



To Evaluate The Impact of Colored Instruments on Child's Perception of Pain in Healthcare

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Abstract

Objective: To evaluate the impact of colored instruments on child's anxiety in healthcare setup.

Material and Method: A total of 60 children aged 3-6 years visiting a healthcare setup for their first dental check-up were randomly selected for this study. Each child was shown emoticon cards depicting cartoon faces (Modified Venham Picture Test) with six different emotions (happy, scared, crying, sad, angry, and running away). The children were then introduced to color coded dental niti flex k- files displayed on the instrument tray with colors - pink, white, yellow, red, blue, green and black. A fictional character and euphemism was used for emotional regulation. Each child was asked to match the happy and crying cartoon faces with the color coded file as per their preference. The data was collected and statistical analysis was done using SPSS.

Results: The response data was collected in Microsoft excel, and the color preferences in males and females were analyzed. Significant differences between genders

as well as different colors association was found statistically.

Conclusion: Color of instruments can impact the child's perception of potentially threatening situation so its knowledge to remodel appearance of instruments can thereby aid as an effective behavior management tool.

Keywords: Anxiety, Children, Color Preference, Instrument, Healthcare.

Introduction

Children live in a world of imagination and are exposed on a daily basis to a lot of creative abundance. The inherent nature to explore the world and to relate to their surroundings forms the core element in a child's psychological development. One such creative measure of their healthy cognitive development is the use of colors as a means of expressing feeling and emotion. ^(1,2) It is interesting to note that children are introduced to the world of vibrant colors at a very young age in the form of introduction to colorful toys and other belongings all

of which carries certain associations influencing corresponding emotions and subsequent behaviors. ⁽²⁻⁵⁾

The understanding of how children perceive and interpret their environment is essential for behavior management in a pediatric practice. ⁽¹⁾ It has already been documented in the literature that color preference can be used as a significant contributor to explore children's perceptions of events in clinical settings. ^(1,6) However, little data is available to evaluate child's perception of colors added to a potential anxiety provoking instrument thereby affecting his or her subsequent behavior for the treatment.

The present study was thus undertaken to evaluate the possible impact of use of colors on instruments towards the child's perception of anxiety provoking situation in healthcare.

Aims and objective

To identify whether any modification in the appearance of instruments can have a positive impact on the child's behavior and to evaluate the impact of colored instruments on the child's perception of pain and subsequent behavioral response in anxiety provoking situation in healthcare

Materials and method

A total of 60 children (30 boys and 30 girls) aged 3-6 years visiting a dental setup were randomly selected to be included in the study. An informed consent was obtained from the parents and the participation was kept totally voluntary. Inclusion criteria was-

1. Those who were willing to participate in the study.
2. First dental visit to a clinical setup.
3. Healthy communicative ability.

Exclusion criteria was

1. Specially-abled children

A set of emoticon cards of cartoon faces (modified from Venham Picture Test) with seven different emotions/expressions -neutral, happy, scared, crying, angry, sad, and running away were used for this study. ⁽⁷⁾

Each child was shown the emoticon cards in the waiting area and was explained about the feeling depicted in each card. A fictional story was then narrated to each child in the waiting area that inside the operatory the doctor is waiting with a small instrument which he has to use on the teeth of a baby bear and the doctor wants them to help to match the seven different colored instruments with the emoticon faces they feel best signifies how the baby bear will feel once the instrument is used on it.

In the dental operatory, seven different color coded niti flexible k-files [pink, white, yellow, red, blue, green and black] were displayed on a tray. The euphemism used for explaining the dental files was applied naming it as 'a tiny-twiny brush used to clean the root of the tooth'.

The children were asked to inspect the so called 'tiny-twiny brush' and answer if they liked the instrument shape or not with a simple yes or no reply. The answer of each child was recorded. After that each child was asked to carefully look at the colors displayed on the file head and then out of all the color coded files select the 'tiny twiny brush' that they feel can make the baby bear happy and the use of which 'tiny-twiny brush' according to them will make the baby bear cry.

