Gend. Issues (2014) 31:142–162
DOI 10.1007/s12147-014-9122-1

ORIGINAL ARTICLE

Impact of Gender and the Stereotyped Nature of Illustrations on Choice of Color: Replica of the Study by Karniol (2011) in a Spanish Sample

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Published online: 1 May 2014

Abstract Early acquisition of stereotypes that associate "blue" with boys and "pink" with girls can influence their preferences for these colors and also their choices in clothing, toys or objects in relation to gender stereotypes. In a Spanish sample (5–10-year olds, n = 614), this study reproduces the previous research conducted by Karniol (Sex Roles 65(1/2):119–132, 2011) for the purpose of analyzing whether gender-linked color preferences rule the choice of coloring booklets and if children's choices of color are affected by their own gender. The results show that although boys used fewer female-stereotyped colors than girls, both genders colored in each figure with the stereotyped colors associated with them. This result indicates that boys and girls share similar gender stereotypes and use colors that agree with these stereotypes.

Keywords Color · Gender · Stereotypes · Illustrations · Preschool · Primary school

Introduction

Color Preferences and Gender Stereotyping

"Blue is for boys and pink is for girls" is a well-known gender stereotype, at least in western societies [12]. This stereotype is reflected in how parents choose specific colors to differentiate boys' and girls' bedrooms furniture, clothes or toys [17, 26], and it is also reflected in the predominant color that the toy industry uses to distinguish between girls' and boys' gender-appropriate toys [1]. These early gender

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socialization experiences mark differences between appropriate colors for both genders, and leads to individuals making color selections based upon gender associations. For instance, Boyatzis and Varghese [3] asked 4- to 7-year-old US children about their favorite colors and how colors make them feel. One girl remarked that pink made her happy because she had pink bedding and lots of pink dresses. Boys, however, liked black because they associated it with their sportswear. Thus, children color preferences can arise from their experience with a color during their socialization.

Moreover, children do not learn gender-associated preferences just by their socialization experiences, The Gender Schema Theory [21] offers a complementary explanation when considering that since infancy, both sexes actively seek gender-related information which will serve as a guide for their own conduct. In this way, gender differences in preferences for colors will be the result of applying these behavioral observations of others to oneself. For example, girls can develop a stronger preference for pinks, purples or reds when they notice that other girls wear clothes and accessories in these colors, and will thus consider that they are prototypical for girls. When boys, however, make the same observations, they can reach the conclusion that pinks or purples are not suitable for boys and will avoiding wearing these colors [6]. Therefore, the learning and interiorization of these gender schemata may influence social information processing, the undertaking of tasks and decisions making related with colors.

In light of this, researchers from different cultures have conducted studies on how children's knowledge of color gender stereotypes influences their color preferences. One of the aims of these studies was to determine the extent to which children's color selections match adult color stereotypes. For example, Picariello, Greenberg and Pillemer [25] asked 3- to 7-year-old US children to choose their favorite pig from a choice of pigs colored in navy blue, brown or maroon for stereotypically masculine colors; and in light pink, bright pink or lavender for stereotypically feminine colors. Of the 33 children, 70 % choose a pig whose color matched the stereotype for their sex. More recently, Chiu et al. [6] asked Canadian children aged 3 to 12-years-old to choose their favorite colors from a color chart and found that girls generally preferred pink/purple to blue, and boys preferred blue to pink/purple. In a large cross-sectional study [20]. US children aged 7 months to 5 years were offered eight pairs of objects and asked to choose one. In every pair, one of the objects was always pink. By the age of 2, girls chose pink objects more often than boys did, and by the age of 2.5, they had a significant preference for the color pink over other colors. Cunningham and Macrae [8] asked Scottish children aged between 3 and 5 years-old to choose the furniture and toys that would go into two bedrooms, one for a little boy and one for a little girl. Boys and girls pick pink-colored objects for girls' bedrooms and blue-colored ones for boyś bedrooms. Similarly, Kilinç [16] examined clothing color preferences in Turkish children aged between 6 and 9 years-old and found that girls prefer violet, magenta or red for their clothes, while boys tend to opt for black, blue or yellow.

The literature reviewed suggests that gender stereotypes about appropriate colors for both genders are pervasive. Based on these stereotypes, boys and girls show preferences that suggest they know that colors have gender associations and they

considered these associations when making decisions. Enforcement of this gender order in preferences is more rigid for boys than for girls [17]. In North America, according to Cherney et al. [5], boys tend to be criticized by peers and parents for cross-gender-type behaviors (e.g. wearing skirts, playing with princess wands), while girls receive less differentiated reactions to gender-typed and cross-gender-typed behavior (e.g. playing with boys' toys, dressing like boys, talking like them). The rigidity of gender norms for boys is also evident in use of colors, especially in use of pink in boys' clothes and toys. In countries like the United Kingdom, Turkey, North America or Spain, parents, friends and industry reinforce the belief that pink is not a masculine color and promote the avoidance of this color in boys [8, 16, 30].

Children's drawings and coloring conduct may also be affected by their gender associations. French [2] and British [7] children tend to draw a character of their own gender when asked to do a free drawing. Toku [31] conducted an analysis of drawings of American and Japanese grade 2, 4 and 6 students living in the US. Analyses revealed that when children drew a single figure and the figure is female, they tended to color clothes with warm colors like red. Contrarily, if the figure was male, they colored clothes with cool colors, such as blue or green. In neutral figures, where there were not gender specific figures, color use differences were not as clear as in the male and female figures.

