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**USAGE AND IMPACT OF COLOR IN GAMES WITH A
FOCUS ON HYPER-CASUAL GAMES**

Master's Thesis

ZAHRAA JAMAL ALGUNAID

ISTANBUL, 2021

**THE REPUBLIC OF TURKEY
BAHCEŞEHİR UNIVERSITY**

**GRADUATE SCHOOL
GAME DESIGN MASTERS PROGRAM**

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ABSTRACT

USAGE AND IMPACT OF COLOR IN GAMES WITH A FOCUS ON HYPER-CASUAL GAMES

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GAME DESIGN MASTER'S PROGRAM

Thesis Supervisor: ASSOC. PROF. DR. Guven Catak

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Purpose: The relationship of coolness or warmth, saturation, values and respective hues hold the potential to develop noticeable difference regarding the perception of colors. The researcher used interpretivism research philosophy, qualitative design, inductive approach and secondary data collection, along with content analysis technique as a data analysis tool. Overall, from the analysis of gathered data, it can be concluded that colours play an important role in not only making the hyper-casual game look attractive and appealing to the player, but the use of appropriate colour tones in the game also play's an important role in impacting the psychological capabilities of the individual such as emotions, behaviour and comparing the game objects with the real-world to make strategic moves. Moreover, the colours used as signifiers and identifiers in the game hold the potential to impact the choices of the players made in the game. In the other hand how HVS and contrast can actually effect on colour and player retention and emotions.

Methodology: Since the purpose of this research is related to the analysis of the effects and importance of colors in hyper-casual games this research has been conduct in two phases one was collecting date and defending colors and their use , the second one was actually playing the game and taking screenshot from it in order to change the amount of contrast and hvs using in each picture.

Results: color can take a huge role in a game environment, changing the player emotions and as we mentioned in our search hyper-casual games are simple games so color is one of the big design elements in , using the right amount of contrast and HVS will give the color its correct meaning .

Conclusion: considering the literature and analysis of the results in the previous section, it can be concluded that different colours incorporate different meanings and hold the potential to affect the emotion of human beings, which ultimately influence them to either like or dislike the game. This indicates that the colour palette used in the game is extremely important and hyper-casual game designers must remain vigilant in choosing the colours of the game in order to evoke the desired emotions. In this regard, while considering the

qualitative outcomes of the study, it can be concluded that to some extent, the colours hold the potential to impact the individual reaction to the game, however, another game element such as design, concept, character and genre also impact the responses of a player to the game. From the study, it can also be concluded that the colours in hyper-casual games help the individuals to identify certain objects in the game, such as evil, good, danger or opportunity, as without the use of certain colour use may find difficult in perceiving the meaning of different objects if they are incorrectly coloured

Key Words: hyper-casual games, colour theory, games framework, impact of colors, player retention.



ABSTRACT

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Amaç: Soğukluk veya sıcaklık, doyunluk, değerler ve ilgili tonlar arasındaki ilişki, renklerin algılanmasıyla ilgili fark edilebilir bir farklılık geliştirme potansiyeline sahiptir. Araştırmacı, veri analiz aracı olarak içerikle birlikte yorumlayıcı araştırma yaklaşımı ve felsefesini, nitel tasarımı, tümevarımsal ikincil veri toplamayı kullanmıştır. Genel olarak, toplanan verilerin analizinden, renklerin sadece hiper-gündelik oyunun oyuncu için çekici ve çekici görünmesini sağlamada önemli bir rol oynadığı değil, aynı zamanda uygun renk oyununun kullanılmasının da etkilemede önemli bir rol oynadığı sonucuna varılabilir. Stratejik hamleler yapmak için bireyin duygu, davranış ve oyun nesnelerini gerçek dünya ile karşılaştırma gibi psikolojik yetenekleri. Ayrıca oyunda belirteç ve tanımlayıcı olarak kullanılan renkler, oyuncuların oyunda yaptıkları seçimleri etkileme potansiyeline sahiptir. Öte yandan, HVS ve kontrastın, renk ve oyuncu tutma ve duygular üzerindeki etkisinde gerçekte nasıl yankılanabileceği.

Metodoloji: Bu araştırmanın amacı hiper-gündelik oyunlarda renklerin etkilerinin ve önemini analizi ile ilgili olduğundan, bu araştırma iki aşamada yürütülmüştür, biri tarih toplama ve renkleri ve kullanımlarını savunmak, ikincisi ise aslında oyun oynamaktır. Her resimde kullanılan kontrast ve hvs miktarını değiştirmek için oyun ve ondan ekran görüntüsü almak. **Sonuçlar:** renk bir oyun ortamında çok büyük bir rol oynayabilir, oyuncunun duygularını değiştirebilir ve aramızda belirttiğimiz gibi hiper-gündelik oyunlar basit oyunlardır, bu nedenle renk, doğru miktarda kontrast ve HVS kullanarak 'deki en büyük tasarım öğelerinden biridir. renge doğru anlamını verecektir.

Sonuç: Bir önceki bölümdeki literatür ve sonuçların analizi göz önüne alındığında, farklı renklerin farklı anlamlar içerdiği ve insanların duygularını etkileme potansiyeline sahip olduğu ve sonuçta onları oyunu sevmeye veya sevmeme konusunda etkilediği sonucuna

varılabilir. Bu, oyunda kullanılan renk paletinin son derece önemli olduğunu ve hiper-rahat oyun tasarımcılarının istenen duyguları uyandırmak için oyunun renklerini seçerken dikkatli olmaları gerektiğini gösteriyor. Bu bağlamda renklerin bir dereceye kadar bireysel tepkiyi etkileme potansiyeline sahip olduğu, ancak tasarım, konsept, karakter ve tür gibi başka bir oyun unsurunun da oyunun tepkilerini etkilediği sonucuna varılan nitel sonuçlar göz önüne alındığında, oyuna oyuncu. Çalışmadan, hiper-gündelik oyunlardaki renklerin, bireylerin oyundaki belirli nesneleri (kötülük, iyilik, tehlike veya fırsat gibi) tanımlamasına yardımcı olduğu, çünkü belirli renklerin kullanılmaması durumunda zor bulabileceği sonucuna varılabilir. Yanlış renklendirilmişlerse farklı nesnelerin anlamını algılama

Anahtar Kelimeler: hiper gündelik oyunlar , renk teorisi , oyun türü , renklerin etkisi , oyuncu tutma.

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ABBREVIATIONS

HVS	:	Hue, value, saturation.
CIE	:	International Commission on Illumination.
CIELUV	:	International Commission on Illumination color space.
CIA	:	Confidentiality, integrity, and availability.



1. INTRODUCTION

1.1 BACKGROUND OF THE RESEARCH

Hyper-casual games is a terminology recently utilised in the gaming world after the impressive success of Voodoo's Helix Jump in mid-2018 which played a significant role in the popularity of these games.

The Helix Jump game eventually became the most downloaded game of 2018 with 334 million downloads, overtaking Fortnite and PUBG and thus increased the interest of gamers (Kim et al., 2017). Coincidence or not, but the growth in popularity of this game just preceded the appearance of a new favourite phrase in the vocabulary of game designers. In addition to Helix Jump, next to PUBG, Subway Surfers and Candy Crush Saga, at that time were located in the tops: Love Balls, Rise Up, Snake vs Block, Hole.io - all the previously mentioned games can be considered a hyper-casual games (Kim et al., 2017). Casual games are designed for a wide range of users, differ in simple rules and do not require players to be very diligent, spend time on training or require any special skills; they are relatively low-cost to develop and distribute.

The term hyper-casual first appeared in in a published press and a series of articles in 2017 by Johannes Heinze entitled "The Ascendance of Hyper-casual" (Chai, Giryes and Wolf 2020).in the mentioned article, the author defines the main features of hyper-casual games which include an:

- a) Instant access to content: Without plot inserts, preloading, level selection or a lengthy tutorial, the users can immediately finds themselves at the epicentre of the game. Thanks to the uncomplicated and not overloaded with details gameplay, to figure out what is happening in just a few seconds. And the short game loop allows them to play anywhere, anything.

- b) Minimalism in gameplay and design: The gameplay is often as simple as possible. The rest of the game's components also match it: visual component, control and audio - nothing should prevent the user from fully focusing on the gameplay.
- c) Simple monetisation model: The game does not encourage the user to pay for the content, instead they “pay” with their time. More than 70% of the game's income comes from advertising: banners, video ads, motivated ads.

Hyper-casual games also have an alternative name that appeared long before the new trend ‘super-casual. The earliest mentions we can find lead appear to the 2015 App Annie Index: 2014 Retrospective (Iversen, 2015). App Annie is most likely to be the first to use this definition. And then it was interpreted very simply: definition that describe one-stage games with a short game session. Furthermore And the first game that tried on this term was that very known game “ Flappy Bird: where it had more than 50 million installations, and landed at the 6th place in Google search trends for that year and "legions of imitators". Next, the banner of super-casual games was immediately picked up by the French from Ketchapp with the port of open source 2048. Throughout 2014, with the exception of two months, super casual games remained in the top 10 in terms of monthly downloads (Iversen, 2015) after that time period leading to the present day these games trend popularity has not changed significantly the market competition of these games is reaching a high level of intensity , with hundreds of games being submitted to publishers each month.

have been appeared only in the recent years, they have become a rapidly bypassing other games in many ways related to their field These games have become undoubtedly one of the trends of the last few years According to some researchs believed that in the current 2019 they will continue to storm the tops of the App Store and Google Play, while others believe that the market is already oversaturated and their popularity will soon fizzle out (Fava, 2021). As some describe it as “A magical and invisible element to the naked eye is Gratification (Mason et al., 2020). To better understand the terminology in terms of game design, Hyper-casual games can be defined as the form of visual/audio/emotional feedback that the player receives after performing any action in the game and that connection makes action fun and

meaningful. Besides the design of computer games, the easiest traditional and most powerful way to impact the players gaming experience is the application of colours. Today computer games have a common element of colours especially in strategy games as it is very significant to them in realising the dissimilarity between foe and friend. The players in these sort of games react on the basis of the variation of colours showing good and evil characters in the game. The present study aims to examine the variation of game colours and patterns associated with the most popular hyper-casual games furthermore to analyse the colour settings in these games that impact the players.

