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# STRESS-RELIEVING EFFECTS OF COLOUR-BY-NUMBER MANDALAS IN CHILDREN HOSPITALISED DUE TO A CHRONIC DISEASE

## KRONİK HASTALIĞI OLAN VE HASTANEDE YATAN ÇOCUĞUN YAŞADIĞI STRESİ AZALTMADA KODLAMALI MANDALANIN ETKİSİ

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**ABSTRACT**

This randomised controlled study aimed to evaluate the stress-relieving effects of colour-by-number mandalas in children hospitalised due to a chronic disease. This study involved 120 children aged 8 to 11 years. The participants were randomly assigned either to the experimental group or to the control group, with each group consisting of 60 children. The Descriptive Information Form and the Perceived Stress Scale were used in data collection. The experimental group had a lower total mean Perceived Stress Scale score than the control group, and the scores of these two groups significantly differed. Thus, the colour-by-number mandalas could effectively decrease the stress levels of children hospitalised due to a chronic disease.

**Keywords:** Child, Nurse, Chronic Disease, Colour by Number Mandala, Stress

**ÖZET**

Randomize kontrollü bu çalışma, kronik hastalığı olan ve hastanede yatan çocuğun stresini azaltmada kodlamalı mandalanın etkisini belirlemek amacı ile yapıldı. Bu çalışma yaşları 8-11 arasında olan 120 çocukla yapıldı. Katılımcılar, her biri 60 çocuktan oluşan deney grubuna veya kontrol grubuna rastgele atandı. Veri toplanmasında Tanıtıcı Bilgi Formu ve Algılanan Stres Ölçeği kullanıldı. Kodlamalı mandala yapan deney grubundaki çocukların Algılanan Stres Ölçeği toplam puan ortalaması kontrol grubuna göre daha düşük olduğu ve aralarındaki farkın istatistiksel olarak önemli olduğu belirlendi ($p< .000$). Kodlamalı mandala kronik hastalığı olan ve hastanede yatan çocuğun yaşadığı stresi azaltmada etkilidir.

**Anahtar kelime:** Çocuk, Hemşire, Kronik Hastalık, Kodlamalı Mandala, Stres

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## INTRODUCTION

The number of children with chronic diseases is increasing around the world. Chronic disease is a cause of mortality and morbidity in children and it is an important health problem (Barlow and Ellard, 2006). Chronic disease is a persistent, not fully treated health problem that causes permanent disability/injury and requires long terms treatment, care and special education. Frequent hospitalization of children with chronic diseases is an unpleasant experience and it may cause them to experience stress (Hatzmann et al., 2014; Latal and Sennhauser, 2012; Prentice and Williams, 2011).

Stress is defined as a situation that negatively affects the fulfilment of basic needs, originates from the internal and external environment, disrupts the stable balance or threatens to disrupt it (Masarik and Conger, 2017; Thompson, 2014). Stress occurs as a result of the occurrence of some changes in individuals' inner world or the environment they live in and as a result of individuals being affected by this. Stress affects individuals physically, emotionally, socially and mentally (Knoll and Carlezon, 2010; Masarik and Conger, 2017; Seaward, 2017; Spielberger et al., 2014). The reason for children's stress in the hospital may be foreign hospital environment, medical supplies, treatment and interventions, presence of foreign people, being away from family, friends and social environment (Francischinelli et al., 2012; Li et al., 2016). If children cannot cope with the stress related with the disease, being hospitalized may cause physical, behavioural and emotional problems such as feeling weak, desperate, hopeless, less self-respect, aggressive, introversion and loss of control (Büyük and Bolışık, 2015; Crnković et al., 2009; Li et al., 2016; Obaid, 2015). In addition, if children have previous negative experiences about the hospital, this may affect their compliance with the treatment negatively (Lerwick, 2013; Sen, 2020 Ullán et al., 2014).

