

## Healing Function Evaluation of Color Samples from the Healthcare Environmental Color Index - A Cross-cultural Comparison Study on Korean and Romanian users

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### Abstract

*The present study is following a series of research investigations on design resources coming from collected data referring to users' awareness and preferences. The aim of this research is to test the Healthcare Environmental Color Index as a basis for practitioners in the field of healthcare design. An array of color samples selected from previous research, have been presented to the respondents via an online survey, in order to identify the preferences of the two groups on the relation between environmental color and health. As a result of the first experiment and through the comparison of processed data, the maximum percentage of respondents from each group is validating the relation between environmental color and health. For the second experiment we intend to highlight the patterns of color preferences for each group, and thus to test the color samples healing function. The compared data also showed a higher awareness of Koreans than Romanians on the potential of color applied to healing environment. Last but not least in the third experiment we show the top five color samples preferred by each group. It is significant that the comparison of the results validated once more some of our previous findings related to the healthcare environment, such as: the general preference for the green hue (associated to fatigue relax according to color psychology) and the blue hue (sedation release effect) but also the yellow hue – associated to bright energy. Three out of the top five preferred color samples have been identical to both groups while the other two samples have shown characteristic variations. These results show that similarities are strong and can be used in a global design strategy as an accessible tool for any practitioner. Based on the Healthcare Environmental Color Index and users' preferences analysis, a new design culture for healthcare can be established and developed.*

**Keywords:** Color Healing Function, Healthcare Environment, Cross-Cultural Study, Color Samples Survey

## 1. INTRODUCTION

Healthcare design has become a contemporary product of the globalized world, due to societal, economic and technological advances. The demand for healthcare services and spaces has constantly increased implying also higher standards. In spite of this, the new rising standards are not accessible to all the corners of the world. With the overall rise of life expectancy and standard of living, the field of healthcare design is more and more active and engaged, playing a defining role in rendering healthcare services more accessible and inclusive.

Today human society discusses and engages in developing a culture focused on healthcare and well-being, on rising awareness and averting future challenges, on approaches focused on people's real needs. This is a global movement, inside which healthcare design plays an important role. Through means like: knowledge exchanges and experience sharing, critical thinking, research by design practices, users analysis including new technologies, and many other resources, healthcare design has the potential to reach a wider scale of demand in the future and truly become a more accessible product worldwide. One way of making it more accessible is to review existing knowledge, critically analyze it, process it and transform it into practical methods and actions available as a reference for any designer. Another way is testing, exporting and importing knowledge to and from complementary domains.

The contemporary challenges and the actions expected from professionals have proved that global efforts and collaborative approaches are needed. It is exactly what this research is trying to achieve by bringing a complementary perspective on the subject and better identify the context and challenges that should be addressed both at a local and a global scale. The present study is continuing a wider research developed in the past years and materialized in a significant number of published works by the same authors. In the same time, the goal of each research phase conducted by this team is also to test and to validate, to improve and to clarify previous findings and conclusions or to identify and exclude potential errors and misinterpretation. Nevertheless one main focus is to question and to explore how design can increase its impact over the healthcare environment, and to identify the necessary conditions for achieving it in a more efficient way. From this perspective we are introducing, testing and disseminating concepts like healthcare environmental color, applied color psychology and the Healthcare Environment Color Index.

### **1.1 Interrogations and Glocal Context**

The investigation related to healthcare environment design was carried in the past years during classes, during field survey and research collaborations. This brought the perspective of observing in real time the increasing need and demand for healthcare spaces that are fit to the expectations of the contemporary users and further into discussion surprising aspects as the following: on one hand, there are a significant number of new facilities that have been designed lately, both in Korea and in Romania. In the recent years in Romania, architecture and design competitions have been organized for developing new medical public facilities that are needed, involving attention from both the public and the professionals for their quality. This is just the beginning of healthcare design in Romania, as many more public and social facilities are necessary while the existing ones need to be upgraded. The projects selected from design competitions represent a better outcome for the public demand. It also gives specialists the opportunity to impose and to raise mandatory quality standards. Another positive outcome of practicing design competitions for healthcare facilities is that designers can express their best skills and resources in the field. Thus a common base of shared resources and practical results coming from the research filed can be a substantial resource for any designer.

