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The physical elements in the design of cartoon illustrations affect the emotional perception of people from different cultures and age groups

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Abstract: This study focuses on the effects of the perception of physical elements on the perception of emotions and communication with cartoons of people of different ages and cultures classified by nationality and age range. The objectives of this research were: 1) to analyze the physical characteristics that affect emotional perception and communication; 2) to analyze and compare the relationship between the physical elements of an image comprising cartoons, emotional perception, and communication. This was a quantitative and qualitative study with a population and sample of 300 volunteers from three nationalities and three age groups: Thai, Japanese, and American. The tools used in this study were questionnaires and interviews using a 5-level estimation scale. Data analysis utilized statistics for comparative analysis and determined the mean and standard deviation. The results showed that the emotional and sensory perception levels were very high, with a mean of 4.06 and standard deviations of 0.89. Emotional characteristics create emotional perception and strengthen emotional awareness, which are at a high level, with a mean of 3.95 and a standard deviation of 0.95. Characters and scenes create emotional perception; deformed character ratios create emotional and sensory perception; natural scenes generate emotional and sensory perception; 2D shapes can generate emotional and sensory perception; depth of field generates emotional and sensory perception; and light and shadow generate moderate emotional and sensory perception, with a mean of 3.80 and standard deviations of 0.97. The scene produced a low level of emotional and sensory perception, with a mean of 3.66 and standard deviations of 1.07. Large characters generate very little emotional perception, with a mean of 3.52 and a standard deviation of 1.04. However, the analysis also shows that a $p<0.05$ value is considered statistically significant. Similarly, the interviews showed that the artistic elements were at the highest level of perception generation, and they were also able to analyze and compare physical characteristics according to the set objectives.

Keywords: *Cartoon, Culture, Illustration Design, Media, Nationality.*

1. Introduction

Communication is the process of exchanging information between individuals and groups. Visual language is a communication tool used by humans to reduce the limitations of language differences by organizing thoughts and explaining them using pictures (Visual Thinking) so that the recipient can clearly see and understand what the messenger wants to communicate [1]. However, it has been found that the main problem in visual communication is that the interpretation of the audience may differ from the same image. Therefore, to make visual communication effective, a shared experience between messengers who are responsible for delivering messages through a certain channel is required. The meaning of the signal or symbol sent by the encoder can be deciphered using a signal and a symbol called encoding to the receiver. By decoding the substance, the receiver receives a message as an audience. Physical elements appear through visual perception. Design is based on a variety of factors,

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such as experience, wisdom level, cultural context, tastes, beliefs, values, style, and different lifestyles. The meaning of viewing images depends on the attitudes, values, and experiences of the person; therefore, pictures are more interesting and recognizable symbols than letters. If the user understands the meaning of the image and communicates through the image using illustrations, it can create an understanding for the audience to comprehend the author or convey the story and explain what is written in the same way. In principle, artistic creation is linked to the relationship between concepts, symbolic systems, and representational images, with images as the medium of communication. Therefore, visual communication does not rely solely on artistic knowledge; it also depends on the creator's skills to convey a meaningful story through images, graphics, signs, and symbols included in the image.

Similarly, cartoon illustration is another type of illustration used to communicate stories, emotions, and feelings to convey or reflect the thoughts and attitudes of the author and the people in that society. It also provides knowledge and instills ideas for readers of all ages and cultures. Yon Ade Lose Hermanto has discussed the elements in illustrations that can communicate perception in emotional communication, including feelings such as the size of the lines, the personality of the characters, and the color tone that can represent emotions and feelings, especially the use of lines and colors. The characteristics of the use of lines include black and small pen lines, while the characteristics of the use of colors involve a variety of bright colors and control of color harmony. Similarly, changing colors represent a character's feelings; for example, red indicates anger. Style patterns or styles should be realistic. There are independent shapes and forms that mimic natural features, as well as the use of natural and realistic proportions.

Nowadays, people have entered the digital era where they exchange information and communicate using new media through social networks and social media. In addition to the main purpose of communication, it is also used to express ideas. Symbols or illustrations of various cartoon types are used to express emotions and feelings instead of text messages, such as video clips, sticker lines, and infographics. However, in the creation of illustrations, elements of a variety of physical characteristics can be explained by conveying emotional perceptions. Different feelings and levels of emotional awareness exist; the feelings associated with the physical elements are also different. Because there are other factors that have not yet been proven in form, it is not possible to know which type of factor and which form indicates a good perception of the physical element factor of a cartoon illustration. Therefore, for the recipient to clearly see and understand what the messenger wants to communicate, to make the perception more effective, and to realize the learning process of the creators of works related to images—including painters, designers, scholars, and researchers who use images as a communication tool—physical elements can be used in illustration designs that create perception and convey emotions. These elements can be reliably matched between designers and audiences through the process. Therefore, empirical research recognizes the need to create a process and method for proving elements in illustration design. Classifying the physical elements in illustration design affects the perception of emotions and feelings in a systematic and reliable manner. Consequently, this study focuses on a case study of comic illustration design. In the next section, the review, methodology, results, and discussion are presented.

2. Literature Review

Art design products and visual communication are heavily influenced. Among the visual arts of communication, the most important issue is graphic design. The most prominent function of graphic design is to convey a certain message or product using visual expression. Visual communication evokes similar feelings and emotions, without the need to speak a particular language. The sense of vision is the most important sensory organ for humans. The information received through this sense can be recognized more clearly than that obtained through other senses [2].

The relevant review and theories of this research consist of various factors and methods, which are divided into the following concepts. The physical factors of cartoons include their history in each

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nation. The illustrations work with the interpretation of the visual elements. The purpose of this study was to determine the physical characteristics of cartoon illustrations. Variables and indicators are used to evaluate and determine which factors and physical elements of cartoon illustrations affect the emotional and interpretive communication of people of different ages and cultures. The concept and theory of illustration design in the comic genre consist of character personality design, design factors, the use of colors and lines, the use of colors according to cultural contexts, and the use of colors according to the principles of color theory. This concept study aims to find a way to obtain elements of illustration creation and communication through cartoon images.

Visual Perception Concept: Visual perception and perception include the meaning of perception, the meaning of visual perception, the meaning of visual reading, elements of visual perception, elements of visual reading, the learning theory of the Gestalt group, the concept of visual representation and significance, data processing, decoding, and meaning. The study of this concept aims to obtain visual perception factors, the cognitive processes linked to the interpretation system, the interpretation and perception, and the limitations of a person in deciphering meaning from images.

