

GUILT AS A MEDIATOR OF ENERGY-SAVING BEHAVIOR?

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Abstract

This study investigates how social referents and disapproval emojis impact energy saving behaviors in the context of digital energy alerts. 300 adult consumers participated in the study. The research examines emotional responses and behavioral intentions upon receiving a digital alert indicating excessive personal energy consumption, tested across six experimental conditions. Participants were asked socio-demographics questions, and we measured their numeracy level. We also asked them about their environmental values using the New Environmental Paradigm. Participants were also asked to rate their self-reported emotions related to the received digital alert, and two behavioral intention measures: whether they intended to increase, keep at the same level, or decrease their energy consumption (Decision task) and to estimate the expected percentage of changed consumption rate (Estimate task). The 6 experimental conditions resulted from a 3x2 factorial design where it was manipulated the absence or presence of a Social Referent (neighbor or friend) and the absence or presence of a disapproving Emoji. The study not only measured self-reported emotions but also recorded skin conductance to deepen insight into emotional arousal. Results of the mediation analysis indicated that Social Referent and Emojis increased guilt which in turn impacted participants' intentions to reduce energy consumption (indirect effect). While our findings confirm that guilt significantly mediates the effect of these social and emotional cues, skin conductance response revealed a mild autonomic activation. The presence of a disapproval Emoji combined with the knowledge of a neighbor's or friend's lower consumption heightened guilt feelings, which in turn influenced sustainable behavioral intentions. These findings highlight the importance of emotional triggering cues in behavioral change strategies and the potential of such psychosocial factors in environmental conservation efforts.

Keywords: *Social referent, guilt, emoji, SGR, energy-saving behavior.*

1. Introduction and objectives

Understanding the psychological mechanism behind energy-saving behaviours is crucial for designing effective interventions. Previous research has highlighted the role of social norms and feedback in shaping sustainable behaviours, yet little attention has been given to the emotional processes involved (for a recent discussion, see Dorigoni and Bonini, 2025). This study investigates how guilt mediates the influence of social referents and disapproving emojis in digital energy alerts, offering new insights into the role of emotional triggers in behavioural change.

The aim of the study is not to test the effect of injunctive social norms on energy-reduction behavior which is well established in literature. Rather, the aim is to test whether the expected typical effect of the "Social Referent" (e.g., information about the neighbor or friend's lower energy-consumption level) and the "disapproving Emoji" (e.g., a frowny face) on energy-saving behavior is mediated by the guilt felt by the participant for the reported personal excessive energy consumption.

If the effects of the Social Referent and Emoji experimental manipulations on energy-saving behavior are due to a guilt avoidance mechanism, then a statistically significant indirect effect of guilt on these behaviours should be found in a mediation analysis. Other previous studies supported this hypothesis (McCarty, 2024; Jacobson et al., 2021).

We used two types of Social Referent. In one case, participants were informed about the lower consumption level of the neighbours. In the other case, they were informed about the lower consumption level of a friend.

In sum, from our hypothesized mediation model, we predict that the presence of a Social Referent or a disapproving Emoji would make the participant feel guiltier, which in turn would favour sustainable behaviours (e.g., the decision to reduce energy-consumption and its planned amount). Thus, a statistically significant indirect effect of guilt on sustainable behaviours should be reported in a mediation analysis.

2. Methods

Three-hundred adult consumers participated to the study, and were individually tested. They were first asked about a few socio-demographics questions. The Electrodermal Activity (EDA) of participants was recorded during all the experimental session by the Biopac GSR-100C EDA amplifier.

Participants first read on a monitor PC a general scenario that was identical for all 6 experimental conditions. The scenario asked them to imagine having downloaded an app on their mobile phone that reads their instantaneous energy power consumption from a smart meter and allows them to get immediate feedback on their current electricity consumption. Then, they were presented with the information related to their current energy consumption (“energy-alert”). In all 6 conditions, the energy alert reported an hourly electricity consumption of 1.5 kwh, which amounts to 0.54 €/hour. This information was orthogonally presented across the 6 experimental conditions resulting from the 3x2 experimental factorial between-subjects design. Namely, factor “Social Referent” (absent vs. neighbour vs. friend) and Factor “Emoji” (absent vs. present). The energy-alert was presented for 20 seconds. When the energy-alert exposure ended, participants had to complete the PANAS scale to measure their feelings (included the “guilty” scale) related to their excessive energy consumption. After that, behavioural intention measures were recorded following the methodology by Graffeo and colleagues (2015). Namely, they were asked whether they intended to increase, keep at the same level, or decrease their energy consumption (Decision task) and to estimate the expected percentage of changed consumption rate (Estimate task). The 300 participants were randomly and equally distributed across the 6 experimental conditions.

After the experimental session ended, we measured participants numeracy and their environmental values by respectively the Lipkus’ scale and the Dunlap and Liere’s New Environmental Paradigm scale (NEP).

