



Emotional Design Evaluation Index and Appraisal a Study on Design Practice

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Abstract. When the most important requirement of product design is no longer quality or function, but user's physiological feelings, understanding consumer/user's emotional reactions and needs will make it easier to successfully develop a product. For design and development team of a new product, it is a common desire of its designers, marketers and decision makers to build an appraisal modal which help them evaluate the emotion and sensibility value conveyed in a product, so as to provide a basis to improve product design and decision-making quality. For enterprises that want to increase the successful rate of product design, achieve the anticipated benefits once the product is introduced to the market while reduce the risk of failure, establishing a set of evaluation indicators that can be followed to improve design has become an urgent issue.

This paper, by adopting literature analysis method and referring to current industry status, firstly studied relevant literature and high-quality industry cases and analyzed the applicability of different emotional evaluation indicators and appraisal methods in the development of industry; then, through quantitative analysis of each indicator's discriminability and applicability, established evaluation indexes and developed a checklist that applicable for general evaluation practice. Application of the sensibility evaluation indexes to develop an emotional design evaluation checklist will greatly help the industry to narrow cognitive gap between designers and consumers and effectively improve the decision-making quality in product design.

Keywords: Emotional design · Sensibility · Evaluation indexes · Design evaluation

1 Introduction

Kotler et al. (2010), a well-known master of marketing, believes that global economy today has developed into an era of “sensibility consumption”, when consumer’s focus on product is no longer “rational consumption” demands of function or quality, but the “emotional consumption” demands of feelings, affections and emotional experience activities brought by the commodity. This explains why among a wide variety of products in the market, some are appealing and cherished by consumers while others attract little attention. What are the differences between these products, and what causes the difference? Scholar Khalid (2006) believes that product will evoke emotions and influence consumer’s purchase decision and behavior. Therefore, today’s design and development of products should not only pursue function and quality requirements, but also understand consumer’s intention, express their perceptual demand and individual emotional experience in products’ connotation and create added value for consumers. In the new era of sensibility consumption, in spite of how to create emotional value in their own products, enterprises also want to know how to evaluate and compare with competitive products’ design, so as to stand out among peers and create more competitiveness.

Impacted by the trend of sensibility consumption, many enterprises are experiencing bottlenecks of development, and begin to attach importance to emotional design in creating added value and improving competitiveness in global market. However, the dilemma is how to figure out what kind of consumer or user emotions will be evoked from a product, how to design to make products elicit emotions, and how to evaluate the emotional design effectiveness. In spite of evaluating degree of emotional design in their own products, what are the advantages and disadvantages from different emotional aspects in comparison with competitor’s products? While emotional cognition is like a black box, the evaluation activity of sensibility design requires high level of expertise and is very time-consuming. Is it possible to establish a set of clear and definite evaluation indexes so as to help enterprises efficiently evaluate the emotional value of their products so as to actively respond to the market beat?

This study attempts to explore relevant factors that affect emotional value in business design practice, and establish a complete set of observable evaluation indexes that helps enterprises to evaluate the emotional value and make decisions, so as to achieve higher rate of success in product development practice. This study, through collecting relevant literature of emotions and analyzing successful design practices, abstracts emotional factors in product design and discusses emotional indicators of multiple perspectives, converts the evaluation indicators into indexes, and establishes an “emotional design evaluation checklist” based on the indexes.

2 Literature Review

2.1 Emotional Relationship Between Consumers and Products

Nowadays, product design does not merely pursue utilitarian value based on rational requirements of quality, function, interface, etc., but should meet higher level emotional requirements of hedonic value, such as emotional and interaction experience that product communicates to its consumers. Dell’Era and Verganti (2007) believe that consumers begin to pay attention to the emotional value contained in products; in spite of quality, function and usability, emotional value has become an important factor to influence customers’ purchase desire and behavior (Seva et al. 2007). Sensory response of emotional design is related to life experience. The reactions of organs to external stimulation generates different emotions that vary from person to person, such as emotional responses to beautiful things, emotional memories with families, living memories with pets, and even experience with a certain article. By adopting factors that cause sensory response, the emotional design is thus evolved. In some cases, through product consumption (of object, event and service), consumer obtain symbolic meanings of social status, corporate image, identity recognition, etc.; while at a higher level of “experiential consumption” stage, products provide consumers with emotional feelings and experiences (such as entertainment, memory, etc.) (Nicholas Zurbrugg and Zurbrugg 1997).