1.2 AIMS AND OBJECTIVES

This study aims to examine the variation of different colours impact on a game, and how using the right amount of contrast and HVS can actually make a player retention and effect on the its emotion, additionally planned on analysing data examining differences that may be associated with colours. To carry out the research, the study aims to undertake the following objectives:

- a) To determine how the colors used in the hyper-casual games are linked to emotions.
- b) To the examination of how colors impact the choices of the player in hyper-casual games.
- c) To recommend the recommendation of the best-suited color theme for a particular game genre.
- d) How using the right contrast and HVS can actually change the color scheme and make the player return to the game

1.3. RESEARCH QUESTIONS

- a) Would the reaction to the game vary depending on the colour?
- b) How would the game settings impact the player based on colours?
- c) Would hyper-casual games be more interesting in the future?

- d) What would the optimist colour scheme for the players to interact with on-screen be?
- e) Playing with the contrast and HVS can actually make an impact on the color scheme and player ?



2. LITERATURE REVIEW

The science and art of using colours is associated to the colour theory. According to Bleicher et al. (2012), colour theory explains how colours are perceived by human along with the visual effects that are gained by contrasting and the mixing of these colours. Colour theory also incorporates the messages that specific colour transfers to the audience. According to Agoston (2013), primary, secondary, and tertiary labels are the instrument that in which the colours are categorized and the logical structure of it and their associated perceptions are based on colour theory. Colours are not important for life, but they are strategically used in branding, packaging, and advertisement to influence the consumer's perception. According to the traditional colour theories, red, yellow, and blue are the primary colours as it is perceived that any colour can be extracted from the mixture of these four colors in various proportions (Westland et al., 2007). The process of merging these four primary colors will generate the creating of purple, orange, and green colors which are known as the secondary colors. Furthermore, when primary and secondary colours are merged together, tertiary colours such as yellow-orange, red-violet and blue-green are generated. According to O'Connor (2010), colour provides harmony in the visual experience that is also appealing to the eyes and develop the sense of engagement. However, the behavior of one colour in relation to other colour and shapes is the most challenging part of the colour theory. Hence, the relationship of coolness or warmth, saturation, values, and respective hues hold the potential to develop noticeable difference regarding the perception of colours.

2.1 COLORS REGARDING BEHAVIOR AND EMOTION

The study of Cho and Lee (2017) revealed that colours are strongly linked to human emotion and behavior as different colours deliver different vibes to the viewer. Cool colours can evoke different emotions than warm colours, and muted colours can create different feelings than bright colours. This all depends on the psychological purposes for which the colours are being used. According to Suk and Irtel (2010), colours significantly impact the emotion of human beings but it is dependent on the tone, brightness, shade, warmness, and coolness of

different colours. The debate over colours and their impact on behavior and emotion is not new. Previous research scholars divided the colours into different categories and studied their impact and emotion. Warm, cool, sad, happy and energizing are the major themes in which the colours are categorized. Yellow, orange and red are considered warm colour, when these colour are used in marketing, packaging, advertisement and even video games, these colours tend to evoke the emotion of energy, optimism and happiness along with attention-grabbing and dangerous effects (Cerrato, 2012). On the other hand, cool colours such as purple, blue, and green sometimes gives the felling of a soothing and calming effect but also represents sadness. The range of colours categorized as happy colours is also found in the literature. Happy colours are a mixture of warm and bright colours such as red, pink, orange and yellow.

According to Hussein (2010), the lighter and brighter the colour is the happier and optimistic it makes to the viewer. In contrast to the happy colours, there are some colours that are categorized as sad colours. The colours that evoke the emotion of sadness are generally muted and dark such as grey, green, and blue or neutral colours like beige and brown might have a similar impact on the human emotion if used correctly. Other important categories of colours that impact emotion and behavior are energizing and calming colours. Cool colours such as green and blue are also considered as calming colours mint, lilac and baby blue can also have a calming effect (Jonaskaite et al., 2019). However, powerful and strong effects on emotion are evoked by bright colours such as neon colours. Colours like neon green, bright yellow and bright red impose energizing and alerting effect but these colours irritate the eyes and not preferred by the viewer to be used on console (Bell, 2013). While emerald, green, magenta, turquoise and royal blue hold the potential to make the user energized and refreshed as these colours have a stimulating impact. Colours can have various meanings and since their use is subjective in nature then it might be possible that one colour can make the person cheerful while the same colour can be irritating for another person. Apart from this aspect, it can be said that emotions, and behavior are closely linked to the psychological use of colour.

2.2 EVOLUTION OF COLOUR IN VIDEO GAMES

The appropriate utilization of colour in gaming is becoming significantly important. According to Küçükünç et al. (2010), the first impression to the user of the video game is the usage of the colour palette. The colour applied in video games can hold the potential of evoking the emotion of the gamer or to set the mood ambience. The function of colours in a video game is considered highly important. The colours used in video games could help the user to identify different objects and it also helps them to see the console of the video game from a real-world perspective (Barnett and Coulson, 2010). For instance, plants are green in colour in the real world, so they are made green in video game as well. Moreover, different categories of colours are used in different games, for instance, nuanced colours are used in core games while casual games use a variety of bright colours. The appropriate usage of colours can make the video game's hierarchically visual, clear, and interactive for the users (Jeong et al., 2012). An important connection exists between the game design and colour. moreover, appropriate colour tones and schemes are used to make the video game more appealing to the user. There are different colour tones and schemes which are described in the below section.

2.3 COLOR TONES

Referring to colour theory, colour tone is defined as “Pure hue with neutral grey added” (Mollica, 2013). The colour becomes less vibrant but remains the same. Following are different colour tones and schemes that are used in video games to make them more attractive.

2.3.1 Warm Tones

Warm colors are a group from the color wheel it crossponded with warmth , sun and fire they evoke the feelings of warm in people.also most of colors can be used as a warm color if you take the right shades , warm colors uses colors like (green ,brown , mustard yellow and warm

reds) you can evoke warm colors from peach amber gold and coral also As discussed previously, warm tones are associated with both comfort and warmth along with representing aggression.

For instance, these are the colours that represent the thinking of a person about sunset and fall. Figure 1 is taken from the game Firewatch and figure 2 is taken from Team Fortress 2 as these two games used warm colours to represent either a safe environment during the sunset or time to go to war.

Figure 2.1: Firewatch



Reference : Firewatch game ¹

Figure 2.2: Team Fortress 2



Reference : team fortress game ²

¹ Figure 1, firewatch <https://www.firewatchgame.com/> (date of access 23 feb 2021)

² Figure 2 , team fortress 2, https://store.steampowered.com/app/440/Team_Fortress_2/ (date of access 23 feb 2021)

2.3.2 Cool Tones

The majority of futuristic and science fiction games uses cool tones and colours to represent sanitized and uncaring future. It has been mentioned previously that cool tones represent sadness, but in the in-game world, the future is perceived as blue which is somewhat cold and bright. Figure 3 and Figure 4 are taken from Mirror's Edge and Portal respectively in which blue colour is used to represent the future.

Figure 2.3: Mirror Edge



Reference : mirror edge ³

Figure 2.4:portal

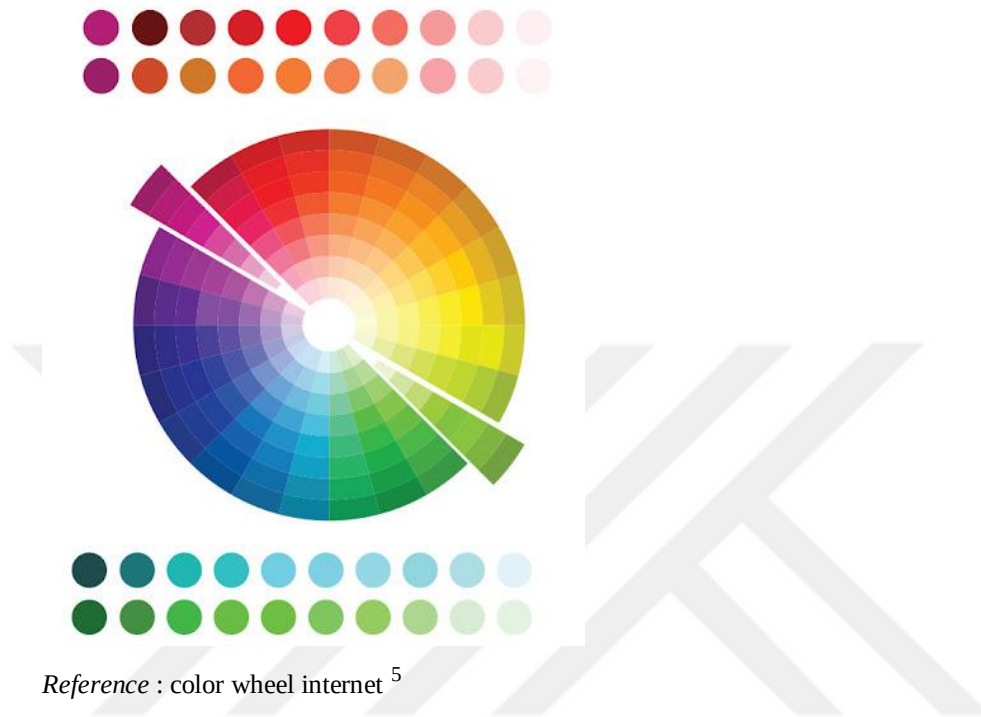


Reference: portal ⁴

³³ Figure 3.mirror's edge <https://www.ea.com/games/mirrors-edge/mirrors-edge-catalyst> (date of access 23 feb 2021)

⁴ Figure 4. Portal <https://www.engadget.com/2011-04-20-portal-1-has-sold-four-million-excluding-steam-sales.html> (date of access 23 feb 2021)

Figure 2.5: color wheel



Reference : color wheel internet ⁵

The color wheel shows the warm and cold colors in it and the shades that you can take.

2.3.3 Western / Dystopian

The end of the world, both metaphoric and geographic is lifeless and grey. Although, bright colours are more likely to stand out when muted colour palette in the game is used. This helps the designers to highlight the important characters and elements in the game. Figure 5 is taken from Metro 2033 Redux, the use of colour is so small that the character's wrist gets the immediate attention of the player. The use of blue colour stands out in comparison to duller colour, ultimately highlighting the important thing.