The Lack of Research in Spain

Studies from many countries suggest that children's gender-related color preferences are similar [10, 13]. However, as the literature review reveals, the methods and measures used to explore color preferences have varied from study to study. There are a few cross-cultural studies on children color associations with gender but, to our knowledge, none has offered a comparative study between cultures to replicate previous findings using the same methodological procedure. Surprisingly, although Spanish studies have shown that gender has an influence on Spanish children's attitudes toward toys [22] and play behaviors [19], there are neither previous systematic research works in Spain that analyze gender-related color preferences and how use of color is influenced by gender color associations, nor studies approaching these issues in relation to children of preschool and primary school years.

This study attempts to bridge this gap in Spanish gender research and to contribute a cross-cultural comparative dimension using Karniol's [15] methodological procedure in the Israeli study but with Spanish children. Karniol's study [15] is one of the most recent approaches to study how gender schemata explain gender differences in color preferences. Her methodological approach allows us to analyze multiple variables related to children's color choices and examine whether or not preferences/choices linked to children's emerging gender identity and stereotypes about the objects themselves.

Karniol's Study

For the purpose of exploring how gender and gender-related information influence choice of color, Karniol [15] conducted a study in which 98 Israeli boys and girls

aged between 4 and 8 years had to choose between two coloring books, each with conflicting gender-stereotypic color and illustration on its cover. One of the covers used was pink (the stereotypical feminine color) but had a male figure on it (an illustration of Batman); the other cover was blue (the stereotypical masculine color) but had a feminine figure on it (an illustration of a Bratz doll). After choosing one of the two books, the boys and girls had to color in three illustrations inside it. They were provided with a selection of colored markers in a range of stereotypically masculine colors (dark/light green/blue) and feminine colors (red, pink, mauve, purple). Children were told they could only use these colors. Two of the illustrations were prototypical of each gender (a feminine figure and another masculine one), while the third illustration was neutral (five stars). The intention of including these three figures was to verify if choice of color when coloring illustrations is influenced by these schoolchildren's gender identity or by the image in the illustration.

Karniol's [15] results showed that boys and girls mainly chose the book based on the illustration on its cover rather than its color. This result suggests that when two contradictory gender stereotypes are presented, the figure or object becomes more important than color when making a decision. When coloring in illustrations, both boys and girls used more colors on the stereotypical figure of their own gender. The main differences appeared when using the stereotypically feminine colors because boys used these colors considerably less frequently for the feminine and the neutral figures than did girls. Nevertheless, no differences between boys and girls were found for use of stereotypically feminine colors with the masculine figure as the frequency of their use was low in both genders. The results also revealed that boys avoided mainly the use of pink and, in many cases, they did not color in the feminine figure. Karniol [15] explained these results in relation to gender socialization and concluded that the choice of the colors that the boys and girls used to paint the illustrations was influenced by their gender identity. Likewise, Karniol [15] analyzed the effect of age on the choice of book and the use of different colors. She did not find significant differences between the various age groups which, according to this author, would be related to early internalization with stereotypes among Israeli children.

Research Approach

The objectives set out in this research work were to: (1) compare the original research results with new data obtained from a different context, Spain in this case; (2) overcome some of the limitations with the materials employed in the original study to analyze the role of gender and the stereotyped nature of the illustrations on color choice in more detail. For these purposes, a study was done in which all the participants received the same instructions, but one part of them were provided with the materials used in the Israeli study sample, and the others received new materials with two changes if compared to the original design.

The first of these changes in the materials was the introduction of two new, specifically neutral colors (yellow and orange). Orange and yellow were selected as neutral colors because gender-differentiated color preferences in using these colors are not as evident as blues and pinks. For example, Iijima et al. [14] did not find

gender differences in the use of yellow and orange in the free drawings done by 5–6-year-old children. Other studies considered orange and yellow as gender-neutral colors because they are used in the packaging for infant and preschool neutral toys [1, 29]. In Karniol's [15] study, although children were not provided with yellow and orange, boys and girls both imported these colors from their own crayons to enhance the variety of colors they used, but also because they did not perceive these colors as gender stereotyped. Our intention of introducing these two neutral colors was to learn if they are employed more often than those considered to be gender-stereotyped.

In line with this change and regarding the variety of colors employed to color illustrations (total number without distinguishing between stereotypical masculine and feminine colors), we expected boys and girls to employ a wider range of colors for the stereotypical figures according to their gender, showing a preference for items stereotyped as own-gender like in previous studies [5]. In addition, we expected girls to use more feminine colors than boys. In relation to the results of the previous study, girls would specifically use more feminine colors for the feminine and neutral figures, whereas no differences would be found as far as the use of these colors are concerned with the masculine figure [15]. In this light, and after considering the inclusion of two new neutral colors, we hypothesized that the differences between boys and girls in their use of stereotypical feminine colors would be more marked among those children who had more colors since boys would have to use the neutral colors to avoid using feminine ones. Pink was the color least employed by boys in the original research sample, and boys' avoidance of pink has been reinforced by parents' and teachers' belief that pink is not a masculine color [30]. In this sense, we believe that boys would employ less pink than girls.

