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Psychology and design. The influence of the environment's representation over emotion and cognition. An ET study on Ikea design

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Abstract

This study aims at exploring how environment's representation can influence perceived pleasantness and purchasing decisions. Starting from the Attention Restoration Theory, we assumed that natural settings promote wellbeing and allow focusing attention. Moreover, according to the model proposed by Kaplan and Kaplan, environmental features generate a positive affective evaluation of the environment when they communicate coherence, legibility, complexity and mystery. We compared interior design projects exploring the hypothesis that the presence of specific elements inside the environment (human figures; doors and passages; nature elements; everyday objects) elicits a positive emotional reaction and an expression of preference in buyers. Twenty-four college students were shown pictures of different interior spaces: 4 designed by Ikea and 4 by other brands. The images were matched by contents. Participants' exploration path and fixations were recorded using eye-tracking technology. Environmental pleasantness, restorativeness and willingness to purchase any of the furniture shown were assessed for every room using self-report questionnaires. Data showed that the interior design style proposed by Ikea was overall able to elicit a more positive emotional response, a more active visual exploration and more willingness to buy the furniture. Implication for interior designers and possible future developments are discussed.

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Keywords: Enviroment; Interior design; Eye tracking; Ikea; Emotions; Cognitive evaluation

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1. Introduction

Every place where we spend some times during life plays a role in influencing our existence at different levels, but one of the most relevant is, of course, our home. This term, as Hayward clarifies [1], encompasses the concepts of family, social network, personal identity, privacy, continuity, customization and behavior. Smith [2] defines "home" as a multi-dimensional concept that people feel at the same time as physical environment, social domain and as a place where they can satisfy personal needs. Indeed, the concept of home can be described by five main attributes that differentiate it from the more neutral "house". First, it's a primary territory for the inhabitant, who holds exclusive control upon it. Then it provides a sense of continuity, which corresponds to the sensation of safety, stability and belonging; this is the feature that children mention the most about home [3]. Privacy is another peculiar quality of homes: according to Altman [4] a home promotes the mastery of social interactions within a precise space, defining the Self; for Seamon [5] it guarantees rest and recharging of both physical and psychological energies. Furthermore, our home gives us a huge chance of self-expression (see [3] and [6]): as Czikszentmihalyi and Rochberg-Halton notice [7], a home is closely related to its owner's identity, because individuals try to express themselves through the personalization of the environment and its objects, meanwhile displaying a self-representation and a self-presentation. Finally, home represents a crucial point of the social life and the relationships of its residents. All these features contribute to make home a confortable and friendly place, promoting a feeling of comfort and satisfaction.

Given these assumptions, an interesting question would be: why do we like one home more than another? Since the Seventies, specific branch of psychology, the environmental psychology [8], has been investigating "the relationship between human behaviour and existence, and the related physical surrounding, or even better physical setting" [9]. Interlacing with disciplines like architecture and design, many researches explored the role of particular characteristics of the environment intended in a broad meaning, for example cities and neighborhoods [10] or landscapes and natural environments [11], in relation with psycho-social constructs like stress, sense of safety etc.; housing places had been considered too, but mainly as residential zones and more general places for dwelling [12, 13], not exactly as "home". Recently, a stronger partnership between psychology and design led to a deeper analysis of how the individual experiences, on both cognitive and emotional levels, his/her presence and his/her interaction with specific environments (e.g. shops, hospital room or waiting room, as in [14]), and the concept of environment even exceeds its boundaries including virtual places and online backgrounds [15]. But an organized and detailed study of the cognitive and emotional effects of the representation of what is a "home", and not simply a "house", in a perspective that embraces both psychological and design-related approaches, has not been conducted yet, to our knowledge. The present research tries to fill this gap, studying the role of specific elements, identified in Ikea's advertising images, in increasing the perceived pleasantness, and consequentially, the purchasing intent.

