

**Published in: Journal of Child Psychology and Psychiatry (2003), 44, 445-455**

**Children's colour choices for completing drawings of affectively characterised topics**

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**Acknowledgements:** The research reported in this paper was supported by ESRC Research Studentship R00429634149 awarded to the first author.

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## **Abstract**

This study was designed to explore whether or not children systematically use particular colours when completing drawings of affectively characterised topics. Three hundred and thirty 4-11-year-old children were subdivided into three conditions, colouring in a drawing of a man, a dog, or a tree, respectively. The children completed two test sessions in counterbalanced order. In one session, children rated and ranked ten colours in order of preference. In the other session, children completed three colouring tasks in which they had to colour in three identical figures but which had been given different affective characterisations: a neutrally characterised figure, a figure characterised as nasty, and a figure characterised as nice. It was found that, in all age groups and for all topics, the children used their more preferred colours for the nice figures, their least preferred colours for the nasty figures, and colours rated intermediately for the neutral figures. It was also found that, in all age groups and for all topics, black tended to be the most frequently chosen colour for colouring in the drawings of the negatively characterised figures. By contrast, primary colours were predominantly selected for the neutral figure, while a wide range of mainly primary and secondary colours were chosen for colouring in the nice figure. These results suggest that children are able to alter systematically their use of colour during picture completion tasks in response to differential affective topic characterisations, and that even very young children are able to use colours symbolically.

## Introduction

Psychologists have long speculated that the contents of children's drawings are a product of more than just the cognitive and perceptual-motor factors which are required for executing those drawings. There is a long history of research into whether the positive or negative feelings which children might have about the topics which they draw are reflected in the contents of their drawings. Both the size (Burkitt, 2000; Burkitt, Barrett & Davis, submitted; Craddick, 1961, 1963; Fox & Thomas, 1990; Koppitz, 1966, 1968; Machover, 1949; Thomas, Chaigne & Fox, 1989) and the spatial disposition (Bombi & Pinto, 1993, 1994) of the contents of a drawing have been found to be affected systematically by the feelings that the child artist holds toward the drawn topic.

Another possible resource which is potentially available to children for expressing their feelings about the topic being drawn is colour. It has frequently been argued in the literature that the child's choice of colour is affected by the feelings which he or she holds towards the drawn topic (e.g. Alschuler & Hattwick, 1943, 1947; Arnheim, 1956, 1974; Brick, 1944; Golomb, 1992; Hammer, 1997; Winston, Kenyon, Stewardson & Lepine, 1995). These claims have often been voiced by clinicians and art therapists (Dalley, 1984; Hammer, 1997; Liebowitz, 1999; McNiff, 1992; Warren, 1993) in relation to the observation and interpretation of colour use in patients' artwork as part of assessment and therapy.

However, although colour use in children's drawings has commonly been regarded as being emotionally significant, the majority of claims to this effect have been based on professional observation rather than on formal experimentation, with research having been conducted mainly within clinical contexts, where systematic independent validation of the artist's feelings towards the colours used, and towards the topics drawn, is not undertaken, and the potential availability of other drawing strategies to the child has not been experimentally controlled. This lack of properly controlled research is a serious omission, as

children's drawings are often interpreted for personal meaning in clinical and educational settings (see, for example, Di Leo, 1973; Hammer, 1997), with interpretations of the emotional significance of the contents of children's drawings - which may have implications for the treatment of those children - being made in such settings in the absence of an adequate research evidence base for those interpretations.

Although an association between colour and emotional symbolism has been established (Alschuler & Hattwick, 1947; Anastasi & Foley, 1943; Hammer, 1953; Zentner, 2001), this work examines children's sensitivity to metaphorical associations of colour, rather than examining children's use of colour in drawing production tasks. No research has systematically examined which colours might be used by children in drawing production tasks for topics which elicit emotions, and the majority of claims as to the usefulness and function of chromatic tests is based largely on individual case studies (Hammer, 1997). Moreover, there have been no attempts to validate such tasks in relation to other factors which might contribute to colour choice, for example, colour preference and familiarity.

The present study aimed to examine whether children systematically vary their use of a single colour in relationship to affective topic characterisations, and whether the colours that are chosen for use in such tasks are systematically related to their own colour preferences. An experimental methodology was used to ensure that any effects that were observed could be unambiguously related to the experimental manipulation. Children were assigned to one of three conditions, in which they were given simple outline drawings of men, dogs or trees to colour in. Each child was required to colour in three versions of the man, dog or tree, namely a neutral, a nice and a nasty version. For each version, the children had to use just a single colour for colouring it in.

The range of topics was chosen to assess whether any effects were influenced by topic animism (trees vs. men and dogs). The suitability of these three topics for use in the study

was established through piloting. The colour range made available to children was based upon the youngest children's familiarity both with the colours and with the names of the colours (as ascertained through teacher questionnaires prior to running the study).

Predrawn outline drawings were used in order to reduce the task demands to a minimum, to minimise any planning and production problems which the children might have had, and to ensure that the choice of a single colour represented the principal planning decision which the children had to make in order to complete the task. Thus, the design was intended to answer the very specific question: when all other production factors are controlled to the maximum possible extent, do children systematically use different colours in order to depict affectively neutral, nice and nasty figures?