Communication Concepts: Communication theory is the creation of representations and symbols that consist of the importance of communication, communication elements, communication theories, and factors that affect a person's perception. The study of this concept involves obtaining the communication process factors and creating illustrations to communicate through images, including messenger, message, receiver, encoding, and decoding from images.

Emotional concepts: The basis of human beings consists of cognitive states, physiological reactions, experiential elements, and behavioral expressions. This study aimed to define operational variables such as happiness, sadness, anger, fear, and surprise. However, a literature review of relevant research is required to obtain theories, variables, and indicators to evaluate and determine which factors and physical elements of cartoon illustrations affect the emotional and interpretive communication of people of different ages and cultures.

2.1. Physical Concept of Cartoon Type Illustration

Cartoons have their roots in the Italian word "catone," which means a big piece of paper. This is because they were originally oil paintings during the Renaissance around the 13th century. Later, in 1843, a cartoon sketch by William Hogarth, an English cartoonist, was discovered. The first cartoon to be published in an official magazine was Punch, featuring John Leech's political parody. In 1884, the first comic magazine to be published was Ally Sloper's Half-Holiday. In the 20th century, cartoons began to differ from graphic novels, and in the early 20th century, in the United States, cartoons were published in newspapers and compiled into books.

In 1929, Tintin Adventures was published in a black-and-white Belgian newspaper. The first color-illustrated cartoon was published in the United States. During World War II, society began to face problems that affected the cartoons of that era, which included superheroes such as Superman and Popeye. Subsequently, it was found that cartoons became more diverse, with characters being developed to have more dimensions and to focus on a more mature target audience. The narrative style is presented in squares. The words of cartoon characters are also included in each square, often referred to as a cartoon, and the cartoons of each nation and culture are influenced by different styles. The design culture perspective is used to realize the tastes of life and create a way of life through cultural creativity. It has been applied in various fields to create a human way of life through innovative designs [1].

Similarly, in the post-World War II Japanese manga period, manga was developed to become more modern and well-known. Manga refers to uncertainty, in which manga is the use of ukiyo-e, a Japanese painting that emphasizes ideas and emotions rather than lines and shapes, combined with Western painting. Therefore, early manga leaned more towards visual novels. Subsequently, Tezuka Osamu developed the style of Japanese manga to be even more unique. Thai cartoons began with paintings on the walls of temples, which were considered illustrations in the early days. These paintings began to

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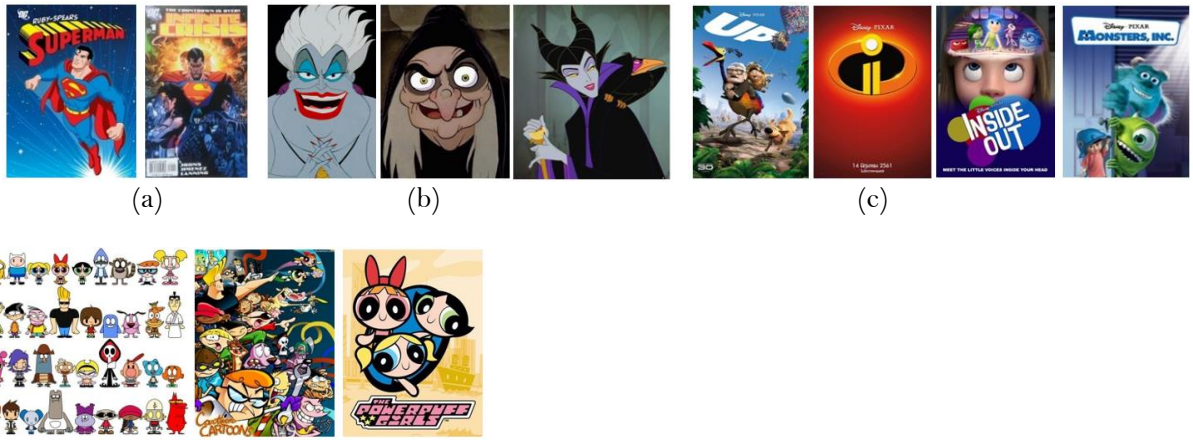
develop a writing style influenced by Western culture. Therefore, Thai cartoons began to play a specific role as political cartoons and illustrations to accompany plots in novels, also known as visual novels.

2.2. Concept and Theory of Cartoon Illustration Design

Theoretical Studies, Articles, and Research on Structure and Evolution. Principles of pattern design of cartoon characters.



(a) (b) (c)

(d)

Figure 1.
Animation of the United States.
Source: https://www.cnstudiosstairwell.com/. https://www.dc.com/, https://thewaltdisneycompany.com/, https://www.pixar.com/).

Illustration and animation combined in a new way show that animation illustration production can be performed for everyone. Creating content on social media, designing GIFs, or creating fully animated videos is now more accessible. Animation illustrations fit the context of animations and motion graphics. Motion can also help bring images to life. Illustrators animate colors, textures, elements, and effects to support the narrative, and the concept is a key point in design [3]. This paper can be divided into topics that need to be studied regarding the factors in the design of cartoon illustrations that affect the emotional and meaningful communication of people of different ages and cultures, using personality traits, props, and scenes in 20 successful animations in the United States and Japan. Case studies can be grouped according to the production style and distinctive, memorable identity of the parent company. Figure 1 shows animations from the United States: (a) a case study of Superman at DC Comics, (b) a case study of The Walt Disney Company, (c) a case study of Pixar Animation Studios, and (d) a case study of Cartoon Network Studios. Similarly, Figure 2 presents the Japanese animation case study from Studio Ghibli. However, there are only a few examples.

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Figure 2.
Animation of the Japanese.
Source: https://ghiblicollection.com/

Figures 1 and 2 show the concepts and theories of comic illustration design used in the decoding analysis. Similarly, the reception of messages to decipher the various semantic codes through visible media or images perceives and understands the emotions and concepts from the images of the personalities of various actors. In animated films, three design approaches can be summarized: character personality design, including size, shape, and forms; design factors, such as lines and styles; and the use of colors, which consider the physical limitations of the target audience, perception, color theory, etc. The decoding process is illustrated in Figure 3.

