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MOOD AND DESIGN ELEMENTS

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Abstract: *The paper presents the results of an experiment aimed to study the influence of focal colours and geometric shapes on mood. The colours were displayed on plastic boxes and the shapes were of perfume bottles. The Profile of Mood Scale (POMS) was used to assess mood. It was found that both focal colours and geometric shapes have a general tendency to induce positive mood values. No specific relationships between a certain mood and a certain colour or geometric shape were found. It was only revealed that the brown colour and the cube have a moderate to strong positive influence on all mood states.*

Key words: *product marketing, mood, POMS, industrial design.*

1. Introduction

A company can rely on a stable and secure market just in extremely few cases. The spread of the Internet, the increasing efficiency of transportation and the proliferation of payment methods have led to a global and aggressive competition. As operating and manufacturing technologies have become more widespread and cheaper, it remains the task of marketing specialists to promote the company's products to the market.

Experts' attempts to offer companies and their marketing departments new weapons in the fierce fight against competition have led to the emergence of various more or less effective methods and frameworks. For example, product personality has been proposed, defined as the set of strongly outlined human personality traits used by humans to distinguish their product from others and to justify the sentimental relationship with it (Jordan, 2002; Dumitrescu, 2007). Numerous researchers have investigated the efficiency of this approach or have introduced new personality models.

An approach that has had a much greater impact in the world of experts has been the design for emotion. In designing a product for interaction, attention should be paid to psychological interaction, namely the use of product aesthetics in arousing strong emotions in the consumer's psyche. Articles and books have been written, and conferences have been organized on this subject. This approach is commendable in that it enriches the product on a level other than the functional one, but it has the great problem that emotions are strong states felt for a brief period of time. In the case of

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design, emotion can only appear in the following situations: a) when the consumer observes the product in the physical or online store; b) after buying the product and placing it in its place; c) when she/he observes it in the following days after installation. Subsequently, the product integrates into the universe of household, office, etc. through the process of domestication and the consumer no longer notices it or and if she/he does notice it, it does not arouse any emotion.

Along the same lines, but much more effective is the approach that exploits the mood produced in consumers by product aesthetics. Unlike emotion, which is a strong and short-lived mental state, mood is of lower intensity, but more durable in time.

However, mood is overlooked for various reasons, but it is essential for the conception of good design. Mood is cardinal to efficient design because it represents the connection between the beyond-rational aspects of humans like sensations and intuitions. Also, design stimulates subconscious feelings before rational thinking takes place (Teal, 2012).

2. Literature Review

In the scientific literature, the word “mood” is often used inappropriately, and a number of articles seem to refer to “mood” when they refer to other things: attitude, arousal, etc. Therefore, this section will only discuss the references that are related to a correct understanding of the mood concept. The proper definition of mood is: “Moods are low-intensity, diffuse (pleasant or unpleasant) feeling states that typically last for hours or days” (Morris, 1989). Also, mood has not always been measured using a well-structured construct.

Since the relationship between emotion and design is unjustifiably more widely addressed in research, it is necessary to emphasize the differences between mood and emotion. Mood is a low-intensity, diffuse feeling, which can last for days and is gradually established. Mood affects individuals globally and influences their perception and motivation. Emotions are high-intensity, very clear feeling states that last for a short period of time and are directed at a particular thing or phenomena (Desmet et al., 2016).

Depending on the moment of interaction with the product, two motives can be identified for which mood is relevant for product design (Desmet, et al., 2016). The first motive is related to the moment of acquisition. Mood influences the consumer's desire to purchase in general (Arnold and Reynolds, 2009), the product choice process (Quartier, et al., 2009; Maier et al., 2012), and product assessment subsequent to the moment of purchase (Miniard et al., 1992; Gorn et al., 1993). The second motive is related to the moment when consumer is using or looking at the product. Mood is used to influence the way the product is accepted by consumers (Djamasbi, Strong and Dishaw, 2010), and the way consumers are going to use the product (Wensveen, Overbeeke, and Djajadiningrat, 2002).

