

# Husbands' Perception of Environmental Characteristics During Participation in Physiologic Delivery

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## Abstract

**Objective:** Nowadays, the presence of husbands during the childbirth process is regarded as an important factor that can contribute to lower rate of the C-section, better success of physiologic delivery and higher satisfaction in childbirth experience. Considering the special sociocultural characteristics of the Iranian society, this method requires accurate assessment to be practical and effective. The aim of this research was finding out how husbands perceive the environmental and physical characteristics of delivery spaces via studying these physical characteristics, exploring them through husbands' perception and finally discovering the mechanism behind formation of this perception.

**Materials and methods:** First, the conceptual model of the study was developed after a review of the physiologic childbirth literature. Then, a research questionnaire was designed and distributed among 120 husbands who recently had the experience of accompanying their wives during physiologic childbirth.

**Results:** The results showed that light, color and temperature play a significant role in husbands' perception of delivery spaces under the special psychological conditions and stress that they experience during the childbirth. Designer should pay due attention to these three factors when designing the structure of childbirth spaces.

**Conclusion:** Promoting the environmental quality of the physiologic delivery room based on husband's perception can help mothers and medical staff better manage childbirth pain which is an integral part of natural childbirths.

**Keywords:** Physiologic Delivery; Husband; Environmental Characteristics; Perception; Mechanism of Perception Formation

## Introduction

Because of increased awareness of communities

about the risks and harms of C-section, researchers are searching for ways to encourage mothers toward choosing natural childbirth. As a result, psychologic factors such as the presence of husbands and environmental variables are now more prominent

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than before.

In early-twentieth century, physiologic childbirth was a typical part of normal life and mothers often gave birth to their children at family places (where they lived their daily life) with the help of their families and friends (1). In the second decade of the twentieth century, however, advancements achieved in medical sciences and the transfer of the childbirth process to hospitals and medical centers led to emergence of obstetrics and gynecology as a medical specialty. Shortly after, anesthesia, analgesia, episiotomy, etc. became common practices in this field (2).

Although these medical advancements and hospital measures, especially C-section, have facilitated the process of childbirth and have improved the overall health of mothers and infants (especially women with high-risk pregnancies), they have had irreparable negative effects as well. Because of their fear of the delivery environment and labor pain, women prefer to undergo C-section rather than give natural birth. In addition to physical and psychological harms, this strong tendency toward C-section has had many negative social effects. Natural childbirth is a very safe process through which maternal instincts result in a very satisfying sensation. C-section, on the other hand, is an invasive surgery with many physical post-operation complications (3). In addition to experiencing more physical problems, mothers who undergo C-section show more psychological symptoms than mothers who give natural birth. These symptoms include self-centered rather than infant-centered attention in the first year of birth, lack of maternal confidence in infant-related affairs in the first year of birth and etc. (4).

Due to the alarming results of studies carried out about the harmful effects of C-section for mothers with low-risk pregnancy, anesthetic measures such as epidural injection for controlling labor pain and the side effects of child delivery as well as use of LD, LDR, LDRP rooms have become more commonplace. In addition to make it possible for husbands to accompany their wives throughout the delivery process, these measures and systems allow establishment of a familiar and friendly atmosphere similar to that of home for laboring mothers (5). Although some physicians believe that laboring women must turn off the thinking part of their brain at the time of giving birth to activate their survival instincts and that the presence of their husbands can disrupt this process, many laboring women become overjoyed to be able to share their childbirth

experience with their husbands (6, 7). Many studies have shown that nothing can replace the role and presence of the husband during the delivery process especially in emergency condition, even nurses who are helping the laboring mother (8, 9). Table 1 shows the results of some of the studies that have highlighted the role of husbands in managing labor pain during the physiologic delivery process.

Studies in many countries have shown that involving men in reproductive health interventions can help improve maternal outcomes (22) but there is no mention of the husband's satisfaction and its direct impact on the management of the mother's pain and the delivery process. The husband's satisfaction is important because many physicians believe that adrenaline secretion is "contagious" and that an anxious husband can affect his wife's oxytocin secretion. When the adrenaline level rises, the secretion of oxytocin decreases and this interferes with the labor progress (23).

Providing the husband with useful information as well as a comfortable atmosphere and physical space can better prepare him for playing the role of support (24). Although several numbers of studies have been carried out about mothers' need for social support and companions so far, not a lot more studies focus on the experiences and perceptions of husbands who support their wives during childbirth in Iran. Understanding perceptions of husbands particularly on support they provided may improve not only their involvement (24) but also establish strategies that enhance the quality of childbirth department in order to increase their satisfaction.