⁵ Figure 5 .color wheel of warm and cold colors (date of access 25 feb 2021)

Figure 2.6: metro 2033 redux



*Reference*⁶

2.3.4 Noir / Cyberpunk

Noir and cyberpunk in video games are visually related to each other. These tones are focused on bright highlights, deep shadows, and high contrast. It is specifically about the colour of light used along with the texture. Games designers use these colours to alert the player to the important information in a dangerous and dark world. Figure 6 is taken from Batman: Arkham City and Figure 7 is taken from Far Cry: Blood Dragon, in both of these images dangerous locations and important creatures are highlighted with bright neon lighting to warn the user about a treat.

Figure 2.7: batman arkham



*reference*⁷

⁶ Figure 6. Metro 2033 redux https://store.steampowered.com/app/286690/Metro_2033_Redux/ (date of access 25 feb 2021)

⁷ Figure 7 . batman arkham [https://teknosafari.net/yeni-batman-arkham-oyunu-yakinda-aciklanabilir/\(date](https://teknosafari.net/yeni-batman-arkham-oyunu-yakinda-aciklanabilir/(date) of access 25 feb 2021)

Figure 2.8: Far Cry Blood Dragon



*reference*⁸

2.3.5 Monochrome / Limited

Different shades of one colour are used in this colour scheme. To add the aesthetic style and dramatic effect, colours in this theme are used as minimalism. The game designer used this colour theme in contrast with other colours to make the game more engaging and even more striking. This can be visualized in Figure 8 which is taken from the game "Inside", where the designer has used monochrome/ limited colours tones to add the dramatic effect.

Figure 9: inside



*Reference*⁹

⁸ Figure 8. Far cry: blood dragon https://store.steampowered.com/app/233270/Far_Cry_3_Blood_Dragon/ (date of access 25 feb 2021)

⁹ Figure 9. Inside <https://store.steampowered.com/app/304430/INSIDE/> (date off access 26 feb 2021)

2.4. GENRAL REVIEW ON GAMES

The computer games industry (development, publishing, and promotion of games) is one of the fastest developing industries of computer technology and at the same time the global sector of entertainment. Games became cultural phenomena and are recognised as works of art. The number of gamers is growing (2.5 billion players in 2019), and gaming itself is becoming a highly paid profession (Mason et al., 2020). A powerful ecosystem is being formed. Around a nucleus consisting of game developers and publishers, specialized media, special financial and advertising tools; specialised physical sites appear (Internet cafes new generation, locations for cyber tournaments, etc.); game development is being taught at the highest educational institutions, etc. In addition, players from adjacent markets also want to occupy their niche - electronics manufacturers (such as Apple) or Internet corporations (such as Google), possessing all the resources to bring promising gaming solutions to the market. As for the key trends determining the development of the global gaming industry, then here, first of all, it is necessary to note new technologies: mobile, cloud, virtual, graphic, artificial intelligence, etc. For several years, computer games are actively integrated into social networks. A reverse trend has also appeared – they themselves become a kind of social networks (Fava, 2021). The popularity of esports is growing. Now eSports tournaments can already be compared to championships in traditional forms of sports by the size of the prize money.

The initial mobile game was launched in 1994 as Tetris, it was pre-installed in a mobile called Hagenuk MT-2000 (Goltermann). In 1997, Nokia released a variant of Snake for specific mobile models which was released three years later. It debuted on the Nokia 6110 and has since been installed on over 400 million phones around the globe making it the most popular video game in the universe (Tushar et al., 2019). After those numerous other games, like an angry bird and subway surfers were designed and installed in the Google app store to be downloaded by everyone using smartphones. Previously, the games were installed on specific mobile devices only. The emerging technological changes have made rapid changes in advancement of the mobile games. Massive development over the past few years has been

analysed in the gaming industry. The colours and modes during the last ten years have changed a lot, people were not fond of playing games on a cell phone. Colour is seemingly the second most significant part of your application, after usefulness. The human to PC collaboration is intensely founded on connecting with graphical UI components, and shading assumes a basic part in this association. It assists clients with seeing and decipher the game application's substance, interface with the right components, and get activities. Each application has a shading plan, and it utilises the essential tones for its principal region. Before 2010 the concept of a smartphone was not common, nowadays online gaming is common and is played by everyone beyond the factor of gender and age. When planning a new game application, it's frequently hard to settle on a shading plan that functions admirably, as there is an endless number of conceivable shadings mixes out there. With the factors of education, the game developer now recognizes the psyche of colours and the human mind therefore they use monochrome, complimentary and other colour schemes, that are significantly complying with each other. A mood board is designed before selecting one colour scheme and if the game is digital like Pubg and call of duty more colour themes are used. Women are also fond of playing fighting games due to the beautiful colours and attractiveness of game towards them. The colours used in the games are being board before developing the game, each colour has its own specific emotion that reflects the situation immediately. That's why the selection of colour tones and schemes in developing game is important.

2.5. HYPER-CASUAL GAMES GENRES

Hyper-casual is a genre of versatile games played by people of all ages, men, and women. When creating such games, a game designer must consider the needs of the widest possible range of players, and attempt to make a game that will please everyone. It should be simple and straightforward, and the graphics should not cause rejection. In the hyper-casual genre, certain standards have developed - a player spends an average of 25-35 seconds on one attempt to complete a level (Iacoviello 2019). Due to this, games of this genre usually

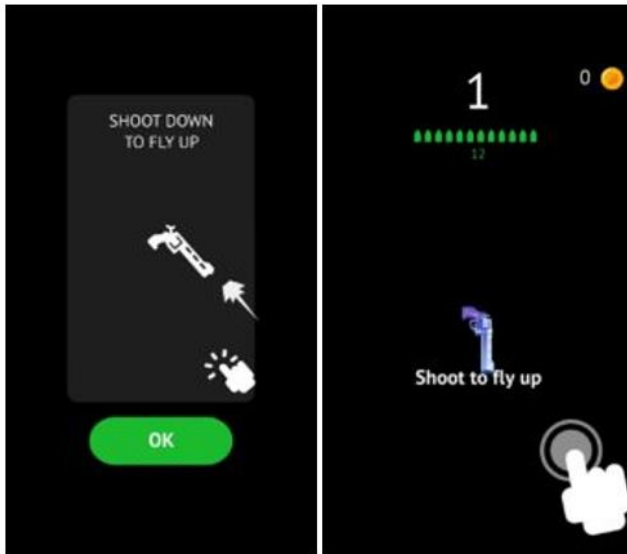
do not have a pause mode. Such short sessions allow the users to easily get distracted from the game and come back when there is a pause of a couple of minutes again.

2.5.1 Mechanics

Sometimes colour is used in the very mechanics of the game. Exit Palette is a colour-mechanic puzzle game. The player must find a way out of each level by painting objects in different colours. Each colour endows objects with certain qualities (such as the ability to fly), and mixing colours allows the player to obtain those specific properties that will help solve the puzzle. Hue is a game in which the player must move colorful objects to make them disappear (Mason et al., 2020). In DayZ, fabrics need to be dyed with dyes made from primary colours. By mixing berries in different proportions, secondary and tertiary colours can be obtained. In some games, the mechanics are based on the ability to distinguish colour shades (Reis and Correia 2012). In the game Blendoku, you need to arrange colored squares in a gradient order, building them up like a crossword puzzle. In Huedoku, the same idea is implemented on a square grid. These games are parallel to the Online Colour Challenge, which trains your ability to collect colour elements in a gradient order. Game Brandseen uses colour-memory players to remember the colours of popular brands and get points for them.

To speed up the process of immersion in hyper-casual, you can make the levels shorter, reduce the number of screens (for example, abandon the level map), remove the training mode (why is it needed if the game mechanics are intuitive?) (Wohn, 2011). For example, the visual style of Tomb of the Mask is reminiscent of the arcade games of the 1990s, which used the same mechanics (Avoidance) and it uses pointers to speed up the session and illuminates the buttons that the player is advised to press. This technique allows the user to quickly jump between levels and upgrade the character without going deep into the settings.

Figure 2.10:immersion in hyper-casual game



*Reference*¹⁰

In addition, if the game "weighs" little and is not demanding on the "hardware", then even users with weak phones and the Internet can download it. This approach helps to expand the audience of the game and reach users from third world countries. Therefore, you need to strive for the game to load faster and weigh as little as possible. There are several ways to reduce the "weight" of the game, one of them is to simplify the graphics (Nurminen 2013). This technique is used in many hyper-casual games, creating minimalistic designs. Simplified graphics require fewer smartphone resources and focus the player's attention on the gameplay.

2.5.2 Monetisation Strategy In-App Purchases

Hyper-casual games have become synonymous with hyper-popularity: in 2018, one in 20 mobile app installs in the world were hyper-casual games (Iacoviello 2019). Fast to develop, with simple game mechanics and not very complex graphics, hyper-casual games have

¹⁰ Figure 10. Immersion in hyper-casual game taking by zahraa algunaaid (date of access 28 feb 2021)

brought fame and money to some companies. Today, game designers and mobile marketers are striving hard to get success in targeting their customers by effective monetisation strategies instead of the traditional way of spending hours on the game-building process in order to accomplish ultimate goals in terms of revenue. Being simple and easy Hyper Casual games have successfully changed the gaming dynamics and users' experiences. While monetizing the gaming content over the internet, developers tend to know their users' expectations and preceding experiences in order to give them more improved experiences and generate the desired revenue. For this purpose, the marketers adopt three common methods comprising advertising and cross-promotion, premium app strategy, and in-app purchases in their hyper-casual games monetization process.

2.5.3 Advertising and Cross-promotion

Marketers consider In-app advertising as one of the key bases to generate cash inflows for hyper-casual games. Researchers have noted that the influence of mobile marketing can greatly increase revenue through advertisements. However, the popup ads feature in in-app ads during the users' gameplay can adversely impact the marketing strategy and put a company at a high possibility of uninstallation. Effective marketers put the ads in between gameplay pauses or gameplay levels (Reis and Correia 2012). In addition, some of the successful companies like Ketchapp and Voodoo have also benefited through cross-promotions. In actuality, their marketing efforts have helped them to reach such an extent that around 48% of the gaming users download arcade games. Most of the users have reported a better gaming experience with mobile applications. Researchers have found more than 70% of gaming users uninstalling an application within three days (Wohn 2011). Thus, cross-promoting is very much influencing which encourages gaming users to download a new application by uninstalling other applications.