The second aspect is that globalization is contributing to a generic context for the development of healthcare environment. An advantage of this phenomenon is the possibility of establishing a balance between needs and expectations between actions and results. Specialized designs are transformed into models of efficiency and performance that can be exported and implemented at various scales locally and globally.

The third aspect observed is that designers can make more use of a common base of tools and shared means of action regarding healthcare design.

Many facilities have been upgraded and many have been developed from scratch lately. In this context designers and architects are making efforts to produce a dedicated approach at high technical and professional standards, involving input from the users. Therefore they should rely on more effective means and methods regarding the direct feedback from the end users. The processed data based on interaction patterns, behavior, patterns of preferences and levels of awareness, etc. can represent vital information into the design process. Even though the link between designers and the end users has developed a lot due to technology advances, it is still a shy relation in some fields. With respect to the healthcare design, quantifying the users' preferences into an operative tool and analyzing how users' behavior may impact the design and vice versa have to become the basis and the most accessible parameters of the design process.

Therefore the following questions are rising: what type of tools can we create based on users' analysis? Can we create a basis for the practice based on the expertise coming from the field of color psychology, as a basic reference available for any designer in the field? Can a model such as the Healthcare environment color index become a very accessible and effective method of designing palpable effects for the users?

Psychology is a very active science nowadays, providing specialized knowledge to many practical domains. The design field needs more methods to transpose the knowledge acquired from users' psychology into palpable design results [1]. Therefore the applied psychology of color is one of our quests for providing new tools for healthcare design.

The fourth observed aspect is that some of the world's most important designers and architects are on the quest for the future hospital design, and now during the pandemic challenges these quests have become even more legit. How will the future of healthcare look like and how do we have to reinvent the complex environment that is dedicated to healthcare? The directions of investigating this topic have to be multiple, and to come from a significant array of professionals not only designers or architects. This implies also collaborative efforts and resources, at a global scale. Until the future models will be checked and balanced, designers could count on existing knowledge that is processed in a specialized method so to get the most out of it and to apply it as efficiently and ethically as possible for the best design outcomes.

## **1.2 Research Background**

The main observation from analyzing design examples dedicated to healthcare, during the past year classes with students, is that neither architects nor designers have a clear tool to count on when it comes to color. Designing spaces and working with color through a method that involves the end users, is not a common practice, even if it sounds as something basic and vital when related to healthcare. Most of the time the color of the interiors is a subjective choice from the designer, or a result coming from different processes that do not involve mainly the users the most impacted by design. Even though color psychology and users' awareness to color is very important in many design fields, it didn't reached a strategically and effective role in the work of architects or interior designers related to healthcare design.

Thus again a set of questions rises: does the color of the ceiling count for a person laying in a hospital bed? Does the color of the walls and the interior space of a hospital have an important impact on the healing process on the patient? Can medical spaces become less traumatic for the patient and its experience improved by the effects of color psychology?

It is known also that the healthcare workers can be a source of stress and anxiety for the patients, and thus colored outfits have been introduced since a long time now, in order to contribute to the interior atmosphere of healthcare spaces [2, 3]. Facilities dedicated to persons suffering from dementia, have even adjusted the outfits of the cares in order to look familiar to the patients and to produce less anxiety for them [4]. Seeing a carer in a special suit or outfit can produce different levels of stress and anxiety and even stronger negative reactions towards the patients. It is also the confirmed case of medical workers in protective gear necessary for COVID 19, that contributed to the deeper isolation and anxiety of the patients, the lack of human interaction and of course the challenging conditions to endure for the medical workers.

Healthcare workers represent another important category of end users. Their long exposure to this environment can be influenced and greatly improved with the means of design, as shown in previous research studies [5]. The last global experiences due to the COVID 19 pandemic has shown what vital role and efficiency have the technological advances but also proves that direct human interaction cannot be substituted. All the categories of people have been affected by isolation and the loss of human interaction during the pandemic. Therefore all healthcare services are challenged to upgrade and to rethink their design.

As both human and digital interaction already exist in healthcare and will develop in the future, professionals will have to find the ways and the means to reinvent and to redesign the relation of interaction between patients and medical workers for providing the safest and the best experience for all.

