

# When the World Is Closing In: Effects of Perceived Room Brightness and Communicated Threat During Patient-Physician Interaction

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## ABSTRACT

**OBJECTIVE:** The study proposes that room brightness creates impressions of a more spacious environment and that this perception positively impacts feelings and behaviors during high-threat conversations in particular.

**BACKGROUND:** To a large extent healthcare providers depend on their patients' willingness to disclose information. In addition to characteristics related to the physician and topic of conversation, research indicates that environmental factors influence patients' affective experiences and self-disclosure.

**METHODS:** A two-factor between-subjects experimental design was used in which participants ( $n = 90$ ) were presented with a scenario describing a patient-physician encounter varying in communicated threat. Subsequently, participants were exposed to a picture in which room brightness was manipulated. Next, patient comfort, experienced spaciousness, and self-disclosure intentions were measured.

**RESULTS:** An effect of brightness was found on affective experiences and self-disclosure intentions. In addition, the predicted interaction was obtained between brightness and communicated threat on these measures. Analyses confirmed that perceived spaciousness mediates the relationship between room brightness and self-disclosure intentions.

**CONCLUSIONS:** The study confirms that brightness impacts self-disclosure intentions. Additionally, this relationship is influenced by psychological circumstances, with a more pronounced need for spaciousness when in an anxious state of mind. The results suggest that the physical environment can be used as a tool to improve active participation. In addition, the results stress the importance of attending to the patient's state of mind in creating the right atmosphere.

**KEYWORDS:** Lighting, patients, physicians, satisfaction

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Imagine yourself entering an unfamiliar room for the first time. Whether it is a colleague's apartment, a private physician's practice, or a counseling environment, you can instantly tell whether the room provides you with enough "breathing room" or freedom of movement. Depending on such impressions, you are likely to feel confined, secure, or lost, and you may feel the urge to stay, explore the space, interact with others, or, alternatively, leave as soon as possible. Sometimes, however, the room that was spacious on one occasion may feel less "roomy" on another, or, put differently, the walls that once were at a safe distance now suddenly are "closing in." What this example suggests is that perceptions of spaciousness are not only the result of architecture and interior design, but also vary with the visitor's state of mind.

In line with this example, research shows that spatial aspects of environmental settings play an important part in influencing affective experiences and behaviors. Sundstrom (1975) showed that limited physical space induces crowding perceptions, which in turn may decrease communicative behavior. Okken, van Rompay, and Pruyn (2012) examined the effects of limited space during patient–physician interaction by altering room size and interpersonal distance. Their results showed that participants who felt physically restricted expressed a lowered willingness to self-disclose. From a practical point of view, however, manipulations related to architectural or interior design elements are often trou-

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*Participants who feel physically restricted express a lowered willingness to self-disclose.*

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blesome; room size is usually fixed, and factors such as room layout and furniture selection are not always under the control of healthcare providers either. Of particular interest to current undertaking, however, is the finding that atmospheric variables such as color and lighting may also foster perceptions of spaciousness (Stamps, 2011) and related feelings (Akalın-Baskaya & Yildirim, 2007) and behaviors (Baron, Rea, & Daniels, 1992). Examining the effects of such environmental influences in a counseling or healthcare context can possibly provide more easily adaptable and flexible tools to create the "right" atmosphere. In turn, this may improve the diagnostic process by increasing patients' active participation during conversations with their physician. Hence, in current research we addressed the relationship between perceived room brightness (fostering perceptions of a more or less spacious environment) on the one hand and experienced affect and behavioral intentions on the other. More specifically, to extend knowledge about the influence of the physical environment on patient–physician communication, this study investigated effects of perceived brightness on the disclosure of personal information during a simulated patient–physician conversation. In addition, we studied whether effects of perceived brightness are qualified by the patient's state of mind, and more in particular, the extent to which a patient feels threatened or relieved.

### ***Environmental Factors and Spaciousness Perceptions***

Research suggests that perceived spaciousness is important to inhabitants across environmental settings because it inspires feelings of freedom. For instance, Meyers-Levy and Zhu (2007) showed that a high, as opposed to a low, ceiling activated feelings of freedom and spaciousness and more creative strategies for problem solving tasks. In a similar fashion, Levav and Zhu (2009) exam-

ined the effects of experienced spaciousness in store environments and showed that narrow aisles activate feelings of confinement, which consumers counteracted by making more varied product choices. These findings suggest (in line with embodiment research; IJzerman & Semin, 2010; Williams & Bargh, 2008) that restraining physical space invokes feelings of limited psychological space. In turn, these negative feelings of restraint may cause reactance, emerging as a refusal to cooperate or comply with behavioral norms or to display expected behavior.