The second change in the materials consisted in introducing two new figures which, despite being gender-stereotyped, attempted to counteract the possible effect of participants' familiarity with the illustrations used in the original study, as they represented well-known TV cartoon characters. We understand that this familiarity could lead boys and girls to color in the illustrations by copying the colors that the characters have in the TV series rather than choosing colors according to their own preferences. The intention was to learn if boys and girls are influenced by either their gender identity or illustration type when they choose colors. We considered that all the differences in color use could be more significant between the boys and girls who colored in the new illustrations because, despite being gender-stereotyped, these figures were not known and, therefore, they were not associated with any previous color. Hence, they could better represent the influence of gender stereotypes when it comes to selecting colors.

Moreover, as the original research work found no age-related effects, our study sought to explore this further by increasing the number and extending the age range of the study sample. The objective of these modifications was to check if there was some kind of difference for choices related with preference and use of color between older and younger boys and girls. The age groups targeted in the present study, which ranged from 5 to 10 years old, are ideal for examining the developmental differences in accessibility to gender stereotypes. Research into gender development shows that approximately by the age of 5, children know a higher number of gender

stereotypes, including more abstract stereotypes, as social roles. It is during the 5–7-year-old period when children generally show more rigidity in their adherence to gender stereotypes. Beyond the age of 8, girls and boys gradually show greater flexibility in adhering to these stereotypes [17, 27] and their experiences with color become more varied when individuals encounter more social experiences with age [3]. Indeed, when children grow older, the fact that they are able to identify stereotypes related to color does not necessarily imply that they personally endorse such generalizations [18]. So, contrary to the Karniol's [15] predictions, we hypothesized that the color choices made by older participants would be less influenced by gender stereotypes than the choices made by younger participants. Nonetheless, it is important to stress that Karniol [15] reported that age had no effect on children's choice of book or use of colors.

Finally, as the color and illustrations on the front cover of the coloring books used in both studies were the same, we expected to find the same result for book choice; that is to say, both boys and girls would select their book according to the illustration on the cover rather than for its color.

Hypothesis Summary

Hypothesis 1: Choice of an Illustrations Book

Based on Karniol's [15] study which showed that children resolved the incongruity between gender related-color stereotypes and gender-stereotyped illustrations by ignoring color cues, we hypothesized that:

H1 Boys and girls will select their illustrations book according to the illustration on the cover rather than by its color.

Hypothesis 2: Variety in the Colors Used in Gender Stereotype Figures

Research that has examined differences between the variety of colors used by boys and girls suggests that girls use a wide variety of colors in their drawings [14, Tugeon 2008). However, Karniol's [15] study indicated that children of both genders used a broader variety of colors for the figure stereotypically associated with their own gender. Based on these results, we hypothesized that:

H2a Boys and girls will employ a wider range of colors for stereotypical figures that are same gender as participant.

H2b Girls will use a broader variety of colors in their drawings than boys.

Hypothesis 3: Use of Gender-Stereotyped Colors

Karniol's [15] study showed that girls use fewer female-stereotyped colors for the male-stereotyped figure, but also employ both color types equally for other figures. Boys's use of female-stereotyped colors does not vary across figures and they avoid using pink. Based on these results, we hypothesized that:

H3a Girls will use more stereotypical feminine colors than boys for the female-stereotyped and neutral figures, whereas girls' use of these colors will not differ for the male-stereotyped figure.

H3b Girls will use more pink than boys, irrespectively of the gender-stereotyped nature of the figures.

H3c Differences between boys and girls in their use of female-stereotyped colors will be more marked among those children who have two neutral colors (orange and yellow), and also among those who color new illustrations.

Hypothesis 4: Age-Group Differences in the Use of Color

Research into gender stereotypes suggests that adherence to these stereotypes is less rigid when boys and girls reach preadolescence [17]. Based on this, we hypothesized that:

H4a Older children will use a wider variety of colors than younger ones.

H4b Older children will use female-stereotyped colors more often than younger ones.

Method

Participants

In the present study, 614 students participated from three preschools and primary schools in the city of Cuenca (Spain) aged between 5 and 10 years ($M = 7.45$; $SD = 1.59$). Of all the participants, 49.3 % (303) were girls and 50.7 % (311) were boys. The study samples was made up of 199 preschool pupils aged 5-6 years, 234 primary education pupils aged 7–8 years and 181 primary education pupils aged 9–10 years. Students were asked to voluntarily participate and written informed consent was obtained from parents. This study was carried out by two researchers as a routine part of usual classroom activities.

Design and Procedure

Participants in their classes had to choose between two illustrations books which were identical except for the color and illustration on their covers. One of the two books had a pink-colored cover with a drawing of Batman (http://goo.gl/vdj81H), while the other had a blue cover and an illustration of a Bratz doll (http://goo.gl/iw6G6D). The books contained three drawings which children were asked to color: a female figure, a male figure and five stars (stars were considered the neutral figure). In our study, part of the books contained the illustrations employed in Karniol's research: a fairy from the Winx Club cartoons (http://goo.gl/1o2CER). The male figure was represented by an illustration of Ben 10 (http://goo.gl/w5VSl2). The remaining books contained illustrations created for this research representing

one boy and one girl aged between 5 and 11 years (Fig. 1). The order in which the feminine and masculine figures were presented was randomized, and the stars were always last in the illustrations book.

Along with the book, each participant received a box with colored crayons. One part of the participants received a box with eight colored crayons, of which four colors were associated with males (light and dark blue, light and dark green) and four with females (red, pink, violet and purple). The remaining participants received a box with ten colored crayons, which included the tones orange and yellow along with the eight colors described before. The participants were told to use the colors at will, and the only exception was they had to paint each star in a different color to avoid participants using only their favorite colors to paint the five starts.

