UNIVERSITY OF TWENTE.

# *The effect of visual art design on mood, creativity and stereotypical differences in gender*

Viviane Lee Meyerhoff
S1465538
Bachelorthesis
June 2016

Faculty of Behavioral Science,
Psychology

Supervisors:
Dr. M. Pieterse & Dr. T. Van Rompay

Abstract

As early childhood is the most and rapid period of development, it becomes increasingly crucial to pay particular attention to the construction of the interior environment of educational settings which ought to meet children´s needs. Especially colors are a salient and powerful factor in children's lives having a beneficial impact on the psychological condition and on the cognitive development. Feelings of comfort and safety as well as the stimulation of creativity are linked to a colorful wall design. Additionally, colors are also known to be helpful for painters as there exists a reciprocal interaction between color usage and emotion so that they are often used to express oneself. Regarding these benefits, this paper intends to explore the effects of a colourful wall design on mood and creativity. Furthermore, because color often reflects traditional gender stereotypes as a function of carrying gender-related information, gender-stereotypical color differences are of further interest. For the assessment, an experimental study design has been implemented in a German kindergarten among 40 children between an age of four to six. The participants were exposed to visual artwork called murals of the Swizz Charity Foundation *ANOUK* showing either a white and grey or blue-dominated mural on the wall, projected by two beamers. A mandala and an one-item-smiley questionnaire were used as measurement tools to assess the variables mood, creativity and stereotypical gender differences. Regardless their color preference and stereotypical color association, results indicated that blue rather than grey or white as the dominated color is more positive with regard to creativity for both males and females while benefits in mood were only found in girls. Finally, with regard to future research it is suggested to apply a longitudinal study that studies the impact of different hues in educational setting more deeply.

*KEYWORDS: color, creativity, mood, gender stereotypes*

# Colors in Kindergarten

Colors are the strongest element in our environment and typically one of the first characteristics that are noticed when entering a room (Venolia, 1988; Tofle, Schwarz, Yoon & Max-Royale, 2004). Already in early childhood which is the most and rapid developmental period in children, they have much power and influence on the development of a child (Unicef, 1994) as children are fascinated by exploring the world and do so through the direct manipulation of their physical environment (David & Weinstein, 2013). According, it becomes increasingly crucial to pay particular attention to the construction of the interior environment which ought to meet children´s needs. In their book, David and Weinstein (2013) highlight variation in the environment of children to provide the best opportunity for them to explore their world through their senses. Thereby, much emphasis lies on color supporting the development of cognitive, social and motor functions as well as the enhancement of cognitive and social competence (David & Wittenstein, 2013). Consequently, colors might be especially beneficial in educational settings in which children are steadily developing (Mehta & Zhu, 2009). Olds (2011) emphasizes color as an element that may foster a feeling of comfort, trust and safety that are supposed to be the most important bases for children.

As one form of representation, visual art presented on the surface of the respective organization expresses colors. In medical institutions, for example, renovation projects indicated that changing sunlight and using colors affect well-being positively, by for example distracting, motivating or comforting them (Dijkstra, Pieterse & Pruyn, 2008; Kirwan, 2013). Making an overall conclusion, color may have a beneficial impact on the psychological condition and the cognitive development of young children. In the current study, the constructs mood, creativity and gender stereotypes in relation to color are of greater interest as further research about it is needed to make certain implications in the context of educational settings.

## Mood

It is known that colors can help to express oneself (Upitis, 2011). Hence, if a child utilises a particular hue in their painting, for example, it can be assumed that this hue is representing his or her emotional status (Pope, Butler & Qualter, 2012). Upitis (2011) further explains that a reciprocal interaction exists between color usage and emotion. This interaction is characterized by special feelings going along with special hues as well as by the combination of mental processes that affect all memories and emotions (Upitis, 2011).

In a qualitative study of Lawler and Lawler (1965) evidence was found on particular

color-mood-associations when students were asked to match colors with a list of adjectives. Thereby, brown turned out to be associated with feeling unhappy, sad and despondent while yellow was matched with cheerful, joyful and exciting (Lawler & Lawler, 1965). Furthermore, in another study by Boyatzis and Varghese (1994), it has been manifested that light colors, such as yellow and blue, are associated with positive emotions (e.g., happy, strong) and dark or neutral colors, such as black, gray and white with negative emotions (e.g., sad lonely, boredom, anger). This was also confirmed by a study of Hemphill (1996) as well as Kaya & Epps (2004). In addition, the cool color blue is linked to comfort, relaxation and safety while the warm color red is associated with love and excitement, but likewise with blood and fight (Kaya & Epps, 2004; Kirwan, 2013). Regardless of age or ethnicity, these positive and negative color-mood-associations are closely linked to color preferences. The more a child likes the color the more it elicits positive feelings (Kaya & Epps, 2004). In another study by Jacoby and Suess (1975), for instance, yellow and also red were found to contribute to anxiety rather than blue and green. Bearing the further argumentation in mind, it is necessary to highlight that blue seems to be the color that evokes the most positive feelings whereas colors such as yellow and red also evoke negative emotions.

**Creativity**

The construct creativity refers to a process, a product or a person (Barron and Harrington, 1981). In context of a product, creativity can be defined as interpersonal and intrapersonal process of developing original, qualitative and authentically significant work, for example a drawing. Van Gielen & Maarleveld (2007) found that many stimuli in the physical environment excite people´s creativity potential. To examine in more detail, it has been explained that an artist itself profits from an interior environment that is designed with other visual art as this often contributes to higher motivation as well as inspiration and equally leads to feelings of beauty, joy and fulfilment (Gielen & Maarleveld, 2007; Upitis, 2011). Subsequently, it might help him or her to use more different colors in a painting.

When the effects of colors in physical art of the exterior and interior environment of child care centers has been compared in a study of Read (2003), it has been found that the use of a colored surface contributes positively to both intrinsic experiences such as creativity, joy and astonishment, and extrinsic experiences like successful learning processes, engagement and self-confidence. This is also confirmed by the findings of Upitris (2011).

Other research about the effects of blue versus red on cognitive task performance illustrates that creativity is stimulated in a blue environment while attention to detail is

stimulated in a red environment (Mehta & Zhu, 2009). Moreover, in a study about creativity in an office environment, cool colors such as blue or green and an interior design with low complexity were found to increase the creativity level when compared to an office with warm colored surfaces (e.g. red or purple) and high complexity (Ceylan, Dul & Aytac, 2008). All in all, a colored surface is beneficial for competence and creativity and is therefore suggested to be used in educational settings

**Gender specific reactivity to color**

With regard to gendered color stereotypes in children´s drawing behavior, paintings can be affected by it through the choice of a stereotypical versus a non stereotypical color. When analyzing gender differentiated color usage in American and Japanese boys compared to girl with an age of five to ten, it turned out that boys use fewer colors and more white hues (Karniol, 2011). Jadva et. al. (2010) further indicated that they also prefer intensity, so that they choose red, blue and black over others. Opposed to this finding, girls vary more often in their color application with the tendency to choose pink and pastel hues several times more (Karniol, 2011). This pattern can be confirmed on basis of observations of American fifth graders. In their study, Boyatzis and Albertini (2000) implied monochromic patterns in boys and variation and vivacity in girls. Finally, Tuman (1999) also indicates a female tendency of variation preference, however, due to low significance of greater creativity manifestation evidence again is contradictory so that no plain conclusions can be drawn from observation in creativity test scores (Tuman, 1999, Baer & Kaufman, 2008) Hence, more research is needed to confirm a real female advantage (Baer & Kaufman, 2008).

**Gender Stereotypes**

Color often reflects traditional gender stereotypes as a function of carrying gender-related information, that is to say pink for girls and blue for boys (Pomerlau, Bolduc. Malcuit, & Cossette, 1990) Being dependent upon their family and social environment, toddlers usually are raised in terms of these stereotypical gender-color associations so that they later on tend to choose their toys on basis of the gender-stereotyped color (Tuman, 1999). However, it is not clear whether these differences only emerge from nurture or also from nature since earlier studies reveal different study outcomes. On the one hand, some studies emphasize the habituation affect and the gender-stereotyped influence in early childhood due to which children choose their color preference. On the other hand, Chiu et al. (2006) found out that children choose the color they identify with. This finding is based on a study they did

with children who are suffering from gender identity disorder.