In addition to variations related to tangible or physical parameters, these perceptions of spaciousness may also vary with room atmospherics such as color (Acking & Küller, 1972; Kwallek, 1996; Oberfeld, Hecht, & Gamer, 2010; Yildirim, Akalin-Baskaya, & Hidayetoglu, 2007) and lighting (Durak, Olgonturk, Yener, Guvenc, & Gurcinar, 2007; Flynn, Spencer, Martyniuk, & Hendrick, 1973; Hidayetoglu, Yildirim, & Akalin, 2012; Manav 2007). For instance, Acking and Küller (1972), who repainted dayrooms in a hospital in different colors, found that a white room was judged as more open, compared to a light green room and a dark green room. In line with these findings, Kwallek (1996) revealed that a white wall color received the highest spaciousness scores, in comparison to darker colors such as green and red. Oberfeld, Hecht, and Gamer (2010) showed that not only a brighter wall color, but also a brighter ceiling color increases perceived spaciousness. The relationship between lighting and perceived spaciousness also has received considerable attention. Flynn, Spencer, Martyniuk, and Hendrick (1973) showed that spaciousness judgments differed significantly for rooms with different lighting conditions. More specifically, lighting all four walls (compared with merely lighting the center of the room with overhead lighting) induced greater feelings of spaciousness. Durak et al. (2007) varied room brightness and found that the brighter condition was judged as more spacious. Finally, Manav (2007) investigated lighting conditions in an office setting and showed that brighter lighting conditions received higher scores for comfort and spaciousness compared to more dimmed conditions.

These findings suggest that spaciousness perceptions vary depending on both lighting conditions and color selection. Nevertheless, understanding of how and why atmospherics influence brightness perceptions is still limited. In addition, atmospheric factors such as color and lighting are complex stimuli, making it hard to pinpoint what exactly accounted for the effects observed (*cf.* Valdez & Mehrabian, 1995). Arguably, perceived room brightness is a key variable in explaining effects of room atmospherics, with brighter surroundings conveying the impression of a more spacious environment. The rationale behind this line of reasoning holds that a brighter, as opposed to a darker, environment provides higher levels of perceptual clarity and that increased perceptual clarity makes an environment come across as more spacious (*cf.* Flynn, Spencer, Martyniuk, & Hendrick, 1973). This is in line with findings of Hidayetoglu, Yildirim, and Akalin (2012), showing that a brightly lit environment positively affects perceptual clarity of the environment and facilitates navigation and wayfinding therein. Also, when looking at our own experience we find that we can better survey our environment during daytime, and that we can see more of our surroundings in daylight compared to nighttime.

### *Perceived Brightness and Self-Disclosure*

Previous research indicates that variations in lighting conditions affect self-disclosure (e.g., Gifford, 1988; Miwa & Hanyu, 2006). For instance, Gifford (1988) showed that bright lighting stimulated both general and intimate communication of participants. In this paper it is argued that effects of brightness on self-disclosure are mediated by spaciousness perceptions with brighter surroundings creating the illusion of a more spacious environment. Because physical freedom triggers positive perceptions of psychological freedom, people are more likely to cooperate with requests (*cf.* Meyers-Levy & Zhu, 2007; Levav & Zhu, 2009), and hence may self-disclose more easily. Darker lighting conditions, on the other hand, may cause negative feelings of insufficient space and reduced freedom, in turn increasing reactance and hence lowering the willingness to self-disclose. Hence the first hypothesis:

**Hypothesis 1:** An increase in perceived brightness induces perceptions of spaciousness (H1a), thereby generating more positive affect (H1b) and enhancing self-disclosure intentions (H1c).

However, as suggested, in some cases darker surroundings may promote self-disclosure, arguably because they create a more intimate environment (Miwa & Hanyu, 2006). In addition, research suggests that feelings of reduced spaciousness may be preferable in terms of affect and behavior when the conversational

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*A smaller interpersonal distance promotes likeability during a positive conversation, whereas during a negative conversation, a larger distance promotes a more positive response.*

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context is stress free. For instance, Greene (1977) showed that when receiving positive feedback, a smaller distance between conversation partners invoked more positive affect. Furthermore, Schiffenbauer and Schiavo (1976) showed that a smaller interpersonal distance promotes likeability during a positive conversation, whereas during a negative conversation, a larger distance promotes a more positive response. Finally, a study by Dosey and Meisels (1969) showed that participants maintain a larger distance between themselves and an interviewer in high-stress, as opposed to low-stress, situations. In line with these findings, Okken, van Rompay, and Pruyn (2012) demonstrated that during a positive conversation the need for space is less pronounced than during a negative conversation.

At this point, one could wonder whether a non-threatening situation merely reduces spaciousness needs or whether a patient's state of mind influences spaciousness perceptions in the first place. Although this question has not yet been tested explicitly in the context of healthcare services, the idea that the state of mind influences environmental perception is commonly accepted in other, related areas of research. For instance, results of Hui and Bateson (1991) indicate that experiencing more control makes a service environment seem less crowded (*cf.* Baum, Fisher, & Solomon, 1981). Inspired by research indicating that one's state of mind steers environmental perception, here it is argued that:

**Hypothesis 2:** Effects of perceived brightness on perceived spaciousness (H2a), affective experience (H2b), and intended self-disclosure (H2c) are more pronounced during a threatening conversation, as opposed to a non-threatening conversation.