While the study was underway, work was done with the group/class so that a study condition was assigned to each class to receive original or new illustrations, and also eight or ten colors. Each group was assigned a condition aleatorily and any variation in the number of participants in each condition was the result of the randomly assignation (Table 1). Although no time limit was set for the participants to color in the drawings, the mean time spent was around 30 min.

Measures

Children in their classes were randomly assigned to different study conditions according to the illustration type and number of colors. Illustration type included

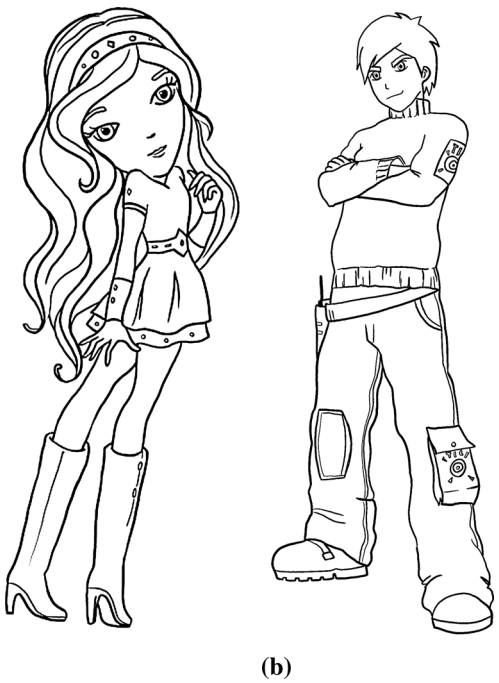

Fig. 1 New illustrations. **a** Feminine figure. **b** Masculine figure

Table 1 Distribution of the participants according to gender and age group under all the conditions included in the research design

Age	Original illustrations				New illustrations			
	8 colors		10 colors		8 colors		10 colors	
	Girls N	Boys N	Girls N	Boys N	Girls N	Boys N	Girls N	Boys N
5–6 years	28	36	32	24	14	22	24	19
7–8 years	38	34	22	19	26	24	35	36
9–10 years	34	31	7	13	24	21	19	32

two kinds of illustrations: those used by Karniol in the Israeli study (original illustrations) or illustrations created for this study (new illustrations). Number of colors referred to the box of colors given to children: a box with eight colored crayons (colors provided in the Israeli study) or a box with ten colored crayons (adding yellow and orange to the eight original colors).

Independent measures used in this study to analyze children's behavior in the coloring task were: gender, age, figure type. Children's gender was understood as the self-categorization as male or female. Figure type referred to the three types of figures than children were asked to color: a stereotypically-male figure (e.g. Ben 10), a stereotypically-female figure (e.g. Winx fairy) and a neutral figure not associated with a specific gender (stars).

Dependent measures used to examine gender preferences and coloring conduct among children were: book choice and color type. Book choice is related to childreńs selection of the coloring book on the basis of the gender-stereotyped illustration or on the basis of gender related colors stereotypes. Color type referred to the crayons used by children to color the figures in male-stereotyped colors (e.g. blue or green), female-stereotyped colors (e.g. pink or purple) or neutral colors (e.g. yellow or orange). The analysis distinguished between variety of colors used for the gender-stereotypes figures and use of gender-stereotyped colors. Variety of colors referred to all the colors that boys and girls used coloring the figure without distinction between male and female stereotyped colors. Gender-stereotyped colors differentiated the use of male-stereotyped colors and female-stereotyped colors.

Data Analysis

The first analysis block was done to identify the variables intervening in the choice of illustrations book. For this purpose, a binary regression analysis was done based on classifying the selection of the blue book as 0 and the pink book as 1.

The second analysis block studied the differences in the use of different colors to color in the figures in each book. Parametric statistics was employed after checking with a Kolmogorov–Smirnov test that none of the variables followed a normal distribution. In this block, the variety of colors used in the gender-stereotyped figures was analyzed without bearing in mind the neutral figure because the

participants were asked to paint each star in a different color. Inter-gender differences in the number of colors used in the masculine and feminine figures were examined by means of a Mann–Whitney U test. The intra-gender differences in the variety of colors were analyzed by the Friedman test and by a post hoc analysis using a range test with Wilcoxon's sign criterion to compare by pairs and to locate differences among figures. Next, the use of stereotypically masculine and feminine colors was examined. Initially, a Mann–Whitney U test was done to see if there were any inter-gender differences in the use of the stereotyped colors per gender, including the neutral figure. Two new variables relating the total use of these colors were generated by summing the masculine colors on the one hand and the feminine colors on the other hand employed in the three figures. Later, as the inter-gender differences were found only in the feminine colors, both the inter- and intra-gender differences in the use of feminine colors were analyzed by Mann–Whitney U- and Friedman tests. After considering the inclusion of the neutral colors, differences in the use of the feminine colors were also examined by considering the number of available colors (8 and 10) to be the independent variable. This analysis was carried out by a Mann–Whitney U test firstly by not considering the gender of the participants, and then by including the gender variable. This analysis differentiated between those who were assigned the original figures from the Karniol study and those who were assigned the two new figures.

