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Freedom from constraints: Darkness and dim illumination promote creativity

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ABSTRACT

Employee creativity is critical to organizational competitiveness. However, the potential contribution made by the workspace and the physical environment is not fully taken into account because, up to now, it has been rather unclear how aspects of the physical environment, especially light, can support creativity. Consequently, in six studies, the present research investigated the effect of light and darkness on creative performance. We expected that darkness would offer individuals freedom from constraints, enabling a global and explorative processing style, which in turn facilitates creativity. First, four studies demonstrated that both priming darkness and actual dim illumination improved creative performance. The priming studies revealed that the effect can occur outside of people's awareness and independent of differences in visibility. Second, two additional studies tested the underlying mechanism and showed that darkness elicits a feeling of being free from constraints and triggers a risky, explorative processing style. As expected, perceived freedom from constraints mediated the effect of dim illumination on creativity. Third, moderation analyses demonstrated the effects' boundary conditions: the darkness-related increase in creativity disappeared when using a more informal indirect light instead of direct light or when evaluating ideas instead of generating creative ideas. In sum, these results contribute to the understanding of visual atmospheres (i.e. visual messages), their importance for lighting effects, and their impact via conceptual links and attentional tuning. Limitations as well as practical implications for lighting design are discussed.

"Creativity begins in darkness."

Cameron, 1992

1. Introduction

During the last 30 years, research on creativity and innovation has gained increasing interest because knowledge workers' innovativeness largely determines companies' competiveness and survival in a knowledge-based economy (Florida, 2005; Lepak & Snell, 2002). In general, creativity is defined as the production of novel and useful ideas as well as problem solutions and refers both to the process of idea generation and the idea itself (Amabile, 1983; Sternberg, 2006). Driven by the notion that employee creativity fosters organizational productivity, researchers have been striving to identify antecedents of creativity. Today, a considerable amount of research provides a good overview of creativity-supportive personality variables (e.g., Gough, 1979), organizational climates (e.g., Amabile, Conti, Coon, & Lazenby, 1996) and situational factors (e.g., Friedman & Förster, 2001). In contrast, less attention has been paid to the physical work environment and, hence, architecture's and design's potential to contribute to creativity-supportive workspaces (Dul, Ceylan, & Jaspers, 2011).

Nevertheless, some researchers have investigated the impact of the physical environment (e.g., architecture and ambient conditions) on the creative potential attributed to a room and the creative performance in the room. For example, one study showed that offices that have more plants, bright lighting conditions, windows, cooler colors, and a lower structural complexity (Ceylan, Dul, & Aytac, 2008) are perceived to have high instead of low creative potential. Building on this first work, Dul and Ceylan (Dul & Ceylan, 2011; Dul et al., 2011) summarized twelve elements of the physical work environment, which – according to their literature review – should support creativity. The authors also showed that the presence of these physical elements (furniture, natural plants, calming

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colors, inspiring colors, privacy, a view of nature, any window view, quantity of light, daylight, indoor physical climate, positive sound, and positive smell) increased knowledge workers' self-assessed performance. Other studies have investigated how variations of single ambient conditions influence creativity. While room temperature apparently has little impact on creativity (Fang, Wyon, Clausen, & Fanger, 2004; Kawaguchi, Tanabe, Nishihara, Haneda, & Uchida, 2009; Wyon, Andersen, & Lundqvist, 1979), environmental distraction (ambient noise, foot traffic, and visual exposure level) can undermine perceived support for creativity at work (Stokols, Clitheroe, & Zmuidzinas, 2002).

Although different aspects of the illumination (e.g., daylight and amount of light) are bandied about in these lists of creativity-supportive elements (e.g., Dul & Ceylan, 2011; Dul et al., 2011), to our knowledge, no study has tested the influence of different lighting conditions (e.g., high or low illuminance levels) on *creative performance*. Nevertheless, light and darkness are ubiquitous aspects of the physical world and have been shown to have a great influence on humans: The light's tremendous impact, ranging from physiological processes (visual perception, Bruce, Green, & Georgesen, 2003; sleep–wake cycle, Cajochen, 2007) to atmosphere perceptions (e.g., Custers, de Kort, IJsselsteijn, & de Kruiff, 2010), cognition (e.g., Steidle, Werth, & Hanke, 2011), and behavior (e.g., Zhong, Bohns, & Gino, 2010), may well influence individuals' ability to produce creative ideas and solutions. Hence, rather than focusing on the creative potential of a room or a combination of different aspects of the physical environment as was done in previous research (e.g., Dul et al., 2011), the current article focuses on clarifying how light and darkness impact creative performance. In line with Cameron's statement "[c]reativity begins with darkness" (1992), we assume that darkness leads to higher creativity than bright light.