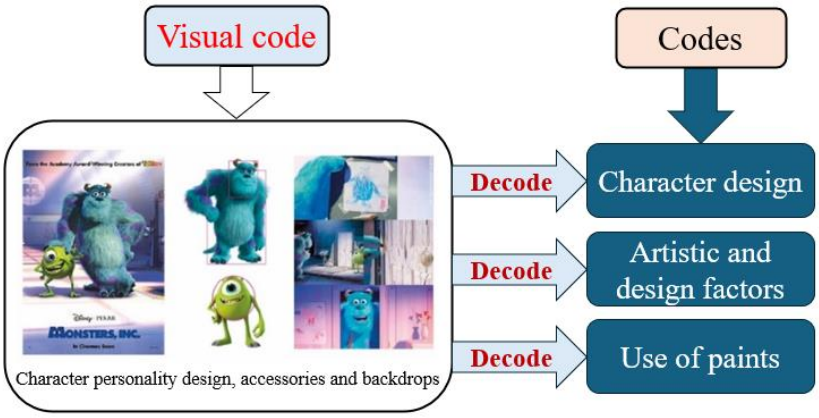

Figure 3.
Decoding process.

2.3. Character Personality Design

This character's personality design, style, and method of illustration have a significant influence on the reader's mind. Regardless of the animation, it is evident that the character design style of each camp has a clear and unique appearance. In particular, character design, the use of lines, color schemes, and techniques, as exemplified by Studio Ghibli and Pixar Animation Studios, are illustrated in Figure 4. Similarly, designing and writing images on a website, as well as displaying images on a webpage effectively, can enhance visual and cultural communication. In particular, the pictures are expressed using lines and colors, which convey emotions and feelings very well [4].

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Figure 4.
The distinctive identity of studio Ghibli and Pixar animation studios.
Source: https://discover.hubpages.com/

Figure 5.
The walt Disney company character creation
Source: https://disneyanimation.com/

Similarly, the process of creating a style focuses on the reality of the character's shape proportions. In addition to the sense of movement of the gesture using the S-curve and the asymmetry of the composition to present the character, this does not have to be the same proportion. However, there are some additions that are more than usual to show outstanding character identity. Therefore, the Walt Disney Company uses an important identity in the design of characters, which is to make the characters move realistically through the use of lines, facial expressions, and gestures based on anatomical principles, as shown in Figure 5.

However, it is also unique in the use of computer techniques to create both thick and thin border lines, including the use of pastel tones that differ from the usual cartoons that focus on bright tones. This is attractive because children's eye muscles are not sufficiently strong. Colors that are not suitable

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for the age range can damage the eye muscles, especially in children's cartoons, and may be customized by adding white, as shown in Figure 6.

Figure 6.
Cartoon network studios' distinctive identity.
Source: https://www.avid.wiki/.

Similarly, the Superman character in DC cartoons has developed and adapted over time. The early style of hand-painted artwork was characterized by a flat, dimensionless image with cut black edges using real colors. Computer drawing techniques have been employed to make the artwork more beautiful, light, shiny, and dimensional, as shown in Figure 7.

Figure 7.
DC cartoon character creation.
Source: https://www.dc.com/.

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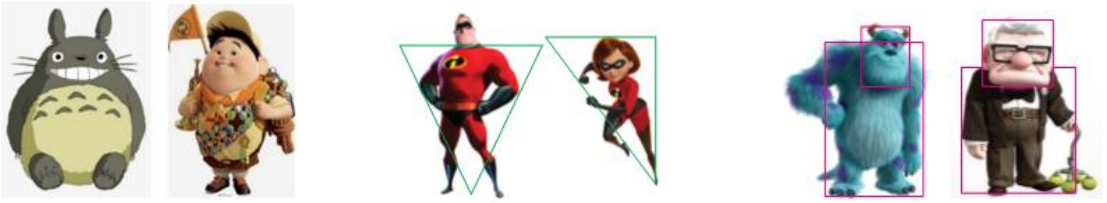
Similarly, Figure 7 shows that if Superman uses bright colors, sometimes the image cannot communicate emotions. Instead, the creators choose to use lines to convey feelings through the character's expression, body language, and facial expressions, which are the main channels for communicating emotions. Therefore, when a character feels sad, it is noticeable through the lines, especially through eye communication. Learning materials are an important element that can serve as messengers to help students learn more effectively. Media can motivate students to acquire knowledge and skills. Thus, learning media, through the application of cartoons, plays a significant role in effective communication. Conveying cartoon illustrations can stimulate the thinking and maturity of people of all ages [5].

2.4. Design Factors

The principle of designing a character to be interesting should consider the following points: it has a distinctive, unique, recognizable, and engaging characteristic pattern. The external personality of a character includes distinct movement postures. There are special symbols that are easy to remember, such as shape, color, or size. However, the colors and sizes are determined to have different styles of creation. For the characters to have a unique personality that allows people to remember each one, having a clear expression of the character's emotions will help the audience understand more about what is being presented. An important factor in character design is the combination of the three main components: size, shape, and proportion. Differentiation is also related to other elements such as differences in color, shape, proportion, and size. However, the fundamental element of character design that affects the basic psychology of human beings in the perception of a character's personality is shape. Character design is based on geometric outlines. In addition to being easy to express the character's personality through their physical appearance, it also affects the feeling of being different according to shape.

If you consider the characteristics of various styles, such as characters with round shapes, they give a feeling of friendliness, cuteness, and kindness. They appear harmless; they are friends of the protagonist and the viewer, as shown in Figure 8 (a). Similarly, a triangular character will convey a sense of danger, but if it is a triangle, the head will make the character stronger, bouncier, muscular, and have a strong personality, as shown in Figure 8 (b). If the character has a square shape, it gives the impression of being a stubborn, strong, and obstinate person, as shown in Figure 8 (c). However, when designing a character, one may start from a simple shape, but the designer should use character creation to make the character stand out by employing distorted proportions to create a special personality that can be recognized. When designing a character, the designer needs to have knowledge and understanding of the anatomy of a person or animal to assist with the design. This knowledge allows for a natural change from the normal pattern to an exaggerated design, such as increasing the size of the nose, widening the ears, and thickening the mouth beyond usual proportions.



(a) (b) (c)

Figure 8.
Characteristics in different styles.

2.5. Principles of Use of Colors and Lines

To understand the character of the child, the child can perceive the artistic elements. Especially in the illustrator's use of colors and lines in the illustration, children will choose to look at the image

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because it is the main feature of the character who sees and guesses prominently about the character's feelings, thoughts, and relationships. Facial expressions, body gestures, and actions of the characters that appear in the illustrations, as well as the understanding of the illustrator's communication, rely on images to understand characters with an understanding of two artistic elements: color and line. Color is used to convey emotions, and lines convey the character's animation. Therefore, the most important elements of art are the use of color and lines that affect the relationship of the character through body gestures, positions, sizes, and facial expressions, such as when the character feels sad. Most children talk about illustrators using lines for communication, particularly regarding eye communication.