The third analysis block examined use of pink to check if, as in the Israeli study, it was a color that boys would avoid more. However while coding the data, we realized that both boys and girls had painted parts of the figures, like faces and hands, in pink because they had not received a color they had systematically required while the study was underway: "a skin tone". This fact led us to reconsider the use of pink as it could be used to paint the body or the clothes of the figure. So we coded use of pink in two different ways: to compare our data with the original research work, use of pink in any of the figures was coded as 1, while no use of this color in any of the figures was coded as 0; with the same classification, its differential use on the body and the clothes of the figure was coded. A Pearson's Chi squared test was used to verify any differences in use of pink.

The fourth analysis block dealt with the feasible differences in choice of colors among the three age groups. Here a Kruskal–Wallis H-test was done (with a post hoc analysis by a Mann–Whitney U test). The SPSS 18.0 statistical package was employed to carry out all the analyses.

Results

Testing H1. Choice of an Illustrations Book

As the analysis variable is dichotomous (a blue or a pink book), a binary regression analysis was done and included gender, age and the gender-age interaction of the participants. The model provided a good overall fit ($\chi^2 = 485.07$, gl $= 3$, $p < .001$, NR2 $= 0.729$, $-2LL = 363.190$), although only gender entered the equation ($\beta = -4.12$, Wald $= 28.71$, $p < .001$). The model correctly identified 91 % of the

participants. Most of the participants chose the book according to the gender stereotypical illustration on its cover rather than its gender stereotypical color: 88.11 % of girls (267) chose the book with the figure of a Bratz doll, while only 11.9 % (36) chose the book with the figure of Batman. Similarly, 93.6 % of boys (292) selected the book with the Batman figure, as opposed to only 6.1 % (19) who opted for the book with the Bratz doll drawing.

Testing H2a, H2b and H4a. Variety in the Colors Used in the Gender-Stereotyped Figures

Table 2 presents the descriptive characteristics relating to all the colors employed to paint the gender-stereotyped figures. The inter-gender differences are offered by the Z scores for the Mann–Whitney U test, while the intra-gender differences are marked by subindices.

For the inter-gender differences, significant differences were found in the variety of the colors employed to color in the feminine figure, irrespectively of the number of colors available and illustration type. The analysis of the intra-gender differences revealed differences in the two illustration types. Differences appeared in the original research work only in the girls who had ten colors, who used more colors to paint the feminine figure than the masculine one ($Z = -2.19$, $p < .05$). In the new illustrations, the analysis revealed that girls used a wider variety of colors to paint the feminine figure for both conditions: eight colors ($Z = -4.06$, $p < .001$) and ten colors ($Z = -2.03$, $p < .05$). However, boys utilized a wider variety of colors to paint the new masculine figure for the two conditions: eight colors ($Z = -4.06$, $p < .001$) and ten colors ($Z = -2.03$, $p < .05$).

In analyzing differences relating to age, differences were observed only in the variety of colors employed in the feminine figure of the new illustrations for both conditions: eight colors (χ^2 (2, 129) = 10.31, $p < .01$) and ten colors (χ^2 (2, 158) = 11.17, $p < .01$). For both conditions, the 5–6-year old participants used a more limited variety of colors in the feminine figure (8 colors M = 4.60, SD = 1.25; 10 colors M = 4.85, SD = 1.52) as compared with the other two age groups: 7–8 years (8 colors M = 5.24, SD = 1.08; 10 colors M = 5.91, SD = 1.48); 9–11 years (8 colors M = 5.44, SD = 1.23; 10 colors M = 6.10, SD = 1.42). No significant differences were found between these last two age groups.

Testing H3a, H3c and H4b. Use of Gender-Stereotyped Colors

No gender differences were found for use of masculine colors, irrespectively of the colors available and illustration type (original or new). Nonetheless, feminine colors were used more by girls as compared to boys for both the original illustrations for the 8-color ($Z = -2.68$, $p < .01$) and the 10-color ($Z = -2.70$, $p < .01$) conditions, and the new illustrations for the 8-color ($Z = -3.55$, $p < .001$) and the 10-color ($Z = -3.54$, $p < .001$) conditions. No age-related differences were seen for use of either masculine or feminine colors.

Table 2 Means, standard deviations and Z scores of the inter-gender differences in the variety of colors used to color in illustrations according to the color range and type of figure

Type of figure	Original illustration						New illustration					
	8 colors			10 colors			8 colors			10 colors		
	Girls (n = 100) M (SD)	Boys (n = 1) M (SD)	Z	Girls (n = 61) M (SD)	Boys (n = 56) M (SD)	Z	Girls (n = 64) M (SD)	Boys (n = 67) M (SD)	Z	Girls (n = 78) M (SD)	Boys (n = 87) M (SD)	Z
Masculine	5.02 (1.17)	5.00 (1.28)	−0.12	5.15^{b} (1.31)	5.17 (1.56)	−0.11	5.43^{b} (1.19)	5.57^{a} (1.12)	−0.34	5.92^{b} (1.68)	6.08^{a} (1.32)	−0.47
Feminine	5.19 (1.23)	4.85 (1.05)	−2.31*	5.96^{a} (1.67)	5.15 (1.51)	−2.45*	5.73^{a} (1.11)	4.95^{b} (1.11)	−2.22*	6.22^{a} (1.55)	5.69^{b} (1.38)	−2.29*

The means that do not share a common superscript are significantly different ($p < .05$) and represent intra-gender differences

* $p < .05$; ** $p < .01$; *** $p < .001$

Regarding the inter- and intra-gender differences for use of feminine stereotypical colors, inter-gender differences appeared in the amount of feminine colors utilized in the feminine and neutral figures in both the original and new illustrations, irrespectively of the number of colors available. Girls employed more of these colors than boys to paint both figures. No gender differences were encountered for use of feminine colors when painting the masculine figure under either condition described above (Table 3).