Regarding the correlation between moods and colours, the scientific literature contains works of unequal value. Some authors have indicated correspondences between colours and what they called moods, even if not all the adjectives used refer to these feelings. Such correspondences were: red – powerful; dark red – rich; orange –

friendly; green – traditional, and so on (Welsh et al., 2002; Yang and Peng, 2008). Given this type of unclear approach above, it is recommended to use established rating scales such as the Profile of Mood Scales (POMS) or Brunel Mood Scale (BRUMS).

In the absence of a systematic use of mood rating scales, the results of research have been very diverse in format. Thus, it has been found that mood is positively influenced by brightness (Adams, and Osgood, 1973) and saturation (Valdez, and Mehrabian, 1994). However, experimental results showed that the relationships of hue to mood/emotions were surprisingly weak (Adams, and Osgood, 1973). Other research has indicated that colour choices represent the mood felt at that moment (Jonauskaite, et al., 2019) and that people wear their favourite colour when they are happy (Kishore, et. al, 2020).

In a field adjacent to mood, Ou et al. (2004) introduced "coloremotions" – "feelings evoked by either colours or colour combinations". They found that chromatic preferences influenced by emotions depend on the active-passive character, colour intensity and warm-cool character of the colour.

Numerous studies have focused on studying the influence of colour on mood using just few colours, especially blue (cool colour) and red (warm colour). It is worth noting that some results regarding the blue colour have been contradictory: strong arousal effect (Kamaruzzaman, and Zawawi, 2010), drowsy effect (Küller et al., 2009; Plitnick, et al., 2010), and positive mood response in virtual reality (Lipson-Smith, et al., 2021).

Other research has focused on the practical aspects of the colour-mood correlation, namely how the predominant colour of the workplace influences the mood of those present in that interior. While some studies have indicated the lack of a colour-mood correlation (Knez, 2001), others have revealed that the index of mood status was higher for those who worked in the most colourful environment (Küller, 2006).

Mood can be affected by certain manifestations of human expression through colours and shapes, such as visual pollution (Dumitrescu and Manolache, 2001; Uka, 2022). The presence of graffiti, large billboards, industrial ruins, etc. induces negative moods in the viewer's psyche.

At the end of this section, it should be mentioned that the search on Web of Science and Google Scholar (on 03.09.2024) did not return relevant results for the following key words: mood and shapes; mood and forms; mood and geometry; mood and geometrical bodies; and mood and curves.

3. Materials and Methods

After analysing the scientific literature, it was noted that the influence of (product) colour on mood and the influence of (product) shape on mood was not studied at all. Since the colour and shape of products (as design elements) are inexorably linked to aesthetic appraisal, then aesthetic appraisal should be taken into account in the experiment. Consequently, the following research questions were formulated:

RQ1. Does the product colour influence mood?

RQ2. Does the product shape influence mood?

RQ3. How strong is the correlation between product aesthetics (expressed by colour) and mood?

RQ4. How strong is the correlation between product aesthetics (expressed by shape) and mood?
RQ5. Which are the colours that can be associated with certain moods?
RQ6. Which are the shapes that can be associated with certain moods?

The *Profile of Mood States (POMS)* was chosen for mood assessment because it is a psychological rating scale that is easy to administer and also clear to participants due to its antagonistic pairs. In addition, the Profile of Mood States (POMS) has been successfully used in many other experiments (Lochbaum et al., 2021; Petrowski et al., 2021). The Profile of Mood States (POMS) is a psychological rating scale used to assess transient, distinct mood states and it uses six pairs of generic moods: Agreeable – Hostile; Composed – Anxious; Clearheaded – Confused; Confident – Unsure; Elated – Depressed; Energetic – Tired.

Given the chosen mood rating scale, the following null hypotheses were formulated associated with research questions RQ1 and RQ2:

H01: The state of agreeableness-hostility does not vary by product colour.
H02: The state of composedness-anxiety does not vary by product colour.
H03: The state of clearheadedness-confusedness does not vary by product colour.
H04: The state of confidence-unsureness does not vary by product colour.
H05: The state of elatedness-depression does not vary by product colour.
H06: The state of energy-tiredness does not vary by product colour.
H07: The state of agreeableness-hostility does not vary by product shape.
H08: The state of composedness-anxiety does not vary by product shape.
H09: The state of clearheadedness-confusedness does not vary by product shape.
H10: The state of confidence-unsureness does not vary by product shape.
H11: The state of elatedness-depression does not vary by product shape.
H12: The state of energy-tiredness does not vary by product shape.