To explain the influence of light and darkness on creative performance, it is important to consider how creative ideas emerge. Ample research has shown that processing information in a global and explorative way helps in finding creative solutions (e.g., Förster & Dannenberg, 2010; Friedman, Fishbach, Förster, & Werth, 2003; Friedman & Förster, 2001). Focusing the attention globally (vs. locally) can facilitate the activation of remote and only weakly associated nodes in memory (Friedman & Förster, 2010; Mednick, 1962). For example, if one thinks about a brick, a global focus will activate more abstract representations (e.g., "portable object" or "red substance"), which then trigger more remote concepts (e.g., "throwing" or "makeup"). In contrast, a local focus only leads to the activation of a few proximal nodes (e.g., "wall"). Hence, global rather than local processing leads to the combination of remote fields, helps seeing the known from a new perspective, and facilitates exploring unconventional ideas, which all supports the generation of new and creative ideas (Cropley, 2006). Although the generation of novel ideas is seen as the core of the creative achievement, in order to increase innovation, the generated ideas and solutions have to be evaluated in the second stage of the innovation process. Evaluation, however, requires a different kind of thinking than idea generation (Cropley, 2006). Here, in order to choose the best idea with the highest potential for successful implementation, it is important to be logical (e.g., see pros and cons), avoid risks, and stick to a narrow range of obviously relevant information that resembles a local and vigilant processing style. Hence, throughout the innovation process, the optimal processing style changes. However, in this paper, we will focus on the core of creativity – the generation of new ideas – and a global and explorative processing style.

Consequently, we strive to determine which lighting conditions can elicit such a creativity-supportive processing style. To answer this question, we draw on light's impact on atmosphere perception (Vogels, 2008) as well as the notion of visual messages (Boyce, 2003) on the one hand and on the link between atmosphere perception and processing style (Friedman & Förster, 2010) on the other hand. Generally, when entering a room, individuals automatically assess their environment and form expectations about what kind of behavior and processing style is appropriate in the situation. The atmosphere and concomitant expectations that certain lighting conditions produce are referred to as the room's visual message (Boyce, 2003). Accordingly, whether individuals adopt a creativity-supportive global and explorative or local, vigilant processing style is determined by their perception of the atmosphere in a certain situation. In a recent review, Friedman and Förster (2010) summarize that benign, safe, and comfortable environments elicit global processing and exploration, because, in this kind of atmosphere, individuals are more eager to take risks. In contrast, threatening and tense environments elicit local processing and vigilance, which helps individuals focus on the problems at hand and find concrete solutions. Other authors have differentiated between a safe and *freeing* atmosphere, which facilitates global processing and taking risks, and a tense and *confining* atmosphere, which induces local processing and heightens risk aversion (Meyers-Levy & Zhu, 2007; Okken, van Rompay, & Pruyn, 2012). Hence, our overall proposition is that, by changing the room's atmosphere (freeing vs. confining), the lighting condition can induce a global and explorative processing style, which in turn improves creative performance. In the following paragraphs, we will summarize previous literature on the effects of bright and dim illumination on the (1) perception of being in a benign freeing or a threatening situation and on the (2) adoption of an explorative and global or a vigilant and local processing style.

First, the brightness of the illumination in a room affects its atmosphere as well as the perceived freedom from constraints. Overall, the majority of studies confirm that dim rooms appear more relaxing and calming than brightly lit rooms (e.g., Manav, 2007; Miwa & Hanyu, 2006). For instance, a field study of illumination in retail shops revealed that the atmosphere in the shops was perceived as cozier, and less tense and detached the dimmer the light was (Custers et al., 2010). Hence, although some studies have yielded mixed effects (Boyce & Cuttle, 1990; Viènot, Durand, & Mahler, 2009), dim rather than bright light creates a cozy and relaxing atmosphere, which is typical for a safe and benign environment. Generally, these safe environments (e.g., being at home) allow people to lower their guard, be themselves, and pay less attention to social norms and constraints. Several studies have suggested that, in the dark or at dim illumination, individuals experience less social control and need for compliance to social norms because their behavior is hidden in the dark. Indeed, darkness induces a sense of being anonymous and unobservable (Zhong et al., 2010) and is assumed to reduce social concern (e.g., Hirsh, Galinsky, & Zhong, 2011). Overall, dim light apparently creates a cozy atmosphere and induces a feeling of being free from social constraints, which, together, create the perception of being in a benign, freeing situation.

Second, presumably due to this perception, dark and dim lighting conditions also increase risky and disinhibited behavior in the form of prosocial and antisocial deviance from norms. Compared to a well lit room, participants in a dim room were more likely to cheat for their own benefit (Zhong et al., 2010) and administered harsher punishments to anonymous learners (Page & Moss, 1976). However, in dim rooms, participants were also more likely to hug and touch unknown persons (Gergen, Gergen, & Barton, 1973) and to disclose private information to someone else (Miwa & Hanyu, 2006). All these behaviors can be seen as risky because people risk being caught committing negative transgressions and subsequently facing punishment. In contrast, self-