timely manner, in order to make decisions appropriate to achieving a desirable goal.

CHAPTER II

REVIEW OF THE LITERATURE

Overview

This study will focus specifically on the connection between musical instrument education and inhibitory control in adolescent youth. This review of the literature will explore the significance of executive function and inhibitory control as an executive function, and examine the relationship between these skills and music education.

Significance of Executive Function

A child's abilities at school are not influenced by academic learning opportunities alone. Their success can also be traced to basic cognitive capacities to learn through their executive functions. Executive function includes several processes that affect a person's ability to self-regulate their own behavior, including working memory, mental flexibility, and inhibitory control. Executive function is connected to various areas of education, and measurement of executive functioning levels can be used as a predictor of academic and behavioral success.

One study showed that several aspects of executive function in preschool age children were a prominent correlate of both early reading and math abilities (Blair, & Razza, 2007). Another study on both 7- and 14-year old students revealed a correlation between a child's working memory and their performance on national curriculum assessments in English, Math, and Science (Gathercole, Pickering, Knight, & Stegmann, 2004). These results suggest that the intellectual operations required by these academic subjects are strongly linked to their executive functioning capacity at multiple stages of a child's development.

Executive function has also been connected to adjustment to middle school, academically and behaviorally. The transition from elementary to middle school is a developmental challenge with the ability to significantly influence a child's academic and social trajectory. A study by Jacobson, Williford, and Pianta (2011) tested the relation between a child's executive function skills before and after a transition from elementary to middle school and their academic and social achievement. The study showed that parents and teachers tended to report more behavioral problems and less regulatory control in middle school students with weaker levels of executive function. The measured levels of executive function also significantly predicted the academic achievement levels of these students.

These findings point to the significance of executive functioning skills and suggest that designing academic programs that include aspects of training in executive functioning development would be most effective in facilitating academic success.

Inhibitory Control as an Executive Function

Inhibitory control is a key element of executive function and development of this ability may be most effective in helping children succeed in school. Inhibitory control is a central feature of the development of executive function. In fact, impulsivity and inhibitory control has been found to be a predictor of overall executive functioning level in adolescents. (Fino, Melogno, Iliceto, D'Aliesio, Pinto, Candilera, & Sabatello, 2014) The inhibitory control aspect of executive function has also been observed to be a prominent correlate of both early math and reading ability in a study involving kindergarten students. (Blair & Razza, 2007) Although the subjects of this study were kindergarteners, it is important to note that the results indicated that inhibitory control proved to have the strongest correlate to academic success out of all aspects of child executive functioning.

Inhibitory control has also been connected to increased abilities of creative problem solving. Neuroscience studies tend to show activation in the prefrontal brain regions associated with inhibitory control during the generation of creative ideas (Cassotti, Agogu, Camarda, Houde, & Borst 2016). These findings show that creative problem solving and the generation of unique ideas relies on the ability to suppress previously acquired knowledge through the use of inhibitory control, and supports the need for more research into whether methods of intervention based on inhibitory control training could enhance creative problem-solving abilities of school-aged children, thereby enriching their academic experience and increasing their chances for success.

Influencing Factors on Inhibitory Control

Inhibitory control develops gradually as a child matures. Variations in levels of inhibitory control are observed from early childhood and continue into adolescence. A study on the development of inhibition control found that the ability to suppress inappropriate responses improved throughout childhood, then diminished slightly throughout adulthood. (Robinson, 2017) Within these results, variation occurred, with possible influences in inhibitory control development including culture, genetics, economic status, and social status.

The unique neurological developments that occur during adolescence must also be taken into consideration when studying the middle school age group. Adolescence is characterized by a higher occurrence of risk-taking decisions and an increased sensitivity to social environment. Although their inhibitory control is more developed during adolescence than it was at a younger age, it is important to note that decision-making in adolescence may be significantly influenced by emotional and social factors. (Blakemore & Robbins, 2012)

Understanding the adolescent brain and neurological development is essential in designing middle school education. Education can be used to offset some of the negative influences on inhibitory control by training students in techniques that use executive function skills like making inferences and generalization, eliminating irrelevant information, and finding relationships. Early advocates of the middle school structure stressed the need for a shift from strictly regimented subject areas to a more interdisciplinary approach with a valuable integration of vocational classes, arts, and home economics. Exposure to subjects like music and the arts allows students to exercise their strengths at a time when their creativity is at the peak of development. (Robinson, 2017)

Music Education as an Influencer on Inhibitory Control

Music education, especially music education that begins early in life, has been connected to the development of many skills. Studies comparing musicians and non-musicians have shown that musical training is associated with the enhancement of academic skills like reading and math as well as cognitive skills like auditory and visual processing, verbal fluency, and attention control. Activities like music and the arts can be also used to develop executive function skills like inhibitory control, leading to a higher likelihood of academic success.