2.5.4 Premium App Strategy

The enormous upsurge in the amount of Hyper Casual games users enabled developers to different user behaviours, generally ensuing low retention rates, relatively quick ROAS, and short-term LTV. This fact has enforced developers to explore technological solutions for taking effective and real-time decisions in terms of monetisation, Premium apps are the opposite of freemium apps. These apps account for more than 40% of mobile apps on the App Store priced at around \$0.99 or more (Wohn, 2011). The application value is very much significant for a user to decide whether to purchase a game's premium version or not. It is recommended for marketers to use the freemium option to sustain their products value and users trust if they are uncertain about their product's value and users' experiences.

2.5.6. Similarity between hyper-casual Games and 80s Retro Games

Hyper-casual games have become trendy and popular in recent years, however, the research of the author Cole (2020), described the context of these kinds of games in terms of mechanism, genre and designs as not new as they have a similar context to the arcade games played in the 70s and 80s, referring to the only difference being that the hyper-casual games are now played on mobile where back then the retro games were played on arcade machines.

However, the use of high-resolution designs, utilization of a wide range of colours, in addition to genre renaissance have revolutionized the hyper-casual games and made a shift in the market, not to mention the development in UI/UX, where the intuitive user interface pairs with a user experience that entertains and makes a perfect formula for continued engagement and long-term retention. For instance, one of the most popular videogames, "Super Mario" was played in the arcade back in the 80s, is now available on mobile phones with extra features and high resolution (Wolf, 2013). Other examples of games that were played in the arcade in the 70s and 80s and continue to be played to this day as hyper-casual games are Donkey Kong, Street Fighter, Pac-Man, and Tetris. Even Google joined the

momentum by slipping in an easter egg that lets people play “Image Breakout” within the search results.

This indicates that the context or the main concept of the games developed in the 80s is parallel to this era’s games, but the devices on which they are played, and the colours and features developed in them have seen great change since that time.

So, what are hyper-casual games? How are they different? and how did they revolutionize the gaming industry?.

Hyper-casual games are lightweight addictive type of games, easy to learn and play, with very little attention and time required. They are usually focused on the core gameplay making the core game very interesting and intense. Just like the retro 80s, their simple game mechanics and minimalistic approaches of design ensure an engaging experience, a tap-to-play kind of simplicity.

Even though the retro arcade games started perishing 30 years ago, the similarities between them and this era’s hyper-casual games are immense, both can be developed within a matter of weeks, with a team of one or two developers working from home, in addition to being able to roll-out a prototype within days.

Most similarities between the old days’ retro games and the hyper-casual innovations come to appear when we discuss mechanics. These games are usually confined to 5 mechanics: timing mechanic, puzzle mechanic, object fall/rise mechanic, to stack mechanic, and growth mechanic.

Just like the good old days’ arcade retro, hyper-casual has intuitive mechanics with the ability to remain consistent throughout the gameplay or may require more tactics as the game becomes more difficult. <https://clevertap.com/blog/hyper-casual-games/> . Despite the ease of use, great hyper-casual games are difficult to master, and although there could be an

increasing challenge within the gameplay, users still become comfortable with the game's mechanics as the game progresses.

While we highlighted the similar mechanics in terms of simplicity, and the addictive element both 80s retro and hyper-casual games bring into the table, these games have clear goals, there are usually no scenarios where you instantly jump into the gameplay.

Hence where does the differentiating element between 80s and hyper-casual come in? The answer is technology. In 2014, the mobile games industry was rocked by a no-name developer with a super-simple game. That game was Flappy Bird. Developer Dong Nguyen had released the game in May 2013, but it didn't go viral until early 2014. The game spread like wildfire and at its peak, was making \$50,000 per day from in-app advertising, according to Nguyen.

Having witnessed the success of Flappy Bird, and the demand for this type of games, publishers and developers began to realize the huge market potential for ultra-simple, short, satisfying, fun for everyone, and easy to pick up and play games, launching the hyper-casual games industry.

Those simple-mechanics based games, began to utilize technology, the developers of today have many advantages that we weren't available in the '80s, which can help make the games they are developing much more successful, first and foremost, Access to internet. Developers set out to implementing many success elements to hit the next level, they gained access to many tools and engines such as Unity, the usage of colours and art assets were a game-changer, not to mention the sound fx

.

There is now a huge global audience, developers no longer need to manufacture cassettes and distribute them to stores, they can access their audience in the push of a button, and they can do that from anywhere in the world with an internet connection, developers now have access to global digital communication channels.

Internet and online resources were indeed the number one enabler in this evolution, but what made this shift in the market was the business model. Some actually refer to hyper-casual games as a successful business model, rather than a game type. The potential to make millions in profit was the actual turning-point.

These games have a simple monetization model, With the vast majority of these games being free, they use a relatively new way to monetize, in-app advertising and sophisticated user acquisition. And in demand for ads revenue to make sense, the cost per install (CPI) must be low.

“Hyper casuals are reliant on very low CPIs,” Thiago Monteiro, Director of Growth at Peak, observed in a recent panel at Mobile Spree, “as soon as an audience gets too expensive, they need to step out.”, speed and momentum are paramount.

The underlying reason for this rapid success after the revolution is Data. These games are data obsessed. For all these available resources to be worthwhile, and to achieve viable user acquisition and a sustainable business model, Hyper-casual games use a data-driven approach. With all the data available for developers to do extensive quick testing, and prototyping, they have a competitive advantage of validating before creating a game that may flop, therefore reducing risks, and relying of data-driven insights and decisions.

Hyper-casual games achieved to create a form of loyal following, where the game addicts are fiercely loyal to the format, Within the year of 2018-2019, hyper casual games grew in the share of gaming app installs in up to 3.5 times, in Q1 2020 hyper-casual games saw hyper-growth. Globally, installs more than doubled from December 2019 to March 2020. According to hyper-casual gaming in 2020 report by Adjust, users didn't just download more hyper casual games; they also played them more often. Adjust data reveals sessions grew by a whopping 72% in March 2020, further reports also highlights that Globally, the total installs per 1,000 impressions increased by 18.2% from Q4 2019 to Q1 2020. This indicates users are more engaged with ads and more likely to act as a result of viewing them.

Today, we can easily pick up our devices for some hyper-casual gaming whenever the gaming urge strikes, these powerful gaming consoles are right in our pockets. But hyper-casual development phenomena will not stop at this point, developers are continuously seeking new-found ways to do more automations to acquire users, increase efficiency, and exploit the ad creation and advertising stream. The competition is relentlessly rising, and that means better and new games for players.



3. METHODOLOGY

3.1 RESEACH PHILOSPHY

The research philosophy of this study determines how the data is gathered and analyzed by the researcher. It is the art that the researcher is following throughout the research process to achieve the aims and objectives. Studies show that it is the belief of the researcher to maintain the flow of the data throughout the research (Cazeaux, 2017). Research philosophy can be categorized as positivism, interpretivism, realism, and pragmatism among which positivism and interpretivism are commonly used by many researchers. According to Alharahsheh and Pius (2020), positivism is mostly used with quantitative methods whereas for subjective realities and human experience researchers use interpretivism philosophy. In the following research, the researcher is aimed to analyze the emerging themes of the hyper-casual games and the importance of a wide range of colors in it which cannot be quantified, thus, positivism as a research philosophy cannot be used. Considering this aspect, the research has utilized interpretivism research philosophy which not only preferred the qualitative nature of the study but has also enabled the researcher to generate new meanings and there from the study towards the end.

3.2 RESEARCH APPROACH

An accurate research approach is necessary to manage and control the actions throughout the research process According to Gregory and Muntermann (2011), the research approach should be selected in a way to accurately manage and control the activities in shaping the flow of the study. The research approach can be categorized as deductive and inductive. In light of Fellows and Liu (2015), the inductive approach facilitates the development of new theories and making the research incorporate generalization in results. Whereas the deductive approach makes the researcher test the hypothesis developed during a survey. Since in the following research no hypotheses are developed, therefore, deductive research approach cannot be considered to test the hypotheses. Therefore, while considering the research

objectives, the researcher in the following study has opted for the inductive research approach, which has facilitated the researcher in generating new theories towards the end of the research about the use and importance of colors in hyper-casual games.

3.3 RESEARCH DESIGN

Research design outlines the techniques and methods that are to be followed by the researcher in data collection, interpretation, analysis and discussion. It determines the complete strategy followed by the researcher to achieve the objective of the study. The research design for the study is to be selected by considering the area of the research. The design can be qualitative, quantitative or mixed based on the requirements of the study topic. In light of Tolley et al. (2016), the quantitative research design is based on the collection of numeric and statistical data while the qualitative research design is based on the collection of participants opinion and experiences. The following study is based on a qualitative research design. This is because the domain of the research is qualitative in nature as the researcher needs to determine the importance and usage of colors in hyper-casual games and these aspects cannot be quantified, hence, the qualitative research design is utilized. This researcher design has enabled the researcher in conducting an in-depth analysis of the theories and themes and relevant to the research topic.

3.4 DATA COLLECTION METHOD

Primary and secondary are the data collection methods that are widely used in research studies. In the primary collection of data, the researcher himself is involved as it is collected with the help of a survey questionnaire or interview. On the other hand, secondary data for the research is collected with the help of research articles, journals, newspaper, and another reliable resource (Saunders et al., 2013). It is important for the researcher to choose an appropriate data collection method while considering the domain of the research. Hence, in the following study, the researcher has aimed to collect the data with the help of secondary sources instead of primary. The researcher has opted for this data collection method because

as compared to primary data, the secondary data is easily accessible. It is cost-effective and time efficient as well, as the researcher needs to only use the internet to search for the relevant articles and websites through which reliable data can be collected, instead of conducting interviews and survey for the collection of primary data.

3.5 INCLUSION AND EXCLUSION CRITERIA

In the secondary qualitative studies, inclusion and exclusion criteria are determined. The criteria enable the researcher to extract relevant and up-to-date data from reliable sources that can be included in the analysis section. Hence, for the following study, the research journals and articles that are related to the importance and usage of colours in hyper-casual games are included, and all the research articles and journals that are not relevant to the research topic are excluded. the articles and journals that are published after 2010 are included and others are excluded. Articles and research journals published in any language other than English are excluded.

3.7 DATA ANALYSIS

Once the data was collected for the research, it was analysed with the help of appropriate tools and technique. The analysis tool is based on the nature of data that is collected for the research. The following research is based on secondary quantitative research design and hence the data collected in this regard required an in-depth and systematic way of data analysis. The qualitative data collected for this study is analysed with the help of content analysis. Content analysis or secondary data analysis technique utilised in the following research has enabled the researcher to use the existing literature and research work, relevant to the research topic in different ways to answer the research questions and objectives, along with generating the viable outcomes, which ultimately impact the validity and reliability of the research positively.