To be able to better identify and define our variables, we started by taking into consideration the different cognitive mechanisms involved during the cognitive exploration of an environment; we also took into account the emotional component that may influence the perception; and we finally focused on the specific cognitive reasons that can bring people to perceive an environment as pleasant and restorative.

The perception of the environment is a complex phenomenon, requiring the simultaneous activation of different sensory channels and involving a human-environment interaction [16]. More specifically, during the exploration of a place we select information using precise mental schemes that guide the action and are simultaneously modified by the incoming information. Extensive studies about environmental schemes have been conducted by Mandler [17]: according to the author, the type of scheme we activate determines how difficult will be the processing of the environmental information and affect subject's attention. An environmental scheme is not only a cognitive construction, but involves emotions as well. This has been recently recognized by the "New Human Factors" approach, which goes beyond usability and aims at «the evaluation and design of the pleasantness of use and the sensory and emotional qualities of the product » [18]. As Norman also argues [19, 20], the concept of usability can not be separated from the sensory component that inevitably accompanies the use of the product: the experience that we have with an artifact includes both the ease of use, as the product is understood and used, both the needs to which it is able to respond, in terms of ability to elicit specific feelings and emotions.

Several studies aimed to identify environment features that can work as predictors of its pleasantness/unpleasantness. An interesting model is the one proposed by Kaplan and Kaplan [21]. They consider

the exploration of the environment as split in two consecutive steps: the attempt to bring sense to the environment through the activation of the appropriate scheme (comprehension) and the attempt of enhance the knowledge on the level of action (exploration). These operations cover four different types of characteristics, whose satisfaction determines a positive affective evaluation of the environment by the subject. Coherence is linked to the possibility to fulfill a cognitive efforts, e.g. when we can easily include the environment in a known scheme; Legibility allows to use large amount of information to support comprehension and to facilitate orientation; Complexity refers to the abundance of perceptual stimuli in the environment; it provides positive emotional state as long as it doesn't undermine Legibility; Mystery is about these features that invite to investigate deeper, to find out more details (e.g. a window from which we can see a landscape, a door that gives a glimpse of another room and even shaded or partially hidden areas). Several researches (for a review, see [22]) pointed out that these elements are able to keep high levels of involvement and interest toward the environment, increasing related preference and promoting a more active exploration. Kaplan and Kaplan's model, however, focuses mainly on physical and esthetical predictors. Other studies [25, 26] found out that the sense of restorativeness [26] could play a lead role in these processes as well. As Korpela, Hartig and collegues [27] clarify, the concept of restorativeness is strictly close to the concept of environmental stress: after an episode of stress or attentive overload, a restorative experience can provide a change to positive mood, restore attention skills, enhance reflection and elicit pleasantness. So, a restorative place is a place that allows people to take their mind off and relax, that fosters positive affects and gives a break from daily routine, as sustained by the Attention restorative Theory, proposed by Kaplan [28, 29, 30, 31]. Ulrich's studies [32,11] highlight the role of stress regeneration: according to the author, to be exposed to specific stimuli, characterized for example by moderate complexity and the presence of plants and water, can provokes aesthetic-affective responses able to restore from stress and reducing arousal. To assess environmental restorativeness, Korpela and Hartig [33] create the Perceived Restorativeness Scale (PRS), a specific instrument that permits to measure the subjective perception of the four restorative factors described by Kaplan's Attention Restoration Theory [27, 29].