A further feature of the study was that the children's affect towards the nice and nasty figures was assessed independently, using a rating scale. The children's colour preferences were also measured independently. This enabled the study to explore whether the children would use different colours for colouring in the drawings of the neutral, nice and nasty versions of the topics, and to ascertain whether their colour choices were related to the children's own colour preferences. Specifically, the study aimed to examine whether children would use more preferred colours for the positively characterised topics, least preferred colours for the negatively characterised topics, and colours receiving intermediate ratings for the neutrally characterised topics. The study also explored the particular colours which children chose to complete their baseline, nice and nasty drawings, in order to see if any particular colours were more or less associated with neutral, nice and nasty figures overall. A large sample size was used in the study. One of the problems which has undermined much previous research into whether children's feelings or emotions influence the contents of their drawings has been the use of small sample sizes, which has meant that even large effects are often statistically undetectable in the small samples that have been used (see Burkitt, 2000,

for a more extended discussion of this problem). Thus, for the present study, power calculations were used at the outset to ensure that the number of children in each experimental group (N = 32 or above) was well above the minimum number (N = 20) needed to detect a medium effect size (0.35) at an alpha level of 0.05 (Faul & Erdfelder, 1992). In addition, a wide age range of children (4 to 11 years old) was used, as Golomb (1992) has argued that children as young as 4 years are able to use colour symbolically. Thus, the study also aimed to explore developmental trends in children's general colour use and choice of specific colours.

## **Method**

### **Participants**

Three hundred and thirty subjects (176 boys and 154 girls) were randomly recruited from mainstream primary and junior schools across the county of Surrey in the UK. Children were divided into three age groups, and then further randomly assigned to the three condition groups (see Table 1).

\*INSERT TABLE 1 AND FIGURE 1 ABOUT HERE\*

### **Materials**

Pre-drawn unshaded line drawings of a man, a dog and a tree were provided (see Figure 1). Each child coloured in three versions of the same line drawing on three separate sheets. Ten individual laminated colour cards shaded using Crayola crayons were used in Session 1 (red, orange, yellow, green, blue, purple, pink, white, brown and black), and the 10 coloured crayons themselves were provided for use by the children in Session 2. A five-point smiley-face Likert scale (showing faces with very unhappy, unhappy, neither unhappy nor happy, happy, and very happy expressions) was used to gather affect ratings towards each

individual colour in Session 1, and to gather affect ratings towards the affectively characterised drawings in Session 2.

## **Procedure**

All children completed two test sessions. The two sessions were presented in counterbalanced order to control for possible order effects. Children were seen individually in a quiet area of their school for both sessions, which were always conducted on two successive days.

### ***Session 1***

Children completed the following two colour preference tasks, which were administered in a counterbalanced order.

#### *Colour rating task*

Children were shown ten cards successively in a random order with one colour on each card (red, orange, yellow, green, blue, purple, pink, white, brown and black). As each colour was presented, they were asked to rate how the colour made them feel, using the Likert scale. Responses were scored between 1 and 5, where 1 = “very unhappy” and 5 = “very happy”. The instructions were as follows:

*“I would like to find out how you feel about this colour. What I’d like you to do is point to the face to show how you feel about the colour. Here are the faces that you are going to be looking at (pointing to each face). The first one is a very unhappy face; the next one is quite an unhappy face; the middle one is neither happy nor unhappy. The fourth face is quite a happy face and the last one is a very happy face. When you answer my question, I’d like you to point to the face that describes how you feel about the colour. OK?”*

The instructions were repeated in full if the child indicated that they had not understood. Few children required additional prompting.

### *Ranking task*

The colour cards were spread out face up in a random arrangement in front of the children. The children were asked to conduct a structured sort of the colour cards, arranging them in order of preference beginning with the removal of their favourite colour. The children were told:

*“Here are some cards with one colour on each card. I’d like you to point to the colour which you like the most. Please put that colour over here. Now, point to the colour which you like the most (pointing at remaining display). Now take away the colour that you like the most from these cards. Keep taking away a colour one at a time that you like the most from the remaining cards. OK?”*

The order in which the cards were removed was recorded, and the instructions were only repeated in full if children stopped removing one card at a time. Only a few children needed to be reminded of the instructions.

### ***Session 2***

In this session, each child was asked to colour in three pre-drawn outline line drawings of a man, a dog or a tree. Each child coloured in the baseline model first, and then completed the positively and negatively characterised models in counterbalanced order. The same colour crayons that had been used to prepare the materials in session 1 were provided for the children to use in this task.

### *Baseline colouring task*

Children were presented with a pre-drawn line drawing (either a man, a dog or a tree) and instructed to choose one colour from the range provided to complete the drawing. The children completing the man were instructed as follows:

*“I’d like you to colour in this shape in front of you using one of these colours. Colour in the whole shape as well as you can. Do not include any details such as the face or the clothes.”*

The children completing the dog received the following instructions:

*“I’d like you to colour in this shape in front of you using one of these colours. Colour in the whole shape as well as you can. Do not include any details such as the hair or claws”.*

Children completing the tree were told:

*“I’d like you to colour in this shape in front of you using one of these colours. Colour in the whole shape as well as you can. Do not include any details such as the leaves or flowers.”*

#### *Nice and nasty colouring tasks*

Children received the following instructions characterising the model as either nice or nasty in counterbalanced order. Completed models were removed before presentation of the second task.

