



The Perceived Impact of Different Types of Ice-Themed Typography on Users

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Abstract. Typography research in the past has focused on the properties of the typeface itself, such as bold, serif, sans-serif, and so on. However, there is still much room for in-depth exploration of the cultural context and user perception of typography. To fill this research gap, this study focuses on the impact of different ice and snow-themed typography on user perception in the context of ice and snow culture, aiming to enhance the dissemination of ice and snow culture through this study. In the study, we chose three ice and snow-themed font designs, including the author's original "Ice Sports Imagery" font, other designers' ice and snow-themed font, and regular bold font, and presented them on the same web banner. The three font types were evaluated by using 15 pairs of adjectives, and participants' perceptions of the different font types and designers were collected through a questionnaire. The results of the study showed that there were significant differences in participants' perceptions of different ice-themed fonts. When web banners were presented using fonts that were considered inappropriate, participants perceived the fonts as unserious and unprofessional in personality. On the contrary, the author's "Ice Sports Imagery" typeface received positive feedback in the banner presentation. From the semiotics point of view, "Ice Sports Imagery" "font successfully extracts the trajectory of ice and snow sports, which is full of dynamics and can fully express the imagery of ice and snow sports, and successfully integrates the imagery of "ice and snow" with the glyphs, which improves the function of ideograms. And from an imagery point of view, the typeface evokes the association of sliding snow and ice for an immersive experience. This strong image experience comes from the clever shape of the strokes and the organic rhythm between the strokes, which can form emotional resonance.

Keywords: Ice Culture · Perception · Emotion · Semiotics · Typography

1 Introduction

Typography is not just a tool for text presentation, it plays an important role in visual communication and directly affects the way information is interpreted and received. Especially in the application of ice and snow theme, the font design is no longer limited to the basic function of words, but forms an expression of emotional perception. For example [1]. The study investigated the effects of choosing different fonts on email

perceived personality, gender and temperament of email writers. The study found that when emails were presented using fonts that were considered inappropriate, the user's perceived personality of the email appeared less professional and less serious. Additionally, inappropriate font choices negatively impacted users' perceptions of the gender and temperament of email authors. This illustrates the significant impact of font choice on the way emotional perceptions are expressed, emphasizing the importance of employing appropriate fonts in scenarios such as email to convey more appropriate emotions and professionalism [2]. The study examined the impact of font "personality" on readers' emotional information processing. In Study 1, personality trait words were presented in a brief manner, and their personalities were displayed through specific fonts, and perceptual differences were observed when the font personalities were consistent or inconsistent with the meaning of the words. The results show that readers who use consistent font personalities perceive faster in an affective lexical decision task. In Study 2, by presenting pages with different fonts, the researcher found that readers' quick judgments of the emotional tone of the page were significantly influenced by font personality. It is concluded that readers are able to immediately perceive and process font personality, which in turn influences their perceptual process of emotional processing on screen. This emphasizes the fact that font personality plays an important role in the perceptual process when it comes to expressing an emotional way of perception. In addition [3]. The results of the study showed that personality traits were associated with the design family of fonts (serif, sans-serif, modern, monospaced, script/funny) and correlated with appropriate use. The results of these studies further discuss the perceptual impact on online material and website design, emphasizing the critical role of typeface choice in conveying emotionally charged perceptual expressions.

In addition, scholars have delved into the impact of different fonts on user legibility. According to [4] the results of the study showed that the legibility of fonts had different effects on the subjective perception of easy-to-read and difficult-to-read poems, and the effect was most significant especially in the case of easy-to-read poems. Through three experiments, the authors examined the effects of poem difficulty and font readability on the subjective perception of poetry. Participants read poems that may have varying degrees of conceptual or structural difficulty, and these poems were presented in easy or difficult to read fonts. Participants then rated their subjective perceptions of the poems they read, as measured by four dependent variables, including overall preference, perceived poetic fluency, perceived thematic clarity, and structure. In a study assessing perceptions of font legibility [5], it was found that size 10 Tahoma was perceived as clearer compared to size 12 textbooks. In addition, the Verdana and Courier fonts at size 12 were perceived as sharper than the Comic, Schoolbook, and Verdana fonts at size 10. Interestingly, Georgia at size 10 is significantly more legible than Tahoma and Schoolbook at size 12. Arial at size 14 is perceived as clearer than Comic at size 14, and Arial at size 10 is also perceived as more legible than Tahoma at size 12. At size 14, only Arial is sharper than the other fonts (size 10 Schoolbook and Comic). [6] revealed that by improving font legibility, the similarity between the evaluations of the elements demonstrated a significant positive impact on consumers' evaluation of the aesthetic impression of packaging. This highlights the importance of the similarity between elemental evaluation and typeface legibility in the perceptual process when evaluating the