3.8 ETHICAL CONSIDERATIONS

Ethical consideration is considered the most important part of the research as it determines the reliability and credibility of the research. Considering its importance some ethical considerations are also taken into account by the researcher in the following study. The ethics considered in this study are given below.

- The information used from the previous research studies in the literature is properly cited to give adequate credit to the original researcher.
- The outcomes are purely based on analysis and there is no interference of researcher's bias.
- Use of data has not resulted in any kind of distress or damage.

4. CASE STUDY AND DISCUSSION

4.1 INTRODUCTIONS

This chapter aims to highlight the results and findings from the secondary qualitative data that is collected for the research. All the methodological tools and techniques that are defined in the previous chapter applied in this chapter to generate the research outcomes and make them align with the research objectives and research questions.

4.2 QUALITATIVE RESULTS

The colors and emotions are closely linked to each other as the different color impact the psychology of human beings and for many decades, different and specific color palettes have been used in videos, advertising and video games to evoke emotion and impact choices. The use of color in video games and hyper-casual games has been evolving for many decades. The research conducted by Nordberg (2020), use four video games, namely Night fire, Monkey Bowling 2, Tetris Super, Fun Race 3D and Crowd City to determine the difference in the emotional responses of the player elicited on the basis of a wide range of colors used in the video games and hyper-casual games. Six effective states of emotion on the basis of colors used in the game were determined, which included depression, joy, pleasure, relaxation, anger and fear. The research further concluded that valance and arousal are the two important things in enhancing the emotions of the player in the video game that is linked to the color used either for the character or the background. For the secondary qualitative data collection, it has been identified previously that the best predictor of the emotions in hyper-casual games colours, but it has been confirmed by the research of Keo (2017), that by changing the warmth, brightness and saturation of different colors in the hyper-causal games the emotions of the players can easily be altered. Hence, it can be said that the correct use of colours in hyper-casual games is important and holds the potential to significantly impact the emotions of the players. For instance, the use of pastel colours in the action game cannot give

the feeling of fear and tension to the player, as the pastel colours are perceived as happy colours.

The table given below determines the colour categories in which each game lies along with the genre and emotions of each game.

Table 4.1: Game categories, genres and color.

Hyper-Casual Game	Genre	Colour Category	Emotions
Night Fire	Action, mystery, adventure and shooting	Green, blue, black and shades of brown 	Fear, alert, danger, anger and excitement
Monkey Bowling	Platforming and party	Gold-yellow, blue, red, pink and purple 	Joyous, fun and happiness
Fun Race 3D	Adventure and maze	Red, blue and yellow	Fun, fear, excitement and joy

			
Crowd City	Action	Green, purple, blue and pink 	Fun, fear and excitement

The table given above determines how different colours are used in different genre of games to evoke different emotions in the player, but the different game genre with the same colours utilisation can evoke different emotions varying from user to user. For instance, the colour palette used in Night Fire is to set the context of the game and make it look dangerous to the user but in the game of Crowd City same colours are giving rise to fun and excited emotions. This is because the contrast and density of colours used in both games are different. Moreover, the colour palette used in the games, Monkey Bowling and Fun Race 3D are nearly the same, and the colour choice of the game designer in both games is justified as shades of red, blue and yellow colours used in the games are evoking the emotions of fun and excitement among the players which also reflects the genre of the game.

The effect of colours such as blue and red on the emotion of the hyper-casual game player was determined by the research of (Mason et al., 2020). The most recent hyper-casual games such as Fun Race 3D, Jelly Jump and Crowd City were used in the research and the colours of these games were manipulated to high contrast of red and blue. The research revealed that

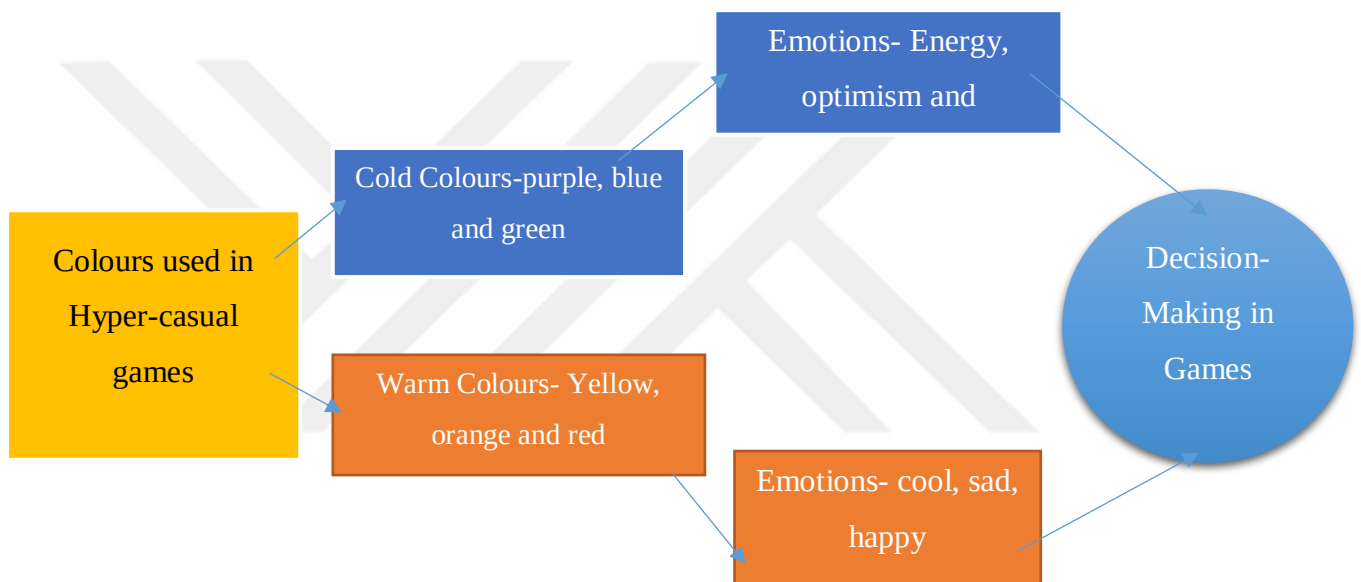
the participant in the blue colour category was less likely to get aroused as compared to the participants in the red colour category for the same games. This indicates that the changes in colours can impact the arousal and emotion of the players, and the use of a wide range of colours in hyper-casual games are directly linked to the emotions of the player.

The research also intends to analyse how colour usage in the game impacts the choices of the people made while playing a particular game. In this regard, the research of Iacoviello (2019) is taken into account in which the author confirmed that specific game colours give the player a feeling of fear, anger, anxiety or happiness on the basis of which the choices in the game can be made. In games hyper-causal games, colours are also used as signifiers and identifiers. The different elements in the games can be identified easily with the help of different colours along with alerting the player with the properties of the specifically coloured element. Identifiers in the game, for instance, the colour red and blue are used to separate and group the game elements such as game areas, teams and evil characters. For instance, if the character in the game is coloured red then it is perceived by the player that it is a harmful character and contact with this character must be avoided. These identifiers are also known as colour glyphs and should be mutually exclusive and easy to label from other neutral colours and identifiers. These kinds of identifiers are used in games such as PUBG, Rise of Nations and Kill Zone. Moreover, properties of the elements are also communicated with the help of colour signifiers such as a section of terrain or item which help the player in making decisions. To mark the significance of the progressive elements in the hyper-casual games, they are coloured in blue most of the time, enabling the player to interact with the particular element. This indicates that the colour variations used in hyper-casual games impact the choices of the player.

It has been mentioned previously that colours used in games not only evoke emotions, but also help the player in making a decision in the games, and this has been supported by many studies that are used to structure the qualitative results. On the basis of research aims and objectives and studies highlighted in this section, the conceptual framework for this study can be developed. The conceptual framework given below indicates that there are two tones

in games that are widely used, these tones are either warm or colour with specific colours such as yellow, orange, red and purple, blue, green respectively. Each of these colours is linked to specific feeling or emotions enabling the player to make a decision on the basis of colours in the game.

Figure 4.11:overview of colors used in games



4.2.1 Experiment of changing HVS

Let's start with game art because it's the most important when creating a hyper casual game and let's not forget the gameplay core. Most hyper casual games install is from ad-viewr , in order to do that your game need to be clear in just a few second maximum 30 seconds ad ,the ad need to contain the core of it : the elements , character , abtaccals and so on , the gameplay need to be super clear and satisfying as we talked before hyper casual games is simple easy and what actually make the game other than that is the colors . in order to do that there is many tools and platform you can use to see the best color scheme for your game for example you can use Adobe color its baiscly can give you the color scheme palette you are searching for just by adding a screenshoooot and select the colors then it will give you colors in between.

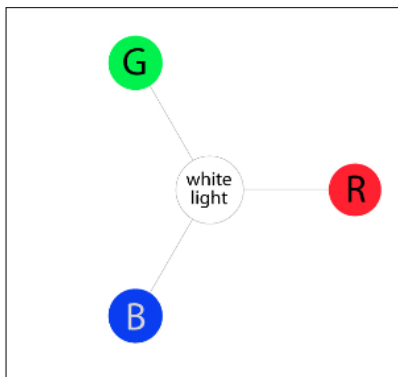
Let's talk more about colors, so colors consists of three main integral parts:

A) Hue

Hue is more specifically described by the dominant wavelength and is that the first item we consult with (i.e., “yellow”) when adding within the three components of a color. Hue is additionally a term which describes a dimension of color we readily experience once we take a look at color, or its purest form; it essentially refers to a color having full saturation. When discussing spectral “light primaries” (RGB), a pure hue like full saturation is decided by the ratio of the dominant wavelength to other wavelengths within the color.

The three primary hues in light are red, green, and blue. Thus, that's why televisions, computer monitors, and other full-range, electronic color visual displays use a triad of red, green, and blue phosphors to provide all electronically communicated color. As we mentioned before, in light, all three of those wavelengths added together at full strength produces pure white light. The absence of all three of those colors produces complete darkness, or black.