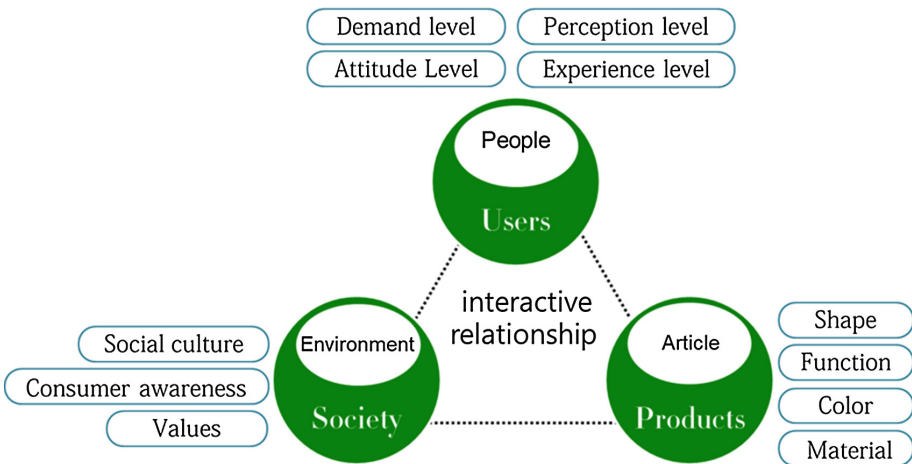


Fig. 1. The interactive relationship among users, products and environment

Based on above analysis, the interactive relationship among user, product and environment is illustrated in Fig. 1. It can be noted that product design should not only consider the product physical features of shape, function, color and material, but also the environment of social culture, consumer awareness and values, as well as user’s need at demand, perception, experience and attitude levels. The interactive relationship below can help designers improve product design.

2.2 The Way Products Communicate Emotions and the Interaction with Users

Emotional design communicates message to stimulate user emotions and at the same time provides users with memorable experience during the process of using products. Humanized design touches users with sincere care of their emotional feelings based on careful observation of their emotional needs; and communicates pleasant feelings to consumers with well-designed product appearance and texture of nice touch. Based on emotional design and good communication, it makes users happier using the products.

It is known that pleasurable product is easier to attract people's attention and evoke rich and strong customer experience that could last for a while. When the sense of beauty, culture, thoughts are embodied in the design of a product, it communicates to consumers not only the physical features, but more profound product values. For consumers, the product is not just a tool, but a living object that has emotions and can communicate emotions to people (Jordan 2003). Based on the fact that emotion helps people to tell "good" from "bad", and impacts consumer behavior when choosing products, Desmet and Hekkert (2007) established a conceptual "framework of product emotion" as the base of emotional interaction. Four important factors of emotional interaction are proposed in this framework:(1) appraisal, (2) concern, (3) product, (4) emotion. The interactive relationship is shown in Fig. 2:

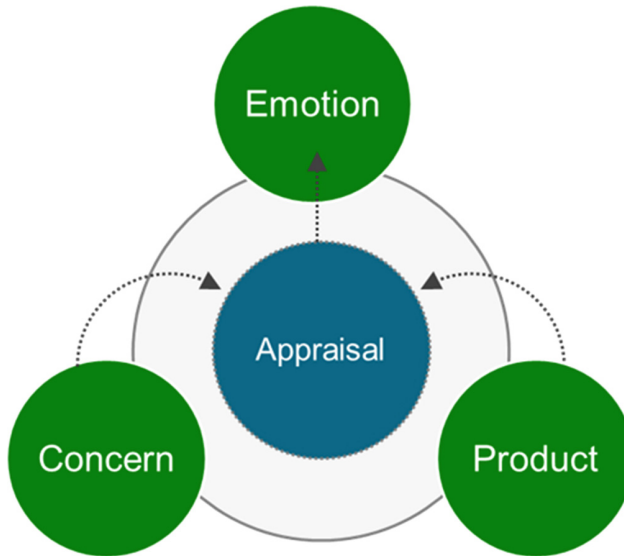


Fig. 2. The fundamental framework of product emotion (Desmet and Hekkert 2007)

Product design is closely related to emotions. When sense of beauty, culture, thoughts are conveyed in the design of a product, in addition to function, users can also sense the emotional value. For consumers, the product is not just a tool, but a living object that has emotions and communicate emotions to people (Jordan 2003).