## **2. THEORETICAL FRAMEWORK**

## 2.1 The Notion of Place Applied to the Healthcare Environment

A significant theoretical background for this study comes from anthropology. In particular the notions of place and non-place were conceptualized by the French anthropologist Marc Auge. The observation and understanding of human environments through the lenses of anthropology has opened new research possibilities in relation to users. The notion of place refers to the quality that a space can have in relation to its functioning and to the users, meaning: a place has identity. It also enhances identity, relations and interactions; it has a certain past, thus a certain recorded history that makes it special for the users [6]. One of the most obvious examples of place is one's home – or the space where people feel natural, comfortable and safe and where one's identity and needs find the best environment to manifest.

On the other hand a non-place is defined as a generic space, where people become serial customers or users, a space that creates anonymity and does not hold enough significations for any person. It is the case of railway or metro stations, hotel rooms, airports and shopping malls. While the home is a very particular place in any culture, hotel rooms, transport stations, shopping malls, airports etc. have the same generic features all over the world. Unfortunately the spaces for healthcare have become also non-places – and hospitals in particular, due to their high specialization and machine like functioning. The experience of patients in a hospital for example, is recognized to be one of the most stressful categories that can influence the behavior and the psychology of any person.

With regard to the healthcare environment in particular, the work of the Romanian anthropologist Vintila Mihailescu is highlighting a relevant approach with new potential to be explored. He shows a vital perspective: the one of the patient and the complex experience that the patient undergoes [7]. The anthropological approach is based on a set of objective references used to highlight the differences and the relevant aspects of this specific patient-experience process. Thus it becomes a tool for researchers but also for strategic decisions during the design process. In the field of design, anthropological research can bring a new and complementary perspective on the existing knowledge, a perspective explaining profound aspects coming from the users based on their behavior and needs, on their cultural background, on their gender or ethnic characteristics, on their social relations, and so on. In anthropological research the group specificity, the preferences, the behavior that defines the group in opposition or difference with another group is relevant. In this case observing and analyzing these differences or the main traits of a certain group - the group of Korean respondents versus the group of Romanian respondents - can offer a tool for explaining and understanding more about the expectations and the needs of the users and the contemporary challenges in healthcare and well-being.

The contemporary world with its accelerated transformations, the impact that these transformations have on the healthcare environment needs a constant and renewed reflection on the typology of its users. All the spectacular evolution fueled by new technologies and infrastructures involve also considerable physical modifications, in the urban structure, in the design of spaces and services. These physical sophisticated traits that happen globally are best reflected by the notions of place and non-place. The medical environment is also reinvented and reshaped by these contemporary advances. The medical environment as infrastructure becomes more and more performing and efficient. The machinery that constitutes the medical environment is one of the most spectacular in terms of performance, and the achievements are great. In the same time and in a proportional way, the emotional experience that the patient undergoes, becomes more and more cold, remote, deprived of sufficient human interaction, more stressing, inducing a negative impact and somehow far from the idea of healing. From this perspective, following Marc Auge's definition of the space of the machine as a non-place, we can identify also the hospital as a non-place. All the facilities that include generic features based on efficiency, utility, functionality, and performance, with universal and standard spatial morphology like airports, train or metro stations, malls and hospitals have become non-places. In particular the design of healthcare spaces should be rethought, in order to identify their potential for positive experiences for the users and to gain the quality of place. Designing the healthcare environment implies a significant degree of generosity in order to generate places for healing and for enhancing the well-being for all the categories of users.

In this sense, collecting and processing data from the users can become a source of feedback in the process of upgrading and reshaping healthcare spaces and services and for providing a better design outcome and a

better reality for the users.

## 2.2 Anthropological Knowledge and Users' Analysis

In anthropology it is much more relevant to focus on the group behavior and not to the individual, on the community and on the public behavior not on the private one. It also deals with environmental relations, behaviors and challenges, considering the healthcare environment a vital one in relation to human society both on local scale and global scale.

Currently medical anthropology is an interdisciplinary domain that is gaining more and more importance and visibility, because it deals with the human healthcare environment, with its systems and with patterns of bio-cultural adaptation. It comprises the development of medical knowledge systems, and care systems, patient-caregiver relationship, the culturally diverse healthcare environments and their potential interaction and integration, the factors that may influence the health of a social or cultural group, the critical analysis of interaction between healthcare services and patients, the impact of technological development upon the healthcare environment and upon patients.