2. Aims and hypothesis

In light of the evidence and reasoning summarized above, the aim of the present study is to explore how environment's representation, especially concerning the domestic sphere, can affect perceived pleasantness and purchasing decision. More specifically, we want to investigate if the presence of specific elements linked to restorativeness is able to elicit a positive emotive response and consequently an expression of preference. We choose to compare Ikea's approach to interior design to other brands. The interior design style used by the Swedish brand differs from those of others competitors on the basis of the presence of specific elements, including most of those discussed above. Hence, we wondered if the great attraction of Ikea on consumers may be due to how this brand designs its environments for advertising. To be more specific, we hypothesize that the "restorative" elements, recurrent in Ikea's promotional images, can influence perceived pleasantness and purchasing decision. First of all, we assume that an human figure represents a source of attraction, according to the proven phenomenon of preference for human faces: this preference has ancient origin and has an adaptive meaning, since it serves to foster relationships between conspecifics, promoting the attachment bond, as demonstrated by the great ability of new born babies to recognize the human face and prefer it in respect of other stimuli (see [34,35]). Then, we hypothesize that doors and passages showing partial view of other places are able to arouse curiosity and elicit positive affect, since they can be assimilated to the pleasantness predictor mystery described by Kaplan and Kaplan [21]. Furthermore, the hypothesis of the importance of plant component in the environmental setting is derived from the numerous researches on restorativeness that, as we discussed before, empower the restorative properties of nature on both psychological wellbeing and attention abilities [29, 30, 32]. Moreover, we hypothesize that everyday objects, like an open book and car keys on the kitchen's table or a teddy bear at the foot of the bed, arranged so as to create a narration may offer to the observer a "possible world", that is a captivating and achievable alternative to his/her real world. Finally, a further peculiarity of the present study is the purpose of verifying whether current criteria adopted by environmental psychology, so far gathered uniquely from the study of environment meant as landscape (e.g. natural landscapes [11] or cityscapes [10]) or as places of social utility (e.g. hospitals [14]), can be validly applied also in the investigation on the evaluation of domestic environments, for advertising purposes.

3. Methods

3.1. Participants

Twenty-four participants joined our study (F = 17; age range: 19-25 yrs., SD = 2.04). They were all college students attending different majors. They all volunteered to take part in the study. They did not receive any incentive or course credit for their participation. All participants had normal or corrected normal vision. None of the participants had a previous specific experience in the filed of interior design.

3.2. Materials

We used 8 advertising images, 4 from Ikea and 4 from different brands. We selected 4 living spaces (living room, bedroom, kitchen and office room). Images were paired so that each space would be mirrored in two categories (hence having an Ikea and a non Ikea image for each living space). We selected the images so that for both categories similar elements, style and colors were portrayed in the advertisement. Ikea images were characterized by the presence of one or more human figures, doors and passages, natural elements (plants), everyday objects. None of these elements was present in the images from other brands. We elaborated the images so that any reference to a specific brand was removed.

We recorded participants' visual exploration of each image using a Tobii x-120 eye-tracker (ET). The Tobii system allows investigators a fast and automatic calibration procedure for each participant. The system is unobtrusive and permits free head movements, allowing spontaneous behavior. ET provides qualitative data organized as clustered images that represent to the most intensely fixated areas of a target stimulus. Quantitative data return specific measures linked to number and lengths of fixations and observations. These data are computed in reference to specific areas of interest (AOI), which we selected according to our research aims (we selected the specific pieces of furniture characterizing the ambient and the surrounding environment). We analyzed the following indexes: observation length (OL: the total time in seconds for every time a person has looked within an AOI within the stimulus, starting with a fixation within the AOI and ending with a fixation outside the AOI) and observations count (OC: The number of visits and re-visits to an AOI).

We also recorded self-reported data, focusing on perceived pleasantness, restorativeness (using Korpela and Hartig's Perceived Restorativeness Scale [33]) and willingness to purchase any of the displayed furniture.

3.3. Procedure

Participants were welcome to the laboratory and asked to sit in front of the ET equipment. Calibration was run and the 8 images were showed in random order. Each image was shown for 10 sec. A black screen was inserted for 3 sec between images. After looking at the images, participants were given the self-report questionnaires and asked to fill in the different scale, referring to each image. In order to avoid recency effects given by the presentation order that should favor memory of the lastly presented stimuli, we provided a printed version of each image to the participants as a reference.