Pediatric nurses have an important role in helping children deal with the negativities they experience. Pediatric nurses' communicating with children according to their developmental age, playing with them, socializing, expressing the disease and treatment in a way they can understand, answering their questions, and using non-pharmacological methods such as making pictures, telling fairy tales may help children to relax (Ball et al., 2012; Francischinelli et al., 2012; Hall and Reet, 2000; Kyle, 2008).

Non-pharmacological methods applied in children include supportive, physical and cognitive/behavioural methods. Play, which is a supportive method, can facilitate hospitalized children's coping with fear, anxiety and stress and adapting psychosocially (Canbulat et al., 2014; Özkan and Polat, 2020; Uman et al., 2006). If play is combined with treatment and care during children's hospitalization, it enables the child to tolerate with some procedures and to feel safe. It provides children to develop cognitively, psychologically, emotionally and socially. Play helps children to adapt to the external world and help them to learn the environment they are in, to communicate, to gain new experiences and abilities (He et al., 2014; Li et al., 2011; Li et al., 2016; Norris et al., 2012).

Studies have reported that playing with hospitalized children may be effective in providing physical and emotional comfort of children and decreasing their anxiety (Delvecchio et al., 2019; Li et al., 2011; Özkan and Polat, 2020; Potasz et al., 2013; Ullan and Belver, 2019). However, there are not enough studies on supportive methods to decrease the stress hospitalized children with chronic disease experience during their hospitalization.

This study aims to evaluate the effects of colour by number mandala in decreasing the stress of children hospitalized due to their chronic disease.

**$H_0$:** Colour-by-number mandalas do not reduce the perceived stress levels in children hospitalised due to a chronic disease.

**$H_1$:** Colour by number mandala reduces the perceived stress level of children hospitalized for a chronic disease.

## MATERIALS AND METHODS

### Desing

This study was carried out in the pediatric services of a university hospital and a state hospital in Turkey between June 2021 and January 2022. It is a randomized controlled experimental study

### Ethical Statement

Permissions were taken from Fırat University Non-interventional Researches Ethics Committee (number:1936/2021) and the hospitals before the study was initiated. The study was conducted in line with the principles specified in the Declaration of Helsinki. After the parents were informed about the

purpose and content, the study was carried out with the parents and their children who agreed to participate in the study. The study was registered in the Clinical Trial Registry (NCT05524272).

**Setting and Sample**

Inclusion criteria: The study was conducted with children between the ages of 8 and 11 who did not have visual and mental disability. According to power analysis, the sample of the study was determined as 120 children with 95% confidence interval, error level of 5%, 0.8 effect size and 95% representation power of the universe. There are 60 children in the mandala colour by number group and 60 children in the control group. The children were selected in the sample group with simple random sampling method, one of the probability sampling methods.

**Randomization**

Experimental and control groups were formed by drawing lots, which is one of the simple random sampling methods. The names and surnames of the children were written on a paper and put in a bag. The child whose surname was written on the paper the second researcher drew from the bag was included in the experimental group, while the child drawn next was included in the control group. Experimental group was formed with 60 children and control group was formed with 60 children (Figüre 1).