aesthetic impression of a package. In addition, the findings of [7] showed that font type had a significant impact on readability for both subjects with and without dyslexia. Sans Serif, Equal Width, and Roman font styles significantly improved reading performance in the test compared to Serif, Proportional, and Italic fonts. Based on this finding, the study recommended a set of more perceptible fonts designed to enhance the reading experience of people with and without dyslexia, which is essential for improving the perception and understanding of text. In addition, the study by [8] assessed the perceived legibility of individual letters, numbers, and symbols in each font by asking participants to look at the characters in each font for a short period of time and to verbally identify them. By calculating the percentage of correctly recognized characters for each character and applying a graphical sunflower chart to highlight misrecognized characters, the results of the study clearly show that the ClearType fonts Consolas and Cambria, and the non-ClearType font Verdana, are more legible in terms of numbers and symbols compared to Times New Roman. This study provides substantial insights into the impact of perceiving different fonts on the screen reading experience, further emphasizing the importance of choosing more readable fonts.

Many scholars have also delved into the impact of different fonts on users' emotional responses. In a study by [9] researchers investigated which fonts were effective in conveying emotions and introduced these fonts into a mobile chat application. A survey was conducted to demonstrate how changes in message fonts can affect the meaning of the message conveyed. The results show that the use of a variety of fonts influences and reinforces the value perceived by the user, and that this variety elicits a positive response among users, leading to a more active emotional experience when sending text messages. This study emphasizes the potential importance of fonts in perceiving emotional responses. Researchers at [10] selected 20 simplified and 20 traditional characters and conducted a perceptual evaluation experiment, and simultaneously collected data on emotional evaluation of Japanese characters in order to study the differences between Chinese and Japanese in terms of emotion. The study found that participants from mainland China and Taiwan showed diametrically opposed classical and contemporary perceptions of the three widely used fonts: bold, loose, and open. And the perception of Taiwanese and Japanese showed a more consistent trend. This study deeply reveals the complexity of different fonts for users' emotional perception in different geographical and cultural backgrounds. In a study by [11], 102 participants shared their immediate emotional responses to 36 different font designs. The results of the study support the correlation between specific font characteristics (variety, contrast, pattern) and specific emotional parameters (amusement, excitement, concentration) and suggests various classroom approaches for purposeful font selection. This study emphasizes the importance of typography for users' emotional perceptions and provides practical guidance for real-world applications. [12] showed that satirical texts read in the new Roman font triggered more interest and anger compared to satirical texts read in Arial font, and that this strong association of emotional perception is consistent with the definition of satire. This apparent interplay between typeface type and the emotional quality of the text not only has an impact on marketing and advertising, but also plays out in persuasive literature. This study highlights the potential power of font choice in shaping users' emotional perceptions, with important implications for creators of various text forms and

marketing practitioners. [13] study worked on constructing font recommendation guides in three languages, English, Burmese and Japanese, through a subjective evaluation approach. The results showed that the study succeeded in finding suitable fonts for each of the 36 perceptual adjectives and identified five clusters of adjectives and types. It is worth noting that, consistent with previous studies of English and Japanese scripts, there is a lack of similar studies in the field of Burmese. In addition, the study emphasizes the need to consider the initially specified font thickness when choosing fonts, and explores how the use of “exciting” perceptual fonts affects readability. This research provides useful emotional and perceptual guidance for font selection in different contexts.

