



Energy behaviors at the office: An intervention study on the use of equipment



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HIGHLIGHTS

- Two behavioral intervention programs in an office setting were tested.
- The interventions aimed at changing energy behaviors (use of printers, computers and lighting).
- Employees in the experimental conditions perceived to have changed more than the control group.
- All conditions show a decrease in electricity consumption.

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ABSTRACT

The study tests two behavioral intervention programs that were aimed at changing energy-related behaviors in an office setting. Participants were 93 office employees in three different departments of a construction company. Each department was randomly assigned to a four-week intervention to one of the following three conditions: control, intervention program or intervention program with group identity salience. The first intervention condition consisted of goal-setting, feedback, information and prompts. The second condition was identical to the first, with an additional group-identity manipulation. Three different types of data were collected: consumption of electricity and paper, pre-and post-questionnaires and weekly observations. The results show that the employees in the two experimental conditions perceived themselves to have changed their behaviors more than the control group. This is supported by the observational data for the intervention program, but could not be shown in the measures of energy consumption, which showed a decrease for all three departments. The implications of these results are discussed.

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1. Introduction

Saving energy is an important task for society. Much of the world's electricity consumption relies on fossil fuels [1], thereby contributing to greenhouse gas emissions. In fact, according to the International Energy Agency, it has been estimated that fossil fuels will continue to constitute about 83% of the world's energy consumption, while our total energy consumption will be increasing 1.8% per year [2]. Apart from electricity, a wide range of other energy consumption behaviors contributes to both emissions and the scarcity of resources (e.g. paper and packaging). In order to reduce the total amount of energy consumed, economic and technological changes seem necessary. However, political decision

makers often circumvent taxation, and even if economic incentives increase, behavioral change is still needed. Technological changes are also necessary, but they depend on investments and many also include human interaction. Thus, behavioral change is, and will continue to be, important for both households and organizations, in order to reduce energy use. Psychologists and behavioral scientists play a pivotal role in finding ways to do this [3].

Numerous psychological and behavioral studies have already been designed in order to reduce individuals' energy consumption, and with relative success (see e.g. [4,5]). These studies have almost exclusively been aimed at private households, however ([6–9]). For a long time, despite their importance, behavior within organizations remained relatively unexplored [8,10,11]. However, recently case studies in the US show how the influence of occupant behavior in office buildings can be a major factor of importance for energy savings together with more technical aspects [12].

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While the cumulative energy consumption of private households constitutes a sizable proportion of a society's total energy use, organizations appear to account for almost twice that energy consumption [8].

In fact, it has been suggested that organizations and their employees are one of the largest users of the world's energy resources [11,13–16]. Needless to say, most of this energy is related to the production of goods and services in society; but it has also been suggested that the day-to-day energy consumption of “general employees” constitutes a sizeable share of our total energy consumption, and that finding ways of reducing this may be a very fruitful venture [9,17]. The research in this area is very scant, however [9]. To the extent that research has focused on employees' energy-use behavior, this has typically been from a technological [17,18] or organizational [11], rather than from an individual [10,19] level of analysis. While it has been suggested that behavioral changes can be just as effective as technological changes [8], we still do not know the extent to which changes at individual level can make a difference.

The general aim of this study is to test the effects of two different intervention programs on employees' conservation behaviors and overall energy consumption. The ample and relatively successful research into energy consumption within households [5] serves as our launching pad. That being said, there are a number of possible limitations in transferring insights from a household setting to an office setting. For the few studies on energy consumption within organizations that have been conducted, it has proven to be far more difficult to achieve results commensurable with those in households (see e.g. [7,11]).

It has been suggested that an important reason for the less impressive results are due to so-called principle-agent problems [8]. For example, there are seldom any personal incentives for a general member within an organization to reduce his or her energy consumption (cf. [15,17,20]). Nor does the member typically have any knowledge of the organization's total consumption, or how behavioral changes by a single individual would affect it [8,17]. Furthermore, since employees often share appliances, each individual may feel that the problem is “out of their hands”, and thus feel less inclined to feel responsibility for engaging in energy conserving behavior [17]. The same is true if employees perceive the energy saving interventions as being in conflict with their own work, somehow preventing them from doing their job [9]. Thus, despite the many similarities between the household and the office setting, there are also important differences.