4. Results

4.1. ET data

We run a repeated-measure GLM ANOVA comparing the OC while looking at different living spaces in the two conditions (Ikea furniture vs. other brands). We found a significant interaction effect between the brand and the living spaces ($F_{3,69} = 4.86$, $p < .01$, $\eta^2 = .17$). As will be clear from Fig. 1a, participants observed more the elements presented in the kitchen and bedroom as presented by Ikea, while the opposite was true for the living room and the studio room.

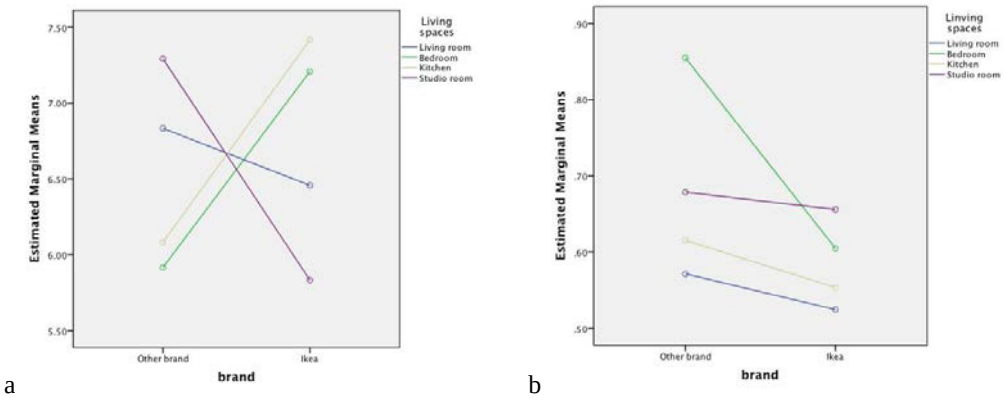

Fig. 1. (a) Differences in OC and (b) OL between brands and among ambients.

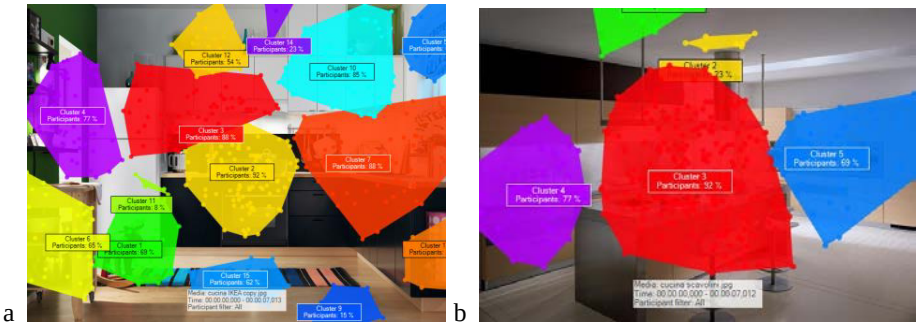

Fig. 2. (a) Cluster map of Ikea kitchen (b) Cluster map of the other brand kitchen.

We run a repeated-measure GLM ANOVA comparing the OL while looking at different living spaces in the two conditions (Ikea furniture vs. other brands). We found a significant interaction effect between the brand and the living spaces ($F_{3,69} = 3.34$, $p < .05$, $\eta^2 = .13$). As is clear from Fig. 1b, Ikea's living spaces were explored more actively (participants spent less time on each element, varying more the number and type of explored elements in the environment) and this was true especially for the bedroom.

These trends were confirmed also by qualitative data. Cluster maps (see Fig. 2a and 2b as examples) highlighted that living spaces presented by Ikea were explored more actively and focusing on more details (i.e., more and smaller clusters).