Similarly, the use of color according to the principles of color theory is important. The color scheme chosen by the designer should consider the emotions and feelings that he or she wants to convey, such as fun. The use of color to communicate a character's emotions signifies a change in the character's feelings; for example, red indicates anger, while orange suggests calming down. The color representing sadness is deep purple. However, children love bright colors, and the preferences of children aged 3 to 7 years should be taken into account. The vibrancy of a book is the preference that affects perception the most. If the target audience is young children, the designer should avoid using dark or overly light colors. This is because children's eye muscles are not strong enough. Colors that are not suitable for their age may cause damage to the eye muscles, which can be mitigated by adding white. The illustrator's use of color to convey the main character's information, especially the feelings associated with using red to represent anger, is prevalent in illustrations. However, in cultural contexts, color influences how children perceive anger. For example, in the animated film Inside Out by Pixar Animation Studios, the character named Anger is represented in red. According to the principle of using color to communicate that emotion, cartoon characters also employ the linguistic criteria of using the word blue, which signifies sadness, aligning with the social context.

2.6. Communication Concepts

Communication is derived from the Latin word "communis," meaning commonality. It refers to the processes that arise from the transmission of information, such as knowledge, news, experiences, and opinions, to the recipient through various media or channels, including speaking, writing, and acting. The communication process that facilitates effective communication varies according to its appropriateness [6].

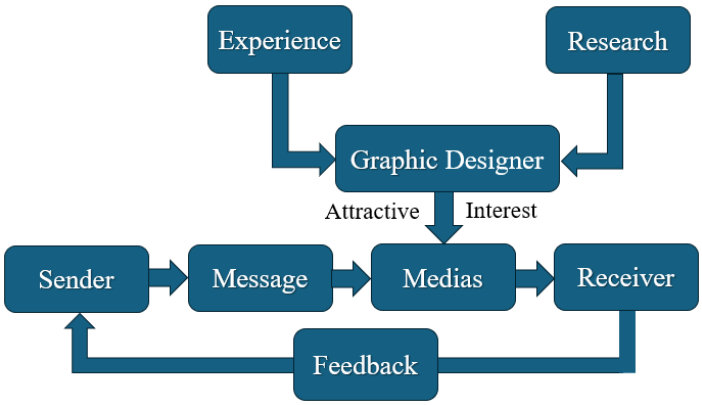

Figure 9.
Demonstrate the process of communicating graphic design.

Therefore, communication is a factor that affects the livelihood of people interacting with each other. It is a process that creates understanding, harmonizes relationships, and links individuals and society to achieve a common understanding. Communication Theory states that a sender transmits a

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message to a receiver. Using media as a means of communication, when the message reaches the recipient, they respond in reverse. However, the meaning of receiving a message depends on the attitudes, values, and experiences specific to the individual. Therefore, the communication process in graphic design can be summarized, as shown in Figure 9. Figure 9 is consistent with the theory of graphic communication, which states that a designer's work can be judged as either successful or unsuccessful based on the reverse reaction. Graphic design makes the news impressive, interesting, and attractive to the audience by utilizing the experience gained from research information together with creativity and artistic skills. When it is sent to the recipient, they consider the information using their experience regarding the subject, along with their attitudes, values, interpretations, or graphic work. It can be concluded that in the element of communication, the receiver is considered one of the important elements of the communication process; that is, the interpreter or decoder of the content through the media, which is related to the effects of the content. There is a clear goal or purpose for sending a message that will be understood by the recipient. The messenger should have a good understanding of the limitations and the ability to receive the recipient's message in terms of communication skills. Therefore, designers should convey a message using creativity as a way of presenting the message to make it attractive. It is necessary to consider who the recipient is, how much experience they have in receiving the message, and their attitude and knowledge in various fields, which will affect the interpretation and elicit a reverse reaction according to the object of the presentation. The above review is only part of this analysis. The next section describes the methodology used in this study.

3. Methodology

From the literature review, an approach that is consistent with the research work is as follows: The physical elements in the design of cartoon illustrations affect the emotional perception of people from different cultures and ages, with the purpose of focusing on the following issues: 1) To analyze the physical characteristics of cartoon visual design elements that affect the emotional and communication perceptions of people of various ages and cultures. 2) To analyze and compare the relationship between the physical elements of cartoon illustrations and the emotional and communication perceptions of individuals from different ages and cultures. The issues in this study are divided and summarized as follows:

3.1. Research Methodology

This study presents the physical elements in the design of cartoon illustrations that affect the emotional perception of people from different cultures and ages. It involved a combination of quantitative and qualitative research. The Delphi Technique was employed to classify the factors and physical elements in the design of cartoon illustrations that influence perception, emotion, and feelings. A quantitative research method was utilized to investigate the level of perception regarding the factors and physical characteristics of elements in cartoon illustration design on the perception of communication, emotion, and feelings among illustration design professionals, individuals knowledgeable about illustration design, and the general public who engage with illustrations. The study examines the relationship between variables, the physical characteristics of the design, individual variables such as age range and cultural habitat differences, and emotional perception variables, as well as how the visual evaluation of feelings affects different perceptions. Advanced statistics were applied, with a Two-way ANOVA used to investigate the variance caused by more than two groups of factors and variables. The details of the research process are as follows.

Step 1: Study and review the literature related to the investigation and presentation of the factors and principles of comic illustration design that affect communication, emotions, feelings, and meanings. Let us analyze and classify the group of factors in the design of cartoon illustrations to determine the variables and indicators of the factors. The basic elements of design include the type of image, composition, character, scene, color, type of line, shape, perspective, and character. The sense of

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conveying meaning to a person or a visual viewer has different personal factors. Synthesized data, including factors related to illustration design, emotions, and personal factors, were used to create tools for investigation.

Step 2: Initial investigation using the Delphi technique. Classification of Physical Characteristics Factors in Cartoon Illustration Design that Affect Emotional Perception Performance Using a Closed-end Questionnaire Mixed with Semi-Structured Interviews. A closed-ended questionnaire was used to confirm the physical characteristics of the cartoon illustration design obtained from the review. Interviews were conducted to gather more opinions on various factors that affect the effectiveness of emotional communication from illustrations. The aim was to develop a research tool for assessing the level of perception of physical characteristics in illustration design for emotional perception. This sampling involved specific randomization, and the results were collected by analyzing the means of the evaluations and interviews to group and classify the factors and variables in the next step.