Regarding the intra-gender differences, girls used more feminine colors in the original illustrations under the 8-color condition to paint the feminine ($Z = -5.60$, $p < .001$) and the neutral ($Z = -4.51$, $p < .001$) figure than the masculine figure. This result was found again for the 10-color condition, where more feminine colors were employed with the feminine ($Z = -4.79$, $p < .001$) and the neutral ($Z = -4.03$, $p < .001$) figure. In the new illustrations under the 8-color condition, girls used more feminine colors for the feminine figure than for the masculine ($Z = -2.41$, $p < .05$) and the neutral ($Z = -2.74$, $p < .01$) one. For the 10-color condition, girls also utilized more feminine colors in the feminine figure than for the masculine ($Z = -4.74$, $p < .001$) and the neutral ($Z = -3.29$, $p < .01$) one.

The boys who colored the original illustrations used more feminine colors under the 8-color condition to paint the feminine ($Z = -4.29$, $p < .001$) and the neutral ($Z = -2.39$, $p < .01$) figure if compared with those they used with the masculine figure. Yet they also used more feminine colors in the feminine figure if compared to the neutral one ($Z = -2.39$, $p < .001$). For the 10-color condition, boys used these colors more to paint the feminine figure as compared to those they utilized to paint the masculine ($Z = -3.25$, $p < .001$) and the neutral ($Z = -2.74$, $p < .01$) figure. In the new illustrations, the boys who had eight colors utilized more feminine colors in the feminine figure if compared to the masculine ($Z = -2.30$, $p < .05$) and the neutral ($Z = -4.22$, $p < .001$) figure. The same can be said for those boys who had ten colors: more feminine colors in the feminine figure versus the masculine ($Z = -2.61$, $p < .01$) and the neutral ($Z = -5.08$, $p < .001$) figure. Nonetheless, boys employed more feminine colors in the masculine figure than in the neutral one under the 8-color ($Z = -2.82$, $p < .01$) and the 10-color ($Z = -2.54$, $p < .05$) condition. No age-related effects were seen for use of feminine colors in all the figures colored in.

Finally, differences in the use of stereotyped feminine colors were analyzed by considering the number of available colors (8 and 10) to be the independent variable. Table 4 presents the means, standard deviations and the Mann–Whitney U test results for the sample as a whole, but does not include participants' gender. The results reveal that those who had eight colors, as opposed to those with ten, used more feminine colors to paint any of the figures.

Another data analysis was done in which participants' gender was considered, and it showed that the differences found for girls lay in the masculine and neutral figures. Those girls who had ten colors used fewer feminine colors in the original masculine ($Z = -5.15$, $p < .001$) and the new masculine ($Z = -5.28$, $p < .001$) figure. For the neutral figure, the girls who had ten colors employed fewer feminine colors to paint the stars than those who colored original illustrations ($Z = -4.34$, $p < .001$) and those who colored new ones ($Z = -2.15$, $p < .05$). Conversely, no

Table 3 Means, standard deviations and Z scores of the inter-gender differences in the use of stereotyped feminine colors to color in illustrations according to the color range and type of figure

Type of figure	Original illustrations						New illustrations					
	8 colors			10 colors			8 colors			10 colors		
	Girls (n = 100) M (SD)	Boys (n = 101) M (SD)	Z	Girls (n = 61) M (SD)	Boys (n = 56) M (SD)	Z	Girls (n = 64) M (SD)	Boys (n = 67) M (SD)	Z	Girls (n = 78) M (SD)	Boys (n = 87) M (SD)	Z
Masculine	2.02^{b} (0.88)	2.00^{c} (0.72)	−0.65	1.21^{b} (1.03)	1.34^{b} (0.94)	−0.88	2.72^{b} (0.68)	2.52^{b} (0.81)	−1.46	1.83^{b} (1.05)	2.05^{b} (0.95)	−1.18
Feminine	2.77^{a} (0.63)	2.50^{a} (0.89)	−2.28*	2.41^{a} (0.97)	2.02^{a} (1.03)	−2.24*	3.03^{a} (0.66)	2.76^{a} (0.74)	−2.37*	2.83^{a} (1.08)	2.41^{a} (0.97)	−2.84**
Neutral	2.70^{a} (0.81)	2.26^{b} (0.74)	−4.14**	2.10^{a} (0.87)	1.50^{b} (0.91)	−3.38*	2.64^{b} (0.76)	2.18^{b} (0.81)	−3.35***	2.27^{b} (1.10)	1.66^{c} (0.93)	−4.05***

The means that do not share a common superscript are significantly different ($p < .05$) and represent intra-gender differences

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4 Variety of feminine colors employed to color in the original and new masculine and feminine figure according to the amount of colors available

	Condition: 8 colors M (SD)	Condition: 10 colors M (SD)	Z
Masculine figure			
Original	2.01 (0.80)	1.27 (0.98)	−6.95***
New	2.62 (0.70)	1.95 (1.00)	−6.31***
Feminine figure			
Original	2.59 (0.77)	2.22 (1.01)	−3.72***
New	2.89 (0.70)	2.61 (1.04)	−2.18*
Neutral figure			
Original	2.48 (0.80)	1.81 (0.93)	−6.11***
New	2.40 (0.82)	1.95 (1.06)	−4.14***

* $p < .05$; ** $p < .01$; *** $p < .001$

significant differences were obtained between the 8- and the 10-color conditions for those girls who used a similar number of feminine colors for the original feminine figure.