Several studies in Iran that explored the reasons behind the increasing CS rates, identified a range of factors including fear of labour pain, perceived safety of CS, concerns about complications following vaginal delivery (25). A researcher (26) interviewed more than 200 mothers and found out that the role of the husband in preparing his wife for physiologic birth is crucial. The desire and satisfaction of the husband to participate in the labor control procedure plays an important role in reducing the mother's pain and increasing her satisfaction with natural delivery. A study conducted in 2002 showed that a natural delivery with the presence of close family members in LDRs room can significantly reduce labor time and pain (27).

These measures (using home-like delivery wards and the husband's presence) in Iran are more complex and limited.

*Husbands' Presence during Childbirth*

**Table 1:** Some of the reasons mentioned by various studies for women's tendency toward C-section and the effect of the presence of husbands on the childbirth experience

Study title	Sample population/ methodology	Finding
In the Nepalese context, can a husband's attendance during childbirth help his wife feel more in control of labour? (10)	309 laboring women in total; 97 accompanied by their husbands; 96 accompanied by one woman; 11 accompanied by their husband and a woman; 105 with no accompany (control group)	Labor pain control was significantly higher among laboring women accompanied by their husbands.
The effect of presence of trained husbands beside their wives during childbirth on women's anxiety (11)	84 laboring women in total; 28 accompanied by their trained husbands; 28 accompanied by a supporting midwife; 28 with no company (control group)	Labor stress was significantly lower in the fourth phase of childbirth among laboring women accompanied by their husbands.
The effect of the presence of the husband during childbirth (12)	200 laboring women in total; 100 accompanied by their husbands; 100 with no company (control group)	The duration of labor pain was less, C-section rate was lower and intrauterine injuries were fewer among laboring women accompanied by their husbands.
Effects of fathers' attendance to labor and delivery on the experience of childbirth in Turkey (13)	50 laboring women in total; 25 accompanied by their husbands; 25 with no company (control group)	High rate of satisfaction among laboring women accompanied by their husbands
The best encouraging persons in labor: A content analysis of Iranian mothers' experiences of labor support (14)	Observations and semi-structured interviews with 25 individuals	The presence of a companion, e.g. their husband, a family member, or a doula, during labor helped them better deal with the labor process, particularly when they felt lonely
The child's father, an important person for the mother's well-being during the childbirth: A hermeneutic study (7)	Analysis of the data acquired from 67 first-time Swedish mothers	Some women expressed that as their partner knew them so well, they only had to glance at him for him to know what to do.
Husband gatekeeping in childbirth (15)	Deep interviews with 200 mothers	The eager presence of the husbands was reported effective in reducing labor pain and increasing childbirth satisfaction.
Effect of the presence of support person and routine intervention for women during childbirth in Isfahan, Iran: A randomized controlled trial (16)	100 laboring women in spontaneous labor in four groups: group 1 received routine intervention with a support person; group 2 received routine intervention without a support person; group 3 received a support person without routine intervention; group 4 did not receive routine intervention or a support person.	The presence of a support person during labor in Iranian women decreases labor length and improves labor outcomes.
Women's experience with social presence during childbirth (17)	Qualitative descriptive study using interviews conducted with 16 women in the immediate postpartum period after vaginal birth	The women felt most comfortable in the presence of someone who "knew them best", offering a sense of personal connection in the birth environment.
A place for the partner? Expectations and experiences of support during childbirth (18)	8 couples living in Hampshire, UK, who were interviewed six weeks before the birth and approximately 12 weeks following labor and delivery	Support provided by the male partner evoked very positive responses from the women. The fathers perceived that they were very helpful to their partner during childbirth. Though the women mostly found childbirth straightforward some fathers, nevertheless, found the experience stressful.

**Table 1:** Some of the reasons mentioned by various studies for women's tendency toward C-section and the effect of the presence of husbands on the childbirth experience (continue)

Study title	Sample population/ methodology	Finding
Requests for cesarean deliveries: The politics of labor pain and pain relief in Shanghai, China (19)	Drawing upon ethnographic fieldwork and in-depth interviews with 26 postpartum women and 8 providers	To reduce C-sections, policy makers should address the lack of pain relief during childbirth and develop other means of improving the childbirth experience that may relieve maternal anxiety, such as allowing family members to support the laboring woman and integrating a midwifery model for low-risk births within China's maternal-services system.
Midwives perceptions of partner presence in childbirth pain alleviation in Nigeria hospitals (20)	A descriptive cross-sectional quantitative study in the maternity units of four hospitals in Abuja, Nigeria with the participation of 100 midwives selected through convenience sampling	The partner's presence was perceived as contributing to pain relief and has been a non-pharmacological technique reported to be utilized by midwives for pain management during childbirth.
Husband's role in assistance of laboring process: Systematic literature review (21)	Systematic literature review of 6 articles taken from the PubMed database.; inclusion criteria: articles 2009-2018, full text, qualitative study design	Husbands have a crucial role in the laboring process; husbands not only help fulfill the wives' needs during the maternity process, but also make mothers feel more comfortable.
How women experience the presence of their partners at the births of their babies (6)	A phenomenological study of 40 Finnish women's experiences of their partners' presence at the births of their children	For the women, the partners are not only support persons but also, above all, the fathers-to-be, a double and sometimes paradoxical assignment in the health care culture.