As an interdisciplinary field, it can also observe and explain both psychological and physiological aspects that are characteristic for a specific group, and how processes of cognition, emotion, preferences, perception, motivation can be used to shape the healthcare environment [8, 9, 11]. With this regard the Healthcare Color Index is a tool that has been generated from previous research involving also the filters of anthropological knowledge, in particular for offering complementary inputs [10].

Cultural forms and differences are always a characteristic feature when discussing and comparing groups of users. Patterns of choices and preferences as interpretation of cultural forms can be explained by cognitive anthropology through shared knowledge, cultural innovation and transmission over time and space. Cognitive anthropology can explain what people from different groups know and how that implicit knowledge changes the way people perceive and relate to the world around them. In the case of this study between Koreans and Romanians, the recorded data showing the awareness of each group on the healthcare environment shows very similar features but also significant differences. These prove on one hand both traditional and modern cultural forms and knowledge that has been transmitted into society with regard to well-being and health promotion, but also a holistic understanding of healthcare and life standards in contemporary times.

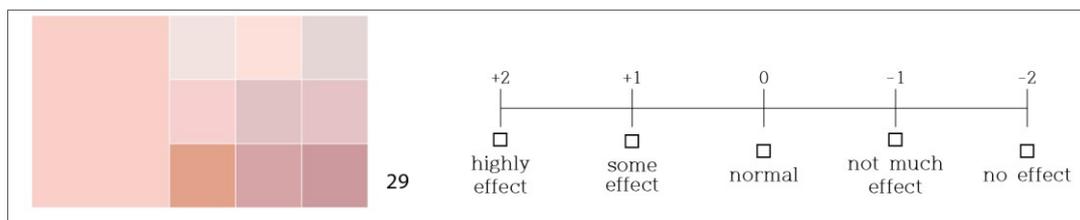
## 3. SURVEY INVESTIGATION

The present comparison study between Korean and Romanian respondents is based on the processing of answers from the online survey. The comparative survey took place from December 2019 to March 2020 and recorded the valid answers of an equivalent number of respondents: 89 Koreans, respectively 86 Romanians. The survey was first developed between 2015-201t and was initially dedicated only to Korean respondents, while its late English version allowed the testing of introducing new categories of respondents and the potential of processing and analyzing comparative results [12, 13]. It is significant that the study related to color awareness applied for the healthcare environment and the Healthcare Color Index, can be further tested among more target groups of users, and based on age, gender, nationality, country of residence, living environment: urban or rural, etc. Not only that new data can be gathered for future research but also the survey can be disseminated at a larger scale due to its English version. The survey is available at the following link ([http://www.healthcarecolor.or.kr/mobile/vote/vote\\_en.php?fbclid=IwAR2LcY2cMc5zB5mH3hOGApSg2Umt9GxPJE XAwNP8jTWdesZInZVdVvCJGU](http://www.healthcarecolor.or.kr/mobile/vote/vote_en.php?fbclid=IwAR2LcY2cMc5zB5mH3hOGApSg2Umt9GxPJE XAwNP8jTWdesZInZVdVvCJGU)).

The present chapter of research refers to analyzing the content comprised from question 25(Q25) to question 48 (Q48) from the survey. Related to the two groups considered in the present study, the focus was on young individuals from both nationalities, which have similar background: students, between the age range of 20-35 years old, with good technological skills and English proficiency. Strategically from the relevant research perspective, this target group was thought to have high education standards and future oriented goals and most of all an important role in the society in the close future. As adults they already have their own understanding about the medical environment and in the future, they will represent the main category of users for healthcare

services and facilities. Also their educational background is reflecting their standards and expectations for the future. The comparison is intended to analyze similarities or differences between the users preferences that reflect both local and global features related to the healthcare environment.

The structure of this chapter from the survey is the following: questions starting from no.25 to no.29 are interrogating the awareness and the interest of the users towards the relation between environmental color and health. Questions starting with no.29 to no.48, represent an array of 20 color samples mapped from previous field survey [5, 10] and classified as it follows: samples from no.29 to no.35 refer to color psychology theory, samples from no.36 to no.38 are the most frequent colors resulting as a preference via field survey from Korean public medical facilities, samples no.39 to no.41 from Korean social sports facilities, samples no. 42 – 44 from Korean nursing facilities and samples no. 45 – 48 reflect the top color preferences based on the respondents age range analysis. For the samples listed in this chapter the respondents were invited to choose the potential healing effect when these colors are applied to healthcare spaces. The scale of choices regarding the potential healing effect ranges from positive (+2, +1) to negative values (-1, -2), as shown in the Figure 1, below. The comparative results between Korean and Romanian respondents are highlighting the healing function evaluation based on health theory and applied color psychology.