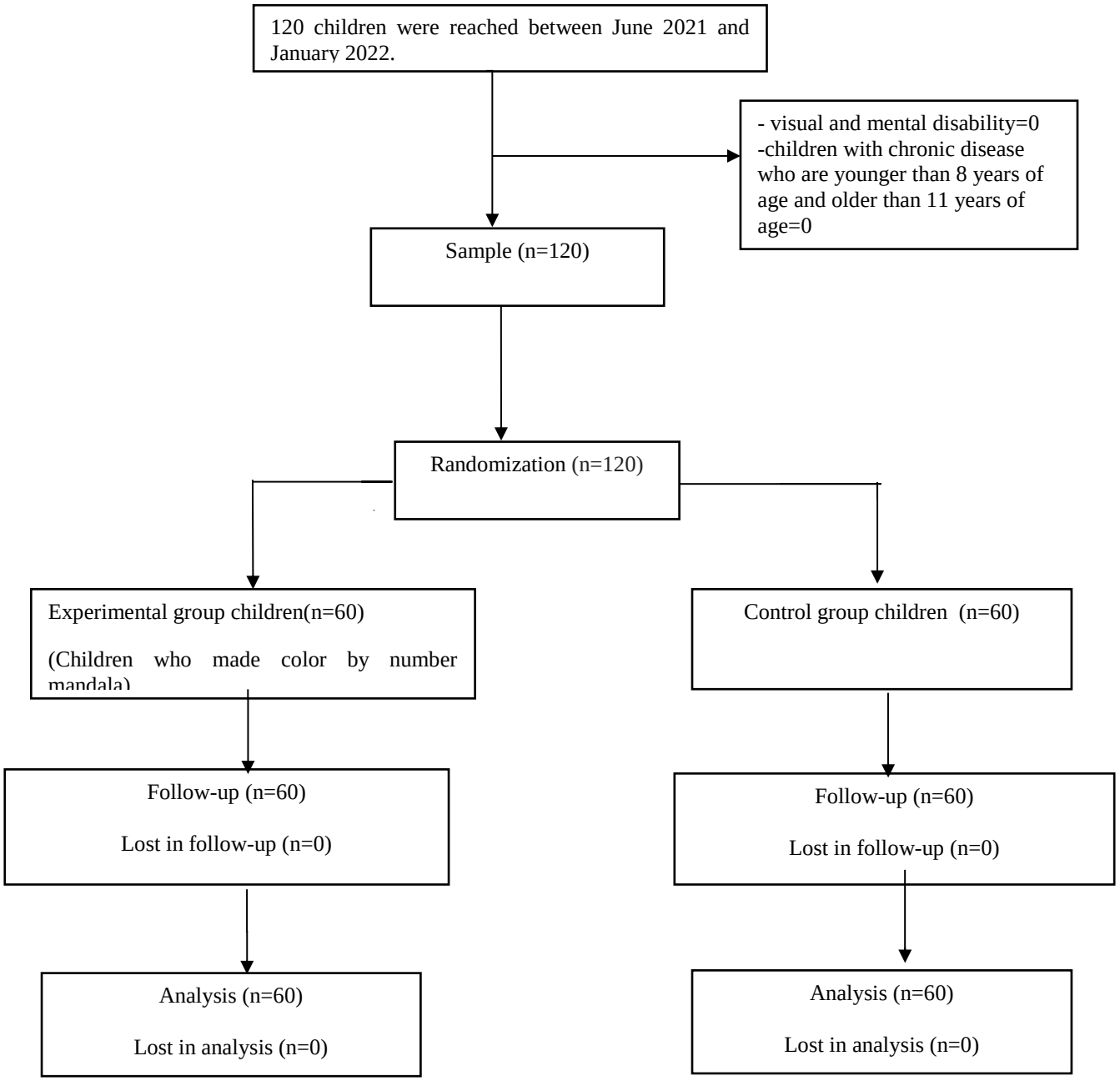


**Figure 1**. Randomization Scheme

**Data Collection Tools:** escriptive information form and Perceived Stress Scale in Children were used to collect the study data.

**Descriptive information form**

This form consists of questions such as the child's age, gender, place of residence, family income status, parental educational status and the state of having been hospitalized before.

**Perceived Stress Scale in Children**

The scale was developed by Snoeren-Hoefnagels (Snoeren and Hoefnagels, 2014). Oral and Ersan conducted the Turkish validity and reliability study of the scale (Oral and Ersan, 2017). Cronbach alpha value of the scale is .76, while the Cronbach alpha value was found as .90 in this study. The scale has 9 items and the minimum possible score is 0, while the maximum possible score is 27.

**Colour by number Mandala**

Colour by number Mandala in different sizes includes pictures and numbers. The child has to find the colour specified in the number and colour it with the specified colour. Colourful pictures emerge as a result of colouring.