In addition, a study by [14] proposed an affective font selection method for different national cultural contexts, highlighting the importance of affective font perception. First, the emotional data of the selected fonts were perceived through a series of evaluation experiments. Second, these fonts were organically categorized into several clusters with similar emotional tendencies through hierarchical cluster analysis. Third, by quantifying the relationship between perceptual clusters of types and impressions in depth through Quantitative Theory Type I, it is suggested that Latin and Japanese fonts be selected and combined in the clusters that are most closely related to the specified impression. The validation results show that the combination of Latin and Japanese font clusters works better than using the original Latin alphabet design with similar shape characteristics in the Japanese font pack. This not only emphasizes the critical role of perception in emotional font selection, but also provides deeper insights into typography. [15] delved deeper into the effects of font type and size on emotion, and through data collected with subjects found that Arial was more strongly associated with positive emotions, compared to Times New Roman, which showed a different tendency towards emotion. It is worth noting that the 8pt font size causes an unpleasant experience and is accompanied by a higher number of errors. In contrast, medium (12pt and 16pt) and large fonts are primarily associated with a pleasurable and comfortable experience. Such research helps to perceive the role of font choice in design more fully, providing more in-depth guidance for optimizing the user experience. In response to the current state of research, most studies revolve solely around the type, size, weight, height, color, and other factors of the font itself. There are also literacy studies on fonts, which test the clarity perceived by users of different font sizes and further measure the legibility of different fonts by evaluating the percentage of users who can read different fonts correctly within a specified period of time. Research on fonts and emotions has focused on font characteristics such as shape, traditional and simplified fonts, and other font attributes. However, there is a lack of research on the application of typography to regional cultural contexts. Therefore, this paper focuses on the impact of different fonts on users’ emotional responses under the dimension of ice culture, and also includes an evaluation of the perceived personality of different fonts.

What is emotion, perception, and typography? There is no agreed upon definition of emotion, [16] defines emotion as a brief but violent mental fluctuation triggered by an intense experience, including fear, surprise, and joy, that causes sudden irritability within the individual. Overall, emotion is a positive or negative mental state that directly affects an individual’s cognition and behavior. [17] This definition cannot be ignored

because emotion has been viewed as a mere physiological response. [18] study by assessing students' and teachers' perceptions of legibility and emotion conveyed by 10 fonts showed that the majority of participants embraced the legibility of the fonts. In terms of affective assessment, four of the fonts proved to be consistent with the emotions conveyed and the remaining six fonts were inconsistent with the emotions conveyed. [19] showed that affective feelings towards fonts can be described by the appearance and evaluation dimensions of fonts. Specifically, the presence or absence of serifs and the style of appearance of the printed or handwritten typeface are the judgment criteria for distinguishing different fonts. The results showed that compared to color, font change had a greater effect on affective judgments such as "complex-simple", "beautiful-ugly", "luxurious-plain", "active-passive", "cause-effect-rule", and "like-dislike". "complex-simple", "beautiful-ugly", "luxurious-plain", "active-passive", "cause-effect-rule", and "like-dislike" affective judgments. Colors had a greater influence than fonts in judging the feelings "friendly-serious" and "soft-hard". [20] states that perception is a subjective experience that is associated and labeled with an individual's past experiences. Perception is personalized and autobiographical in nature due to the unique life experiences of each individual. [21] study presents the results of a subjective evaluation study of four variants of the Helvetica Neue font (Ultra Light, Light, Normal and Bold). These variants contain high vs. low contrast and positive vs. negative polarity. The results suggest that ultralight fonts are rated lower in legibility among users of different ages, but younger users may find them more aesthetically appealing than older users. Based on the results of the study, we provide recommendations on the use of lightweight fonts in user interface design. Considering the use of different combinations of font thickness, contrast, and polarity in a design can better satisfy users' aesthetic and reading needs. We recommend that designers not only consider legibility when choosing fonts, but also focus on the attractiveness of fonts to ensure a more interesting and engaging user experience. This may have a positive aesthetic effect on users of different ages, making them more willing to interact with the user interface [22] study confirms that people will match basic taste words (sweet, sour, salty, bitter) with different fonts that are rounded and angular on a perceptual level. The study concluded that there is a strong relationship between the degree of roundness/angularity of the typeface, the ease of handling and personal preference, which in turn influences the establishment of a correspondence between the typeface and the sense of taste at the perceptual level. [23] is based on relevant literature on the use of different languages on package labels and aims to investigate whether the use of exotic Chinese language in package design affects consumer preferences and perceptual evaluations of packages in different countries. The results of the analysis found that consumer preference for exotic Chinese package labels was associated with individual Chinese character recognition ability. In this study, packaging with exotic Chinese characters demonstrated attractiveness and aesthetics, with Chinese and Japanese subjects who could recognize Chinese characters scoring higher on the dimensions of attractiveness, aesthetics, innovation, sophistication, and engineering, while Thai subjects who did not know Chinese had the lowest scores on all dimensions. In terms of theories related to typography, [24] in the Handbook of Typography defines typography as the selection of appropriate fonts for specific needs, rationalization of space on the page, and consideration of the reader's reading comfort as much as possible. In the