#### *Nice task*

The children completing the outline drawing of the man were instructed:

*“Now pretend that the shape is of a very nice kind man who is very pleasant and friendly to everyone. Colour in the man in front of you using one of these colours, remembering what a nice person he is. Colour in the whole shape as well as you can, but do not include any details such as the face or clothes”.*

The children completing the outline drawing of the dog were instructed:

*“Now pretend that the shape is of a very nice kind dog, which is very pleasant and friendly with everyone. Colour in the dog in front of you using one of these colours, remembering what a nice dog it is. Colour in the whole shape as well as you can, but do not include any details such as the hair or claws.”*

The children colouring in the outline drawing of the tree were told:

*“Now pretend that the shape is of a very nice lovely tree, which everyone likes looking at and which is very pleasant. Colour in the tree in front of you using one of these colours, remembering what a nice tree it is. Colour in the whole shape as well as you can, but do not include any details such as the leaves or flowers”.*

*Nasty task*

The group completing the model man were instructed as follows:

*“Now pretend that the shape is of a very nasty horrible man who is very mean and unfriendly to everyone. Colour in the man in front of you using one of these colours, remembering what a nasty man he is. Colour in the whole shape as well as you can, but do not include any details such as the face or clothes”*

The instructions for children colouring in the dog were as follows:

*“Now pretend that the shape is of a very nasty horrible dog, which is very mean and unfriendly, and barks at everyone. Colour in the dog in front of you using one of these colours, remembering what a nasty dog it is. Colour in the whole shape as well as you can, but do not include any details such as the hair or claws.”*

The children completing the model tree were told:

*“Now pretend that the shape is of a very nasty horrible tree, which everyone hates looking at and which is very unpleasant. Colour in the tree in front of you using one of these colours,*

*remembering what a nasty tree it is. Colour in the whole shape as well as you can, but do not include any details such as the leaves or flowers.”*

#### *Affect ratings towards the characterised topics*

Immediately after completing each of the two affectively characterised topics, the children were asked to rate their affect towards the drawings using the Likert scale and the following instructions:

*“I would like to find out how you feel about the (man/dog/tree). What I’d like you to do is point to the face to show how you feel about the (man/dog/tree). Here are the faces that you are going to be looking at (pointing to each face). The first one is a very unhappy face; the next one is quite an unhappy face; the middle one is neither happy nor unhappy. The fourth face is quite a happy face and the last one is a very happy face. When you answer my question, I’d like you to point to the face that describes how you feel about the (man/dog/tree). OK?”*

The children’s responses were scored between 1 and 5, where 1 = “very unhappy” and 5 = “very happy”.

## **Results**

All children successfully completed the sequence of tasks, and restricted their colour use to one colour for each drawing type. As a precaution, the data were screened for possible effects of the order of presentation of the two test sessions, as well as the order of presentation of the two characterised drawing tasks within Session 2. No main or interaction effects involving order were found. Thus, these two orders of task administration were excluded as factors from the following analyses.

## **The children's colour preferences**

The Likert-scale affect ratings taken in Session 1 towards each of the 10 colours were correlated with the ranks assigned to those colours using Spearman's rho. This was intended to assess whether the two measures provided convergent evidence of the children's preferences for the various colours. The correlation coefficients for each individual colour are shown in Table 2. All of the coefficients were significant at the 0.01 level, indicating that the two measures yielded convergent findings about children's colour preferences: if the children gave a more positive affect rating to a colour, then they did indeed rank that colour more highly. The correlations between affect ratings and rankings for each individual colour were also calculated for each age group separately. Once again, all correlations were significant at the 0.01 level. Table 2 also shows both the mean affect ratings and the mean ranks which were attributed to the ten colours in the two tasks by the sample as a whole

\*INSERT TABLE 2 ABOUT HERE\*

## **Affect ratings for the colour choices for each drawing type**

The children's affect ratings (taken in Session 1) towards the colours selected for the three drawing types (baseline, nice and nasty) were submitted to a 3 (age group) x 2 (sex) x 3 (condition: man vs. dog vs. tree) x 3 (drawing type: baseline vs. nice vs. nasty) four-way mixed ANOVA, with drawing type entered as a repeated measure and the other factors entered as independent measures. A significant main effect was found for drawing type ( $F(2, 624) = 608.40, p < 0.001$ ). Table 3 shows the mean affect ratings for the colours chosen for the baseline, nice and nasty tasks by the three age groups. *Post hoc* paired t-tests showed that the colours for each drawing task were rated significantly differently from each other at the 0.001 level, with the colours chosen for the nice drawing being rated more positively than the

colours chosen for both the baseline and nasty drawings, and the colours chosen for the baseline figures being rated significantly more positively than the colours chosen for the nasty figures. A significant interaction effect between age group and drawing type was also revealed ( $F(4, 624) = 2.82, p < 0.05$ ). *Post hoc* Scheffé ( $p < 0.05$ ) analysis located the interaction in the affect ratings for the nasty drawing type, where the colour choices made by the oldest group were found to be significantly more positive than those made by both the youngest and middle age groups.