**Figure 1. Scale of choices for the potential color effect**

### 3.1 First Phase of the Investigation: Users' Awareness

The first part of the experiment was questioning the awareness of the respondents to the relation between environmental color and health and highlighted comparative preferences between users.

Question 25 from the English version of the survey shows that: 63.8% Koreans and 27.9% Romanians consider there is a certain relation and influence between environmental color and health. 22.8% Koreans and 58.1% Romanians consider the healing effect can be much related to environmental color. 9.4% Koreans and 12.8% Romanians consider there is an indifferent or normal relation between the two, while 3.1% Koreans and 0% Romanians consider the relation is somewhat irrelevant and 0.8% Koreans and 1.2% Romanians consider the relation is totally irrelevant. Therefore the overall awareness for recognizing the relation is high for both groups, and the comparison of the results validates also the previous findings from the Korean version of the survey [5, 10]: not only the group of Koreans proves a high awareness but also a total distinctive group of Romanian nationals prove the importance of the relation between environmental color and health.

When challenged to explain why health and environmental color are related, 12.6% of Koreans and 54.7% Romanians consider the relation enhances relaxation, 70.9% of Koreans and 19.8% of Romanians consider it enhances psychological stability, 17.4% of Romanians and 11% of Koreans consider it helps to relieve stress, while 4.7% of Koreans and 8.1% of Romanians consider the relation as having a real healing effect.

The following question is aimed to focus on the influence of color on the particular environment of healthcare facilities (like hospitals, clinics, nursing homes, etc.) and on the patient's health enhancement.

Thus 64.6% of Koreans and 43% of Romanians consider color has a certain impact on healthcare facilities environment and patient's health enhancement. 19.7% of Koreans and 9.3 % of Romanians consider there is a normal and indifferent influence while 14.2% of Koreans and 46.5% of Romanians consider that color is a very important influence in this relation. So the answers proving this relation are significantly more numerous, making a total of 78.8% of Koreans and 89.5% of Romanians in favor of a certain degree of influence and a high degree of influence.

Furthermore the survey is testing the availability to action of the respondents, based on their awareness

related to environmental color and health: thus 44.9% of Koreans and 47.7% of Romanians agree to apply the color environmental principles to their own space in order to improve their health, 32.3% of Koreans and 40.7% of Romanians strongly agree, 18.9% of Koreans and 11.6% of Romanians are neutral about this, while only Koreans (3.1% and 0.8%) disagree or respectively strongly disagree. Again the maximum percentage of respondents is in favor of recognizing and validating the relation.

### **3.2 Second Phase of the Investigation: Users' Patterns of Color Preferences**

The second part of the experiment consisted in highlighting the patterns of color preferences of the two distinctive groups of respondents, Koreans and Romanians. Based on data analysis, we identified the percentage of persons that have considered the sample colors can have impact on their health, when applied to healthcare spaces. In this chapter the survey is focused on testing the amount of healing effect of the selected color samples. The numbers of respondents that have chosen a certain color sample were transformed in percentages from the total number of respondents.

The percentage of preferences for each sample have been classified in a decreasing value hierarchy and thus the top five samples preferred by each group of respondents have been identified and further compared. The first ranking criterion was the healing function defined as having "some effect": more than 60% of the total Korean respondents and more than 46% from the total Romanian respondents considered that some of the color samples can have a certain healing effect on themselves.

The second ranking criterion identified was the healing function defined as "highly effective": about 22% of Korean and about 27% Romanian respondents considered that some of the color samples can be highly effective on their health.

These data also showed a higher awareness of Koreans than Romanians on the potential of color applied to a healing environment: about 81% from Koreans compared to 69% Romanians. This level of awareness can be explained by cultural differences and mainly by the fact that Koreans are in general more aware of healthcare than Romanians [12].

For the evaluation of the color samples healing function, were considered also the indifferent and the negative estimations, such as: normal effect, not much effect and no effect. Thus 46.8% Koreans and 49.9% Romanians considered certain samples have a normal/average effect on the healthcare environment, 28.9% Koreans and 31.3% Romanians have considered certain color samples have not much healing effect, while 12.5% Koreans and 29% Romanians have considered that some samples have no healing effect at all.