One of the first actions taken in line with the government's decision for reforming the healthcare system in 2014 was establishment of LDR rooms in Iran's hospitals (28, 29). A total number of 2022 LDR rooms have been built in 350 hospitals of Iran with the aim of encouraging mothers to give natural birth in private, safe and satisfying environments (29, 29). Other measures taken by Iran's Ministry of Health and Medical Education for reducing the rate of C-section include free natural childbirth services in public hospitals, eight free prenatal educational sessions, establishing specialized natural birthing wards where midwives play an important role and optimization of existing wards for having safe natural childbirths with minimal labor pain (28, 29).

The presence of a husband in the labor ward as a supporting company for his laboring wife can be challenging based on the culture and customs of the society in which they live. Due to special cultural values in Iran, this issue is even more difficult as structured and targeted arrangements are still missing. Because of these shortcomings, the presence of husbands in the labor ward is either completely prohibited in most Iranian hospitals or it is regulated by very strict rules. As a result, husbands cannot have an effective presence during their wives' childbirth process.

Regardless, due attention should be paid to husbands' perception and expectations of childbirth spaces prior to any decision-making about their presence in LDR rooms during normal physiologic delivery. Such spaces can be classified into two general aspects: environment and physical structure. Considering the stressful conditions in delivery rooms and the special cultural conditions in Iran, husbands' perception of these spaces, both environmental and physical, are fundamentally important and this study sought to explore this subject.

In the following sections of the paper, first the husbands and laboring mothers' preferences of delivery spaces will be discussed; then, the environmental and physical characteristics of these spaces will be briefly reviewed. Then the conceptual model of the study developed about how husbands perceive the environmental and physical characteristics of natural childbirth spaces will be introduced. Finally, the proposed model will be evaluated and interpreted using the results of the questionnaire-based survey and the structural equation modeling (SEM) method in SmartPLS software.

### **Environmental and Physical Needs of Laboring Women in the Delivery Ward**

A 2005 study carried out in the UK suggests that laboring women's environmental needs are highly important (30). According to this study, what women majorly asked for were having a clean room, being able to stay in the same room during labor and being able to walk around.

Most of the women also believed that a separate indoor toilet, some walkable space and a reclining chair were necessary for their husbands. More than 50 percent of the women said having a birthing pool was moderately important while 30 percent believed it was very important (31). Based on studies, one of the most important contributors to a laboring woman's comfort is the presence of her husband and the most important contributors to a husband's comfort are resting space and food (31). Needs of husbands during delivery of mothers have been outlined in Table 2. This table is considered as the conceptual framework of this study in understanding the husbands' perception of physical characteristics of childbirth environment.

The content of Table 2 has been collected via library research, observations and field interviews with husbands just after physiologic delivery, and midwives, obstetricians, nurses and healthcare designers. These interviews have done with the purpose of specifying the dependent variables of successful physiologic delivery namely, husband's presence, childbirth satisfaction, management of labor pain and progression as well as dependent variables of childbirth spaces, namely physical and environmental components. Based on the results of previous studies, the most common reason mentioned by women for choosing C-section is fear of labor pain (32). Another qualitative studies revealed that factors related to elective cesarean were fear of pain, previous cesarean birth and previous negative birth experiences (33, 34, and 35). In another study carried out in China, fear of pain is mentioned as the major reason for elective C-sections; according to this study, mothers decide to undergo C-section because natural childbirth lacks painkiller usage, spousal support and midwife presence (16).

As mentioned earlier, the best social and psychological support for a laboring woman is the active presence of her partner. The husband is a link between the medical staff and the laboring mother and can help make decisions and calm the situation if the process becomes stressed. But this presence can be efficient only when the husband's needs, both environmental-physical and mental-psychological, are met.