\*INSERT TABLE 3 ABOUT HERE\*

A second main effect was found for condition ( $F(2, 312) = 13.50, p < 0.05$ ). Table 4 shows the mean overall affect ratings for the three drawing types for each condition. *Post hoc* Scheffé ( $p < 0.05$ ) analysis showed that the colours used for the man and the tree had received significantly more positive ratings overall than the colours used for the dog. An interaction effect was also found between drawing type and condition ( $F(4, 624) = 5.51, p < 0.05$ ). *Post hoc* Scheffé ( $p < 0.05$ ) and paired t-tests ( $p < 0.05$ ) showed that the colours used for the baseline and nice drawings had received significantly higher ratings in the man and tree conditions than in the dog condition; as far as the nasty drawings were concerned, there were no significant differences between the three conditions.

\*INSERT TABLE 4 ABOUT HERE\*

An interaction effect was also found between sex and drawing type ( $F(2, 624) = 3.18, p < 0.05$ ). *Post hoc* independent t-tests ( $p < 0.05$ ) and paired t-tests ( $p < 0.05$ ) were performed to locate the interaction, but no significant differences were found at the 0.05 level. However,

inspection of the means suggested that the girls gave more positive affect ratings towards the colours chosen for the baseline ( $M = 3.98$ ,  $sd = 1.21$ ) and nice ( $M = 4.53$ ,  $sd = 0.92$ ) drawing tasks than the boys ( $M = 3.58$ ,  $sd = 1.43$  and  $M = 4.40$ ,  $sd = 0.98$  respectively), while the boys gave more positive ratings for the colours chosen for the nasty task ( $M = 1.88$ ,  $sd = 1.23$ ) than the girls ( $M = 1.65$ ,  $sd = 1.05$ ). No further main or interaction effects were revealed by the ANOVA.

### **Affect ratings towards the affectively characterised drawings**

During Session 2, all children rated the positively and negatively characterised drawings immediately after completing the colouring of each. These data were subjected to a 3 (age group) x 2 (sex) x 3 (condition) x 2 (drawing type) four-way mixed ANOVA, with age group, sex and condition entered as independent factors, and drawing type entered as a repeated measure. A main effect was found for age group ( $F(2, 312) = 3.26$ ,  $p < 0.05$ ). *Post hoc* Scheffé ( $p < 0.05$ ) analysis failed to locate significant differences between the age groups. However, inspection of the means (Youngest  $M = 3.02$ ,  $sd = 0.28$ ; Middle  $M = 3.00$ ,  $sd = 0.31$ ; Oldest  $M = 3.10$ ,  $sd = 0.34$ ) suggested that the oldest group gave slightly more positive ratings overall than the youngest and the middle age groups.

A second main effect was found for drawing type ( $F(1, 312) = 6461.74$ ,  $p < 0.001$ ). *Post hoc* paired t-tests ( $p < 0.05$ ) revealed that the children rated the nice drawings ( $M = 4.76$ ,  $sd = 0.48$ ) far more positively than the nasty drawings ( $M = 1.32$ ,  $sd = 0.51$ ). An interaction effect was also found between sex and drawing type ( $F(1, 312) = 6.55$ ,  $p < 0.05$ ). *Post hoc* independent t-tests ( $p < 0.05$ ) showed that the girls gave more positive affect ratings towards the nice drawings ( $M = 4.81$ ,  $sd = 0.40$ ) than the boys ( $M = 4.70$ ,  $sd = 0.52$ ), and the boys

gave significantly more positive affect ratings towards the nasty drawings ( $M = 1.40$ ,  $sd = 0.54$ ) than the girls ( $M = 1.26$ ,  $sd = 0.47$ ). No other main or interaction effects were found.

Non-parametric analyses were also conducted on the rank orderings which the children had assigned to the colours used for the baseline, nice and nasty drawings, in order to see whether children ranked the colours which they chose for each drawing type significantly differently. A Friedman two-way ANOVA showed that, overall, the children used more highly ranked colours for the nice task (mean rank = 2.78), the lowest ranked colours for the nasty task (mean rank = 8.62), and intermediate ranked colours for the baseline task (mean rank = 3.86) ( $\chi^2(2) = 347.86$ ,  $p < 0.001$ ); post hoc Wilcoxon tests indicated that there were significant differences between all three drawing types. These non-parametric analyses failed to reveal any effects associated with age, gender or condition.

### **The specific colours used for completing the baseline, nice and nasty drawings**

Frequency counts of the specific colours which were used for the three drawing types (baseline, nice and nasty) were made for each condition individually. The data were analysed using correspondence analysis, in order to explore the specific colours which had been used for the different drawings. Correspondence analysis (Hammond, 1988, 1993) uses well-established geometric principles to provide a pictorial representation of the relationship between categories of response and groups of individuals. It permits a multi-dimensional analysis of categorical data by providing a plot in which the geometric distance between the groups and the types of response gives a direct measure of the relative degree of association between the groups and the response types. This graphical representation reveals those colour choices which are most closely associated with each group (be it age, gender, condition or

drawing type) and which therefore best discriminate the behaviour of the children in each subgroup.