Based on above analysis, it can be concluded that emotions are people's sensory response to things, products and services based on individual experience. Design and emotion are interrelated that product design evokes user emotion and user emotion impacts product design (Khalid 2006). Preece et al. (2015) believe that designers and users are of different backgrounds and the design pattern is not necessarily available for users, thus designers and users cannot fully communicate. There is cognitive gap between designers and users when designers do not fully understand users' needs and preferences, and users can only passively accommodate to the final design results – a problem in the process of product design and development that scholars and experts always want to overcome. Therefore, both designers and decision-makers want to create a set of emotional design indicators to narrow the cognitive gap between designers and users, and provide important basis to improve design and decision-making, which is of great help to the overall development of new products.

2.3 Evaluation Indexes and Methods

In the highly competitive product design process, designers need to know the product attributes that customers take into consideration when selecting products and the importance attached to each factor, such as function, comfort, appearance and price, so as to assist enterprise to make decisions about product design and development. From the perspective of system science, evaluation is a system engineering. The basic contents include: evaluation index, appraisal approach and evaluated object; system framework evaluation module; input and output of data and expert consulting system module (Friedmann et al. 2013).

“Evaluation” is a common cognitive activity in human society. In evaluation practice, assessment of an object (such as a product) involves multiple factors and indicators, thus evaluation is an overall judgment based on interaction of multiple factors. Emotional design is a process of quantifying “sensibility”. Quantification is inseparable from standards, while standards are based on appraisal system. Quantification of emotion includes three factors as establishing sensibility indicator (index), semantic description of emotional indicator, and sensibility appraisal (Stone et al. 2005).

There is often more than one way to measure or quantify a concept. In spite that measurement of basic concept such as gender is simple and direct, multiple indicators are required to measure concepts of abstract and complex meanings (Stone et al. 2005). It's easier to create an index than to establish a scale. Indicators are typically weighted to create an index. While establishment of a scale or checklist is based on the findings of indicators' structural relations and composing them according to a certain method.

3 Methodology

Emotional design involves complex emotions. How to transform and integrate the emotions into product design so as to effectively stimulate consumers' psychological feelings? And how to evaluate and measure the sensibility of a product efficiently and effectively? Consumer experience process involves multiple emotions, and products of different categories and characteristics evoke different sensibilities. The "emotional value" of products should include a wide range of emotions in multiple dimensions. Thus, this study aims to figure out the emotional factors based on designer's and consumer's multi-dimension emotions, compose the factors into representative indicators (indexes), and establish an "emotional design evaluation checklist" to provide a simple but efficient method to evaluate emotional design, and a scientific and effective reference for enterprises to improve decision-making in product design and development practice.

In order to figure out the key factors that affect emotional value, this research, first studied literature and industrial cases to analyze emotion, sensibility, pleasure and culture's corresponding product value through literature analysis method to summarize the factors that affect sensibility evaluation, then discovered conceptual framework of product's emotional communication and prepared material of interview based on the finding, then invited five designers to the "semi-structured interview" respectively and forwarded the interview results to the "focus group", where they were coded and sorted, to define the key emotional factors. Later, we prepared evaluation questions of each indicator (factor) according to current industry situation, culture and values, and adopted quantitative factor analysis to discover multiple dimensions of emotion, and further determined the evaluation indexes and question items of emotional design. Lastly, through variance analysis of each indicator's discriminability and applicability, it was verified that the indicators are applicable for identification of products of same positioning. Establishment of "emotional design evaluation checklist" was thus completed as shown in Fig. 3.