**Table 2:** Coordination of the environmental and physical components of childbirth spaces with the needs of husbands accompanying their laboring wives

Goal		Content		Toward natural childbirth	
				Husband's presence	
Physical	Environmental components	Mental comfort	Clean room	*	
			Beautiful room	*	
			View and landscape	*	
			Access to private green space and open area	*	
			Access to clock	*	
			Aromatherapy	*	
			Physical comfort	Possibility of walking around in private area	*
				Possibility of moving up ramps and stairs	*
				Access to shower room	*
				Access to comfortable double bed	*
		Access to hospital bed		*	
		Access to bathtub		*	
		Access to birth pool		*	
		Access to private bathroom		*	
		Access to foodstuff		*	
		Access to non-drug pain relief equipment		*	
		Quiet	Music-assisted control	*	
			Prevention of sounds from leaving delivery room	*	
			Reduction of sounds coming from corridors and nursing stations	*	
			Reduction of sounds coming from other delivery rooms	*	
				*	
		Darkness and solitude	Natural and artificial light control	*	
			Maternal room visibility control	*	
		Husband's comfort	Resting space in delivery room	*	
			Resting space outside delivery room	*	
			Showering without wetting husband	*	
			Access to foodstuff	*	
			Access to separate bathroom	*	
			Freedom in entering and leaving delivery room	*	
			Access to smoking room	*	
			Safety	Physical Availability of resuscitation equipment	*
				Mental Resuscitation equipment being out of sight	*
			Environmental components	Light	Access to natural light
Wall and ceiling artificial lights	*				
Temperature	Adjustable temperature	*			
	Design	Home-like		*	
Couple-oriented		*			
Mother-centered		*			
Furniture	Warm colors	*			
	Made of wood and cloth	*			
Navigation	Movable by personal preferences	*			
	Easy and understandable	*			
Privacy	Staying in one room for the whole childbirth process	*			
	Control over who enters or leaves	*			
	Separate walkable space for husband	*			
Non-physical	Education	Educational session	Participation by the couple together	*	

This study particularly focuses on the environmental needs via the mechanism through which husbands perceive childbirth environments.

The more attention is paid to the design and control of environmental and physical factors of childbirth spaces such as light, color, noise, etc., the more positive stimuli and distractions are created for the laboring mother, which in return increases her childbirth satisfaction; similarly, the more a laboring woman is satisfied with environmental factors, the staff's behavior, etc., the more she cooperates during the childbirth process. If the laboring woman's needs are not addressed, however, her fear of labor pain and childbirth process take over and she may start to demand C-section halfway through the process.

It is a fact that labor pain cannot be reduced in physiologic childbirth as this very pain helps the birth of the child. Therefore, the goal of labor pain management is preventing the laboring mother from suffering and to change the labor pain into a stimulus for the labor progress. What pregnant women worry about most is the pain of labor. But the pain caused by uterine contractions is very valuable. These contractions are a tool with which nature has equipped women to give birth. In other words, the pain of each contraction is a guide for the laboring woman. The positions and activities that a woman takes and does in reactions to her pain help advance the delivery process and stimulate the fetus to descend into the birth canal (36).

As was mentioned before, the husband's presence and fulfillment of his environmental and physical needs is one of the important factors for a woman to experience a successful physiologic childbirth. This study focused on these factors and the perception of laboring women from the viewpoint of husbands. As such, both laboring women and their husbands filled out the questionnaire and were interviewed regarding the needs of husbands from their own point of view and their wives' point of view.

## **Materials and methods**

The methodology of this research was descriptive-analytical. In the description section, the characteristics and concepts related to physiologic childbirth and its indicators were examined. In addition, the conceptual model of how husbands perceive and are affected by the environmental and physical characteristics of childbirth spaces was developed.

In the analytical section, first a research questionnaire was designed. The experimental

questionnaire consisted of 37 questions in two sections: The first section is demographic data which is coded alphabetically to determine the characteristics of the statistical sample in terms of education, number of birth participation and age, and the second section has been set up to analyze the research data to reach the purpose of this research. The husbands' preference questions were compiled and elaborated from the factors related to the environmental needs of husbands participating in physiologic childbirth of mothers (Table 2) in 6 items and 37 sub items: Mental comfort, Physical comfort, Quiet, Darkness and solitude, Husband's comfort, Safety. Husbands' preferences levels were asked on the 4-point Likert scale ranging (very high, high, low, and very low). Since in new and complicated subjects, people tend to choose the neutral/median point, and this would cause deviation in the results of the questionnaire, so it was decided to eliminate the neutral/median point.

The data were collected over 3 months in summer 2021. Using a simple random sampling method, which were identified in 15 pilot questionnaires, a minimum sample of 120 was sufficient according to the Cochran's formula. The questionnaires were distributed among 120 husbands one day after they participated in mothers' natural birth in Imam Khomeini and Sarem hospitals in Tehran as well as Ayatollah Mousavi and Bahman hospitals in Zanjan. The questionnaires were prepared by on-site technique and in the form of interviews in the postpartum room on different days of the week. The average time to complete the questionnaire met the expected 15 minutes.