Step 3: Confirm the classification results and levels of physical characteristics in the design of the Delphi Technique cartoon illustrations by re-conducting the questionnaire. The results obtained in Step 2 were used in a closed-end questionnaire. Obtain physical characteristics in the design of cartoon illustrations that affect the performance of emotions, feelings, and expressive perceptions. The questionnaire was an image questionnaire classified according to the physical characteristics of the design of the cartoon images obtained from the review. The images used in the inquiry were from five successful animation studios: DC Cartoon, Walt Disney Company, Pixar Animation Studio, Cartoon Network Studios, and Studio Ghibli. The conceptual framework of applied research was created from a communication model based on the concept of David K. Berlo. This framework separates and groups physical art into four aspects: elements of art (lines/tones), character factors (size/proportion/shape/dimension of the image), scene factors (type of scene/narrative scene/camera angle/image size), and visual factors (type of image/complexity of the image/dimension of light and shadow).

Step 4: Qualitative Evaluation of the Questionnaire Research Tool to Analyze the Levels of Emotional and Interpretive Perceptions from the Classification of Physical Characteristics of Cartoon Illustration Design for People of Different Ages and Cultures. An evaluation using the IOC (Index of Item Objective Congruence) was conducted to determine the appropriateness of the tools used to assess the level of perception of physical factor variables in the design of comic illustrations that affect emotional and expressive communication. The tool employed was a series of questionnaires from Step 3, along with an IOC assessment, to question the sample, age group, and culture of this study.

Step 5: Tryout of the IOC Assessment Questionnaire. In Step 4: Experiment with the Questionnaire Tool, before applying it to the sample Thai, Japanese, and American populations, separated by culture and age group, which includes university age, working age, and old age. Determine the level of emotion, feelings, and semantic perception from the classification of physical characteristic variables in the design of cartoon illustrations for people of different ages and cultures. Thirty questionnaires were used to determine their confidence values. The Alpha Coefficient formula was based on Cronbach's method. In this step, the tool was improved from the questionnaire used in Step 3, which separates the variables of the physical element factor of the cartoon illustration. A total of 23 main variables were divided into 76 sub-points. A questionnaire was used to determine the confidence level of the instrument by testing its accuracy. Reliability and complete content validity were used to collect data from a predetermined number of samples. The operational definitions of the six basic human emotional indicators were used to find the level of representation in various emotions, including happiness, sadness, disgust, surprise, fear, and anger.

Step 6: Assessment of the level of knowledge of the physical characteristics of cartoon illustration design that affect the communication of emotions, feelings, and meanings of people of different ages and cultures. A simple but specific sample of personality attributes consisted of Thai, Japanese, and American individuals. The participants were divided into three age groups: 50 people of university age (20-24 years old), 50 people of working age (25-54 years old), and 50 senior citizens (over 55 years old),

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for a total of 150 people from three nationalities. The research tool used was a closed-ended questionnaire consisting of images of the classification of factors, variables, and indicators from the conclusions of research steps 3-5 and the results of data analysis from the assessment to confirm the physical elements in the design of cartoon illustrations that affect the perception of emotions, feelings, and semantic communication of people of different ages and cultures. The results of the research were analyzed and collected from the means to represent higher and lower levels of perception in the future.

Step 7: Examining the relationship between three or more variables, namely the physical characteristics in the design of cartoon illustrations that affect emotions, feelings, and expressive perceptions, as well as the variables of different ages and cultures that produce varying cognitive effects. The results obtained from step 6 were used to rank the level of perception and classify the types of data (typological analysis) that transmitted emotions with a higher mean level to evaluate the relationship between the three groups of variables. The mean level of physical factors in the illustration design, with a mean value of 4.00 or more, is used as an example of keywords in the creation of the simulation image to be used as prompt details. AI was employed to generate images and include them in the questionnaire. The cartoon image is divided into two forms: cartoons that communicate emotions, happiness, and sadness. We examined the correlations using two-way ANOVA statistics to identify significant differences. A simple but specific sample of individual factors includes Thai, Japanese, and American nationalities. In the study, there are three age groups: 50 people of university age (20-24 years old), 50 people of working age (25-54 years old), and 50 people of senior age (over 55 years old), totaling 450 people from the three nationalities.

Step 8: Summarize the results of Steps 2, 3, 6, and 7 to present the factors and characteristics. The physical elements in the design of cartoon illustrations affect the perception of emotions, feelings, and meanings for people of different ages and cultures.

3.2. Population and Sample

The population and sample used in this study were divided according to the following objectives:

Objective 1: The sample was divided by nationality by selecting three nationalities, consisting of volunteers from Japan and the United States, who were the prototypes of successful animation with a unique style that is highly popular. The selection criteria were as follows: (1) Nationality and age range were among the target groups of the research. (2) No design experience was required. (3) Consent to provide information by completing a questionnaire. Participants must be Thai, Japanese, or American volunteers living in their own countries. The sample of volunteers in the research from one nationality was divided into three age groups: 50 people of university age (20-24 years old), 50 people of working age (25-54 years old), and 50 people of working age (over 55 years old), for a total of 450 people from three nationalities. It was obtained from a simple sampling of the target audience of the research and was voluntarily conducted using an online questionnaire (closed-end). It is a random unit to collect data from a sample of the first evaluation study for confirmation.

Objective 2: Sample by Nationality for Thai, Japanese, and American volunteers living in their own countries. In one nation, there are three age groups: university age (20-24 years), 50 people; working age (25-54 years), 50 people; and senior citizens (over 55 years old), including 450 people from the three nationalities. This was obtained from a simple sampling of the target audience, and the research was conducted voluntarily. Online (closed-end) questionnaires were used as the random units. Data were collected using a sample from the second study to compare the association between age range and cultural differences.

3.3. Research Tools

In this study, the tools were used according to the research objectives. The objectives are as follows:

Objective 1: To study the factors in the design of communication illustrations that affect perception, understanding, interpretation, emotions, and feelings. The researchers determined that the study consisted of physical elements of cartoon illustration design, theoretical concepts in communication,

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and personal factors that affect perception. The study of relevant documents and research can be summarized as follows: (1) The process of visual decoding is based on the conceptual framework of applied research using a conceptual communication model based on Berlo's concept, shapes, and artistic and design factors such as lines and style. The use of colors is based on the limitations of the target group, according to perception, color theory, and so on. (2) Factors affecting perceptions. (3) Personal and communication factors, as well as six basic human emotions.