The colours used in experiment were only focal colours, both for participant convenience and for ease of results processing. The colours used were: red, pink, orange, yellow, green, blue, azure, violet, brown, white, grey, and black. The shapes were geometric: sphere, cylinder, cone, ellipsoid, parallelepiped, cube, and tetrahedron.

Since plastics are the only materials that allow a wide range of colours, it was decided that the first product used in experiment would be made of plastic. Also, in order for the observer to be predominantly influenced by colour, a product as simple as possible was chosen, namely the plastic box.

In the case of shape, it was considered that the product that allows for variation in shape without affecting the perceived functionality is the perfume bottle. To minimize the influence of colour, all perfume bottles used in the experiment had the same colour: medium grey (50% black). The images of the plastic boxes and perfume bottles were generated using a computer. Figures 1, 2 and 3 display the azure plastic box and the cubic and cylindrical perfume bottles, respectively.

It was decided that each participant in experiment would complete an electronic questionnaire in which they would be able to observe, in turn, the image of each product and answer the associated set of questions, each question assuming a response on a 7-point Likert scale.

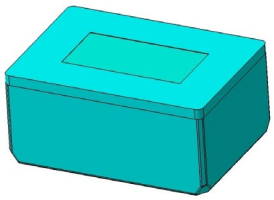

Fig. 1. *"Azure" plastic box*

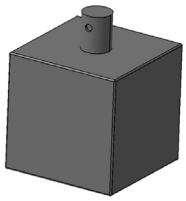

Fig. 2. *"Cubic" perfume bottle*

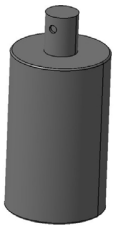

Fig. 3. *"Cylindric" perfume bottle*

The same set would be used for both colour and shape. The structure of the questionnaire is as follows:

"Please assess the beauty of product *X*." [Ugly 1 – 7 Very nice]

"Please assess the attractiveness of product *X*." [Unattractive 1 – 7 Very attractive]

"Please assess the impression made by product *X*." [Trivial 1 – 7 Impressive]

"How do you think a person who looks at/uses the product becomes?"

[Agreeable 1 – 7 Hostile]
[Composed 1 – 7 Anxious]
[Clearheaded 1 – 7 Confused]
[Confident 1 – 7 Unsure]
[Elated 1 – 7 Depressed]
[Energetic 1 – 7 Tired]

4. Experimental Results

The participants were students enrolled at a large technical university in Romania. The participants were not financially rewarded for their participation in experiments. The participants had basic training in product aesthetics. The participants were screened for visual deficiencies. The product images were presented on computer screens where they were displayed with a height of 9 cm. All computer monitors were of the same model and were properly calibrated.

The minimum sample size was calculated considering: 90% confidence level, 50% population proportion and 5% margin of error. The result was 229. So, the experiment was performed with 239 participants (132 women and 107 men). The mean age was 24.54 years (SD = 5.14). The accuracy of results was tested using *Z-score*. The *Z-score* values ranged between -2.52 and 2.67. The reliability of data was tested using Cronbach's alpha coefficient. The calculated value for the complete set of data was $\alpha = 0.956$, value which stands for a very good reliability.

The first look at the experimental results did not reveal great differences, so the very first question was if the colour or the shape really influences observer's mood. So, it was decided to apply the ANOVA single way method to the results for each pair of mood states in order to test the null hypotheses indicated in section "3. Materials and Methods". The results are displayed in Tables 1 and 2. All null hypotheses were rejected based on quite great values, so it was absolutely clear that colours and geometric shapes have a great influence on mood.