**Study procedure**

The participants were randomly assigned either to the experimental group or to the control group.
Experimental group: The children, along with their parents, were interviewed by one of the researchers on their first day of hospitalisation. The parents were informed about the Descriptive Information Form and the Perceived Stress Scale for Children, which the researcher filled out in the presence of the children and their parents. The children were then given a colour-by-number mandala and colouring pencils. A different colour-by-number mandala was given to each participant every day; the mean length of hospital stay was 3 days. At the end of the third day, the same researcher interviewed the children and filled out again the Perceived Stress Scale for Children.

**Statistical analysis**

The data were evaluated with SPSS 22 package program. Mean, standard deviation, percentage and t test were used in data analysis. Normality distribution of the data was performed with Shapiro Wilk normality test ($p>.05$). $p<.05$ was considered as statistically significant.

## RESULTS

Table 1 presents the descriptive characteristics of the children in the experimental and control groups. No significant differences were observed between the two groups in terms of age, gender, school grade level, place of residence, birth order, family income status, parental educational level, hospitalisation history, and what they felt during their hospitalisation ($p > .05$, Table 1).

**Table 1.** Comparison of Descriptive Characteristic of Experimental and Control Group Children

| Descriptive characteristics | Experimental group (n=60) number | % | Control group (n=60) number | % | $X^2$ | P |
|---|---|---|---|---|---|---|
| **Age** | | | | | | |
| 8 | 11 | 18.3 | 10 | 16.7 | .594 | .898 |
| 9 | 19 | 31.7 | 22 | 36.7 | | |
| 10 | 17 | 28.3 | 14 | 23.3 | | |
| 11 | 13 | 21.7 | 14 | 76.7 | | |
| **Gender** | | | | | | |
| Female | 29 | 48.3 | 29 | 48.3 | .000 | 1.000 |
| Male | 31 | 51.7 | 31 | 51.7 | | |
| **Grade** | | | | | | |
| 3 | 11 | 18.3 | 10 | 16.7 | .594 | .898 |
| 4 | 19 | 31.7 | 22 | 36.7 | | |
| 5 | 17 | 28.3 | 14 | 23.3 | | |
| 6 | 13 | 21.7 | 14 | 23.3 | | |
| **Place of residence** | | | | | | |
| City | 44 | 54.3 | 46 | 76.7 | .180 | .914 |
| Town | 7 | 8.6 | 6 | 10.0 | | |
| Village | 9 | 11.1 | 8 | 13.3 | | |
| **Birth order** | | | | | | |
| 1 | 18 | 30.0 | 22 | 36.7 | 1.777 | .620 |
| 2 | 27 | 45.0 | 25 | 41.7 | | |
| 3 | 12 | 20.0 | 8 | 13.3 | | |
| 4≥ | 3 | 5.0 | 5 | 8.3 | | |
| **Family income level** | | | | | | |
| **Income<expense** | 8 | 13.3 | 4 | 6.7 | 1.487 | .475 |
| **Income=expense** | 43 | 71.7 | 46 | 76.7 | | |
| **Income>expense** | 9 | 15.0 | 10 | 16.7 | | |
| **Paternal education level** | | | | | | |
| **Primary education** | 2 | 3.3 | 2 | 3.3 | .036 | .982 |
| **High school** | 22 | 36.7 | 23 | 38.3 | | |
| **University** | 36 | 60.0 | 35 | 58.3 | | |
| **Previous hospitalization** | | | | | | |
| **Yes** | 58 | 96.7 | 56 | 93.3 | .702 | .402 |
| **No** | 2 | 3.3 | 4 | 6.7 | | |
| **How the child felt during hospitalization** | | | | | | |
| **Restless** | 30 | 50.0 | 36 | 60.0 | 2.203 | .531 |
| **Calm** | 1 | 1.6 | 2 | 3.3 | | |
| **Low intensity pain** | 22 | 36.7 | 15 | 25.0 | | |
| **High intensity pain** | 7 | 11.7 | 7 | 11.7 | | |