Objective 2: To analyze the design principles and elements of current illustration designs that affect perception. A questionnaire was created to study the documents and related research using Delphi. The questionnaire was tested to determine the confidence level of the instrument by assessing its accuracy. Reliability and content validity were evaluated based on the appropriateness of accuracy by research experts. A questionnaire was administered to the sample in the study. The tools according to the objectives of the study can be summarized as evaluation guidelines as follows:

Step 1: Initial review by nine illustration design experts. Questionnaires and semi-structured interviews were used to identify the relevant variables. The content and details will be verified by experts involved in the research to provide academic opinions and university lecturers in the field of study related to cartoon illustration. This will provide intellectual insights related to the factors of illustration design and designers, illustrators, cartoonists, storytelling, and character creation experts to determine the appropriate physical characteristics in the composition of comic illustrations.

Step 2: Confirm and evaluate the level of perception of the physical elements in the design of cartoon-type illustrations that affect emotional responses. The questionnaire and expert opinion form were divided into two parts as follows: Part 1: Information on the general status of experts. Part 2: Design Factors for Representation Issues: The questions are divided into two categories: (1) consider the representation of the physical elements of the illustration to determine which elements affect the perception of emotions, feelings, and meaning, and (2) determine the degree of representation of the physical elements of the illustration that best affect the emotional, affective, and semantic communication of the cartoon illustration. A total of 23 main variables and 76 sub-issues were divided into 5 levels of scale interpretation.

Step 3: Questionnaire and unstructured interviews with experts to provide opinions on the results of the analysis obtained from the questionnaire and summarize the results of the data analysis.

3.4. Data Analysis

Objective 1: Qualitative data analysis uses the results obtained from questionnaires from expert and nationality samples. The results were evaluated and interpreted using the mean, standard deviation (S.D.), and mean deviation (M.D.) at each level. The criteria for interpreting the scale are divided into five levels. The data analysis method employs the results obtained from expert inquiries to evaluate, analyze, and interpret the findings. The means and standard deviations were calculated. The standard deviation and mean deviation were determined by defining the interpretation criteria of the mean into five score ranges.

Objective 2: Quantitative data analysis uses simulated images and questionnaires from a sample of volunteers by nationality to evaluate the analysis results. The analysis was divided as follows: (1) Evaluation of the level of knowledge of physical characteristics in cartoon illustration design that affect the communication of emotions, feelings, and meanings of people of different ages and cultures in the six basic human emotions. The results were analyzed and interpreted using means and standard deviations. Analyze the differences in individual aspects that affect the perception of the design factors of cartoon illustrations, whether they perceive the same or differently. The criteria for interpreting the scale are divided into five levels. Similarly, mean analysis, by defining the interpretation criteria of the mean as a score range, was divided into five points according to the general standard analysis principle. (2) Inferential Statistics: Examining the relationship between three or more variables, namely the variables of physical characteristics in the design of cartoon illustrations that affect the variables of emotions, feelings, and semantic perception, and the variables of different ages and cultures that have

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different cognitive effects. The results of the data obtained from the questionnaire were used to evaluate the analysis and interpret the results using variance analysis. This data analysis was used to test hypotheses about the difference in the means case of more than two population groups. Two-way ANOVA was used to test the hypothesis using a significance level of 0.05 with a 95% confidence level. At least one pair of different means was compared in a complex using the LSD (Least Significant Difference) test. To analyze the relationship and comparison between the physical elements of cartoon illustrations and the perception of emotional and semantic communication of people of different ages and nationalities, the differences between the mean values of the samples were compared. A detailed explanation above is the key point of this study. In the next section, the Results and Discussion are presented in more detail.

4. Results and Discussion

This section describes the results and discussion of the physical elements in the design of cartoon illustrations that affect the emotional perception of people from different cultures and ages. The world recognizes visual communication as an important tool for achieving mutual understanding. Additionally, cartoon images are a type of visual used to communicate stories and convey emotions effectively. This study focused on the importance of examining and classifying the physical elements that influence emotional perception and communication. Focusing on case studies, visual design primarily consists of cartoons with the following objectives: 1) To analyze the physical characteristics of cartoon image design elements that affect the emotional perception and communication of people from different ages and cultures. 2) To analyze and compare the relationship between the physical elements of cartoon illustrations and the emotional and communicative perceptions of people from different ages and cultures. This study combined quantitative and qualitative research. The population and sample used in the study consisted of volunteers from three nationalities: Thai, Japanese, and American, divided into three age groups, totaling 300 people. Similarly, the tools used in this research were semi-structured questionnaires and interviews, employing a five-level estimation scale. Data analysis utilized statistics to perform a two-way ANOVA, along with mean and standard deviation calculations, and comparative analysis to determine the correlation value. The details of the study, results, and analysis are as follows.

Objective 1: To analyze the physical characteristics of cartoon graphic design elements that affect the emotional perception and communication of people of different ages and cultures. Results of Physical Composition Perception of Cartoon Illustrations on Emotions and Happiness of People of Different Ages and Cultures Classified by Nationality and Age Range. The perception of the representation of the physical element factors of the 11 happiness illustrations in three nationalities consists of Thai nationality, Japanese nationality, and American nationality. The three nationalities were divided into three age groups: 20-24 years old, 25-54 years old, and over 55 years. Nine groups found that the line generated a high level of emotional and feeling perception, with a mean of 4.0 and a standard deviation of 0.89. Emotional characteristics generated moderate emotional perceptions with a mean of 3.99 and a standard deviation of 0.98. Complementary colors generated moderate emotional perceptions, with a mean of 3.92 and a standard deviation of 0.91. Characters and scenes generated a moderate level of emotional perception with a mean of 3.89 and a standard deviation of 1.06. The super-deformed character ratio generated a moderate level of emotional and feeling perception, with a mean of 3.86 and a standard deviation of 0.94. Natural scenes generated moderate levels of emotional and feeling perception, with a mean of 3.80 and a standard deviation of 0.90. 2D shapes can generate a moderate level of emotional and feeling perception, with a mean of 3.78 and a standard deviation of 0.92. The depth of field generated a moderate level of emotional and feeling perception, with a mean of 3.75 and a standard deviation of 1.05. Light and shadow produced moderate levels of emotional and sensory perception, with a mean of 3.73 and a standard deviation of 0.96. Afternoon scenes generated moderate emotional and feeling perceptions, with a mean of 3.66 and a standard deviation of 1.07. Large characters generated a moderate level of emotional perception with a mean of 3.52 and a standard deviation of 1.04.