A series of individual correspondence analyses was run. Colour choices for each drawing type were compared individually and simultaneously across age groups, gender and condition. Colours with a response frequency count of less than 5 were not included in the sequence of analyses in order to avoid the results being biased by these low frequency responses (Hammond, 1988). The outcomes for the three conditions individually, irrespective of age, were as follows.

***Plot 1: Man: Colour choices for each drawing task for all age groups together.***

The analysis was based on the colours chosen by the children for completing the man in the baseline, nice and nasty tasks. Only one significant dimension was found ( $\chi^2(11) = 145.20, p < 0.05$ ), which only allows interpretation of distances along the horizontal axis of the plot. This shows that blue, white, red, pink and green were more closely associated with the nice and baseline drawings than with the nasty drawings, and that brown and black were more closely associated with the nasty drawings than with the nice and baseline drawings.

\*INSERT PLOTS 1-3 ABOUT HERE\*

***Plot 2: Dog: Colour choices for each drawing task for all age groups together***

Colour choices for the three drawings of the dog were also examined. Two significant dimensions were found ( $\chi^2(11) = 111.69, p < 0.05$ ;  $\chi^2(9) = 39.04, p < 0.05$ ), allowing interpretation of the plot in terms of both the horizontal and the vertical axes of the plot. The plot shows that black was more closely associated with the nasty drawings than with the

baseline and nice drawings; that brown was more closely associated with the baseline drawings than with the nice and nasty drawings; and that yellow, blue, orange and white were more closely associated with the nice drawings than with the baseline or nasty drawings.

***Plot 3: Tree: Colour choices for each drawing task for all age groups together***

Colour choices for the three drawings of the tree were analysed. Two significant dimensions were found, allowing interpretation of the plot in two dimensions ( $\chi^2(11) = 202.71, p < 0.05$ ;  $\chi^2(9) = 33.20, p < 0.05$ ). Red, blue, purple and yellow were more closely associated with the nice drawings than with the baseline and nasty drawings; green was more closely associated with the baseline drawings than with the nice and nasty drawings; and brown and black were more closely associated with the nasty drawings than with the baseline and nice drawings.

***Additional correspondence analyses***

Further correspondence analyses were run to examine differences in colour choices for each condition broken down by age group and broken down by gender. There were only slight age group variations to the response patterns shown in Plots 1-3. As far as the drawings of the men were concerned, black and brown were both more closely associated with the nasty drawings than with the baseline and nice drawings in the middle and oldest age groups; however, in the youngest age group, only black (and not brown) was more closely associated with the nasty drawings. As far as the drawings of dogs were concerned, brown was closely associated with the baseline drawings in the youngest age group, but not in the middle and oldest age group, while all three age groups selected black for their nasty tasks. The drawings of the tree indicated less variation of colour choice than the groups completing the models of men and dogs. Green was associated with the baseline task in all three age groups, although

blue was also associated with the nice drawings in the oldest age group. Black and brown were most closely associated with the nasty drawings for all age groups. No effects of gender were revealed by any of the correspondence analyses.

### **Discussion**

This study shows that children use different colours for completing pre-drawn line drawings of neutrally, positively and negatively characterised topics. In addition, a relationship has been found between children's colour preferences and the colour selected for completion of the three drawing types. Children's responses in both the colour rating and the rank ordering tasks show that children use more preferred colours for positively characterised drawings, least preferred colours for negatively characterised drawings, and colours rated and ranked intermediately for neutrally characterised drawings. It was found that this pattern of colour use occurred at all ages (from 4-11 years), and for all drawing topics (i.e. for men, dogs and trees). Furthermore, these results have been obtained using a design in which the children's own affect towards the affectively characterised drawings was independently assessed in order to confirm that the children did indeed feel differently towards the topics that had received the positive and negative characterisations.

A notable trend emerged in the children's choice of colours for negatively characterised topics. In all age groups, and for all topics, black tended to be the most frequently chosen colour for completing the drawings of the negatively characterised topics. Again, this finding was neither age- nor topic-specific. By contrast, primary colours were predominantly selected for the baseline task, and a wide range of mainly primary and secondary colours were chosen for completion of the nice task. These results suggest that children do alter their colour choice during colour completion tasks in response to differential

affective topic characterisations. Furthermore, these findings support the suggestion that children can and do use colour symbolically from a young age (Golomb, 1992; Winston et al., 1995). It would be interesting to ascertain whether children's choice of black for colouring in nasty topics is related to their racial attitudes (Aboud, 1988; Stabler & Johnson, 1972), and whether such behaviour varies in children of different ethnicities: it is noteworthy that the children in the present study were predominantly white in ethnicity.

It is interesting that the children changed their choice of colour for affectively characterised topics regardless of topic animism (men and dogs versus trees) and regardless of whether the topic was human (men) or not (dogs and trees). Children's selection of more preferred colours for the nice task, least preferred colours for the nasty task, and intermediately rated colours for the neutral task was not affected by topic. However, there were some subtle differences in the specific colours which were used for the neutral, nice and nasty versions of men, dogs and trees. For example, the children used brown to complete the nasty man and tree, but not the nasty dog. This suggests that the tree and the man were treated more similarly than the man and dog, a finding which lends itself neither to the anticipated distinction of treatment between animate topics and non-animate topics (men and dogs versus trees) nor between human topics and non-human topics (men versus dogs and trees). Another difference that occurred between the three topics was that the children completing the drawings of the dogs and the trees seemed to make more realistic colour choices in their baseline drawings (i.e. brown for neutral dogs, and green for neutral trees) than the group completing the man. Children may have been imagining the men to be in clothing, allowing for a wider choice of colour. The extent to which the perceived realism of a colour interacts with its expressive properties in determining children's decisions over choice of colour in their drawings is an issue which clearly merits further investigation.