Indicated by LoBue and DeLoache (2011) stereotypical color preferences are particularly present in 2,5 years-old children as they found that girls give preference to pink to a great extent while boys avoid it which again supports the influence of nurture in color usage. Interestingly, while the avoidance of pink and painting female-stereotypical figures (i.e. Bratz) could be especially observed in boys, girls utilised both female and male stereotypical colors in a female-stereotyped figure but not in the male-stereotyped figure (i.e. Batman) (Karniol, 2011).

**Research Gap**

Valdez and Merhabian (1994) reviewed the research on psychological and cognitive effects of colors. Although they illustrated that there already exists a lot of literature about colors influences on constructs such as emotion and creativity, there are still some ambiguities. Sometimes either single colors have been used or the time of expose was too short to get reliable results (Valdez & Mehrabian, 1994). Moreover, the effect of colors seems to be different when colored pictures are shown to someone rather than expose him or her unconsciously to a colored environment. By simply showing colors the person is not susceptible to the intervening variables of reality, for example textures and the natural or artificial light. In order to get valid results it is necessary to use a design that is close to reality, for example, by exposing the participants to colors in the interior environment while performing a task or playing. Aside from that, there is a lack of control measurements as most research focuses on empirical observation and qualitative research (Valdez & Mehrabian, 1994).

Summing up all research, there is no doubt about the influence of colors in visual drawings on children´s psychological condition, cognition and behavior (Maier, Barchfeld, Elliot & Perun, 2009), but it may be questioned to which extent color effects mood and creativity and whether there is an interaction with gender. Furthermore, it may be interesting to get more profound results about the influential effect of learned stereotypes on the painting behavior of children when contrasted under two different conditions. The present study lays its focus on children in kindergarten. In doing so, an experimental study design has been implemented to find out if there are differences between the conditions when making use of a grey/white versus a colourful, blue-dominated surface. Finally, with reference to the previous findings about color-mood associations, creativity and color as well as colored-gender stereotypes the following three hypothesises have been formulated:

1. It is assumed that children from an age of four to six are indicating significantly higher positive mood in a blue-dominated environment compared to a white/grey environment.
2. It is assumed that in a blue-dominated environment, children aged four to six are showing higher creativity levels expressed by the usage of more different colors.
3. When compared to children from four to six who are exposed to a grey and white environment, it is assumed that exposure to a blue-dominated environment leads to less stereotypical color usage in children from four to six.

## Methods

### Participants

The participants were members of the German Kindergarten "Saint Monika Kindertagesstädte" in Dülmen, a small town approximately 30 km from Münster, North-Rhine-Westphalia. In total, 40 healthy and normally developing children, their age ranging from four to seven took part. The mean age was five with a standard deviation of 0.72. Most of them owned German citizenship, but some were foreign with little German language skills. The children randomly were divided in one experimental and one control-group, with 20 children each. These groups again were subdivided in smaller teams of four children by the kindergarten educators because of an easier implementation of the assessment. Girls and boys have been stratified across both conditions to ensure equal distribution, with eleven girls in the experimental and nine in the control-group, the boys vice versa. The children´s parents have been asked for permission in a written consent before participation (see Appendix A for the informed consent). In doing so, an official letter with detailed information about the constitution and the goal of the study has been posted on the black board of the kindergarten, that is studied by the parents every day. The parents are suggested not to hesitate if they have had any questions so that the mobile phone numbers of the experimenter has been posted, too. If the parents approved of the participation of their child, they were asked to give their signature on the dedicated letter.

### Materials

**Murals.** The manipulation was implemented by using colourful paintings of the Swiss charity organization *ANOUK*, specialized on visual art design for children called murals. *ANOUK Foundation* holds the view of the EACH Charter, the European Association for

Children in Hospital, to create a child-friendly environment with opportunities to play, recreate and being educated. For the current experimental study, the same pictorial mural for both conditions has been chosen, with only the colors being different. It was noted that the pattern was unobtrusive, so that the children would not be distracted by it as the image was irrelevant. Regarding the color, as supposed to stimulate positive mood and creativity as effectively as possible, the mural was colorful and blue-dominated in the experimental group, whereas in the control-group the same pictures were screened onto the wall in more negatively associated grey and white dominated colors (see Appendix C). Therefor, they had been changed with the adaption program Picasa photo viewer before. In doing so, the original mural has been altered into a black white picture. Moreover, the brightness and the saturation were increased in order to have less or no affection of color at all. On the other hand, in the experimental group, the original colorful picture got a stronger saturation and a blue cast in order to highlight the power of this cool color. In both research conditions, the mural was screened on the wall twice with two beamers, in fact one on each long side of the room. Apart from the projectors, there was little furniture and features, except six chairs, one big table in the middle and one smaller table in the corner of the room. Furthermore, for determining the time, a stopwatch was used as well as a mobilephone-camera for taking pictures of the research data.

**Mandala.** Mandalas have been used as overall measurement toll of the study in order to assess the different constructs, intending to proof weather the hypothesis can be verified. They are supposed to help individuals to draw into a state that similar to meditation since it leads to better concentration and relaxation (Curry & Kasser, 2005). The mandala was designed for a previous study by the experimenter and an engineer (Kersten & van der Vennet, 2010). For the current experiment it had been printed on a DIN-4 paper and existed of 40 fields in total, composed of a circle within a square and another square and circle that enclose the various shapes. It is divided into sections by lines which link the four corners. The size of the fields is expressed as a percentage allowing a reliable calculation of the exact percentage amount of colors that were used (see Appendix D) (Kersten & van der Vennet, 2010). For instance, if blue filled the upper left as well as the upper right hand quadrant, two times 7.13% of 100% in total, thus 14.27% of the mandala's area consisted of blue. It was not allowed to mix different colors so that mixed shapes were not taken into account.

**Measures**

**Creativity**. Regarding the measurement methods of creativity, there are several procedures. Most of the time, it is evaluated by changes in diversity and novelty. That means that quantity and originality play decisive roles in the assessment (Winston & Baker, 1985; Lubart, Pacteau, Jacquet, & Caroff, 2010). The children could use nine felt pens, with the same different colors each, giving every child the same proportions. Besides the primary colors blue, red and yellow and the secondary colors orange, green and purple, the colors pink, black and grey were included in the experiment. Thus, all colors that are known as most common and that might play an important role in the experiment were taken into account (Nassau, 1998). Considering a child who uses five of five available colors, he or she can be described as highly creative since the highest amount of colors with the greatest originality has been used.

**Mood.** In the current study, the emotional state during the whole experiment should be assessed in order to evaluate the construct *mood* (Ekman, 1994). One of the most essential sources in the communication of emotions and mood is the face since it is supposed to be the most expressive part of the body (Knapp & Hall, 2007). Some facial expressions can be classified since they are known to be innate, universal and without cultural influences (Darwin, Ekman, & Prodger, 1998). Happiness and Sadness are two of these emotions that signify the same for everybody. Therefor, an one item smiley-rating scale was used that contains five Smiley-faces with different facial expressions. This assessment method was constructed by the experimenter herself as smileys´ are a theoretically accepted tool to assess emotions (Ekman, Friesen, O'Sullivan, Chan, Diacoyanni-Tarlatzis, Heider & Scherer, 1987; Keren & Lewis, 1993). The smileys indicate a particular feeling ranging from “very good” or “happy” to “very bad” or “sad”, with 1 indicating “very bad” and 5 “very good” (see Appendix D). The different smileys were chosen on the basis of their emotional expression that are defined accurately and thus have a high validation (Jäger & Bortz, 2001). The total mood score was obtained by the chosen smiley. The higher the score the better was the child´s mood in that particular moment.

**Stereotype.** The variable *stereotype* was conceptualized intending to analyze the role of pink for girls and blue for boys when painting the mandala. To do so, the amount of different colors was evaluated counting together the different percentages of the fields with the same color. In the end, there have been ten percentages in total, nine values for each color and one value for the fields that have not been painted. Then, the color with the highest percentage in the painted murals was matched against the respective stereotypical color for

each child, which is blue for boys and pink for girls. If stereotype and color preference stipulated, the child received the number 1. If this was not the case, the child received the number 0.

