

In the Spotlight: Brightness Increases Self-Awareness and Reflective Self-Regulation

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Introduction

Being in the spotlight means that an individual's behavior can be judged and evaluated by others. These situations 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 standards (Duval & Wicklund, 1972). Environmental cues triggering self-awareness automatically induce a perception of being observed such as eyes, cameras or mirrors (e.g., Bourrat, 2010). Darkness allows individuals to go undetected, while light makes individuals' behavior visible and observable for others. Hence, individuals should be motivated to make a good impression and to act in line with their personal and social standards. The present paper tested the assumption that, in contrast to darkness, bright light increases self-awareness and reflective self-regulation.

First, darkness and dim lighting conditions impair visual perception and recognition of other individuals. This reduced observation of others and by others can increase feelings of anonymity (Hirsh, Galinsky, & Zhong, 2011; Zhong, Bohns, & Gino, 2010) and a state of deindividuation (Gergen, Gergen, & Barton, 1973; Johnson & Downing, 1979) which represents a state of reduced awareness of the own identity and the perception of reduced accountability. Kasof (Kasof, 2001, 2002) proposes that bright light should increase self-awareness. In support, a study by Gifford (1988) shows that bright light increases the use of self-referential words and self-disclosure which can be interpreted as a sign of heightened self-awareness. On a metaphorical level, many 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". In sum, in contrast to darkness, bright light signals potential observation by others which should lead to a heightened state of self-awareness.

Second, high self-awareness reduces disinhibition and leads to more controlled ways of self-regulation (Carver & Scheier, 1998). We argue that light and brightness as cues for self-awareness lead to similar results. Several studies confirm that bright lighting condition reduces disinhibition (Gergen, et al., 1973; Page & Moss, 1976). Kasof (2001, 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. Kasof (2002) argues that heightened self-awareness should mediate these effects. In sum, light and brightness as cues for self-awareness should increase controlled and reflective behavior regulation. In the present studies, we examined the effects of brightness and darkness on self-awareness and behavior regulation.

Study 1: Brightness Increases Self-Awareness

Previous research provides indirect evidence that bright light increases self-awareness (Gifford, 1988; Kasof, 2001, 2002; Zhong, et al., 2010). However, up to date, no study directly tested this effect. We expected that, in contrast to darkness, brightness would heighten self-awareness. High self-awareness can be measured as a subjective experience. In Study 1A, participants answered the following

questionnaires after sitting for one hour in either at 150 lux (dim lighting) or at 1500 lux (bright light) horizontal illuminance on the table: public and private state-self-awareness (Ruisinger, 2003) and perceived anonymity (Zhong, et al., 2010). Participants in the bright room reported a higher public self-awareness ($M = 2.45$; $SD = 1.13$) than participants in the dim room ($M = 2.01$; $SD = 1.09$), $t(105) = 2.07$, $p = .041$, $d = .40$, but there were no differences in private self-awareness or perceived anonymity, $t(105) < 1$, $ps > .75$. Bright light apparently enhances people's concern about their impression on other people around them which supports our assumption that brightness increases self-awareness.

Studies 2-3: Brightness Increases the Preference for Reflective Self-Regulation

Generally, enhanced self-awareness leads to more reflective self-regulation (Carver & Scheier, 1998). Several studies already confirmed that dim room lighting increases impulsive behavior (Gergen, et al., 1973; Zhong, et al., 2010). Hence, we investigated the processes of reflective and impulsive self-regulation on the subjective level. A controlled and reflective regulation is characterized by a high level of self-control. Self-control refers to altering one's responses to bring them in line with socially desirable thoughts, feelings, and behaviors and to overriding impulses (Baumeister, Gilbert, Fiske, & Lindzey, 1998; Carver & Scheier, 1981). We expected that, in contrast to darkness, brightness as trigger of self-awareness would strengthen reflective forms of behavior regulation and self-control.

In Study 2, ambient lighting was set either at 150 lux (dim lighting) or 1500 lux (bright lighting). After one hour exposed to the lighting condition, participants assessed their current preference for an autonomous and a controlled self-regulation strategy (O'Hara & Sternberg, 2001). As expected, in the bright lighting condition, participants preferred a controlled ($M = 5.43$; $SD = .63$) to an autonomous self-regulation strategy ($M = 4.88$; $SD = .82$), $t(32) = -2.95$, $p = .006$, $d = .75$. In contrast, in the dim condition,

participants preferred an autonomous ($M = 5.28$; $SD = .85$) to a controlled self-regulation strategy, ($M = 4.81$; $SD = .90$), $t(33) = 2.32$, $p = .027$, $d = .55$. This pattern of results is in line with our assumption that brightness activates a more controlled and reflective style of self-regulation.

In Study 3, brightness (darkness) was manipulated using a word search task with words related to darkness (brightness). Participants then invented a story about two persons depicted on a picture and assessed their two characters regarding a reflective or impulsive self-regulation (impulsive-reflective; spontaneous-planned; emotional-rational). Participants primed with brightness assessed the behavior of the characters in their study as more reflective and less impulsive ($M = 3.09$; $SD = .65$) than participants primed with darkness, ($M = 2.62$; $SD = 0.70$), $t(62) = 2.77$, $p = .007$, $d = .70$. This shows that priming brightness facilitates the attribution of a reflective self-regulation which is in line with our assumption that brightness fosters this kind of self-regulation. In sum, the results of the two studies suggest that, compared to darkness, bright light or brightness priming both increase the preference for reflective self-regulation at a subjective and conscious level.