As the color coded dental flexi k-files were used for demonstrative purposes only, each child was allowed to inspect the colored k-file carefully. The emoticon cards with cartoon drawing of faces (modified from Venham Picture Test) with seven different emotions/expressions (neutral, happy, scared, crying, angry, sad, and running away) were presented to children again. The children

were made to see all the different emotions depicted on the card again so as to create emotional awareness before eliciting an emotionally regulated response. To make the task simple, once the subjects were made to look at each emoticon cards, only two cards were finally placed on the table for the child to choose from - one with a happy face and other with a crying face.

Each child was then given the exercise of matching and selecting the most preferred color coded dental k-file with the emoticon cards with happy face and then for the crying face according to their preference. Throughout this process care was taken that no parent/ accompanying person helps their child in choosing the displayed instrument with the preferred cards.

Once this exercise was over, the cards and the color coded k files were removed from the sight of the child and the routine dental check-up was done using a mouth mirror and light.

The data was collected and the findings were later statistically analyzed.

Result

Out of the total 60 sample size, 95 percent children when asked about if they liked the shape of the instrument gave their reply as 'No'. This finding was found to be statistically highly significant. Only three children chose to stay quiet but their facial expressions were sufficient to show that they had become anxious on seeing the pointed shaped instruments placed on the tray possibly perceiving it as an object with potential threat to elicit pain on the body of the fictional character 'baby bear'.

Out of the thirty boys, majority of the boys 18 (60%) when asked about the most preferred color coded 'tiny-twiny brush' for the bear picked up blue colored file, and majority girls 19 (63.3%) picked pink. (Tables 1,2,3)

The most preferred color matching with the happy face card by boys was chosen as the blue colored file (60%) and out of the thirty girls, nineteen girls chose color pink for happy face card (63.3%).

The least preferred color for depicting the happy faced emoticon card was found to be black amongst both boys and girls (1.6%). 75% of the total sixty children matched black colored file with the crying face card.

Statistical analysis was done and Chi-square test was used for analysis of color-emoticon matching exercise which showed significant differences between genders as well as different colors association (Tables 1,2,3)

Discussion

The introduction to the world of colors is an integral part in a child's life. Most often the use of colors in a child's environment including his/her toys, clothes and other belongings convey many psychological messages and judgments. ^(5,8)

Research has proven that each specific color has the potential to elicit a specific emotional response in an individual, influencing the purchases of a particular product thereby categorizing the products into more appealing and aesthetically pleasing ones based upon the use of colors. ⁽¹⁾ Color impact becomes more evident in the case of children where even a colorful pencil box or the use of color in art can be a manifestation of an underlying emotional status having an influence on how a child perceives it, associates with it, prefers it and recalls it. ^(1,5, 8-10) Jonauskaitė et al (2019) have suggested the statistically significant link between colors and emotions, associating lighter and more chromatic colors with emotions of joy and relaxation. ⁽¹¹⁾

Studies have shown that emotional awareness supports emotion regulation capacity and emotional awareness is

a specific skillset that becomes essential before learning adaptive emotion regulation strategies. ^(12,13)

In our study, the concept of showing emoticon cards of seven varied emotions was therefore considered as an elementary step designed to improve children's cognitive emotional awareness. The Modified Venham Picture Test (VPT) emoticon cards was used as an emotional awareness measure of situational anxiety, ranging from behaviors of neutral emotion and smiling to behaviors of attempted escape from treatment. ⁽¹⁾

Further in our study the use of euphemism was done to facilitate better understanding and to make the child comfortable with the pointed shape of the instrument. The dental niti flexi files used for our study included seven easily identifiable color groups: pink, white, yellow, red, blue, green and black as these chosen colors corresponded to the four principal colors (blue, green, yellow, and red) of the Munsell system which have already been used as standards in previous other studies. ^(1, 14)

The spectrum of colors designated with various mood tones are often the colors yellow, green and blue associated with happiness and calmness whereas other colors like red, black and brown with emotions of anger and darkness. ^(5, 8,15,16) Literature review reveals that the color black is considered a powerful accent color with an absence of light since no wavelengths are reflected thereby suggesting of a depressing/ sad emotion as mostly people are afraid of the dark. ⁽¹⁶⁾

In the present study also the majority of children matched black colored niti file to the crying face emoticon card thereby suggesting a possible association of color black to anxiety/ sadness.