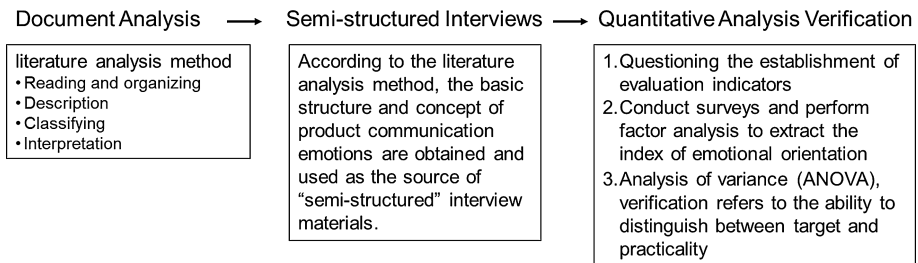


Fig. 3. The research method used

4 Results

Since relevant contents are complex, we obtained the following results and suggestions by widely collecting, reading and concluding more than 100 pieces of relevant literature from medicine, physiology, cognitive science and anthropology and by expert interviews.

4.1 Evaluation Indicators of Emotionalized Sensibility Value

In order to discover the factors that affect sensibility value, this paper analyzed dozens of literatures to summarize domestic and foreign scholars' views on emotion, sensibility, pleasure and culture's product value. Based on the literature findings and the fact that in the process of designing multiple emotions are considered and that products of different categories and characteristics embody different styles of sensibility, it can be

Table 1. Dimensions and indicators for evaluation of emotionalized sensibility value

Dimension	Indicator	Main literature resources and theories
Pleasure	Physical pleasure	<ul style="list-style-type: none"> • Tiger (2017) Four concepts of pleasure in products; • Jordan (2003) Four concepts of pleasure in products; • Jordan (1999) User demand theory of product features; • Desmet and Hekkert (2007) Three levels of interaction between users and products.
	Mental pleasure	
	Functional pleasure	
	Social pleasure	
Attractiveness	Demand	<ul style="list-style-type: none"> • Baxter (Baxter 1995) Four levels of attractiveness of product to consumers; • Khalid and Helander (2004) Three kinds of emotional demands in product design; • Park, Jaworski and MacInnis (Park et al. 1986) Product requirements
	Attitude	
	Consciousness	
	Experience	
Image	Self-image	<ul style="list-style-type: none"> • Park et al. (1986) Product requirements; • Silverstein et al. (2004) Four emotional levels; • Desmet and Hekkert (2007) Three levels of interaction between users and products. • Hassenzahl et al. (2010) Hedonic value of interactive products; • Mugge (2007) Four factors that influence affection of products; • Ashby and Johnson (2003) Personalized features of products
	Social symbol	
	Values	
Association	Elicit emotions	<ul style="list-style-type: none"> • Khalid and Helander (2004) Three kinds of emotional demands in product design; • Mugge (2007) Four factors that influence affection of products; • Ashby and Johnson (2003) Personalized features of products
	Recall memories	
	Cultural meaning	

Source: Sorted in this study

concluded that the “emotionalized sensibility value” of products include a wide range of emotions of multiple dimensions. Based on this idea, the paper analyzed different point of views and summarized multiple dimensions of emotional design through literature and case study; and through expert interview and focus group’s processing, finally determined the dimensions and indexes for emotionalized sensibility evaluation as listed in Table 1, and proposed a “framework of emotional design appraisal system” as shown in Fig. 4.