**Color Preference**. In addition to the dependent variables, the observed continuous variable *preference* was included in every statistical analysis in order to control a confounding effect. This variable covered the children´s favourite color that had been mentioned by them after the experiment. If the favourite color was blue, the child obtained the value 1 while every other color preference got the value 0. That was done in order to make sure that an effect is not related to the preference for blue, but only for the mural itself. Thus, with help of the covariate *preference*, it is possible to except potential influences of the children´s preferred color in the experiment. That has been done because in their daily life people often have to choose particular colors that mostly tend to be their favorite color (Campfens, 2007).

## Procedure

The data were collected over a time period of four week days during 1.30 and 3.30pm. The random division in condition, that is experimental or control-group as well as the subdivision in groups of four within the conditions had taken place beforehand. Firstly a pilot group underwent the assessment. After this, experimental- and control-group underwent the procedure alternately, with three groups in total on Tuesday and Thursday and two groups on Monday and Friday. In doing so, the small foursome teams were asked to enter an approximately 26 square meter room after each other and to take a seat. They sat facing one another at the table of the room, with two children looking on one side of the room and two on the other. The murals were projected on the left and right hand side of the children perspective. The two experimenters sat next to the children and the beamer was placed in the corners of the room. The study started with an introduction in which everyone introduced oneself by telling their name, their age and their preferred activity in kindergarten, intending to get high standardisation. After that, the experimenters explained the following task (see Appendix B for the protocol). Next, every child sustained its own mandala and the felt pens. In the following 20 minutes, they had time to paint the picture and were asked to use only their own pens and to finish every started field since a reliable and valid assessment would have been otherwise not possible. While drawing, the children were allowed to communicate with each other as well as with the experimenter as long as it did not influence their individual drawing behaviour. In situations of less concentration or drawing motivation, the

experimenter tried to motivate the children up again. Some children needed less time than 20 minutes and, if so, one experimenter had already started to take the designated mood scale. Accordingly, one experimenter and one child sat facing one another on another table in the room in order to fill it in individually. They were instructed to indicate which smiley face applies most to him/her in that situation. While taking the question, the other children of the team continued painting accompanied by the other experimenter. When the whole scheduled time actually was up, the experimenter kindly asked the children to finish their last field. For analysing the mandala, the experimenters took a picture of each mandala because most of the children wanted to keep the original painting. After everyone had accomplished the whole assessment, they were brought back to the group.

**Data Analysis**

For calculating the percentages and structuring the data, they were ordered in an Exel table first of all. When all data had been transformed, the Exel table was transcribed to the statistical program IBM SPSS, version 22 for Windows to make statistical analyses. For the examination of each hypothesis, the function *General Linear Model* was chosen. To begin with, the first hypothesis about the influence of the manipulation on mood was tested. Thereby, the option *Univariate Analysis of Variance,* was applied in order to evaluate the main and interaction effects of the categorical independent variables *condition* and *gender* on the interval dependent variable *mood*. That means it was examined if group means differ and whether there is a direct- or joint effect of *gender* or *condition* on *mood*. For the second hypothesis, the same statistical analysis was conducted, only with *creativity* being the dependent variable instead of *mood*. In order to get a better indication of the creativity level of the children, another *One-Way-ANOVA* was implemented that tested the differences in means of the variable *empty fields* containing the percentage amount of fields that have not been painted by the children. Additionally, the variable *preference* has been added as a covariate to each statistical test that included *mood* and *creativity* intending to control whether it has had an influence on the dependent variables. In this way, it can be precluded that the manipulation is only successful if blue is the favourite color since an effect of the manipulation can be attributed to the color in the murals and thus the experiment itself instead of to the color preference that could have been mentioned by the children afterwards. Concerning hypothesis 3, a cross tab with chi-square statistic for independence was done in order to get an indication of the relation between *stereotypical color usage* and *condition*. Furthermore descriptive

statistics were analysed for *gender, condition* and *stereotypical* or *non-stereotypical color usage*.

## Results

### Hypothesis 1

The first statistical analysis tested the effects of *condition* on *mood* in an Univariate Analysis of Variance since hypothesis 1 stated that girls and boys in the blue-dominated environment are indicating significant better mood compared to the white/grey environment. The results showed that the hypothesis had to be partly confirmed. Firstly, when looking for simple main effect of the fixed factors, the outcomes indicated no direct effect of either *gender* nor *condition* (control group: $M = 4.00$, experimental group: $M = 3.30$) as there was no statistically significant difference in mean of *mood* between males and females [$F$ (1, 35) = 0.002, $p = .969$] nor between experimental and control-group [$F$ (1, 35) = 2.38, $p = .132$]. However, the joint effect of *gender* and *condition* in relation to mood indicated a marginal interaction effect, with $F$ (1, 35) = 4.11, $p = .05$. In the experimental group, a great incline in mood for the girls ($M = 4.45$) could be observed when compared to the control group ($M = 3.00$) while boys remained almost constant in both conditions, with an average of 3.55 without and 3.44 with manipulation effect (see figure 1). Thus, it can be said that the effectivity of the manipulation depends on gender. Additionally the covariate *preference* was included in the analysis. On basis of the statistics, it has been found that a preference for the color blue did not affect the experiment [$F$ (1, 35) = 0.97, $p = .33$]. Finally, when examining the R-Square for the full model, it can be said that 18% (adjusted R square = 9%) of the total variation in *mood* can be explained by *gender, condition and preference* [$F$ (4, 35) = 1.91, $p = .13$]. Table 1 shows the most important outcomes.

**Table 1**

*ANOVA Main- and Interaction Effect of the Factors Condition and Gender as well as the Covariate Preference on Mood*

| Independent Variable | df | F | p |
|---|---|---|---|
| Condition | 1 | 2.38 | 0.13 |
| Gender | 1 | 0.002 | 0.97 |
| Condition*Gender | 1 | 4.11 | 0.05 |
| Preference | 1 | 0.97 | 0.33 |

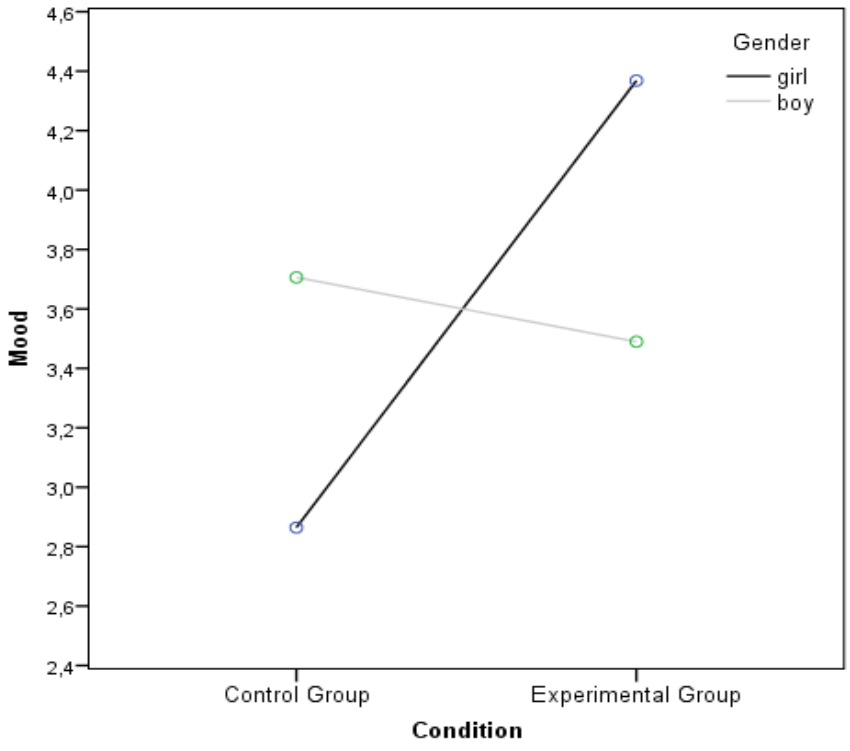



*Figure 1.* Interaction of Gender and Condition on Mood

**Hypothesis 2**

In the second hypothesis, it was assumed that girls and boys in the experimental group are more creative than the children in the control-group. The hypothesis had to be confirmed. Results of the Univariate Analysis of Variance showed a statistically significant main effect of condition on *creativity* [$F$ (1, 35) = 8.79, $p$ = < .01], with $M$ = 4.65 for the control group and $M$ = 6.75 for the experimental group. Additionally, the differences in gender between experimental and control group were examined in terms of *creativity*, indicating a marginal effect of the factor gender on the dependent variable *creativity* [$F$ (1, 35) = 3.02, $p$ = .09]. Regardless the condition, descriptive statistics showed that girls generally utilised more colors than boys with an average of 5.33 for girls and 4.09 without manipulation and 7.73 for girls and 5.56 for boys with manipulation. More detailed analysis on the interaction between *condition* and *gender* in turn showed no statistically significant effect so that it can be stated that the colorful manipulation was equally effective for both boys and girls [$F$ (1, 35) = 1.05, $p$ =.31]. In the full model, involving *creativity* as the dependent variable, the predictors were highly accountable [$F$ (4, 35) = 5.43, $p$ < .01] for the variability in the outcome, with a R-Square of 38% [adjusted R square = 31%].