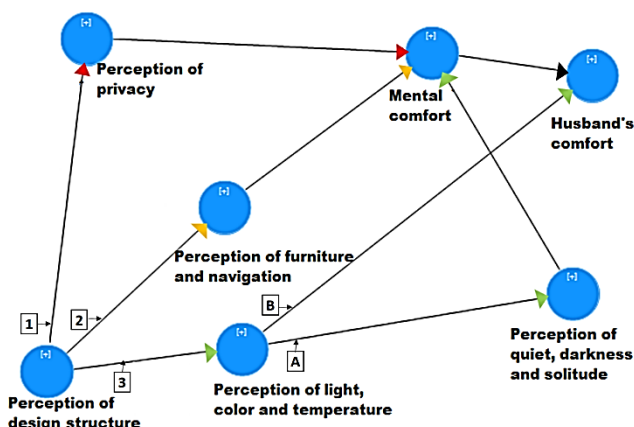
Then, the conceptual model of the research was analyzed based on the research goals via path analysis methods and SEM. As it is one of the main methods of analyzing complex data structures and one of the new methods of examining cause and effect relationships, it is a proper choice to understand the perception of husbands in Iran which is a new concept. It is practically close to the realities of social life because it allows for data analysis in a multivariate space. The model developed in this study was assessed using SEM and Smart PLS software.

## **Impact of the Environmental-Physical Characteristics of Childbirth Spaces on Husbands**

Based on what was discussed above, the presence of the husband during the childbirth process as the main supporter of the laboring mother is essential. However, no study has comprehensively identified

the environmental and physical preferences of husbands during the process of childbirth. Researchers have examined only the experiences of husbands during their presence in childbirth spaces. Considering that pregnant women are the focal point in the design of LDR rooms, it stands to reason that the design criteria should be based on the environmental and physical needs of mothers. Accordingly, husbands' perceptions of these environmental and physical needs and the mechanism through which these perceptions form can be evaluated.

A conceptual model was needed for analysis of this mechanism. Since perception-related concepts are not qualitatively measurable, quantitative methods, namely questionnaire and field-library research, were used in this study. Based on the content of Table 2, the literature of the study and the results of the measurement of the components of satisfaction in laboring mothers and their husbands via field observations and interviews in Iranian hospitals, the conceptual model of the study can be presented as follows in Figure 1.



**Figure 1:** The conceptual model of the mechanism through which husbands are affected by the environmental-physical characteristics of physiologic childbirth spaces

In this model, tangible variables classified into physical and environmental are the most independent variables. The more psychological and abstract the nature of a variable is, the more dependent the variable becomes in this model.

### Perception of Design Structure

The only completely independent variable in this conceptual model is the perception of design structure variable. The reason for the complete independent nature of this variable is that it is the cause and

precondition for formation of other variables and thus for formation of the space design.

Design structure refers to a set of factors that the architect considers for the welfare and needs of the user in an environment and designs them according to architectural and therapeutic protocols. This set includes light, color, sound insulation, furniture, navigation, etc. Perception of design structure is the understanding of these components by the users (laboring mothers and their husbands in this study).

### Husband's Overall Comfort

The most abstract and psychological concept in this model is the overall comfort of the husband (named "husband's comfort"). Therefore, it is the most dependent variable that is affected by all previous variables. Overall comfort refers to the average value of the mental, physical, etc. comfort of a person. For example, a husband may not be satisfied with the physical components but because of having mental comfort or fulfillment of his other needs, he becomes satisfied in the end. In such situation, he is said to have overall comfort.

Since this model was developed using SEM, it can be said to be based on dual dependent-independent systems. For example, the perception of privacy variable acts as a dependent variable for the perception of design structure variable and as an independent variable for the mental comfort variable.

To avoid overcomplicating the model and to achieve a correct reading and interpretation, the authors categorized conceptually related variables into groups. Accordingly, "perception of light, color and temperature", "perception of quiet, darkness and solitude" and "perception of furniture and navigation" each became one single category despite having multiple components.

**Path 1:** The design structure affects the husband's mental comfort via enhancing privacy and eventually leads to the husband's overall comfort. In other words, the design should be coherent and in accordance with the protocols so that the husband feels satisfied in terms of his own and his wife's privacy. This in return provides him with mental comfort and satisfaction and makes him happy with his presence during the childbirth process.

**Path 2:** The design structure affects the husband's mental comfort via enhancing his perception of furniture and navigation and eventually leads to his overall comfort. In other words, the design of the ward in terms of the placement, colors, materials, and etc. of furniture and ease of navigation helps the



husband easily find his way around the place and have a spatial and psychological identity in the childbirth ward. This provides him with mental comfort and satisfaction and makes him feel an overall comfort during his stay with his laboring wife in the childbirth room.

**Path 3:** The design structure brings about the overall comfort of the husband via enhancing the quality of his perception of light, color and temperature in two ways:

(A) First, it leads to his perception of quiet, darkness and solitude, then to his mental comfort and finally to his overall comfort;

(B) It directly leads to his overall comfort.