Finally, research indicates that effects of environmental variables can translate to respondents' judgments of other persons present in the room. For instance, a classic study of Maslow and Mintz (1956) showed that people consider faces more attractive when presented in an aesthetically pleasing, as opposed to an ugly, room. Similar results were found by Teven and Comadena (1996), who studied the effect of the aesthetic quality of a teacher's office on, among others, evaluations of teacher credibility and communication style. Results showed that room aesthetics positively influenced credibility ratings and translated to more positive judgments of communication style. These findings suggest that positive affect inspired by room atmospherics may positively influence person perception. Hence, for explorative purposes we will test the prediction that:

**Hypothesis 3:** The positive effects induced by room brightness translate to higher ratings of physician likeability.

## Method

To test the three hypotheses outlined above, perceived brightness was manipulated using pictures of a consultation room, and the level of communicated threat by constructing two variants of a scenario (i.e., a low threat and a high threat scenario), resulting in a 2 (perceived brightness: bright vs. dark)  $\times$  2 (communicated threat: low vs. high) between-subjects design.

## Participants and Procedure

A total of 90 participants (33 male, 57 female; mean age 20.94 years,  $SD = 2.25$ ) participated. They were recruited by approaching passers-by on the campus of a Dutch university with the request to participate in a study on their impression of healthcare environments. All participants were students enrolled in various (under)graduate programs at the university. In the introduction, participants were informed that the purpose of the study was to extend knowledge about patients' judgments of consultation rooms of general practitioners and specialists in hospitals. Next, they were presented with one of two possible scenarios varying in communicated threat. The low threat condition presented a conversation with a doctor following a "nothing to worry about" checkup, whereas the high threat condition presented a conversation following a more troublesome checkup. A manipulation check confirmed the intended difference between the scenarios [ $F(1, 89) = 15.31; p < 0.001$ ], displayed below. (*Note:* Manipulations are displayed in bold typeface; wording used in the high threat condition are between brackets.)

About 8 weeks ago you visited your general practitioner because you experienced skin irritations on your abdomen and back. You were referred to a dermatologist at the local hospital. In the following period, several medical tests took place and the dermatologist provided you with a zinc ointment to rub on the irritated parts of your body. The treatment appears **[not] to work** because you experience **less itching [more itching]** and the irritation **has almost disappeared [seems to increase]**. Last week you had a telephone consultation with your dermatologist. He informed you that the test results of the

latest test are in **and that it appears to be nothing serious [and that the results are inconclusive]**. Today you have an appointment with the dermatologist for a discussion of the test results, your experiences and an additional check-up. You feel **relieved [worried]** because **the itching and irritation pose no serious threat [the source of your complaints is unclear]**, and **have almost disappeared [that it is hard to assess the seriousness of the health threat involved]**.

Next, the participants were presented with a picture of one of two possible consultation rooms and asked to imagine themselves in the situation depicted. In order to manipulate perceived brightness, one template of a consultation room was used, of which the brightness of the back wall was modified. A pilot study was conducted in which 10 participants were shown a series of pictures with different brightness values and asked to indicate what they considered a realistic setting for a patient–physician conversation. Based on these results, one picture was selected for the bright condition and one picture for the dark condition. The difference in brightness value was 60% (RGB values dark vs. bright: 137, 133, 129 vs. 189, 185, 180). In order to control for a possible confound of aesthetic impression, participants of the pilot study were also asked to judge the aesthetics of the pictures. Results showed that the selected pictures do *not* differ in this regard ( $F < 1$ , *ns*).

Next, the questionnaire was presented, comprising the dependent variables perceived spaciousness, affective experience and intended self-disclosure. Upon completion of the questionnaire, participants were thanked for their cooperation and dismissed.

## Measures

Responses to all scales were recorded on 7-point rating scales.

### *Perceived Spaciousness*

Perceived spaciousness was measured using the items: “I would feel constricted inside this room” (reverse coded), “I would feel confined inside this room” (reverse coded), “I would have sufficient freedom of movement inside this room,” and “I would easily feel suffocated inside this room” (reverse coded) ( $\alpha = 0.68$ ).

### *Affective Experience*

To measure affective experience, a measure was used comprising the items: “Inside this room I would feel at ease,” “Inside this room I would feel unhappy” (reverse coded), “I would feel uncomfortable inside this room” (reverse coded) and “This room would give me a pleasant feeling” ( $\alpha = 0.73$ ).

### *Intended Self-Disclosure*

Intended self-disclosure was measured using the items: “I would feel inhibited from speaking inside this room” (reverse coded), “Inside this room I would feel

able to speak freely,” “I would feel uncomfortable in sharing personal information inside this room” (reverse coded) and “It would be hard for me to talk about myself inside this room” (reverse coded) ( $\alpha = 0.82$ ).