The academic benefit of music education has been observed through study of test scores. Students in music classes tend to have higher standardized test scores and better grades in English Language Arts and Math classes than their peers who are not enrolled in music classes. Achievement is observed in students who have had as little as one year of music study, and increases with an additional 2-3 years of instruction. (Holochwost, Proper, Wolf, Willoughby, Fisher, Kolacz, & Jaffee, 2017).

Studies on the cognitive benefits of music education have also been published. Music education has been found to enhance verbal fluency and processing speed, as well as cause heightened brain activation. (Zuk, Benjamin, Kenyon, & Gaab, 2014) Children who receive music training experience benefits in neural processing of sound, which helps improve language skills. In the case of adolescent students observed while receiving music training over a course of three years, enhancement of phonological processing was greater than that of students of the same age who were not receiving music instruction. This demonstrates that in-school music training programs can benefit brain plasticity even when instruction begins as late as adolescence (Tierney, Krizman, & Kraus, 2015). In a study involving children ages 9-12 years of age, results suggested significant associations between music lessons and five areas of executive functioning: set shifting, selective attention, planning, inhibition, and fluency. The strongest contributors to the correlation were the measures of selective attention and inhibition (Dege et al., 2011).

Executive functioning may also be enhanced by instrumental music instruction in particular. One study on kindergarteners measured the effects of five weeks of instrumental music instruction using the violin Suzuki Method. Results indicated that attention control is enhanced with instrumental music instruction when presented in early childhood (Hallberg Martin, & McClure, 2017). Connections have also been made with performing on a musical instrument and auditory processing and working memory. Clayton, Swaminathan, Yazdanbakhsh, Zuk, Patel, & Kidd (2016) published a study that showed that adult musicians with at least ten years of musical training on an instrument performed better than non-musicians on tasks that involve the use of working memory and auditory processing. Correlations between auditory processing and cognitive factors confirmed a relationship between musicianship and these elements of executive functioning. The findings of these two recent studies support further

investigation into the specific benefits of instrumental music instruction on executive function skills of children in other age groups, particularly those in adolescence.

CHAPTER III

METHODS

The purpose of this study is to investigate the relationship between instrumental music study and inhibitory control in adolescent youth. This study is a quasi-experimental design in which the independent variable is participation in an instrumental music education class and the dependent variable is performance on an assessment measuring inhibitory response. Participants in this study were grouped into two categories, those who have received an instrumental music education (Instrumentalists) and those who have not (Non-Instrumentalists). Each group participated in a test that measured their level of inhibitory response and the results of the two groups were compared.

Participants

The participants in this study are 52 students enrolled in 8th grade at a school in the Baltimore County Public School district in Maryland. Since these students were enrolled in the researcher's class, a convenience sample was used. Participants in the study were divided into two groups based on their level of instrumental music instruction. The Instrumentalists sample group consists of 23 students, 13 males and 10 females, who are enrolled in an 8th grade band or orchestra class. Since all students begin their involvement in instrumental music in 5th grade, these students were chosen to represent the portion of the student body because they have received the most years of instrumental music instruction, and would therefore be the best comparison to students who have received no instrumental music instruction. The students in the Instrumentalists sample group have received a public school instrumental music education for four years, including instruction on the musical instrument of their choice from a Maryland State

certified music teacher and participation in their school's performing ensemble. The total instruction for these students occurs during the school day, for an average of two to three 90-minute class periods per week. Students are permitted and encouraged to take their instruments home for independent practice.

The Non-Instrumentalists sample group consists of 23 students, 14 males and 9 females, who are in the 8th grade and have never been enrolled in an instrumental music class, but are enrolled in an American Music History class. These students have been exposed to basic concepts of music through enrollment in general music classes, but have not received any formal instrumental music education through their school.

Instrument

The instrument used in this study is the Stroop Color and Word test, commonly known as the Stroop Effect test. This instrument is designed to test how participants perform when the brain is asked to interpret information under conflict, specifically a conflict between word recognition and color recognition. The conflict requires extra processing time to resolve, since the brain has to inhibit the process of word recognition in order to perform a correct response using color recognition. (Stroop, 1935) This test was chosen for use in this study because of its ability to be replicated in a timely manner and because the material tested (recognizing colors and color words) is appropriate for the middle school age of the participants of the study.