4.2. Self report data

We run a repeated-measure GLM ANOVA on self-reported data about perceived pleasantness of each living space. We found a significan interaction effect between the brand and the living spaces ($F_{3,21} = 6.06$, $p < .01$, $\eta^2 = .46$). Data reported in Fig. 3a show that Ikea interiors have been rated as more pleasant, with the exception of the studio room. The pairwise comparisons among living spaces highlighted a significan difference between the living room and the studio room ($p < .05$) and between the bedroom and the studio room ($p < .01$).

We run a repeated-measure GLM ANOVA on the subscale of the restorativeness scale. A significant interaction effect between the brand and the living spaces emerged ($F_{3,21} = 7.33$, $p <. 001$, $\eta^2 = .51$). As can be derived from Table 1, Ikea' s bedroom and kitchen were perceived as more relaxing, whereas the studio room and living room were perceived as less relaxing than those from other brands. Pairwise comparisons highlighted a significant difference between the mean scores of relax ascribed to the bedroom and to the kitchen ($p < .001$). A similar

analysis was performed on the scores of the boredom scale. We found a significant interaction effect between the brand and the living spaces ($F_{3,21} = 3.83$, $p < .05$, $\eta^2 = .35$). All the living spaces designed by Ikea were perceived as less boring that the equivalent ones from other brands (Table 1). Pairwise comparisons showed a significant difference between the living room and the studio room ($p < .05$). Analyzing the scores of the complexity scale, a significant interaction effect between the brand and the living spaces ($F_{3,21} = 2.88$, $p < .05$, $\eta^2 = .30$) emerged (Table 1): the living room and the studio room designed by Ikea were perceived as the most complex. Pairwise comparisons highlighted a significant difference between the bedroom and both the living room and the studio ($p < .01$).

Table 1. Mean Scores and Standard Deviation (in Parentheses) for the Restorativeness Scale.

Living spaces	Ikea	Other brand
Relax		
Living room	3.79 (1.61)	4.42 (1.64)
Bedroom	5.21 (1.47)	4.46 (1.69)
Kitchen	3.71 (1.19)	3.17 (1.52)
Studio room	3.96 (1.87)	4.75 (1.77)
Boredom		
Living room	2.12 (1.22)	2.67 (1.61)
Bedroom	1.92 (1.59)	3.58 (1.79)
Kitchen	2.21 (1.18)	3.62 (1.81)
Studio room	3.67 (1.90)	3.83 (1.93)
Complexity		
Living room	5.58 (1.95)	3.67 (2.39)
Bedroom	4.67 (1.93)	2.21 (1.41)
Kitchen	4.46 (1.96)	4.04 (2.35)
Studio room	5.83 (1.81)	4.08 (2.18)

Focusing on the purchasing decision, we run a repeated-measures GLM ANOVA on the scale measuring the level of willingness to buy the displayed forniture. A significant interaction effect between the brand and the living spaces emerged ($F_{3,21} = 4.21$, $p < .05$, $\eta^2 = .38$). As shown in Fig. 3b, participants were more willing to purchase the bedroom and the kitchen designed by Ikea, whereas the opposite was true for the livong room and the studio room.

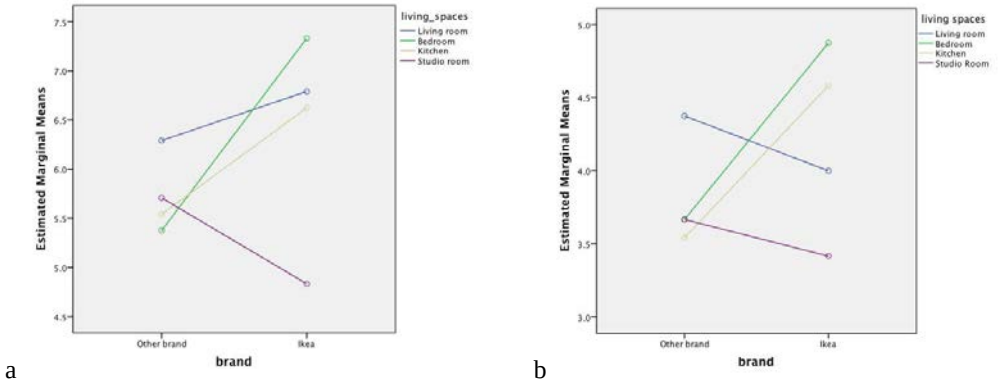

Fig. 3. Differences between brands and among spaces for Restorativeness levels (a) and willingness to buy (b).