### Liking

To measure the patient’s judgment of the physician in terms of liking, a measure was used comprising the items: “This physician is unkind” (reverse coded), “This physician is involved,” “This physician is empathetic,” and “This physician is unfriendly” (reverse coded) ( $\alpha = 0.77$ ).

## Results

Analyses of variance (ANOVA) were conducted with perceived brightness and communicated threat as the independent variables and perceived spaciousness, affective experience and intended self-disclosure as the dependent variables. Results were analyzed for gender and age using ANOVA, but because none proved significant there will be no further discussion of these variables ( $p > 0.10$  for all measures).

### Perceived Spaciousness

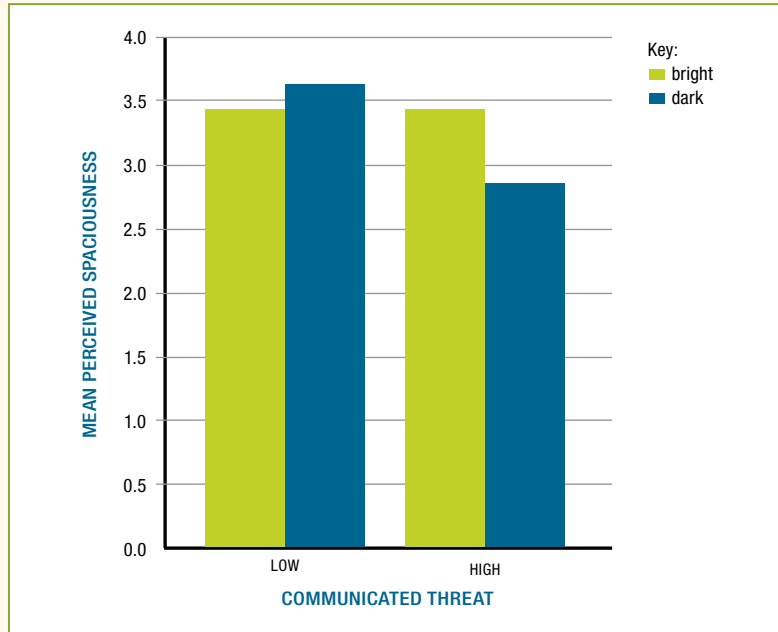
No main effect was found for perceived brightness [ $F(1, 88) = 1.14, p = 0.289$ , partial  $\eta^2 = 0.01$ ]. Communicated threat, on the other hand, was found to have a significant effect on perceived spaciousness [ $F(1, 88) = 4.52, p = 0.036$ , partial  $\eta^2 = 0.05$ ], indicating that the low threat condition triggered more perceived spaciousness than the high threat condition (Table 1).

Interestingly, and in line with expectations (H2a), an interaction was obtained between communicated threat and perceived brightness [ $F(1, 86) = 4.43, p = 0.038$ , partial  $\eta^2 = 0.05$ ] (Figure 1). For the high threat condition, the difference in mean scores for perceived brightness was significant, with participants

**Table 1.** Means and Standard Deviation (in parentheses) for All Variables

	COMMUNICATED THREAT		PERCEIVED BRIGHTNESS		BRIGHTNESS X COMMUNICATED THREAT INTERACTION			
	Low threat	High threat	Brighter room	Darker room	Low threat		High threat	
					Brighter room	Darker room	Brighter room	Darker room
Perceived spaciousness	3.53* (0.13)	3.14* (0.14)	3.44 (0.14)	3.24 (0.14)	3.44 (0.17)	3.64 (0.20)	3.44* (0.20)	2.83* (0.20)
Affective experience	2.86* (1.00)	2.49* (0.92)	2.79 (0.14)	2.57 (0.15)	2.73 (0.18)	3.04 (0.20)	2.87** (0.20)	2.11** (0.20)
Intended self-disclosure	3.73 (0.17)	3.61 (0.18)	3.75 (0.16)	3.60 (0.18)	3.57 (0.22)	3.95 (0.25)	3.98* (0.25)	3.25* (0.25)
Liking	4.13 (0.15)	4.16 (0.16)	4.17 (0.15)	4.11 (0.16)	3.94 (0.19)	4.37 (0.22)	4.48* (0.22)	3.85* (0.22)
<b>NOTES:</b> * $p < 0.05$ ** $p < 0.01$								

**Figure 1.** The interaction between brightness and communicated threat for perceived spaciousness scores.



judging the brighter room as more spacious than the darker room [ $F(1,86) = 4.75, p = 0.032, \text{partial } \eta^2 = 0.05$ ]. For the low threat condition, this difference was not significant ( $F < 1, ns$ ). Hence, perceived brightness only affected spaciousness perceptions (in the predicted direction) in the high threat condition.