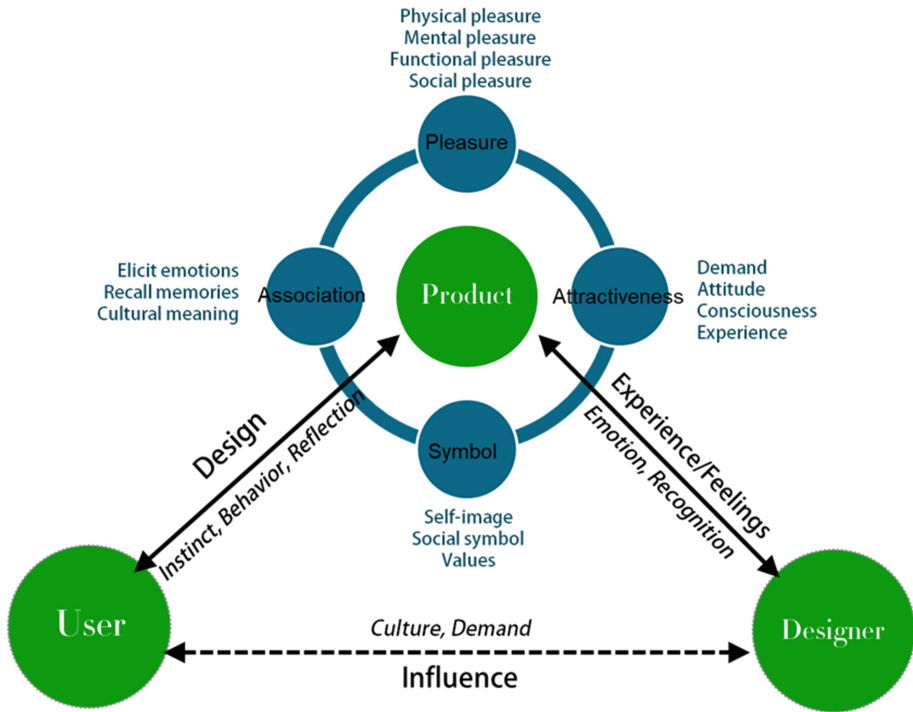


Fig. 4. Framework of emotional design appraisal system Source: sorted in this study

4.2 Establish Emotional Design Evaluation Indicators and Questions

Design is subjective creation based on designer’s personal experience, whether a product can evoke consumer’s emotion should be judged by objective evaluation. This study studied emotional factors in relevant researches to figure out evaluation indicators and dimensions, converted each indicator into text description that is observable and measurable according to scholars’ key points of notice, and prepared questions for each index (indicator) by taking into consideration current industry situation, culture and values. Through testing investigation and quantitative factor analysis, the sensibility design evaluation indexes and the questions were determined. Lastly, the questions were classified and organized according to the three levels (instinct, behavior and reflection) design theory of Norman (2004), into Table 2.

Table 2. Evaluation indicators and questions on emotional design

Dimension	Indicator	Question	3 Levels
Pleasure	Physical pleasures	The appearance, color, material, touch, etc. of the product satisfy users' aesthetic needs and produce joyful feelings	Instinct
		Semantic description (metaphor, analogy, simile, allegory) of the product is humors and interesting	Instinct
	Mental pleasures	The product arouses positive feelings such as fun, surprise, etc.	Behavior
	Functional pleasures	The operation is easy to understand, and the product is easy to use	Behavior
		Smooth operation brings users comfortable and joyful experience	Behavior
Social pleasures	Brings the pleasure of "interactive experience" or "human relation improvement"	Reflection	
Attractiveness	Demand	The functions meet user's needs	Behavior
		The product produces satisfactory result	Behavior
	Experience	The product is attractive and appealing	Instinct
	Consciousness	The design inspires the impulse to immediately own the product	Instinct
	Experience	The product effectively represents different value from other products	Instinct
		The added-value is satisfactory on the whole	Behavior
Symbol	Self-image	The product shows personal taste, style or image	Reflection
	Social symbol	Possession of this product is a simple of "high social status" or attracts "admiration"	Reflection
	Values	This product reflects individual uniqueness	Reflection
Association	Elicit emotions	Some features of product design recall certain memories	Instinct
	Recall memories	This product recalls beautiful experience and memories	Reflection
	Cultural meaning	There is cultural meaning in this product, which adds to its value	Reflection

Source: Sorted in this study

4.3 Sensibility Evaluation and Checklist

Relative importance of each index varies in practical application according to the differences of product attributes, product design goals or product life cycle. Therefore, creation of the emotional design evaluation checklist included weight factor to measure the evaluation index so as to provide more flexibility in different design evaluation practice. The evaluation indicators and questions were reordered in accordance with design's three levels. And through variance analysis of each indicator's discriminability

Table 3. Emotional design evaluation checklist

Design level	Evaluation questions	Score	Index weight	Weighted score
		1-10		
Instinct level	The appearance, color, material, touch, etc. of the product satisfy users' aesthetic needs and produce joyful feelings			
	Semantic description (metaphor, analogy, simile, allegory) of the product is humors and interesting			
	The product is attractive and appealing			
	The design inspires the impulse to immediately own the product			
	The product effectively represents different value from other products			
	Some features of product design recall certain memories			
Behavior level	The product arouses positive feelings such as fun, surprise, etc.			
	The operation is easy to understand and the product is easy to use			
	Smooth operation brings users comfortable and joyful experience			
	The functions meet user's needs			
	The product produces satisfactory result			
	The added-value is satisfactory on the whole			
Reflection level	Brings the pleasure of "interactive experience" or "human relation improvement"			
	The product shows personal taste, style or image			
	Possession of this product is a simple of "high social status" or attracts "admiration"			
	This product reflects individual uniqueness			
	This product recalls beautiful experience and memories			
	There is cultural meaning in this product, which adds to its value			
[Note] Weight reference: 0.5 (least important), 0.75 (less important), 1 (important), 1.25 (more Important), 1.5 (most important)		Total:		

Source: Sorted in this study

and applicability, it was verified that the indicators are applicable for identification of other products of same positioning. On the basis of above studies, “emotional design evaluation checklist” was finally completed, shown in Table 3.