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Therefore, the results of the perception of physical composition factors of cartoon illustration types, emotions, and happiness were classified according to nationality and age range. It was also found that the physical elements of cartoon illustrations and the perception of emotional communication and happiness were the best perceptions among three nationalities and three age ranges when ranking the top five elements with the highest scores that clearly affect visual perception. Using conflict tones increases the distance of the character from the background. The scene factor is that there are characters and scenes in which the scenes help to promote emotions and tell the story and events of the characters. In terms of characters, the proportions of SD (super-deformed) characters were the same. Similarly, the character has a large head proportion, making facial expressions emotionally detailed on the face visible. When the image is small, lines are used through facial expression gestures to make the characters express their emotions. The least recognizable elements are images with large characters because the size of the characters in the image affects emotional communication. However, the use of lines and colors is the main factor in body gestures with a line of action, dynamic poses, and facial expressions. Similarly, a large character makes it possible to see emotions clearly, affecting perception in the elderly group.

However, we also considered the emotions of happiness. Physical elements of illustration lines, as shown in Table 1, indicate that the physical elements of cartoon illustrations are interconnected. The individual factor is nationality, which shows no difference in the level of recognition. However, the age factor can create a significant level of emotional perception of happiness in individuals over 55 years old from three nationalities: Thai, American, and Japanese, with mean scores of 4.40, 4.09, and 3.76, respectively.

Table 1.
Means physical composition of line type cartoon illustrations.

Age range	20-24		25-54		55+		Total	
Nationality	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Thai	3.90	1.05	4.22	0.88	4.40	0.78	4.17	0.90
Japanese	3.94	0.86	4.08	0.89	3.76	1.08	3.92	0.94
American	3.92	0.89	3.90	0.88	4.09	0.85	3.97	0.87
Total	3.92	0.93	4.07	0.88	4.08	0.90	3.90	1.08

Similarly, Table 2 shows that the physical elements of the cartoon illustration type convey character expressions. However, the age factor can create a significant level of emotional perception of happiness among individuals aged 55 years and older across all three nationalities, including Thai, American, and Japanese, with mean scores of 4.36, 4.14, and 4.12, respectively.

Table 2.
Means physical composition of cartoon illustrations character types of express emotions.

Age range	20-24		25-54		55+		Total	
Nationality	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Thai	3.66	1.15	4.16	0.91	4.36	0.77	4.06	0.99
Japanese	3.60	0.96	3.96	1.14	4.12	1.02	3.89	1.06
American	3.88	1.22	4.00	0.83	4.14	0.94	4.02	1.01
Total	3.66	1.15	4.16	0.91	4.36	0.77	4.06	0.99

The physical composition of the complementary color scheme illustrated in Table 3 demonstrates the physical composition of the cartoon illustration complementary color scheme type. The individual factor is nationality, with no difference in the level of awareness; however, the age factor significantly influences emotional awareness and happiness, particularly among individuals aged 55 years and older, who are elderly across all three nationalities. Thai, American, and Japanese nationalities account for 4.28, 4.24, and 4.20, respectively.

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Table 3.
Means physical composition of cartoon illustrations complementary colors type.

Age range	20-24		25-54		55+		Total	
Nationality	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Thai	3.82	0.89	3.26	1.10	4.28	0.88	3.79	1.03
Japanese	3.96	0.97	3.74	1.08	4.20	0.85	3.96	0.98
American	3.99	0.96	3.78	0.73	4.24	0.93	4.00	0.90
Total	3.91	0.94	3.59	1.00	4.24	0.88	3.91	0.97

If the physical composition of an illustration is considered, the genre includes characters and scenes. The physical composition of the cartoons is presented in Table 4. This genre includes characters and scenes. The individual factor is that the age range shows no difference in the level of perception, but the nationality factor creates a significant level of emotional perception of happiness, with total means of 4.15, 3.90, and 3.64 for Thai, American, and Japanese nationals, respectively.

Table 4.
Means physical composition of cartoon illustrations conflict tone type.

Age range	20-24		25-54		55+		Total	
Nationality	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Thai	4.10	1.08	4.13	1.03	4.22	1.16	4.15	1.08
Japanese	3.52	0.83	3.66	1.18	3.74	1.08	3.64	1.04
American	3.84	1.14	3.91	0.88	3.96	1.17	3.90	1.07
Total	3.82	1.05	3.90	1.05	3.97	1.15	3.89	1.08

Table 5 lists the physical elements of the super-deformed character proportion types. The physical elements of the cartoon illustration were the super-deformed character proportions. The individual factor is nationality, which shows no difference in the level of awareness; however, the age factor creates a significant level of emotional perception of happiness in the age group of 55 years and above. The mean values for the three nationalities are 4.17, 4.09, and 4.06, respectively.

Table 5.
Means physical composition of cartoon illustrations character types and scenes.

Age range	20-24		25-54		55+		Total	
Nationality	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Thai	3.84	1.01	3.60	1.12	4.06	0.93	3.84	1.03
Japanese	3.92	0.73	3.65	1.01	4.09	0.84	3.89	0.88
American	3.76	1.06	3.68	1.06	4.17	1.01	3.87	1.04
Total	3.84	0.94	3.64	1.04	4.10	0.92	3.86	0.98

Objective 2: To analyze and compare the relationship between the physical elements of cartoon illustrations and the emotional and communicative perceptions of people of different ages and cultures. Based on the results in Tables 1-5, the analysis of the relationship and comparison between the physical elements of the different types of cartoon illustrations indicates that age and nationality have an interactive influence on these illustrations. Statistical significance was set at a level of < 0.05.

However, the results of the analysis also found that different age ranges and nationalities significantly affected perceptions at a significance level of 0.05. Therefore, it can be concluded that individual factors include varying ages and cultural backgrounds, previous experiences, shared experiences, lifestyle choices, and environmental contexts. These factors affect communication and perception in the composition of different types of cartoon illustrations. To make visual communication effective, it is necessary to rely on a shared experience (Field of Experience) so that the receiver receives the message as an audience. The perception of images through symbols or physical elements in the design depends on various individual factors, including age, experience, wisdom level, cultural background, knowledge, cultural context, tastes, beliefs, values, and lifestyles. The perception of images

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is influenced by the attitudes, values, cultural contexts, and experiences of the individual. This creates a perception of the connection of the system with the ability to interpret different images.