The Stroop Color and Word Test is reviewed in the Mental Measurements Yearbook. (Golden, 1985) Reviewers believe that evidence on the instrument's reliability is presented clearly and is consistent across several studies. The validity of the test is also supported with examples of the test being used in research. Overall, the reviewers advise caution in using the

test in a clinical environment as a measurement of psychological disorders, but they do believe that it is an appropriate tool for collecting data for research purposes in investigating inhibitory response.

Procedures

Participants in the Instrumentalists group were selected through a convenience sample, since they were enrolled in the researcher's Instrumental Music class. The Non-Instrumentalists were also a convenience sample, since they were enrolled in the researcher's American Music History class. Test participants were tested during their class time by the researcher. Each participant was tested individually, and was read scripted directions before being asked to complete the test. The test was presented in two rounds; images of both rounds are attached in Appendix A. In both rounds, a 5x8 grid of color words was presented on a laptop screen. In round one, each word matched the color in which it appeared. In round two, each word did not match the color in which it appeared. Participants were asked to say the color of each word as fast as they could. The researcher used a digital countdown timer, placed in view of each test participant, to set a one-minute time limit for each round of the test. Two rounds were administered in immediate succession of each other with the researcher recording the time remaining on the one-minute timer after completion of each round. Participants who went over the one minute time limit were automatically assigned a time of zero.

CHAPTER IV

RESULTS

The purpose of this study was to determine the impact that participation in an instrumental music education would have on students' inhibitory control. Thus, an independent samples *t*-test was conducted. The independent samples *t*-test analyzed differences in student performance based on overall scores on the Stroop color test. This analysis was conducted with the goal of determining if there was evidence of statistical significance between the two groups. The significance level of this analysis was set at $p < .05$.

Table 1 illustrates the results of the independent *t*-test on the mean scores of the Instrumentalists and Non-Instrumentalists groups.

Table 1

Stroop Color Test Scores: Instrumentalists and Non-Instrumentalists Groups

Group Name	Group Size (N)	Mean	Std. Deviation	t	df	p
Instrumentalists	23	15.0000	7.42845	-.340	44	.736
Non-Instrumentalists	23	15.8261	8.98813			

The analysis revealed that there was no statistically significant difference between the Instrumentalists group ($M = 15.0000$, $SD = 7.642845$) and the Non-Instrumentalists group ($M = 15.8261$, $SD = 8.98813$).; $t(44) = -.340$, $p = .736$. These results suggest that students exposed to an

instrumental music education did not score statistically higher or lower than students who were not exposed to an instrumental music education. As such, the null hypothesis is supported. The results and their implications are discussed in Chapter 5.

CHAPTER V

DISCUSSION

Results

The results of this study show that there was no statistically significant difference in the measured levels of inhibitory control in students who are exposed to an instrumental music education and those who are not. Therefore, this study's findings failed to reject the null hypothesis.

Implications

This study does not prove that an instrumental music education influences the level of inhibitory control in adolescent youth. In fact, the means of the two groups show that the Non-Instrumentalists completed the Stroop color test, on average, 0.8261 seconds faster than the Instrumentalists. However, one cannot say that there is a significant difference in the scores of the two groups since the *t*-test scores of -.340 are not in the range we need to show significance in this study. These findings could imply that inhibitory control in adolescent youth develops independent of instrumental music instruction, or could suggest that one of the groups was influenced significantly by environmental factors. Further studies would need to be conducted to determine if the difference in mean scores on the Stroop color test between Instrumentalists and Non-Instrumentalists can be replicated, or was displayed by chance.

Threats to Validity

The internal validity of this study may have been influenced by the reading comprehension level of the students, the sampling method, or the treatment level of the Instrumentalists group. The comprehension level of the students could have affected their performance on the assessment. A student with a lower reading level or a student who speaks English as a second language may have taken less time to complete the test. The conflict between word and color would have been stronger for a student who is quick with word recognition compared to one who is not as skilled in word recognition. The method of selection of subjects is also a threat to the validity of this study. The participants were selected through convenience, since the participants in both the Instrumentalists and the Non-Instrumentalists groups were enrolled in the researcher's classes. A random sample would have been more representative of the total population. In addition, the level of instrumental music education of those in the Instrumentalists group varied due to the amount of time students spend on independent practice, participation in extracurricular music groups, and attendance to the instrumental music classes. Students who elected to spend extra time practicing their instrument outside of class hours would have a higher level of instrumental music education than those who only participated in class. In contrast, students who were absent from classes would have a lower level of instrumental music education than those who had perfect attendance.