Aside from testing the quantity of colors, the percentage of the variable *empty fields* that have not been painted during the experiment was controlled. By that, a significant difference in means was found [$F$ (1, 35) = 11.85, $p$ < .01]. There were more empty fields in the experimental group ($M$ = 32.36%) when contrasted to the control group ($M$ = 7.5%). This significance did neither depend on *gender* [$F$ (1, 35) = 1.13, $p$ = .30] nor on *preference* in terms of blue [ $F$ (1, 35) = 1.96, $p$ = .17]. The test further explored that the covariate *preference* did neither have any statistically influence on the dependent variable *creativity* [$F$ (1, 35) = 2.22, p = 0.15] nor on the variable *empty fields* [ $F$ (1, 35) = 1.96, $p$ = .17]. In order to get an overview, a summary of the most important descriptive statistics and further analysis concerning the dependent variable creativity is given in table 2. Moreover, in Appendix E four examples of painted mandalas in both conditions and gender groups are presented.

**Table 2**

*Descriptive Statistics and ANOVA of the Factors Condition, Gender as well as the Covariate Preference on Creativity*

| Independent Variable | N | M (SD) Girls | Boys | Total | F | p |
|---|---|---|---|---|---|---|
| Experimental | 20 | 7,73 (1,49) | 5,56 (2,70) | 6,75 (2,34) | | |
| Control | 20 | 5,33 (1,41) | 4,09 (2,17) | 4,65 (1,93) | | |
| Total | 40 | | | | 8.79 | <0.01 |
| Gender | | | | | 3.02 | 0.09 |
| Condition*Gender | | | | | 1.05 | 0.31 |
| Preference | | | | | 2.22 | 0.15 |

**Hypothesis 3**

Thirdly, it was hypothesized that exposure to a blue-dominated environment leads to less stereotypical color usage in children when compared to children who are exposed to a grey and white environment. This hypothesis had to be rejected. The findings of an chi-square test for independence that has been done in order to discover if there is a relationship between the two categorical variables *stereotypical color usage* and *condition*, showed that there is no relation between these two variables [$X^2$ (1, $N$ = 40) = .10, p = .75]. This implies that the usage of pink or blue is not linked to the condition of the children. Only on basis of descriptive statistics, it could be observed that boys generally differ in their usage of pink when compared to girls and the utilisation of blue. In the control group boys´ average mean for pink was 3.47 and 1.16 in the experimental group, while girls had an average value of 10.4 in the control group for blue and 10.59 in the experimental group. Thus, blue is used more often in both gender groups whereas pink only was high for girls, with $M$ = 13.97 with manipulation and $M$ = 10.70 without. A summary of the descriptive statistics and most important findings is given in table 3.

**Table 3**

*Percentage Use of Pink, Blue and Other Colors and the Differences Between Gender and Condition*

| Condition | Gender | N | Blue | Pink | Others |
|---|---|---|---|---|---|
| | | | M (SD) | | |
| Experimental | Girl | 11 | 10,59 (10,07) | 10,7 (8,99) | 58.33 (24.85) |
| | Boy | 9 | 22,63 (16,78) | 1,16 (1,47) | 79.07 (24.20) |
| | Total | 20 | 16.01 (14.43) | 6.41 (8.19) | 67.66 (26.14) |
| Control | Girl | 9 | 10,04 (17,02) | 13,97 (17,09) | 86.26 (21.51) |
| | Boy | 11 | 27,88 (34,75) | 3,47 (9,63) | 96.74 (6.97) |
| | Total | 20 | 17.93 (22.70) | 7.30 (11.45) | 79.85 (24.63) |

## Discussion

Research generally suggested that internal personal factors have a greater effect on children than external environmental factors (Hennessey & Amabile, 1988). Keeping this in mind, the goal of this experimental study was to explore which color as an environmental feature may actually count for. In doing so, it should be indicated wheather a colored surface has a beneficial effect on children´s mood and creativity. Additionally, the differences in gender pertaining these constructs were subject of interest. To explore this, an experimental study with children from four to six was designed. In the experiment, it was made use of a mural of the *ANOUK* Foundation that has been produced on a wall of a German kindergarten. The results of the conducted analysis partly come to an agreement with the hypotheses and partly indicated other unexpected effects.

### Creativity

As an initial thought, it was assumed that creativity increases in a room with a blue-dominated surface. Taking the findings into consideration, it can be stated that this is true since the manipulation by a blue-dominated surface was beneficial for the children´s creativity. Considering the unobtrusive method and the subtle manipulative procedure of the current experiment, this effect could have happened implicitly. Either they had recognized the color out of the corner of their eye or they had not been aware of them at all. As such learning processes often give rise on even better results since they allow more information to be acquired compared to conscious processes (Wippich et al., 1994; Wippich & Mecklenbräuker, 1998), already small differences between the conditions are of great value. (Zimmer, Steiner

& Ecker, 2002).

It was astonishing that the children sometimes talked about water, swimming and how they like swimming pools although they did never explicitly refer to the murals that showed water, bubbles, a stepping stone and people playing in the water. Especially in the experimental group where the murals´ main color was blue, the subject seemed to play a role in the spontaneous associations evoked by the murals. Hence, some children seem to have connected murals´ color and subject either implicitly or fully consciously. These associations might have moderated or even mediated the study outcomes. In this context, it is known that the age of the concerned person plays an important role in visual information processing (Milbrath & Trautner, 2008). According to Milbrath & Trautner (2008), on the one side, children who still have to develop their understanding of drawings judge visual art only based on quantitative features such as size and content of subject matter instead of on qualitative features like expressions of colors. In a study of Golomb (1992), on the other side, it was argued that younger children tend to choose colored pictures for detailed ones when showing them different drawings that have some variation in color, details and depth. Golomb (1992) also found that the influence of colors decrease from an age of seven when children generally prefer detailed pictures regardless whether it is colored or uncolored. To sum up, it becomes obvious that the age or/and the procession in cognitive development is of great significance in the response to visual stimuli.

In context of gender and creativity, it was found that girls are affected stronger than boys. However, it needs to be considered that girls generally seem to have a slightly greater creativity potential than boys since the analysis indicated that girls used more different colors than boys regardless their condition. Consequently, their creativity potential was also higher under a blue-dominated wall design when compared to boys so that the degree to which the manipulation affected the girls eventually did not differ significantly from the effect in boys. As supported by previous research, females tend to alternate colors regardless of their environment, generally indicating a higher creativity level. Additionally, they are known to be especially sensitive to their environment and have a broader spectrum of color vision than men (Meyers-Levy, 1986; Verrelli & Trischkoff, 2004). They prefer variations and harmony of colors as well as more details in features while boys are known to communicate aggression by using more expressive lines and draw more likely monotonous pictures (Tuman, 1999).