Studies 4-5: Brightness Increases Reflective Self-Regulation at the Implicit Level

However, Fitzsimmons and Bargh (2004) point out the importance of automatic and non-conscious processes underlying effective self-regulation, for instance, automatic goal priming or automatic goal pursuit. Hence, we investigated reflective and impulsive self-control at the implicit level. We expected that, in contrast to darkness, brightness would strengthen implicit self-control by increasing the availability of duties rather than personal wishes and by implicitly reducing impulses.

In Study 4, brightness (darkness) was manipulated by wearing clear glasses or sun glasses (Zhong, et al., 2010). Participants were asked to recall their current duties and

wishes (adapted from Willis & Rodriguez Bailon, 2010). The prevalence of personal wishes over duties (pleasure orientation) was computed by deducting the number of duties from the number of personal wishes. A high score signals a less controlled self-regulation. Participants primed with brightness had lower pleasure orientation ($M = .95$; $SD = 1.96$) than participants primed with darkness ($M = 2.50$; $SD = 2.26$), $t(37) = 2.62$, $p = .013$, $d = .73$. This is in line with our assumption that brightness increases self-control and reflective self-regulation.

In Study 5, brightness (darkness) was manipulated by writing about a dark (bright) location. Participants were smokers who have a chronically increased impulse to smoke and non-smokers who have no smoking impulse. After the priming, participants completed an Approach-Avoidance-IAT to assess their implicit impulse to smoking-related cues (De Houwer, Custers, & De Clercq, 2006). A negative IAT-score is typical for non-smokers and indicates an impulse to avoid smoke-related cues. Craving or a high smoking impulse is represented by a more positive IAT-score (Waters, et al., 2007). Smokers generally possess this impulse although they know that smoking is unhealthy and that it would be better to quit. Hence, a reduced smoking impulse among smokers would be a sign of a less impulse and more controlled self-regulation. We expected that in the dark condition the smoking impulse would be stronger for smokers than for nonsmokers, but that there would be no difference in the smoking impulse between smokers and nonsmokers in the bright condition. Overall, smoker had less negative IAT-score than nonsmokers, $F(1, 211) = 1.37$, $p = .03$, $\eta_p^2 = .02$. As expected, this main effect was moderated by priming condition, $F(1, 211) = 6.64$, $p = .01$, $\eta_p^2 = .03$ (no main effect of priming, $F(1, 211) = .60$, $p = .44$). In the dark condition, smokers had a less negative IAT-score ($M = -.17$; $SD = .51$) than nonsmokers ($M = -.57$; $SD = .51$), $t(116) = 3.47$, $p = .001$, $d = .78$, which signals that nonsmokers automatically avoid smoke-related cues more than smokers. This

difference disappears in the bright condition: smokers did not show a weaker avoidance score ($M = -.46$; $SD = .68$) than nonsmokers ($M = -.42$; $SD = .53$), $t(95) = -.29$, $p = .77$. Hence, priming brightness apparently fosters the generally weak impulse of smokers to avoid smoking-related stimuli. Moreover, after brightness priming the automatic avoidance reaction of smokers is comparable to the reaction of nonsmokers. This supports our assumption that brightness leads to a more reflective self-regulation.

The presents finding show that, compared to darkness, brightness reduces the prevalence of personal wishes over duties and weakens the automatic smoking impulse in smokers. In sum, this supports our assumption that brightness increases reflective self-regulation and self-control on the implicit level.

Discussion

The present paper investigated the effect of brightness and darkness on self-awareness, reflective behavior regulation, and self-control. In Study 1, brightness increased the focus on and availability of the self in form of heightened public self-awareness. It is well-known that self-awareness increases self-control and a reflective form of behavior regulation (Carver & Scheier, 1998; Carver & Scheier, 1981). Hence, we assumed that brightness as a cue for self-awareness would also promote controlled behavior. Four studies supported this assumption on explicit (2 and 3) and implicit measures (4 and 5). This adds to previous research regarding the inhibiting effects of bright light on behavior (Gergen, et al., 1973; Page & Moss, 1976; Zhong, et al., 2010). Taken together, brightness and darkness change self-awareness and controlled behavior at implicit and explicit levels regardless of whether darkness and brightness were perceptually manipulated or primed.

Previous research argued that anonymity and reduced accountability caused the disinhibited behavior in the dark (Page & Moss, 1976; Zhong, et al., 2010). Recently, Hirsh and his colleagues argued (Hirsh, et al., 2011) that darkness should decrease the

activity of the Behavior Inhibition System (BIS) which in turn should reduce disinhibition. The present findings confirm this assumption by showing that, in contrast to darkness, brightness increased the salience of desirability concerns (heightened public self-awareness) and focus on reflective and less impulsive self-regulation. Moreover, the framework suggested by Hirsh (Hirsh, et al., 2011) assumes that brightness and darkness would affect the reflective BIS but not the more impulsive Behavior Activation System (BAS). Our studies 2-4 suggest that brightness not only strengthens inhibitory forces but can also change variables which are rather part of the BAS than the BIS, for instance, smoking impulse. Hence, it would be interesting for future research to explore the multiple implicit and explicit ways by which brightness and darkness influence our view on our self and our self-regulation.

An important implication of the current research is that brightness and darkness - both as perceptual experience and as conceptual priming - affect self-regulation at implicit and explicit levels. These results posit the questions of how brightness and darkness are represented in memory, how it unfolds its influence on an implicit level, and how it contributes to the grounding of behavior regulation. Further research embedded in grounded cognition approaches (Barsalou, 2008) are needed to answer the questions.

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