



In the spotlight: Brightness increases self-awareness and reflective self-regulation



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ABSTRACT

Impulse and reflection jointly drive people's behavior. However, the impact of the physical environment, especially light and brightness, on reflective and impulsive behavior and the underlying processes have not been understood. We expected that light and brightness would increase self-awareness and, in turn, lead to a reflective and controlled self-regulation. Five studies confirmed our assumptions. Particularly, participants in a brightly lit room reported a higher public self-awareness than those in a dim room. Moreover, brightness triggers more controlled and reflective forms of self-regulation independent of whether lighting conditions (Study 2) or priming methods (Study 3) were used to manipulate brightness. Finally, two additional studies revealed that brightness facilitates the suppression of desires and socially undesirable impulses which signals high self-control. Overall, these results contribute to the understanding of automatic effects of light and brightness and effortless self-control. Limitations as well as practical implications for lighting design in therapeutical settings and retail spaces and are discussed.

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1. Introduction

Eating the cookie or continuing the dietary regime? Cheating to achieve a better result or following the rules of fairness? Hugging and kissing another person or giving a polite handshake? In all these situations and decisions, people can either follow their impulses or show a controlled, reflective behavior. Contemporary dual-system models of self-regulation (e.g., Metcalfe & Mischel, 1999; Smith & DeCoster, 2000; Strack & Deutsch, 2004) state that human behavior is jointly determined by impulse and reflection. Impulses and urges striving for immediate gratification, like smoking, involve automatic and habitual processes, whereas reflective behavior rather represents reasoned action and decision-making based on the effortful consideration of personal standards, attitudes and expectancies. In Plato's mythology, impulse and reflection are symbolized by a dark, tempestuous horse and a bright, temperate, and obedient horse that pull forward the chariot of the human soul. Whether the bright or the dark horse determines the direction depends on dispositional, situational, and environmental factors.

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The environment sends a myriad of signals of what an individual could or should do in a certain situation (Barsalou, 2008; Smith & Semin, 2007). A lot of features of a physical environment (e.g., a chair) function as affordances showing behavioral possibilities. However, a few other stimuli inform people whether it is important to pay attention to how one *should* behave. These environmental cues, such as cameras, eyes, and mirrors, signal that an individual is observed, judged, and evaluated by others or one-self (e.g., Bourrat, Baumard, & McKay, 2011). Generally, environmental cues signaling observation (e.g., a camera) evoke a state of heightened self-awareness in which individuals direct their attention to their own behavior, inner states, and standards and are motivated to bring their actual behavior in line with personal and social standards (Duval & Wicklund, 1972). While some cues present actual observation by others (e.g., eyes), other environmental conditions, especially lighting conditions, change visibility and, consequently, the possibility of being observed. Darkness allows individuals to go undetected, while light makes individuals' behavior visible and observable for others. Accordingly, the expression "being in the spotlight" means that an individual's behavior can be judged and evaluated by others. Hence, "in the spotlight", individuals should be motivated to make a good impression and to act in line with their personal and social standards. Building on the metaphor of the two horses, the bright horse of reflection should determine the direction at bright light, while the dark horse of impulse and passion decides on our way in the dark. Hence, the present paper tested the

assumption that, in contrast to darkness, bright light increases self-awareness and reflective self-regulation. Thus, we aim at contributing to the question how light has shaped the psychological fundamentals of human behavior regulation.

Our argumentation is based on the fact that bright and well-lit environments generally facilitate visual perception and recognition of other individuals and by other individuals. Correspondingly, on a metaphorical level, several expressions related to high social control, attention on self or other's behavior make reference to light and visual perception: "to have an eye on someone", "to bring to light" and "hidden in the dark". From the empirical perspective, several studies have investigated how lighting conditions and other variations of light and darkness change people's feeling of being observed (perceived anonymity) and their self-awareness. First, darkness has been used in several studies to create anonymity (Gergen, Gergen, & Barton, 1973; Page & Moss, 1976; Zhong, Bohns, & Gino, 2010; for an overview see also Kasof, 2002). For example, in a study by Zhong et al. (2010), darkness induced by wearing sunglasses increased participants' subjective feelings of anonymity. Some authors also assumed that darkness induces a state of deindividuation (Gergen et al., 1973; Johnson & Downing, 1979) which represents a state of a reduced awareness of the own identity and reduced accountability. Being anonymous or under deindividuating circumstances, people worry less about their impression on others.