**Mood**

Interestingly, with regard to the hypothesis about mood neither a main effect of

gender, nor an effect of color manipulation could be found. Besides keeping in mind the previous mentioned differences between visual information processing (Golomb, 1992; Milbradt & Trautner, 2008), the situational context and the former emotional stability of the children might also explain the unexpected findings (Kwallek, Woodson, Lewis & Sales, 1997). Considering participants who are in a negative mood with inactivity and dullness, their current emotional condition would be reinforced by exposing to a blue-dominated environment as blue is known for creating a calm atmosphere and relaxation (Kirwan, 2013). Possibly these children needed to become more open and active in order to improve their mood. Dependent on a person´s conditions and needs, colors are experienced differently (Partala, Kallinen, 2012). A child which wants to be active after sitting the whole morning in school, for example, needs an environment providing him or her with an opportunity to release energy, such as a at a playground or a school gym. For that child an environment that has a relaxing atmosphere could have negative consequences since it could increase the opposite than expected and thus bad mood and restlessness. Read (2003) explained that warm hues are supposed to stimulate the senses by making active children more responsive to the respective environment and displaying more disclosure by expressing their mood and personality. Consequently, it is necessary to pay particular attention to individual needs in order to provide an environment that supports positive feelings, health and satisfaction (Kaplan, 1995; Partala & Kallinen, 2012).

The current study further indicated that benefits in mood due to a colored surface generally have to be qualified on the basis of the considered gender. Boys´ mood almost has not changed and even slightly decreased whereas girls´ mood increased under the experimental circumstances. That is not astonishing as it is proposed that girls are more emotionally expressive than boys in many European cultures (Kring & Gordon, 1998). As being supported by both theory and research, girls have an emotional advantage with happiness and internalizing negative emotions such as sadness being one of these emotions that are attributed to woman more often (Brody, 2000). Boys, in comparison, do not always express what they actually feel. That is supposed to arise from different thresholds for the expressive, experiential, and physiological components of emotion. These thresholds vary depending on the intensity of emotional events (Ekman, 1994). Men are supposed to have a higher threshold for experienced emotion. That may come from a different socialization process in the development of boys and girls. For girls it is more acceptable to express their emotion freely compared to boys. Brody (2000) further explains that young boys biologically have more negative feelings and a higher arousal level that have to be scaled down by the

social environment in order to control their emotionality (Kring & Gordon, 1998; Else-Quest, Higgins, Allison & Morton, 2012). As opposed to this, in girls emotional behavior is encouraged by parents when talking to them more emotionally and with higher intensity in words (Chaplin & Aldao, 2013). What this all amounts to is that emotion experience and its expression are not always consistent and differ between the two genders.

**Gender Stereotypes**

Thirdly, it was argued that exposure to a more colorful environment leads to less stereotypical color usage of children from four to six. In contrast to the expectation, it could be observed that there hardly any difference is noticeable between experimental group and control group in terms of stereotypical color usage. Thus, this hypothesis could not be verified. However, when it comes to the concrete differences between the stereotypical color usage in boys compared to girls, striking observations could be made. Boys seem to be more stereotypical as they chose few pink in both conditions when compared to their usage of other colors. In contrast, girls utilisation of blue was high in both conditions. In a previous study, it is explained that the female likeliness for a reddish contrasts, in particular for pink is supposed to evolve on of universal preference for blue (Hurlbert & Ling, 2007). That is, blue is the immediate neighbour of pink in the hue circle. Therefore, it is assumed that a blue dominated contrast often is preferred by both girls and boys.

**Color Preferences**

It can be asserted that a high probability of the most frequently used colors is not related to the denoted color preference of the children so that it did not confound the results. This might be explained by the promotion of creativity that helps to overcome structured habits of mind by restructuring thought and encouraging free flowing (Gow, 2000). Additionally, in the experimental group greater accuracy and the stimulation of deliberation might be a reason of the significant differences in the amount of empty fields in the murals of the children (Kwallek et al., 1997; Mehta & Zhu, 2009). That is consistent to the observations as there were more participants in the colored room who changed the pen after each field, thinking about the next color choice more deeply and longer compared to the participants in the grey/white room. These observations indicate that colors promote not only creativity but at the same time attention to detail, accuracy and task performance increase. This is consistent with other findings (Kwallek et al., 1997; Mehta & Zhu, 2009).

**Strength and Limitations**

**Confounder.** Even if blue seems to have the most positive effects in children according to previous research (Jacoby and Suess, 1975; Kaya & Epps, 2004; Ceylan, Dul & Aytac, 2008; Mehta & Zhu, 2009), the usage of a blue-dominated mural also could have been a crucial limitation as it might have had a confounding role. If so, current findings in boys who participate in the experimental condition might be emerged from the exposure to their stereotypical color blue. Results for creativity, for instance, indicated an advantage for girls. Indeed they were more creative in both condition, however, the question rises whether boys creativity potential would have been stimulated more strongly under the exposure of a different color than blue.

**Methodological Limitations.** Secondly, there are some methodological problems that should be mentioned. For the implementation, the children have been divided in groups of four. This had been taken place randomly similarly the division in experimental or control group. However, despite this randomized method, a nesting effect can not be totally avoided. When the social workers of the kindergarten picked the children out of their groups to form groups, they decided who to put in one group on basis of the availability of the children. If some were busy with other projects in that particular moment, these children took part on another day. The only organizational criteria in groups was a balance of boys and girls and an age between four and six. This was important as gender was one of the study´s variables and the age was crucial for the participants´ developmental level. A nesting could have been the case if occasionally groups with close friends had been formed or if aroused groups consist of four children that just had come from the gym and thus were very active compared another group that possible had already painted before. To sum up, the children might have different starting situations in the two conditions that might have had a vital influence.

Another negative aspect of this procedure is the possibility of influencing each other with regard to the color choice in the mandals. Children in this age group tend to imitate the behaviour of others. Thus, even if the experimenter has been paid particular attention to individuality by emphasizing that the mandala´s should be a personal painting, it would have been conspicuous that the color choice of the children in the same group was quite similar in some cases. Furthermore, regarding the one-item-smiley questionnaire, there might have been impact differences in the choice of the smiley´s in relation to the consistency of children´s responses. That is to say, the type of image might have influence the answer among the different personalities (Reynolds-Keefer & Johnson, 2011).

Besides these procedural weaknesses, it needs to be mentioned that the sample size

with 40 participants in total was quite small so that the possibility might of false-negative findings was very high and the representativeness low (Rumsey, Rasker, Leistra, 2012). Further, the study design was not a double blinded experiment. That means in particular, that the study´s designer have both created and implemented the study. Therefore, errors might have occured as it would have been very easy for the researcher, even unaware and unconsciously, to have an impact on the experimental observations, particularly true in behavioral science. That is why double blindness should be usually used to ensure impartiality avoiding errors that arise from bias. In doing so, neither the participants nor the experimenters know which participants are in the experimental- and control groups during the actual course of the experiments. Despite these limitations, the clearly defined protocol proofed value. The experimenter strictly carried out the instructions that had been written down in detail before. Hence, design related errors were avoided.

**Positive Contributions.** Despite all doubts, this research made a positive contribution to the psychological science since it supported in taking a step forward and gaining new insights. Ultimately, on basis of this study it can be suggested to work with colors in educational settings. First of all, it might help to promote leaning processes, performance and the cognitive development of children (Kwallek et al.,1997). Second, it might encourage creativity and mood. In general, it became obvious that choosing blue rather than grey or white as the dominated color is more positive for both males and females regardless their color preference and stereotypical color association. As this was especially observable in females, it is recommended to pay particular attention to different male needs.

## Conclusion and Future Research

Finally, with regard to future research it is recommended to make a fully experimental design, including double blindness (Misra, 2012). That means, in order to avoid methodological errors such as influencing the drawing behaviour of the infants, the researcher should observe the study from outside, for example, from a nearby room via video-recording. In doing so, they still could intervene during the implementation if urgent necessary, but would not influence the procedure subconsciously. Additionally, it is suggested to research the role of colors among young children in the interior environment profoundly by controlling for effects of other particular hues and their characteristics such as saturation, brightness and the interrelationship of contiguous colors. That could be done by designing a longitudinal study in educational organizations to make comparisons of different conditions over time (Vu, 2015). For that, there has to be one organization that has mainly white or grey surfaces and

another organization in which colors dominate. Thereby, attention should be paid to the size of the sample also in order to have confidence that the results are representative for many children in that agegroup, eliminating errors as effectively as possible. Moreover, further research might also get some more indication of psychological needs, preferences and stereotypes concerning colors since it might be questioned to which extent the environment has to be tailored to these variables. In relation to this, it is also interesting to know whether the color blue is appropriate to deactivate or active emotional and cognitive processes as opposed to the effects of other colors.