Figure 4.12: HUE



Reference ¹¹

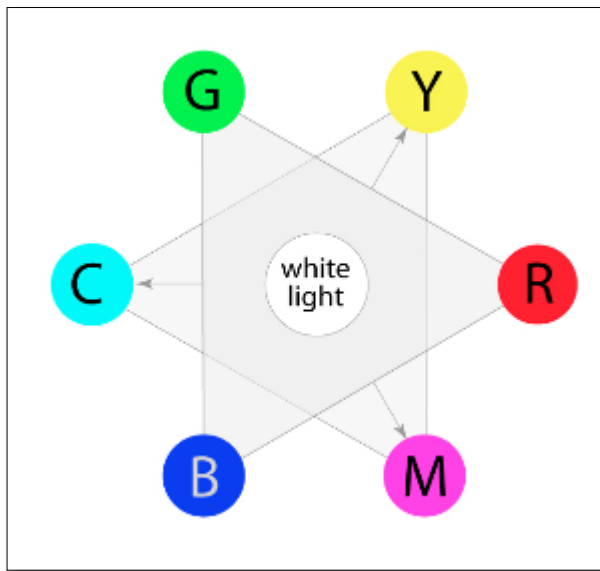
Mixing Adjacent Primaries = Secondary Hues
Making Cyan, Magenta, and Yellow

¹¹ Figure 11 hue <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 20 july 2021)

Although additive and subtractive color models are considered their own unique entities for screen vs. print purposes, the hues CMY don't exist during a vacuum. they're produced as secondary colors when RGB light hues are mixed, as follows:

- a) Blue + Red light → Magenta
- b) Red + Green light → Yellow
- c) Green + Blue light → Cyan

Figure 4.13: white light



Reference ¹²

B) Value

Next, let's examine the "value "

As is discussed on the "Elements: Value" refers to the lightness or darkness of a color. It indicates the amount of sunshine reflected. When touching on pigments, dark values with black added are called "shades" of the given hue name. Light values with white pigment added are called "tints" of the hue name.

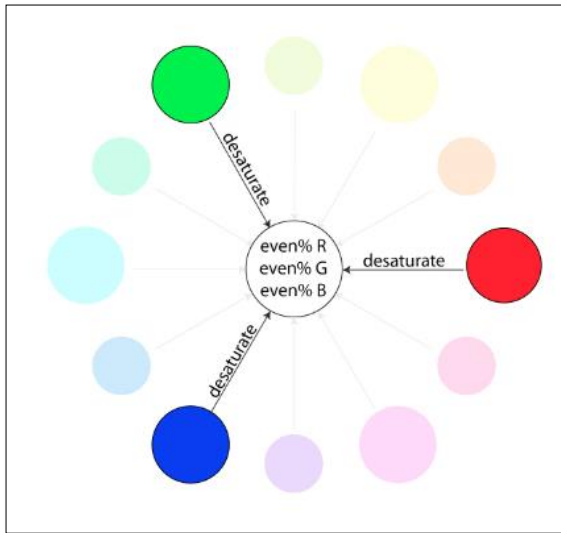
¹² Figure 12 hue <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 20 july 2021)

C) Saturation

Colors are precisely specified by their hue, saturation, and brightness (value). These three attributes of color are sufficient to differentiate one color from all other possible perceived colors. The hue is that the aspect of color usually related to its name like red, blue, yellow, etc. Saturation refers to relative purity. When a pure, vivid, strong shade of red is mixed with any amount of gray, weaker or paler reds are produced. All those produced reds will have the identical hue, but different saturations. Brightness is related to the full amount of sunshine energy present in this color ("Colour"). the feeling of one color may vary with a change in anybody of the three attributes of that color. In other words, when saturation and/or brightness and/or hue of a color change, the feeling of that color also changes. Saturation defines the brilliance and intensity of a color. When a pigment hue is "toned," both white and black (grey) are added to the colour to scale back the color's saturation. In terms of the "additive" light color model, though, saturation works on a scale supported what proportion or how little other hues are represented within the color.

Saturation is additionally observed as "intensity" and "chroma." It refers to the dominance of hue within the color. On the border of the hue wheel are the 'pure' hues. As you progress into the middle of the wheel, the hue we are using to explain the color dominates less and fewer. after you reach the middle of the wheel, no hue dominates. These colors directly on the central axis are considered desaturated.

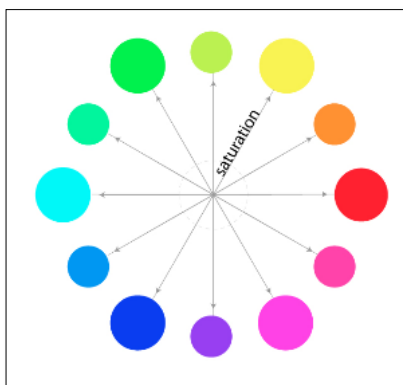
Figure 4.14: value



Reference ¹³

Naturally, the other of the image above is to saturate color. the primary example below describes the final direction color must go the color circle to become more saturated (towards the outside). The second example depicts how one color looks completely saturated, having no other hues present within the color.

Figure 4.15: General Saturation Direction

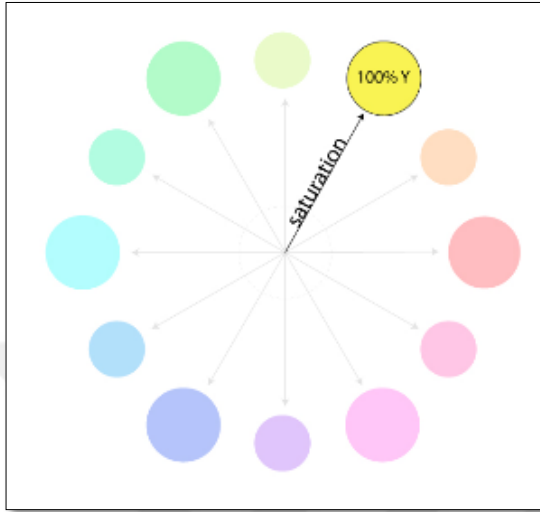


Reference ¹⁴

¹³ Figure 13 value <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 20 july 2021)

¹⁴ Figure 14 genral saturation direction <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 23 july 2021)

Figure 4.16:Pure” Hue With Complete Saturation: no other hues present



reference¹⁵

So how can these translate into a design language? Let's consider it. Hyper casual games are simple in concept, aimed toward providing a fun user experience, and therefore the design language should reflect that. Hyper casual games usually don't include user instructions, and words are kept to the minimum. Given the shortage of words and detail, it's right down to other factors like palette, contrast, shading, and more that may influence the user experience. Hyper casual games call out for interesting and colorful visuals, clean lines, and geometric angles. At the identical time, given the simplicity, there's limited scope for trying something new. Users must be ready to understand what they have to try and do immediately, which will come from the visual of the look. the proper colors influence player behavior and influences how they interact with the sport. Hyper casual is robust, attractive, eye catching. The palettes you select should be bright, strong colors that stand out. Every element should stand out. When it involves the palette, plan of the box, anything goes. As long because it is big, bright, and bold. At the identical time, remember to stay it simple.

¹⁵ Figure 15 Hue With Complete Saturation: no other hues present
<http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 24 27 july 2021)

Too many colors within the palette and you'll overwhelm the sport, distract users, and flood their senses. Contrasting colors enhance the image on the screen, create a sense of fun, and produce users back again and again. Contrast incorporates a practical purpose too – every element should stand out so it's easier to grasp it and recognize its purpose. Different sets of contrasting colors also are an excellent way of showing players that they need levelled up. Color shades lead the attention, add depth to the screen, and overall create an environment and environment for your game. you may want to consider the employment of shades from your palettes to make atmosphere. Hyper casual games are simple, and encourage clean lines and clear shapes. These lines and shapes will work along with the colours to make the general look and feel of your games. The shapes you decide on will influence how the player understands the game .

D) Contrast

Successive contrast is that the phenomenon where the intensity or chromaticity of a part of the visual view is modified by the preceding stimulus (Williamson and Cummins 331). When eyes are fixed on a coloured patch during a painting for a sufficient period of your time and so they're removed on a distinct patch of a different color, it's likely that the image of the primary patch is perceived upon the image of the second. This phenomenon, successive contrast, is principally caused by the variation of the response of the sensory system with time.

Simultaneous contrast is that the phenomenon where the visual intensity or chromaticity of a part of the sight view is modified by the intensity or chromaticity of adjacent areas (Williamson and Cummins 331). one in every of the foremost common experiments for the phenomenon is fixing the eyes on a square neutral gray patch at the middle of a green area. With a green surrounding, the neutral gray patch looks reddish. because it is difficult to regulate the motion of eyes in normal viewing, the occurrence of simultaneous contrast might include an afterimage contribution from the previous stimulation. Simultaneous contrast is additionally called spatial contrast. The changes in perceiving colors

while there's simultaneous contrast don't seem to be usually noticed, especially when there's a comparatively large background. If two different color patches of equal size are placed side by side, both will exhibit changes in color appearance. When the patches are separated, the changes decrease and eventually diminish, because the distance between them is increased.

Simultaneous contrast effects the hue changes by roughly superimposing the complementary of the background on the foreground patch. This hue change is in the course of changes within the perceived saturation reckoning on the afterimage chromatic color produced. for instance if a blue-green patch is viewed against a red background, the patch are perceived as blue-green again, but with an increased saturation. The afterimage complementary of red is cyan, and when cyan is visually superimposed on blue-green, the patch will look “more” blue-green. Thus, the induced blue-green accentuates the focal blue-green present, which increases the number of blue-green hue relative to the number of white already present within the focal color (Agoston 201). counting on the afterimage produced, for a distinct color patch, suppression can also be observed.

Simultaneous contrast occurring between same hues of different saturations is explained well by Agoston:

Let us now consider what can occur if the color of the patch is at reduced purity, for example a red patch on a background that has the same hue but higher purity. The perceived saturation of the patch is diminished because the induced blue green suppresses some of the focal red. It is possible that, in a second patch of still lower purity, the blue green may be just sufficient to suppress the focal red and leave a neutral gray appearance. In the third patch of purity lower than that of the second, the induced blue green will be more than enough to suppress the focal red; the patch will have a faint blue green appearance.

As shown above , contrast should not be interpreted as subtraction but as a ratio . Kelly (1976) was one of the earliest ones to conduct a study about chromatic luminance contrast.