Corresponding to these assumptions and findings, but focusing more on self-regulatory variables, Kasof (2001, 2002) proposed that bright light should increase self-awareness. In support, a study by Gifford (1988) showed that bright light increases the use of self-referential words and self-disclosure which can be interpreted as a sign of heightened self-awareness. Additionally, brightness induces an independent self-construal (definition of self in terms of unique, individual traits; "I") rather than an interdependent self-construal (definition of self in relation to important others; "We"; Steidle, Hanke, & Werth, 2013). Two studies demonstrated that, compared to darkness, brightness was implicitly associated with independent self-construal and promotes a unique and concrete self-description. Together, these findings prompt the idea that light and brightness may increase the sense of one's identity and self. However, these results cannot clarify whether brightness really induces the motivation to make a good impression which is also part of heightened self-awareness and should be most relevant for changes in self-regulation. Nevertheless, it can be summarized that bright light apparently signals potential observation by others which should lead to a heightened state of self-awareness.

Ample research shows that self-awareness changes the way people regulate their behavior (Carver & Scheier, 1998). Particularly, high self-awareness leads to more controlled and reflective ways of self-regulation. We argue that light and brightness as cues for self-awareness have similar effects on self-regulation. Our notion is indirectly supported by related research on preferred lighting levels which shows the bright lighting conditions are favored when performing behaviors requiring self-awareness and self-control. Ample research has shown that many behaviors require self-control, for instance concentrating one's attention to a work task, controlling one's emotion or managing one's social behavior in order to make good impression on other people (Baumeister, Vohs, & Tice, 2007). Interestingly, individuals preferred brighter light for behaviors requiring self-control and a reflective behavior regulation (working, studying, meeting guests) than for behaviors requiring no or little self-control (listening to music, thinking, taking a break, dining with the partner; Kobayashi, Inui, & Nakamura, 2001). The effects remained independent of whether preferences were measured in form of subjective assessments and variations in actual illuminance level. For instance, participants favored an environment with a high mean

illuminance above a 1000 lux while working or meeting with people at their office. These findings are in line with previous research showing that people prefer brighter illumination in public and working contexts (e.g., class room, office) than in private contexts (e.g., family room, bed room; Butler & Biner, 1987) and during interaction with friends (rather close relationship) than with the partner (very close relationship; Biner, Butler, Fischer, & Westergren, 1989). Overall, this preference for bright light when exerting self-control could be interpreted as an indication that individuals believe that bright light may facilitate self-control and, therefore, choose higher lighting levels when engaging in activities requiring self-control.

In addition to this indirect link, other research provides more direct support for our idea of light-induced changes in self-regulation. Several studies using situational variations in actual lighting confirmed that bright lighting reduces disinhibition which can be seen as a sign of a controlled behavior regulation (Gergen et al., 1973; Page & Moss, 1976; Zhong et al., 2010). For example, in a study by Gergen et al. (1973), participants were more likely to touch and hug an anonymous stranger when sitting in dark than in a well-lit room. Moreover, dim lighting improves creativity which profits from unusual, non-conforming ways of thinking (Steidle & Werth, 2013). This effect was mediated by a heightened feeling of freedom from constraints at dim lighting conditions. Another study revealed similar results for situational lighting preferences. Kasof (2002) showed that self-restrained eaters, who preferred eating at dim lighting conditions, were more likely to show bulimic behavior and deviate from normal eating behavior than those who preferred eating at bright lighting conditions. The author proposed that heightened self-awareness should mediate these effects but did not test this idea. Hence, in all studies, bright light reduced impulsive and disinhibited behavior. In sum, this evidence suggests that light and brightness change people's self-regulation.

The current set of studies aimed at clarifying the effect of light and brightness on self-awareness and self-regulation. Overall, we expected that light and brightness lead to higher self-awareness and, in turn, to a more controlled and reflective self-regulation. First, we investigated the effect of lighting conditions on self-awareness. Self-awareness had previously been proposed as the process underlying lighting-related changes in self-control (Kasof, 2002), but had not been tested until now. Second, the effect of brightness on the preference for a reflective and controlled self-regulation was examined in two studies. Brightness was varied situationally by changing the lighting conditions (Study 2) or priming the concept of brightness (Study 3). Lighting conditions were varied so that illuminance remained within the range that is likely to be encountered within office building but would also evoke subjective impression of being bright or dim without necessarily reducing visual performance or triggering photobiological processes. Moreover, using priming methods allows controlling directly for potentially biasing confounds associated with lighting conditions, for example visibility or alertness. We wanted to test whether the brightness-related changes in self-awareness and self-regulation exist independent of visibility, alertness, actual or subjective anonymity, as well as the perception of bright or dim lighting conditions. This independence would indicate a rather intrinsic and automatic association between brightness and self-regulatory processes. Third, focusing on effortful and automatic components of self-control, we wanted to show that brightness-related increases in controlled and reflective self-regulation are not necessarily effortful or depleting, but involve automatic self-control processes. Therefore, two additional studies focus on the automatic suppression of desires (Study 4) and impulses (Study 5).

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