3. Results and discussion

50% of participants were female. Their mean NEP value was 3.8. The percentage of participants who correctly responded to the numeracy test was the following: 41% (0-6 correct answers out of 8), 28% (7 correct answers out of 8), and 31% (8 correct answers out of 8). The age of participants was roughly equally distributed across three intervals: 30% (21-28 yrs.), 35% (29-44 yrs.) and 35% (over 44 yrs.).

Our hypothesized mediation model predicts that the presence (vs. absence) of a Social Referent (neighbour or friend) and the presence (vs. absence) of a disapproving Emoji would make the participant feel guiltier (Path A) which in turn would favour (Path B) intended sustainable behaviours (e.g., the decision and the amount of intended energy-consumption reduction). Thus, a statistically significant indirect effect of guilt on both sustainable behaviours (Path A by Path B) should be found.

To test the indirect effect of guilt on sustainable behaviours we ran a simple mediation analysis by using Hayes PROCESS SPSS macro (Version 4.2, Model 4). We run six simple mediations analyses. Three analyses related to the decision to decrease the energy-consumption (“Decision task”. Factors: Neighbour, Friend and Emoji), and three analyses related to the estimated amount of energy consumption decrease (“Estimate task”. Factors: Neighbour, Friend and Emoji). The indirect effect found in three analyses for the Decision task are reported below.

Neighbour: The indirect effect of Neighbor to Decision was tested by a bootstrapping analysis. The indirect effect (I.E.=.441) was statistically significant: 95% C.I. (.180, .813). As predicted, the Social Referent neighbor caused the participant to feel guiltier, which in turn favored the decision to reduce energy-consumption. A direct effect of Neighbor on Decision was also reported (Path C’). This finding suggests that the effect of Neighbor on the decision to reduce energy consumption is only partially mediated by guilt, and that Neighbor has some additional effect on Decision that is not mediated by guilt.

Friend: The indirect effect of Friend to Decision was tested by a bootstrapping analysis. The indirect effect (I.E.=.263) was statistically significant: 95% C.I. (.022, .560). As predicted, the Social Referent Friend caused the participant to feel guiltier which in turn favored the decision to reduce energy-consumption. No statistical direct effect of Friend on Decision is reported (Path C’). This finding suggests that the effect of Friend on the decision to reduce energy-consumption is fully mediated by guilt.

Emoji: The indirect effect of Emoji on Decision was tested by a bootstrapping analysis. The indirect effect (I.E.=.270) was statistically significant: 95% C.I. (.052, .557). As expected, the presence of the Emoji caused the participant to feel guiltier which in turn favored the decision to reduce energy consumption. No statistical direct effect of Emoji on Decision is reported (Path C'). This finding suggests that the effect of Emoji on the decision to reduce energy-consumption is fully mediated by guilt.

The indirect effect found in three analyses for the Estimate task are reported below.

Neighbour: The indirect effect of Neighbor to Estimate was tested by a bootstrapping analysis. The indirect effect (I.E.=-2.044) was statistically significant: 95% C.I. (-3.595, -.727). As predicted, the referent Neighbor caused the participant to feel guiltier which in turn increased the estimated amount of energy-consumption reduction. No statistical direct effect of Neighbor on Estimate is reported (Path C'). This finding suggests that the effect of Neighbor on Estimate is fully mediated by guilt.

Friend: The indirect effect of Friend to Estimate was tested by a bootstrapping analysis. The indirect effect (I.E.=-1.218) was statistically significant: 95% C.I. (-2.453, -.053). As predicted, the Social Referent Friend caused the participant to feel guiltier which in turn increased the estimated amount of energy-consumption reduction. No statistical direct effect of Friend on Estimate is reported (Path C'). This finding suggests that the effect of Friend on the Estimate is fully mediated by guilt.

Emoji: The indirect effect of Emoji to Estimate was tested by a bootstrapping analysis. The indirect effect (I.E.=-1.10) was statistically significant: 95% C.I. (-2.305, -.174). As predicted, the Emoji caused the participant to feel guiltier which in turn favored a greater intended reduction of energy consumption. No statistical direct effect of Emoji on Estimate is reported (Path C'). This finding suggests that the effect of Emoji on Estimate is fully mediated by guilt.

As predicted, in all six mediation analyses an indirect effect of guilt on intended sustainable behaviours (both for the Decision and Estimate tasks) was found. Said differently, the presence of the Social Referent (Neighbour or Friend) and the Emoji made the participant feel guiltier (Path A) which in turn favoured the decision to reduce energy-consumption, and its estimated amount (Path B). The result is congruent with the hypothesized guilt-avoidance mechanism (see, for example, Jacobson et al., 2021 and McCarty, 2024).

These findings have theoretical implications, particularly in understanding how abstract concepts like environmental conservation can be internalized through emotions like guilt. The study anchors itself in the broader psychological discourse, where emotions are increasingly acknowledged as catalysts for behavioural change.

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