Table 4.2: Chromatic luminance contrast

Color selection number	ISCC-NBS color name	ISCC-NBS centroid number	Luminance factor Y	Munsell value V
1	White	263	0.90	9.5
2	Black	267	0.0094	0.8
3	Vivid yellow	82	0.59	8.0
4	Strong purple	218	0.14	4.3
5	Vivid orange	48	0.36	6.5
6	Very light blue	180	0.57	7.9
7	Vivid red	11	0.11	3.9
8	Grayish yellow	90	0.46	7.2
9	Medium gray	265	0.24	5.4
10	Vivid green	139	0.19	4.9
11	Strong purplish pink	247	0.40	6.8
12	Strong blue	178	0.13	4.1
13	Strong yellowish pink	26	0.43	7.0
14	Strong violet	207	0.10	3.7
15	Vivid orange yellow	66	0.48	7.3
16	Strong purplish red	255	0.15	4.4
17	Vivid greenish yellow	97	0.63	8.2
18	Strong reddish	40	0.070	3.1
19	Vivid yellow green	115	0.40	6.8
20	Deep yellowish brown	75	0.070	3.1
21	Vivid reddish orange	34	0.24	5.4
22	Dark olive green	126	0.036	2.2

Source: Agoston 92.

As shown above in table (4.2) the color immediately preceding it in the list, also contrast with the earlier colors , the first nine colors provide maximum contrast not only for people with normal color vision , but also for people with color vision difficulties or known as color blind (red-green) agoston comments in kelly's findings that if: - the color pairs in the list are not additively complementary they are predominantly brightness contrast (agoston 92-94) kelly's criterion was that the farther two points apart in CIE color space ,the more distinguished they are . carter and carter also supported this criterion , they found that difference of 40 CIELUV units or less is too small to be generally useful in high-contrast applications , the farther two color points apart on two-dimensional cia (y.x) graph and approach the boundaries , the more saturated both points become. The author believes that one should better explain the contrast-causing color attributes and therefore define colors with high luminance contrast and colors with high contrast chromatic (saturation) contrast separately .

As shown below in table (4.3) we did analysis 10 games taken from a research we did between games listed in rising high academy and global gameforum (2020) this table will explain the genres mechanics , platform and colors used in , during the course of 10 months each of these games was once marked for top downloads , but in mobile games the number of downloads actually change every month.

Table 4.3: hyper-casual Games Analysis

name	Genre	Used colors	Ios / android	mechanic
Soccer kick	Tap	Shades of green , warm red ,gold ,grey ,blue	App store/google play	Timing
Gummy drop	Tap/swipe	Purple ,blue , gold , grey ,neon and bright	App store	Fall/rise
Stack	tap	Shades of grey and green	App store/google play	Stack

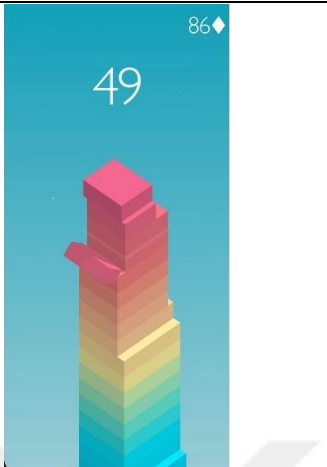
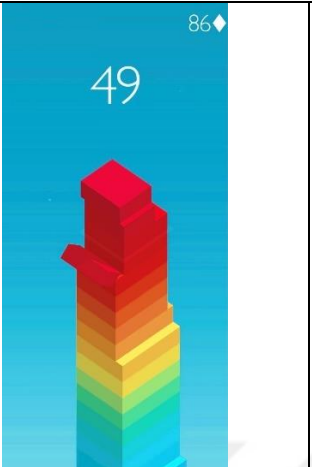
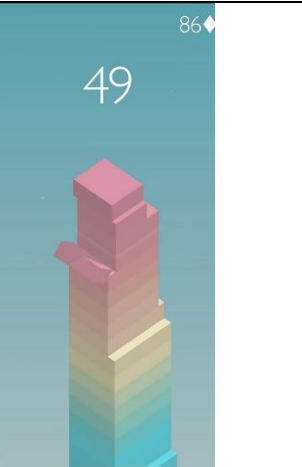
Hole.io	Tap/swipe/drag	Grey ,blue ,green	App store/google play	Growth
Acrylic nails	Tap	Pink shades of purple ,green and brown	App store	Timing
Blend it 3D	tap	Blue green red and their shades	Google play	Timing
Drive hills	Drag/swipe	Blue purple orange yellow brown	App store/google play	Turning
Flappy floor	tap	Shades of green , blue ,white	Google play	Timing
bungeet	Swipe/drag	Blue , green , gray ,red and white	App store/google play	Fall/rise
Johnney trigger	tap	Gray , green .blue brown orange	App store/google play	Fall/rise
Farm Land 3D	tap	Green , Brown ,White and Yellow	Google play	Growth
Bridge Race	Tap/swipe	Red,Blue,White	Google oplaylapp store	Timing
Run of life	taplswipe	Blue,green,grey, shades of green	App store	Timing

On the table below we added the screenshoot taking from the games and changed it contrast and saturation in order to know if you chose the right amount of color contrast in your game will actually effect on the player retention and the clearness of the player eyes.

Table 4.4 : screenshot From Games and chaning The Contrast And HVS

Game	Screenshoot	More HVS and contrast	Less HVS and contrast
Soccer kick			
Gummy drop	 16		

¹⁶ All photos wa taking as a screenshoot by zahraa algunaidd (date of access 10 august)

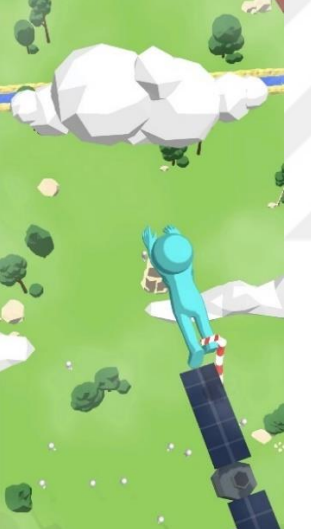
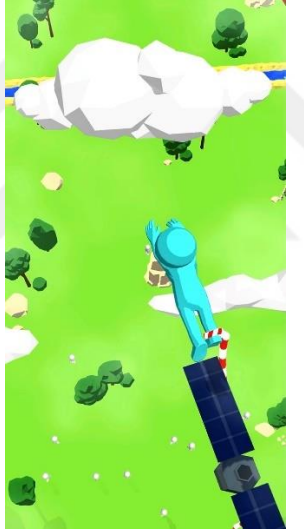
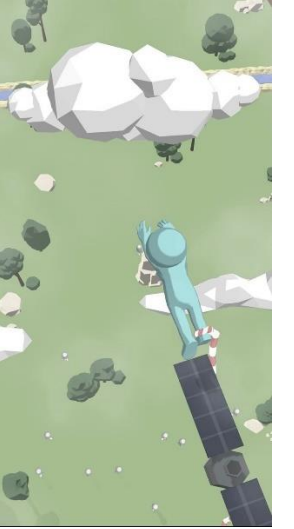
Stack			
Hole.io			
Acrylic nails			

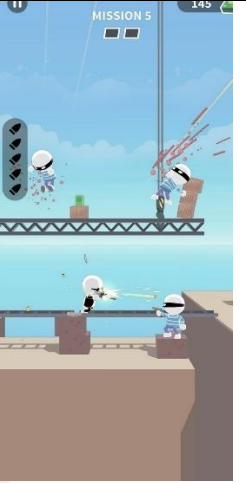
¹⁷ All photos was taking as a screenshot by zahraa algunaid (date of access 18 august 2021)

Blend it 3D			
Drive hills			

18

¹⁸ All photos was taking as a screenshot by zahraa algunaid (date of access 19 august 2021)

Flappy floor			
bungeet			

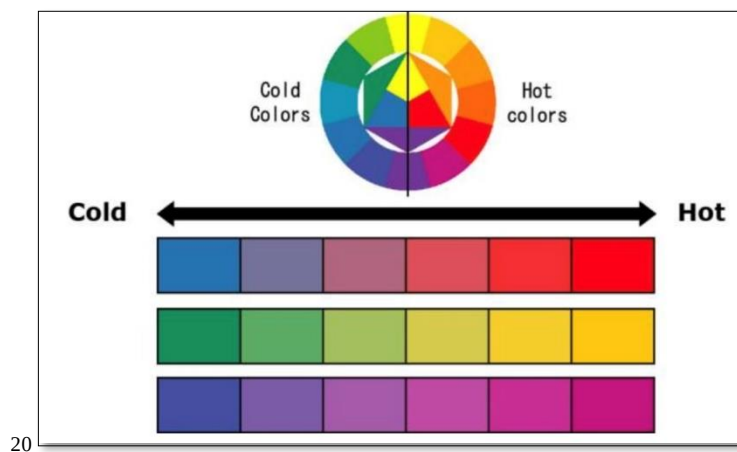
Johnney triger			
Run of life			
Bridge Race			

¹⁹ All photos was taking as a screenshot by zahraa algunaid (date of access 20 august 2021)



observing the table above , as we can see from the screenshots that had been taken from the list of high rise academy and gameforum, looking at the difference from changing the contrasts and just playing with brightness can make a difference compared to the original one, seeing as the high contrasts and saturation; lacking features but showing more obstacle and can catch the eye of the player , hence the high amount of color, therefor catching the attention of the players while making them feel the warmth of the game. looking at the less section, the color losses its warmth while showing more shadows, therefor not attracting the player with its cold colors.

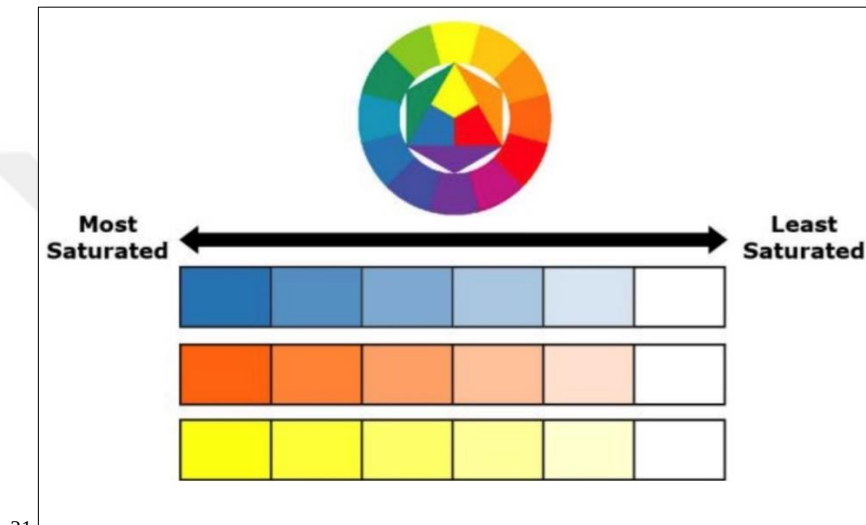
Figure 4.17: hot and cold contrast



²⁰ Figure 17 hot and cold contrast <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 26 august 2021)

The color wheel is divided in half. Any color on the right side is considered a hot color, while any color on the opposite side is considered cold. Using this is to determine which color is considered hot and which is cold.