This problem has been noted by previous researchers, who have called for further research into organizational settings; and specifically the extent to which previous research on household energy consumption can be generalized and used to influence energy consumption within organizations and office settings [11,16]).

Consequently, we need to both take into account and test interventions previously found to be effective in households, and also to be wary of the differences in office settings and ready to identify new angles of approach. A possible opportunity lies in how people within office settings come together in a social, rather than a private domain; a fact that has also been pointed out by previous researchers [8,17,21]; cf. [9,15]). We may therefore look to the power of appealing to group identity in order to strengthen social norms and influence behavior (cf. [15]; [9]). When using a group identity approach in these types of interventions, an important potential drawback to note is that this may aggravate pre-existing tensions between groups [22]. It is essential that the intervention does not polarize different groups as in-groups and out-groups [23]. Therefore, although enhancing group identity is facilitated

by comparison with other groups, this should be avoided, at least when comparing departments within an organization.

It should also be pointed out that both economic and environmental motives might influence organizations to reduce their energy consumption. Thus, in contrast to the traditional view that organizations must be willing to forego profits through higher costs, or a less efficient workforce, in order to act pro-environmentally [9], recent research suggests that these goals are often fully compatible [8]. With rising electricity prices, engaging in energy conserving behavior can reduce the organizations' costs and provide them with a competitive edge; and there is much evidence to suggest that business leaders look to such solutions [11]).

Furthermore, as more and more people become aware of the threat of global warming and climate change, a growing customer constituency looks to companies with a pro-environmental image [11,24]. Thus, engaging in energy reducing behavior can provide the company with such an image, which may lead to more business and higher revenues.

From previous research it seems clear that combining several intervention techniques [5] increases the likelihood of behavioral change. From these studies, the following four intervention techniques appear to be an efficient combination: goal-setting, feedback, information and prompts.

Goal-setting is based on the idea that individual behavior is goal directed and that the anticipation of attaining a goal has a motivating effect. The goals ought to be high, yet realistic, to be effective [25]. Goal-setting has also proved to be particularly effective when combined with feedback [5].

Feedback consists of providing people with information about some given performance they have undertaken. The notion behind this technique is that feedback influences behavior, since it offers insight into the links between certain outcomes, as well as the behavior changes necessary to reach those outcomes [26]. In most feedback intervention studies (see [5]) feedback contains information about the energy consumption of the households in terms of energy units and/or monetary values. A distinction is made between continuous feedback, in most cases using a monitor or display showing the current consumption, and daily, weekly or monthly feedback, where participants are given information via e-mail or the Internet. Studies using non-continuous feedback generally show positive, but quite weak, effects on energy consumption [5]. For continuous feedback, most studies find a significant reduction of energy use [5,27].

Information is probably the most straightforward intervention technique. It is based on the assumption that if people do not have sufficient understanding of how to achieve a certain objective, they will be less motivated to change their behavior. Thus, the intervention is used to eliminate this barrier by providing individuals with sufficient understanding of how the objective in question can be achieved [28]. It has been found that the information alone tends to result in higher knowledge levels, but not necessarily in changes of behavior or reduced energy consumption [5].

The function of prompts, and prompting, is to offer a reminder, and possibly encouragement, to change one's behavior. Not surprisingly, this has been found to be most effective when it comes to non-complex behaviors, and when it is well-placed and well-timed [29].

The present study combines and packages these intervention techniques into an intervention program. Additionally, we appeal to group identity, in order to strengthen social norms and influence behavior. Several studies in household settings suggest that social norms can be a powerful tool in affecting people's behaviors [30]. Given the social nature of life within an organization, there is reason to believe that making the group identity more salient can be particularly useful in an office setting.

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