Thus, children do tend to use darker colours for negative topics, and these darker colours (i.e. brown and black) are typically ranked and rated as the children's least preferred colours overall. It has frequently been argued in the clinical literature that darker colours tend to be used to a greater extent by individuals who are less well emotionally-adjusted, and for the depiction of negative topics (Alschuler & Hattwick, 1943, 1947; Brick, 1944; Milijkovitch de Heredia & Milijkovitch, 1998; Waehner, 1946). Some support for the idea that black and brown are more closely associated with the depiction of negative topics is provided by the present study.

Precisely how children come to associate different colours with positive or negative topics is an issue which now needs to be addressed by further research. One possibility is that children acquire these associations from cultural conventions which they have seen and used in colouring books and other interactive media. This explanation has been suggested as a possible mechanism influencing children's associations of particular colours with facial expressions of emotions (Zentner, 2001), and it may also help to explain the differential use of colour when drawing emotion-eliciting topics.

There was no evidence of any substantial developmental trends or gender differences in children's use of colour in this study. There were some minor differences between the boys and the girls in their ratings of the colours which were used for the differentially characterised topics, but the correspondence analyses did not reveal any significant differences between the boys and the girls in their actual choice of colours for the various tasks. Research with clinical groups suggests that girls integrate more colour in their responses to the Rorschach test than boys (Ames, Metraux & Walker, 1971), and use colour at an earlier age than boys in their

drawings of common objects (Milne & Greenway, 1999). It would be of interest to explore whether sex differences would emerge in children's drawings using the current paradigm with comparable clinical populations.

The measure of the children's affect towards the drawing topic which was taken immediately after drawing completion showed that the children did indeed rate the topics following affective characterisation in the anticipated directions. However, no measure of the children's feelings towards their drawings was taken at the actual time of drawing (e.g. using physiological measures). It might be interesting to do so in order to confirm the presence of differential affect towards the topic at the actual time that the children make their colour choices in order to establish whether there is a direct link between the emotions which are experienced by a child at the time of producing a drawing and the specific contents of the drawing which is produced.

In addition, the present experiment utilised pre-drawn and rather unusual models, completed under a specific set of tightly controlled conditions (for the reasons given in the Introduction to this paper). It would be interesting to ascertain whether these effects of affective characterisation occur when more naturalistic pre-drawn drawings are used, or when children have to produce their own freehand drawings of nice and nasty figures, when they would be able to utilise a range of drawing strategies (in addition to the differential use of colour) for drawing affectively characterised topics. The extent to which the availability of other drawing strategies might over-ride the use of differential colour in children's freehand drawings remains the subject for further study.

That said, however, the present study has provided clear evidence that, when other drawing strategies are not available to the child, 4-11-year-old children do indeed use colour differentially and systematically for colouring in simple line drawings that have received differential affective characterisations. This has been demonstrated using an experimental paradigm that has not previously been utilised in order to address these issues. It has been found that children use their more preferred colours for positive figures, their least preferred colours for negative figures, and colours rated intermediately for neutral figures. Furthermore, this study provides evidence that even four years olds are able to use colour symbolically (Golomb, 1992; Winston et al., 1995).

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Table 1: Number of children, mean ages and age ranges of children within each condition.

	<i>Age Group</i>		
<i>Condition</i>	<i>Youngest</i>	<i>Middle</i>	<i>Oldest</i>
	<i>N = 132</i>	<i>N = 96</i>	<i>N = 102</i>
<i>Man</i> <i>(N=110)</i>	N=44 Mean=6y3m Range=4y6m- 7y9m	N=32 Mean=8y10m Range=7y11m- 9y9m	N=34 Mean=10y6m Range=9y10m- 11y6m
<i>Dog</i> <i>(N=110)</i>	N=44 Mean=6y3m Range=4y8m- 7y8m	N=32 Mean=8y10m Range=7y11m- 9y6m	N=33 Mean=10y6m Range=10y0m- 11y7m
<i>Tree</i> <i>(N=110)</i>	N=44 Mean=6y4m Range=4y7m- 7y10m	N=32 Mean=8y11m Range=8y0m- 9y8m	N=34 Mean=10y7m Range=9y10m- 11y8m
<i>Grand Means</i> <i>(N=330)</i>	Mean= 6y 3m Range=4y 6m - 7y 10m	Mean= 8y 11m Range=7 y 11m - 9y 9m	Mean= 10y 6m Range=9y 10m - 11y 8m

*Table 2: Spearman correlations between the children's affect ratings towards, and their rankings of, each of the ten colours, together with the mean affect rating and the mean ranking of each individual colour in the sample as a whole (listed in descending order of preference shown on the rank ordering task).*