To bring it back to the assumption that internal personal are stronger than external environmental factors, it can be argued that this is not compulsory. The current results allow advising to use a colored surface in educational institutions which special emphasize on blue as having generally positive effects on girls and a slight influence on boys between four and six. In summary, although there are still unresolved issues, this study gained valuable insights and initiated thinking processes for science.

## Acknowledgments

This research was supported by Dr. M. Pieterse & Dr. T. van Rompay. I am using this opportunity to express my gratitude to them as they supported me throughout the course of this Bachelorthesis. I am thankful for their aspiring guidance, invaluably constructive criticism and friendly advice during the project work. I am sincerely grateful to them for sharing their truthful and illuminating views on a number of issues related to the project.

Furthermore I would also like to thank ANOUK Foundation for the provision of their visual art work and their support as well as the responsible people of the Kindertagesstätte Dülmen who offered me the possibility to implement my research and provided me with the facilities being required for my Bachelothesis.

**References**

Adams, F. M., & Osgood, C. E. (1973). A cross-cultural study of the affective meanings of color. *Journal of cross-cultural psychology*, *4*(2), 135-156.

Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual review of psychology*, *32*(1), 439-476.

Baer, J., & Kaufman, J. C. (2008). Gender differences in creativity. *The Journal of Creative Behavior*, *42*(2), 75-105.

Boyatzis, C. J., & Albertini, G. (2000). A naturalistic observation of children drawing: Peer collaboration processes and influences in children's art. *New directions for child and adolescent development*, *2000*(90), 31-48.

Boyatzis, C. J., & Varghese, R. (1994). Children's emotional associations with colors. *The Journal of genetic psychology*, *155*(1), 77-85.

Buck, R. (1977). Nonverbal communication of affect in preschool children: Relationships with personality and skin conductance. *Journal of Personality and Social Psychology*, *35*(4), 225.

Brody, L. R. (2000). The socialization of gender differences in emotional expression: Display rules, infant temperament, and differentiation. *Gender and emotion: Social psychological perspectives*, 24-47.

Campfens, L. A. M. (2007). De rol van kleurgebruik in collegezalen in relatie tot de gevoeligheid voor de omgeving.

Ceylan, C., Dul, J., & Aytac, S. (2008). Can the office environment stimulate a manager's creativity?. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *18*(6), 589-602.

Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: a meta-analytic review. *Psychological Bulletin*, *139*(4), 735.

Chun, M. M., & Jiang, Y. (1998). Contextual cueing: Implicit learning and memory of visual context guides spatial attention. *Cognitive psychology*, *36*(1), 28-71.

Curry, N. A., & Kasser, T. (2005). Can coloring mandalas reduce anxiety?. *Art Therapy*, *22*(2), 81 85.

Darwin, C., Ekman, P., & Prodger, P. (1998). *The expression of the emotions in man and animals*. Oxford University Press, USA.

David, T. G., & Weinstein, C. S. (Eds.). (2013). *Spaces for children: The built environment and child development*. Springer Science & Business Media.

Dijkstra, K., Pieterse, M., Pruyn, A. (2006). Physical environmental stimuli that turn healthcare facilities into healing environments: systematic review. *Journal of Advanced Nursing,* 56(2), 166-182.

Dijkstra, K., Pieterse, M.E. Pruyn, A.T.T. (2008). Individual differences in reactions towards color in healthcare environments: The role of stimulus screening ability. *Journal of Environmental Psychology*, 28: 268-77.

Ekman, P. (1994). Moods, emotions, and traits. *The nature of emotion: Fundamental questions*, 56-58.

Ekman, P., Friesen, W. V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K.& Scherer, K. (1987). Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of personality and social psychology*, *53*(4), 712.

Else-Quest, N. M., Higgins, A., Allison, C., & Morton, L. C. (2012). Gender differences in self-conscious emotional experience: a meta-analysis. *Psychological bulletin*, *138*(5), 947.

Golomb, C. (1992). Eytan: The early development of a gifted child artist. *Creativity Research Journal*, *5*(3), 265-279.

Gow, G. (2000). Understanding and teaching creativity. *Tech Directions*, *59*(6), 32.

Hemphill, M. (1996). A note on adults' color–emotion associations. *The Journal of genetic psychology*, *157*(3), 275-280.

Hennessey, B. A., & Amabile, T. M. (1988). 1 The conditions of creativity. *The nature of creativity: Contemporary psychological perspectives*, 11.

Hurlbert, A. C., & Ling, Y. (2007). Biological components of sex differences in color preference. *Current Biology*, *17*(16), R623-R625.

Jacobs, K. W., & Suess, J. F. (1975). Effects of four psychological primary colors on anxiety state. *Perceptual and motor skills*, *41*(1), 207-210.

Jadva, V., Hines, M., & Golombok, S. (2010). Infants' preferences for toys, colors, and shapes: Sex differences and similarities. *Archives of sexual behavior*, *39*(6), 1261 1273.

Jäger, R., & Bortz, J. (2001). *Rating Scales with Smilies as Symbolic Labels-Determined and Checked by Methods of Psychophysics*. na.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of environmental psychology*, *15*(3), 169-182.

Karniol, R. (2011). The color of children's gender stereotypes. *Sex Roles*, *65*(1-2), 119-132.

Kaya, N., & Epps, H. H. (2004). Relationship between color and emotion: A study of college students. *College student journal*, *38*(3), 396.

Keren, G. E., & Lewis, C. E. (1993). *A handbook for data analysis in the behavioral sciences: Methodological issues*. Lawrence Erlbaum Associates, Inc.

Kersten, A., & van der Vennet, R. (2010). The impact of anxious and calm emotional states on color usage in pre-drawn mandalas. *Art Therapy*, *27*(4), 184-189.

Kirwan, C. (2013). Immediate effects of red, blue & white lighting on blood pressure, heart rate, mood and stress.

Knapp, M. L., & Hall, J. A. (2007). Nonverbal Communication in Human Interaction. Wadsworth: Thomas Learning. *ISBN O*, 15-506372.

Kring, A. M., & Gordon, A. H. (1998). Sex differences in emotion: expression, experience, and physiology. *Journal of personality and social psychology*, *74*(3), 686.

Kwallek, N., Woodson, H., Lewis, C. M., & Sales, C. (1997). Impact of three interior color schemes on worker mood and performance relative to individual environmental sensitivity. *Color Research and Application*, *22*(2), 121-132.

Lawler, C. O., & Lawler III, E. E. (1965). Color-mood associations in young children. *The Journal of genetic psychology*, *107*(1), 29-32.

Lev-Wiesel, R., & Dapna-Tekoha, S. (2000). The self-revelation through color technique: Understanding clients' relations with significant others, silent language, and defense mechanisms through the use of color. *American Journal of Art Therapy*, *39*(2), 35.

Lubart, T., Pacteau, C., Jacquet, A. Y., & Caroff, X. (2010). Children's creative potential: An empirical study of measurement issues. *Learning and Individual Differences*, *20*(4), 388-392.

Maier, M. A., Barchfeld, P., Elliot, A. J., & Pekrun, R. (2009). Context specificity of implicit preferences: the case of human preference for red. *Emotion*, *9*(5), 734.

Mehta, R., & Zhu, R. J. (2009). Blue or red? Exploring the effect of color on cognitive task performances. *Science*, *323*(5918), 1226-1229.

Meyers-Levy, J. (1986). *Gender differences in information processing: A selectivity interpretation* (Doctoral dissertation, Northwestern University).

Milbrath, C., & Trautner, H. M. (Eds.). (2008). *Children's understanding and production of pictures, drawings, and art: Theoretical and empirical approaches*. Hogrefe Publishing.

Misra, S. (2012). Randomized double blind placebo control studies, the "Gold Standard" in intervention based studies. *Indian journal of sexually transmitted diseases*, *33*(2), 131.

Nassau, K. (1998). Fundamentals of color science. In *Color for science, art and technology* (Vol. 1, p. 1). New York: Elsevier Science.

Olds, A. R. (2001). *Child Care Design Guide*. McGraw-Hill, PO Box 548, Blacklick, OH 43003.

Partala, T., & Kallinen, A. (2012). Understanding the most satisfying and unsatisfying user experiences: Emotions, psychological needs, and context. *Interacting with computers*, *24*(1), 25-34.

Pessoa, L. (2005). To what extent are emotional visual stimuli processed without attention and awareness? *Current opinion in neurobiology*, *15*(2), 188-196.