### Affective Experience

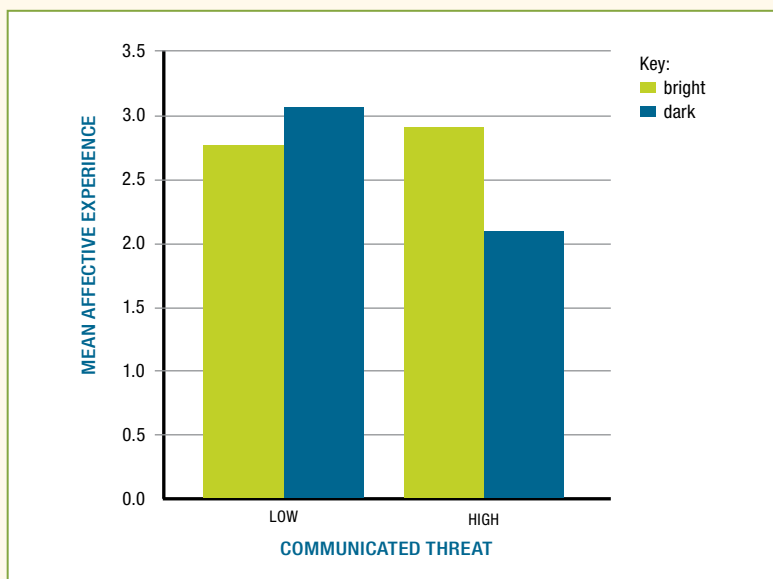
Again, no main effect was found for perceived brightness (H1b) [ $F(1, 88) = 1.35, p = 0.249, \text{partial } \eta^2 = 0.01$ ]. Communicated threat, again, had a significant effect on the affective experience [ $F(1, 88) = 4.02, p = 0.048, \text{partial } \eta^2 = 0.05$ ], indicating that the low threat condition generated more positive affect compared to the high threat condition.

Similar to the results for perceived spaciousness, an interaction was obtained between communicated threat and perceived brightness [ $F(1, 86) = 7.30, p = 0.008, \text{partial } \eta^2 = 0.08$ ] (see Figure 2). For the high threat condition, the difference in mean affective experience scores for perceived brightness was significant, with participants experiencing more positive affect in the brighter room [ $F(1,86) = 7.04, p = 0.009, \text{partial } \eta^2 = 0.08$ ]. For the low threat condition, the difference in mean affective experience scores for perceived brightness was not significant [ $F(1, 86) = 1.26, p = 0.264, \text{partial } \eta^2 = 0.01$ ].

To test whether spaciousness perceptions can account for the latter interaction, analyses of covariance (ANCOVA) were conducted. Following the procedure of Baron and Kenny (1986) these analyses should show (in addition to yielding



**Figure 2.** The interaction between brightness and communicated threat for affective experience scores.



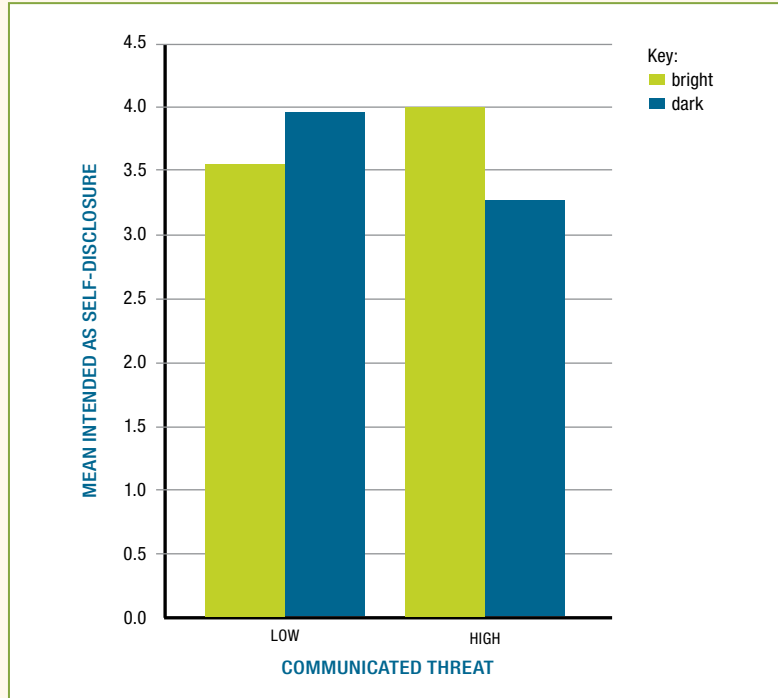
the effects described above) that the interaction effect between the two independent variables (perceived brightness and communicated threat) on the dependent variable (affective experience) should weaken when the mediator (perceived spaciousness) is included as a covariate in an ANCOVA. In addition, the effect of the mediator on the dependent variable should be significant. Analyses following these outlines show that the effect of the perceived brightness  $\times$  communicated threat interaction indeed becomes non-significant [ $F(1, 85) = 3.53, p = 0.064$ , partial  $\eta^2 = 0.04$ ], while the influence of perceived spaciousness is significant [ $F(1, 85) = 24.37, p < 0.001$ , partial  $\eta^2 = 0.22$ ]. In other words, in the high threat condition, the brighter room generated more positive affect *because* participants experience it as being more spacious.