<i>Colour</i>	<i>Correlation between affect rating and rank</i>	<i>Mean affect rating (and sd)</i>	<i>Mean rank ordering (and sd)</i>
Red	- 0.71	4.40 (1.14)	3.18 (2.44)
Blue	- 0.69	4.28 (1.19)	3.41 (2.30)
Yellow	- 0.64	4.10 (1.21)	4.52 (2.16)
Green	- 0.63	3.56 (1.38)	4.80 (2.21)
Purple	- 0.64	3.33 (1.68)	4.94 (2.50)
Orange	- 0.68	3.56 (1.40)	5.27 (1.87)
Pink	- 0.79	2.81 (1.85)	5.88 (3.26)
White	- 0.64	2.65 (1.62)	6.36 (2.27)
Brown	- 0.59	1.56 (1.11)	8.22 (1.71)
Black	- 0.69	1.58 (1.18)	8.45 (2.21)

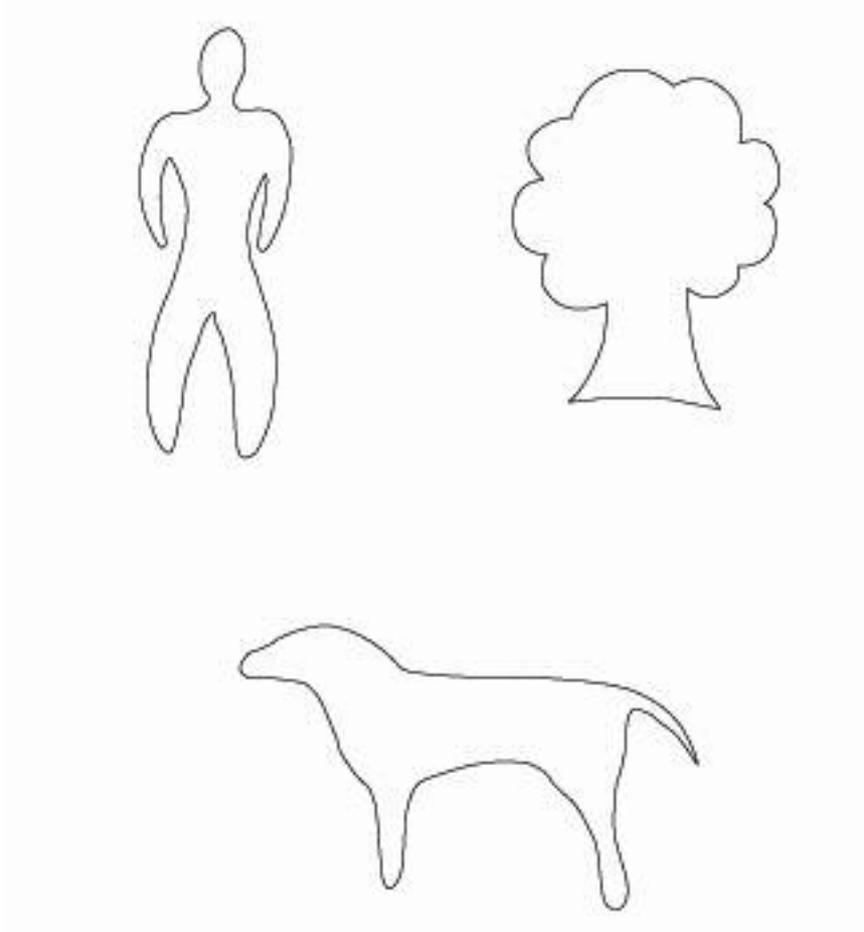
*Table 3: Mean affect ratings towards colour choice for each drawing type for each age group (scale runs from 1 to 5).*

	<i>Age Group</i>			
<i>Drawing Type</i>	<i>Youngest</i> ( <i>N=132</i> )	<i>Middle</i> ( <i>N=96</i> )	<i>Oldest</i> ( <i>N=102</i> )	<i>Grand Means</i> ( <i>N=330</i> )
<i>Baseline</i>	3.91 (sd=1.57)	3.69 (sd=1.60)	3.77 (sd=1.34)	3.80 (sd=1.51)
<i>Nice</i>	4.60 (sd=1.08)	4.58 (sd=1.06)	4.47 (sd=0.94)	4.55 (sd=1.03)
<i>Nasty</i>	1.34 (sd=1.09)	1.37 (sd=0.99)	1.77 (sd=1.14)	1.48 (sd=1.09)
<i>Grand Means</i>	3.28 (sd=0.79)	3.21 (sd=0.76)	3.34 (sd=0.71)	

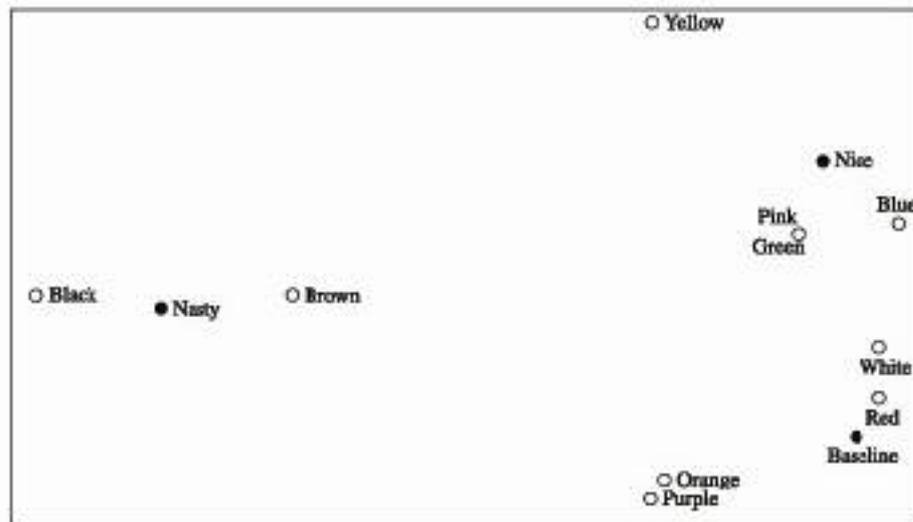
Table 4: Mean affect ratings for drawing type colour choice for each condition (scale runs from 1 to 5).