Pope, D. J., Butler, H., & Qualter, P. (2012). Emotional understanding and color-emotion associations in children aged 7-8 years. *Child Development Research*, *2012*.

Read, M. A. (2003). Use of color in child care environments: Application of color for wayfinding and space definition in Alabama child care environments. *Early Childhood Education Journal*, *30*(4), 233-239.

Read, M. A., & Upington, D. (2009). Young children's color preferences in the interior environment. *Early Childhood Education Journal*, *36*(6), 491-496.

Reynolds-Keefer, L., & Johnson, R. (2011). Is a picture is worth a thousand words? Creating effective questionnaires with pictures. *Practical Assessment, Research & Evaluation*, *16*(8), 1-7.

Saito, M. (1996). A comparative study of color preferences in Japan, China and Indonesia, with emphasis on the preference for white. *Perceptual and Motor Skills*, *83*(1), 115 128.

Tesser, A., & Martin, L. (1996). The psychology of evaluation.

Tofle, R.B., Schwartz, B., Yoon, S., & Max-Royale, A. (2004). Color in Healthcare Environments: A Critical Review of the Research Literature. *California: The Coalition for Health Environments Research (CHER).*

Tuman, D. M. (1999). Gender style as form and content: An examination of gender stereotypes in the subject preference of children's drawing. *Studies in Art Education, 41*(1), 40-60.

Unicef. (1994). *The state of the world's children. 1998*. Unicef.

Upitis, R. (2011). Arts education for the development of the whole child. *Prepared for the Elementary Teachers' Federation of Ontario*.

Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of experimental psychology: General*, *123*(4), 394.

Van Gielen, K., & Maarleveld, M. (2007). Creativiteit: een issue voor de facility manager?!: Een zoektocht naar de werkomgeving voor de creatieve mens. Facility Management Magazine, 154, Authors version.

Verrelli, B. C., & Tishkoff, S. A. (2004). Signatures of selection and gene conversion associated with human color vision variation. *The American Journal of Human Genetics*, *75*(3), 363-375.

Venolia, C. (1988). *Healing Environments. Your Guide to Indoor Well-being.* Berkely: Celestial Arts.

Vu, U. (2015). At Work 81. *Institute for Work & Health.* 81(2).

Winston, A. S., & Baker, J. E. (1985). Behavior analytic studies of creativity: A critical review. *The Behavior Analyst*, *8*(2), 191.

Wippich, W. (1994). Intuition in the context of implicit memory. *Psychological Research, 56*(2), 104-109.

Wippich, W., & Mecklenbräuker, S. (1998). Effects of color on perceptual and conceptual tests of implicit memory. *Psychological research, 61*(4), 285-294.

Zimmer, H. D., Steiner, A., & Ecker, U. K. (2002). How" implicit" are implicit color effects in memory?. *Experimental psychology, 49*(2), 120.

Appendix A

Informed consent

*St. Monika-Kindergarten Dülmen*
Hülsenweg 17

48249 Dülmen

Tel.: 02594 2212

Dülmen, den 21.03.206

Liebe Eltern,

im Zeitraum vom 04. April – 08. April 2016 findet im Kindergarten ein Project statt, welches von uns, Lena Alfs (23) und Viviane Meyerhoff (22), zwei Psychologiestudentinnen der Universität in Enschede durchgeführt wird. Im Rahmen unserer Bachelorarbeit möchten wir gerne das Malverhalten ihrer Kinder unter verschiedenfarbigen Umgebungseinflüssen untersuchen. Hierfür werden Ihre Kinder ein Mandala erhalten, welches Sie 15 Minuten ausmalen dürfen. Anschließend werden ihnen einige kindgerechte Fragen zu ihrem Wohlbefinden und ihren Gefühlen gestellt.

Sollten Sie noch Fragen haben oder mit der Teilnahme Ihres Kindes nicht einverstanden sein, setzten Sie sich gerne mit uns oder einen der Erzieher/innen in Verbindung.

Lena Mobil: 0049172479333792

Viviane Mobil: 004917699969782

Mit freundlichen Grüßen,

Lena und Viviane

# Appendix B

## Protocol

Instruction for the children:

Schön, dass wir heute mit euch zusammen arbeiten dürfen. Wir sind Viviane und Lena und sind 23 Jahre alt. Wir sind heute hier, weil wir gerne mit euch ein Mandala malen möchten. Es wäre schön, wenn ihr uns zuerst euren Namen und euer Alter verratet, damit wir euch kennen lernen können.

(Vorstellrunde)

Wir haben für jeden von euch ein Mandala und 10 Filzstifte mitgebracht. Ihr habt jetzt etwas Zeit, um das Mandala soweit wie möglich auszumalen. Bitte benutzt nur eure eigenen Stifte, damit ihr euch nicht streitet. Es wäre schön, wenn ihr jedes angefangene Feld auch zu Ende ausmalt. Wir schauen euch dabei zu.

(Ausmalzeit)

Die anderen Kinder wollen gleich auch noch malen, deshalb könnt ihr jetzt nur noch euer angefangenes Feld beenden.

(Letzte Ausmalzeit)

Wir finden eure Bilder klasse, ich habt euch alle sehr viel Mühe gegeben. Damit wir am Ende eine Erinnerung an diesen Tag heut haben, möchten wir gerne ein Foto von euren Mandalas machen. Bevor ihr gleich zurück in eure Gruppen geht, würden wir euch gerne noch ein paar Fragen stellen.

(Abnahme der Fragebögen mit jedem Kind; weitere Malzeit für die wartenden Kinder)

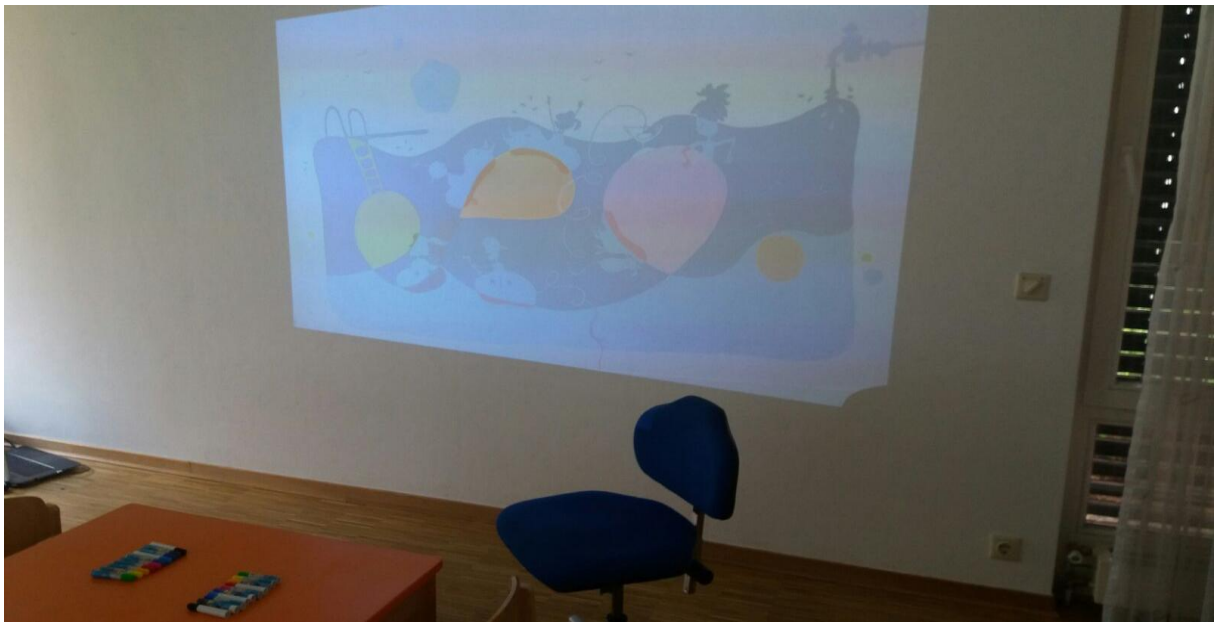
Wir fanden es sehr schön mit euch zusammen zu arbeiten. Weil ihr so tolle Bilder gemalt habt und es uns sehr viel Spaß mit euch gemacht hat, dürft ihr euch noch eine Smarties nehmen.