$X^2$= chi-square test

When the differences between the groups were examined, the mean total pre-test scores were 18.26 ± 2.63 for the experimental group and 15.35 ± 2.74 for the control group, and the difference between these scores was statistically significant ($p < .05$). The mean total post-test scores were 7.45 ± 2.35 and 21.18 ± 2.43 for the experimental and control groups, respectively, and their difference was statistically significant ($p = .000$). When the intragroup comparison of the experimental and control groups was examined in the study. In the experimental group, the mean total pre-test and post-test scores were 18.26 ± 2.63 and 7.45 ± 2.35, respectively, and their difference was statistically significant. The mean total Perceived Stress Scale score was found to decrease ($p = .000$). In the control group, the mean total pre-test and post-test scores were 15.35 ± 2.74 and 21.18 ± 2.43, respectively, and their difference was

statistically significant. The mean total Perceived Stress Scale score was found to increase (p = .000).

**Table 2.** Comparison of Perceived Stress Scale mean scores of children in the experimental and Control groups within and between groups

| Scale | Application time of the scale | Experimental group (n=60) | Control Group (n=60) | Between groups $t^b$ /p |
|---|---|---|---|---|
| | | **x̄±SD** | **x̄±SD** | |
| Total mean score | Pre test | 18.26±.2.63 | 15.35±2.74 | t=5.933 p=.000 |
| | Post test | 7.45±2.35 | 21.18±.2.43 | t=-31.431 p=.000 |
| Intragroup $t^a$/p | | t=31.516 p=.000 | t=-15.215 p=.000 | |

$t^b$= Independent groups t test , **$t^a$** Dependent groups t test; **x̄**=mean, **SD=** standard deviation

## DISCUSSION

Independence and friendship are important for school children. However, frequent hospitalisation due to a chronic disease and being away from family and friends may negatively affect these patients and may cause them to experience stress (O'Conner-Van, 2000). Drawing and colouring could be effective means for school children with a chronic disease to cope with the negativities they experience (Altay et al.,2017; Arnett and Malchiodi, 2013; Durualp and Altay, 2012). This study evaluates the stress-relieving effects of colour-by-number mandalas among children hospitalised due to a chronic disease. In our literature review, we did not find any studies investigating the effect of colour-by-number mandalas on the stress levels of children. Thus, our results are discussed in relation to the findings of studies on stress reduction among children in hospital environments.

In this study, the mean total pre-test Perceived Stress Scale score was higher in the experimental group than in the control group. Thanks to the colour-by-number mandalas they accomplished during their hospitalisation, the children in the experimental group showed a reduced mean total post-test score, which significantly differed from the mean total post-test score of the control group. It was observed that while working on their mandalas, the children's attention was drawn in another direction in the hospital room, which is an environment that is foreign to them. This shows that a therapeutic play is effective in relieving stress among children. A therapeutic play can be an effective means to communicate with children, to understand their emotions and thoughts, and to enable them to develop a positive coping mechanism (Artilheiro et al., 2011; Costa Fernandes and Arriaga, 2010; Lemos et al., 2016). Therapeutic play is an activity that contributes to children's development by using play tools; it decreases anxiety, tension and stress, and it promotes one's adaptation to a hospital setting (He et al., 2015; He et al., 2014; Li et al., 2016; Manyande et al., 2015; Sanchez-Garcia et al., 2015). Studies have found that a therapeutic play effectively decreases fear, pain, anxiety and stress experienced by hospitalised children, and it improves their cooperation with healthcare professionals (Aydın et al., 2017; He et al., 2015; Li et al., 2014; Lima and Santos, 2015; Mohammadi et al., 2017; Moore et al., 2015; Stulmaker and Ray, 2015).

## CONCLUSION

This study, which was conducted to examine the effects of colour by number mandala in decreasing the stress of hospitalized children with chronic disease, it was found that colour by number mandala is effective in decreasing the stress of hospitalized children with chronic disease.

### Author Contributions

**Plan, design:** DCŞ, MŞ **Material, methods and data collection:** DCŞ, MŞ; **Data analysis and comments:** DCŞ, MŞ; **Writing and corrections:** DCŞ, MŞ.

### Conflict of Interest

The authors declare no conflicts of interest.

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