### Intended Self-Disclosure

No main effects were obtained for either room perceived brightness ( $F < 1$ , ns) or communicated threat ( $F < 1$ , ns). However, the interaction between communicated threat and perceived brightness was significant [ $F(1, 86) = 5.45, p = 0.022$ , partial  $\eta^2 = 0.06$ ] (Figure 3). Similar to the interactions above, in the high threat condition, the difference in mean scores for perceived brightness was significant, with participants having a higher intention to self-disclose in the brighter room [ $F(1, 86) = 4.37, p = 0.039$ , partial  $\eta^2 = 0.05$ ]. For the low threat condition, this difference was not significant [ $F(1, 86) = 1.40, p = 0.240$ , partial  $\eta^2 = 0.02$ ].

Again, we tested whether spaciousness perceptions underlie the obtained interaction between perceived brightness and communicated threat. When perceived spaciousness was included in the model, the influence of the perceived bright-

**Figure 3.** The interaction between brightness and communicated threat for intended self-disclosure scores.



ness  $\times$  communicated threat interaction became non-significant [ $F(1, 85) = 2.76$ ;  $p = 0.100$ , partial  $\eta^2 = 0.03$ ], while the influence of perceived spaciousness was significant [ $F(1, 85) = 11.45$ ;  $p = 0.001$ , partial  $\eta^2 = 0.12$ ]. In other words, in the high threat condition, participants disclose more information in the brighter room because they experience more spaciousness.

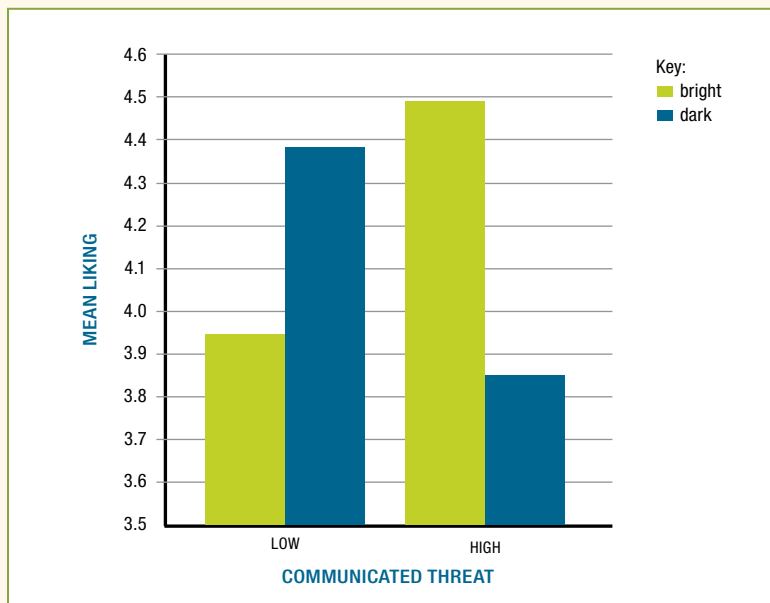
Similar analyses were conducted to test whether the relationship between the perceived brightness  $\times$  communicated threat interaction and intended self-disclosure was mediated by affective experience. However, the mediating effect of this variable was non-significant ( $p = 0.335$ ).

### Liking

No main effects were found for brightness ( $F < 1$ , *ns*) and communicated threat ( $F < 1$ , *ns*). An interaction was obtained between communicated threat and brightness [ $F(1, 86) = 6.42$ ,  $p = 0.013$ , partial  $\eta^2 = 0.07$ ] (Figure 4). For the high threat condition, the difference in mean scores for brightness was significant. With participants judging the physician more positively in the brighter room [ $F(1, 86) = 4.26$ ,  $p = 0.042$ , partial  $\eta^2 = 0.05$ ]. For the low threat condition, this difference was not significant [ $F(1, 86) = 2.26$ ,  $p = 0.136$ , partial  $\eta^2 = 0.03$ ].

This time however, the effect of the brightness  $\times$  communicated threat interaction remained significant [ $F(1, 85) = 4.56$ ;  $p = 0.036$ , partial  $\eta^2 = 0.05$ ] when

**Figure 4.** The interaction between brightness and communicated threat for liking scores.



inserting perceived spaciousness as a covariate, and the influence of perceived spaciousness was non-significant [ $F(1, 85) = 2.62$ ;  $p = 0.110$ , partial  $\eta^2 = 0.03$ ]. This indicates that the relationship between the room brightness  $\times$  communicated threat interaction and physician judgment is *not* mediated by perceived spaciousness.