In other words, the husband's perception of the amount and controllability of natural and artificial light, the appropriateness and controllability of temperature and the suitability of colors for positive distraction fulfill the husband's need for a quiet space that filters out corridor noises, the voices of other laboring mothers and the unwanted presence of other people. This provides him with mental comfort and eventually overall comfort and satisfaction.

The following section examines the conceptual model of the research by the SEM method and based on the data collected by the questionnaires. For measuring the goodness of fit of the model using SEM, the six variables of perception of design structure, perception of light, color and temperature, perception of furniture and navigation, perception of quiet, darkness and solitude, perception of privacy and mental comfort were regarded as influential factors that affect the husband's comfort. A total of 37 items were allocated to these indicators in the questionnaire based on the theoretical framework of the study. The model will be assessed in two sections; its reliability and validity will be examined in the first section and its structural fit (the significance of the relationships and their path coefficients) in the second part.

**Results**

**Reliability and Validity:** The Cronbach's alpha for the 37 items of the husbands' questionnaire is 0.894, which indicates that it has good reliability and the results are indeed reliable.

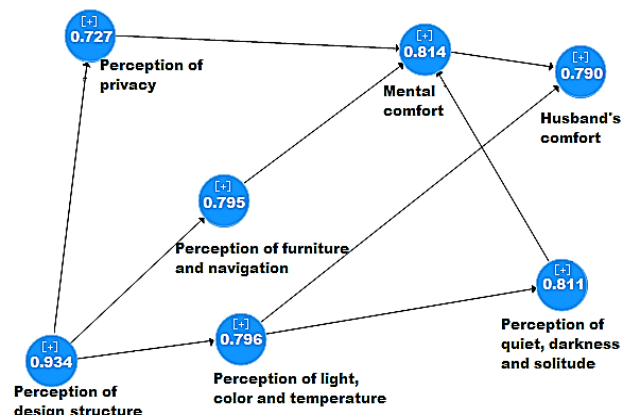
According to the principles of SEM, the reliability and validity of a proposed model should be assessed prior to examination of the significance of path relationships and the coefficients of the impact of variables on one another in each path. One of the ways to evaluate the reliability of a research model is

using the composite reliability (CR) coefficient. The validity of a model can be evaluated using the convergent validity of the average variance extracted (AVE). As shown in Table 3 and Figure 2, the CR values are acceptable in the research model.

**Table 3:** The values of the CR index of the research model

Variable	CR
Perception of design structure	0.934
Perception of light, color and temperature	0.796
Perception of furniture and navigation	0.795
Perception of quiet, darkness and solitude	0.811
Perception of privacy	0.727
Mental comfort	0.814
Husband's comfort	0.790

As shown in Table 4 and Figure 2, the AVE values of all indices are above 0.5 and the convergent validity of the model is thus confirmed.



**Figure 2:** The CR values in the research model

**Structural Fit of the Model:** The necessary criterion for measuring the structural pattern of a model is the coefficient of determination ( $R^2$ ) of the latent dependent variables.

**Table 4:** The convergent validity index of the research model

Variable	AVE
Perception of design structure	0.860
Perception of light, color and temperature	0.665
Perception of furniture and navigation	0.672
Perception of quiet, darkness and solitude	0.749
Perception of privacy	0.622
Mental comfort	0.709
Husband's comfort	0.705

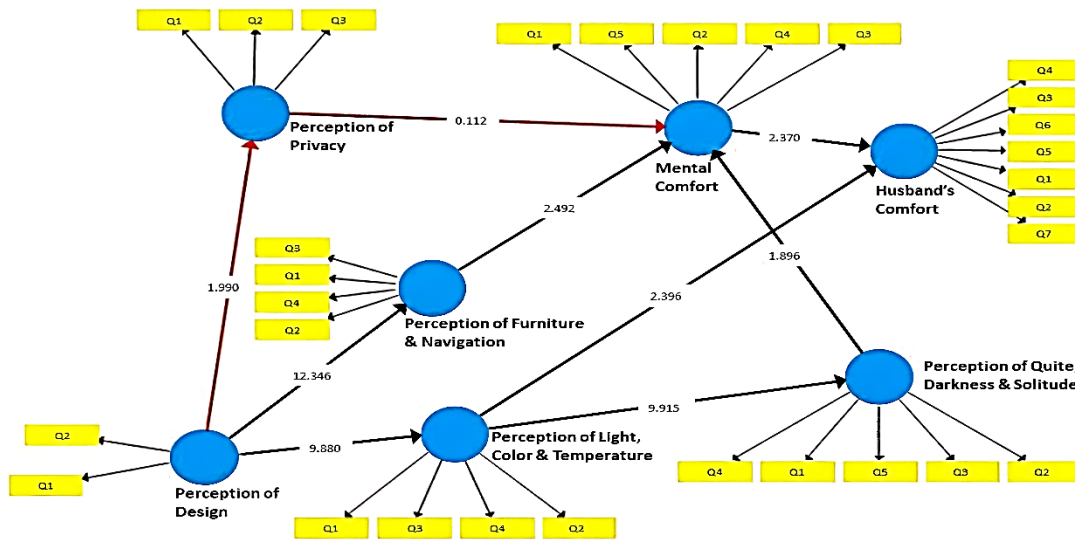


Figure 3: The t-values in the base model

Based on the obtained value for the  $R^2$  index, the research variable explains 0.365 of the husband's comfort dependent variable, which is acceptable.