typographic process, the choice of fonts is consistent with the temperament of the typographic content, which allows the reader to effectively grasp the reading information. Exploring the theories of typography from the perspective of different cultural contexts, [25] proposed the concept of “exogenous”, which is defined as “a design in which the typeface is a Latin character, and the design is clearly influenced by the characteristics of typefaces in different countries”. The design of a typeface with Latin characters is clearly influenced by the characteristics of typefaces in different countries. The typeface design process may incorporate typeface features from the designer’s home country, or it may draw on inspiration presented from different countries.“

Therefore, in response to the previous discussion, the author proposes two hypotheses:

1. H1. The “Ice and Snow” font designed by the author for the theme of ice and snow culture will have an impact on the participants’ emotional response.
2. H2. Different participants perceive different font personalities for the “Ice and Snow” font.

• **Study of independent variables, dependent variables:**

- Independent variables: Different types of ice and snow themed font designs, including the author’s original ice and snow font designs and other designers’ ice and snow themed fonts, as well as a regular bold font.

Cultural Context: Considering that culture may be an important factor influencing perception, cultural background was used as the independent variable. Different cultural groups were further covered to test the potential influence of culture on perception.

– **Dependent Variable:**

Subjective perception: This includes the user’s subjective evaluation of font aesthetics and visual appeal. Users’ subjective perception is quantified through questionnaires or subjective ratings.

Readability and comprehensibility: How well the user reads and understands the text. Assessed through screen viewing tests, comprehension questions or relevant questionnaires.

User preferences: user preferences for different types of ice-themed fonts. User preference information is obtained through questionnaires or rating systems.

Cognitive consistency: the consistency of users’ perceptions of the ice-themed font design with their personal or cultural perceptions. Interviews or questionnaires were used to find out whether users’ perceptions of the design were consistent with their expectations of the ice theme.

2 Research Methodology

This study used a variety of methods to delve into the possible effects of different cultural contexts on the perception of ice and snow themed fonts. These included questionnaire analysis, semi-structured interview analysis, and experimental tasks. First, by designing a structured questionnaire, we collected information on subjects’ subjective feelings, preferences, and perceived effects of different types of ice and snow-themed fonts.

This approach allowed us to systematically understand subjects' perceptions in terms of ice-themed typography and to capture their perceptual tendencies. Second, using semi-structured interview analysis, we conducted face-to-face or remote interviews to communicate in depth with the participants in order to gain a more comprehensive understanding of their experiences, perceptions, and suggestions on ice and snow-themed typography. This type of in-depth communication helped to tap into the deeper perception and cognition of the subjects. In the experimental task, subjects engaged in interactions with different types of ice-themed fonts, including reading, recognition, or evaluation tasks. This step allowed us to observe how subjects reacted to the fonts in the actual task, and thus to assess more objectively the actual effects of the typography. Finally, through a cross-cultural comparative analysis, we considered cross-cultural factors when recruiting subjects to ensure that the findings were broadly applicable. This helps to identify potential differences in the perception of snow and ice-themed fonts across cultures, providing a more comprehensive understanding for further research.