Among the male participants, differences lay in the number of feminine colors they used to color in both the masculine and feminine figures. The boys who received ten colors utilized fewer feminine colors in the original masculine figure ($Z = -5.15$, $p < .001$) and in the new one ($Z = -5.28$, $p < .001$). Those who received ten colors also employed fewer feminine colors in the original feminine figure ($Z = -4.34$, $p < .001$) and the new feminine figure ($Z = -2.15$, $p < .05$). No significant differences were noted in the number of feminine colors employed in the neutral figure under either condition.

Testing H3b. Use of Pink

First, an analysis was done to see whether boys tended to avoid using pink to a greater extent than girls. Table 5 shows the percentages of total use of pink per gender, (without distinguishing among the figures) and the percentages of use in all the figures, as well as the Chi square test results. The results indicate that boys used much less pink than girls in general, and in the feminine and the neutral figures in particular. No differences were found for the use of pink to color in the masculine figure or among the three age groups.

Second, as boys used pink less than girls, we analyzed whether this color was used more among boys to color in the clothes and body of the figures. The results demonstrate that of all the male participants, 89.7 % (279) used pink in at least one of the figures. However, other analyses showed a significant relation between total use of pink and use of pink on the body of the figures (χ^2 (1, 279) = 88.31, $p < .001$). Of all the boys participating who painted with pink, 81.3 % (226) used this color to paint the body of the figures. Likewise, another significant relation was observed between total use of pink and use of this color for the clothes of the figures

Table 5 Percentages of the complete use of pink and differentiating them per illustration type depending on the participants' gender

	Boys n (%)	Girls n (%)	χ^2 (2, 614)
Total			
No	32 (10.3)	10 (3.3)	11.76*
Yes	279 (89.7)	293 (96.7)	
Masculine figure			
No	98 (31.5)	93 (30.7)	.48
Yes	213 (68.5)	210 (69.3)	
Feminine figure			
No	68 (21.9)	34 (11.2)	12.55**
Yes	243 (78.1)	269 (88.8)	
Neutral figure			
No	191 (61.4)	95 (31.4)	55.73**
Yes	120 (38.6)	208 (68.6)	

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

(χ^2 (1, 279) = 16.65, $p < .001$). Of all the boys who used pink, only 37.8 % (105) painted the clothes of the figures in this color. In short, boys employed pink more to color the body of the figures than their clothes.

Discussion

In general terms, our results corroborate the conclusions reported by Karniol [15] on the influence that both gender identity and the gender stereotyped nature of illustrations have on boys' and girls' preferences for some colors or others. Notwithstanding, our work provides new data on the gender variable for color selection and how this selection is influenced by the stereotyped nature of the illustrations in Spain.

Choice of an Illustrations Book

As for the choice of illustrations books, as expected, most of the boys and girls who participated in the present study chose their book according to the gender information in the illustration on the cover and not for the color of the book. These data coincide with those reported by Karniol [15] with the Israeli sample, and they reinforce the idea that, although blue and pink as colors are relevant gender cues [20], they influence decision making to a lesser extent when other contradictory gender cues come into play which, in this case, were illustrations. This result is in line with previous research in countries like North America [5] and Sweden [29], which have shown that children prefer items stereotyped as own-gender. This finding also suggests that boys and girls differentiate own-gender other-gender

figures and that they favor own gender regardless of contradictory stereotypical color cues.

Variety in the Colors Used in the Gender-Stereotyped Figures

When comparing the variety of colors employed to paint the figures, we discover that girls used more colors to paint the feminine figure than boys. Nonetheless contrarily to what Karniol [15] reported, we found no gender differences in the colors used for the masculine figure. This result may indicate that girls exhibited more flexibility when coloring both the male and female figures. Former research has revealed that girls do not rigidly avoid masculine toys to the same degree that boys avoid feminine toys [29], and this greater flexibility can be extrapolated to coloring female and male figures. These results also partly support previous research indicating that girls use a greater variety of colors than boys [14, 23].

After analyzing the intra-gender differences the analyses examined gender differences in participants' color choices. The data indicate that both boys and girls used more colors for the figure associated with their own gender as compared with the colors they employed for the other-gender figure. Girls used more variety of colors for the feminine figure than for the masculine one, while boys used more variety of colors when painting the masculine figure than the feminine one. Consistently with previous findings [4], this implies preference for their own-gender figure. However, this tendency was significant only among the participants who colored the new illustrations. Lack of differences in the original illustrations could be due to participant's use of colors that matched the colors to those they associate with the TV character.

Use of Gender-Stereotyped Colors

When analyzing the use of masculine and feminine colors, our work reproduced the results obtained by Karniol [15] in inter-gender differences terms, as expected. More feminine colors were used among girls than boys in overall terms and in the feminine and neutral figures. These data confirm that boys tend to avoid feminine colors, whereas girls use masculine colors to the same extent as boys. Once again, this study reveals that girls employ a wider variety of colors in their drawings, which supports with studies done in Australia [23] and Japan [14], and compliments research done in Canada [6] and Scotland [20] indicating that boys prefer stereotyped masculine colors like blue.