In addition, several factors could threaten the external validity of this study. It would be difficult to replicate the exact instrumental music education a student receives at one school, since the instruction is never the same from school to school. The teaching style of the instructor, the availability of teaching materials, or the class size of each lesson group are all factors that could affect the quality of instrumental music instruction. The development of executive

functioning skills can also be affected by external factors that are difficult to control, such as social, economic, or environmental forces. (Blakemore & Robbins, 2012) For example, the development of executive functioning skills in an adolescent who experienced high levels of childhood trauma would be delayed as compared to one who had not had traumatic experiences. If one of the tested groups had a higher level of negatively influencing factors than the other, it would significantly impact the results in a way not connected to the independent variable.

Connections to the Existing Literature

This purpose of this study was inspired by previous studies that suggested that there could be an increase in inhibitory control in students who are exposed to an instrumental music education. Robinson (2017) cited the need for music classes in middle school because of the unique qualities of the adolescent development stage. Creativity is at peak development during adolescence, and Robinson believed that courses like music would help students take advantage of these skills and give them opportunities to develop further. A study by Cassotti et al., (2016) showed a positive correlation between creativity and inhibitory control, which prompted the researcher's choice to study the inhibitory control of students who are exposed to an instrumental music education. In designing this study, the researcher chose to compare the traits of musicians and non-musicians, much like the studies of Clayton et al., (2016).

Since this study failed to reject the null hypothesis, it is important to review literature that discusses the influencing factors on inhibitory control. In his 2017 study, Robinson stated that inhibitory control development can be influenced by several external factors including culture, genetics, economic status, and social status. Blakemore and Robbins (2012) also found that decision-making in adolescence may be significantly influenced by emotional and social factors since adolescence is characterized by a sensitivity to social environment. The sample groups of

students in this study were not surveyed about any of these factors, so it is impossible to determine whether the results were affected.

Implications for Future Research

This study's comparison of inhibitory control in students enrolled in instrumental music education to those not enrolled in instrumental music education proved to have no statistically significant difference. For future studies, several changes could be made to improve the chance of showing significance. A wider variety of sample groups could be tested to include students in different types of music classes, including vocal music and general music, as well as students who are not enrolled in any type of music education. In each sample group, the number of participants should be increased to have a greater chance of representing the total population, and the participants should be selected through random sampling. Including students from several different schools in the sample would also eliminate the effect that the instructor or the teaching method at any one school may have on the results.

Further research into the benefits of music instruction could also be conducted. A correlational study would help investigate if the amount of time spent practicing a musical instrument outside of regular instruction is related to the development of inhibitory control. In addition, several studies cited in Chapter II investigated other executive functions such as self-regulation, working memory, and mental flexibility. Conducting a similar study comparing Instrumentalists to Non-Instrumentalists in these areas would help clarify the effect of instrumental music instruction on adolescent youth when looking at their overall executive functioning.

Conclusions

This study focused on the comparison of the levels of inhibitory control in adolescent youth who were enrolled in instrumental music education to those who were not. Two groups of students (Instrumentalists and Non-Instrumentalists) were assessed using a modified version of the Stroop color test and it was determined that there was no statistically significant difference in the levels of inhibitory control in students who are exposed to instrumental music education. It is important to note that this study was limited in terms of sample size and the characteristics of the students. Further studies that include a more representative sample of adolescent youth is suggested to determine if these results can be replicated.

REFERENCES

- Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647-663. doi:10.1111/j.1467-8624.2007.01019.x
- Blakemore, S., & Robbins, T. W. (2012). Decision-making in the adolescent brain. *Nature Neuroscience, 15*(9), 1184-1191. doi:10.1038/nn.3177
- Cassotti, M., Agogu, M., Camarda, A., Houd, O., & Borst, G. (2016). Inhibitory control as a core process of creative problem-solving and idea generation from childhood to adulthood. *New Directions for Child & Adolescent Development, 151*, 61-72. doi:10.1002/cad.20153
- Clayton, K. K., Swaminathan, J., Yazdanbakhsh, A., Zuk, J., Patel, A. D., & Kidd, G. (2016). Executive function, visual attention and the cocktail party problem in musicians and non-musicians. *PLoS ONE, 11*(7), 1-17. doi:10.1371/journal.pone.0157638
- Dege, G. F., Kubicek, C., & Schwarzer, G. (2011). Music lessons and intelligence: A relation mediated by executive functions. *Music Perception, 29*(2), 195-201. doi:10.1525/MP.2011.29.2.195
- Fino, E., Melogno, S., Iliceto, P., D'Aliesio, S., Pinto, M. A., Candilera, G., & Sabatello, U. (2014). Executive functions, impulsivity, and inhibitory control in adolescents: A structural equation model. *Advances in Cognitive Psychology, 10*(2), 32-38. doi:10.2478/v10053-008-0154-5