2.1 Font Selection and Experimental Procedures

Three fonts are displayed in the cell phone banner page. The first one is the author's original font design "Ice Sports Imagery", which is inspired by the ice sports in the regional ice and snow culture. The author extracts the imagery of the characteristics of ice and snow sports, mainly from the words of "coherence", "power" and "agility" and other characteristics. In terms of font structure, the design is based on the running script of Chinese calligraphy. The overall effect seeks to create the shape of a "snowball" in terms of the characteristics of the strokes, adopting the rounded head of the strokes, and at the same time borrowing from the calligraphic style of the line to strengthen the dynamic connection between the strokes. In addition, the structure of the font adopts the right corner of the upward momentum, while increasing the contrast of the space within the word, making it more dynamic. The second font is a snow and ice theme font "Jiang Shuang Song" created by other font designers, while the third font is a regular bold font design. To ensure the credibility of the experiment, the designer of each font was not informed prior to the start of the experiment, and none of the subjects had seen the three fonts to be presented in advance. The experiment was divided into two parts. The first part divided all the participants into three groups of 50 each. In addition, participants in each group were fixed to look at one of the three fonts. In the second part, participants were asked to make a perceptual assessment of the viewed fonts, using a 7-point scale of 15 pairs of adjectives. Finally, participants were asked questions through a questionnaire, including "Do you know what type of font this font belongs to?", "How often on average do you pay attention to the knowledge about font design?" and "Do you consider yourself a typeface design enthusiast?" The questions included "Do you know what typeface this font belongs to? (Fig. 1).

- (a) the author's original "Ice Sports Imagery" font
- (b) other designers' ice and snow-themed font
- (c) regular bold font



Fig. 1. Demonstration of three fonts

2.2 Participants

A total of 150 participants completed the experiment from a variety of majors in art and design, majoring in art and design, as well as majors related to typography, to ensure that they had an understanding of design elements and aesthetics. In addition, we recruited participants from different grade levels to ensure a diverse sample.

3 Results and Analysis

3.1 Semiotic Theory Analysis

Since its inception, semiotic theory has played an important role in the interpretation of visual works in terms of their symbolic meaning and impact [26]. Among them, the analytical method of the semiotician Saussure emphasizes the relationship between the “energy” and “reference” of symbols, as well as the connection between different symbols. “Energetic reference” refers to the sounds and images of symbols, which are manifested mainly through the physical dimension, including “the form of things presented by sensory stimuli, including text, sound, images, etc.”. The “referent” is the extended meaning attached to the “capable”. At the same time, the relationship between “energy” and “reference” is not static. [27] In addition, the semiotician Roland Barthes, relying on Saussure, proposed that “sign” is an element that develops at the level of culture and society, and argued that the sign can be embodied in two dimensions, namely, “inner meaning” and “outer meaning” and “extensible meaning”. There is general agreement that “connotative meaning” includes implicit, associative and flexible meanings, while “denotative meaning” refers to direct linguistic meaning. The analytical approach of Saussure and Roland Barthes focuses on historical context and cultural context. The research theme in this paper combines the excavation and promotion of ice and snow culture with typography. Based on the analysis of semiotics, the font design of ice and snow theme is the result of the connection of multiple energetic and referential meanings. Relying on the context of semiotic theory, the author further refines the semiotic analysis method of typography by combining the studies of [28] and [29]: 1. Analyze the connotations of typography in depth, and identify their unique visual characteristics, in order to more profoundly identify the “visual assignments” embedded in typography. 2. Apply semiotic theory to standardize the translation of the corresponding visual meanings, so as to decode the relevant meanings for the typography. 3. Utilize the results of the perceptual assessment in the Semantic Difference Method to further validate the distilled visual meanings through the results of the Semantic Difference Method. The results of the perceptual evaluation in the semantic differential method will be used to further verify the refined visual meanings.