Furthermore, the current study analyzed whether avoidance of feminine colors was more marked among the participants who had received neutral colors because, as other authors have pointed out [8, 16], when boys and girls have neutral colors, they may feel less pressure to use stereotypical colors. As expected, our results demonstrate that the boys who had neutral colors used fewer feminine colors that boys who had only blue and pink hues. This may lend support to the theory that boys actively avoid feminine colors because it violates their definition of what is masculine.

Nevertheless, the intra-gender analysis on the utilization of feminine colors demonstrated that both boys and girls made color choices depending on not only the figure they were coloring in, but also on the gender stereotype evoked by the figure. Specifically, boys and girls used more feminine colors in the feminine figure than in the masculine one. In both cases, they always used fewer feminine colors in the neutral figure than those they employed with the feminine figure. This result is one of the most important obtained from the present study because it reveals that boys and girls share similar stereotypes of the "most suitable" colors for each figure type, and that they change their coloring conduct according to these stereotypes. Despite boys exhibiting less flexibility than girls when choosing colors, both genders showed awareness of the contextual cues which, in our case, evoked the stereotyped nature of each figure. The illustrations seemed to provide them with information about which colors can be considered more suitable in each circumstance. This result indicates that Spanish boys may be more flexible in adapting to the stereotypes related to gender and color in comparison to the Israeli sample [15].

Use of Pink

The analyses done on use of pink reveal that, in line with previous findings, boys use this color less than girls [15, 20, 25]. Despite this finding, the differences observed are not as marked as in the original study where only 16 boys used pink to color at least one of the figure whereas in our study 279 boys used pink to color at least one of the figures. The greater use of pink among boys in our work is perhaps explained by our new coding scheme, where we noted how pink was used. In our study, 81.3 % of boys used it to color in the body of the figures. Yet this percentage lowered to 37.8 % when it was used to color in the clothes of the figures. The fact that boys can distinguish between the body and clothes is key if we consider that gender cues can operate distinctly. Pink as a color is appropriate to color in the body of figures when children have no other colors that resemble the color of human skin. Conversely, its use for clothes may be more associated with what is feminine, thus boys avoid using it. These results support the Gender Schema Theory approach insofar as our study supports the conclusion that boys observe gender cues in the social context and can form the idea that pink is a very suitable color for the body, but not for the clothes of the figures masculine figures [6, 21]. One particularly significant finding is that, unlike the results of Karniol's [15] study, boys' avoidance of pink is not as clear as in the Israeli sample and Spanish boys did not refuse to color in the female-stereotyped figure.

Age-Group Differences in the Use of Color

In our study, there were no significant effects noted in relation to participants' age. As in Karniol's study [15], no age-related differences were found when choosing an illustrations book or using stereotypical colors. The only difference found in our study appeared in the variety of colors employed by older participants who colored in the new feminine figure under the 10-color condition. Based on our prediction, this difference may be related to the fact that older participants use a wider range of

colors as they display more flexibility in gender-related matters, which seems to emerge the closer they are to preadolescence [17]. Notwithstanding, it would be useful to analyze this aspect in more detail in future research as the precise reason for the association between age and color choice is unclear.

Limitations

There are several limitation to this study. First, there are unmeasured factors that may explain the differences between our findings and those of the Israeli study. For instance, motivations to color or motivations behind color choices were not explored, nor were children's attitudes toward specific illustrations, and any of these factors conceivably could differ by study populations. Second, there are several plausible methods effects in the study: the participants worked in a classroom and could, therefore, have been influenced by what other boys and girls did. Future research could avoid these issues if the coloring activity takes place outside the classroom and on an individual basis, and if the participants are asked a posteriori about their decisions when choosing colors. In addition, since the illustrations embedded stereotypical cues, it would be useful to design a condition option in which participants colored illustrations that they themselves drew, in order to observe differences in use of color more naturally. Third, the results must be interpreted with caution as the study sample came from a single region of Spain. Moreover, comparisons with the study by Karniol [15] may be interesting but need to be interpreted with attention to the different sociohistorical contexts of Karniol's research and that of the present study. As Del Olmo [9] pointed out, color preferences have varied in historical and geographical terms, as have customs.

Implications for Policy

Finally, our results suggest social implications that must be taken into account when planning education actions which intend to modify gender stereotypes. The study presented herein illustrates that boys and girls stereotypically associate drawings and colors with one gender and with the other, and that their coloring conduct is influenced by these associations. Internalization of these associations may affect many other aspects of their choices, such as playing, dressing, or even their relationships with other people [28]. Stereotypes cues have been associated with risk conducts, such as violence during adolescence in a sample of Spanish students aged 12–18 years-old who had been interiorized stereotypical masculine traits [24]. As these stereotypes are learned from very early ages at home and school [11], it is necessary to raise awareness of the importance of gender in the emerging identities of boys and girls. Mothers, fathers, tutors, and educators need to reflect on, and understand, how these stereotypes are acquired, how they influence children's learning and the role that adults play as models in disrupting or perpetuating them.

Acknowledgments We would like to thank Ana B. Delgado for creating the new illustrations used for this study. We would also like to thank reviewers for clarifying the meaning of our words and for the suggestions that have contributed to a tighter and more comprehensive work.

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