Further we will discuss only the patterns that have validated the criteria of "certain effect" and "highly effect", considered relevant for our healthcare environmental color study. The answers identifying not much effect and no effect at all will be analyzed and discussed in future studies.

### **3.3 Third Phase of the Investigation: Users' Top Five Color Sample Preferences**

The third phase of this research is aiming to highlight the top five color sample preferences coming from the two groups and to identify the patterns of choices that validated the color samples. For this reason we focused our analysis on the relevant data for the two categories of answers that involve the influence of environmental color over health.

As shown in Figure 2 the maximum percentage of respondents were considering there are color samples with certain healing effect when applied to the healthcare environment. Thus for the criterion of "some effect", the Korean respondents have validated the following color samples: sample no.31 with 60.8% preferences, sample no.30 with 54.6% preferences, sample no. 48 with 54.6% preferences, sample no. 45 with 53.8% preferences and sample no.47 with 53% preferences.

For the Romanian group the top five preferences, visible in Figure 1, were the following color samples: no.30 with 46.4% preference, no. 46 with 45.2% preference, no. 48 with 39.4% preference, no.42 with 37.1% preference, and no.45 with 36% preference.

KOREANS						ROMANIANS					
Sample No.	high effect %	some effect %	normal %	not much %	no effect %	Sample No.	high effect %	some effect %	normal %	not much %	no effect %
31	20.3	60.8	14	3.9	0	30	23.2	46.4	20.9	4.6	4.6
30	11.7	54.6	27.3	4.7	0.8	46	15.1	45.2	25.6	9.3	4.7
48	5.5	54.6	32.7	4.7	1.6	48	9.3	39.4	29.0	17.4	4.7
45	11	53.8	20.3	12.5	1.6	42	10.4	37.1	34.8	15.1	2.3
47	22.6	53	21.1	2.3	0	45	15.1	36.0	25.6	17.4	5.8
46	15.6	53	19.5	10.1	0.8	32	10.4	34.8	18.6	27.8	8.1
44	7.8	50.7	32	7	1.6	29	27.8	33.6	20.9	15.1	2.3
32	12.5	43.7	35.1	6.2	1.6	35	18.6	33.6	23.2	18.6	5.8
36	4.7	39.8	37.4	14.8	2.3	33	17.4	33.6	27.8	15.1	5.8
38	6.2	39.2	36.7	14	3.9	43	5.8	33.6	30.2	25.5	4.6
42	2.3	38.2	43.7	10.1	4.7	34	13.9	31.3	25.5	22.0	7.0
43	1.6	38.2	42.9	13.3	3.1	31	20.9	30.2	32.5	12.8	3.5
29	5.5	37.4	44.5	11	0.8	47	20.9	30.2	26.7	16.2	5.8
33	5.5	37.4	40.6	14.8	0.8	41	12.8	30.2	22.0	23.2	11.6
34	3.1	36.7	35.1	21.1	3.1	44	7.0	27.8	49.9	11.6	3.5
35	7.8	33.5	39	14.8	3.9	38	5.8	25.5	37.1	20.9	10.4
41	1.6	32	35.9	22.6	7	36	15.1	23.2	37.1	15.1	9.3
37	3.9	24.2	46.8	17.9	6.2	39	4.6	15.1	24.4	31.3	24.4
39	2.3	15.6	40.6	28.1	12.5	37	2.3	15.1	38.3	27.8	16.2
40	2.3	14	44.5	28.9	9.4	40	2.3	13.9	27.8	26.7	29.0

Figure 2. Comparative hierarchy of preferences considered to have “some effect”

As visible in Figure 3, the preferences of Koreans highlight 2 hues of green, one hue of blue, one hue of yellow, and one of purple-blue, respectively a pattern of G, B, Y, PB, while the pattern of choices of the Romanians shows 2 hues of blue, one hue of yellow, one hue of gray and one hue of purple-blue, respectively B, Y, Gray, PB. A total of 3 samples are identical between the choices of the two groups of respondents.