5. Discussion and conclusions

Our data highlighted significant differences in participants' cognitive and emotive responses to Ikea design as compared to that of other brands. Yet, it is interesting to notice how the "Ikea effect" was not always recorded: not only some of the analyzed interior spaces were not considered better than the equivalent ones from other brands, but the different reactions were also linked to a different behavior, when willingness to buy was taken into account.

Understanding better which are the key factors that promoted different responses could hence be valuable not only for cognitive scientists, but also for interior designers and marketing professionals.

If overall all Ikeas living spaces were classified as less boring and promoted a more active exploration, differences emerged when focusing on specific measures. The bedroom and the kitchen, as proposed by Ikea, elicited more detailed observations (as measured by the observation counts and cluster maps) and they were also rated as the most relaxing. It is interesting to point out that these two rooms were also the ones that participants were more willing to buy.

Which are the characteristics that distinguish these two spaces in the Ikea version? This is a relevant question because, as stated in the method section, we selected all 4 the Ikea living spaces because they all shared the key elements that, according to Kaplan and Kaplan's model [21] should promote restorativeness. An interesting difference is given by the fact that the two spaces that were not considered so relaxing, and that people were less likely to buy in the future (the living room and the studio room) were also the ones that were rated as the most complex to read. This data is coherent with Kaplan's theory [22:] a living space must have enough details to be perceived as interesting (and not boring). But if it presents too many details, it may generate confusion.

The studio room was the living space that was always rated in a more negative way, if compared to other's living spaces in the Ikea category. This can be explained by the fact that this room was the one that looked less "home-like" and was not a prototypical office room. This, together with the fact that it was possibly too complex, may have confused the participants and elicited a more negative cognitive and emotive response.

The prominence of the selected key elements in the different Ikea's living spaces could also be used as a key to read and interpret our results. Human figures, especially in a realistic and everyday pose, had an influence on the perceived pleasantness. For example in the Ikea kitchen a child was shown while reading a book sitting on the floor. Natural elements appeared to have a positive effect only if they are present in large quantity. For example, in the Ikea bedroom, part of one wall was covered by green plants, which really attracted participants' attention. On the other hand, even if natural elements were present in all other rooms, they constituted only small marginal elements in the environment. Doors and passages did not differ in any way among the 4 Ikea spaces and did not capture more attention than other parts of the 8 presented environment. More investigation is needed to explore the role of these elements. Everyday objects always attracted more attention and the environments where these elements were more varied and/or related to children were the one that participants liked more and explored with more attention.

Overall we can conclude that even if the present study presents some limitation (relatively small sample size, only 8 environments used as stimuli, sample constituted only by college students), and hence will need more data to allow a generalization of the findings, some interesting idea emerged. Living environments should be composed by different elements, with a preference given to natural elements (grouped in order to create an attentional focus) and everyday life objects. Yet, if it is too complex, or too far from what people may expect from the ambient (e.g., a living room that does not look like a living room but more like a playroom), then both the cognitive and emotional responses will be negative. Interior designers should take this notion into account. From a marketing standpoint, the same considerations are true. Moreover, adding to the advertisement human figures portrayed while performing normal everyday activities can also improve the willingness not only to pay more attention to the environment, but also to buy the related furniture.

Finally the positive data collected seems to support the idea that the current criteria adopted by environmental psychology can be effectively used also to study interior design'es features.

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