Results of ANOVA applied to mood and colours Table 1

F_{critic}	*F*	*p-value (<0.05)*	*Decision*
1.791	17.371	8.4×10^{-34}	The H01 null hypothesis was rejected.
1.791	17.813	9.6×10^{-35}	The H02 null hypothesis was rejected.
1.791	17.761	1.2×10^{-34}	The H03 null hypothesis was rejected.
1.791	10.588	2.4×10^{-19}	The H04 null hypothesis was rejected.
1.791	27.472	3.4×10^{-55}	The H05 null hypothesis was rejected.
1.791	28.056	2.1×10^{-56}	The H06 null hypothesis was rejected.

Results of ANOVA applied to mood and shapes Table 2

F_{critic}	*F*	*p-value (<0.05)*	Decision
2.104	15.792	1.1×10^{-17}	The H07 null hypothesis was rejected.
2.104	22.217	2.8×10^{-25}	The H08 null hypothesis was rejected.
2.104	22.383	1.8×10^{-25}	The H09 null hypothesis was rejected.
2.104	22.441	1.5×10^{-25}	The H10 null hypothesis was rejected.
2.104	10.414	2.3×10^{-11}	The H11 null hypothesis was rejected.
2.104	9.503	2.7×10^{-10}	The H12 null hypothesis was rejected.

The means of mood scores are displayed in Tables 3 and 4. It should be kept in mind that the experimental values were obtained using a 7-point Likert scale. The value of 4 is the median for this scale. So, it can be considered that the values between 3.5 and 4.5 are not relevant because they are at a relatively equal distance from the positive, respectively negative state of mood. These values are in grey cells in Tables 3 and 4.

Considering only the remaining values, it can be noticed that absolutely all values are smaller than 3.5, indicating a tendency to positive mood states (agreeable, composed, etc.). Significant mood scores for colours were obtained for clearheaded (2.77 – azure, and 2.80 – white), and energetic (2.67 – green, and 2.76 – azure). Meaningful mood scores for shapes were found for clearheaded again (2.96 – parallelepiped, 2.97 – cube), and confident (2.99 – parallelepiped, 2.95 – cube).

Means of mood scores against product colour Table 3

	Red	Pink	Orange	Yellow	Green	Blue
Agreeable-Hostile	3.45	2.95	3.21	3.64	2.90	3.15
Composed-Anxious	3.64	2.82	3.53	3.59	3.03	2.92
Clearheaded-Confused	3.85	3.23	3.64	3.86	3.03	3.05
Confident-Unsure	3.66	3.51	3.50	3.35	3.00	3.18
Elated-Depressed	3.41	3.30	3.68	3.28	2.86	3.52
Energetic-Tired	3.34	3.53	3.67	3.26	2.67	3.56

	Azure	Violet	Brown	White	Grey	Black
Agreeable-Hostile	4.06	3.45	3.56	2.83	3.88	4.09
Composed-Anxious	2.85	3.62	3.48	2.87	3.96	3.94
Clearheaded-Confused	2.77	3.47	3.58	2.80	3.99	4.03
Confident-Unsure	2.89	3.56	3.80	3.03	4.02	3.77
Elated-Depressed	3.05	3.57	4.14	3.45	4.34	4.45
Energetic-Tired	2.76	3.72	4.34	3.51	4.38	4.30

Means of mood scores against product shape Table 4

	Sphere	Cylinder	Cone	Ellipsoid
Agreeable-Hostile	3.43	3.59	4.08	3.32
Composed-Anxious	3.28	3.52	4.21	3.51
Clearheaded-Confused	3.57	3.60	4.21	3.62
Confident-Unsure	3.44	3.65	4.20	3.53
Elated-Depressed	3.66	4.00	4.05	3.69
Energetic-Tired	3.65	4.01	4.10	3.55
	Parallelepiped	Cube	Tetrahedron	
Agreeable-Hostile	3.02	3.01	3.84	
Composed-Anxious	3.00	3.05	4.12	
Clearheaded-Confused	2.96	2.97	4.10	
Confident-Unsure	2.99	2.95	4.11	
Elated-Depressed	3.22	3.28	3.83	
Energetic-Tired	3.22	3.46	3.81	

Correlation coefficients were calculated to test the relationships between colours/ shapes and mood states. The correlation coefficients are presented in Tables 5 and 6. It should be noticed that absolutely all coefficients are negative, pointing out a certain correlation between positive mood states and colours, respectively geometric shapes. (The positive mood states were on the lower side of the Likert scales.) The correlation intensity was relatively small for most of the colours with the remarkable exception of colour brown which displayed moderate to strong intensities. The correlation intensity was greater for geometric shapes compared to colours, and the cube displayed a moderate to strong intensity.