It becomes imperative to know that Anxiety is defined as an emotion that entails the appraisal of threat and is

associated with subjective feelings of apprehension about impending or anticipated harm ⁽¹⁷⁾ and the fear of needles/pins in health care treatment is most common apprehension of anticipated pain which needs greater attention directed to interventions which alleviate fear and anxiety. ⁽¹⁸⁾ It has been assumed that children relate their choice to general experience of health care to the assumption and expectations about the instrument presumably used in medical/dental based on its physical appearance. ⁽¹⁾ In our study, as the physical appearance of a niti flex dental k file was sharp and pointed so it was hypothesized that its first sight itself can be perceived as a pain eliciting instrument by children thereby making it a potential anxiety creating tool. The response of the first question as 'No' recorded by all children suggested the same as hypothesized.

The main objective of our study was however to focus on whether the simple modifiable component of adding appropriate colors could have the potential to attain positive behavior thereby increasing the acceptability for the future use of that instrument by the child.

Adding the use of colors to instruments has been believed to be the simplest way to assess the emotional response as colors have been reported to have a significant visual impact on individuals capturing as much as eighty percent of the whole product impression. ^(19, 20) Colors have shown to not only convey a product's features and characteristics but to also trigger a positive or negative psychological perception of a particular product so its use on instruments was focused to be evaluated. ⁽²⁰⁻²²⁾

Our study is thus in accordance to the findings of Hotwani and Sharma wherein it was concluded that color preference and perception can be used to explore children's perceptions of events in clinical settings. ⁽¹⁾

Previous studies have reported that the link between color and emotion preferences vary between age, gender and individual experiences. ^(1, 2, 23, 24) Children have shown gender differentiated preferences of play, color and toy preferences. ^(2,23,24) In the present study, boys preferred matching blue color instrument the most to the happy face emoticon card. This finding is in accordance to the study of Hotwani and Sharma where boys preferred blue colored dental injectors in their study. ⁽¹⁾ The color most preferred by the girls in our study was however found to be pink. Similar association of pink color in girls as a statistically significant happy color has also been associated in the past. ⁽²⁵⁾ Our findings thereby also suggests a possible gender bias toward greater preference for pink in females and to blue color in boys which may be attributed to the previous conditioning to certain colors in the minds of young children. Thus, it may be speculated that mood tones of the child with previous gender biased conditioning to certain colors can be a possible a factor for color preferences in children.

The aim of the present study however remained to attempt to assess the impact of colors on instruments used in clinical setups in achieving better behavior response in anxiety provoking situations. The results of our study are in accordance to the study of Hotwani and Sharma showing that children do have preferential colors and the use of appropriate “child friendly” instruments can create a positive attitude in the child’s mind. ⁽¹⁾

Knowing color preference among children is thus important. The need for introduction of newer appropriate color coded instruments in health care system especially for the pediatric population should thus be explored and more studies be conducted on the

impact of colored instruments on child’s anxiety in varied healthcare fields using different other age groups, bigger sample size and wider color spectrum.

A key element of comprehensive care for children involves the coordination of services between medical/dental health care providers, researchers and innovators. Thus, the present study highlights a thought provoking concept that whenever a new surgical instrument is introduced in the field of medical/dental health care especially for pediatric age groups, its designing must be done in such a colorful way that the physical appearance of the product in itself can act as an effective behavior modification tool.

Conclusion

Use of appropriate colors on clinical instruments can have a possible impact on attaining acceptability towards a particular treatment situation. Reducing a child's anxiety by adding colors to the instruments is a thought provoking idea, a step towards introducing a new noninvasive non-pharmacological behaviour management module.

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Legend Figure

Table 1: Color-emoticon matching results in males

	Happy	Crying
Pink	1	1
White	1	1
Yellow	2	1
Red	5	3
Blue	18	1
Green	2	1
Black	1	22
Total	30	30

Table 2: Color-emoticon matching results in females

	Happy	Crying
Pink	19	0
White	1	1
Yellow	5	0
Red	1	3
Blue	1	2
Green	3	1
Black	0	23
Total	30	30

Table 3: Colors most preferred amongst genders

	Most preferred for happiness	Most preferred for crying
Boys	Blue	Black
Girls	Pink	Black

Statistically significant ($p < 0.001$)

What this study adds?

- Colors impact child's perceptions
- This study highlights a thought provoking concept that whenever instruments for pediatric age groups are designed, the impact of colors must be explored as an effective behavior modification modality.