- Gathercole, S. E., Pickering, S. J., Knight, C., & Stegmann, Z. (2004). Working memory skills and educational attainment: Evidence from national curriculum assessments at seven and fourteen years of age. *Applied Cognitive Psychology, 18*(1), 1-16. doi:10.1002/acp.934
- Golden, Charles J. (1985) [Review of the test Stroop Color and Word Test]. In *The Ninth Mental Measurements Yearbook*. Lincoln, NE: Buros Institute of Mental Measurements.
- Hallberg, K. A., Martin, W. E., & McClure, J. R. (2017). The impact of music instruction on attention in kindergarten children. *Psychomusicology: Music, Mind & Brain, 27*(2), 113-121. doi:10.1037/pmu0000177
- Holochwost, S. J., Propper, C. B., Wolf, D. P., Willoughby, M. T., Fisher, K. R., Kolacz, J., Jaffee, S. R. (2017). Music education, academic achievement, and executive functions. *Psychology of Aesthetics, Creativity & the Arts, 11*(2), 147-166. doi:10.1037/aca0000112
- Jacobson, L. A., Williford, A. P., & Pianta, R. C. (2011). The role of executive function in children's competent adjustment to middle school. *Child Neuropsychology, 17*(3), 255-280. doi:10.1080/09297049.2010.535654
- Putkinen, V., Tervaniemi, M., Saarikivi, K., & Huotilainen, M. (2015). Promises of formal and informal musical activities in advancing neurocognitive development throughout childhood. *Annals of the New York Academy of Sciences, 1337*(1), 153-162. doi:10.1111/nyas.12656
- Robinson, R. (2017). Implications for middle schools from adolescent brain research. *American Secondary Education, 45*(3), 29-37. Retrieved from <https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com/goucher.idm.oclc.org/login.aspx?direct=true&db=a9h&AN=125089082&site=ehost-live&scope=site>

- Propper, S.J., Wolf, C.B., Willoughby, Fisher, M.T., Kolacz, K.R. & Jaffee, S. R., (2017). Music education, academic achievement, and executive functions. *Psychology of Aesthetics, Creativity & the Arts*, 11(2), 147-166. doi:10.1037/aca0000112
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18:643-662
- Tierney, A. T., Krizman, J., & Kraus, N. (2015). Music training alters the course of adolescent auditory development. *Proceedings of the National Academy of Sciences of the United States of America*, 112(32), 10062-10067. doi:10.1073/pnas.1505114112
- Williams, B. R., & Ponesse, J. S. (1999). Development of inhibitory control across the life span. *Developmental Psychology*, 35(1), 205. Retrieved from <https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com/goucher.idm.oclc.org/login.aspx?direct=true&db=a9h&AN=1510192&site=ehost-live&scope=site>
- Zuk, J., Benjamin, C., Kenyon, A., & Gaab, N. (2014). Behavioral and neural correlates of executive functioning in musicians and non-musicians. *PLoS ONE*, 9(6), 1-14. doi:10.1371/journal.pone.0099868

APPENDIX A

Part 1

RED	YELLOW	BLUE	GREEN	BLACK
PINK	ORANGE	BROWN	GRAY	PURPLE
GREEN	GRAY	BLACK	BLUE	YELLOW
GRAY	BROWN	PINK	ORANGE	BLUE
YELLOW	RED	GREEN	BLACK	GRAY
BLACK	BROWN	PURPLE	ORANGE	PINK
PURPLE	BLACK	YELLOW	RED	GREEN
ORANGE	PINK	BROWN	GRAY	PURPLE

Part 2

RED	YELLOW	BLUE	GREEN	BLACK
PINK	ORANGE	BROWN	GRAY	PURPLE
GREEN	GRAY	BLACK	BLUE	YELLOW
GRAY	BROWN	PINK	ORANGE	BLUE
YELLOW	RED	GREEN	BLACK	GRAY
BLACK	BROWN	PURPLE	ORANGE	PINK
PURPLE	BLACK	YELLOW	RED	GREEN
ORANGE	PINK	BROWN	GRAY	PURPLE