3.2 Discussion of Findings

The results of this study indicate that the ice and snow themed font design is related to the emotional response of the participants, and the participants perceive different font personalities for different font types. The survey results show that the “Ice Sports Imagery” designed by the author makes the participants feel more “elegant”, “flexible”, “exciting”, “unruly”, “expensive”, “normative”, “professional” and other themes. According to the structure of the calligraphy, smooth and powerful strokes reflect a certain writing speed, and a certain sense of continuous rhythm between strokes makes the font structure look more flexible and vivid. At the same time, the “Ice Sports Imagery” pays attention to the horizontal and vertical structure, and the stable and balanced shape is formed between the fonts and strokes, which may bring people a standardized and stable feeling. In addition, the font adopts special strokes, such as vertical strokes of the font, irregular vertical line shape, and the change in thickness reminds people of the rhythm of skiing tracks, which may make people feel that it is not in line with the regular personality. In addition, the “Jiang Shuang Song” typeface designed by other designers makes participants feel “rigid”, “amiable”, “masculine”, “conformist”, “old”, “practical” and other themes, “Jiang Shuang Song” typeface is based on the Chinese Qing Dynasty calligrapher Jin Nong’s lacquer book “Tong Meng Ba Zhang Juan”. The letters in the lacquer book “Tong Meng Ba Zhang Juan” are like writing with a special horizontal brush, showing a thick sense of sweeping the brush, which may make participants feel rigid and masculine. In addition, the “Jiang Shuang Song” font in the horizontal and vertical strokes to a large extent reflects the Chinese calligraphy of “Dao Xie”, “Dao Xie” brushwork makes the strokes appear first wide and then sharp, and at the same time, the longitudinal trend of the font is appropriately increased, so that the overall temperament of the font is like the pine and cypress standing tall in the snow, and the overall characteristics of the font have very obvious calligraphy characteristics in the lacquer book “Tong Meng Ba Zhang Juan”. This may make people perceive the characteristics of conformity and old age. The last font is a regular boldface font, and the results show that it makes people perceive more features such as “standard”, “cheap” and “boring”. Since boldface font is not specially designed for the theme of snow and ice, it may lead to a low professional score in the evaluation. However, because boldface font is more efficient in People’s Daily life, this may lead to people feeling more normative, ordinary, cheap and other characteristics. The “Ice Sports Imagery” designed by the author makes most participants perceive the “professional” impression. According to Saussure’s semiotic theory, the relationship between signifier and signified is established in culture. In terms of design concept, the “Ice Sports Imagery” chooses the shape of “snow ball” to spread out in the pen and the track of skiing. At the level of font expression, the calligraphy style of Chinese calligraphy is chosen to be displayed, and the stroke speed is accelerated and the stroke fluidity is strong. There is a clear correlation between the “able reference” of the characteristic image of running script and the cultural meaning of the ice and snow theme expressed in this image, i.e. the “reference”, which makes the participants clearly feel the cultural concept of the ice and snow theme.

4 Conclusion

Our study further confirms that the category of fonts evokes different emotional perceptions in participants, and the results further apply semiotic theories to explain the perceptual impact of different font designs in terms of “referent” and “denotation” on participants. In addition, our study provides guidance on the development of font libraries and the affective demand aspects of typeface design, and in particular provides insights into the perceptual assessment of typeface design in the context of a geographic culture with a snow and ice theme. This study addresses the differences in assessed perceptions and perceived impact of three different fonts in the context of snow and ice culture. The results show that different fonts produce different feeling impressions. The “Ice Sports Imagery” gave participants a greater sense of the characteristics associated with ice and snow culture, with participants favoring adjectives such as “professional” and “elegant”. The second typeface, “Jiang Shuang Song”, is significantly less relevant to the perception of the snow and ice theme than Ice and Snow, evoking more “amateurish” participants, “rigid” and “customary” adjectives. The third regular bold font made participants feel more adjectives such as “uninteresting” and “cheap”. In the process of font development, perceptual evaluation of fonts is more conducive for designers to grasp the significance that needs to be brought by the structure and stroke shapes of fonts. This will lead to more effective design strategies for fonts with different themes and needs to meet the needs of different users. Font design also follows the human-centered design concept, to let our font design to convey additional meaning, the need for designers to understand the font at the beginning of the “can mean” and “refer to” in the user’s mind to present the perceived personality.

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