Figure 4.18: saturation contrast

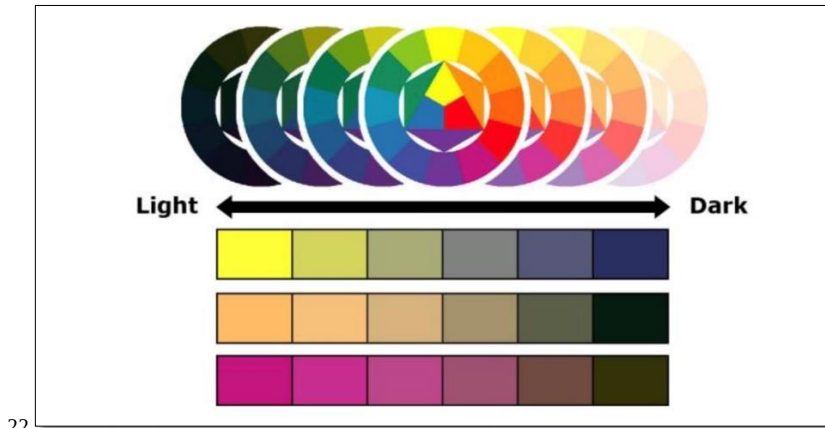


21

the contrast saturation depends on the purity of a color. the more color is blended down , the less saturated it becomes. a saturation contrast is based in the difference between more saturated color and less saturated one.

Figure 4.19: light and dark contrast

²¹ Figure 18 saturation contrast <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 26 august 2021)



a color is mixed with dark or light colors (generally black or white) in order to make lighter or darker colors.

To create an enjoyable gaming experience for users with different skill levels, it is necessary that new methods are explored to accommodate these players in a digital environment. Game environment that confused the player will end up frustrating them. However even though color remains a core component of any digital game, this has shown that color at least when used in contrast will give a significant feeling a warmer feeling but the color itself has no significant on player improvement. The few exceptions can be considered coincidence

4.3 DISCUSSION

4.3.1 Colours In Hyper-Causal Games And Their Link To Emotions

A wide range of literature has been discussed in the study by focusing on the topic of usage and the importance of colors in hyper-casual games. By analyzing the qualitative data it has

²² Figure 19 light and dark contrast <http://www.thesis.bilkent.edu.tr/0001471.pdf> (date of access 26 august 2021)

been found out that the colours used in the games are closely related to the emotions of the player and hold the potential to make the player excited, happy or filled with rage. For instance, the colour red evokes fear or anger emotions while the pastel colours used in the game can demonstrate happy colours. This can further be supported by the literature that warm colours specifically red, black, yellow, orange, and pink helps to evoke emotions in the users and boost their energy and happiness (Cerrato, 2012). The findings of the research revealed that the emotions are linked to the valence and arousal of the player while playing the game which is directly or indirectly related to the colours such as red, pink, orange or blue used in the game. These colours help in grabbing their attention throughout video games thus making them more satisfied and happier. It is also evident from the literature that different colour can evoke different emotion among the users. Hence with the help of the literature and results analysed in the previous section, it can be discussed that apart from the game setting and genre, colour plays an important part in evoking the emotions of the players during the game, ultimately making the player more excited. This leads to the fulfilment of the second objective of the research.

4.3.2 Impact Of Colors On Choices Made By The Player In The Hyper-Casual Game

The secondary qualitative data has been collected and analysed in the previous section regarding the impact of colour on the choices made by the players in the hyper-casual games. The results highlight that warm colours in hyper-casual video games give a more pleasant experience to the people. People feel happier when they experience warm colours in video games. The analysis of the qualitative data the result of the research also revealed that the designers in the game use colours as identifiers and signifiers to ease the game for the player so that the appropriate choices can be made and actions can be taken on the basis of the colour. For instance, yellow is perceived as a happy and energetic colour and if the evil character in the game is of yellow colour then the game player might not perceive the character as evil and continue to interact with it until he realises that the character is evil, but not coloured red, black or neon which are usually the enemy colours in the game. This finding of the research can be supported by the literature findings and warm colours are considered

to provide comfort and reduce aggression among the people (Cerrato, 2012). This shows that colour plays an important part in identifying objects and dangers in a video game. Usually, the designers use bright and dark colours to highlight the dangerous area or any dangerous object within the vicinity.

Moreover, colours help in identifying evil and good characters in video games. Most of the games use dark colours to specify an evil character. Many video game designers consider red, black, dark green, orange and purple colours to make the monsters and villains prominent for the users (Joosten, Van Lankveld, and Spronck, 2010). Similarly, hyper-casual video games use light pastel colours like pink, white, green, blue and yellow to highlight the good characters in the games. Thus colours play an important part in identifying the nature of the character. Besides this, colours in video games help in identifying objects. Hence, by considering the finding of the research, which are perfectly aligned with the research topic, it can be colours used in the hyper-casual game influence the player to make certain moves and if the incorrect use of the colour by the designer to show evil characters, good characters, teams and progressive elements can result in the poor decision made by the player in the hyper-causal game settings leading to the low interest of the player in the game.

4.3.2 Future Of Hyper-Casual Games

With the increased use of mobile phones, the use of hyper-casual games for fun and entertainment has also been increased. From the findings and literature, it has been observed that hyper-casual games have been evolving for many years in terms of genre, game settings and colours. The colours used in the games a few decades ago were not appealing because they were flashy and dark, and are not but into the game by the designers while considering the colour psychology. But in the recent era, colour psychology is considered a more crucial element to be taken into account while putting the colours in games as they hold the potential to impact the decision, valence, arousal and emotion of the player, which ultimately makes the games more exciting and future of the hyper-casual games extremely promising when colour variations, technology and techniques are concerned.



5. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

In this study, different aspects of colours, their usage in the hyper-casual game and how they evoke emotions among the gamers were discussed in detail. To fulfil the research objectives, the researcher utilised secondary qualitative methodology to gather the data. By considering the literature and analysis of the results in the previous section, it can be concluded that different colours incorporate different meanings and hold the potential to affect the emotion of human beings, which ultimately influence them to either like or dislike the game. This indicates that the colour palette used in the game is extremely important and hyper-casual game designers must remain vigilant in choosing the colours of the game in order to evoke the desired emotions. In this regard, while considering the qualitative outcomes of the study, it can be concluded that to some extent, the colours hold the potential to impact the individual reaction to the game, however, another game element such as design, concept, character and genre also impact the responses of a player to the game. From the study, it can also be concluded that the colours in hyper-casual games help the individuals to identify certain objects in the game, such as evil, good, danger or opportunity, as without the use of certain colour use may find difficult in perceiving the meaning of different objects if they are incorrectly coloured. For instance, if dangerous objects are coloured pink, blue or yellow instead of red in the game then it may affect the behaviour and choices of the player in the game.

Another aspect that is covered in the research is the association of emotion with colours used in hyper-casual games. From the qualitative analysis of the collected data in the previous section, it can also be concluded that the player, such as yellow, orange, pink, prefers the use of warm colours in the video game and red can evoke happy emotion, but the same colours can be perceived differently if the genre of the game is different. The psychological use of colours in games is dependent on the genre of the game. For instance, in the action game blue can be used to represent a good character, while in the science-fictional game the same colour

can be used to represent the cold futurist environment, which is dangerous. Apart from emotion, object identification and enhancing the interest of the individual in the game with the help of colours, branding and recognition of the game is also dependent on the colour palette used to design the hyper-casual games. Overall, from the analysis of gathered data, it can be concluded that colours play important role in not only making the hyper-casual game look attractive and appealing to the player, but the use of appropriate colour tones in the game also play important role in impacting the psychological capabilities of the individual such as emotions, behaviour and comparing the game objects with the real-world to make strategic moves. Moreover, with the increased use of mobile phones in the current era, hyper-casual games are becoming extremely popular it is the responsibility of the game designers to make the hyper-casual games more interesting and attractive with the help of appropriate colour design and tones to grasp the attention of the wide audience.

5.2 LIMITATIONS OF THE STUDY

Due to the unexpected COVID-19 pandemic our research faced some limitations with a lack of practical approach to the study. Initially it was planned to conduct in-person edits to hypercasual games by collaborating with game companies which was impossible to conduct with the ongoing pandemic. Therefore, secondary data was utilised for the research which is not up-to-date. Another limitation of the study is that the experience of the real-life game enthusiast and their perspective about different colours used in the hyper-casual games are not integrated into this study, indicating that the researcher does have access to up-to-date and most relevant data related to the research domain which might impact the research outcomes. At first we wanted to work along with game companies and , have participants play the games along with some modifications to the colors scheme the thesis was based on , but due to COVID the idea had to be changed to theoretical research

5.3 RECOMINDATIONS

The importance and usage of colours in hyper-casual games were highlighted in the previous section, however, certain recommendations can be made regarding the colour schemes that might be best for the game players to see on screen. Some important recommendation regarding the game colour is listed below.

- a) The game designer needs to determine the genre of the game first before selecting the colour palette for the game.
- b) To evoke happy emotions the use of warm colours is recommended, while to show futuristic and sad aspects of the game, cool tones can be used.
- c) The game designer must take colour mixing and contrasting techniques into account to add a dramatic effect to the game.
- d) It is recommended not to use highly bright and neon colours in the game design frequently as they might irritate the players.
- e) It is recommended to use the same colours for the real-world objects in the game, for instance, the use of blue colour for representing calm weather.

Concerning the research study, the following recommendations can be made

- a) The future researcher can make use of mixed methodology to make the research outcomes more viable.
- b) It is recommended for future research to compare and contrast the colours of hyper-casual and console game to determine the effectiveness of different colours and how their usage is different in both.

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