5. Conclusion

The results and analysis of the data described above lead to an approach that aligns with the objectives set for the topic. The physical elements in the design of cartoon illustrations influence the emotional perceptions of individuals from various cultures and age groups. The objective of this study is to examine the factors in illustration design, including compositional elements that affect emotional perception and interpretation. The purpose of this research was to focus on the following issues: 1) To analyze the physical characteristics of cartoon image design elements that impact the emotional perception and communication of individuals from different ages and cultures. 2) To analyze and compare the relationship between the physical elements of cartoon illustrations and the emotional and communicative perceptions of individuals from various ages and cultures. Therefore, the following conclusions were drawn.

Factors that affect emotional communication include personal factors such as age, experience, cultural background, and knowledge, which influence perception, interpretation, connection, subject matter of the system, and the ability to interpret images through symbols or physical elements. Illustration design encompasses artistic elements, lines, colors, characters, shapes, forms, and proportions. It can be concluded from the interviews that experts believe the first artistic element is the line, the second is the line used to express the character's emotions, and the third is color. However, these three elements are always artistically related. The use of lines and colors enhances communication effectiveness. The illustrator utilizes the relationship between these two components to convey meaning to the recipient, enabling them to understand the image and the character's feelings. Lines are employed in facial expressions, body features, and colors to express the character's emotions. The receiver relies on these two elements to comprehend the characters. Choosing to use lines to communicate feelings through character expressions via the body is essential. Body gestures and facial expressions are the primary channels for conveying emotions, and lines are associated with color. The designer employs the method of determining the color structure to communicate the emotions and feelings of the character. However, according to expert opinions, it is consistent that the elements of art, namely lines and colors, have a significant positive effect on the creation of perception, emotional communication, visual feelings, and character representation.

Likewise, Objective 1 analyzes the physical characteristics of the elements in the visual design, including accompanying cartoon genres that affect emotional perception, feelings, and meanings for people of different ages and cultures. The results of the evaluation of opinions on the physical factors and elements that influence the formation of perception, emotional communication, and feelings in cartoon illustrations can be summarized. The results showed that artistic composition had the highest level of awareness. The use of lines and colors plays an important role in allowing the receiver to understand the image and feelings of a character. By using lines to communicate feelings through the expression of characters, there is a clear expression of emotions through facial expressions, eyes, gestures, and the choice of colors to support emotions. Next is the character aspect, as it is part of creating a style or form (formation). It creates interest in the personalities and external characteristics of characters with distinctive, different, and unique traits. Additionally, the scene is important because it helps expand the narrative of the event, indicating the environment in which the character is situated and the situation they are in. The visual aspect is at a minimal level because it is part of the style that characterizes the personal writing of each artist and illustrator, which is presented through images.

The study also found that thick black lines had a better effect on sensory perception than thin lines. According to expert feedback, the size of the line can establish a level of emotional perception, creating good visual attraction, contributing to the cutting of the line, and resulting in the emotional vision of the character of the recipient of the subject at all ages, which is more clearly visible than the thin line.

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Especially when used in media with a small area, the image is still visually pronounced, and the shape that affects the perception of emotional and emotional communication is a circular geometric shape. Shapes are fundamental design elements that affect the basic psychology of human beings in the perception of a character's personality. This affects the creation of feelings, and there are different shapes, making it easier to express the character's personality through physical appearance.

Similarly, Objective 2 examined the relationship between the physical elements of cartoon illustrations and emotional perception, as well as the feelings and meanings of people from different ages and cultures. The results of the hypothesis test were used to compare the relationship between the physical characteristics in the design of cartoon illustrations that affect the emotional and semantic communication of people from various ages and cultures. It was found that different interpersonal factors, including age, cultural backgrounds, previous experiences, shared experiences, lifestyle choices, and environmental contexts, significantly affected communication and perception in the composition of different comic illustrations at a statistical significance level of 0.05.

Based on the analysis of two-way ANOVA of age range and nationality that affects the perception of physical elements of illustrations, emotions, happiness, and 11 sub-points are summarized as follows: (1) The personal factor variable, namely the age factor, affects the statistically significant element at the level of 0.05 and can create different perceptions of happiness when comparing pairs to determine the differences between groups with different age ranges. (2) Personal factors included nationality, which affected the statistically significant component at a level of 0.05 when comparing pairs to determine the differences between groups with different age ranges. (3) Age range and nationality had a statistically significant interaction at a level of 0.05. It can be concluded that personal factors, namely nationality and age range, affect the perception of physical elements of cartoon illustrations of happy emotions. (4) Age and nationality did not interact with each other, but it was found that the variables of individual factors, namely nationality and age, had different effects on the perception of the physical elements of the illustrations, statistically significant at the level of 0.05.

However, from the analysis of the results of this study, it can be concluded that the artistic element is the use of lines, which significantly affects the formation of perception, feeling, and level of emotional awareness. The sense of composition and physicality is also different. Physical factors in illustration design that affect perception include artistic elements, such as the use of lines and colors, character factors, such as characters and scenes, and character expressions. Messages are sent through one channel by using signals and symbols, where the encoder is the one who sends the message, and the decoder is the one who decodes the meaning of the signal or symbol sent by the encoder. By decoding, the receiver or destination receives the message as an audience through visual perception of symbols or physical elements that appear in the design, which will depend on a variety of personal factors that affect the perception factor. Interpretation involves the connection of the subject matter system and the ability to interpret images through symbols or physical elements in illustration design, such as artistic elements, lines, colors, characters, shapes, and proportions that enhance the ability to interpret images.

However, research suggests that the physical elements in the design of cartoon illustrations affect the emotional perception of people from different cultures and ages. The classification of physical elements in visual design influences the creation of emotional perceptions. This study aims to confirm the elements and physical characteristics of illustration design that impact emotional perception. This will create benefits and disseminate knowledge to artists. Designers, academics, and researchers in the field of illustration design can utilize these insights as communication tools, making visual design more effective. Physical elements can be employed in the design of illustrations to create perceptions and convey emotions that resonate with both the designer and the audience. However, in terms of design creation, the meanings attributed by the designer and the audience are crucial for the target demographic. In addition to the perception of emotional communication and interpretation, the success of design lies in the satisfaction of the audience or target group. Artists, painters, or designers should evaluate their work directly with the target demographic and age group to enhance and develop their work in alignment with actual needs.

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The author confirms that the manuscript is an honest, accurate, and transparent account of the study, that no vital features of the study have been omitted, and that any discrepancies from the study, as planned, have been explained. This study followed ethical practices during the writing process.

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