Whether the affective experience mediated the brightness  $\times$  communicated threat interaction was examined. Insertion of the affective experience as a covariate revealed a significant effect of this mediator [ $F(1, 85) = 6.19$ ;  $p = 0.015$ , partial  $\eta^2 = 0.07$ ]. In addition, the brightness  $\times$  communicated threat interaction became non-significant [ $F(1, 85) = 3.27$ ;  $p = 0.074$ , partial  $\eta^2 = 0.04$ ], indicating that the relationship between room brightness  $\times$  communicated threat and physician judgment is mediated by positive affect. In other words, in the high threat condition, participants judged the physician more positively in the brighter room because they experienced more positive affect.

## Discussion

The results presented first and foremost show that effects of room atmospherics in the healthcare context vary depending on the patient's state of mind; no main effects were obtained for perceived brightness. However, when taking into account communicated threat, a relationship surfaced between perceived brightness and the outcome measures; in a threatening conversation, perceived brightness positively influenced perceptions of freedom, generated more positive affect, and a higher willingness to self-disclose. In a worry-free conversation, participants were unaffected by the brightness manipulation. These combined find-

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*Effects of room atmospherics in the healthcare context vary depending on the patient's state of mind.*

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ings are in line with previous research indicating that people value more space particularly when they perceive the situation as threatening (Albas & Albas, 1989; Dosey & Meisels, 1969; Greene, 1977). In line with this emphasis on people's need for space, results further showed that the interactive effects of perceived brightness and communicated threat on both the affective experience and intended self-disclosure are mediated by perceived spaciousness.

In addition, the results revealed a significant main effect of communicated threat on perceived spaciousness. This finding provides strong evidence for the claim that environmental perception (and related affective and behavioral measures) is very much shaped by psychological circumstances; participants in the high threat condition actually perceived the room as less spacious compared to participants in the low threat condition. This finding suggests that depending on one's mindset, walls that appear at a safe and comforting distance in a joyous, relaxed situation may indeed seem to be "closing in" when threat comes to the fore and anxiety takes over.

In line with reactance theory (e.g., Levav & Zhu, 2009), our results show that a room that comes across as less spacious not only invokes less positive judgments, but also decreases self-disclose intentions. Hence, displaying a lower self-disclose intention can be seen as a form of reactance to a "space invasion." This is in line with results of Albert and Dabbs (1970), who studied the effect of interpersonal distance on attitude change. Their results show that when interpersonal distance decreases, the amount of reactance increases, transpiring in a lowered willingness to accept persuasive messages. Generally, reactance can be expected to surface in a refusal to comply with (implicit) requests, in our study the physician's "request" to self-disclose information that allows for an accurate diagnosis and a fitting treatment or procedure.

Additionally, our results show that room brightness may also steer physician perceptions, a finding in line with previous research (e.g., Campbell, 1979; Maslow & Mintz, 1956; Schiffenbauer & Schiavo, 1976; Teven & Comadena, 1996; Van Rompay & Tanja-Dijkstra, 2010). Specifically, our results show that a brighter room makes the physician come across as more likeable. This relationship was not mediated by perceived spaciousness, but rather by the affective experience. It should be noted however that the mediation analyses presented across the variables by no means rule out additional mediators (especially when taking into account that the interaction terms remained marginally significant

after insertion of the mediator as a covariate). For instance, earlier research suggests that prototypicality plays an important role in determining likeability-outcomes, with physicians displayed in more prototypical offices coming across as more positive (Swan, Richardson, & Hutton, 2003; Ward, Bitner, & Barnes, 1992). Alternatively, brightness may induce competence perceptions, perhaps generating more trust and hence more self-disclosure.

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*A room that comes across as less spacious not only invokes less positive judgments, but also decreases self-disclosure intentions.*

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## Limitations

The main limitation of the current study is that visual displays were used to represent the environments and that participants were not physically “submerged” in an actual setting. However, the use of photographic material in environmental research has been shown to accurately simulate real environments (Bateson & Hui, 1992; Hendrick, Martyniuk, Spencer, & Flynn, 1977; Stamps, 1990). A meta-analysis of research using both measurements obtained in actual environments and measurements obtained through photographic material revealed a 0.86 correlation (Stamps, 1990). Likewise, Okken, van Rompay, and Pruyn (2012, 2013) showed that reactions to limited space did not differ across simulated settings (i.e., photographic material) and actual environments. Of course, in order to enhance applicability of our findings and to allow recommendations on specific brightness levels (i.e., absolute values as opposed to relative differences in brightness levels), follow-up studies are required.