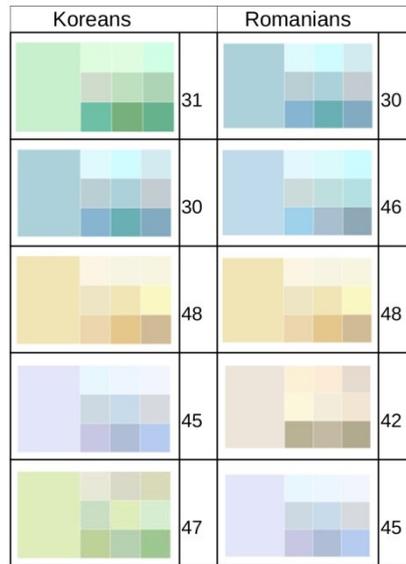


Figure 3. Comparative samples of the top five preferences considered to have “some effect”

For the category of samples considered to have a highly effect on the healing function, shown in Figure 4 the group of Korean respondents have highlighted the following samples: no. 47 with 22.6% preference, no. 31 with 20.3% preference, no. 46 with 15.6% preference, no.32 with 12.5% preference and no. 30 with 11.7% preference. The Romanian top five choices for highly efficient healthcare environmental color are: no.29 with 27.8% preference, no. 30 with 23.2% preference, sample no.31 with 20.9% preference, sample no.47 with 20.9% preference and sample no.35 with 18.6% preference.

KOREANS						ROMANIANS					
Sample No.	high effect %	some effect %	Normal %	not much %	no effect %	Sample No.	high effect %	some effect %	Normal %	not much %	no effect %
47	22.6	53	21.1	2.3	0	29	27.8	33.6	20.9	15.1	2.3
31	20.3	60.8	14	3.9	0	30	23.2	46.4	20.9	4.6	4.6
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45	11	53.8	20.3	12.5	1.6	33	17.4	33.6	27.8	15.1	5.8
44	7.8	50.7	32	7	1.6	46	15.1	45.2	25.6	9.3	4.7
35	7.8	33.5	39	14.8	3.9	45	15.1	36.0	25.6	17.4	5.8
38	6.2	39.2	36.7	14	3.9	36	15.1	23.2	37.1	15.1	9.3
48	5.5	54.6	32.7	4.7	1.6	34	13.9	31.3	25.5	22.0	7.0
33	5.5	37.4	40.6	14.8	0.8	41	12.8	30.2	22.0	23.2	11.6
29	5.5	37.4	44.5	11	0.8	42	10.4	37.1	34.8	15.1	2.3
36	4.7	39.8	37.4	14.8	2.3	32	10.4	34.8	18.6	27.8	8.1
37	3.9	24.2	46.8	17.9	6.2	48	9.3	39.4	29.0	17.4	4.7
34	3.1	36.7	35.1	21.1	3.1	44	7.0	27.8	49.9	11.6	3.5
42	2.3	38.2	43.7	10.1	4.7	43	5.8	33.6	30.2	25.5	4.6
39	2.3	15.6	40.6	28.1	12.5	38	5.8	25.5	37.1	20.9	10.4
40	2.3	14	44.5	28.9	9.4	39	4.6	15.1	24.4	31.3	24.4
43	1.6	38.2	42.9	13.3	3.1	37	2.3	15.1	38.3	27.8	16.2
41	1.6	32	35.9	22.6	7	40	2.3	13.9	27.8	26.7	29.0

Figure 4. Comparative hierarchy of preferences considered to have “high effect”

As can be further seen in Figure 5, the choice pattern of Koreans is dominated by 2 hues of green, 2 hues of blue and one of yellow, while the choice pattern of Romanians is dominated by a red hue, a blue hue, 2 green hues and one purple-blue hue. Again, 3 color samples from the top 5 samples identified as having a highly effect on health are identical for each group. Visualizing these samples of preferences in parallel and comparing them offers an advantage and an opportunity for further designs of the healthcare environment.