4.4 Appraisal of the Emotional Design Evaluation Checklist

The “emotional design evaluation checklist” developed by this paper is not limited to the evaluation of a single product, but is widely applicable for the evaluation of emotional design for products of different attributes, design goals and in different product life cycles. In evaluation practice, firstly, set the weight value for each indicator according to the “emotional design evaluation weight setting table” based on the product’s attribute, design objective and lifecycle; secondly, invite 5-10 core personnel of product development or experts in this field to make expert evaluation respectively for their own products and competitive manufacturers’; thirdly, collect and summarize the results to generate a weighted evaluation result; lastly, compare the evaluation results and analyze the differences between products of their own and competitors’ indicator by indicator, and make decision to improve design accordingly.

5 Conclusions and Suggestions

The aim of this paper to develop an “emotional design evaluation checklist” is to provide an objective, effective and efficient way of emotional design evaluation, which helps designers and manufactures evaluate the emotional design between their own products and competitive products, further understand the similarities and differences from different indicators, and make decisions to strengthen the competitiveness and overcome the shortcomings in product design.

This paper aims to find out the general evaluation indicators shared by designers and consumers in emotional design evaluation and formulate a set of scientific analysis and decision-making model with these indicators to effectively narrow the cognitive gap between designers and consumers and help the industry improve decision-making and product design during the new product development process.

In spite of price and function, consumer will judge product and make decision based on their overall understanding and feeling. So nowadays designers are facing greater challenges than ever before in designing products. Emotional design that embodies sensibility, emotion, creativity and innovation into products is regarded as a key factor to improve the product’s cognitive value. This paper discussed user emotions through literature analysis, summarized sensibility dimensions and indicators to create emotional design evaluation indexes; prepared questions for each indicator based on current industry situation, culture and values, and developed the “emotional design evaluation checklist” to meet industry needs. User’s subjective measurement and cognition of gain and loss is an essential part of decision-making, and demand of positive emotion and sensibility generally overpass the rational requirements of cost or function to influence consumer behaviors. Conclusions, suggestions and limitations of this study are as follows.

New product development and high-quality decision-making are key factors for enterprise's sustainable development and competitiveness. This paper developed an "emotional design evaluation checklist" based on the findings on three research stages: firstly, collecting and analyzing domestic and foreign literatures on emotion, sensibility, pleasure, culture, values and evaluation methods; secondly, building up a "framework of emotional design appraisal system" based on the literature findings and industrial development situation; thirdly, setting up questions for each evaluation index (indicator), establishing "emotional design evaluation checklist" and proposing the appraisal method of evaluation practice, so as to provide a reference for different industries to evaluate the emotional design in new product development. This study established sensibility/emotion evaluation dimensions and indicators, and adopted the form of questionnaire and checklist to provide an easy reference for the industry to evaluate sensibility value and make decisions, so as to greatly narrow the cognitive gap between designers and consumers, and help enterprises to effectively improve decision-making during product design and development.

The "framework of emotional design appraisal system" and "emotional design evaluation index" proposed in this study are applicable for different industries' product design practice to help designers better understand the emotional factors that influence consumer's behavior and develop emotional products that meet customers' needs and evoke user emotions. Also, indicators of reflection dimension can help marketing personnel develop marketing strategies that effectively stimulate consumers' desire to purchase. The "emotional design evaluation checklist" added in weight factor of indicators to appraise differential design and communication modes as well as provide an important basis to improve product development and decision-making. Although this study has checked through key points of each evaluation indicator to avoid unnecessary omissions, because of time and environment limit, it failed to conduct reliability and validity analysis of the dimensions and questions in the "emotional design evaluation checklist", which leaves room for future studies.

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