	<i>Condition</i>			
<i>Drawing Type</i>	<i>Man</i> (N=110)	<i>Dog</i> (N=110)	<i>Tree</i> (N=110)	<i>Grand Means</i> (N=330)
<i>Baseline</i>	4.05 (sd=1.37)	3.20 (sd=1.70)	4.15 (sd=1.25)	3.80 (sd=1.51)
<i>Nice</i>	4.67 (sd=0.92)	4.28 (sd=1.24)	4.70 (sd=0.85)	4.55 (sd=1.03)
<i>Nasty</i>	1.35 (sd=0.94)	1.47 (sd=1.04)	1.62 (sd=1.27)	1.48 (sd=1.09)
<i>Grand Means</i>	3.36 (sd=0.63)	2.98 (sd=0.80)	3.49 (sd=0.74)	

*Figure 1: Outline models used in colouring tasks (not to scale)*

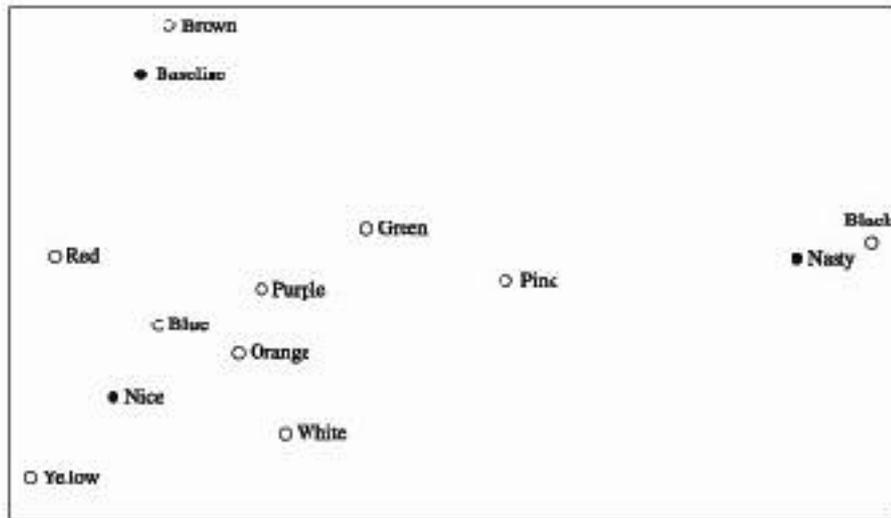


Plot 1: Man: Colour choices for each drawing task for all age groups together



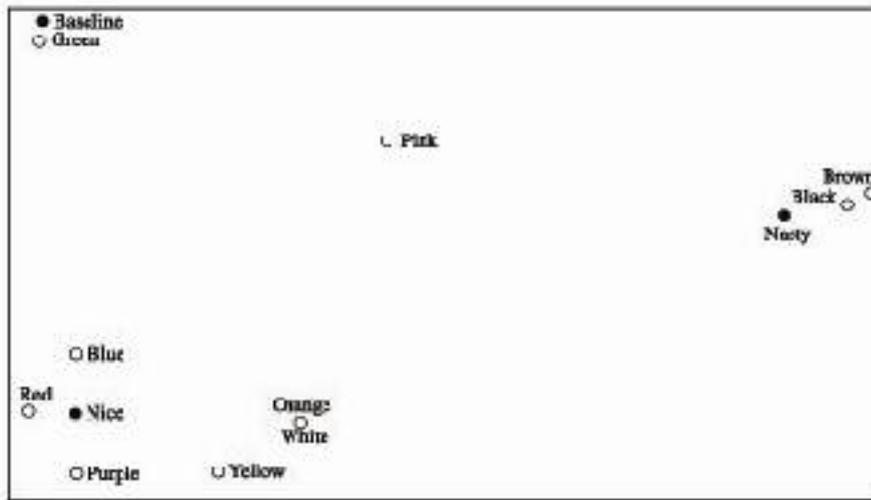
Din 1:  $\chi^2(11) = 145.20, p < .05$

Plot 2: Dog: Colour choices for each drawing task for all age groups together



Dim 1:  $\chi^2(11) = 111.69, p < .05$   
Dim 2:  $\chi^2(9) = 39.04, p < .05$

Plot 3: Tree: Colour choices for each drawing task for all age groups together



Dim 1:  $\chi^2(11) = 202.71, p < .05$

Dim 1:  $\chi^2(9) = 33.20, p < .05$