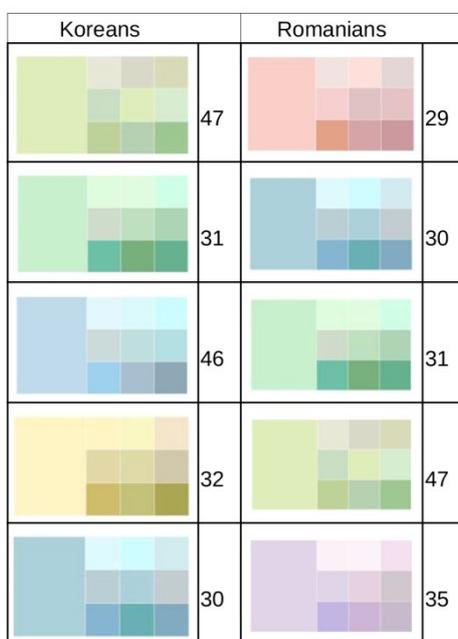


Figure 5. Comparative samples of the top five preferences considered to have “high effect”

#### 4. DISCUSSION

From the comparison of the two groups, regarding the criteria of “some effect”, it results there are three identical samples that make the top five preferences of both groups (sample no. 30, 45, 48). According to color psychology theory these colors are generally associated to sedating release and bright energy. This is a significant similarity between the choice patterns, and validates also previous research findings [12]. While

the Korean choice pattern seem to be dominated by the green hue – respectively the relaxation of fatigue hue according to color psychology, the Romanians choice pattern is dominated by the blue hue as the sedation release hue. Secondly the same yellow hue associated to bright energy and the purple-blue hue associated to psychological stability have been validated by both groups as having a certain healing function. This means that independent of cultural differences both the green hues and the blue hue have been once again validated in relation to the healthcare environment together with the yellow hue and the blue-purple hue.

From the comparison referring to the “highly effect” criteria the choice patterns show both similarities and significant differences. There are three identical samples considered highly effective by both groups: sample no. 30, 31 and 47. Samples no.31 and no.47 are associated to relax of fatigue while the sample no. 30 with sedation release according to color psychology. The results are significant because they validate previous findings of our research [10, 12], meaning the importance of green and blue hues for the respondents. Complementary Koreans consider a sample of green and one of yellow as highly efficient while Romanians consider a sample of red and one of purple-blue as highly efficient. In other words the common samples identified by both groups (no. 30, no.31 and no. 47) enhance sedation, relaxation and release of fatigue. The complementary samples enhance sedation release and bright energy as chosen by Koreans while Romanians prefer vital energy and psychological stability.

## **5. CONCLUSION**

Because interior spaces are vital in the relation to the users, designers should investigate how healthcare spaces can be upgraded and what are the newest and the most accessible modes and means of achieving a better palpable reality for the users. Color psychology is a first-hand reference which can be further revisited and invested with the resources of contemporary technology and disseminated at a larger level. Also an important basis for palpable design results is to consider the awareness of the users and to respond to their needs and preferences in an efficient and professional manner. The healthcare environment as a performing machinery should also include a process of generous design, meaning a dedicated design centered on the users’ processes, needs and experiences and contributing to create more places for healing and for well-being.

We developed the English version of the survey in order to reach greater accessibility and to have the opportunity for the comparison method. This tool operated with knowledge from anthropology allowed us to test two very different groups of potential users and to extend the comparison to even more distinct groups in the future. Secondly both data acquiring and dissemination of results has increased due to the English version survey. The critical analysis of the users’ interaction with the healthcare environment is a vital aspect because it reflects patterns of behavior and psychological responses that can be objectively transformed into design features. From this regard, the identified colored samples have a lot of potential to be further explored into design.

One of the most important outcomes of this research is aimed to address the effects of alienation, anxiety and stress for the patients and for the healthcare workers. The applied color psychology through the proposed Healthcare Environmental Color Index can have a great impact on the quality of the healthcare environment. As proven by various studies, the two groups of respondents have recognized the value of the relation between environmental color and the psychological state of the patient, thus implicitly its effect on healing. The same encouraging results have also been shown from the perspective of public healthcare workers. The samples that we identified in this study based on users’ preferences are an open source for designing places where patients and healthcare workers can have experiences with positive outcomes toward their physical and mental health.

The cross-cultural results are highlighting differences in some aspects and similarities in other aspects. The overall awareness of Koreans related to the healthcare environment is in general greater than of Romanians. This finding provides us information that certain measures can be taken to enhance the awareness of one group, or to use certain features as a model coming from the other group. Comparing, sharing and disseminating knowledge, rising new and continuous interrogations can only favor further research development and results. Due to the English version of the survey and a further interactive website for environmental color simulations, we provide a resource of processed data as a basis for the next healthcare design culture.

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