# Appendix C

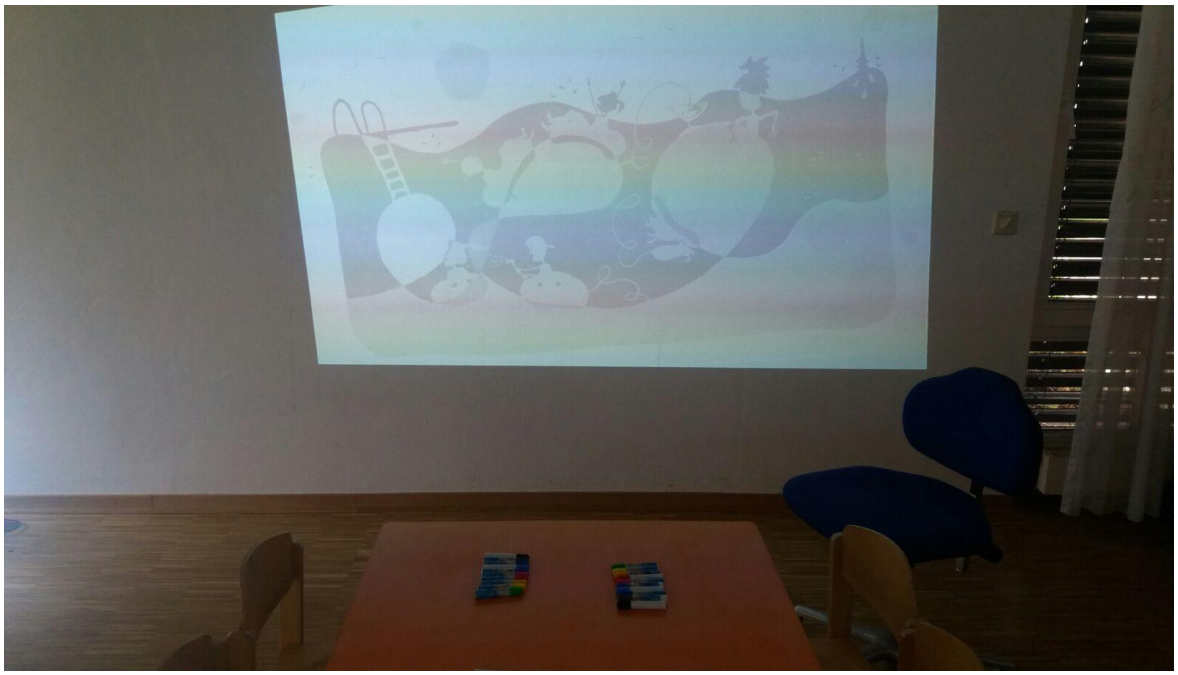
## Murals of ANOUK Foundation

Original Mural of Anouk foundation.

Adjusted Blue-dominated mural of the experimental condition.

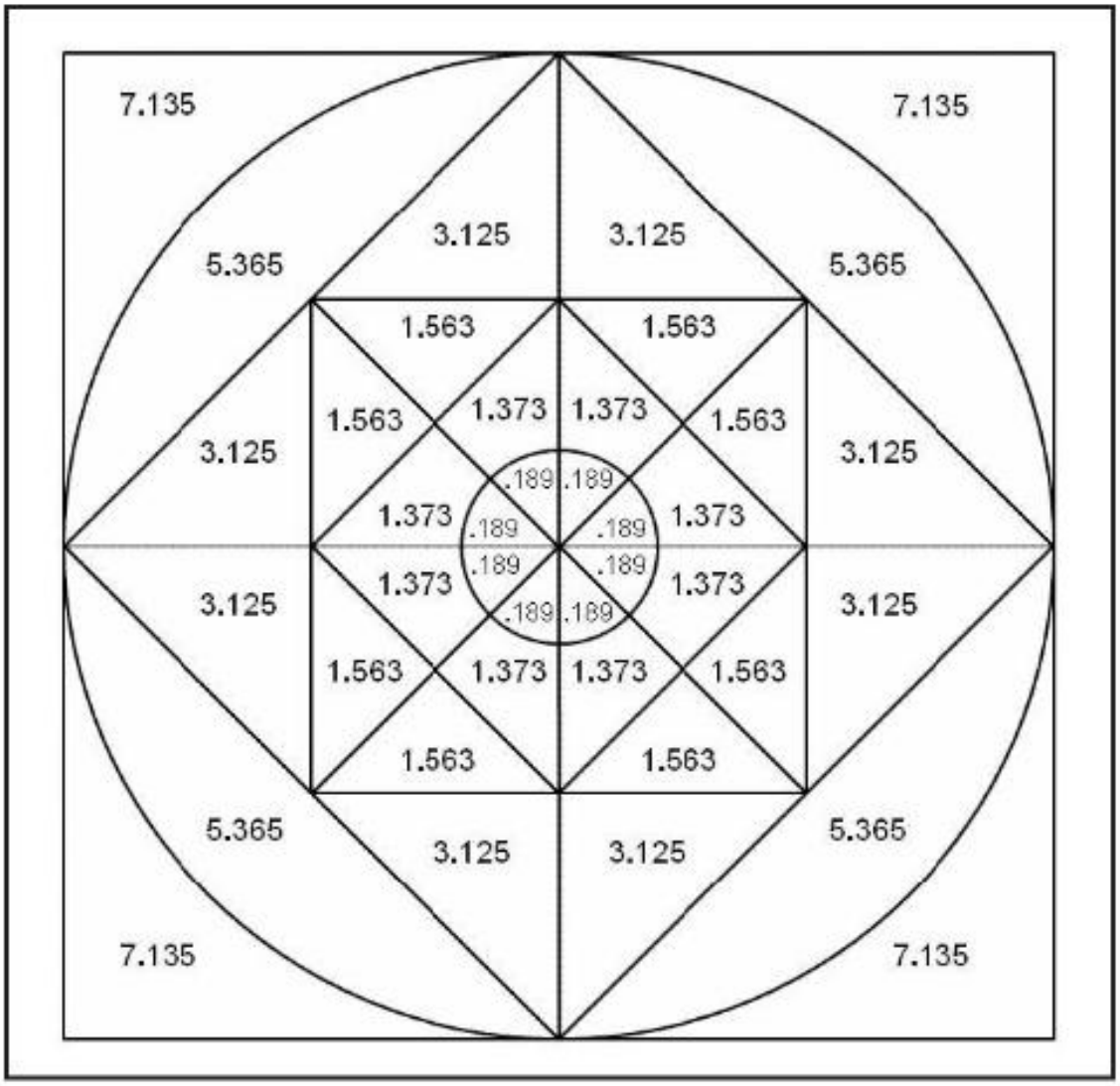


Adjusted grey/white-dominated mural in control condition.



Appendix D

Mandala with percentages in Kersten & van der Vennet (2010)



Appendix E

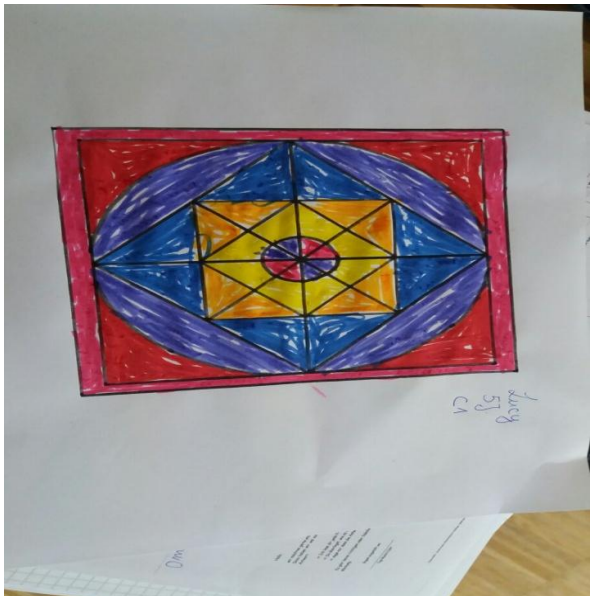
One-Item-Smiley-Questionnaire

# Appendix F

## Mandala Examples

Male mandala of the control condition.


Female mandala of the control condition.



Male mandala of the experimental condition.

Female mandala of the experimental condition.