Figures 3 and 4 show the general output models of Smart PLS software. These output models include both the structural model and the measurement model. The t-test was used for testing the research hypotheses and the t-value was used for evaluating the significance of the relationships. In this model, a t-value above 1.96 confirms the relationship between two factors (a path) with 95% confidence interval.

If the coefficient between an independent latent variable and a dependent latent variable is positive, an increase in the independent variable would entail an increase in the dependent variable and if the

coefficient is negative, an increase in the independent variable would entail a decrease in the dependent variable. As can be seen in Figure 3, the only path in which there is no significant relationship is the "design structure  $\rightarrow$  perception of privacy  $\rightarrow$  mental comfort" path. All other relationships are significant. Figure 4 shows the coefficient value of each path.

The coefficients of significant paths vary between 0 and 1. The closer this number is to 1, the greater the intensity of the relationship is. Table 5 shows the sum value of these coefficients in each path from the independent variable to the dependent variable, namely the husband's comfort. Two general paths can be defined in this conceptual model for the husband's perception of the childbirth space.

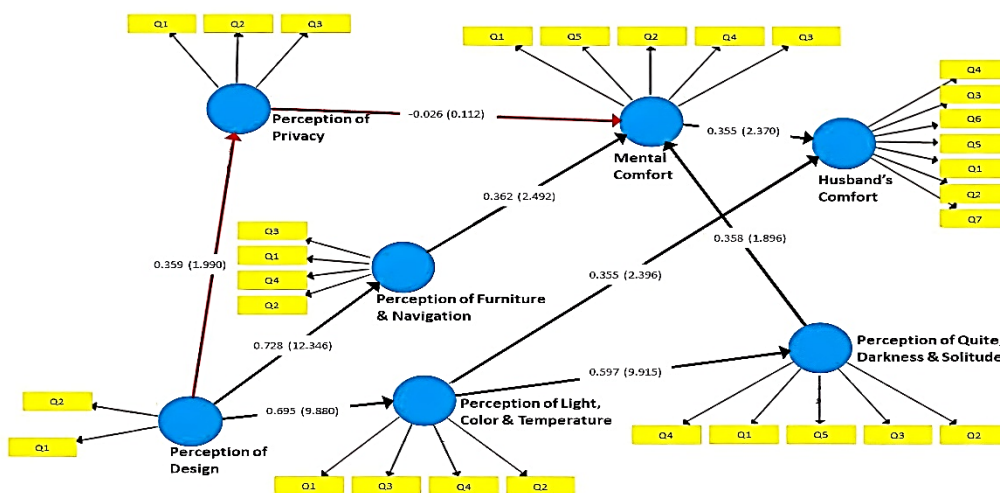


Figure 4: The coefficient of each path in the base model

**Table 5:** The test results of significant paths (hypotheses)

Path	Path coefficient	Status
Perception of design structure → perception of furniture and navigation → mental comfort → husband's comfort	0.094	Confirmed
Perception of design structure → perception of light, color and temperature → husband's comfort	0.297=0.24+0.057	Confirmed
Perception of design structure → perception of light, color and temperature → perception of quiet, darkness and solitude → mental comfort → husband's comfort		

The critical path with the overall coefficient of 0.297 includes the “perception of design structure → perception of light, color and temperature → husband's comfort” and the “perception of design structure → perception of light, color and temperature → perception of quiet, darkness and solitude → mental comfort → husband's comfort” paths.