Another point of attention is that in the current study no actual patients participated. Although one can safely assume that the students in our study have experiences visiting a general practitioner or specialist (and can draw on these encounters to imagine themselves in the scenarios described in our study), field studies examining actual behaviors of patients with actual (situation-specific) fears and worries in real environments are needed to further increase knowledge about the influence of environmental factors. Furthermore, although analyses did not reveal age and gender-related differences, it should be noted that participants in our study were all students similar in age, cultural background and education. Hence, our findings do not rule out that differences related to these factors play a role with different, or less homogeneous, target groups. For instance, concerning cultural background, Hofstede and colleagues have extensively documented differences across cultures with respect to variables such as power distance (i.e., the degree to which less powerful members of a society accept and expect that power is distributed unequally) and masculinity–femininity (e.g., Hofstede, Hofstede, & Minkov, 2010). For instance, the masculinity side of the latter dimension represents a preference in society for achievement, and assertiveness and thus reflects the extent to which society at large is competitive. Its opposite, femininity, stands for a preference for cooperation and caring, and this reflects a more consensus-oriented society. Arguably, self-disclosure comes more natural and easy in the latter type of society, similar to how, on an individual level, self-disclosure is sometimes said to come easier for women (Dindia & Allen, 1992).

Furthermore, although the results presented in this paper indicate that relatively small differences in perceived brightness influence both affective experiences and behavioral intentions, no conclusions can be drawn about specific brightness settings (apart from the obvious prediction that extreme values are likely to induce negative effects).

## Conclusions

Our findings show that altering the atmospherics can be used as a tool to improve the affective quality of the environment. In small environments in particular, perceived spaciousness can be increased by increasing room brightness (as our findings suggest). In addition to room brightness, previous research showed that lighting likewise may affect self-disclosure intentions (although the line of reasoning proposed in this paper has not been tested in relation to lighting) (Gifford, 1988). In addition to such atmospheric (non-tangible) variables, research suggests that material aspects of built environments may also affect spaciousness perceptions and can thus be used to improve the spatial ambiance of the environment. For instance, Stamps and Krishan (2006) investigated the influence of wall texture or roughness on perceived spaciousness and showed that spaciousness perceptions differed across (otherwise identical) rooms varying in wall texture. Finally, environmental features such as furniture selection and positioning (i.e., layout) within the room can also affect spaciousness perceptions (e.g., with a greater interpersonal distance as the result of furniture layout enhancing spaciousness impressions and hence self-disclosure intentions).

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Regardless of the environmental factor under discussion, however, it is most important to realize that such effects are very much dependent on the patient's state of mind. It could even be argued that as familiarity and intimacy with a physician increase in the course of a treatment, a more intimate setting might even generate positive effects, as also suggested by research showing that dim lighting may increase self-disclosure (Miwa & Hanyu, 2006). And although effects of perceived brightness were non-significant in the low-threat conversation, the results across the dependent variables (see Figures 1–4) tentatively suggest that patients may prefer a less spacious setting when emotions such as relieve and happiness, rather than anxiety and fear, take over. Arguably then, physicians might benefit from means that allow for flexible adaptation of room atmospherics. For instance, usage of a dimmer switch in consultation rooms could enable the physician to adjust lighting conditions to the type of conversation at hand, using brighter lighting when high anxiety or stress levels can be expected (i.e., first visits, discussing results of medical tests, etc.) and dimmed lighting for low-stress situations.

Based on the observation that such adjustments are particularly called for when patients face worries and anxiety, and that such a state of mind is common in many healthcare environments (e.g., visits to one's physician are usually not stress-free), our findings are particularly relevant in the healthcare context. Their importance is further stressed by research demonstrating that more active participation of patients during interactions with physicians (implying more self-disclosure) improves the effectiveness of medical consultations (Zandbelt, Smet, Oort, Godfried, & Haes, 2007), and that patient satisfaction, adherence and medical outcomes fare well by increased self-disclosure (Harrington, Noble, & Newman, 2004). These combined findings underline the importance of attending to patients' affective needs and creating a soothing environment. Additionally, this type of knowledge can also be put to use in other types of services in

relation to which creating a pleasant (service) environment is considered important. This also follows from research examining effects of spatial density and experienced spaciousness in retail environments, showing that creating open spaces (Haytko & Baker, 2004; van Rompay, Galetzka, Pruyn, & Moreno-Garcia, 2008) may boost shopping satisfaction.

Awaiting future research addressing these and related issues, the findings presented are a first step towards unraveling how environmental and psychological variables conjointly influence affective experiences and related behaviors.

### **Implications for Practice**

- The content of this paper and its results can help designers of healthcare environments become more cognizant of the effects of environmental stimuli on both affective and behavioral responses of patients.
- Based on the observation that fostering spaciousness perceptions is called for especially when patients face worries and anxiety, and that such a state of mind is common when discussing health-related issues, our findings are particularly relevant in the healthcare context.
- The results underline the importance of attending to patients' affective needs and creating a soothing environment.
- The findings presented indicate that—in addition to the physical or architectural dimensions of health settings—relatively subtle and easy-to-incorporate adjustments in atmospheric variables may also impact spaciousness perceptions and hence increase self-disclosure.

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