Correlation coefficients between aesthetics (colours) and mood Table 5

	Red	Pink	Orange	Yellow	Green	Blue
Agreeable-Hostile	-0.33	-0.39	-0.28	-0.18	-0.26	-0.44
Composed-Anxious	-0.30	-0.41	-0.20	-0.18	-0.14	-0.29
Clearheaded-Confused	-0.31	-0.43	-0.24	-0.18	-0.23	-0.36
Confident-Unsure	-0.43	-0.39	-0.29	-0.03	-0.27	-0.24
Elated-Depressed	-0.43	-0.36	-0.28	-0.17	-0.34	-0.28
Energetic-Tired	-0.48	-0.31	-0.26	-0.13	-0.35	-0.31

Table 5 (continuation)

	Azure	Violet	Brown	White	Grey	Black
Agreeable-Hostile	-0.23	-0.42	-0.73	-0.22	-0.18	-0.47
Composed-Anxious	-0.25	-0.39	-0.72	-0.25	-0.20	-0.42
Clearheaded-Confused	-0.25	-0.40	-0.66	-0.28	-0.17	-0.41
Confident-Unsure	-0.27	-0.39	-0.61	-0.28	-0.12	-0.39
Elated-Depressed	-0.10	-0.35	-0.60	-0.23	-0.05	-0.31
Energetic-Tired	-0.05	-0.42	-0.49	-0.23	-0.02	-0.28

Correlation coefficients between aesthetics (shapes) and mood Table 6

	Sphere	Cylinder	Cone	Ellipsoid
Agreeable-Hostile	-0.38	-0.47	-0.43	-0.44
Composed-Anxious	-0.45	-0.55	-0.45	-0.41
Clearheaded-Confused	-0.44	-0.46	-0.41	-0.42
Confident-Unsure	-0.46	-0.51	-0.43	-0.50
Elated-Depressed	-0.29	-0.49	-0.35	-0.39
Energetic-Tired	-0.32	-0.39	-0.39	-0.30

	Parallelepiped	Cube	Tetrahedron
Agreeable-Hostile	-0.51	-0.65	-0.40
Composed-Anxious	-0.51	-0.64	-0.45
Clearheaded-Confused	-0.48	-0.68	-0.43
Confident-Unsure	-0.44	-0.58	-0.42
Elated-Depressed	-0.40	-0.61	-0.51
Energetic-Tired	-0.40	-0.66	-0.41

5. Discussion and conclusions

In an experiment that investigated the influence of product focal colour and product geometric shapes on mood, the following conclusions were reached.

In the case of both colours and geometric shapes, a pronounced and general tendency towards positive mood states was observed. This tendency was noted both in the scores resulting from the questionnaire and in the correlation coefficients. The general tendency of colours to induce positive moods is in agreement with those discovered by Küller (2006), and the fact that focal colours are also saturated validates the conclusions of Valdez and Mehrabian (1994).

There are certain limitations of the experiment: a) unsaturated colours were not used, so future research should approach this aspect; b) the colours were displayed on computer screens, so colours placed on products should also be tested; c) the experiment was carried-out with young intellectuals, so other population segments should be approached.

A particular case was the brown colour, which had a moderate to strong positive influence on all mood states included in the POMS scale (agreeable; composed; clearheaded; confident; elated; energetic). The cube was the particular case regarding geometric shapes with a similar influence.

The conclusions regarding geometric shapes cannot be compared with the results of other researchers, this study being the first in this direction, as it was also shown at the end of the section "2. Literature review".

To the question "why did the study not reveal strong correlations between certain colours and certain moods?", the answer is that, unlike emotions (which are predominantly visceral), moods are to a small extent visceral and, also, are strongly influenced by the individual's own life experience and culture.

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