**Discussion**

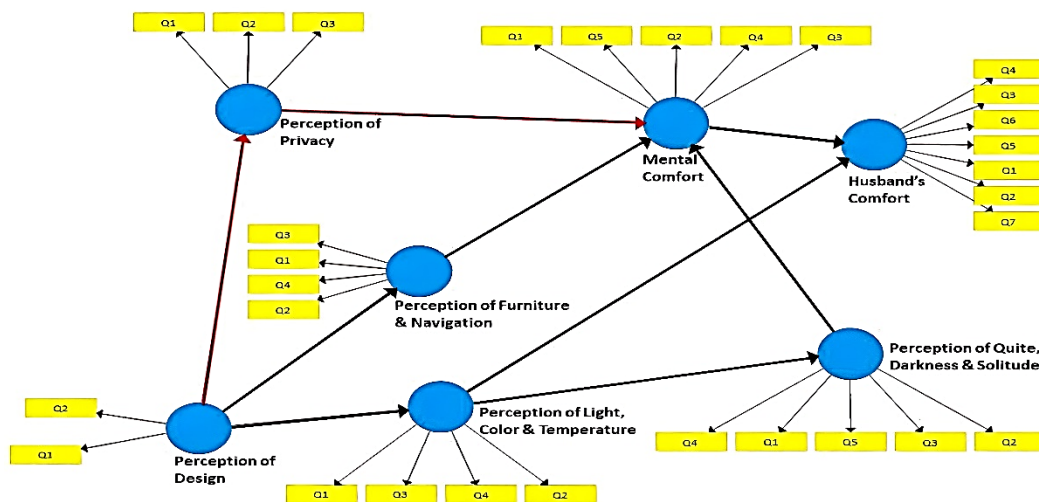
**Principal Findings:** Following the general improvements in the healthcare of human communities, childbirth standards have become significantly more important. Many researchers are now looking for ways and methods to encourage mothers to give natural birth considering the harmful impacts and challenges associated with C-section. It seems that the characteristics of childbirth spaces can play a significant role in motivating mothers toward physiologic childbirth. According to many researchers, the husband's presence in the physiologic delivery space is one of the most influential factors. However, the husband's presence has its own spatial requirements. Because of the rather special features of the Iranian culture, these spatial requirements need special attention.

**Clinical Implications:** Prior to taking any action,

however, husbands' perception of the physiologic childbirth spaces in LDR rooms must be assessed based on Iran's sociocultural context. This study sought to find out how husbands spatially perceive childbirth spaces. After development of a conceptual model based on the related literature (Figure 5), a research questionnaire was designed and distributed among the husbands of a number of women who had just left the physiologic birth ward. The collected data were analyzed using SEM in Smart PLS software.

This model is abstract and shows the paths that form in a husband's mind based on the principles of SEM when he is present in a delivery room as shown in Figure 5. However, the nature of this model is hypothetical and each path represents one hypothesis. The advantage of examining husbands' mental paths using this method is that all paths can be evaluated together on the basis of regression relations and this minimizes errors.

The validity and reliability (collectively referred to as goodness of fit) of the model were examined and confirmed based on equation modeling standards. The acceptability of the model's validity and reliability means that this conceptual model is generalizable and can be used as a base model in other studies.



**Figure 5:** The conceptual model of how husbands perceive the environment of physiologic delivery spaces

**Research Implications:** The existence of relationships and the intensity of each relationship were examined and evaluated in the model measurement stage. The results showed that, except for the “perception of design structure → perception of privacy” and “perception of privacy → mental comfort” paths, the other relationships are significant in the husband’s perception of the delivery room and can affect his satisfaction. For example, the design structure of childbirth spaces directly and significantly affects the users’ perception of furniture and navigation transparency. In addition, furniture arrangement has a direct and significant effect on the mental comfort of the users in the sense that more cohesive design structures which are based on the needs of accompanying partners allow husbands to locate furniture and specific spaces more easily by their colors, placement and materials; as a result, they would be more mentally comfortable. The relationships and effects of the factors on one another can be summarized as follows:

- Design structure has significant positive effect on perception of furniture and navigation.
- Furniture arrangement has significant positive effect on mental comfort.
- Mental comfort has significant positive effect on overall comfort.
- Design structure has significant positive effect on perception of light, color and temperature.
- Light, color and temperature have significant positive effect on overall comfort.
- Light, color and temperature have significant positive effect on perception of quiet, darkness and solitude.
- Quiet, darkness and solitude have significant positive effect on mental comfort

Via analysis of these significant relationships, two critical paths that affect the perception of husbands in delivery rooms and thus determine their satisfaction during their stay in these spaces were specified as follows:

1. Perception of design structure → perception of light, color and temperature → husband’s comfort
2. Perception of design structure → perception of light, color and temperature → perception of quiet, darkness and solitude → mental comfort → husband’s comfort

## Conclusion

The design structure of delivery rooms plays a significant role in husbands’ perception of these

places and their comfort by adjusting the light, color and temperature indices. In fact, light, color and temperature play a key role in these two paths via the elements associated with design.

A husband accompanying his laboring wife experiences a lot of stress, tension and psychological pressure before, during and after the childbirth. According to the principles of environmental psychology, the lighting, color and temperature of the delivery room have a significant positive effect on these psychological conditions. Therefore, proper use of lighting, colors and temperature control can notably improve the quality of physiologic birth rooms from the viewpoint of husbands.

## Conflict of Interests

Authors declare no conflict of interests.

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